



## **W1000Xd1 Series**

**COMPACT MACHINING CENTER SPEEDIO**

# **INSTALLATION MANUAL (For Installers & Machine Setup Specialists)**

Please read this manual carefully before operating the machine.  
Be careful not to lose the manuals, and keep them handy at all times.



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# **SAFETY MANUAL**

**Please read this safety manual carefully  
before starting operation.**

**Brother Industries, Ltd.**

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# What is the Safety Manual?

## Please read

The Safety Manual should be read by all personnel involved in the installation, operation, setup, machining and maintenance of this machine. The Safety Manual refers to all people involved in any way with this product as "Users".

## Purpose

This product consists of components such as high-voltage electronic circuits, high-speed rotating tools, and a table and ATC magazine which operate with tremendous force. The machine is equipped with a variety of safety functions, but there is a strong possibility that accidents involving serious injury may occur if the machine is not handled correctly.

The purpose of this Safety Manual is to protect users from hazards associated with this product. As a result, the Safety Manual provides a description of warnings and instructions.

Warning: Warns the user of the type of danger

Safety directions to avoid danger: Tells the user what to do to avoid that danger

## Safety Manual Content and Use with Other Manuals

A safety manual is included in all instruction manuals (excluding the programming manuals) that are specific to each worker or operator.

Read the Operation Manual to learn more about the machine functions or operation procedures.

### 1. Operation Manual (For general operators)

Safety Manual

Door Interlock Function

Operation Manual (How to operate the machine necessary for basic operations)

Japanese	English	German	French	Chinese
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Part code:	69A783001	69A784001	69A901001	69A902001	69A785001
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### 2. Operation Manual

Safety Manual

Door Interlock Function

Operation Manual (Machine operation procedures required for setup and machining)

Japanese	English	Chinese
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(Operation1)	Part code: 69A773001	69A774001	69A775001
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(Operation2)	Part code: 69A778001	69A779001	69A780001
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(Data)	Part code: 69A788001	69A789001	69A790001
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### 3. Installation Manual

Safety Manual

Door Interlock Function

Installation Manual (Installing and assembly procedure for the machine and options)

Japanese	English	Chinese
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Part code: 69A768001	69A769001	69A770001
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### 4. Programming Manual

Programming Manual (Procedure for creating machining programs)

Japanese	English	Chinese
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(Conversation)	Part code: 69A793001	69A794001	69A795001
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(NC)	Part code: 69A798001	69A799001	69A800001
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### 5. Instruction Manual DVD

DVD contains the Instruction Manual data for this product

Japanese, English and Chinese

Part code: 6D0462001

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## **Safety Labels**

There are particularly important notes and items in the Safety Manual that are affixed to the machine as safety labels. A description of each safety label can be found at the end of the Safety Manual. If any of the safety labels on the machine are pealing off or worn out, get a replacement label and re-affix it.

## **Language**

The Safety Manual and safety labels for machines shipped domestically are in Japanese. Depending on the country, the manual and labels are available in 6 different languages (English, German, French, Chinese, Portuguese and Korean) for machines shipped internationally. Request a manual and labels in a language that is understood by operators and staff. Contact the dealer where the machine was purchased for support in other languages.

## **How to Obtain a Safety Manual and Safety Labels**

Contact the dealer where the machine was purchased if you have lost your Safety Manual or safety labels. If you can't find a dealer, use the information below to contact the dealer nearest you.

1-5, Kitajizoyama, Noda-cho, Kariya-shi, Aichi-ken, 448-0803, Japan.

BROTHER INDUSTRIES, LTD.

Phone +81-566-95-0075

Fax +81-566-25-3721

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## **Handling Your Safety Manual**

Be careful not to lose your Safety Manual and always make sure that it is available and on hand. In addition, if the owner of the machine changes, please give the manual to the new owner along with the machine.

### **Hazard Level**

The hazard level is classified into three categories depending upon the level of damage that may occur when warnings are not observed.

1. DANGER

#### **⚠ DANGER**

If no safe or preventive action is taken, the current situation will almost certainly result in death or serious injury.

2. WARNING

#### **⚠ WARNING**

If no safe or preventive action is taken, the current situation may result in death or serious injury.

3. Caution

#### **⚠ CAUTION**

If no safe or preventive action is taken, the current situation may result in a minor or moderate injury.

### **Order of Explanation**

An explanation of the dangers and warnings are provided in the following order.

1. Keyword (danger, warning or caution ) and pictograph which express the hazard level.
2. Potential damage or injury(inherent risk)
3. Safety directions to avoid danger( SAFETY INSTRUCTIONS)

## Pictograph Meaning

The warnings and instructions in the safety labels and Safety Manual use pictographs to warn the user of the intuitive dangers and to provide the user with safety directions to avoid those dangers. The section here shows the pictographs and their meanings.

### 1. Danger



Slippery



Objects Shoot Out



Risk of Falling



Flammable



Keep Hands Clear



Uneven Surface



Electric Shock Risk



Beware of Moving Parts



Burn Hazard



Inhalation Hazard



Keep Clear of Movings Parts



Rotating Tool



Moving Blade



Objects Shoot Out



Falling Objects



Vertical axis drops down

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## 2. Safety Directions to Avoid Danger



Ear Protection Required



Gloves Required



Safety Boots Required



Hard Hats Required



Goggles Required



Disconnect Power Plug



Connect Ground



Task Requires 2 People



Prohibited Act



Do Not Disassemble



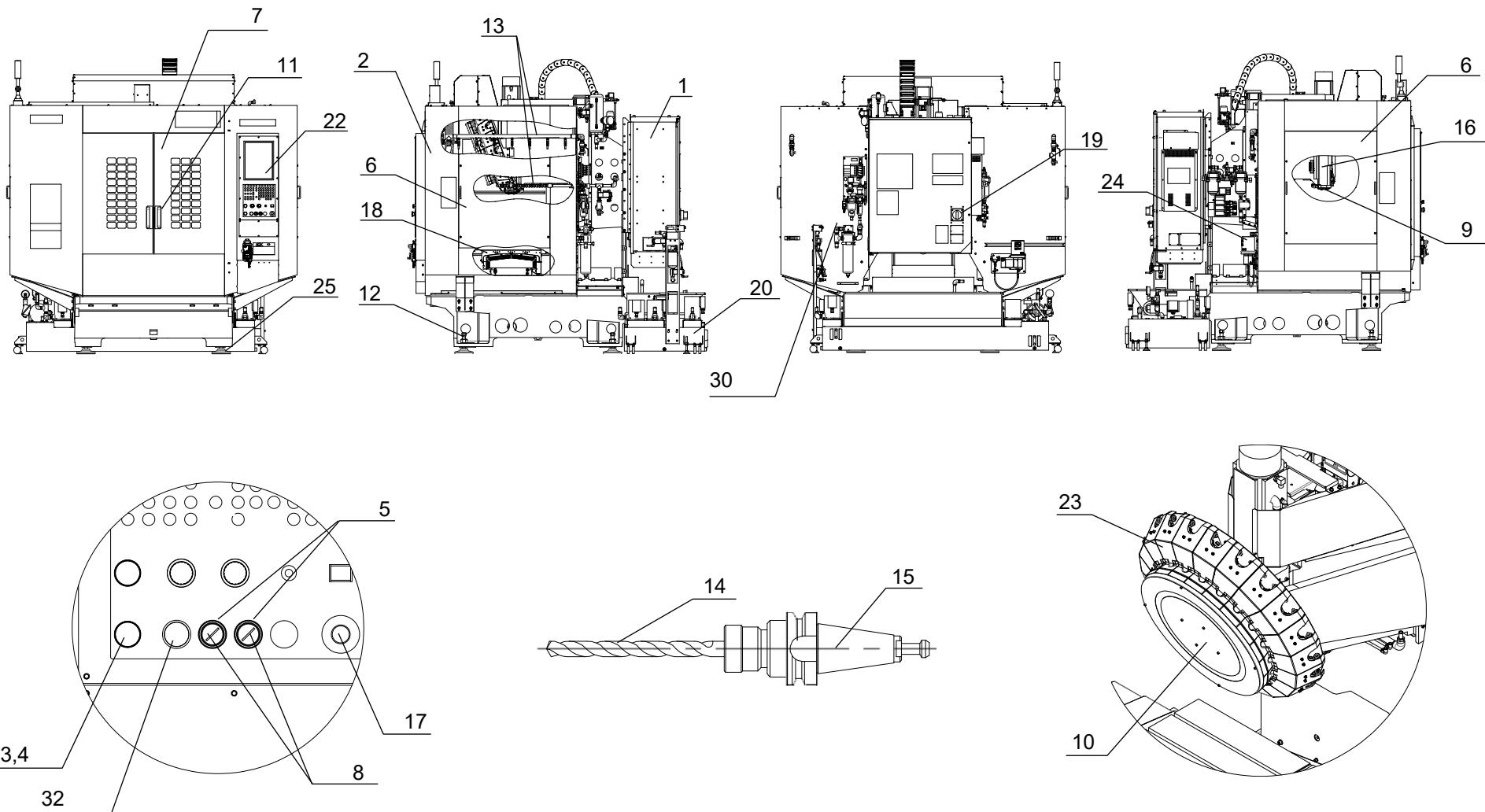
No Gloves



Do Not Touch



Keep Off



21, 26, 27, 28, 29, 31 \*

The numbers noted on the left are not functions for this product.

No.	各部の名称 日本語	Part names English	部件名称 中文
1	制御箱	control box	控制箱
2	機械カバー	machine cover	机械外罩
3	〔フィードホールド〕スイッチ	[FEED HOLD] switch	〔暂停〕开关
4	フィードホールドランプ	feed hold lamp	进给保持指示灯
5	〔ドアインターロックモード〕スイッチ	[DOOR INTERLOCK MODE] switch	〔操作门连锁模式〕开关
6	メンテナンスカバー	maintenance cover	维修罩盖
7	正面扉	front door	正门
8	〔ドアインターロックモード〕スイッチの鍵	key for [DOOR INTERLOCK MODE] switch	〔操作门连锁模式〕开关钥匙
9	スピンドル	spindle	主轴
10	ATC マガジン	ATC magazine	ATC 刀库
11	取っ手	handle	把手
12	レベリングボルト	leveling bolt	水平调节螺栓
13	クーラントノズル	coolant nozzle	冷却液喷嘴
14	工具	tool	刀具
15	工具ホルダ	tool holder	刀具夹
16	スピンドルヘッド	spindle head	主轴头
17	非常停止スイッチ	emergency stop switch	紧急停止开关
18	テーブル	table	工作台
19	主電源ブレーカ	main power breaker	主电源开关
20	クーラントタンク/チップコンベア	coolant tank /chip conveyor	冷却液罐/排屑器
21	側面扉	side door	侧门
22	操作パネル(操作箱)	operation panel (Operations box)	操作板(操作箱)
23	グリップカバー	grip cover	夹钳套
24	自動間欠給油ポンプ	automatic intermittent lubricating unit	自动间歇加油泵
25	レベリングプレート	Leveling plate	调平板
26	内扉	inner door	内门
27	右側面扉	right door	右侧门
28	ツールポット	tool pot	刀具刀槽
29	ポットシャッター	pot shutter	刀槽关闭器
30	レギュレータ	regulator	调节器
31	コイルコンベア	chip auger	螺旋排屑机
32	イネーブルスイッチ	enable switch	使能开关

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# Warnings & Safety Directions to Avoid Danger

Numbers inside the parentheses or brackets, such as (1) and (2), correspond to the numbers for their respective part names.

## **⚠ DANGER (For General Operators)**



OD1 If oil-based coolants are used during cutting, the cutting area may become hot and sparks may be generated.  
(SAFETY INSTRUCTIONS)

Do not use oil-based coolants when there is no fire alarm box, fire extinguishing equipment or exhaust system installed.  
An operator must always monitor the machine while cutting is in progress.

## **⚠ DANGER (For General Operators, Installers & Machine Setup Specialists)**



D1 Using inappropriate water-soluble coolants on combustible metals (for example, magnesium, titanium or aluminum) can produce hydrogen, and when it ignites, it can lead to an explosion and fire.  
(SAFETY INSTRUCTIONS)

Use coolant for machining combustible metals or an oil-based coolant.  
When machining combustible metals, carry out a risk assessment and implement any safety measures that are needed.

## **⚠ DANGER (For Installers & Machine Setup Specialists)**

The following warnings and precautions are for installers and machine setup specialists.  
These warnings and precautions are not for work performed by operators.



ID1 If oil-based coolants are used during cutting, the cutting area may become hot and sparks may be generated.  
(SAFETY INSTRUCTIONS)

If there is no fire alarm box, fire extinguishing equipment or exhaust system installed and the machine is filled with an oil-based coolant, do not operate the machine and notify the supervisor.  
When using oil-based coolants, a fire alarm box, fire extinguishing equipment and exhaust equipment must be set up.  
An operator must always monitor the machine while cutting is in progress.

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## ⚠ WARNING (For General Operators)



- OW1 If any modifications are carried out, such as disabling the limit switch for the door interlock, the safety devices may stop operating. Therefore, the machine may operate even when a door (7) (21) (26) (27) is open, and you may get caught or drawn into the machine.

(SAFETY INSTRUCTIONS)

Do not perform any unauthorized modifications on the safety devices.

Do not secure the safety devices in such a way that will prevent them from operating.

If an operator finds an unauthorized modification on the machine, they should notify the supervisor immediately, without operating the machine.



- OW2 If a machine with an inner door (26) is used without locking that inner door (26), then the door could open up during operation and objects could shoot out causing injury.

(SAFETY INSTRUCTIONS)

If the inner door (26) is open or if the inner door (26) is not locked, do not operate the machine and notify the supervisor immediately.

If there is an inner door (26), do not open the inner door (26) while the axis in the machining room is operating.



- OW3 Disassembling the machine and modifying parts may compromise the safety.

(SAFETY INSTRUCTIONS)

Do not disassemble the machine and/or modify any parts.



- OW4 If the door interlock mode is set to machine setup or service mode, the machine will operate even when a door (7) (21) (26) (27) is open, and you may get caught or drawn into the machine.

(SAFETY INSTRUCTIONS)

Do not operate the machine while the door interlock mode is set to machine setup or service mode.

The operator must check that the door interlock mode is set to automatic operation before operating the machine.

The operator must inform the supervisor if the key for the [DOOR INTERLOCK MODE] switch (5) is attached.

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## **⚠ WARNING (For General Operators)**



**OW5** If the maintenance cover (6) is removed, coolant coming from inside the machine when it is operating may get into your eyes, or the tools (14) or workpieces may shoot out causing injury.

**(SAFETY INSTRUCTIONS)**

The operator should check to make sure that the maintenance cover (6) is properly attached before turning ON the power.

If the maintenance cover is not attached or not attached properly, do not operate the machine and notify the supervisor immediately.

The supervisor must attach the maintenance cover (6).



**OW6** There are movable parts inside the machine such as the spindle head (16) and table (18), and your body may get caught on them if you go inside the machine.

**(SAFETY INSTRUCTIONS)**

Do not go inside the machine.

The operator should visually check to make sure that there is nobody inside the machine before starting the machine.

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## **⚠ WARNING (For General Operators, Installers & Machine Setup Specialists)**



**W1** If the emergency stop switch (17) does not activate, an emergency stop may be unavailable on the machine.

(SAFETY INSTRUCTIONS)

Check the emergency stop switch (17) operation before starting machine operation.  
If the emergency stop switch (17) is damaged or does not function, it should be replaced.

Do not place or hang any objects on the emergency stop switch.



**W2** If a workpiece is not properly attached, it could come off during machining and shoot out from the machine, striking personnel and causing injury.

(SAFETY INSTRUCTIONS)

Workpieces should be securely attached.  
Do not rotate the lathe spindle on the machine when the workpiece is not securely fixed.



**W3** If a workpiece made of explosive material is machined, it may cause an explosion.

(SAFETY INSTRUCTIONS)

Do not machine a workpiece made of explosive material.



**W4** If an air blower or similar equipment is used to remove chips or shavings, they may shoot out and get into your eyes.

(SAFETY INSTRUCTIONS)

Chips or shavings should not be blown off the machine using an air blower or similar equipment.



**W5** Working in noisy conditions can cause hearing loss.

(SAFETY INSTRUCTIONS)

Always be sure to wear ear plugs when working in noisy conditions.

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## **⚠ WARNING (For General Operators, Installers & Machine Setup Specialists)**



**W6** Touching the tool, chips, shavings or workpieces immediately after machining may lead to a burn injury due to the heat generated from cutting.

(SAFETY INSTRUCTIONS)

Do not use your hand to directly touch parts that generate or emit heat.



**W7** If an error occurs on the pneumatic control device, the worker may get caught in or wedged by the tool pot (28) and pot shutter (29), causing injury.

(SAFETY INSTRUCTIONS)

Do not put your hand on or near movable parts for the tool pot (28) and the pot shutter (29) at the ATC standby position.

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## **⚠ WARNING (For Installers & Machine Setup Specialists)**

The following warnings and precautions are for installers and machine setup specialists.  
These warnings and precautions are not for work performed by operators.



- IW1 If you put any parts of your body inside the machine while the maintenance cover (6) has been removed for setup or maintenance work, you may get caught or drawn into the machine if the machine is operated by mistake.

**(SAFETY INSTRUCTIONS)**

Do not put any part of your body inside the machine while it is operating.  
Turn OFF the main power breaker (19) before removing the maintenance cover (6).  
Attach a padlock to the main power breaker (19) so that the power cannot be turned ON.  
A sign or notice should be placed near the operation panel (22) of the machine to warn others that work is in progress.



- IW2 High-voltage components are present inside the control box (1). There is risk of electric shock if you touch these components by mistake.

**(SAFETY INSTRUCTIONS)**

Maintenance and inspection of electrical components must only be carried out by a qualified electrician who is trained in electrical safety and who has thorough knowledge of the electronic circuits in this machine.  
Turn OFF the main power breaker (19), and then wait at least 20 minutes before carrying out work.  
Attach a padlock to the main power breaker (19) so that the power cannot be turned ON.  
A sign or notice should be placed near the operation panel (22) to warn others that work is in progress.  
If leaving the machine unattended, close the control box (1) and secure it with screws.



- IW3 If the power supply is not grounded, there is risk of electric shock because the leakage current breaker will not operate.

**(SAFETY INSTRUCTIONS)**

Connect the ground according to the specified method.  
The PE line for the power line is longer than the other lines (L1, L2 and L3), and therefore, all of the slack should be taken up when the line is connected.

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## **⚠ WARNING (For Installers & Machine Setup Specialists)**

The following warnings and precautions are for installers and machine setup specialists.  
These warnings and precautions are not for work performed by operators.



- IW4      If the control box (1) or operation panel (22) is touched accidentally with wet hands while performing installation or maintenance, an electric shock or short-circuit may cause a fire.

(SAFETY INSTRUCTIONS)

Do not touch the control box (1) and the operation panel (22) with wet hands.  
The cover to the control box (1) must be closed while the machine is operating.  
The control box (1) and the operation panel (22) must be kept free of coolant, water, chips and shavings.



- IW5      If terminal connections on the PCBs or terminal block screws become loose, poor contacts may cause overheating or a fire.

(SAFETY INSTRUCTIONS)

There should be no loose screws when connecting the wiring.  
Do not replace fuses and electrical parts that have been soldered to the inside of the unit.



- IW6      If the thermal settings are changed, the protection equipment may not operate and may cause a fire.

(SAFETY INSTRUCTIONS)

The installer must check the setting values of the protection unit.



- IW7      If the machine is moved while the cables are still connected, an open circuit may cause electric shock.

(SAFETY INSTRUCTIONS)

The installer must disconnect all cables from the main machine unit, the coolant tank (20), the chip conveyor (20) and the peripheral equipment before moving the machine.

The installer must disconnect all primary cables from the main machine unit before moving the machine.

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## **⚠ WARNING (For Installers & Machine Setup Specialists)**

The following warnings and precautions are for installers and machine setup specialists.  
These warnings and precautions are not for work performed by operators.



- IW8      If you touch cables which have been crushed or damaged by heavy objects, there is risk of electric shock.  
In addition, short-circuits may occur if cables are crushed or damaged by heavy objects.  
**(SAFETY INSTRUCTIONS)**  
Cables should be gathered up or arranged to prevent them from being crushed. If a cable has become damaged, it must be replaced with a new one.



- IW9      If you climb onto the machine, you may fall down.  
**(SAFETY INSTRUCTIONS)**  
Do not climb onto the machine.



- IW10     When lifting or performing leveling work during machine setup, the machine may overturn or the jack may become loose, and a person may become trapped by the machine.  
**(SAFETY INSTRUCTIONS)**  
Only use a forklift that can bear the full weight of the machine with forks long enough to lift the machine up securely.  
The machine should be set up on a stable, level surface.  
Attach fixing brackets for transport when moving the machine.  
The installer should perform leveling work on the floor, and should use tools to perform adjustments and should never place his or her hands underneath the machine.  
The installer should use a jack at the center-front part of the machine's base.



- IW11     When replacing parts or disconnecting hoses from the coolant equipment, the coolant may shoot out and injure your eyes.  
**(SAFETY INSTRUCTIONS)**  
Always be sure to wear protective goggles.  
Purge all remaining pressure before carrying out such work.  
Handle the hoses carefully so that they are not subjected to any impacts.  
If coolant gets into your eyes, rinse with clean water and then seek medical advice.

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## **⚠ WARNING (For Installers & Machine Setup Specialists)**

The following warnings and precautions are for installers and machine setup specialists.  
These warnings and precautions are not for work performed by operators.



- IW12      High-pressure air escaping from damaged sections of air hoses or from valves while setup or maintenance work is being carried out may cause injury to your eyes or ears.

(SAFETY INSTRUCTIONS)

Always be sure to wear protective goggles.

Always be sure to wear ear plugs.

Connecting and changing over air hoses containing high-pressure air must only be performed by a qualified technician who has been trained in handling high-pressure air with thorough knowledge of this machine.

Always be sure to disconnect the pressure source and reduce the pressure before connecting high-pressure air hoses.



- IW13      If the machine is used in conditions where coolant mist may be generated and there is no mist collector present or the mist collector performance is poor, the coolant mist may be inhaled and have adverse effects on your health.

(SAFETY INSTRUCTIONS)

Check the safety data sheet (SDS) for the coolant being used, and adopt the required safety measures.

When using the CTS device or if there is coolant mist, always be sure to use a mist collector with sufficient extraction capacity.

Clean the filter for the mist collector regularly.



- IW14      Do not climb onto the machine or other nearby equipment when performing installation or maintenance, otherwise you may fall down and injure yourself.

(SAFETY INSTRUCTIONS)

Do not climb onto the machine or nearby equipment.

Use a step or step-ladder to provide a secure foot hold when the working position or conditions are awkward or out of reach.

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## **WARNING (For Installers & Machine Setup Specialists)**

The following warnings and precautions are for installers and machine setup specialists.  
These warnings and precautions are not for work performed by operators.



- IW15 There are pneumatic drive devices (28) (29) inside the machine, and your body may get caught on them if you go inside the machine.  
**(SAFETY INSTRUCTIONS)**

The operator should visually check to make sure that there is nobody inside the machine before connecting the primary pressure source.

When working close to the pneumatic drive devices (28) (29), use the pressure adjustment knob on the air source regulator (30) to set the pressure to zero, and attach the cover to the regulator (30).

Turn OFF the primary pressure source.

A sign or notice should be placed near the regulator (30) on the machine to warn others that work is in progress.



- IW16 If the machine is set up without taking into account the clearance when the table (18) rotates relative to the jig, etc., a partition, etc., may interfere with the jig. As a result, the jig may break off and shoot out causing injury.  
**(SAFETY INSTRUCTIONS)**

The operator should check visually to make sure that the maintenance cover (6) is attached before turning ON the power.

The operator must inform the supervisor if the maintenance cover (6) is not attached. The supervisor must attach the maintenance cover (6).

Take the necessary precautions even when the maintenance cover (6) is attached, because dangerous situations, such as an explosion caused by combustible materials, cannot always be prevented.



- IW17 If the machine cover (2) or the middle partition is modified, coolant coming from inside the machine when it is operating may shoot out and get into your eyes, or the tools (14) or workpieces may shoot out causing injury.  
**(SAFETY INSTRUCTIONS)**

Do not modify the machine cover (2) or the middle partition.

If modifications are necessary, contact Brother Industries to obtain written approval before proceeding.



- IW18 Your hand may get drawn into the machine if you put it into the discharge port on the conveyor while the chips or shavings are cleaned during automatic operation.  
**(SAFETY INSTRUCTIONS)**

A chip bucket with a high edge on at least 3 sides must be set up at the bottom of the chip discharge port for the chip conveyor (20).

The chip conveyor (20) must be stopped first before replacing the chip bucket. Mark the floor (black/yellow safety tape) so that others can identify the setup location of the chip bucket.

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## **⚠ WARNING (For Installers & Machine Setup Specialists)**

The following warnings and precautions are for installers and machine setup specialists.  
These warnings and precautions are not for work performed by operators.



IW19 Your hand may get drawn into the machine if you put it into the chip feed port on the chip conveyor (20) or chip auger (31).

(SAFETY INSTRUCTIONS)

Do not put your hand inside the chip feed port on the conveyor when the power is turned ON.



IW20 When the machine is equipped with the lathe machining function and the ceiling cover is removed, tools or workpieces may shoot out from inside the machine during operation causing injury.

(SAFETY INSTRUCTIONS)

The installer should visually check to make sure that the ceiling cover is securely attached before turning ON the power.

The supervisor must ensure that the ceiling cover is attached.



IW21 Your hand may get drawn into the machine if you put it into the discharge port on the chip auger.

(SAFETY INSTRUCTIONS)

Do not put your hand inside the discharge port on the conveyor (or auger) when the power is turned ON.

During automatic operation, keep the discharge port covered on the chip conveyor (and other conveyors) and ensure there are no gaps so that a worker cannot insert his/her hand.



IW22 If any modifications are carried out, such as disabling the limit switch for the door interlock, the safety devices may stop operating. Therefore, the machine may operate even when a door (7) (21) (26) (27) is open, and you may get caught or drawn into the machine.

(SAFETY INSTRUCTIONS)

Do not perform any unauthorized modifications on the safety devices.

Do not secure the safety devices in such a way that will prevent them from operating.

If any operator finds that an unauthorized modification on the machine, they should notify the supervisor immediately, without operating the machine.

If modifications are necessary, contact Brother Industries to obtain written approval before proceeding.

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## **⚠ WARNING (For Installers & Machine Setup Specialists)**

The following warnings and precautions are for installers and machine setup specialists.  
These warnings and precautions are not for work performed by operators.



- IW23      If a machine with an inner door (26) is used without locking that inner door (26), then the door could open up during operation and objects could shoot out causing injury.

(SAFETY INSTRUCTIONS)

If there is an inner door (26), lock the inner door (26) with the key before using the machine.  
Always lock the doors after installation and maintenance work.  
If there is an inner door (26), do not open the inner door (26) while the axis in the machining room is operating.



- IW24      There is risk of compromising the safety when disassembling and modifying parts which are not described in the manual.

(SAFETY INSTRUCTIONS)

Do not disassemble or modify parts which are not described in the manual.



- IW25      If the door interlock mode is set to machine setup or service mode, the machine will operate even when a door (7) (21) (26) (27) is open, and you may get caught or drawn into the machine.

(SAFETY INSTRUCTIONS)

The installer or setup personnel must never leave the machine unattended while the door interlock mode is set to machine setup or service mode.  
The key (8) for the [DOOR INTERLOCK MODE] switch should be kept by the supervisor.



- IW26      If the maintenance cover (6) is removed, coolant coming from inside the machine when it is operating may get into your eyes, or the tools (14) or workpieces may shoot out causing injury.

(SAFETY INSTRUCTIONS)

All operators should check to make sure that the maintenance cover (6) is properly attached before turning ON the power.  
Attach the maintenance cover after the installation or maintenance work is complete.  
The supervisor must attach the maintenance cover (6).

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## **⚠ WARNING (For Installers & Machine Setup Specialists)**

The following warnings and precautions are for installers and machine setup specialists.  
These warnings and precautions are not for work performed by operators.



- IW27      There are movable parts inside the machine such as the spindle head (16) and table (18), and your body may get caught on them if you go inside the machine.  
(SAFETY INSTRUCTIONS)

Do not go inside the machine.

When a worker must unavoidably go inside the machine, always notify the supervisor. After removing the maintenance cover, use a fixing bracket (for transport) to secure the door and/or use a bolt to keep the door open, so as to avoid being trapped inside.

If you go inside the machine, turn OFF the main power breaker (19), and then attach a padlock to the main power breaker (19) so that the power cannot be turned ON. The operator should visually check to make sure that there is nobody inside the machine before starting the machine.

A sign or notice should be placed near the operation panel (22) to warn others that work is in progress.



- IW28      If an unbalanced tool is attached or if the tool (14) limits are not followed, the tool or another part may shoot out from inside the machine and strike personnel causing injury.  
(SAFETY INSTRUCTIONS)

Read the tool labels and follow the instruction manual to ensure compliance with the tool (14) limits.

Check that the tips are securely attached before installing the tool (14).

---

## ⚠ CAUTION (For General Operators)



OC1 There is a risk that a worker may trip over the machine, or nearby equipment, or slip on coolant and fall down.

(SAFETY INSTRUCTIONS)

Protective equipment such as safety footwear and helmets must be worn while working.

The area around the machine must be organized, tidy and clean before performing work.

If there is any excess length or slack in the cable or air tubing, inform the supervisor.

## ⚠ CAUTION (For General Operators, Installers & Machine Setup Specialists)



C1 When opening and closing a door (7), (21), (26) or (27), do not insert your fingers into the space between the door panels or between the door and the machine cover (2). Otherwise, your fingers may get caught causing injury.

(SAFETY INSTRUCTIONS)

Always be sure to hold the handle (11) when opening and closing a door (7), (21), (26) or (27).

If you insert your fingers in between a door (7), (21), (26) or (27) and the machine cover (2), they may get caught causing injury.



C2 The coolant may shoot out and injure your eyes while work is being carried out.

(SAFETY INSTRUCTIONS)

Always be sure to wear protective goggles.

If coolant gets into eyes, rinse with clean water and then seek medical advice.

---

## **⚠ CAUTION (For Installers & Machine Setup Specialists)**

The following warnings and precautions are for installers and machine setup specialists.  
These warnings and precautions are not for work performed by operators.



- IC1** Keep away from moving or rotating parts in the machine during operation, otherwise you may get caught or drawn into the machine causing injury.  
**(SAFETY INSTRUCTIONS)**
- Do not put your hand or any part of your body inside the machine while it is operating.  
Do not operate the machine while touching any moving or rotating parts.  
Wear tight-fitting clothing. Long hair should be tucked away securely underneath caps.  
Do not wear leather gloves except when performing setup work while the machine is stopped.  
Do not wear accessories.  
Do not modify the safety devices. Do not secure the safety devices in such a way that will prevent them from operating.  
If modifications are necessary, contact Brother Industries to obtain written approval before proceeding.  
If an operator finds that the machine has been modified, they should notify a supervisor immediately, without operating the machine.  
If there is an inner door (26), lock the inner door (26) with the key before using the machine.  
If there is an inner door (26), do not open the inner door (26) nor the side door (21) while the axis in the machining room is operating.



- IC2** If the enable device is used to operate the machine while part of your body is inside the machine, you may get caught on moving parts in the machine causing injury.  
**(SAFETY INSTRUCTIONS)**
- When opening a door and using the enable device to operate the machine, pay attention to the moving parts and do not put any part of your body inside of the machine.  
The operator should visually check to make sure that there is nobody inside the machine before starting the machine.  
A sign or notice should be placed around the machine to warn others that work is in progress.



- IC3** Touching the control box (1) or operations box (22) during installation or maintenance work may lead to a burn injury due to the machine heating up.  
**(SAFETY INSTRUCTIONS)**
- Wait 20 minutes after turning OFF the main power breaker (19) before touching parts inside the control box (1) or operations box (22).

---

## **⚠ CAUTION (For Installers & Machine Setup Specialists)**

The following warnings and precautions are for installers and machine setup specialists.  
These warnings and precautions are not for work performed by operators.



- IC4 Touching the motor immediately after operation when performing installation or maintenance work may lead to a burn injury due to the machine heating up.  
(SAFETY INSTRUCTIONS)  
Wait 30 minutes after operation before touching parts that generate or emit heat.



- IC5 If using a three wire type sensor for power supply lines, an open circuit or short-circuit may cause a fire.  
(SAFETY INSTRUCTIONS)  
Installers should always use two wire type sensors instead of three wire type sensors. If the installer must use a three wire type sensor, overcurrent protection must be set up by adding a separate fuse or similar device on the power supply line.



- IC6 If it is dark inside the machine, you may cut your hand on the jig or the tool (14).  
(SAFETY INSTRUCTIONS)  
If the illumination on the tip of the tool (17) is less than 500 lux, a light should be placed inside the machine.



- IC7 Do not touch chips or shavings directly with your hands when cleaning them away. Otherwise, you may injure yourself by cutting your hand on the chips or shavings.  
(SAFETY INSTRUCTIONS)  
Do not touch the chips, shavings or workpieces directly without wearing gloves. Wear leather gloves and use a brush when cleaning away the chips or shavings. Ask for assistance when carrying heavy objects, such as the chip receiver.



- IC8 If this warning is not heeded, personnel may accidentally bump into the machine or nearby equipment, while setup and maintenance work is being carried out, and cause injury.  
(SAFETY INSTRUCTIONS)  
Protective equipment such as safety footwear and helmets must be worn while working.  
A sign or notice should be placed near the operation panel (22) to warn others that work is in progress.

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## **⚠ CAUTION (For Installers & Machine Setup Specialists)**

The following warnings and precautions are for installers and machine setup specialists.  
These warnings and precautions are not for work performed by operators.



**IC9** When carrying heavy objects, be careful not to drop anything on your feet, strain your back or lose your balance and fall over.

(SAFETY INSTRUCTIONS)

Protective equipment such as safety footwear and helmets must be worn when working.

Ask for assistance when carrying heavy objects.



**IC10** Touching the rotary joint may lead to a burn injury due to it heating up.

(SAFETY INSTRUCTIONS)

Wait at least 1 hour after machine operation has stopped before touching the rotary joint directly with your hands.



**IC11** If you stand on the chip conveyor (20) or the coolant tank (20), you may slip or trip on the pumps and fall down.

(SAFETY INSTRUCTIONS)

Take the necessary precautions to avoid the equipment from overturning if performing work while standing on the chip conveyor (20) or the coolant tank (20).



**IC12** There is a risk that a worker may trip over the machine, or nearby equipment, or slip on coolant and fall down.

(SAFETY INSTRUCTIONS)

Protective equipment such as safety footwear and helmets must be worn while working.

The area around the machine must be organized, tidy and clean before performing work.

Any excess length in the cable or air tubing should be removed so that there is no slack.

If cables are running along the floor, they must be covered.

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## **⚠ CAUTION (For Installers & Machine Setup Specialists)**

The following warnings and precautions are for installers and machine setup specialists.  
These warnings and precautions are not for work performed by operators.



- IC13 When replacing the setup equipment and the tool (14), the blade of the tool (14) or other parts may cut your hands.  
(SAFETY INSTRUCTIONS)
- Do not hold the tool (14) by the blade.
  - Wear leather gloves and hold the tool holder (15) with both hands.
  - Do not insert your fingers in between the tool pots (28).
  - Do not insert your fingers in between the tool (14) or the tool holder (15) and the ATC magazine (10).
  - Wear leather gloves when working near the tool (14).
  - Use a step or step-ladder to provide a secure foot hold when the working position or conditions are awkward or out of reach.

---

# Precautions Related to Machine Tool Fires

Always read before use.

## 1. Usage Precautions

### 1-1 Coolants

We recommend using water-soluble coolant in order to prevent fires from igniting and/or spreading.

The burning or combustion conditions and fire extinguishing method varies depending on the machining materials and coolant types. Therefore, be sure to check the safety data sheet (SDS) issued by the material manufacturer and coolant manufacturer, and use the appropriate coolant.

#### 1-1-1 Machining combustible materials

This machine does not come standard equipped with an automatic fire extinguishing and exhaust system. We recommend installing an automatic fire extinguishing system when machining combustible materials.

There is danger of an explosion and fire when using water-soluble coolants while machining particularly with combustible metals (for example, magnesium, titanium or aluminum) because they can produce hydrogen and ignite. Therefore, use metalworking or oil-based coolants.

Be sure to use a special mist collector when machining combustible materials. If an appropriate mist collector is not used, a fire or explosion may occur.

#### 1-1-2 Oil-based coolants

This machine does not come standard equipped with an automatic fire extinguishing and exhaust system. When using an oil-based coolant, perform the following countermeasures because there is a heightened risk of a fire.

- When using an oil-based coolant, select types with a high flash point and supply coolant at a sufficient flow rate on the cutting positions.
- When the oil-based coolant has a high viscosity, replace the pump with a large capacity one to ensure the appropriate discharge volume.
- Install a mist collector in order to remove mist which can lead to a fire. When installing a mist collector, include the following measures.
  - Be sure to run the mist collector piping route so that no fluid collects or remains in the piping. In addition, connect the mist collector and piping components to the protection circuit to provide static electricity protection.
  - Install the exhaust duct on the machine at a position so it does not suck in chips, shavings and/or other fluids.
  - Use a fire damper and/or similar device to prevent any potential fire from spreading to the exhaust outlet.
  - Use a butterfly valve or similar device to prevent the discharge of fire retardant.
- Install an automatic fire extinguishing system that can quickly extinguish a fire in the event that one breaks out.
- When installing a centralized exhaust device, include the following measures.
  - Use a fire damper and/or similar device to prevent any potential fire from spreading to the exhaust outlet.
  - Use a butterfly valve or similar device to prevent the discharge of fire retardant.
- Oil-based coolant cannot be used on the CTS.

Make sure foreign materials do not mix with the oil-based coolant (such as cleaning agents and protective products for machines, cleaning agents and solvents for workpieces and lubricants that are unknown) in order to maintain the coolant's integrity and characteristics and prevent a fire from igniting.

- 
- 1-2 Dry machining and MQL machining support  
This machine does not come standard equipped with an automatic fire extinguishing system.  
There is an increased danger of an explosion when chips, shavings or fine particles have built up and dry machining with combustible metals (for example, magnesium, titanium or aluminum). Therefore, install an automatic fire extinguishing system. In addition, do not use compressed air to avoid scattering the chips or shavings.  
Stop machining if the chips or shavings build up or if the exhaust appears adversely affected.
  - 1-3 Support during machining  
Do not let the machine operate unattended.  
Regularly monitor the machine for normal operation during machining. In addition, to be prepared in the event of a fire, we recommend installing an automatic fire extinguishing system on the machine unit and on peripheral devices when necessary. Assuming that there may be circumstances in which a fire cannot be extinguished, install a fire detection and alarm system at the location where the machine is installed.
  - 1-4 Cutting conditions  
When machining under cutting conditions that lead to an excessive load on the machine, the chips or shavings become hot and can cause a fire. Machine using cutting conditions that are appropriate for the workpiece and tool combination. In addition, we recommend replacing the tools regularly in order to maintain the appropriate cutting conditions.
  - 1-5 NC program check  
Avoid programming which uses tool path instructions that cause interference, or which use continuous operation or cutting instructions that lead to an excessive load on the machine and thus result in overheating or a fire. In addition, execute a dry run before starting the program, and make sure that there are no problems before machining in order to avoid overloads or interference caused by program errors or the wrong tool offset amount.  
Furthermore, use tool life management in the program for optimum tool use, because tool wear or breakage can prevent the cutting conditions from being met and thus cause an overload.
  - 1-6 Machine setup check  
Be sure to check the machine setup carefully. If you fail to check the machine setup, there is risk of the spindle and workpieces colliding or an overload may occur, which can lead to overheating and/or a fire. Be sure to check and manage the protruding length of the tool and the tool diameter. In addition, make sure that the attachment position of the workpiece, the selected jig and the clamp position of the workpiece match the NC program.
  - 1-7 Tool breakage and abnormal wear support  
If the tool breaks or if the tool teeth suffer abnormal wear, the load on the teeth increases and the teeth overheat, and it may generate sparks on the teeth. Therefore, the tool life must be managed. In addition, we recommend installing a tool breakage detector.
  - 1-8 Chip and shaving removal support  
When the chips or shavings build up inside the machine, clean up the chips or shavings right away otherwise it can lead to a fire. In addition, when using coolant, adjust the direction of the nozzles so it hits the machining points. When managing and disposing of the ejected chips or shavings, be sure to process them appropriately.
  - 1-9 Refilling the coolant  
When the coolant supply is weak, the coolant may not reach and hit the machining points sufficiently and therefore lead to a fire. Clean the inside of the tank regularly and check the coolant level inside the tank in order to ensure a stable coolant supply. In addition, inspect the discharge volume from the nozzle on a daily basis.

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#### 1-10 General notes

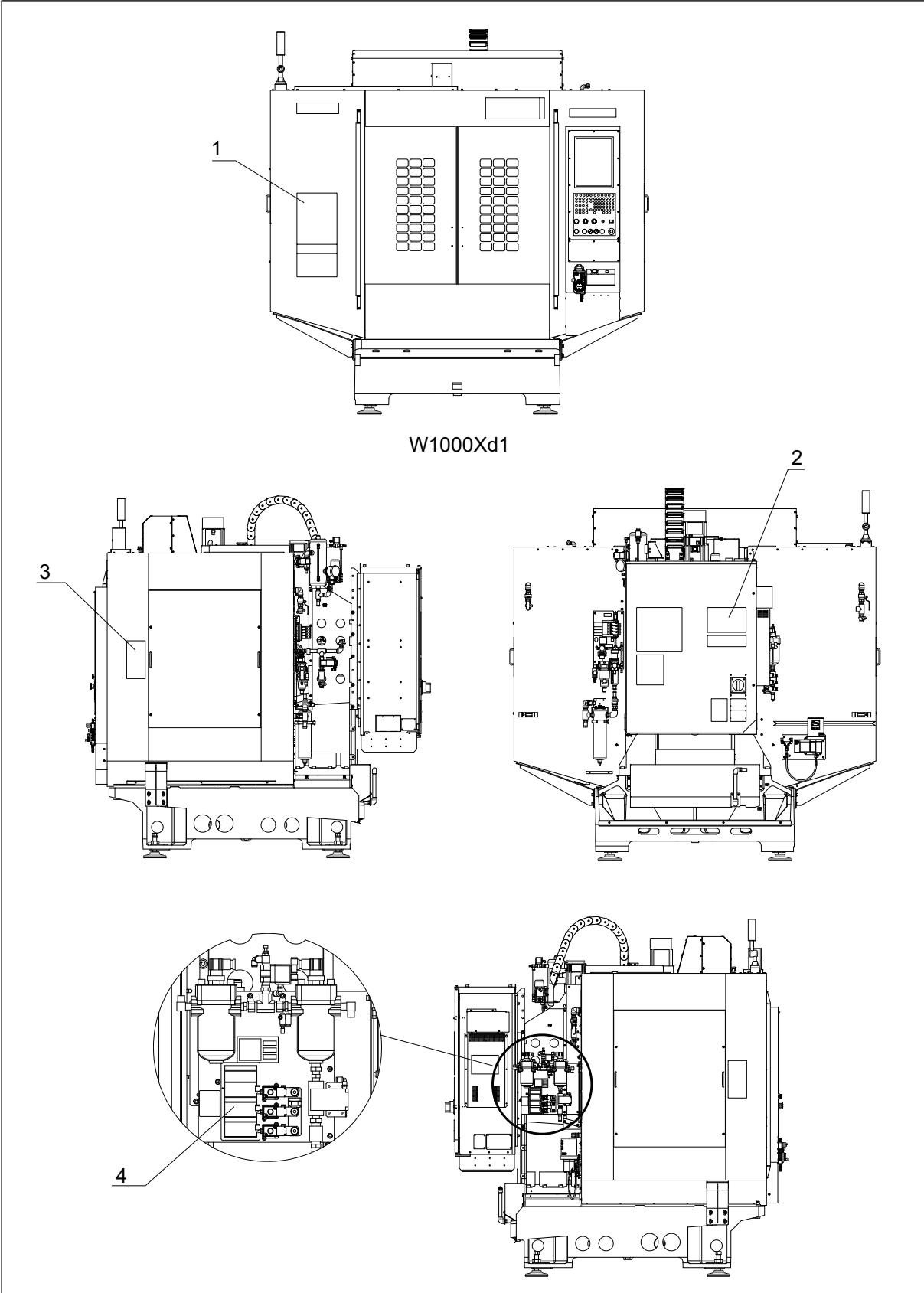
- Do not smoke near the machine and do not perform work that generates sparks, such as welding work.
- Do not put objects that are highly flammable close to the machine, such as wood chips, paper, cloth or gas cylinders. In addition, do not insert those objects inside the machine or mix them with the chips or shavings.
- If a fire erupts while a user is operating the machine, be sure to alert the other workers about the fire and immediately report the fire to the Fire Department.
- If a fire erupts while a user is operating the machine, take the appropriate measures to ensure your safety and at the same time take steps to extinguish the fire early on using fire extinguishing equipment or manually activating the automatic fire extinguishing system when necessary.
- Be careful when extinguishing an electrical fire because pouring water on places where the insulation is damaged on the electrical circuits can cause electric shock due to a ground-fault or short-circuit.
- Make sure that there is fire extinguishing equipment with fire retardant available for electrical fires and use it appropriately.
- Be careful of hot gas discharging from openings or gaps in the door generated by a fire.
- Do not touch the machine or internal components after a fire because they will be hot.
- Opening a door or restarting the machine immediately after a fire is dangerous and can cause a secondary accident.
- Hazards from modifications performed by the machine tool user  
There are potential hazards as noted below if the machine tool user performs modifications. Therefore, do not modify the machine tool.
  - (1) Changing the wiring material or adding or changing a unit can cause an overcurrent and lead to an electrical fire.  
In addition, using a fire retardant insulating film for the wiring material can lead to the fire spreading.
  - (2) Using the machine while the detector for the automatic fire extinguishing system, the fire alarm box or the fire extinguishing function is disabled can hamper or prevent a fire from being extinguished.  
In addition, the seal to the machining chamber becomes compromised if the machine cover is removed on equipment with a gas type automatic fire extinguishing system or if there is an opening on the machining chamber cover or window. As a result, the ability to extinguish a fire becomes hampered and the user may be unable to extinguish the fire.

## 2. Inspection & Maintenance

Perform the daily inspection and maintenance work tasks (noted in “9.1 Periodic machine inspections” in Installation Manual) in order to prevent a fire and minimize damage in the event of a fire.

## Checking Safety Labels

The safety labels are affixed to the machine as shown in the figures below. Check and make sure that there are not safety labels missing. If there is a safety label missing, obtain a new label and re-affix it.



## [1] Front safety label

**Language**  
 Japanese, Chinese, English  
 English, German, French

**Part code**  
 69A918001  
 69A919001

This machine has hazards.

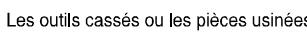
Read instruction manuals to understand hazards and avoid them before operation.

Diese Maschine birgt Gefahren.

Um Risiken zu erkennen und vermeiden, vor dem Einschalten die Betriebsanleitung lesen.

L'utilisation de cette machine comporte des risques.

Lisez les manuels d'instruction pour connaître les risques et les éviter avant d'utiliser cette machine.

 <b>DANGER</b>	 <b>GEFAHR</b>	
	<p>Bei der Bearbeitung von brennbaren Materialien oder bei Verwendung von einem auf Öl basierenden Kühlmittel besteht Feuer- oder Explosionsgefahr.          Der Abrieb bzw. die Späne müssen möglichst rasch entfernt werden.          Bei der Bearbeitung kontrollieren, ob ausreichend Kühlmittel vorhanden ist.          Bei der Überwachung müssen stets ein Feuermelder und eine Feuerlöscheinrichtung vorhanden sein.</p>	
 <b>WARNING</b>	 <b>WARNUNG</b>	 <b>AVERTISSEMENT</b>
	<p>There is danger of a fire or an explosion when machining with combustible materials or using oil-based coolants.          Clean up chips or shavings as soon as possible.          Make sure there is sufficient coolant when machining.          Always have a fire alarm box and fire extinguishing equipment available when monitoring.</p>	<p>Il existe un risque d'incendie ou d'explosion lors de l'usinage avec des matériaux combustibles ou l'utilisation de liquides de refroidissement à base d'huile.          Éliminez les rognures ou les copeaux le plus rapidement possible.          Assurez-vous qu'il y a suffisamment de liquide de refroidissement lors de l'usinage.          Ayez toujours une boîte d'alarme incendie et un équipement d'extinction à portée de main lors du contrôle.</p>
 <b>WARNING</b>	 <b>WARNUNG</b>	 <b>AVERTISSEMENT</b>
	<p>Machine in operation will suddenly move and crush you.          Keep away from moving parts.</p>	<p>Maschine in Betrieb kann plötzlich laufen und Sie stoßen. Beim Betrieb der Maschine von allen bewegenden.          Teilen sich fernhalten, um Verletzungen zu vermeiden.</p>
 <b>WARNING</b>	 <b>WARNUNG</b>	 <b>AVERTISSEMENT</b>
	<p>Broken tool or workpiece can hit and wound you.          Shut door before starting machine.</p>	<p>Gebrochene Werkzeuge oder Werkstücke könnten Sie treffen und verletzen.          Vor dem Start der Maschine Tür schließen.</p>
 <b>WARNING</b>	 <b>WARNUNG</b>	 <b>AVERTISSEMENT</b>
	<p>If a part is removed accidentally, a load bearing axis may fall down.          Do not stay underneath a load bearing axis.</p>	<p>Falls ein Teil versehentlich entfernt wird, kann eine tragende Achse herunterfallen.          Sich nicht unter einer tragenden Achse aufhalten.</p>

69A919001/2011()

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[2] Rear safety label

**Language**  
Japanese, Chinese, English  
English, German, French

**Part code**  
69A922001  
69A923001

<b>! WARNING</b>	<b>! WARNUNG</b>
 	<p>Hochspannung kann zu schweren Verletzungen mit sogar tödlichem Ausgang führen. Elektrische Schaltkreise dürfen nur von qualifiziertem und mit Sicherheitsanforderungen vertrauten Personal eingestellt oder repariert werden. Den Hauptschalter ausschalten und vor Arbeitsbeginn mindestens 20 Minuten warten. Einen Hinweis auf die ausgeführte Arbeit anbringen.</p>
<p>High voltage will cause severe injury or death. Never attempt to adjust or repair electrical circuits unless you are familiar with circuits and qualified to work safely on electrical circuits. Turn off the main power breaker, and then wait at least 20 minutes before working. Post notice you are working.</p>	<p>Les hautes tensions peuvent provoquer des blessures graves, voire la mort. Ne jamais tenter de régler ou de réparer des circuits électriques à moins d'être familier avec ces équipements et qualifié pour travailler en toute sécurité sur des circuits électriques. Éteindre le disjoncteur du secteur puis attendre au moins 20 minutes avant de travailler. Indiquer que des travaux sont en cours.</p>

69A923001/2011(1)

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[3] Side cover safety label

**Language**  
Japanese, Chinese, English  
English, German, French

**Part code**  
69A957001  
69A958001



69A958001/2011(1)

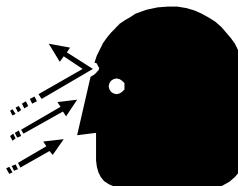
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[4] CTS safety label 1

**Language**  
Japanese, Chinese, English  
English, German, French

**Part code**  
698936001  
698949001

**! WARNING**



Splashed coolant can cause eye damage.

Press the manual air valve button and lower the pressure of the pipe connected to the pump to 0 MPa before performing maintenance.

**! WARNUNG**

Kühlmittelspritzer können Augenverletzungen verursachen.

Vor der Wartung den manuellen Knopf des Luftventils drücken, um den Druck der Rohrleitung zur Pumpe auf 0 MPa zu senken.

**! AVERTISSEMENT**

Les éclaboussures de réfrigérant sont dangereuses pour les yeux.

Avant toute intervention d'entretien, appuyer sur le bouton de soupape d'air manuelle pour faire baisser la pression du tuyau relié à la pompe jusqu'à 0 MPa.

698949001/1710(1)

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# Door Interlock Function

- 1      Handling Precautions
- 2      External View
- 3      Startup Inspection
- 4      Door Interlock Function Specifications

# 1 Handling Precautions

## **WARNING**

If any modifications are carried out, such as disabling the limit switch for the door interlock, the safety devices may stop operating. Therefore, the machine may operate even when a door is open, and you may get caught or drawn into the machine.

### [SAFETY INSTRUCTIONS]

Do not perform any unauthorized modifications on the safety devices.

Do not secure the safety devices in such a way that will prevent them from operating.

If an operator finds an unauthorized modification on the machine, they should notify the supervisor immediately, without operating the machine.

## **WARNING**

If the door interlock mode is set to machine setup or service mode, the machine will operate even when a door is open, and you may get caught or drawn into the machine.

### [SAFETY INSTRUCTIONS]

Do not operate the machine while the door interlock mode is set to machine setup or service mode.

The operator must check that the door interlock mode is set to automatic operation before operating the machine.

The operator must inform the supervisor if the key for the [DOOR INTERLOCK MODE] switch is attached.

## **WARNING**

There are movable parts inside the machine such as the spindle head and table, and your body may get caught on them if you go inside the machine.

### [SAFETY INSTRUCTIONS]

Do not go inside the machine.

The operator should visually check to make sure that there is nobody inside the machine before starting the machine.

Purpose of door interlock function

The door interlock function is designed to protect the user from dangerous machine operations and motions.

Overview of door interlock function

While there are certain differences in the behavior depending on the door interlock mode, generally speaking, this function limits the machine operation and motion while a door is open. There are 3 types of door interlock modes.

## 1. Automatic operation mode:

This mode is used for machining. The machine will not operate when a door is open. When the doors are closed, the machine can be used without any operation restrictions (except for certain operations). Refer to “4.3 Restricted operation in each door interlock mode” for further details.

## 2. Machine setup mode:

This mode is used for machine setup. The machine will not operate when a door is open. However, some axes can be moved by using the enable switch. Note that only a single axis can be operated at a low speed using manual operation. When the doors are closed, memory operation or MDI operation is not available unless using single operation, machine lock or dry run.

## 3. Service mode:

This special mode is used for maintenance and service. The machine will operate even if a door is open. Note that only a single axis can be operated at a low speed using manual operation. In this mode, operation continues to be restricted even if the doors are closed.

Door interlock function components

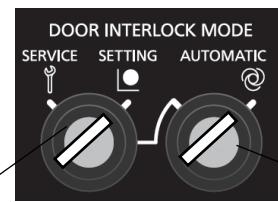
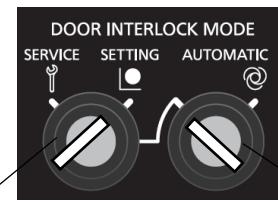
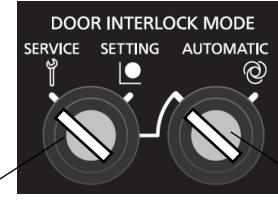
The door interlock function is made up of the following components.

1. Door limit switch and **[DOOR INTERLOCK MODE]** switch
2. IL PCB unit and SR PCB
3. Servo amplifier and safety relay

Usage

## 1. Normal

Always set the **[DOOR INTERLOCK MODE]** switch to automatic operation mode.

Door interlock mode	<b>[DOOR INTERLOCK MODE]</b> switch status
Automatic operation mode	
Machine setup mode	
Service mode	

## Door Interlock Function

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### 2. (1) During machine setup

Set the [DOOR INTERLOCK MODE] switch to machine setup mode only when machine setup tasks are required.

Workers must understand the information in the Installation Manual. They also must have knowledge and/or experience in the following:

- (i) Knowledge of electric circuits in this machine and be a qualified electrician in order to perform maintenance and inspection of electrical components
- (ii) Knowledge of piping on this machine and experience in handling high pressure air because there is high pressure piping on this machine
- (iii) Knowledge related to workpiece adjustment and clamping
- (iv) Experience in installation, operation and monitoring of machines
- (v) Knowledge and experience in selecting, using and installing tools
- (vi) Knowledge and experience in machining workpieces and optimizing machining processes
- (vii) Knowledge of risks related to machine setup and required safety measures and protection
- (viii) Knowledge related to appropriate use of protective equipment

### 2. (2) During maintenance work

Many parts of the door interlock function are disengaged in service mode, and the machine is in a dangerous state for workers.

In addition to the aforementioned requirements, workers must have knowledge about maintenance work and understand any other potential risks related to machine maintenance work mentioned in the Safety Manual. When performing work tasks, use a chain with a warning sign to cordon off the machine area as shown below.

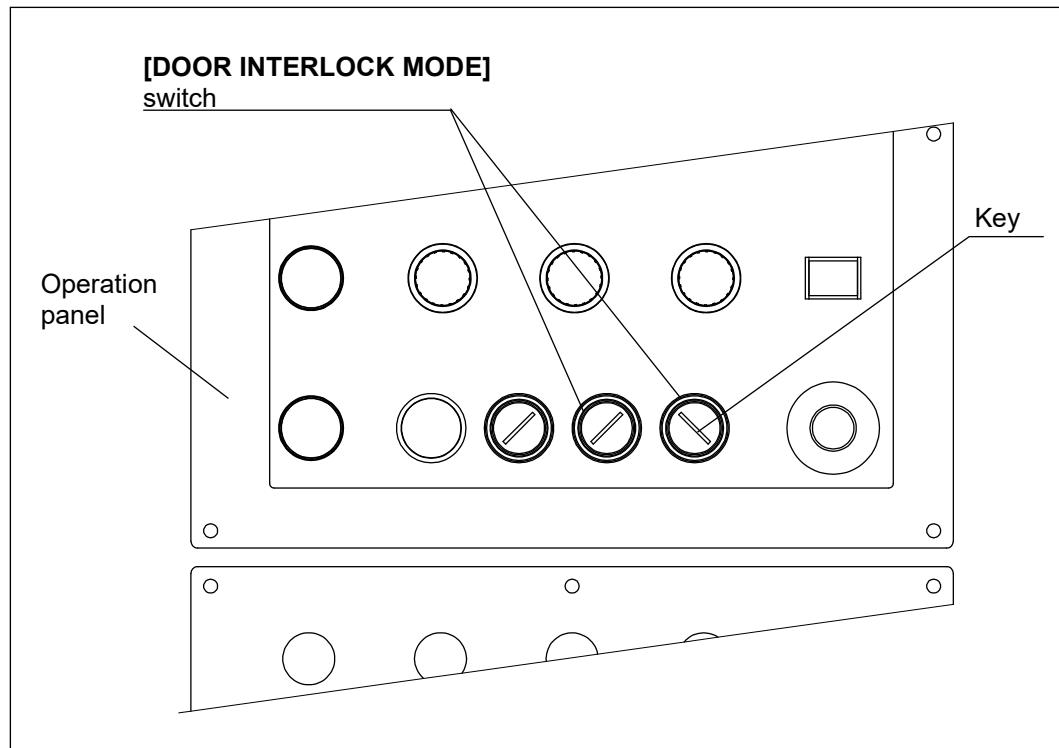


Maintenance workers can perform the following work tasks.

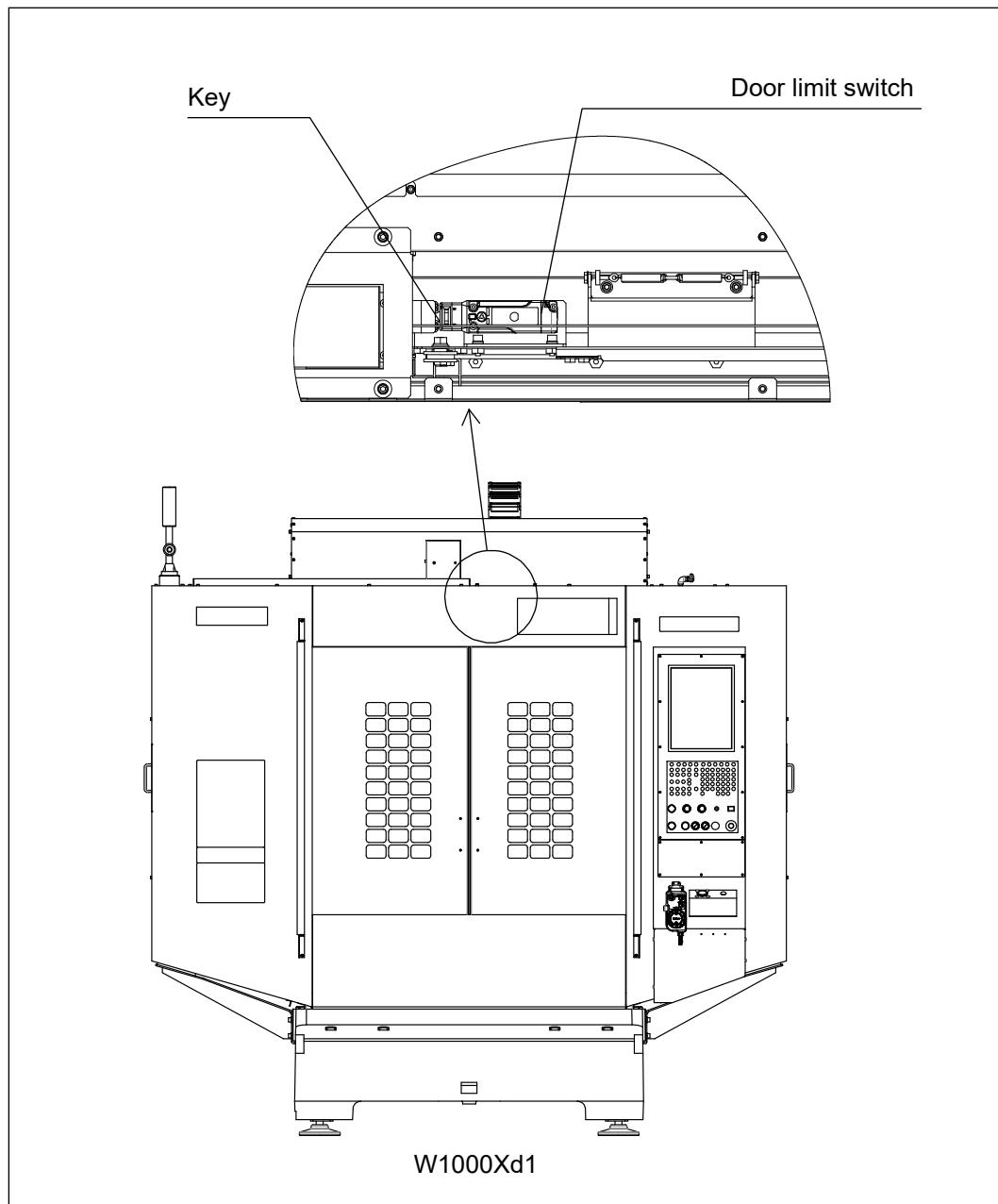
- (i) Work where a tool is used and the cover is removed
- (ii) Work such as installing or moving a machine
- (iii) Work content that is listed under “Chapter 9 Inspection” in the Installation Manual  
Maintenance workers must carefully read and understand the Installation and Operation Manuals before performing work.

Always follow the instructions below when using machine setup or service mode.

- Take the necessary steps to avoid getting caught on the rotating tool or moving and gyrating parts.
- Change the mode back to automatic operation mode after the setup or service tasks.
- Turn the key to the right and remove it.
- Return the key to the supervisor.



## 2 External View



### 3 Startup Inspection

Always be sure to inspect the emergency stop and door interlock devices before turning ON the power and starting operation.

If not functioning properly, report it immediately to the supervisor.

#### Emergency stop inspection procedure

1. Make sure that the alarm <<\*Emergency button activated>> does not appear on the screen.
2. Press the [**EMERGENCY**] switch on the machine's operation panel.
3. Make sure that the alarm <<\*Emergency button activated>> appears on the screen.
4. Turn the [**EMERGENCY**] switch button to the right to release the latch and reset the button.
5. Press the [**RST**] key on the operation panel.
6. Make sure that the screen alarm disappears.

\* Perform this procedure with all the [**EMERGENCY**] switches installed on the machine.

#### Door interlock device inspection procedure

- Make sure that the device does not operate when the door is open
1. Make sure that the [**DOOR INTERLOCK MODE**] switch is set to automatic operation mode.
  2. First, close all doors and covers before performing a machine zero return operation.
  3. Open the front door.
  4. While in manual mode, press the [-X] key on the operation panel to move the X-axis.
  5. Make sure that the alarm <<\*Door open>> is triggered and the axis does not move. If the alarm is displayed, the door interlock device is functioning properly.
    - Door lock inspection
    - 6. Close the front door.
    - 7. Press the [**SP.CW**] key. The spindle should rotate.
    - 8. Open the front door. Make sure that the front door is locked. If the front door locks, the door interlock device is functioning properly.
  9. Press the [**SP.STOP**] key. The spindle should stop.

# 4 Door Interlock Function Specifications

Door	Door interlock mode	Operation
Closed	Automatic operation mode	Operation is possible but with restrictions (NOTE 1)
	Machine setup mode	Operation is possible but with restrictions (NOTE 1)
	Service mode	Operation is possible but with restrictions (NOTE 1)
Open	Automatic operation mode	Operation is not possible
	Machine setup mode	Operation is possible but with restrictions (NOTE 2)
	Service mode	Operation is possible but with restrictions (NOTE 3)
Open ↓ Closed	All modes	Maintains previous state. Closing the door does not automatically start operation.
Closed ↓ Open	All modes	If operation is in progress, it stops. (NOTE 4)
Open or Closed	Change in door interlock mode	If operation is in progress, it stops. (NOTE 5)

(NOTE 1) Refer to “4.3 Restricted operation in each door interlock mode”.

(NOTE 2) Refer to “4.4 Limits on operation when doors are open” and “4.8 Enable operation”.

(NOTE 3) Refer to “4.4 Limits on operation when doors are open”.

(NOTE 4) The door lock status varies depending on the setting. Refer to “4.5 Door locks after closing” and “4.7 Special notes” for further details.

(NOTE 5) Refer to “4.7 Special notes” for further details.

## 4.1 Special Notes When Changing Door Interlock Mode

When the door interlock mode is changed, all axis servos are temporarily turned OFF and then turned ON again.

Be careful because an axis may shift or move.

## 4.2 Operation Status in Each Door Interlock Mode

(Description provided in table)

○: Full operation is possible ×: Full operation is not possible Δ: Operation is restricted

Door interlock mode Door status (NOTE) Enable switch	Automatic operation		Machine setup		Maintenance	
	Closed	Open	Closed	Open	Closed	Open
Operation mode	-	-	-	OFF	ON	-
Memory operation	○	×	Δ	×	×	×
MDI operation	○	×	Δ	×	Δ	×
Manual operation	Δ	×	○	×	Δ	Δ

(NOTE) The door status is considered closed with both the front and side doors are closed.

## 4.3 Restricted Operation in Each Door Interlock Mode

- Automatic operation mode  
During spindle rotation, manual operation is only possible for JOG feed, handle operation, spindle normal rotation, spindle stop and lathe spindle selection.
- Machine setup mode  
Memory operation and MDI operation is not possible when either single operation, dry run or machine lock is not set.
- Service mode  
Memory operation and MDI operation are not possible.  
Lathe spindle rotation is not possible. Axis travel is not possible during spindle rotation. In addition, spindle rotation is not possible during axis travel.

## 4.4 Limits on Operation When Doors are Open

If a door is open and the door interlock mode is set to machine setup or service mode, operation is restricted.

The axis travel speed and axis rotation speed are restricted to a low speed. In addition, the operation restrictions in the table below also apply.

(Description provided in table)

○: Operation is possible ×: Operation is not possible

Operation	Door interlock mode	Machine setup	Maintenance
Manual operation	Machine zero return	×	×
	JOG feed	○	○
	Step feed	×	○(NOTE 1)
	Handle operation	○	○
	Spindle selection	○	○
	Spindle rotation	×	○(NOTE 2)
	Lathe spindle rotation	×	×
	ATC	×	○(NOTE 2) (NOTE 3)
	Magazine turn	×	○(NOTE 2)
Common to memory / MDI operation	Spindle rotation	×	×
	Additional axis operation for lathe spindle	×	×
	Spindle orientation	×	×
	Tool change	×	×
	Tap operation	×	×
	Brake load test	×	×
Memory operation		×	×
MDI operation		○ Single operation (NOTE 4)	×

(NOTE 1) Operation is possible on the rotation axis if the maximum step travel amount is 1°.

(NOTE 2) Operation is executed only while the key is pressed. Operation immediately stops when the key is released.

## Door Interlock Function

(NOTE 3) If the user releases the key while the Z-axis is still raising from the “Distance to Z-axis zero” position to the ATC zero point, then the [ATC] key LED flashes and the alarm <<Stopped Z-axis rise to ATC zero point>> is triggered. While the [ATC] key LED is flashing, press the [ATC] key again to move the Z-axis up to the ATC zero point.

If the user releases the key while the Z-axis is still moving from the ATC zero point to the “Distance to Z-axis zero” position, then the [ATC] key LED turns off. When the [ATC] key LED is turned off, press the [ATC] key again to lower the Z-axis down to the “Distance to Z-axis zero” position.

When the [ATC] key LED is flashing, if the user carries out one of the following operations, the key LED turns off.

- When a manual operation besides ATC is carried out
  - When the [RST] key is pressed
  - When the mode is changed to another mode besides manual operation mode
  - When the door interlock mode is changed to another mode besides service mode
- When the [ATC] key is pressed in this situation, the Z-axis lowers down to the “Distance to Z-axis zero” position.

(NOTE 4) Even if the [SINGL] key is turned off, the single operation is automatically carried out when the door opens.

## 4.5 Door Locks After Closing

If the user parameter (switch 1: door) <Door lock method> is set to <0: Automatic lock when door closes>, the door automatically locks after it closes. If the parameter is set to <1: Lock only when needed>, the door automatically locks when operation is started.

If the <Door lock method> is set to <1: Lock only when needed> is selected, the table below shows the corresponding operations when the machine locks the door automatically. If <0: Automatic lock when door closes> is selected and an attempt is made to start one of these operations while the door is closed but still being locked, the alarm <<Door was not locked>> is triggered. Lock the door using a manual operation. Refer to the subtools in “1.4.1.2 Control key display area” for further operation details.

(Description provided in table)

○: Door locks ×: Door does not lock -: Corresponding operation is not possible

Operation	Door interlock mode Enable switch	Machine setup		Maintenance
		Automatic operation	OFF	
Additional axis operation for lathe spindle	○	○	○	×
Brake load test	○	○	○	○
ATC in memory / MDI operation	○	○	○	—
Magazine turn in manual operation (including magazine turn using ATC)	○	○	○	×
ATC in manual operation (excluding magazine turn)	○	○	○	×
Spindle rotation and spindle orientation in progress	○	○	○	×
Machine operations apart from those above	○	○	○(NOTE)	×

(NOTE) The door does not lock when the door is open.

Refer to “4.4 Limits on operation when doors are open” for details on operations that are possible when a door is open.

In addition, the user can set in the user parameter whether to automatically unlock the door after the program ends. Refer to “1.5 User parameters” in the Data Bank & Alarm Manual for further details.

## 4.6 Limits on Operations After Unlocking Door

If the door interlock mode is set to <Auto. operation> or <Machine setup> and a door is unlocked, then the servo turns OFF on the additional axis for the lathe spindle/spindle.

However, if the user performs one of the following operations before the servo turns OFF (but after the door unlocks), the servo will first turn OFF and then after the servo turns ON again, the operation is carried out.

- ATC in manual operation (rises to “Distance to Z-axis zero” position)
- Spindle forward rotation in manual operation
- MDI operation
- Memory operation

## 4.7 Special Notes

While the machine is operating, do not open a door or change the door interlock mode. When a user operation is carried out during machine operation, machine operation immediately stops.

## 4.8 Enable Operation

Enable operation can only be operated when <Door interlock mode> is in <Machine setup>.

Perform one of the following operations to turn ON the enable operation.

- Turn ON the [ENABLE] switch on the operation panel. (NOTE 1)
- Set the [Axis selection] switch on the manual pulse generator to another setting besides [OFF] and turn ON the [ENABLE] switch.

Refer to “3.5 Switch and lamp functions” and “Chapter 5 Manual operation” in Operation Manual I for details about each enable operation.

Do not perform two or more of the aforementioned enable operations at the same time.

If two or more are used at the same time, the alarm <<Multiple enable switches were operated at the same time>> is triggered and both enable operations become invalid .

If a door is open and enable is turned ON, manual operation, MDI operation and manual operation of the chip auger can be carried out.

The user can operate JOG feed or MDI operation while the [ENABLE] switch on the operation panel is turned ON.

The handle on the manual pulse generator can be operated while the [ENABLE] switch on the manual pulse generator is turned ON.

When an operation is performed with the [ENABLE] switch turned ON and if that operation is not possible, the alarm <<Operation not possible with pressed enable switch>> is triggered.

If enable is turned OFF during manual operation, machine operation stops and the alarm <<[ENABLE] switch was turned OFF>> or <<Enable switch OFF>> is triggered.

If enable is turned OFF during MDI operation, the machine stops and the alarm <<Enable switch was turned OFF during operation>> is triggered.

The alarm <<[ENABLE] switch was turned OFF>> is reset by turning enable ON or by closing the door.

The alarm <<Enable switch OFF>> is reset by pressing the [RST] key.

The alarm <<Enable switch was turned OFF during operation>> is reset by pressing the [RST] key.

(NOTE 1) When the [Axis selection] switch on the manual pulse generator is turned [OFF].

(NOTE 2) Excluding spindle rotation, lathe spindle rotation, magazine turns, ATC operation, tap operation, thread cutting and brake load tests.

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---

# **INSTALLATION MANUAL**

**Read this manual before performing work.**

**brother**

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## Attention

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- When you purchase the Product, we guide you through “OPERATION MANUAL (FOR GENERAL OPERATORS)”, “INSTALLATION MANUAL”, “OPERATION MANUAL (OPERATION)”, and other explanatory documents related to this Product as needed. In addition, we usually issue a letter of warranty together with various explanatory documents. Please keep these documents in a designated place so that you can read them whenever needed. The letter of warranty (hereinafter referred to as the “**letter**”) is a significant document that states the warranty period of this Product. Please note that the warranty conditions may not apply if you do not keep and show us the letter even if the letter has been issued.
- The content described here is common to the “OPERATION MANUAL (FOR GENERAL OPERATORS)”, “INSTALLATION MANUAL” and “OPERATION MANUAL (OPERATION)”. Please note that if there is a discrepancy between the content described here and that of the letter, the latter shall prevail regarding the warranty period, while the former shall prevail regarding any other contents in the Manuals.
- We warrant to you that this Product will correspond with any relevant specifications of the Product (hereinafter referred to as “**Specifications**”) described in the “OPERATION MANUAL (FOR GENERAL OPERATORS)”, “INSTALLATION MANUAL”, “OPERATION MANUAL (OPERATION)” and other explanatory documents or product catalogs issued by us (hereinafter collectively referred to as “**Manuals**”) and that this Product will operate in accordance with the Specifications.
- We make every effort to ensure that this Product does not impair the quality and reliability of the Specifications. However, if we fail to meet the Specifications (if modified, the latest version shall apply) of unused Products purchased from us or our designated distributor/dealer within **one (1) year** from the purchase of the Product (provided, however, that if a letter of warranty is issued separately by us and you provide us with such letter, the warranty period specified in the letter shall prevail in case of any discrepancy), we will, at our discretion, repair this Product or take any other measures that we consider necessary (hereinafter referred to as the “**Warranty**”); provided, however, that the Warranty shall not apply if the non-conformance of Specifications is due to any of the followings (hereinafter referred to as “**No-Warranty Conditions**”):

**<No-Warranty Conditions>**

- (1) you use, transport, relocate or store the Product in a way that is not in accordance with the method and environment (including specifications, standards, etc.) and purpose of use of the Product specified in the Manuals, any other documents attached to this Product, our website, and other documents provided by us in a timely manner (including the case where we know your method, environment and purpose of use in advance);
- (2) you modify, alter or make any other change to the Product without our prior consent;
- (3) you connect or link this Product to other equipment or make any other settings for such purpose under any methods or procedures prohibited or not described in the Specification without our prior consent;
- (4) we confirm that you could have prevented the non-conformance if you were to replace, install, use or maintain the consumables of the Product, in a timely manner, in accordance with the contents described in the Manuals, any other documents attached to the Product, our website, and/or other documents provided by us (including the case where you do not understand the relevant contents in the Manuals but use this Product without making inquiries to us);
- (5) the user of this Product is lack of basic knowledge and/or operation skills about machine tools (including possession of necessary training and qualifications), or fails to meet the minimum health requirements necessary for the operation of this Product (including having normal five senses, and not being influenced by alcohol and/or drug);
- (6) the non-conformance is caused by circumstance that is impossible or difficult to foresee based on general scientific and technology level of the industry at the time when the customer purchased this Product from us or our designated distributor/dealer;
- (7) the non-conformance is caused by natural disasters (including earthquakes, fires, floods, lightning strikes), abnormal voltages, wars, civil wars, terrorism, labor disputes, government policies, infectious diseases, pollution, salt damage, invasion of foreign substances/pests or any other force majeure events;
- (8) the non-conformance is due to your change of the installation location of this Product without our prior consent, or any environmental factors related to the installation location (including polluted air, water quality, toxic gas, electromagnetic waves, radiation or other harm or pollution, or devices or products not connected to this Product);
- (9) the non-conformance is related to be sensual features (including sound, vibration or oozing of oil) that is objectively recognized as having no effect on the functioning and accuracy of the Product;
- (10) the non-conformance is caused by damage, wear or deterioration due to aging (including natural fading of painted surface, plated surface, rust, etc.);
- (11) we consider that the non-conformance of this Specification is minor and does not affect the basic operation of this Product;
- (12) we consider that you can take necessary measures for the non-conformance by yourself based on the explanation of work procedures in the Manuals;
- (13) the non-conformance is related to non-standard Specifications separately designated by you; or
- (14) the non-conformance is cause by any other factors not attributable to us.

- \* In addition to the above, any damage, wear or deterioration of any consumables of this Product are not covered by this Warranty, and if replacement of consumables is required, we will charge an additional fee.
- At your sole cost and responsibility, you shall comply with and take any actions to meet any requirements, including the laws, guidelines, standards or qualifications, government approval/licenses, and any other regulations that apply to the use of this Product, except for those that are related to the development or manufacture of this Product itself.
- We do not make any warranty that this Product is suitable for your business use. Please verify and confirm whether this Product is suitable for your business use by yourself.
- **To the maximum extent permitted under applicable laws, other than normal and direct damages caused by non-conformance of the Specification of this Product as provided in this Warranty, we hereby disclaim and exclude any other liability or loss for any damages, including but not limited to any damages or malfunctions of any other equipment/devices, any indirect damages, special damages, damages arising from interruption of business, loss of profits, punitive damages, or any other similar damages. Even if we are required to bear any such liability or loss, the maximum total amount of our liability shall be limited to the purchase price of this Product (including any attached options, software and paid replacement parts). In addition, we shall not be liable for any damages caused by any of your intentional acts or negligence, nor any damage arising from your use of the software included in this Product to create any program. To the maximum extent permitted under applicable laws, the above exclusion and limitation of liability shall apply even if we have known or could have foreseen the possibility and/or results of these damages or loss in advance.**
- Although we attempt to explain the cases and circumstances where you should not use this Product due to certain Specification, applicable laws and regulations or other reasons, it is difficult to specify all such cases due to the wide variety of such cases. Therefore, you shall not use the Product for any purpose or usage that is not specifically described in the Manuals without our prior consent.
- This Product is a target equipment of our loading system (which includes a set of accessories such as loader body, mount, side door, hand valve, piping and wiring, hereinafter collectively referred to as the “**System**”). If you and us separately agree that you will use the System, we will deliver this Product with the System connected. In that case, there are the following conditions in addition to the No-Warranty Conditions under which our Warranty will not apply (hereinafter referred to as “**Additional No-Warranty Conditions**”); provided further, that in the event of any inconsistency between the content of the following Additional No-Warranty Conditions and that of the No-Warranty Conditions, the former shall prevail:

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#### <Additional No-Warranty Conditions>

- (1) the non-conformance is due to (a) you use the Product with the System, remove the Product from or reconnect to the System, or modify, alter or make any change to the Product in a way that is contrary to the method or purpose of use described in the "OPERATION MANUAL (FOR GENERAL OPERATORS)", "INSTALLATION MANUAL", "OPERATION MANUAL (OPERATION)" and other explanatory documents or product catalog of the System(hereinafter collectively referred to as "**Loading Manuals.**"), attachments, our website and/or any other documents provided by us in a timely manner (including the case where we know your method and environment for use and purpose of use in advance); or (b) you modify, alter or make any change to this Product in relation to the System without our prior consent (including the case our company knows your method and environment for use and purpose of use in advance);
  - (2) the non-conformance is due to you connect the System to the Product after its warranty period has expired;
  - (3) the non-conformance is due to you connect this System to a Product that is not a suitable model to be connected;
  - (4) the non-conformance is due to you have not completed user registration or connect the System to a Product with incorrect registration information; or
  - (5) the non-conformance is caused by any non-compliance with the contents of the Loading Manuals, attachments, our website, and/or other documents provided by us in a timely manner.
- If there is any non-conformance occurs in the System caused by this Product, please refer to the warranty condition of the Loading Manual.
  - This Warranty covers software provided together with this Product, but if there are any other contractual conditions separately agreed between you and us regarding the software, the terms and conditions of such contractual conditions shall prevail.
  - We reserve the right, with or without notification to you, to add, delete, modify, enhance, update or upgrade any functions to the Product (including the software) at our own discretion for the purpose of modifying, maintaining or enhancing technology, provided however, that we do not have any obligation to carry out any of such actions.
  - This Warranty describes our conditions. If our designated distributor/dealer or anyone who sells this Product has its own warranty, the additional warranty is provided at their sole cost and responsibility and, therefore, please contact them if you have any questions regarding such additional warranty.
  - **If there is a change of the Specifications, an update or modification to the explanatory content regarding this Product, or any other appropriate reasons, we may amend the content of the Manuals at our discretion after we publicly disclose the content on our website or through other similar methods; provided that the content of the amendment shall take effect from the effective date described in the disclosure and if you continue to use this Product after such effective date, you are deemed to agree to such amendment of the Manuals. Please note that due to this change, there may be slight differences between the functions described in the amended Manuals and that of this Product.**

#### <The following applies to Products destined FOR JAPAN>

- This Warranty is based on the assumption that the warranty services will be carried out during our normal working hours (9:00 to 17:00 Japan time) excluding Saturdays, Sundays, national holidays and our holidays. However, if it is unavoidable to work outside those hours (including the case that we need to work in Hokkaido, Okinawa or other remote islands), you shall bear the actual expenses for travel and transportation.
- If you purchase this Product (that is a second-hand product) from us or a third party other than our designated distributors/dealers, please promptly make the procedures for changing the user registration (including paying the prescribed change of registration fee). If you complete the procedures, you can receive our support (with charges) based on the conditions specified separately. However, please note that you may not be eligible for our support (with charges) if any of the following applies.
  - (1) (1) before you purchase this Product (that is a second-hand product), if the third party who you purchase the products from, or if there are multiple owners in the past any of the owners (hereinafter collectively referred to as "**Third Party, etc.**") falls into any of the cases of the "**No-Warranty Conditions**";
  - (2) the non-conformance is caused by a specification separately designated by the Third Party, etc.
  - (3) the non-conformance is caused by a change to the external environment due to change of user (impact caused by removal at the relocation source, transportation to the relocation destination, or re-installation at the relocation destination) and environmental factors in the relocation process or relocation destination (including polluted air, water quality, toxic gas, electromagnetic waves, radiation or other pollution or natural environment, or equipment or products that are not connected to this Product), or due to any differences in the external environment between the relocation source and the relocation destination.
  - (4) the non-conformance is caused by any issue between you and the Third Party, etc. that is not attributable to us.
- It is assumed that you or the Third Party etc. will not export and/or use this Product outside Japan. In the unlikely event that the Product will be exported and/or used outside Japan (including the case where you permit the use by the Third Party etc.), you have to obtain our prior written consent and import/export at your own expense and responsibility. Please comply with the applicable laws and regulations such as import/export control laws and regulations. Please note that this Warranty does not cover any Product used or exported outside Japan, even if you have obtained our prior written consent and have complied with such import/export control laws and regulations.
- Regarding the Warranty, a translated version in other language may be created for reference. If there is any discrepancy between the Japanese version and that of other language, the Japanese version shall prevail.
- This Warranty shall be governed by and construed in accordance with the laws of Japan.

#### <The following applies to Products destined OUTSIDE JAPAN>

- When you or the Third Party etc. use this Product (including the case where you resell the Product, permit their use and re-exports the Product to any other countries), please comply with any relevant procedures specified in the Manual, import/export control laws and regulations and other relevant laws and regulations which are applicable in relevant countries or regions at your own expense and responsibility. Please note that this Warranty will not apply if you fail to comply with such procedures, the applicable import/export control laws and regulations and other relevant laws and regulations.
- This Product is designed and manufactured for the purpose of manufacturing general products for general industrial use. Therefore, this Product is not intended to be used to manufacture any products that require an extremely high level of safety and may pose serious risk to human life or health or result in serious threat to the peace and order of the society, including but not limited to products for nuclear-related purpose or military-related purpose (excluding the manufacture of non-military products used in military facilities) (hereinafter referred to as "**Purpose**"). If you use this Product for the Purpose or if you use this Product to manufacture any other products (including parts) for the Purpose, this Warranty will not apply and we shall not be liable for any damages or loss incurred by you or the Third Party resulting from or in connection with such use.
- Regarding the Warranty, a translated version in other language may be created for reference. If there is any discrepancy between the English version and that of other language, the English version shall prevail; provided, however, that regarding the Warranty for the Product destined for the People's Republic of China (excluding Hong Kong, Macau and Taiwan), the Chinese version shall prevail.
- To the extent that the Warranty or any part thereof is inconsistent with applicable laws, the Warranty or the corresponding part shall be deemed modified to be consistent with such applicable laws. Except to the extent lawfully permitted, this Warranty do not exclude, restrict, or modify but are in addition to the mandatory statutory consumer rights applicable to the sale of this Product to you.
- If you are a company incorporated and operating in the country or region in which the Product purchase from our designated dealer to you took place (hereinafter referred to as "**Purchase Country**"), this Warranty shall be governed by and construed in accordance with the laws of the Purchase Country or otherwise the laws of England and Wales shall govern this Warranty. Please note that the United Nations Convention on Contracts for the International Sale of Goods does not apply to this Warranty.

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## Introduction

Thank you for purchasing the SPEEDIO (hereafter referred to as “machine”) made by Brother. Always be sure to read this manual carefully first, in order to use the machine functions properly and safely.

This machine manual is divided into the following sections.

- Operation Manual  
This manual describes the operation procedure for the machine.
- Installation Manual  
This manual describes the machine’s installation procedure and inspections.
- Programming Manual  
This manual provides a program description.

Attach this manual to the machine if it is resold.

Contact the nearest Brother sales office or Brother approved service dealer if this manual or the safety labels are damaged, lost or missing. (Charges apply)

**The re-exporting and resale of this machine is regulated by Japan's export laws and regulations in accordance with international export management.**  
**When exporting, permission from the exporting country's government and/or from the Japanese government may be required.**  
**Contact a Brother Industries dealer in advance before re-transferring, reselling or re-exporting this machine.**

Copying and reprinting all or part of the content in this manual without permission is illegal.

The content of this manual may be changed without prior notice.

Brother has taken steps to ensure this manual is accurate and complete. However, if you notice or suspect that there is an error, please contact the nearest Brother sales office or Brother approved service dealer.

We provide source code to customers who wish to use GPL or LGPL software.

Contact Brother for further details. (A separate fee and service charge applies.)

Ethernet is a registered trademark of Xerox Corp. in the U.S.A.

DeviceNet™ and EtherNet/IP™ are a trademark of ODVA.

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Any trade names and product names of companies appearing on Brother products, related documents and any other materials are all trademarks or registered trademarks of those respective companies.

## How to Read This Manual

**This manual is divided into the following sections.**

**(1) Overview** ----- A summary of the content is provided for the corresponding section.

**(2) Warning**----- A warning is provided for any hazards that could potentially cause serious bodily injury, death or damage to the machine.

The hazards are described in the following order.

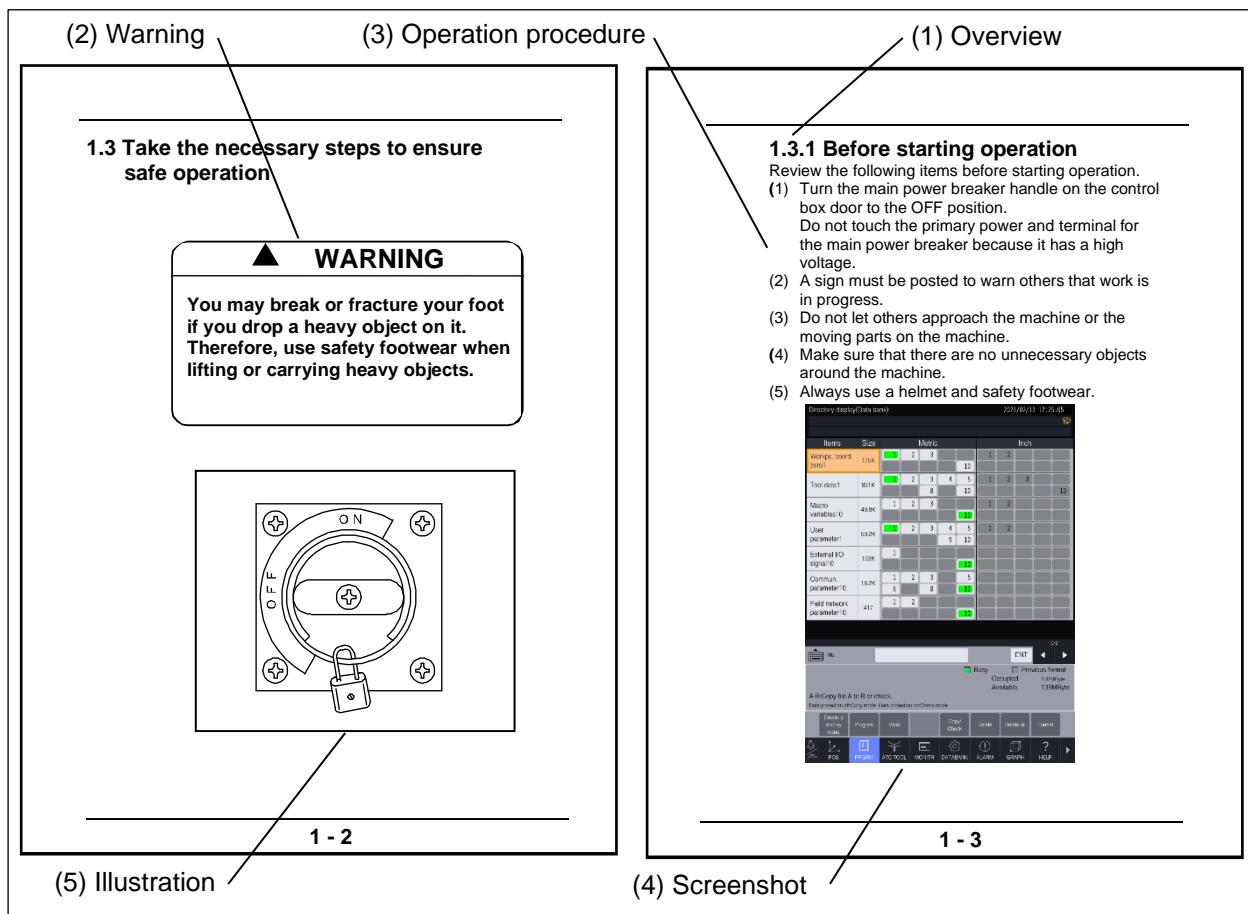
- (2-1) Hazard level
- (2-2) Type of hazard
- (2-3) Potential damage
- (2-4) Safety directions to avoid danger

**(3) Operation procedure** --- The procedure describes how to operate each function.

**(4) Screenshot** ---A screenshot is inserted into places to highlight certain points in the operation procedure.

The screenshot messages are shown at an approximate position and may differ slightly from the actual position of the line or column. The same applies to the font.

**(5) Illustration** ---- Illustrations, such as explanatory drawings, diagrams that show the dimensions, positioning, ranges, figures or configurations, are used in certain places where a written explanation alone may be hard to understand.



**In this manual, the following symbols are used to differentiate between keys, switches, text displayed on screens and alarm messages.**

- [ ] : Keys
- [ ] : Switches
- < > : Text displayed on screens
- << >> : Alarm messages

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## Striving for a Better, Richer Environment

### ———— Request for Your Cooperation ——

First, we would like to thank you for using Brother products.

Brother Industries established an environmental policy based on “Manufacturing products using an environmentally-friendly process from product development to product disposal,” in order to ensure the planet stays lush and green. As a responsible corporate member of society that can coexist with the local community and environment, we hope to contribute as much as we can in environmental conservation activities.

We hope that you can support this approach and ask for your understanding particularly with production activities in order to help in our environmental conservation efforts.

- Please ask a salvage or recycling business to process unnecessary packaging materials and chips/shavings in order to support recycling when possible.
- The outflow and spillage of coolant, waste oil and other pollutants can lead to polluting the environment. Make provisions in the event that there is a spill and/or outflow of coolant and waste oil, and consider installing those provisions onto the machine.
- Coolant, waste oil, electrical parts, replacement parts and other items must be properly disposed of in accordance with all national laws and local government regulations.

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\*1 The description in this chapter is omitted because this product is not equipped with this function.

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# CHAPTER 1

## HANDLING PRECAUTIONS

- 1.1    Important Precautions**
- 1.2    Safety Precautions**
- 1.3    Authorized Workers and Operators**

## 1.1 Important Precautions

### **⚠ DANGER**

If oil-based coolants are used during cutting, the cutting area may become hot and sparks may be generated.

#### [SAFETY INSTRUCTIONS]

Do not use oil-based coolants when there is no fire alarm box, fire extinguishing equipment or exhaust system installed.

An operator must always monitor the machine while cutting is in progress.

### **⚠ DANGER**

Using inappropriate water-soluble coolants on combustible metals (for example, magnesium, titanium or aluminum) can produce hydrogen, and when it ignites, it can lead to an explosion and fire.

#### [SAFETY INSTRUCTIONS]

Use coolant for machining combustible metals or an oil-based coolant.

When machining combustible metals, carry out a risk assessment and implement any safety measures that are needed.

### **⚠ WARNING**

If the emergency stop switch does not activate, an emergency stop may be unavailable on the machine.

#### [SAFETY INSTRUCTIONS]

Check the emergency stop switch operation before starting machine operation.

If the emergency stop switch is damaged or does not function, it should be replaced.

Do not place or hang any objects on the emergency stop switch.

### **⚠ WARNING**

If you put any parts of your body inside the machine while the maintenance cover has been removed for setup or maintenance work, you may get caught or drawn into the machine if the machine is operated by mistake.

#### [SAFETY INSTRUCTIONS]

Do not put any part of your body inside the machine while it is operating.

Turn OFF the main power breaker before removing the maintenance cover.

Attach a padlock to the main power breaker so that the power cannot be turned ON.

A sign or notice should be placed near the operation panel of the machine to warn others that work is in progress.

**⚠ WARNING**

High-voltage components are present inside the control box.  
There is risk of electric shock if you touch these components by mistake.

**[SAFETY INSTRUCTIONS]**

Maintenance and inspection of electrical components must only be carried out by a qualified electrician who is trained in electrical safety and who has thorough knowledge of the electronic circuits in this machine.

Turn OFF the main power breaker, and then wait at least 20 minutes before carrying out work.

Attach a padlock to the main power breaker so that the power cannot be turned ON.

A sign or notice should be placed near the operation panel to warn others that work is in progress.

If leaving the machine unattended, close the control box and secure it with screws.

**⚠ WARNING**

If the power supply is not grounded, there is risk of electric shock because the leakage current breaker will not operate.

**[SAFETY INSTRUCTIONS]**

Connect the ground according to the specified method.

The PE line for the power line is longer than the other lines (L1, L2 and L3), and therefore, all of the slack should be taken up when the line is connected.

**⚠ WARNING**

If the control box or operation panel is touched accidentally with wet hands while performing installation or maintenance, an electric shock or short-circuit may cause a fire.

**[SAFETY INSTRUCTIONS]**

Do not touch the control box and the operation panel with wet hands.

The cover to the control box must be closed while the machine is operating.

The control box and the operation panel must be kept free of coolant, water, chips and shavings.

**⚠ WARNING**

If any modifications are carried out, such as disabling the limit switch for the door interlock, the safety devices may stop operating. Therefore, the machine may operate even when a door is open, and you may get caught or drawn into the machine.

**[SAFETY INSTRUCTIONS]**

Do not perform any unauthorized modifications on the safety devices.

Do not secure the safety devices in such a way that will prevent them from operating.

If any operator finds that an unauthorized modification on the machine, they should notify the supervisor immediately, without operating the machine.

If modifications are necessary, contact Brother Industries to obtain written approval before proceeding.

**⚠ WARNING**

If a machine with an inner door is used without locking that inner door, then the door could open up during operation and objects could shoot out causing injury.

**[SAFETY INSTRUCTIONS]**

If there is an inner door, lock the inner door with the key before using the machine.

Always lock the doors after installation and maintenance work.

If there is an inner door, do not open the inner door while the axis in the machining room is operating.

**⚠ WARNING**

If the door interlock mode is set to machine setup or service mode, the machine will operate even when a door is open, and you may get caught or drawn into the machine.

**[SAFETY INSTRUCTIONS]**

The installer or setup personnel must never leave the machine unattended while the door interlock mode is set to machine setup or service mode.

The key for the [DOOR INTERLOCK MODE] switch should be kept by the supervisor.

## **⚠ WARNING**

**There are movable parts inside the machine such as the spindle head and table, and your body may get caught on them if you go inside the machine.**

**[SAFETY INSTRUCTIONS]**

**Do not go inside the machine.**

**When a worker must unavoidably go inside the machine, always notify the supervisor. After removing the maintenance cover, use a fixing bracket (for transport) to secure the door and/or use a bolt to keep the door open, so as to avoid being trapped inside.**

**If you go inside the machine, turn OFF the main power breaker, and then attach a padlock to the main power breaker so that the power cannot be turned ON.**

**The operator should visually check to make sure that there is nobody inside the machine before starting the machine.**

**A sign or notice should be placed near the operation panel to warn others that work is in progress.**

### 1.1.1 Before Using the Machine

This machine can be used for drilling, tapping, and facing processes for metals such as steel and aluminum.

Be sure to read this instruction manual thoroughly before using the machine, in order to understand the details about dangers and how to avoid them.

If any modifications are carried out such as disabling safety devices (limit switch for the door interlock), the safety devices may stop operating. Therefore, the machine may operate even when the front door is open, and a worker can get caught or drawn into the machine. As a result, using the machine in particular ways which are not mentioned in the instruction manual or in ways which depart from general safe behavior is extremely dangerous and may lead to personal injury or damage to the machine. Do not modify the safety devices.

Before operating the machine, make sure that the control box door, the machine's front door and the maintenance cover are all securely closed.

There is risk of compromising the safety when disassembling and modifying parts which are not described in the manual. Therefore, never disassemble or modify those parts.

### 1.1.2 Axis Travel

Axis travel for the machine's table or spindle head occurs at a high speed.

Before performing axis travel, make sure that there are no obstacles in the travel area and that there is no interference among tools, workpieces and jigs.

Never go inside the machine through the machine cover during operation.

### 1.1.3 Indexing the Magazine

The magazine rotates at a high speed.

Securely attach a holder onto the magazine grip.

Never go inside the machine through the machine cover while the magazine is rotating.

### 1.1.4 Automatic Operation

Before operating the machine, make sure that the control box door and the maintenance cover door are both securely closed.

Never directly or indirectly touch any moving parts during operation.

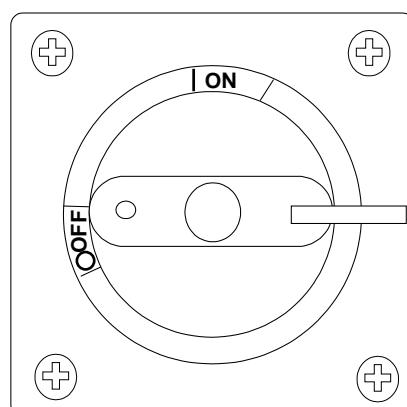
## 1.1.5 Installing and Performing Maintenance Work

### 1.1.5.1 Working Inside the Machine

When working inside the machine near moving parts, always turn OFF the main power breaker handle on the control box door.

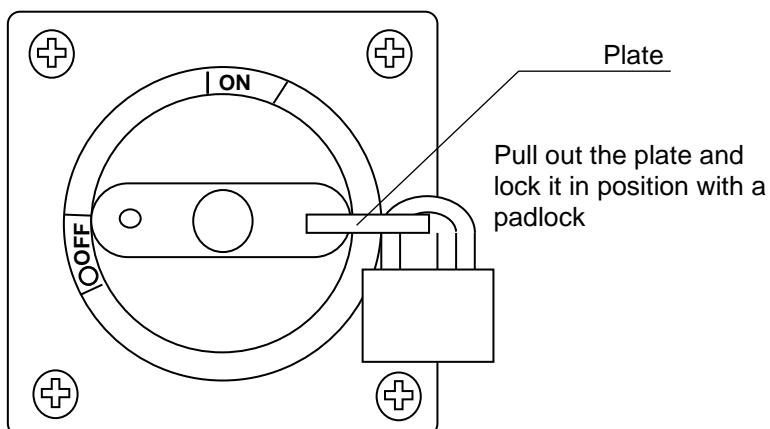
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Main power breaker (OFF position)



Lock the handle with a padlock.

Lock the main power breaker in the OFF position

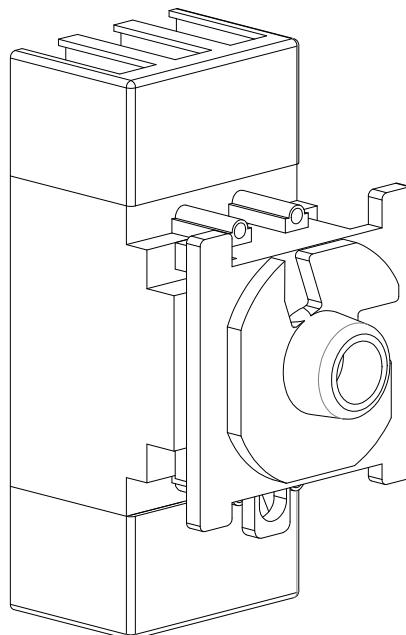


### 1.1.5.2 Working Inside the Control Box

When performing electrical related maintenance and inspection inside the control box, always turn OFF the main power breaker handle on the control box door. Turn the main power breaker handle to OFF, and then wait at least 20 minutes before carrying out work.

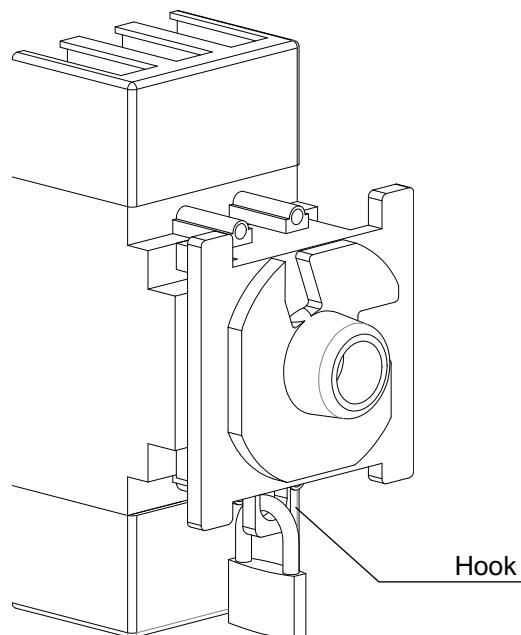
Main power breaker handle

1



Attach a padlock to the hook on the bottom of the handle for the main power breaker.

Lock the main power breaker in the OFF position



Attach a padlock to the hook  
on the bottom of the main  
power breaker

### 1.1.6 Signs of Danger or Machine Trouble

Press the [EMERGENCY] switch to stop all machine operation. Press the switch if you sense any machine abnormality or danger in the slightest.

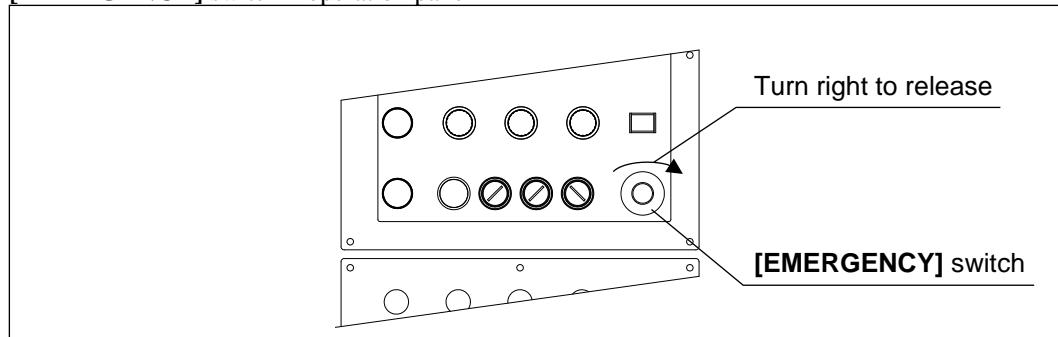
Refer to “7.1.14 Emergency stop” in Operation Manual I for further details on the release procedure.

Refer to “5.11 ATC recovery procedure” in Operation Manual I for further details on the recovery procedure after an emergency stop during a tool change operation.

Refer to “6.8.5 Synchronized tap return” in Operation Manual II for further details on the recovery procedure when the [EMERGENCY] switch is pressed while the tap is stuck in a workpiece.

If objects are hung from the EMERGENCY switch, it may prevent the switch from being pressed, and injury may occur. Do not hook or hang any objects from the switch.

[EMERGENCY] switch – operation panel



### 1.1.7 Door Interlock Function

Before opening a door, make sure that the Z-axis does not fall down, or that the magazine axis does not rotate. While it is rare, the Z-axis brake can fail causing the Z-axis to fall down, or the magazine axis brake can fail causing the magazine to rotate. Nevertheless, even after a door is opened, be careful that the Z-axis does not fall or that the magazine axis does not rotate.

The door interlock function is significantly reduced in service mode, and the machine is in a dangerous state for workers.

Workers without specialized training or qualifications are prohibited from using this mode.

### 1.1.8 Setting up the Wiring

High-voltage components are present inside the control box. Wiring work must only be carried out by a qualified electrician or trained technician. Otherwise, there is risk of electric shock. Such work must only be carried out by a qualified electrician who is trained in electrical safety and who has thorough knowledge of the electronic circuits in this machine.

Turn OFF the main power breaker before commencing work, and attach a padlock to the main power breaker so that the power cannot be turned ON.

If the control box and operation panel are wet, an electric shock or short-circuit may cause a fire. The control box and the operation panel must be kept free of coolant, water and shavings. In addition, never touch the control box or operation panel when your hand is wet.

If the power supply is not grounded, there is risk of electric shock because the leakage current breaker will not operate. Connect the ground according to the specified method.

## 1.1.9 Machining

We recommend using coolant when machining.

When executing dry machining, the dust (or fine particles) inside of the machine may blow around, stick to parts or build up in places, contaminating the sliding sections on the grip or ball screw, making the machine more susceptible to a malfunction. In addition, the chips or shavings may be flammable when performing dry machining on iron-based metals.

In this situation, countermeasures become necessary, such as regular cleaning, adding grease and/or adding a dust collector. When machining with resin material, even if coolant is used, the coolant filter may not function and/or other machine malfunctions may occur. Therefore, keep in mind that the filter will need to be replaced during use.

If oil-based coolants are used during cutting, the cutting area may become hot and sparks may be generated. When using oil-based coolants, a fire alarm box and fire extinguishing equipment must always be on hand for use, and an operator must always monitor the machine while cutting is in progress.

Do not use combustible coolant.

(NOTICE) Oil-based coolant cannot be used on the CTS.

Using water-soluble coolants on combustible metals (for example, magnesium, titanium or aluminum) can produce hydrogen, and when it ignites, it can lead to an explosion and fire. Use coolant for combustible metals or oil-based coolant.

If workpieces and jigs are not correctly installed, they may shoot out and hit you, causing injury. Install them securely to the table.

Loud sounds or noises can occur depending on the cutting conditions. Review the cutting conditions to lower the level of the noises, and use protective gear if necessary.

If an excessive pull-out force is applied to a tool due to the cutting conditions, the tool may be pulled out from the spindle. Check the cutting conditions.

When machining under cutting conditions that lead to an excessive load on the machine, the chips or shavings become hot and can cause a fire. Machine using cutting conditions that are appropriate for the workpiece and tool combination. In addition, we recommend replacing the tools regularly in order to maintain the appropriate cutting conditions.

Avoid programming which uses tool path instructions that cause interference, or which use continuous operation or cutting instructions that lead to an excessive load on the machine and thus result in overheating or a fire. In addition, execute a dry run before starting the program, and make sure that there are no problems before machining in order to avoid overloads or interference caused by program errors or the wrong tool offset amount. Furthermore, use tool life management in the program for optimum tool use, because tool wear or breakage can prevent the cutting conditions from being met and thus cause an overload.

Be sure to check the machine setup carefully. If you fail to check the machine setup, there is risk of the spindle and workpieces colliding or an overload may occur, which can lead to overheating and/or a fire. Be sure to check and manage the protruding length of the tool and the tool diameter. In addition, make sure that the attachment position of the workpiece, the selected jig and the clamp position of the workpiece match the NC program.

If the tool breaks or if the tool teeth suffer abnormal wear, the load on the teeth increases and the teeth overheat, and it may generate sparks on the teeth. Therefore, the tool life must be managed. In addition, we recommend installing a tool breakage detector.

When the chips or shavings build up inside the machine, clean up the chips or shavings right away because it can lead to a fire. In addition, when using coolant, adjust the direction of the nozzles so it hits the machining points.

When managing and disposing of the ejected chips or shavings, be sure to process them appropriately.

Do not carry out polishing or machining such as abrasive machining that uses a sharpening stone or sandpaper or that uses a brush made with an abrasive grain or grit.

This machine was developed for machining metals such as iron and aluminum. It was not designed for machining materials with a high degree of hardness (such as glass, ceramic, carbon or graphite) or for cutting processes that generate fine chips or shavings.

If the machine becomes damaged due to machining applications that fall outside of the original design (as noted above), this machine damage falls outside of our standard machine warranty. If the machine is used for machining applications noted above, refer to the following table for those mechanisms and components that will not be covered by the warranty.

Spindle	Spindle bearing, spindle unit and end cover
All feed axes	Ball screw, guide, shaft bearing, oil seal and cable carrier
Additional axis	Additional axis unit, shaft bearing, oil seal and speed reducer
ATC	Grip related components and speed reducer
Cover	Front door related parts, telescopic cover and sliding cover
Coolant	Pump, coolant valve, filter and all piping
Other	Mechanism with sliding parts and/or rotating parts, related components and all piping
	Machine accuracy that becomes poor due to the deterioration of the aforementioned parts

### 1.1.10 When Opening / Closing a Door

If a door is opened or closed forcefully, the momentum can damage the machine.

When opening or closing a door, open and close it slowly. In addition, if chips or shavings build up around the door, they may keep the door from opening or closing. Clean the inside of the machine regularly.

### 1.1.11 Using Touch Panel

1. Use your finger to operate and use the touch panel. The touch panel has difficulty responding to fingertip (end of the fingernail) operations. In addition, if the tip of a screwdriver or another pointed instrument is used to operate the touch panel, it may scratch or crack the surface of the panel.
2. The touch panel may also have difficulty responding to user operations when the user is wearing thick gloves.
3. If the touch panel is dirty, the panel may not respond or may respond incorrectly to the touch operation. When the touch panel becomes dirty, clean it.

To clean the touch panel while the power is ON, press the [DSP OFF] key to turn OFF the display and then wipe the screen. When the display is turned OFF, the user can press any key to turn it back ON.

Number key, character key, symbol key, cursor key, [Home] key, [MANU] key, [MDI] key, [MEM] key, [EDIT] key or [RST] key

4. If a certain amount of the liquid sticks to the touch panel, the touch panel may go into low sensitivity mode in order to avoid the screen from responding incorrectly to a touch operation. At this time, a pictogram and the operator message <<Screen is dirty. Touch panel low sensitivity mode.>> appears. Refer to “3.4.1 Alarm/Operator message area” in Operation Manual I for further details.  
In this mode, the operational performance lowers because the touch panel sensitivity is intentionally lowered. Wipe off the liquid that is on the touch panel.
5. Use a soft cloth to clean the touch panel. When using a detergent, be sure to use a neutral detergent.
6. When there is metal powder that is stuck to the touch panel, first remove the powder before use to avoid scratching the glass.
7. When a protective film is affixed to use the touch panel, the sensitivity may become less sensitive and the panel may have difficulty responding to touch operations.

## 1.2 Safety Precautions

### **⚠ WARNING**

**High-pressure air escaping from damaged sections of air hoses or from valves while setup or maintenance work is being carried out may cause injury to your eyes or ears.**

#### [SAFETY INSTRUCTIONS]

**Always be sure to wear protective goggles.**

**Always be sure to wear ear plugs.**

**Connecting and changing over air hoses containing high-pressure air must only be performed by a qualified technician who has been trained in handling high-pressure air with thorough knowledge of this machine.**

**Always be sure to disconnect the pressure source and reduce the pressure before connecting high-pressure air hoses.**

### **⚠ WARNING**

**Do not climb onto the machine or other nearby equipment when performing installation or maintenance, otherwise you may fall down and injure yourself.**

#### [SAFETY INSTRUCTIONS]

**Do not climb onto the machine or nearby equipment.**

**Use a step or step-ladder to provide a secure foot hold when the working position or conditions are awkward or out of reach.**

### 1.2.1 Before Performing Work on the Machine

1. Workers must be trained for all work required to perform installation.
2. Turn the main power breaker handle on the control box to the OFF position. Wait at least 20 minutes before carrying out work.  
Do not touch the primary power and terminal for the main power breaker because it has a high voltage.
3. Disconnect the primary power plug for the main power breaker, turn OFF the breaker on the switchboard for the building and make sure that there is no voltage applied to the primary side of the main power breaker. Post a sign or a notice that prohibits anyone from re-connecting the power plug or switchboard while maintenance is in progress. If possible, use and attach a lock and key to prevent others from accidentally re-connecting the power.
4. Post a sign or a notice that prohibits unauthorized personnel from entering the work area so that they do not go near the machine.
5. Do not place unnecessary objects close to the machine.
6. Always be sure to wear a helmet and safety footwear.
7. When performing pneumatic related work, always be sure to disconnect the compressed air source and purge any residual pressure before proceeding.  
Always be sure to wear protective gear for your eyes and ears.

### 1.2.2 While Working on the Machine

1. When two or more workers are working together, loud voices should be used for communication to ensure safety.
2. Only qualified technicians who are trained in electrical safety are allowed to open the control box door.  
The supervisor or responsible party shall carry the key.
3. If leaving the machine unattended, close the control box door and lock it with the key.
4. Make sure to clean inside and around the machine.
5. Do not put your hand or any other part of your body under the spindle head.
6. Do not put your fingers in between the ATC grip.  
Do not put your fingers in between the tool or the tool holder and the magazine.
7. Always follow the warning or cautionary labels that are affixed to the machine.

### 1.2.3 After Work is Completed

1. Close the control box door and lock it with the key.
2. Turn the main power breaker handle on the control box to the OFF position.
3. Set the [DOOR INTERLOCK MODE] switch to automatic operation mode.
4. Make sure the safety devices are returned back to their original settings.
5. Make sure that the safety covers, such as the maintenance cover, are reattached as before.
6. Make sure that there are no hand tools left inside the machine.
7. Return the air pressure back to its original setting. Attach the cover and tighten the cover screws.

### 1.2.4 Other Precautions

- Do not hook or hang any objects from the EMERGENCY switch.
- Do not put any heavy objects such as the mist collector on the ceiling cover.

## 1.3 Authorized Workers and Operators

### **⚠ WARNING**

High-voltage components are present inside the control box.  
There is risk of electric shock if you touch these components by mistake.

#### [SAFETY INSTRUCTIONS]

Maintenance and inspection of electrical components must only be carried out by a qualified electrician who is trained in electrical safety and who has thorough knowledge of the electronic circuits in this machine.

Turn OFF the main power breaker, and then wait at least 20 minutes before carrying out work.

Attach a padlock to the main power breaker so that the power cannot be turned ON.

A sign or notice should be placed near the operation panel to warn others that work is in progress.

If leaving the machine unattended, close the control box and secure it with screws.

### **⚠ WARNING**

If the control box or operation panel is touched accidentally with wet hands while performing installation or maintenance, an electric shock or short-circuit may cause a fire.

#### [SAFETY INSTRUCTIONS]

Do not touch the control box and the operation panel with wet hands.

The cover to the control box must be closed while the machine is operating.

The control box and the operation panel must be kept free of coolant, water, chips and shavings.

### **⚠ WARNING**

High-pressure air escaping from damaged sections of air hoses or from valves while setup or maintenance work is being carried out may cause injury to your eyes or ears.

#### [SAFETY INSTRUCTIONS]

Always be sure to wear protective goggles.

Always be sure to wear ear plugs.

Connecting and changing over air hoses containing high-pressure air must only be performed by a qualified technician who has been trained in handling high-pressure air with thorough knowledge of this machine.

Always be sure to disconnect the pressure source and reduce the pressure before connecting high-pressure air hoses.

This manual is written for personnel who set up and install the machine.

### 1.3.1 Qualified Personnel

Maintenance and inspection of electrical components must only be carried out by a qualified electrician who has thorough knowledge of the electronic circuits in this machine.

Connecting and changing over air hoses containing high-pressure air must only be performed a qualified technician who has been trained in handling high-pressure air with thorough knowledge of this machine.

1

All workers identified below must be meet the requirements to perform work.

#### 1. General workers

It is prohibited for children to operate or work on this machine.

Only trained personnel are qualified and authorized to operate and work on this machine. In addition, workers must understand all information related to the operations in the Operation Manual and Safety Manual.

#### 2. Installer/machine setup specialists

In addition to the requirements, general workers must understand the information in the Installation Manual. They also must have knowledge and/or experience in the following:

- (1) Knowledge of electric circuits in this machine and be a qualified electrician in order to perform maintenance and inspection of electrical components
- (2) Knowledge of piping on this machine and experience in handling high pressure air because there is high pressure piping on this machine
- (3) Knowledge related to workpiece adjustment and clamping
- (4) Experience in installation, operation and monitoring of machine
- (5) Knowledge and experience in selecting, using and installing tools
- (6) Knowledge and experience in machining workpieces and optimizing machining processes
- (7) Knowledge of risks related to machine setup and required safety measures and protection
- (8) Knowledge related to appropriate use of protective equipment

#### 3. Maintenance workers

In addition to the requirements of the general workers and machine setup specialists, workers must have knowledge about maintenance work and understand any other potential risks related to machine maintenance work mentioned in the Safety Manual. When performing work tasks, use a chain with a warning sign to cordon off the machine area as shown below. In addition, maintenance workers can perform the following work tasks.

- (1) Work where a tool is used and the cover removed
- (2) Work such as installing or moving a machine
- (3) Work content that is listed under “Chapter 9 Inspection”

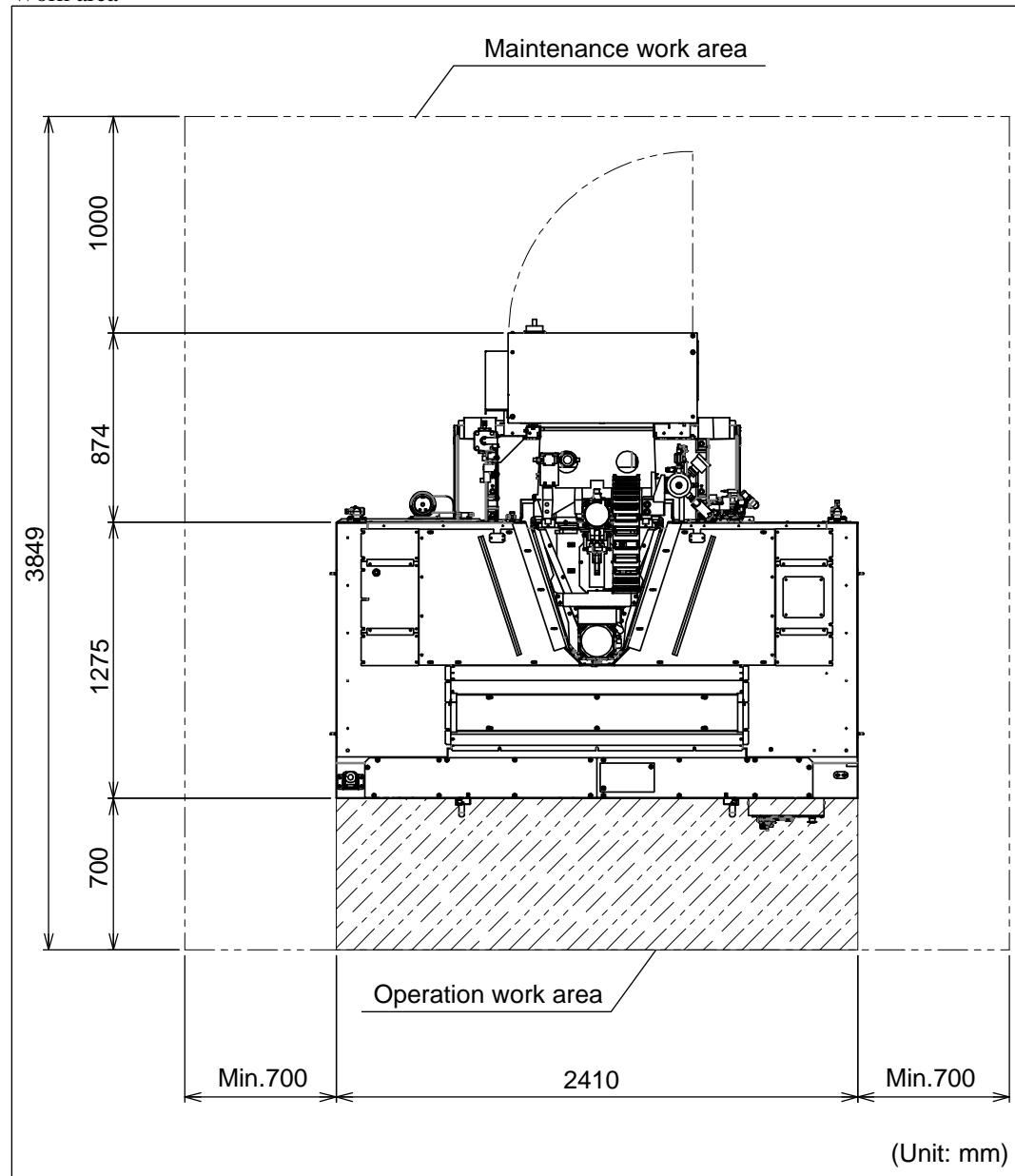
Maintenance workers must carefully read and understand this manual before performing work.



### 1.3.2 Work Area

Before performing work, be sure to make enough space for the “Operation work area” and “Maintenance work area” as indicated by the two-dotted dashed line in the diagram below.

Work area



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# CHAPTER 2

## OVERVIEW

- 2.1 Main Features**
- 2.2 Basic Structure**
- 2.3 External View and Main Dimensions**
- 2.4 Machine Specifications**
- 2.5 Accessories**

## 2.1 Main Features

The main features of this machine are described below.

### 2.1.1 Spindle Head Structure

1. The spindle uses precision bearings to ensure high rotation accuracy over a long period of time.
2. The structure has a grease seal which eliminates the need to constantly add grease.
3. An AC servo motor is used for the spindle motor, increasing the rotation range.

2

### 2.1.2 Feed Mechanism (X, Y and Z)

1. An AC servo motor is used for the feed motor which eliminates the need to replace brushes.
2. The feed motor and precision ball screw are directly connected, and in addition, the guide uses a linear motion bearing, facilitating a smooth feed operation.

This mechanism practically eliminates all sticking and slipping, eliminating gear backlash.

Gear backlash is the clearance or margin in between the cogs when they mesh together in the cogwheel.

Sticking and slipping occurs when the table starts to move and there is a relatively large friction force on the sliding surface, producing intermittent, not continuous, movement.

## 2.2 Basic Structure

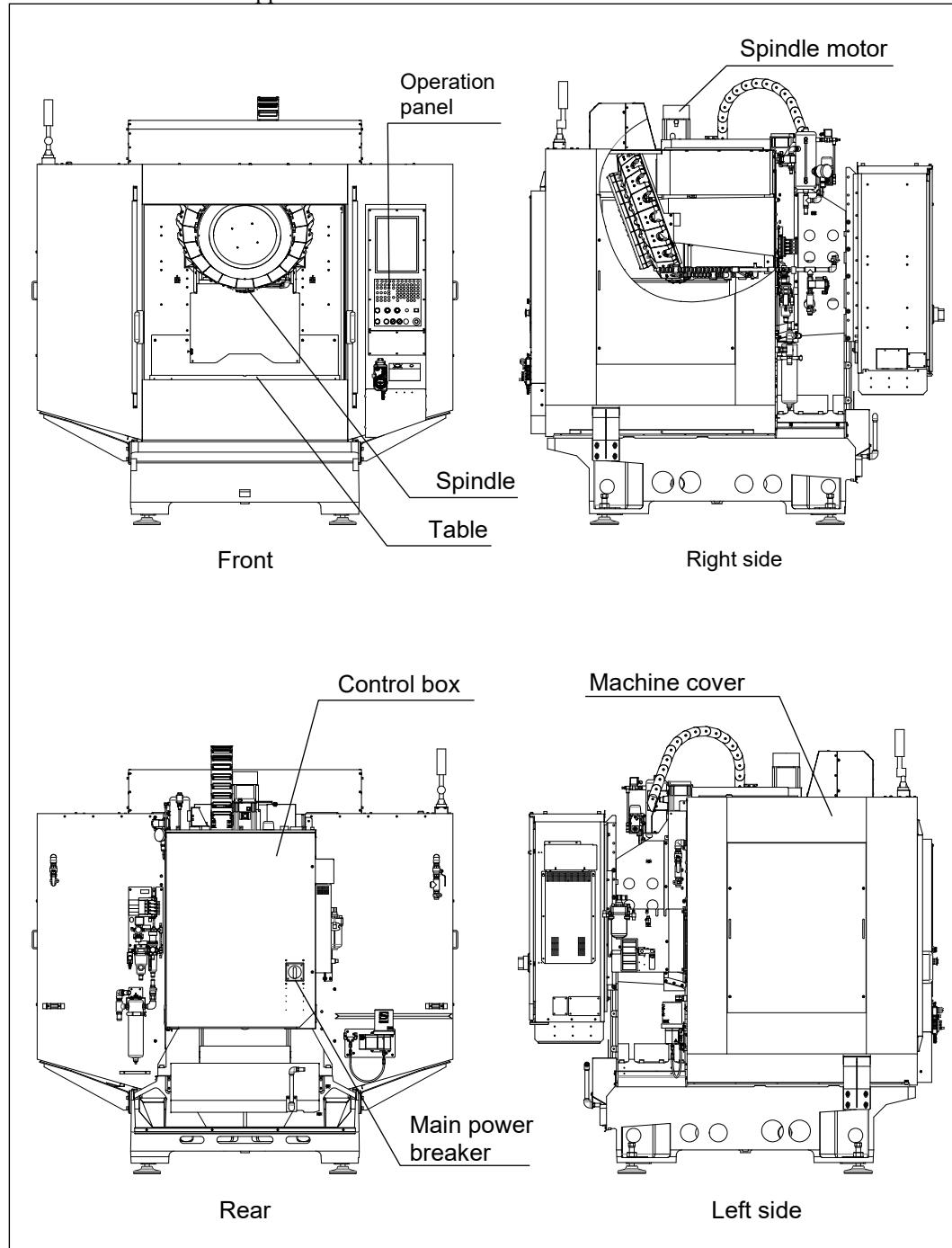
The basic structure of this machine is described below.

### 2.2.1 Basic Structure

1. It has a vertical spindle head.
2. The X- and Y-axes travel along the table.
3. The Z-axis is for spindle head movement.
4. The shortest random access path and unique armless ATC mechanism facilitate quick tool changing.
5. The control box is located at the rear of the machine. It requires minimal space for installation space because it integrates mechanical and electrical control.

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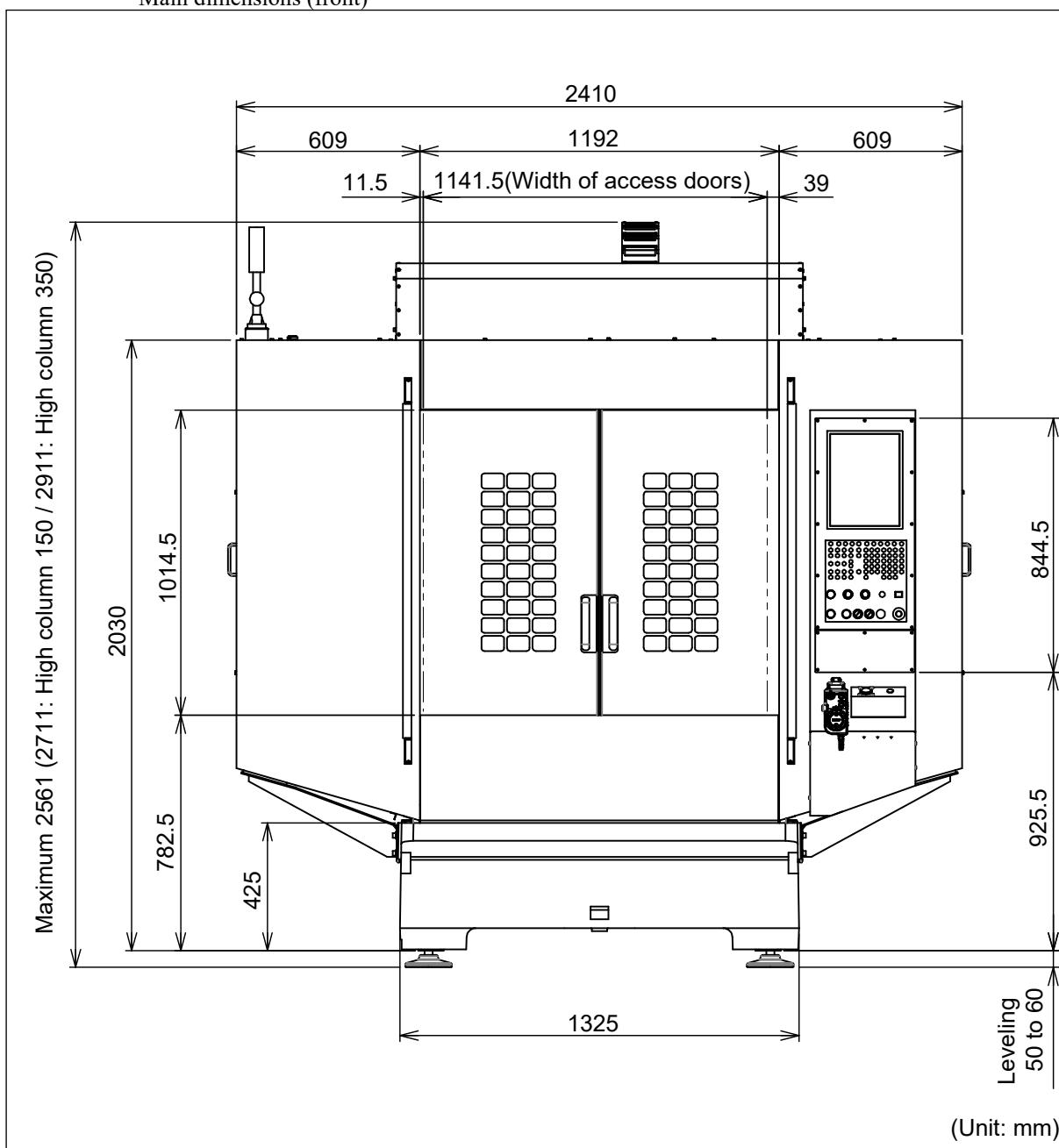
Part names and external appearance



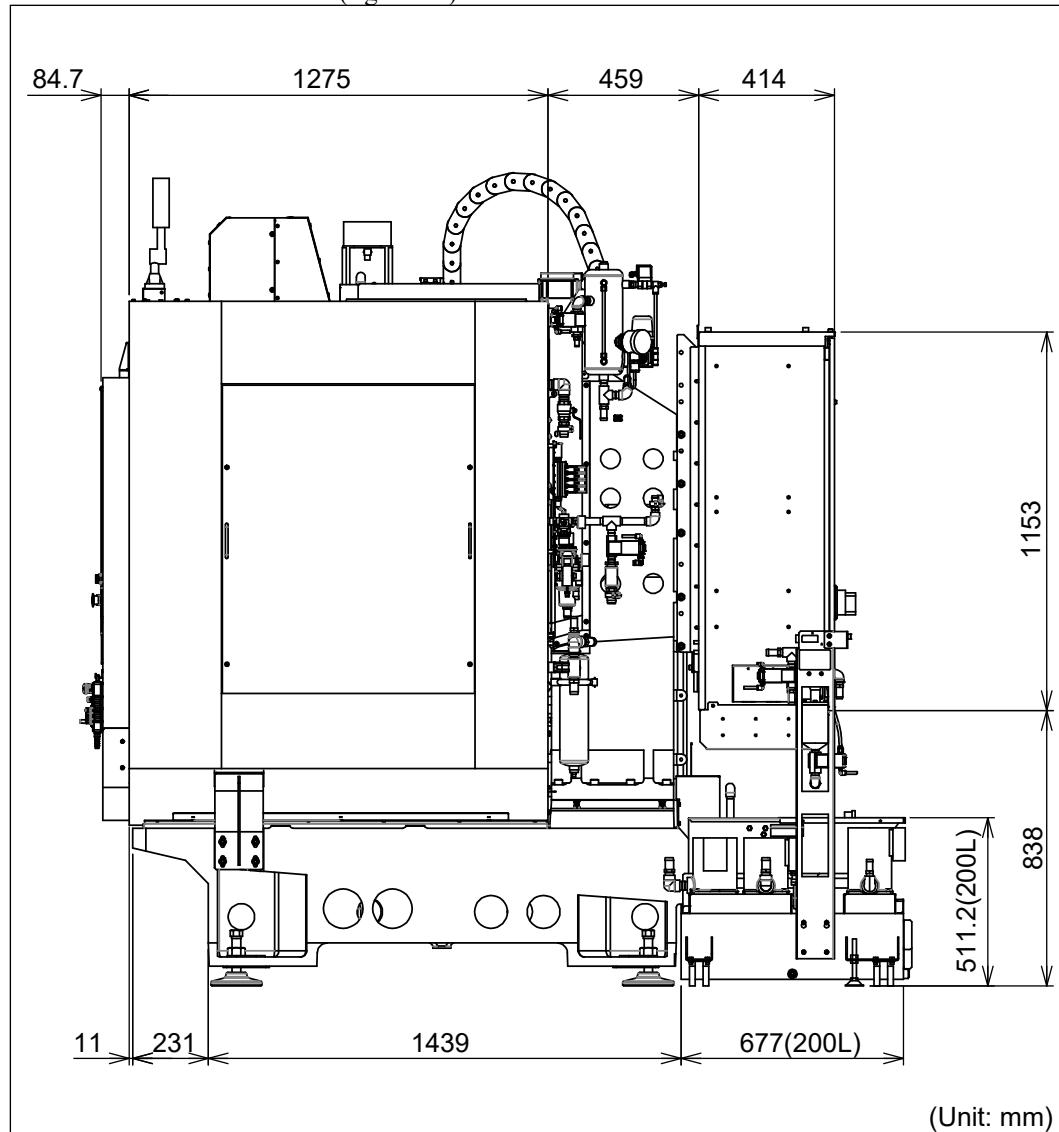
## 2.3 External View and Main Dimensions

Main dimensions (front)

2



External view and dimensions (right side)



## 2.4 Machine Specifications

List of machine unit specifications (1)

	Item	Unit	W1000Xd1
Travel amount	X-axis travel amount Y-axis travel amount Z-axis travel amount (Spindle head vertical) Distance from top of table to end of spindle	mm mm mm mm	1000 500 300 180~480(Standard column specification) 330~630 (150 mm high column specification) 430~730 (250 mm high column specification) 530~830 (350 mm high column specification) 545
Table	Size of table's operation face  Maximum table load weight (*1 uniform load) *1 The load position may impact the accuracy. Shape of table top	mm kg	1100×500  X direction, T-slot 14 mm, Qty. 3 Y direction, key slot, Qty.1
Spindle	Spindle rotation speed  Maximum spindle rotation during tapping	min <sup>-1</sup> min <sup>-1</sup>	1 to 10000 (10k specification) (10k high-torque specification) 1 to 16000 (16k specification) 6000 (10k specification, 10k high-torque specification, 16k specification)
	Spindle tapered hole – BT specification BBT specification Spindle bearing inner diameter Tapered side × Motor side	mm	7/24 Taper No.30  7/24 Taper No.30 BIG-PLUS φ50×φ45 (10k specification, 10k high-torque specification, 16k specification)
Feedrate	Rapid feedrate (X and Y) Rapid feedrate (Z) Cutting feedrate (X, Y and Z)  Manual feedrate (X, Y and Z) Low rotation speed (4-, 5- and 6-axes)	mm/min mm/min mm/min  mm/min min <sup>-1</sup>	50000 56000 1 to 30000 (When using high accuracy mode B) 50 to 4000 (22 levels) 0.1 to 7.5 (19 levels)
Automatic tool	Tool shank type		MAS-BT30 (BT specification) MAS-BT30/BBT30 (BBT specification)
Automatic tool changer (ATC)	Tool storage capacity (Max.) Pull stud type Max. tool diameter (NOTE) Max. tool length (NOTE) Max. tool weight (NOTE) Overall tool weight (NOTE) Tool selection method	Qty. mm mm kg kg	14/21 MAS-P30T-2(60°) 125 250 4.0 25 (14 tools) / 35 (21 tools) Random shortcut access

(NOTE) Refer to “3.7.2 Tool holder limits” in Operation Manual I for further details on the tools.

## List of machine unit specifications (2)

Item	Unit	W1000Xd1	
Automatic tool changer (ATC)	Tool change time (Tool to tool)	sec	<Maximum tool specification settings>: Standard tool 0.6 (50 Hz, 60 Hz – 14 tools) 0.6 (50 Hz, 60 Hz – 21 tools) <Maximum tool specification settings>: Heavy tool 0.7 (50 Hz, 60 Hz – 14 tools) 0.7 (50 Hz, 60 Hz – 21 tools)
	Tool change time (Chip to chip)	sec	<Maximum tool specification settings>: Standard tool 1.2 (50 Hz, 60 Hz – 14 tools) 1.2 (50 Hz, 60 Hz – 21 tools) <Maximum tool specification settings>: Heavy tool 1.3 (50 Hz, 60 Hz – 14 tools) 1.3 (50 Hz, 60 Hz – 21 tools)
Motor output	Spindle motor	kW	10000 min <sup>-1</sup> (rpm) spec. 18.9 (Instantaneous max.)
		kW	10.1 (10 min.)
		kW	7.0 (Continuous)
		kW	16000 min <sup>-1</sup> (rpm) spec. 15.4 (Instantaneous max.)
		kW	7.4 (10 min.)
		kW	5.1 (Continuous)
		kW	10000 min <sup>-1</sup> (rpm) High-torque spec. 26.2 (Instantaneous max.)
		kW	12.8 (10 min.)
		kW	9.2 (Continuous)
	Feed axis motor (X and Y) (Z)	kW	1.0
		kW	2.0
Power requirement	Power variation	V Hz	AC 200 to 230 V±10%, 3-phase 50/60±2% Ground system (TT, TN)
Capacitance	Continuous power rating Start peak current	kVA Arms	10000 min <sup>-1</sup> (rpm) spec. 9.5 106.0
	Continuous power rating Start peak current	kVA Arms	16000 min <sup>-1</sup> (rpm) spec. 9.5 106.1
	Continuous power rating Start peak current	kVA Arms	10000 min <sup>-1</sup> (rpm) High-torque spec. 10.4 130.8
Air pressure source	Pressure Flow rate (Overall) (Spindle air purge)	MPa L/min (ANR)	0.4 to 0.6 (4 to 6 kgf/cm <sup>2</sup> ) 45
Machine size	Machine height (from floor)	mm	2553
	Required floor space (including space for accessing the control box)	mm	2410×3072
	Machine weight (including control unit)	kg	3300 (14 tools) 3350 (21 tools)

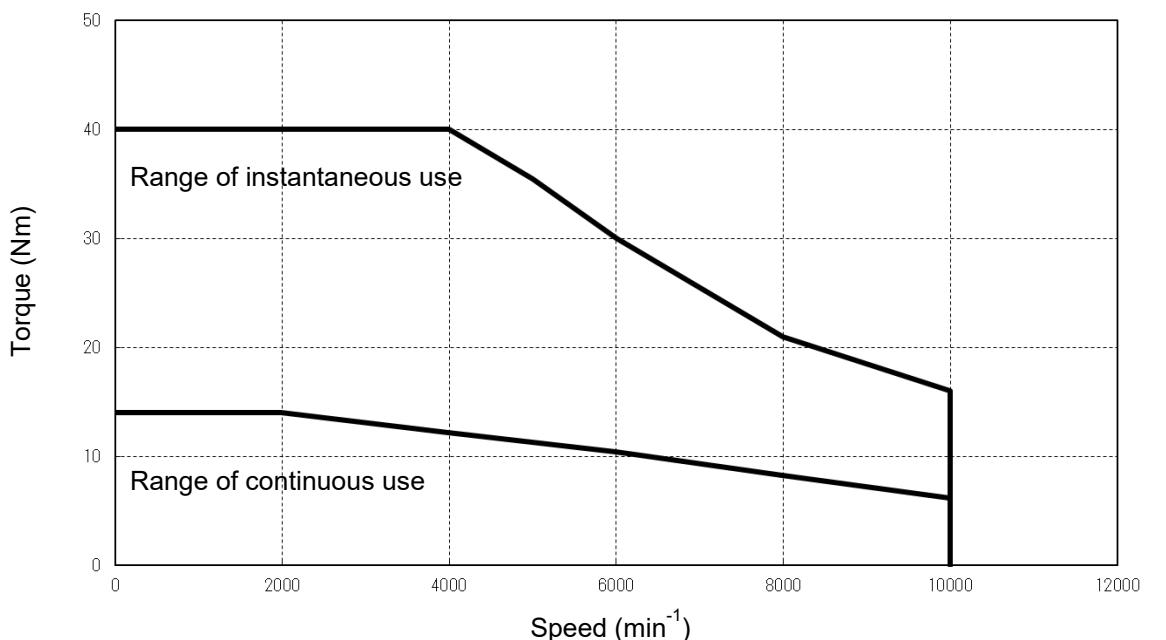
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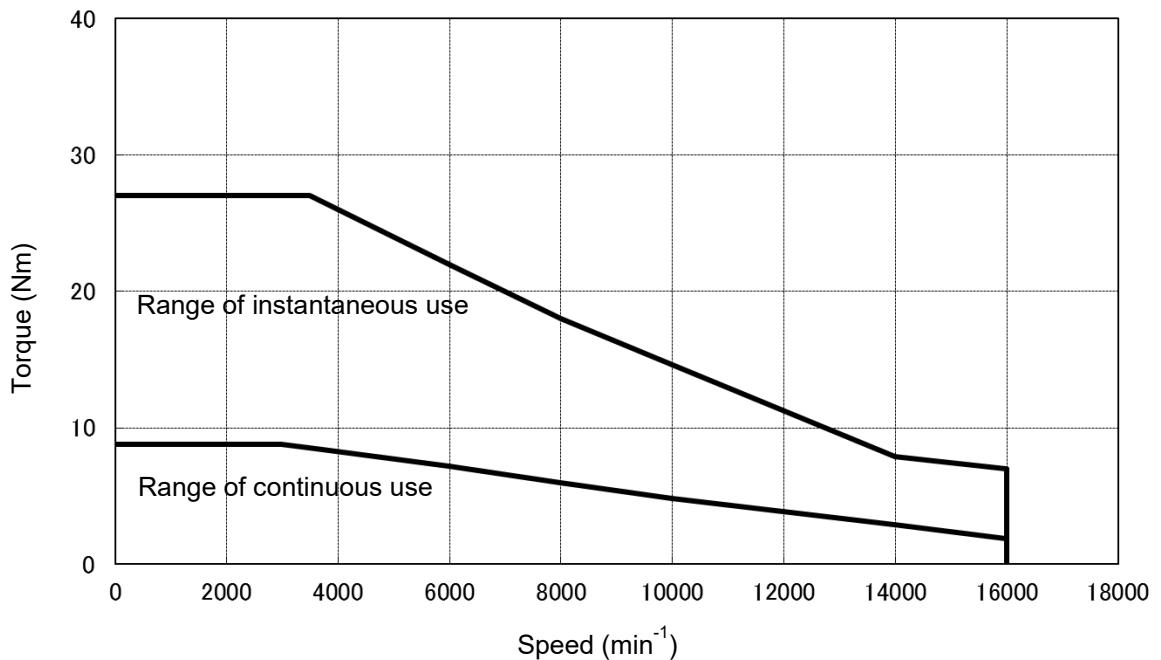
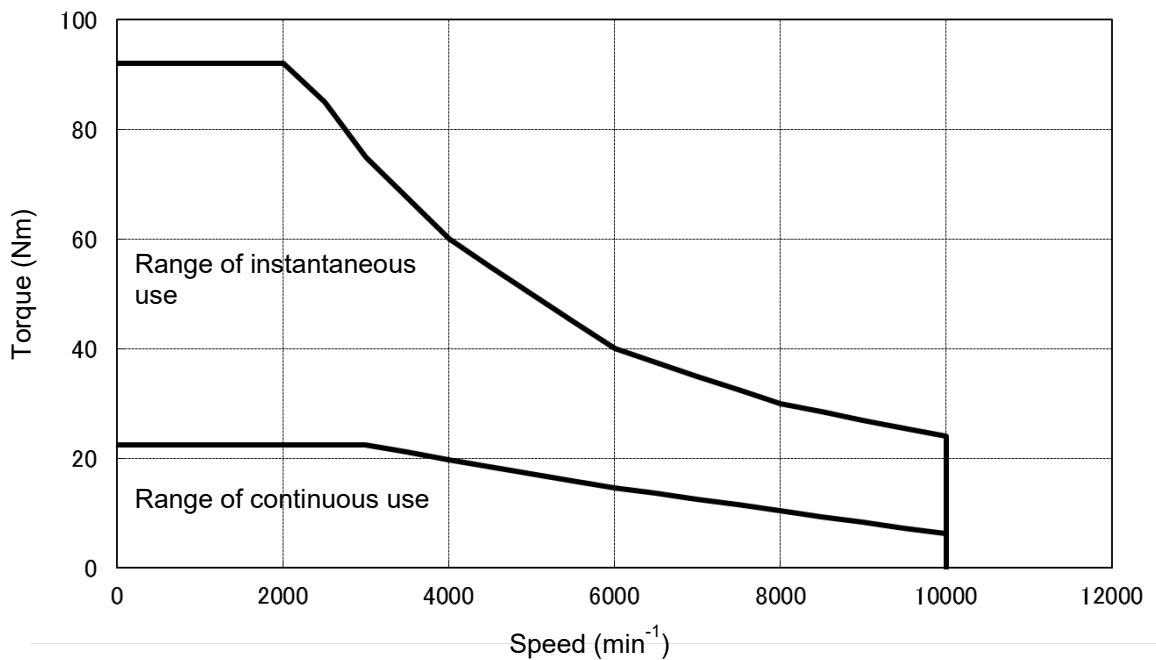
Item		Unit	W1000Xd1
Accuracy	Bidirectional positioning accuracy (ISO230-2(2006))	mm	Overall length of measurement axis 0.006~0.020
	Accuracy for repeating same bidirectional positioning (ISO230-2(2006))	mm	Overall length of measurement axis Less than 0.006
Noise*1	Equivalent noise level L Aeq K inaccuracy (1 m from front of machine, 1.6 m from floor) Operating conditions ISO 8525 Annex B 3.3.1	dB dB	74 4

\*1 Insert the following statement in accordance with the EU standard EN 12417.

“The figures quoted are emission levels and are not necessarily safe working levels. While there is a correlation between the emission and exposure levels, this cannot be used reliably to determine whether or not further precautions are required. Factors that influence the actual level of exposure of the personnel include characteristics of the work room, other sources of noise, that is, the number of machines and other adjacent processes, etc. The permissible exposure level can also vary from country to country. However, this information will enable the user of the machine to make a better evaluation of the hazards and risks”.

Graph of torque characteristics for spindle motor (10000 min<sup>-1</sup> specification)



Graph of torque characteristics for spindle motor ( $16000 \text{ min}^{-1}$  specification)Graph of torque characteristics for spindle motor ( $10000 \text{ min}^{-1}$  high-torque specification)

## 2.5 Accessories

### 2.5.1 Standard Accessories

Standard accessories

Item	Qty.
Manuals (Installation, Operation I, Operation II, Data Bank & Alarm, PLC, Conversation Language Programming and NC Language Programming)	Total: 7 manuals
Leveling bolts	4
Leveling plates	4

2

### 2.5.2 Options

Options

Accessories
Cleaning gun
Handle (Manual pulse generator)
Automatic door
Automatic door (with area sensor)
LED machine lights (single and double)
Display lights (Single: Yellow, Double: Yellow and red, Triple: Red, yellow and green)
Tool breakage detector
Automatic intermittent lubricating system (only ball screw and linear guide)
Automatic greasing system (only ball screw and linear guide)
Expanded program memory capacity: 3000 MB
Spindle override
Additional axis connection unit (for 1axis and 2 axes)
PLC programming software
Switch panel (8holes / 10 holes)
Tool washing (Air assist)
High column (150 mm, 250 mm, 350 mm)
Specified color
Jig shower valve unit
200 L coolant unit with chip shower (200 L tank with valve and 250 W pump ×3)
200 L coolant unit with chip shower, 1.5 MPa CTS device and cyclone filter device (200 L tank with valve and 250 W pump ×4 + 650 W pump)
200 L coolant unit with chip shower, 1.5 MPa CTS device, cyclone filter device and tool wash (200 L tank with valve and 250 W pump ×4 + 650 W pump)
CV nozzles under head
7 MPa coolant-through-spindle (CTS) (not including tank and pump)
RS232C connector
Grip cover
Side cover with window
Ceiling cover
Software option items (such as submicron command)
Fieldbus network
FC unit (For PROFIBUS, DeviceNet and CC-Link)
CM unit (For CC-Link)
FE unit (For EtherNet and PROFINET)
Power extension assembly (50A breaker)
EXIO unit
Operation preparation assembly (MASTER ON switch, etc.) *1
Data protection switch
Rotary table T-200Ad
Zero point matchmark
100V power outlet (excluding the EU and U.S.A)
200V power outlet (excluding the EU and U.S.A)
Parts seal

\*1 Refer to [MASTER ON] Connection Manual for further details.

# CHAPTER 3

3

## TRANSPORT & STORAGE

- 3.1 Machine Transport**
- 3.2 Precautions When Storing / Not Using the Machine  
for Long Periods**

## **WARNING**

If you put any parts of your body inside the machine while the maintenance cover has been removed for setup or maintenance work, you may get caught or drawn into the machine if the machine is operated by mistake.

**[SAFETY INSTRUCTIONS]**

Do not put any part of your body inside the machine while it is operating.

Turn OFF the main power breaker before removing the maintenance cover.

Attach a padlock to the main power breaker so that the power cannot be turned ON.

A sign or notice should be placed near the operation panel of the machine to warn others that work is in progress.

## **WARNING**

If the machine is moved while the cables are still connected, an open circuit may cause electric shock.

**[SAFETY INSTRUCTIONS]**

The installer must disconnect all cables from the main machine unit, the coolant tank, the chip conveyor and the peripheral equipment before moving the machine.

The installer must disconnect all primary cables from the main machine unit before moving the machine.

## **WARNING**

When lifting or performing leveling work during machine setup, the machine may overturn or the jack may become loose, and a person may become trapped by the machine.

**[SAFETY INSTRUCTIONS]**

Only use a forklift that can bear the full weight of the machine with forks long enough to lift the machine up securely.

The machine should be set up on a stable, level surface.

Attach fixing brackets for transport when moving the machine.

The installer should perform leveling work on the floor, and should use tools to perform adjustments and should never place his or her hands underneath the machine.

The installer should use a jack at the center-front part of the machine's base.

## **WARNING**

When replacing parts or disconnecting hoses from the coolant equipment, the coolant may shoot out and injure your eyes.

**[SAFETY INSTRUCTIONS]**

Always be sure to wear protective goggles.

Purge all remaining pressure before carrying out such work.

Handle the hoses carefully so that they are not subjected to any impacts.

If coolant gets into your eyes, rinse with clean water and then seek medical advice.

**⚠ WARNING**

High-pressure air escaping from damaged sections of air hoses or from valves while setup or maintenance work is being carried out may cause injury to your eyes or ears.

**[SAFETY INSTRUCTIONS]**

Always be sure to wear protective goggles.

Always be sure to wear ear plugs.

Connecting and changing over air hoses containing high-pressure air must only be performed by a qualified technician who has been trained in handling high-pressure air with thorough knowledge of this machine.

Always be sure to disconnect the pressure source and reduce the pressure before connecting high-pressure air hoses.

**⚠ WARNING**

If the door interlock mode is set to machine setup or service mode, the machine will operate even when a door is open, and you may get caught or drawn into the machine.

**[SAFETY INSTRUCTIONS]**

The installer or setup personnel must never leave the machine unattended while the door interlock mode is set to machine setup or service mode.

The key for the [DOOR INTERLOCK MODE] switch should be kept by the supervisor.

## 3.1 Machine Transport

The re-exporting and resale of this machine is regulated by Japan's export laws and regulations in accordance with international export management. When exporting, permission from the exporting country's government and/or from the Japanese government may be required. Contact a Brother Industries dealer in advance before re-transferring, reselling or re-exporting this machine.

3

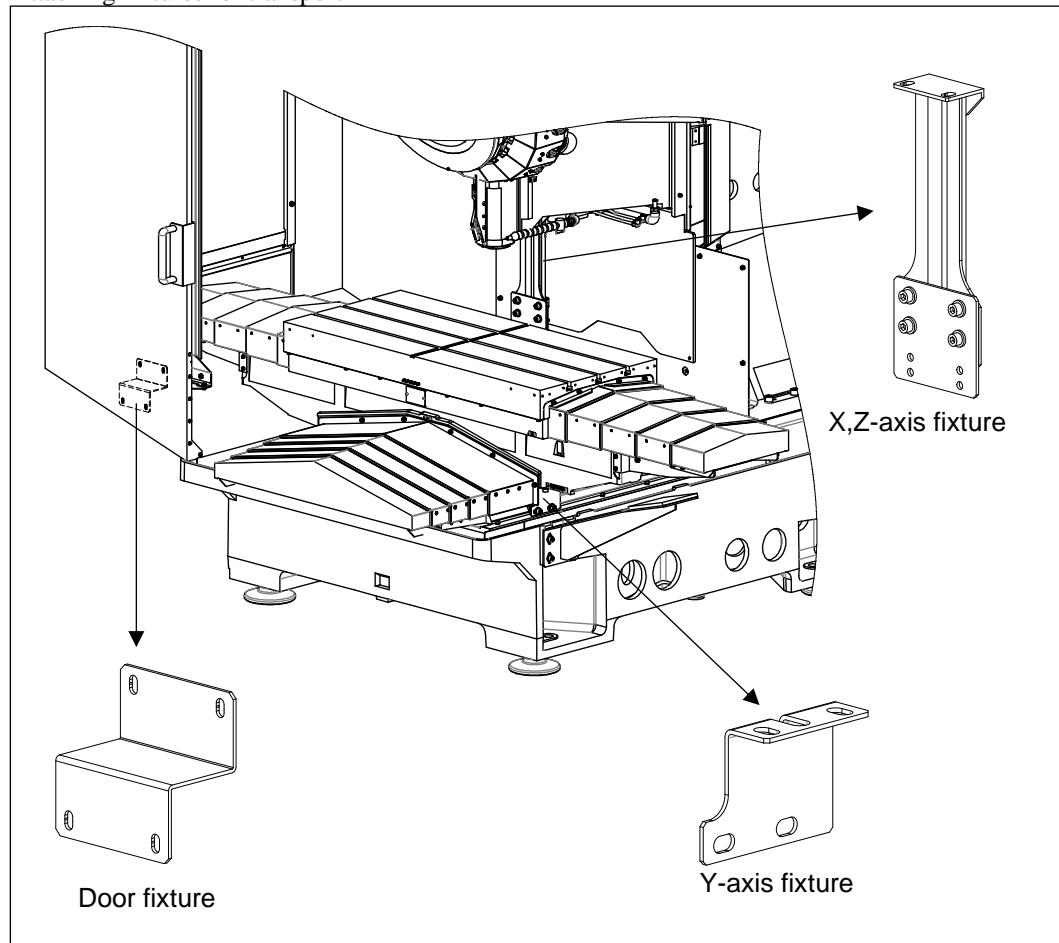
On machines equipped with a relocation detection device, if the machine is relocated, operation is temporarily disabled. When a machine is relocated, please submit a relocation application to a Brother Industries dealer in advance.

Make sure that leveling is performed properly because it has a major impact on the machine's accuracy and lifespan.

### 3.1.1 Preparations for Transport

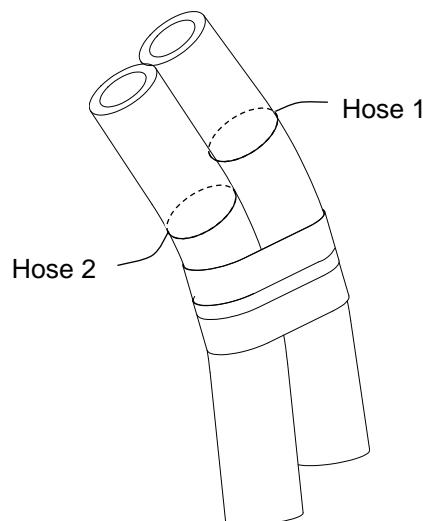
1. Use manual operation mode to move the axes and secure the fixtures.  
This procedure is for balancing the machine and moving the center of gravity to the machine center.  
Refer to "Chapter 5 Manual operation" in Operation Manual I for further details on manual operation mode.

Attaching fixtures for transport



- (1) Move the table to the front end of Y, and attach the Z-axis fixing bracket (table side) for transport to the back of the table.
  - (2) Move the table to X coordinate position -500.
  - (3) Move the table to the Y coordinate position: -149.
  - (4) Move the spindle head to the Z coordinate position: 277, and attach the Z-axis fixture.  
(High column 150 spec: 352, high column 250 spec: 452, high column 350 spec: 552)
  2. Open the front door, and mount the Y-axis fixture and door fixture.
  3. There are no specific fixtures required when moving the machine a short distance, such as within the factory premises.  
In this situation, move the Z-axis in the minus direction (down) as much as possible, and move the X-axis and the Y-axis to the center.
  4. Turn OFF the power, and disconnect the power cord.
  5. If there are accessories attached, disconnect the hose, cord, and other relevant items.  
Attach a note to the hose and other items that were removed and keep them together in order to make it easier to re-attach them afterwards.
- (NOTICE)** Remove the hoses and tubing from the machine and the surrounding equipment, and then move the machine. If the machine is moved or transported with the connections in place, the hoses may get pulled on and damage the machine.

Binding the hoses together (Example)

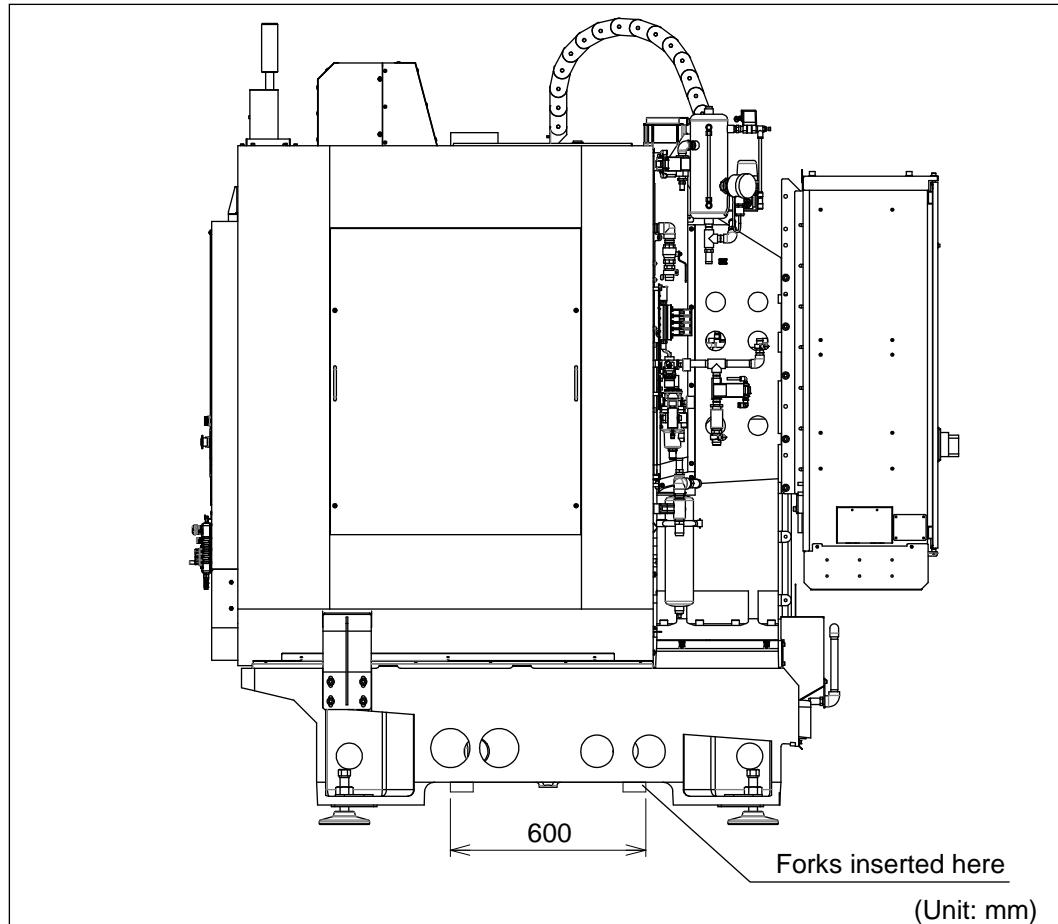
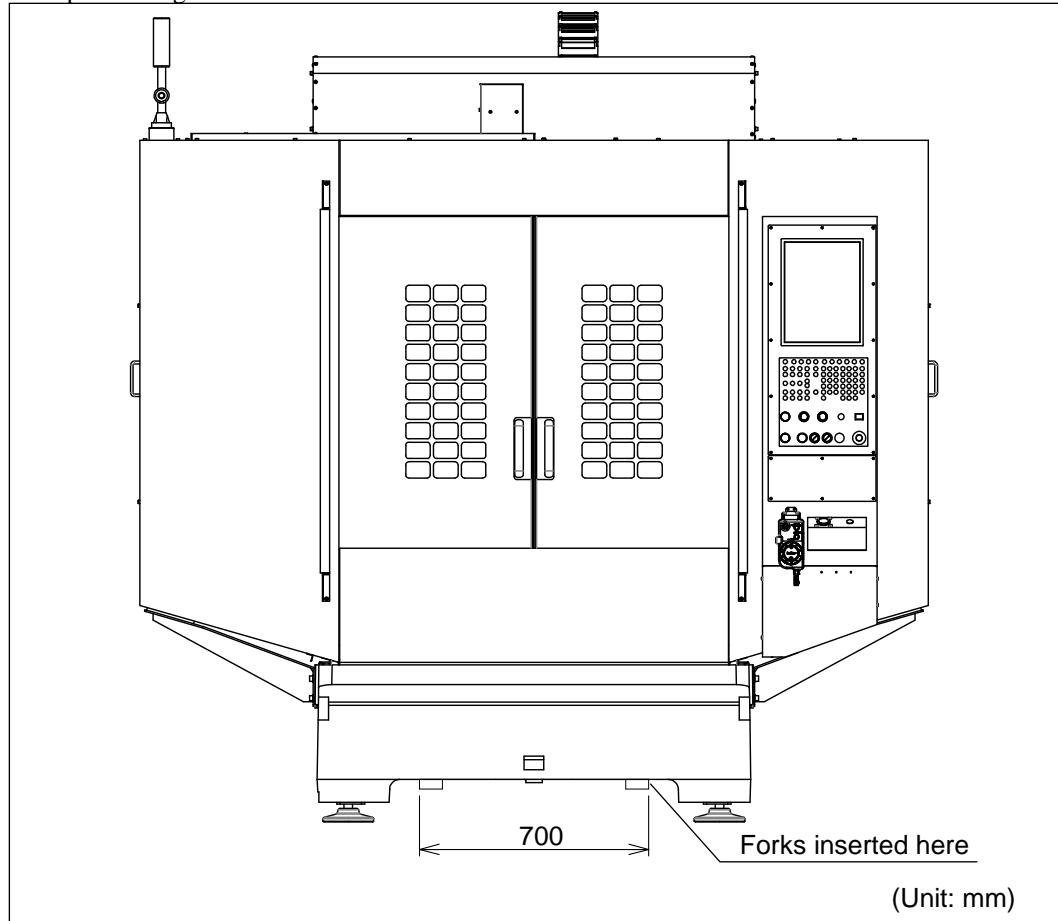


6. Apply grease to prevent rust on the following parts.
  - Spindle taper
  - X-axis and Y-axis telescopic cover
  - Table surface
  - Other (Casted machining surface and untreated chassis parts)
7. Position the forks on the forklift under the legs of the machine to support the machine.  
Make sure that the machine is secured and not susceptible to vibrations or any impacts during transport. In addition, make sure that the hoses, cords and other items do not get damaged.  
Only a forklift with long forks that can bear the full weight of the machine should be used.

Machine weight	3350 kg (W1000Xd1)		
Fork length on forklift (Effective length)	From machine front	From machine side	From machine rear

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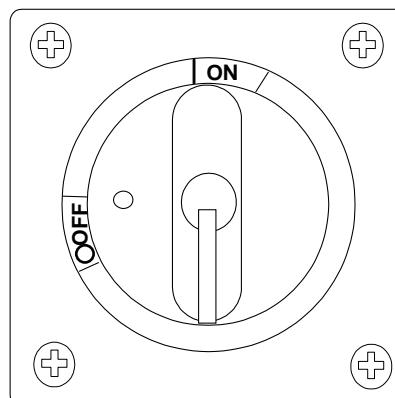
Fork positioning on machine



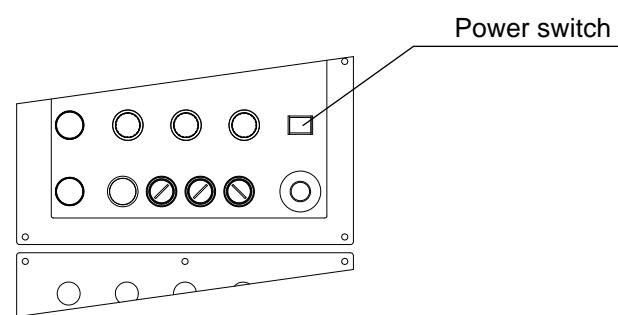
### 3.1.2 Unloading from Forklift

1. Unload the machine from the forklift gently to the position where it will be installed.  
Always be sure to use the leveling plates provided in the standard accessories underneath the leveling bolts.  
Refer to “4.6 Leveling” for further details on the leveling procedure.
2. Remove the transport braces that were secured onto the Z-axis for transport. (Remove the Y-axis and door fixtures for export specifications.)
3. Connect the power cord on the side of the machine to the factory’s power outlet, and turn ON the factory side power.
4. Turn ON the main power breaker handle in the control box.  
When the handle lock key is in the lock position (▲ Lock), the main power breaker handle will not move.
5. Turn ON the power on the operation panel.

Main power breaker handle (ON position)



Power switch (ON position)



## 3.2 Precautions When Storing / Not Using the Machine for Long Periods

**Please follow the directions below to prevent problems that are caused by rust forming on the machine or data loss caused by expired batteries, and to prevent the relocation detection status from activating and disabling operation temporarily (on machines that are equipped with a relocation detection device).**

3

### 3.2.1 Steps Before Turning OFF Power

1. Lubricate the feed axis (grease), and move the axis approximately 3 full strokes to spread the grease all along the inside of the guide block and the guide rail.  
This task helps prevent rust from forming due to the moisture inside the coolant that remains after machining.  
Refer to “9.2 Inspecting Machine Lubrication” for further details on the lubrication procedure.
2. Index the magazine tool number to the number 1 position, move the X- and Y-axes to the center, move the Z-axis to the top end of the stroke, and then turn OFF the power.  
Performing this task beforehand helps facilitate the zero point adjustment.
3. If one of the following alarms is triggered: <<Time to change batteries>> and <<Change batteries on relocat. detect. device with power ON>>, refer to “9.7.5 Battery Replacement” and replace the batteries. Then, make sure that the alarm no longer triggers.

### 3.2.2 Conditions When Storing / Not Using for Long Periods

1. Store the machine in a location with little variance in the ambient conditions and avoid high temperature, low temperature and high humidity.  
Refer to “4.1.1 Ambient conditions” for further details.
2. Apply grease to prevent rust on the following parts.
  - Spindle taper
  - X-axis and Y-axis telescopic cover
  - Table surface
  - Other (Casted machining surface and untreated chassis parts)

### 3.2.3 Operating and Powering Up After Storing

1. When turning ON the power switch
  - If the alarm <<Time to change batteries>> is triggered, only replace the batteries while the power switch is turned ON.
  - When the alarm <<Change batteries on relocat. detect. device with power ON>> is triggered on a machine equipped with a relocation detection device, replace the batteries (while the power switch is turned ON). If the alarm <<Relocation was detected>> is also triggered, the relocation detection status must be reset after replacing the batteries.

Refer to “9.7.5 Replace batteries” for further details on battery replacement.

Refer to “Chapter 14 Relocation detection device” for further details on resetting the relocation detection status.

2. Lubricate the inside of the guide block and guide rail with grease, as noted in section 1 above under 3.2.1.
3. When a tank is connected, agitate or stir the coolant.

4. Perform a spindle test run.

Use the spindle speeds and operating times in the table below, and execute the program in the “MAINT” folder. If the recommended program is deleted, follow the table below and carry out the operation.

<b>“MAINT” O0110</b>	<b>10000min<sup>-1</sup>/10000min<sup>-1</sup> high torque spec.</b>	<b>Ver1.0</b>
120	Continuous (5 sec. rotation)	0.1
1000	Continuous (180 sec. rotation)	3
4000	Intermittent (50 sec. rotation + 5 sec. at 500 min <sup>-1</sup> ) × 5 sets	4.6
6000	Intermittent (50 sec. rotation + 5 sec. at 500 min <sup>-1</sup> ) × 5 sets	4.6
8000	Intermittent (50 sec. rotation + 5 sec. at 500 min <sup>-1</sup> ) × 5 sets	4.6
9000	Intermittent (50 sec. rotation + 5 sec. at 500 min <sup>-1</sup> ) × 5 sets	4.6
10000	Intermittent (50 sec. rotation + 5 sec. at 500 min <sup>-1</sup> ) × 60 sets	55
10000	Continuous (660 sec. rotation)	11
Total		87.5

<b>“MAINT” O0116</b>	<b>16000min<sup>-1</sup> specification.</b>	<b>Ver1.0</b>
120	Continuous (5 sec. rotation)	0.1
1000	Continuous (180 sec. rotation)	3
4000	Continuous (180 sec. rotation)	3
8000	Intermittent (10 sec. rotation + 30 sec. at 500 min <sup>-1</sup> ) × 8 sets	5.3
10000	Intermittent (10 sec. rotation + 30 sec. at 500 min <sup>-1</sup> ) × 8 sets	5.3
12000	Intermittent (10 sec. rotation + 30 sec. at 500 min <sup>-1</sup> ) × 8 sets	5.3
14000	Intermittent (10 sec. rotation + 30 sec. at 500 min <sup>-1</sup> ) × 8 sets	5.3
16000	Intermittent (10 sec. rotation + 30 sec. at 500 min <sup>-1</sup> ) × 3 sets	2
16000	Intermittent (40 sec. rotation + 10 sec. at 500 min <sup>-1</sup> ) × 20 sets	16.7
16000	Continuous (840 sec. rotation)	14
Total		60

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# CHAPTER 4

## INSTALLATION

4

- 4.1 Recommended Conditions for Installation**
- 4.2 Installation**
- 4.3 Factory and Machine Side Power Setup**
- 4.4 Piping**
- 4.5 Setting Operating Conditions**
- 4.6 Leveling**
- 4.7 Reset Relocation Detection Status**

## 4.1 Recommended Conditions for Installation

### **⚠ WARNING**

**When lifting or performing leveling work during machine setup, the machine may overturn or the jack may become loose, and a person may become trapped by the machine.**

**[SAFETY INSTRUCTIONS]**

**Only use a forklift that can bear the full weight of the machine with forks long enough to lift the machine up securely.**

**The machine should be set up on a stable, level surface.**

**Attach fixing brackets for transport when moving the machine.**

**The installer should perform leveling work on the floor, and should use tools to perform adjustments and should never place his or her hands underneath the machine.**

**The installer should use a jack at the center-front part of the machine's base.**

### **⚠ WARNING**

**When replacing parts or disconnecting hoses from the coolant equipment, the coolant may shoot out and injure your eyes.**

**[SAFETY INSTRUCTIONS]**

**Always be sure to wear protective goggles.**

**Purge all remaining pressure before carrying out such work.**

**Handle the hoses carefully so that they are not subjected to any impacts.**

**If coolant gets into your eyes, rinse with clean water and then seek medical advice.**

4

The conditions of the machine installation must be taken into account in order to maintain machine accuracy. We recommend the following conditions when installing the machine.

### 4.1.1 Ambient Conditions

Ambient conditions

Item	Conditions	Special notes
Temperature	17°C to 25°C -15°C to 60°C (Storage and transport)	Note that the permissible range is from 0°C to 40°C.
Temperature variation	1.0°C per hour	Ideally the temperature difference should be within ±2.0°C per day.
Humidity	40% to 75% when 20°C	Make sure there is no condensation.
Altitude	1,000 m or below	-

Do not use in a location that is exposed to radiation (i.e. microwaves, ultraviolet rays, laser beams or X-rays, etc.). Do not use in a corrosive or combustible environment.

Keeping the temperature constant and the variation to a minimum are key to maintaining machining accuracy.

Avoid the following conditions.

1. Places where the machine is exposed to direct sunlight.
2. Places where there is high humidity.
3. Places where the temperature fluctuates significantly.
4. Places where the machine is exposed to major vibrations.
5. Places where the machine is exposed to strong magnetic fields.
6. Places where there is a lot of dust or dirt.
7. Places where the machine is exposed to the air-conditioning.

### 4.1.2 Special Notes When Installing

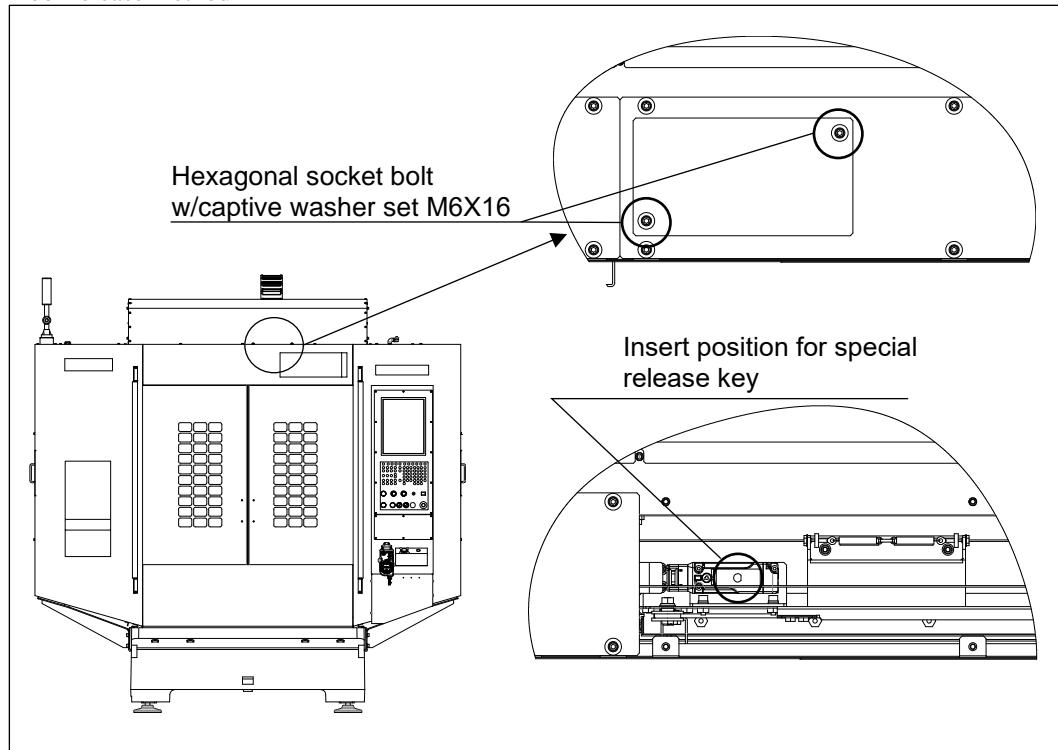
1. Pay particular attention not to expose the CNC control unit or the machine's moving parts to dust or other contaminants.
2. Make sure that there is enough space at the rear of the machine to open the control box door all the way.
3. For the air supply to the machine, use clean air without any oil content or moisture per the following.

Impurities in compressed air	Standard value
Solids	Smaller than 5 µm
Moisture	Dew point under pressure: Less than 10°C
Oil concentration	Less than 1 mg/m³ (ANR)

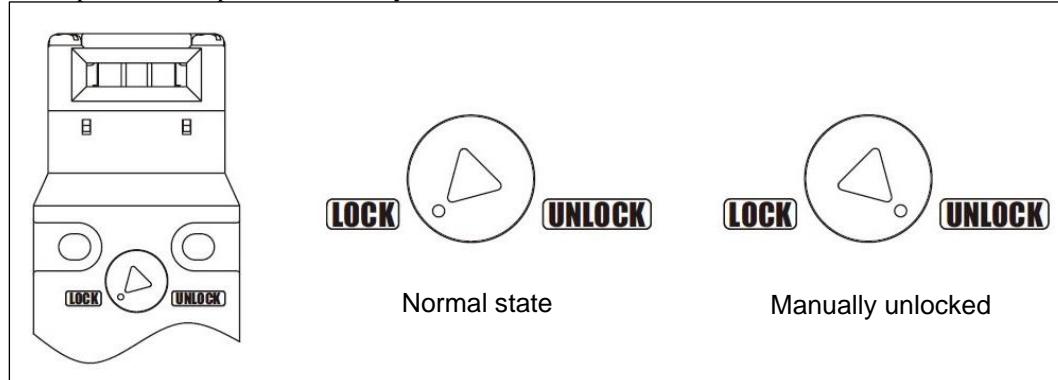
4. Always use the special leveling plates provided when installing the machine.
5. If the machine is installed in a location with a slippery floor, the machine may move during operation. In this situation, special measures must be taken to secure the foundation of the anchors.
6. The machine could be exposed to major vibrations if installed near a road or close to other machines, therefore consider changing the installation location or special measures to protect the machine, such as a soundproofing partition or a wall.
7. The machine can be installed using the leveling bolts without implementing special measures to secure the foundation. However, if the foundation is weak causing the machine to sink or tilt, special measures must be taken to secure the foundation.
8. In order to ensure that the static accuracy and performance of the machine, install it in a place where the air flow in the factory will not adversely affect the machine.  
There is no need to use air conditioning but it is recommended that the ambient temperature be between 17 and 25°C.
9. The static accuracy and performance of the machine can be further maintained when the temperature does not fluctuate more than  $\pm 2^\circ\text{C}$  in a 24 hour period (1 day) and when the temperature does not fluctuate more than  $1^\circ\text{C}$  at a height that is approximately 5 m from the floor.
10. If the coolant hose is damaged, the coolant or cutting fluid may shoot out.  
Make sure that the hose is not damaged and is securely connected.
11. If the doors are closed when the power is turned OFF, the doors are locked and cannot be opened. To open a door while the power is OFF, use the release key that is provided to open the door.

4

Door release method



Insert position for special release key



## 4.2 Installation

Install the machine based on the following diagrams.

The bubble level on the table may change due to axis travel at locations where the foundation of the factory is weak.

In addition, if there are also major vibrations from other machinery, it can adversely affect the machining accuracy.

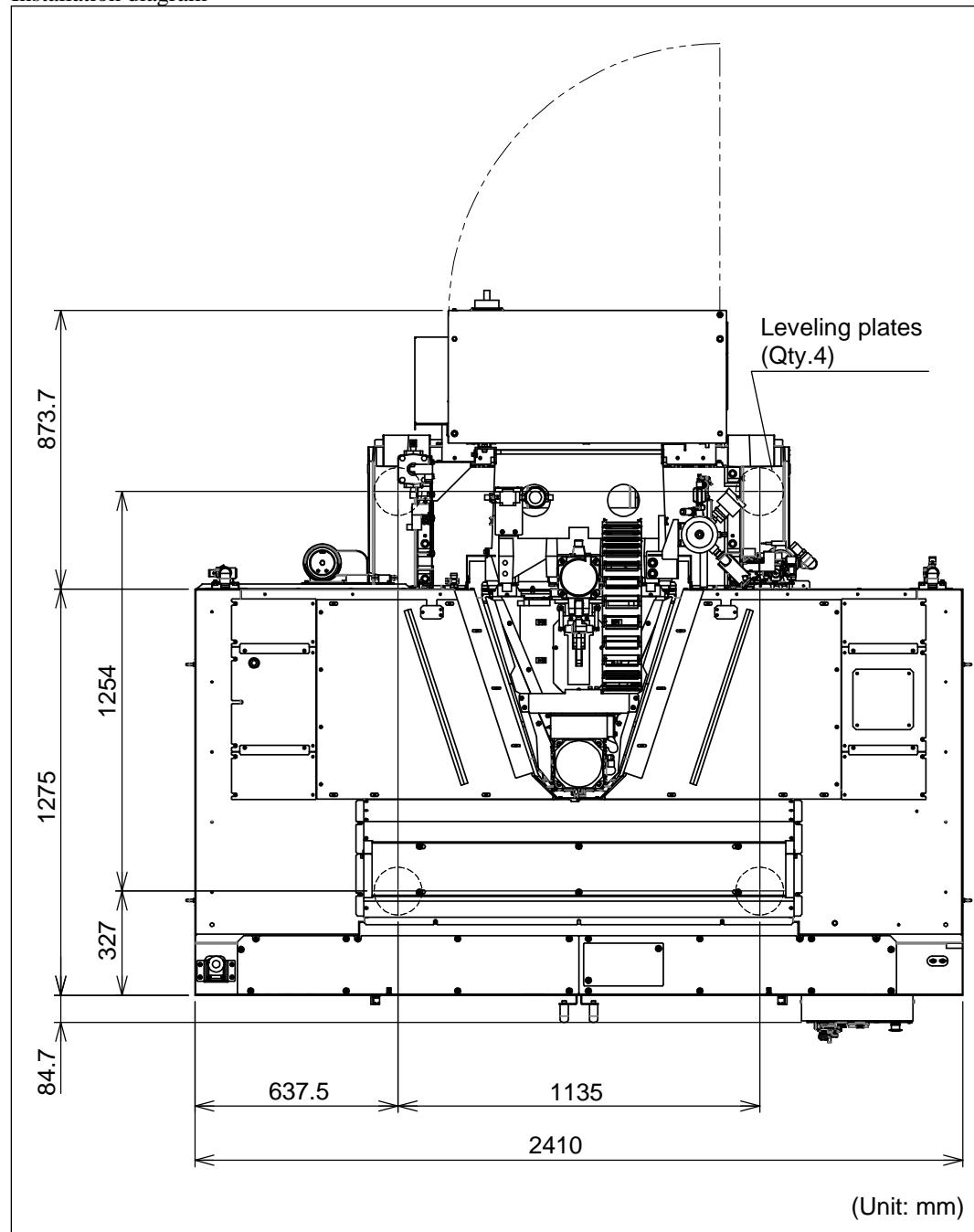
A problem or error could also occur on the machine unit, therefore consider the weight of the machine and install it on a strong foundation. (Foundation strength: 1.0 MPa or greater)

Wipe down and remove the grease (used to prevent rust) on the following parts inside of the machine.

- Spindle taper
- X-axis and Y-axis telescopic cover
- Table surface
- Other (Casted machining surface and untreated chassis parts)

Installation diagram

4



## 4.3 Factory and Machine Side Power Setup

### **⚠ WARNING**

High-voltage components are present inside the control box.  
There is risk of electric shock if you touch these components by mistake.

#### [SAFETY INSTRUCTIONS]

Maintenance and inspection of electrical components must only be carried out by a qualified electrician who is trained in electrical safety and who has thorough knowledge of the electronic circuits in this machine.

Turn OFF the main power breaker, and then wait at least 20 minutes before carrying out work.

Attach a padlock to the main power breaker so that the power cannot be turned ON.

A sign or notice should be placed near the operation panel to warn others that work is in progress.

If leaving the machine unattended, close the control box and secure it with screws.

### **⚠ WARNING**

If the power supply is not grounded, there is risk of electric shock because the leakage current breaker will not operate.

#### [SAFETY INSTRUCTIONS]

Connect the ground according to the specified method.

The PE line for the power line is longer than the other lines (L1, L2 and L3), and therefore, all of the slack should be taken up when the line is connected.

### **⚠ WARNING**

If the control box or operation panel is touched accidentally with wet hands while performing installation or maintenance, an electric shock or short-circuit may cause a fire.

#### [SAFETY INSTRUCTIONS]

Do not touch the control box and the operation panel with wet hands.

The cover to the control box must be closed while the machine is operating.

The control box and the operation panel must be kept free of coolant, water, chips and shavings.

### **⚠ WARNING**

If terminal connections on the PCBs or terminal block screws become loose, poor contacts may cause overheating or a fire.

#### [SAFETY INSTRUCTIONS]

There should be no loose screws when connecting the wiring.

Do not replace fuses and electrical parts that have been soldered to the inside of the unit.

## **WARNING**

**If you touch cables which have been crushed or damaged by heavy objects, there is risk of electric shock.**

**In addition, short-circuits may occur if cables are crushed or damaged by heavy objects.**

**[SAFETY INSTRUCTIONS]**

**Cables should be gathered up or arranged to prevent them from being crushed. If a cable has become damaged, it must be replaced with a new one.**

This procedure is for setting up the power on the factory side and machine side.

High-voltage components are present inside the control box. Wiring work must only be carried out by a qualified electrician or trained technician. Otherwise, there is risk of electric shock. Such work must only be carried out by a qualified electrician who is trained in electrical safety and who has thorough knowledge of the electronic circuits in this machine.

- Setting up cables and power on the factory side and machine side.
- Changing the cables for the transformer connection terminals.

4

Turn OFF the power breaker on the factory side while setting up the cables and wiring. In addition, make sure to check the cable contacts so that the PCBs on the control box do not get damaged.

Various problems could occur if the power on the machine side is not properly connected.

- The connecting procedure varies depending on the voltage supplied on the factory side. Check the voltage, carefully read this chapter and connect accordingly.
- Only the power supply capacity for this machine and the standard Brother options have been provided for the transformer box. Do not use this transformer box for supplying power to other devices or equipment.

Check the following points when setting up the cables and wiring.

- Make sure that the terminal box screws are tightened.
- Close the control box, the transformer box door (cover) and cable clamp securely, in order to prevent problems caused by oil mist and dust, etc.

### 4.3.1 Overview

The procedure for changing the power cable connections and voltage taps varies depending on the voltage for the power on the factory side.

When using 400 V systems, set up the transformer box outside of the machine.

1. When using 200 V systems  
Refer to section 4.3.5.1.
2. When using 400V systems (non-EU specification)  
Refer to section 4.3.5.2.
3. When using 400V systems (EU specification)  
Refer to section 4.3.5.3.

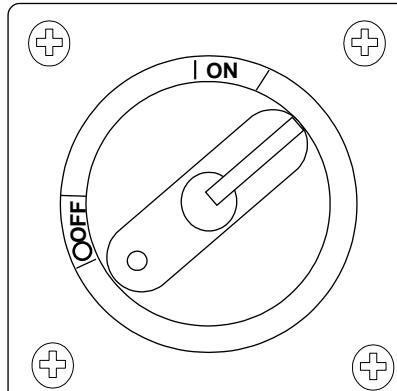
### 4.3.2 Opening and Closing the Control Box Door

#### 1. When opening the door

Loosen the simple lock and the 2 socket bolts (M5) on the top and bottom of the door. Then, turn the main power breaker handle to the Open Reset position and pull to open. Refer to the <Door lock method> diagram on the next page for the bolt position.

When the handle is locked, the main power breaker handle will not move.

When opening the door

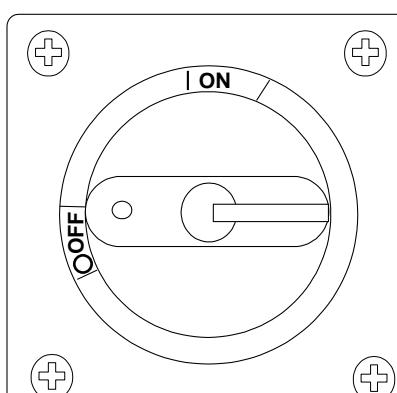


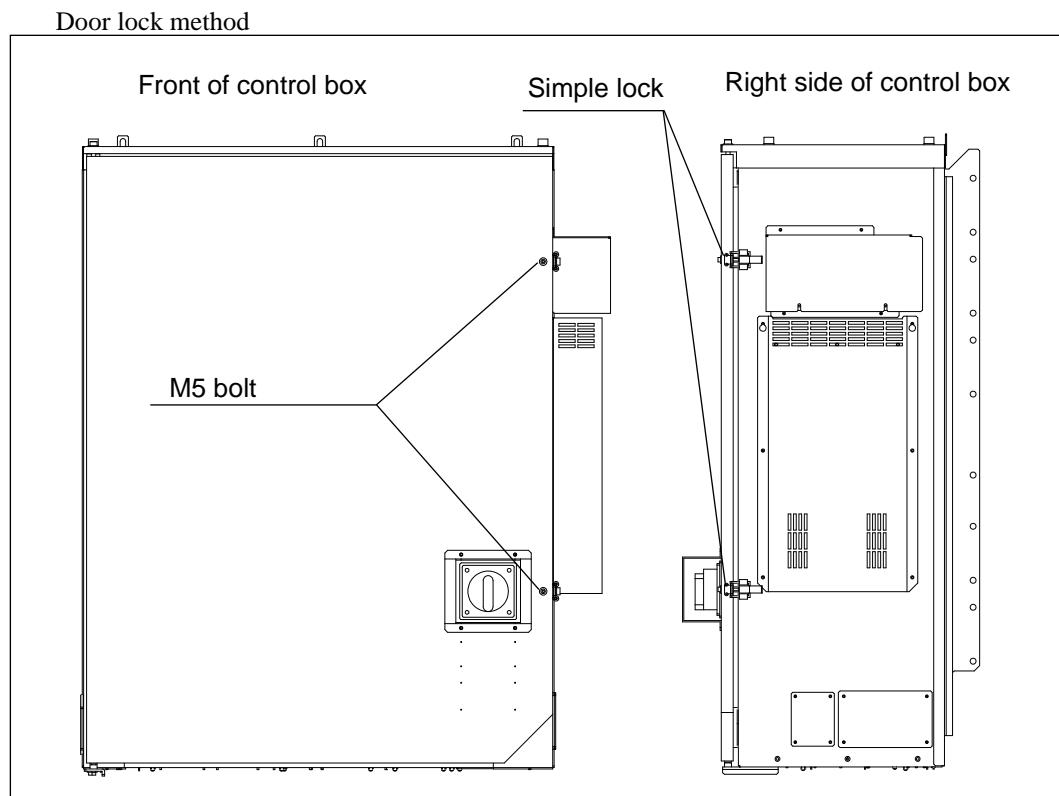
#### 2. When closing the door

Turn the main power breaker handle to the OFF position, and push to close it.

Use the simple lock and 2 socket bolts (M5) to lock the door on the top and bottom.

When closing the door





(NOTICE) Always lock the control box door in order to prevent problems caused by oil mist and dust, etc.

### 4.3.3 Grounding

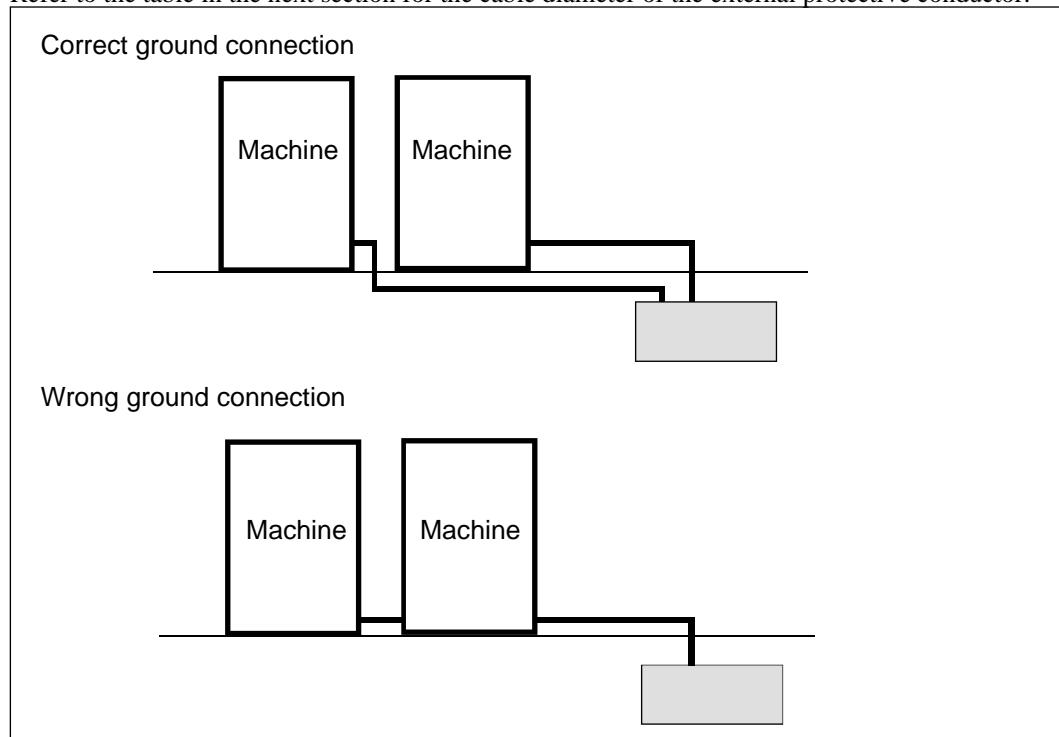
Use a 4 core vinyl cabtyre cable to ground.

Be sure to follow the relevant standards in the country or region when performing this task. Never connect the ground as indicated in the diagram below. Always ground the machines independently of each other.

The ground resistance should be  $100\Omega$  or less.

(Use the grounding standard for Type D (Type 3) in Japan.)

Refer to the table in the next section for the cable diameter of the external protective conductor.



#### 4.3.4 Transformer Box Position

When using a 400V system, a transformer box can be selected as an option.  
The Brother standard transformer box is prepared as indicated in the table below.

Transformer box capacity	9.5kVA	11.4kVA	19.0kVA (NOTE 1)
400V system non-EU specification	○	○	○
400V system EU specification	○	○	× (NOTE 2)

(NOTE 1) When using a power supply expansion assembly (Option)

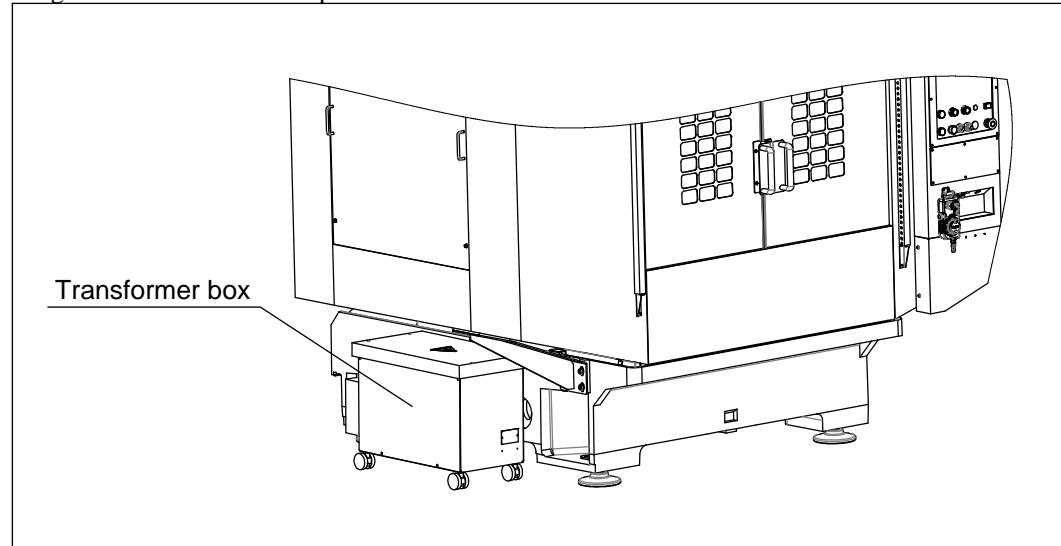
(NOTE 2) The customer must make arrangements.

Set up the box on the left side of the machine.

After setting it up, lock the casters to make sure that it is not moved accidentally.

Diagram of transformer box position

4



## 4.3.5 Wiring

### 4.3.5.1 When using a 200V system

1. Distribution panel and wiring

- (1) The user must install an overcurrent protective device as described below in order to protect the components against an overcurrent on the machine and the power conductors.

Power supply expansion assembly (Option)	Not equipped	Equipped
Rated current	30A	50A
Type of overcurrent protective device	Earth leakage circuit breaker	

- (2) The device interrupts the circuit where it is installed when the current is larger than the expected short-circuit current.
- (3) Always be sure to use special wiring in order to protect the cables and wiring from the electrical impact from other large equipment and devices. In particular, do not use and share wiring and switchboards with machinery or equipment (welders, induction hardening equipment using high frequency, presses, etc.) that emits a lot of noise because the noise can cause the CNC unit to malfunction.
- (4) When using our machine, if multiple devices with inverters are connected to the primary power supply, an electric leakage or ground fault may be detected on the power breaker (30 mA sensitivity) for protecting personnel. We recommend splitting up the primary power supply system.
- (5) There is a large starting current when the spindle starts up. If the power supply capacity and wiring is not sufficient, an alarm may be triggered due to a voltage drop and the machine may not perform properly. Refer to the maximum rating and the recommended conductor values noted in “2. Power specifications table (200V system)” when setting up the power.
- (6) When equipped with a power supply expansion assembly (option), refer to “Chapter 11 (19) Power supply assembly” for further details on the wiring.

## 2. Power specifications table (200V system)

Model		W1000Xd1									Conditions		
Power requirement		AC 200/210/220/230V±10% 3-phase 50/60 ±1 Hz									If the customer sets up a transformer, set up the transformer to output 220 V.		
Power supply expansion assembly (Option)		Not equipped				Equipped							
Power supply capacity		10,000 min <sup>-1</sup> spec.	16,000 min <sup>-1</sup> spec.	10,000 min <sup>-1</sup> high-torque spec.	10,000 min <sup>-1</sup> spec.	16,000 min <sup>-1</sup> spec.	10,000 min <sup>-1</sup> high-torque spec.	Current value when AC 200 V				Recommended values based on the power supply capacity and voltage drop. Copper conductor PVC cable (Oil resistant and heat resistant (105°C) part) Ambient temperature: 40°C or less	
	Continuous power rating	9.5 kVA (27.5 A/phase)		10.4 kVA (30 A/phase)	17.3 kVA (50 A/phase)								
	Start peak current	106.0 A/phase	106.1 A/phase	130.8 A/phase	126.0 A/phase	126.1 A/phase	150.8 A/phase						
	Main breaker (QA1)	30A				50A							
	Breaker for power supply expansion (QA4)					20A							
Recommended power conductor values	Nominal cross-sectional area	Maximum wiring length	Nominal cross-sectional area	Maximum wiring length	Nominal cross-sectional area	Maximum wiring length	Nominal cross-sectional area	Maximum wiring length	Nominal cross-sectional area	Maximum wiring length	Nominal cross-sectional area	Maximum wiring length	Recommended values based on the power supply capacity and voltage drop. Copper conductor PVC cable (Oil resistant and heat resistant (105°C) part) Ambient temperature: 40°C or less
	5.5 mm <sup>2</sup>	6 m or less	5.5 mm <sup>2</sup>	6 m or less	5.5 mm <sup>2</sup>	5 m or less	5.5 mm <sup>2</sup>	6 m or less	5.5 mm <sup>2</sup>	5 m or less	5.5 mm <sup>2</sup>	5 m or less	
	8 mm <sup>2</sup>	9 m or less	8 mm <sup>2</sup>	8 m or less	8 mm <sup>2</sup>	7 m or less	8 mm <sup>2</sup>	8 m or less	8 mm <sup>2</sup>	7 m or less	8 mm <sup>2</sup>	7 m or less	
	14 mm <sup>2</sup>	15 m or less	14 mm <sup>2</sup>	14 m or less	14 mm <sup>2</sup>	13 m or less	14 mm <sup>2</sup>	14 m or less	14 mm <sup>2</sup>	13 m or less	14 mm <sup>2</sup>	12 m or less	
External protective conductor		Cross-sectional area of power cable or greater				Cross-sectional area of power cable or greater				Copper conductor			

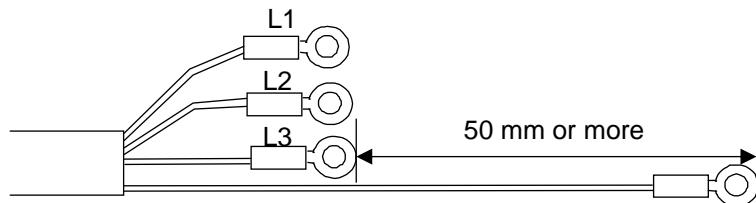
3. Wiring from factory side power supply to control box on this machine (200V system)
  - (i) Power cable terminal setup
 

Refer to “2. Power specifications table (200V system)” when setting up the power cable.

The recommended example of the power cable terminal is provided below.

Ground wire should be 50 mm or more longer than the other wires.

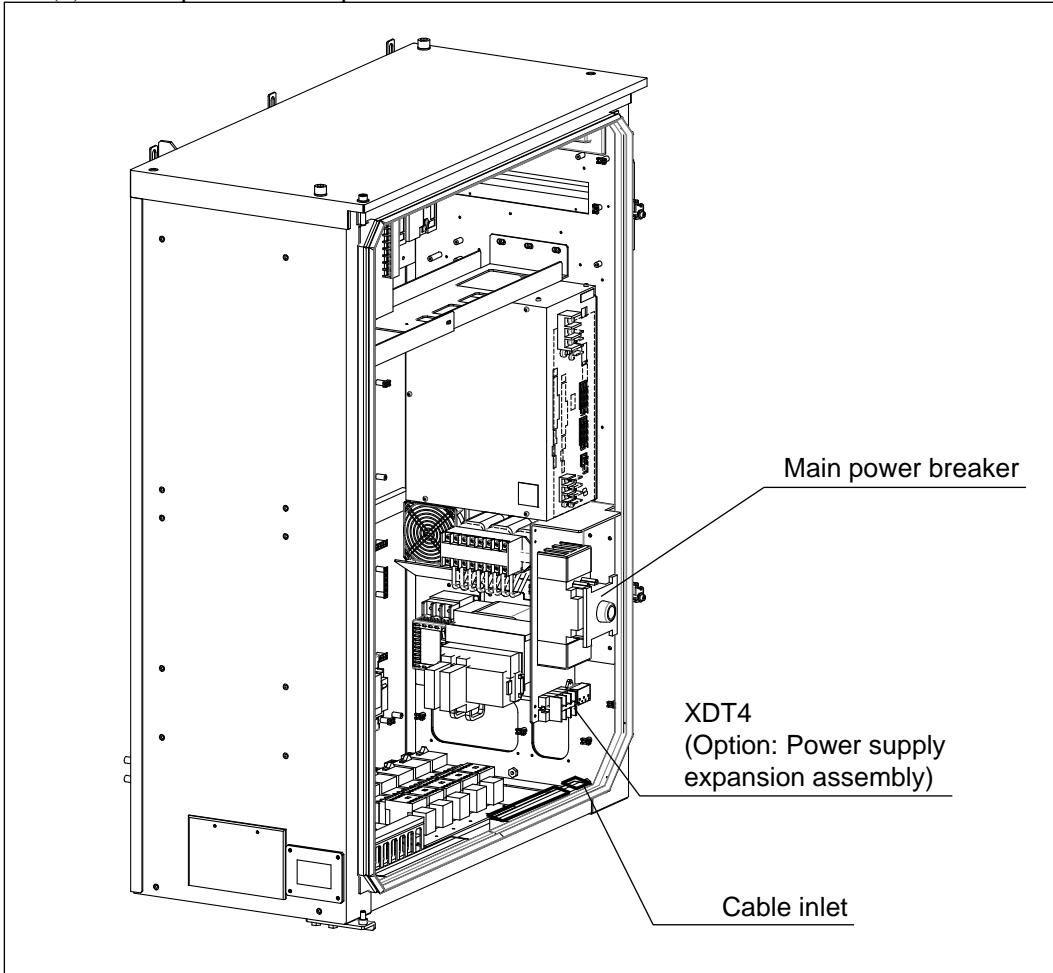
To ensure the power cable does not pull and become disconnected inside the control box, adjust the cable length so that the ground line is connected properly all the way to the end in order to prevent electric shock.



L1, L2 and L3: Terminals for M5  
 External configuration: 15 mm or less  
 PE: Terminal for M6

4

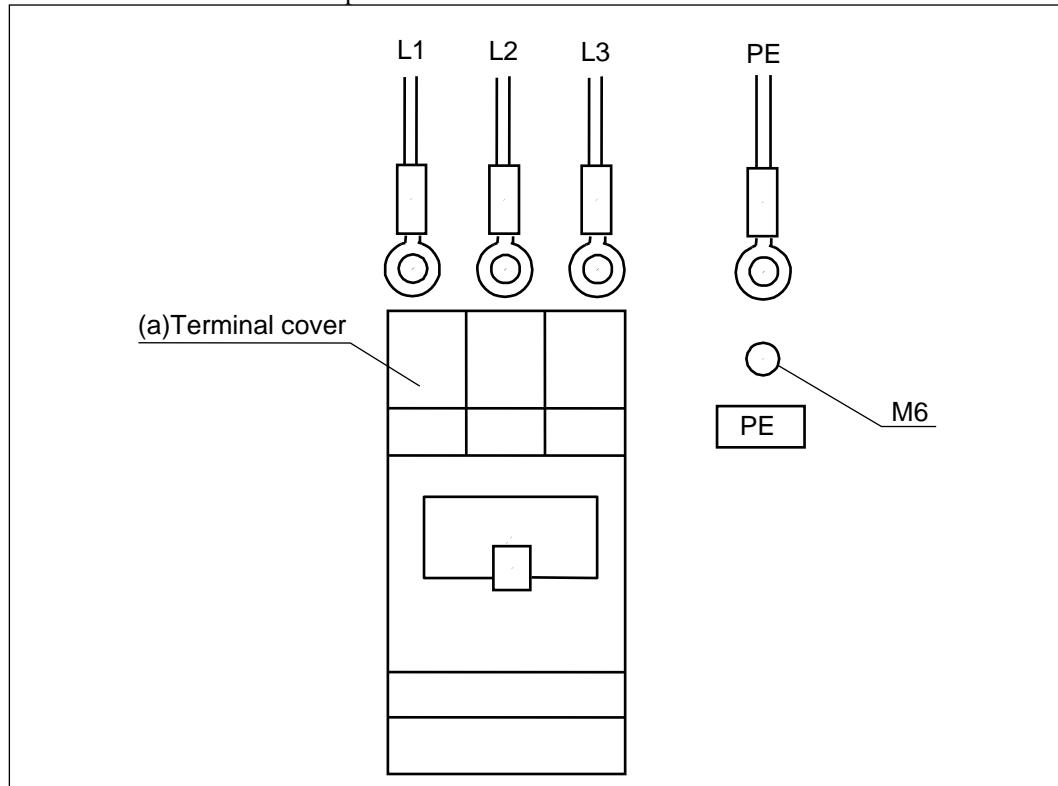
- (ii) Main power breaker position



- (NOTICE) Use the cable inlet on the right end on the bottom of the control box.  
 (NOTE) Use the terminal block XDT4 when equipped with the power supply expansion option.

### (iii) Connection to main power breaker

Connect to the main power breaker in the control box.



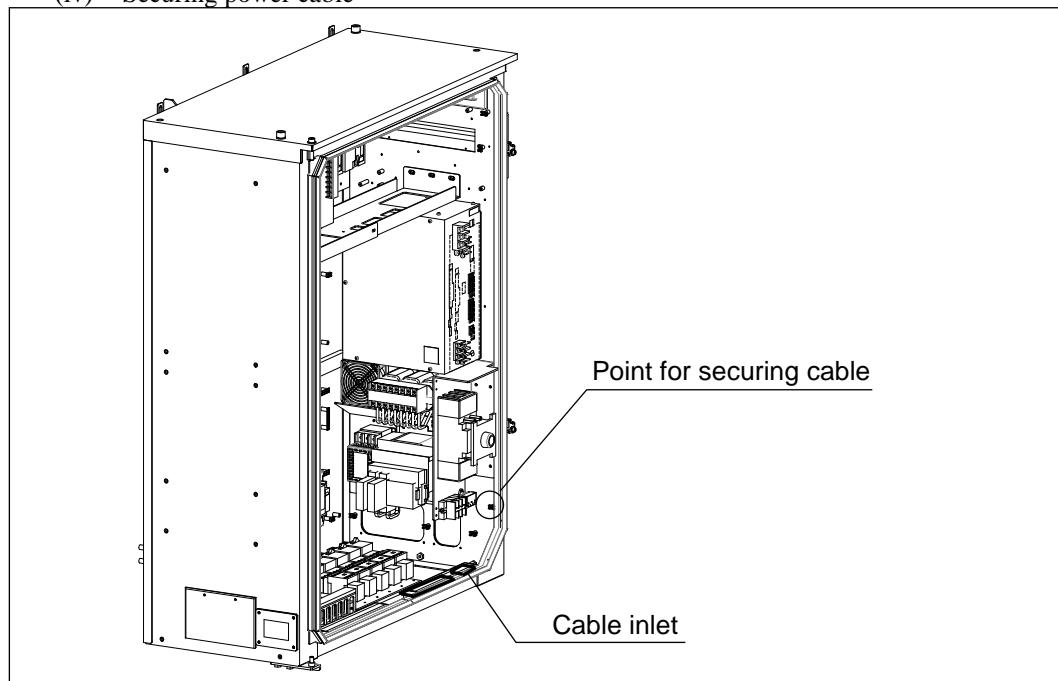
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- (1) Secure the power cable firmly but make sure that there is no force applied onto the main power breaker connection.

Use a tie to secure the power cable at the indicated point on the inner right side of the control box. Refer to the point for securing the power cable in the diagram below: "Securing power cable". Close and secure the cable so that there is no gap or space on the cable inlet.

- (2) After setting up the wiring and cable, attach the terminal cover on the main power breaker.

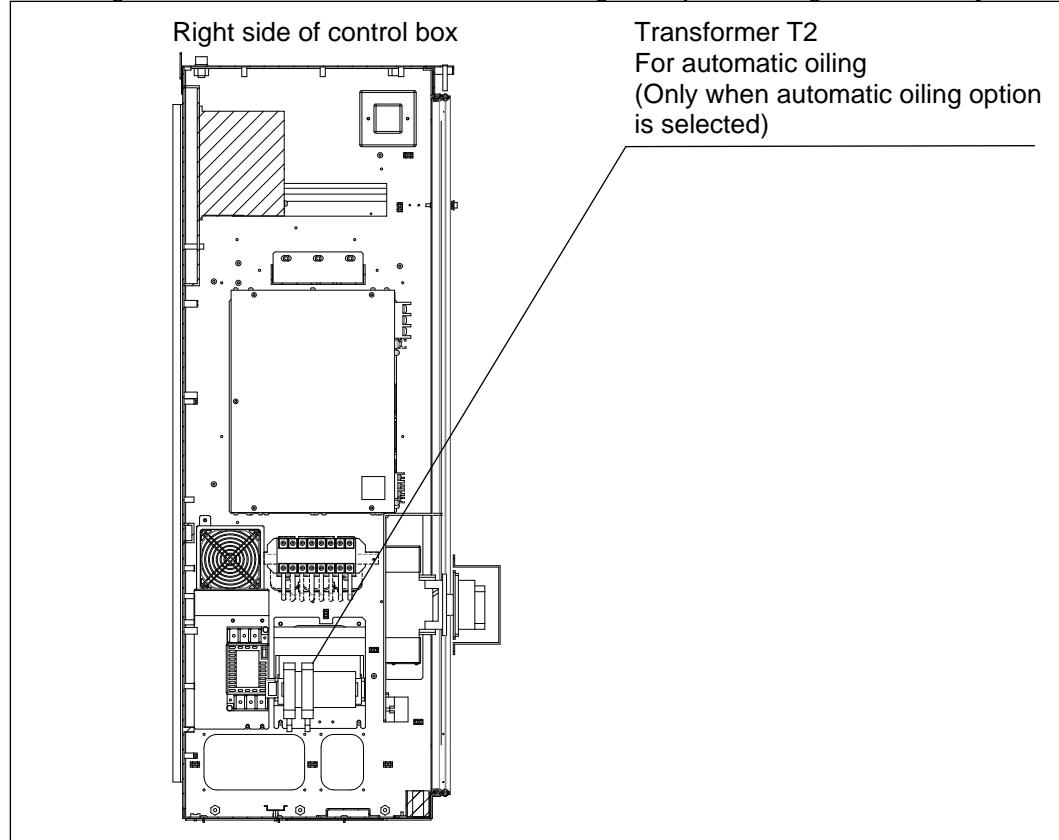
### (iv) Securing power cable



4. Wiring for transformer (T2) inside control box on machine (200V system)

First, turn OFF the main power breaker and the power on the factory side before working on the transformer cables and wiring.

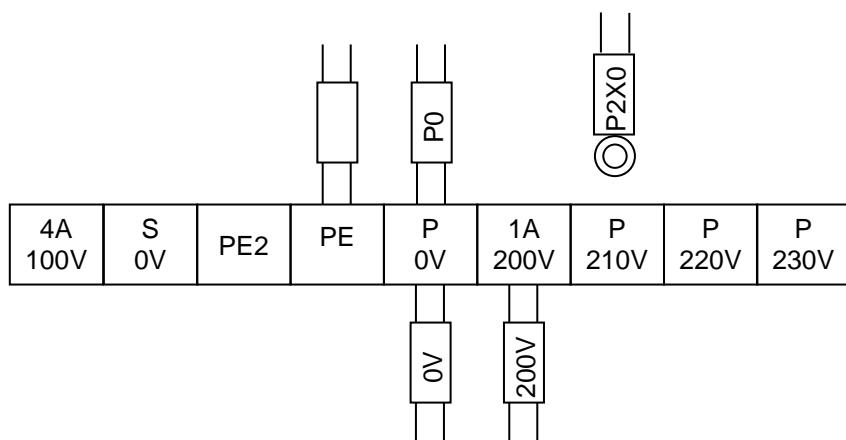
Change the connection to the transformer according to the power voltage on the factory side.



4

Wiring for transformer T2 (for automatic oiling)  
When using non-EU specification

T2 terminal block



\*1 Change the connection for the P2X0 cord according to the power voltage on the factory side.

The connections for other cords do not need to be changed.

\*1 Connections for P2X0 cord

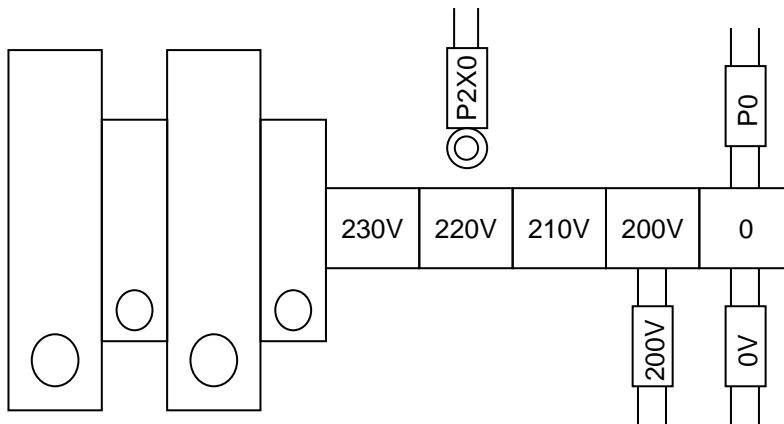
Factory side voltage	Terminal block connection
AC200V	1A 200V
AC210V	P 210V
AC220V	P 220V
AC230V	P 230V

(NOTICE) When using the transformer box (option), connect T2 to P 220 V.

### When using EU specification

T2 terminal block

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\*2 Change the connection for the P2X0 cord according to the power voltage on the factory side.

The connections for other cords do not need to be changed.

\*2 Connections for P2X0 cord

Factory side voltage	Terminal block connection
AC200V	200V
AC210V	210V
AC220V	220V
AC230V	230V

(NOTICE 1) When using the transformer box (option), connect T2 to 220 V.

(NOTICE 2) The EU specification is 400V, but the factory side power can also be 200V. Therefore, use according to the conditions of the customer.

### 4.3.5.2 When using a 400V system (non-EU specification)

#### 1. Distribution panel and wiring

- (1) The user must install an overcurrent protective device as described below in order to protect the components against an overcurrent on the machine and the power conductors.

Power supply expansion assembly (Option)	Not equipped	Equipped
Rated current	20A	30A
Type of overcurrent protection device	Earth leakage circuit breaker	

- (2) The device interrupts the circuit where it is installed when the current is larger than the expected short-circuit current.
- (3) Always be sure to use special wiring in order to protect the cables and wiring from the electrical impact from other large equipment and devices. In particular, do not use and share wiring and switchboards with machinery or equipment (welders, induction hardening equipment using high frequency, presses, etc.) that emits a lot of noise because the noise can cause the CNC unit to malfunction.
- (4) When using our machine, if multiple devices with inverters are connected to the primary power supply, an electric leakage or ground fault may be detected on the power breaker (30 mA sensitivity) for protecting personnel. We recommend splitting up the primary power supply system.
- (5) There is a large starting current when the spindle starts up. If the power supply capacity and wiring is not sufficient, an alarm may be triggered due to a voltage drop and the machine may not perform properly. Refer to the maximum rating and the recommended conductor values noted in “2. Power specifications table (400V system, non-EU specification)” when setting up the power. When using this system without considering the environment or conditions, an overload problem may occur. Be mindful of the ambient temperature where it is installed and select a cable that can handle the flowing current.

Table: Ambient temperature increase of cable due to flowing current

	20A	30A	40A	50A
Increase value	15.9	23.5	34.5	48.8

- (6) There is no additional power supply capacity available in the 9.5 kVA and 11.4 kVA transformer boxes for peripheral equipment that customer needs for machine configurations that are not the Brother standard option. For example, if a power expansion assembly and hydraulic equipment or large coolant pumps are added, a 19.0 kVA (option) transformer box will be needed, or the user will need to obtain a transformer box.
- (7) When the customer provides a transformer box, prepare for the following:

Transformer capacity for machine + Transformer capacity for peripheral devices

Power supply expansion assembly (Option)	Machine specification	Transformer capacity for machine	Output voltage
Not equipped	10,000/16,000 min <sup>-1</sup> spec.	9.5 kVA	220V AC
	10,000 min <sup>-1</sup> high-torque spec.	11.4 kVA	220V AC
Equipped	10,000/16,000 min <sup>-1</sup> spec.	19.0 kVA	220V AC
	10,000 min <sup>-1</sup> high-torque spec.		220V AC

- (8) When equipped with a power supply expansion assembly (option), refer to “Chapter 11 (19) Power supply expansion assembly” for further details on the wiring.

## 2. Power specifications table (400V system, non-EU specification)

Model		W1000Xd1							Conditions				
Power requirement		AC 346/380/400/415/440V±10% 3-phase 50/60 ±1 Hz							Switches using tap in transformer box				
Power supply expansion assembly(Option)		Not equipped				Equipped							
Transformer box capacity		9.5 kVA		11.4 kVA		19.0 kVA							
Power supply capacity		10,000 min <sup>-1</sup> spec.	16,000 min <sup>-1</sup> spec.	10,000 min <sup>-1</sup> high-torque spec.	10,000 min <sup>-1</sup> spec.	16,000 min <sup>-1</sup> spec.	10,000 min <sup>-1</sup> high-torque spec.	Current value when AC 400 V					
	Continuous power rating	9.5 kVA (13.7 A/phase)		10.4 kVA (15 A/phase)	17.3 kVA (25.0 A/phase)								
	Start peak current	53.0 A/phase	53.1 A/phase	65.4 A/phase	63.0 A/phase	63.1 A/phase	75.4 A/phase						
	Main breaker (QA1)	30A				50A							
	Breaker for power supply expansion (QA4)					20A							
Recommended power conductor values		Nominal cross-sectional area	Maximum wiring length	Nominal cross-sectional area	Maximum wiring length	Nominal cross-sectional area	Maximum wiring length	Nominal cross-sectional area	Maximum wiring length	Nominal cross-sectional area	Maximum wiring length	Recommended values based on the power supply capacity and voltage drop. Copper conductor PVC cable (Oil resistant and heat resistant (105°C) part) Ambient temperature: 40°C or less	
		5.5 mm <sup>2</sup>	17 m or less	5.5mm <sup>2</sup>	15 m or less	5.5 mm <sup>2</sup>	14 m or less	5.5 mm <sup>2</sup>	16 m or less	5.5 mm <sup>2</sup>	14 m or less		
		8 mm <sup>2</sup>	24 m or less	8 mm <sup>2</sup>	21 m or less	8 mm <sup>2</sup>	20 m or less	8 mm <sup>2</sup>	22 m or less	8 mm <sup>2</sup>	20 m or less		
		14 mm <sup>2</sup>	42 m or less	14 mm <sup>2</sup>	37 m or less	14 mm <sup>2</sup>	36 m or less	14 mm <sup>2</sup>	39 m or less	14 mm <sup>2</sup>	35 m or less		
External protective conductor		Cross-sectional area of power cable or greater				Cross-sectional area of power cable or greater					Copper conductor		

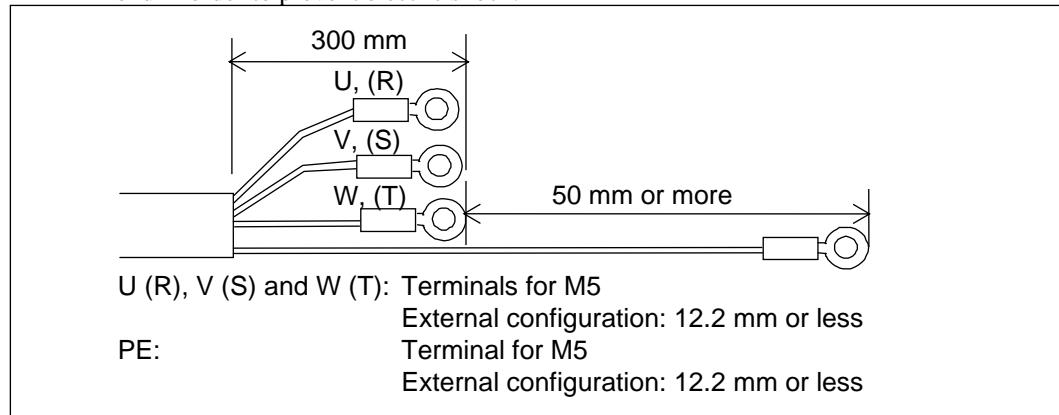
3. Wiring from factory side power supply to transformer box (400V system, non-EU specification)
- (i) Power cable terminal setup

Refer to the power specifications table (400V system, non-EU specification) for the cable and wiring to the transformer box when setting up the power cable.

The recommended example of the power cable terminal on the factory side (transformer box connection) is provided below.

Ground wire should be 50 mm or more longer than the other wires.

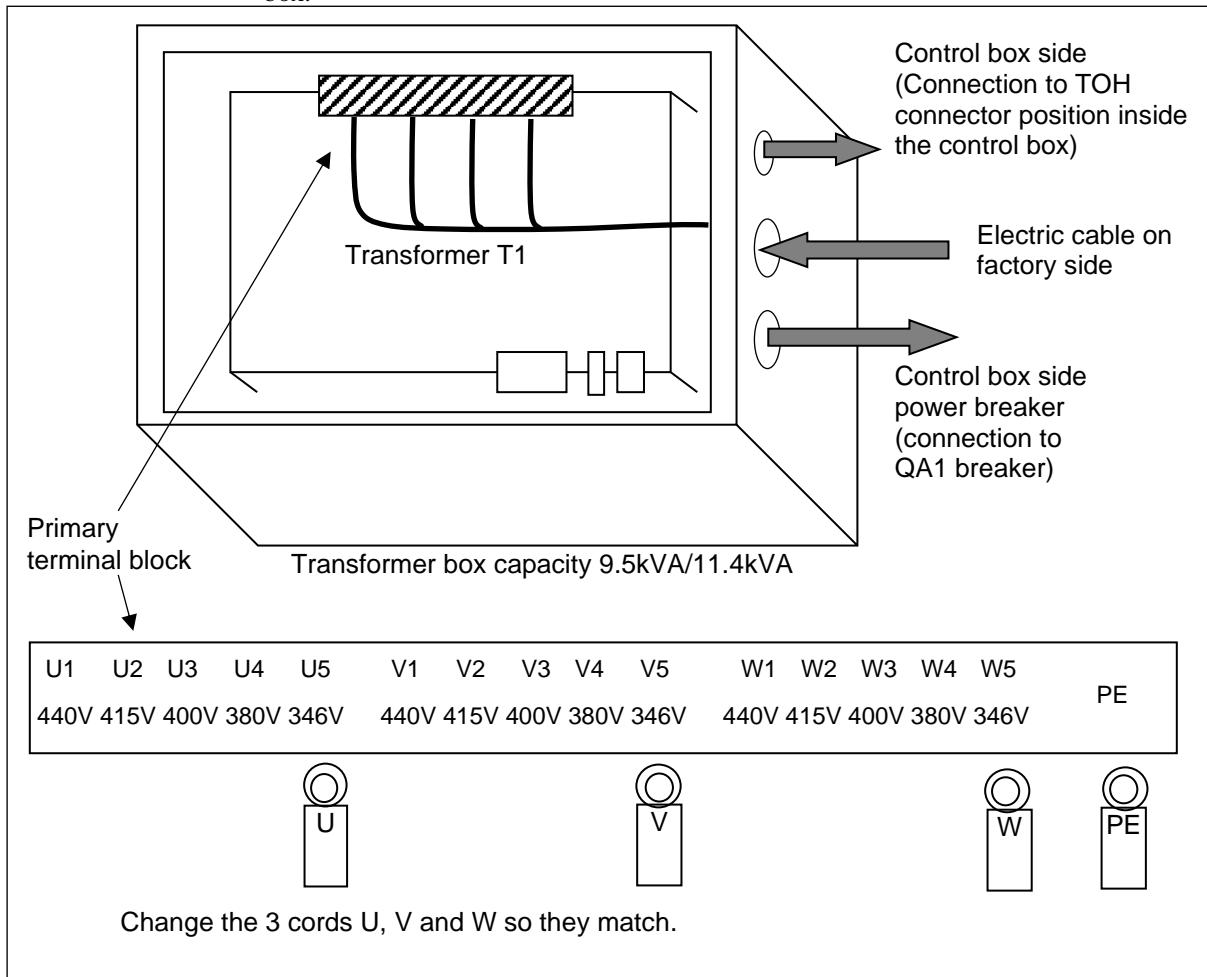
To ensure the power cable does not pull and become disconnected inside the control box, adjust the cable length so that the ground line is connected properly all the way to the end in order to prevent electric shock.



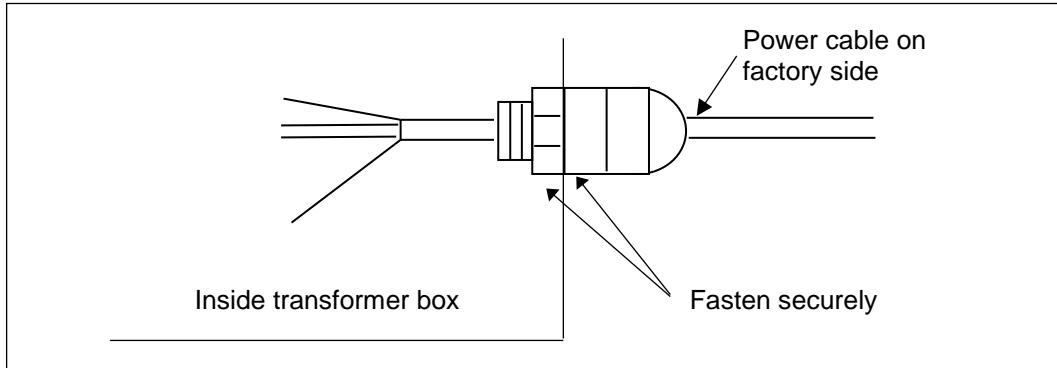
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- (ii)-1 Terminal block wiring for transformer box (when using standard transformer box)

Connect the power cable on the factory side to the terminal block inside the transformer box.



- (1) Connect the power cable on the factory side to the transformer box via the cord lock provided.
- (2) Connect to the primary terminal block. (Connect according to the power voltage being used.)
- (3) Secure with the cord lock so that the factory side power cable does not pull.



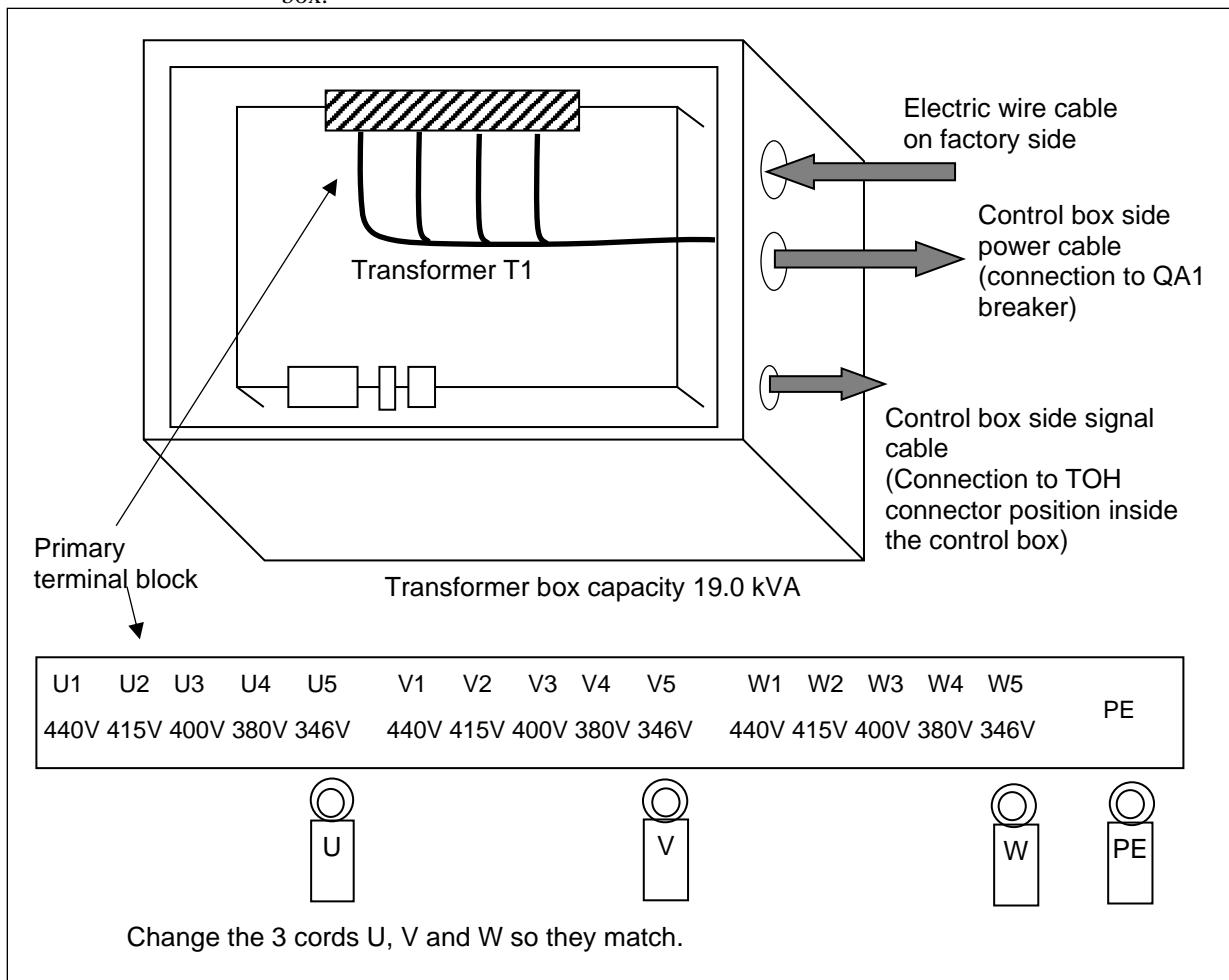
## 4

### (SAFETY INSTRUCTIONS)

**Be careful not to disconnect or cut the ground line when opening and closing the lid because the ground line is connected to the lid of the transformer box.**

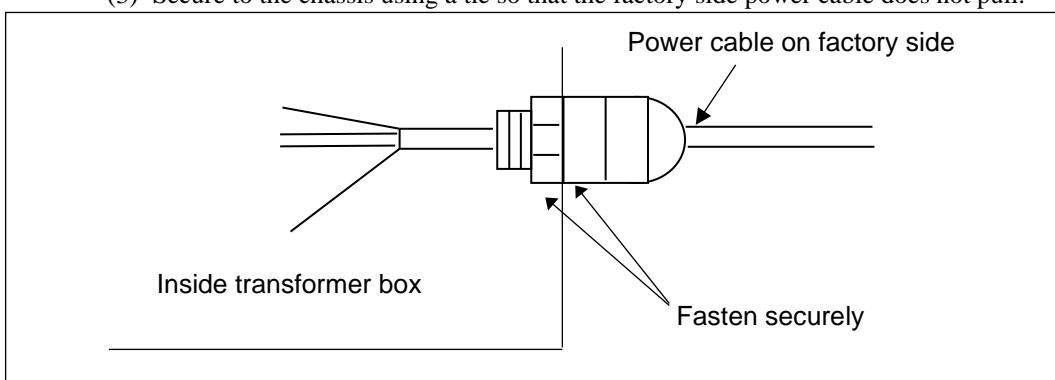
- (NOTICE 1) There are two types of cord locks that are provided: one for a compliant cable outer diameter of  $\phi 12$  mm to  $\phi 16$  mm and one for  $\phi 16$  mm to  $\phi 20$  mm. Make sure that cord lock matches the outer diameter of the power cable being used on the factory side.
- (NOTICE 2) Set up the power cable for the factory side so that it does not make contact with the transformer.

- (ii)-2 Terminal block wiring for transformer box (when using transformer box for power supply expansion (option))  
 Connect the power cable on the factory side to the terminal block inside the transformer box.



4

- (1) Connect the power cable on the factory side to the transformer box via the grommet.
- (2) Connect to the primary terminal block.
- (3) Secure to the chassis using a tie so that the factory side power cable does not pull.



#### (SAFETY INSTRUCTIONS)

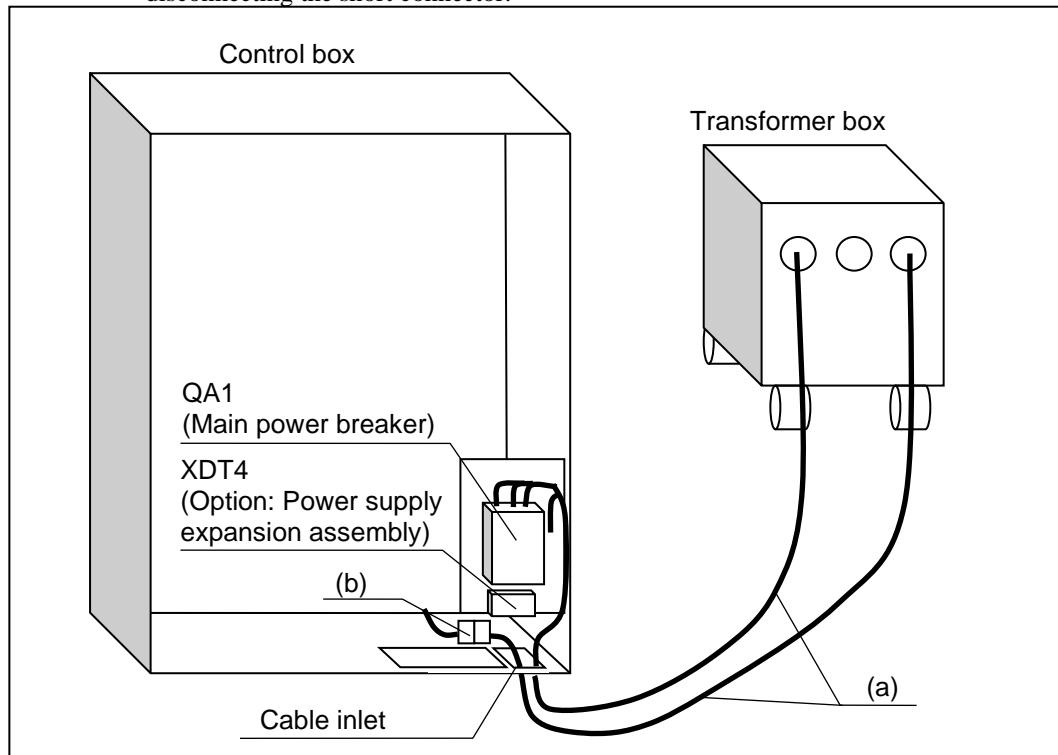
**Be careful not to disconnect or cut the ground line when opening and closing the lid because the ground line is connected to the lid of the transformer box.**

- (NOTICE)** Set up the power cable for the factory side so that it does not make contact with the transformer.

## Chapter 4 Installation

4. Wiring from transformer box to machine's control box (400V system, non-EU specification)
  - (i) When using a standard transformer box or one for the power supply expansion (option)
    - (1) Insert the cables (a) from the transformer box into the control box.
    - (2) Connect the connector "TOH" (bipolar nylon connector).  
The connection (b) is positioned near this connection hole. Connect after disconnecting the short connector.

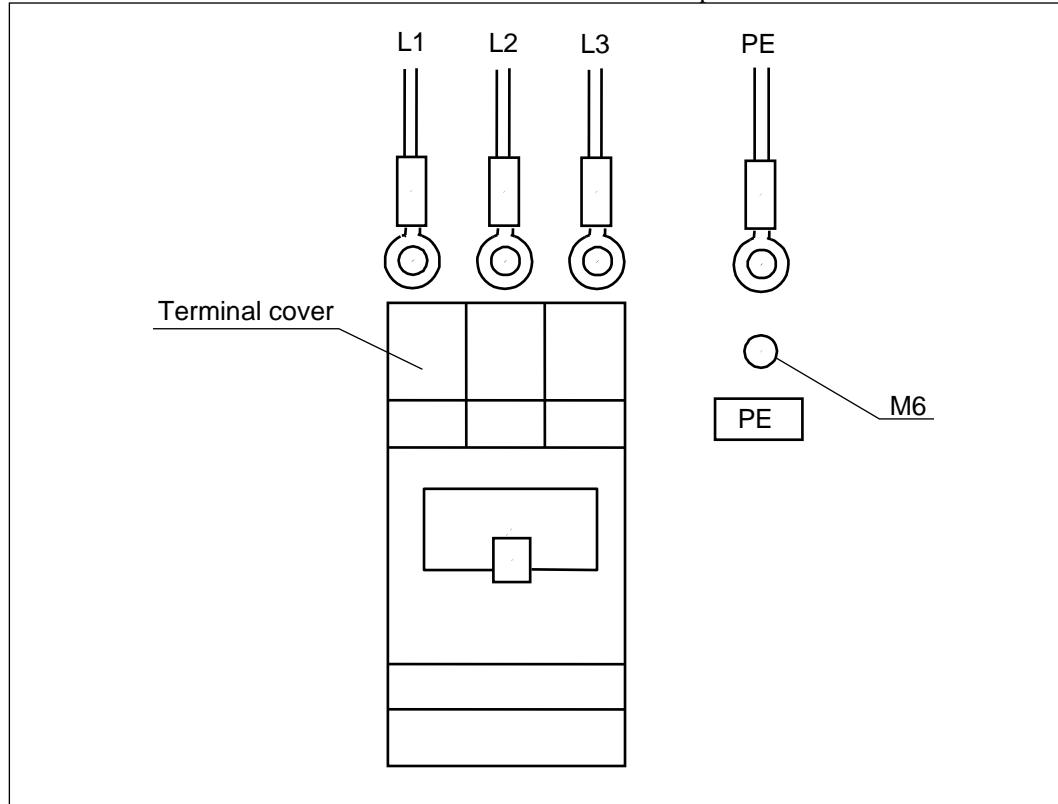
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- (NOTICE) Use the cable inlet on the right end on the bottom of the control box.  
(NOTE) Use the terminal block XDT4 when equipped with the power supply expansion option.

## (ii) Connection to main power breaker

Connect the cable from the transformer box to the main power breaker.



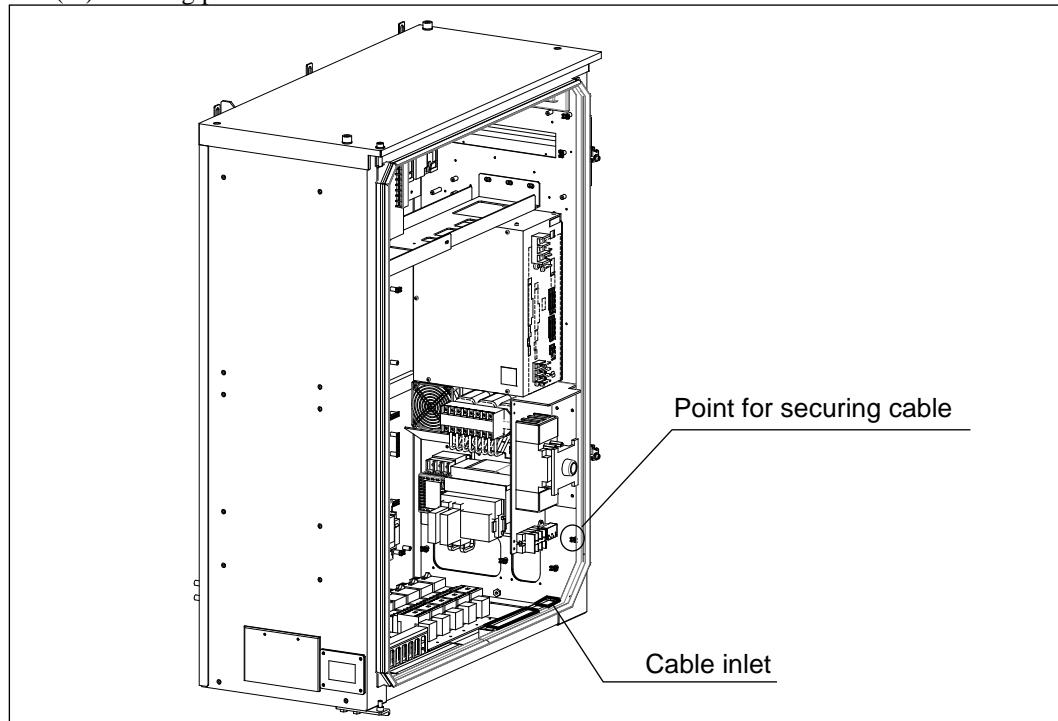
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- (1) Secure the power cable firmly but make sure that there is no force applied onto the main power breaker connection.

Use a tie to secure the power cable at the indicated point on the inner right side of the control box. Refer to the point for securing the power cable in the diagram below: "Securing power cable".

- (2) After setting up the wiring and cable, attach the terminal cover on the main power breaker.

## (iii) Securing power cable



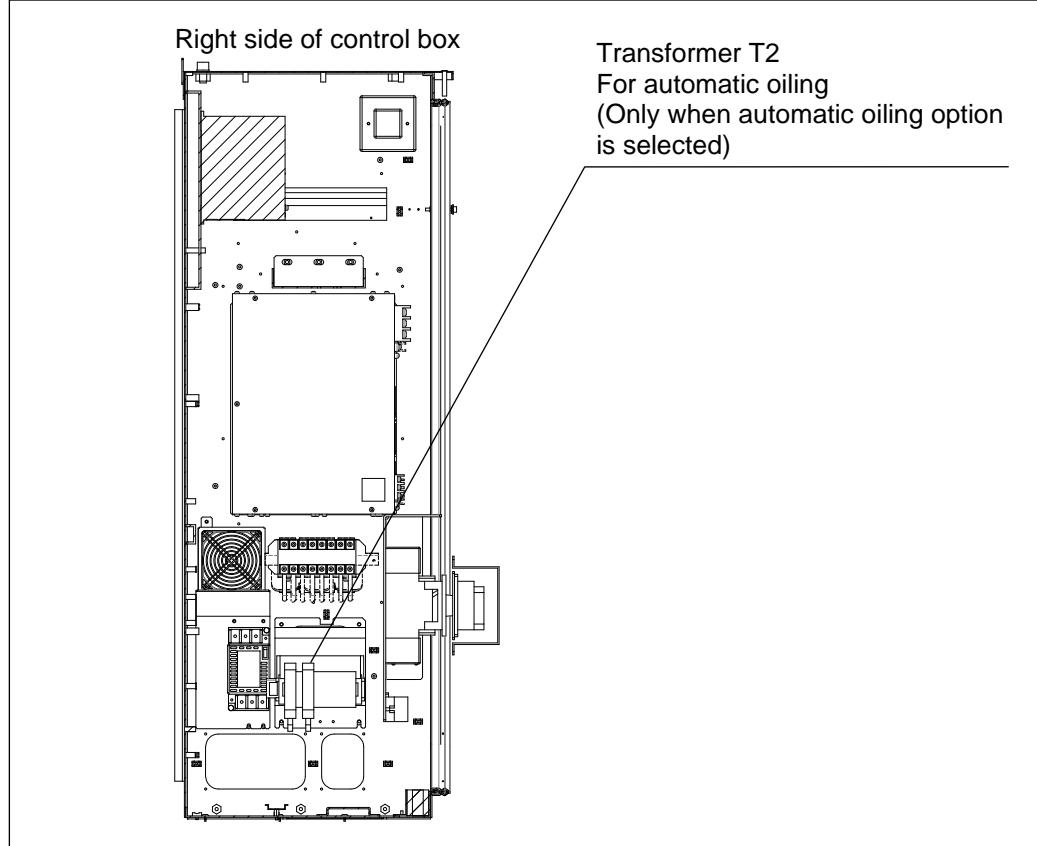
## Chapter 4 Installation

- Wiring for transformer (T2) inside machine's control box (400V system, non-EU specification)

First, turn OFF the main power breaker and the power on the factory side before working on the transformer cables and wiring.

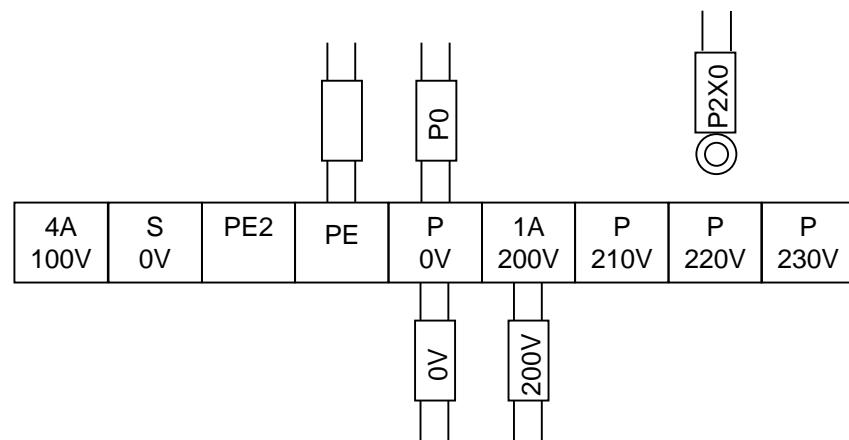
Change the connection to the transformer according to the power voltage on the factory side.

4



Wiring for transformer T2 (for automatic oiling)  
When using non-EU specification

T2 terminal block



(NOTICE) When using the transformer box (option), connect T2 to P 220 V.

### 4.3.5.3 When using a 400V system (EU specification)

#### 1. Distribution panel and wiring

- (1) The user must install an overcurrent protective device as described below in order to protect the components against an overcurrent on the machine and the power conductors.

Power supply expansion assembly (Option)	Not equipped	Equipped
Rated current	20A	30A
Type of overcurrent protective device	Earth leakage circuit breaker	

- (2) The device interrupts the circuit where it is installed when the current is larger than the expected short-circuit current.
- (3) Always be sure to use special wiring in order to protect the cables and wiring from the electrical impact from other large equipment and devices. In particular, do not use and share wiring and switchboards with machinery or equipment (welders, induction hardening equipment using high frequency, presses, etc.) that emits a lot of noise because the noise can cause the CNC unit to malfunction.
- (4) When using our machine, if multiple devices with inverters are connected to the primary power supply, an electric leakage or ground fault may be detected on the power breaker (30 mA sensitivity) for protecting personnel. We recommend splitting up the primary power supply system.
- (5) There is a large starting current when the spindle starts up. If the power supply capacity and wiring is not sufficient, an alarm may be triggered due to a voltage drop and the machine may not perform properly. Refer to the maximum rating and the recommended conductor values noted in “2. Power specifications table (400V system, EU specification)” when setting up the power. When using this system without considering the environment or conditions, an overload problem may occur. Be mindful of the ambient temperature where it is installed and select a cable that can handle the flowing current.

Table: Ambient temperature increase of cable due to flowing current

	20A	30A	40A	50A
Increase value	15.9	23.5	34.5	48.8

- (6) There is no additional power supply capacity available in the 9.5 kVA and 11.4 kVA transformer boxes for peripheral equipment that customer needs for machine configurations that are not the Brother standard option. For example, if a power expansion assembly and hydraulic equipment or large coolant pumps are added, a 19.0 kVA (option) transformer box will be needed, or the user will need to obtain a transformer box.
- (7) When the customer provides a transformer box, prepare for the following:

Transformer capacity for machine + Transformer capacity for peripheral devices

Power supply expansion assembly (Option)	Machine specification	Transformer capacity for machine	Output voltage
Not equipped	10,000/16,000 min <sup>-1</sup> spec.	9.5 kVA	220V AC
	10,000 min <sup>-1</sup> high-torque spec.	11.4 kVA	220V AC
Equipped	10,000/16,000 min <sup>-1</sup> spec.	19.0 kVA	220V AC
	10,000 min <sup>-1</sup> high-torque spec.		220V AC

- (8) When equipped with a power supply expansion assembly (option), refer to “Chapter 11 (19) Power supply expansion assembly” for further details on the wiring.

## 2. Power specifications table (400V system, EU specification)

Model	W1000Xd1							Conditions
Power requirement	AC 346/380/400/415/440V±10% 3-phase 50/60 ±1 Hz							Switches using tap in transformer box
Power supply expansion assembly (Option)	Not equipped				Equipped			
Transformer box capacity	9.5 kVA		11.4 kVA		19.0 kVA			
Power supply capacity	10,000 min <sup>-1</sup> spec.	16,000 min <sup>-1</sup> spec.	10,000 min <sup>-1</sup> high-torque spec.	10,000 min <sup>-1</sup> spec.	16,000 min <sup>-1</sup> spec.	10,000 min <sup>-1</sup> high-torque spec.	Current value when AC 400 V	
	Continuous power rating		9.5 kVA (13.7 A/phase)	10.4 kVA (15 A/phase)	17.3 kVA (25.0 A/phase)			
	Start peak current	53.0 A/phase	53.1 A/phase	65.4 A/phase	63.0 A/phase	63.1 A/phase	75.4 A/phase	
	Main breaker (QA1)	24A		30A	50A			
	Breaker for power supply expansion (QA4)					20A		
Recommended power conductor values	Nominal cross-sectional area	Maximum wiring length	Nominal cross-sectional area	Maximum wiring length	Nominal cross-sectional area	Maximum wiring length	Nominal cross-sectional area	Maximum wiring length
	Less than 6 mm <sup>2</sup>	Usage restricted	Less than 6 mm <sup>2</sup>	Usage restricted	Less than 6 mm <sup>2</sup>	Usage restricted	Less than 6 mm <sup>2</sup>	Usage restricted
	6 mm <sup>2</sup>	22 m or less	6 mm <sup>2</sup>	19 m or less	6 mm <sup>2</sup>	18 m or less	6 mm <sup>2</sup>	18 m or less
	10 mm <sup>2</sup>	36 m or less	10 mm <sup>2</sup>	32 m or less	10 mm <sup>2</sup>	31 m or less	10 mm <sup>2</sup>	30 m or less
External protective conductor	Cross-sectional area of power cable or greater				Cross-sectional area of power cable or greater			Copper conductor

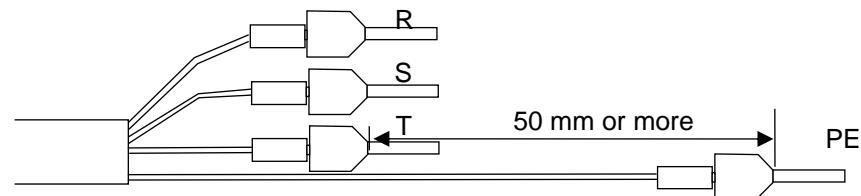
3. Wiring from factory side power supply to transformer box (400V system, EU specification)  
 (i) Power cable terminal setup

Refer to the power specifications table (400V system, EU specification) for the cable and wiring to the transformer box when setting up the power cable.

The recommended example of the power cable terminal on the factory side (transformer box connection) is provided below.

Ground wire should be 50 mm or more longer than the other wires.

To ensure the power cable does not pull and become disconnected inside the control box, adjust the cable length so that the ground line is connected properly all the way to the end in order to prevent electric shock.



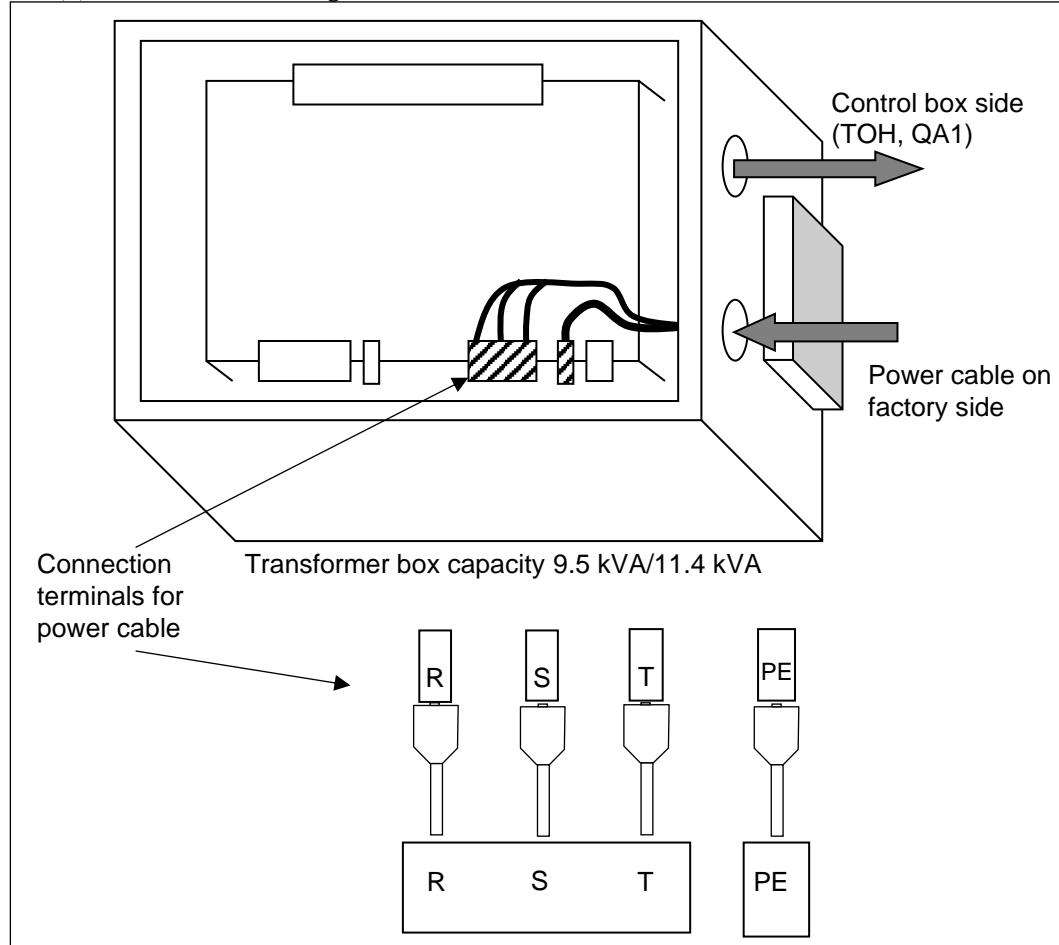
R, S, T and PE: Rod terminals with insulation sleeve made by Phoenix Contact

For 6 mm<sup>2</sup>: AI-XL6-12YE

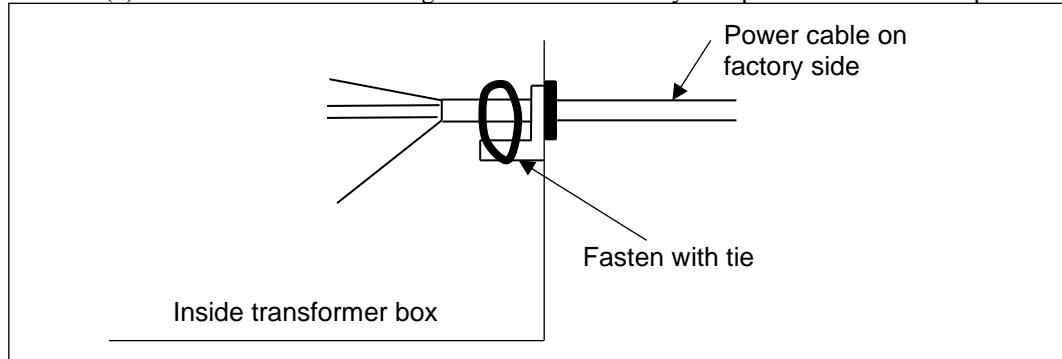
For 10 mm<sup>2</sup>: AI-XL10-12RD

4

- (ii) Terminal block wiring in the transformer box



- (1) Connect the power cable on the factory side to the transformer box via the grommet.
- (2) Connect the power cable on the factory side to the terminal block inside the transformer box.
- (3) Secure to the chassis using a tie so that the factory side power cable does not pull.



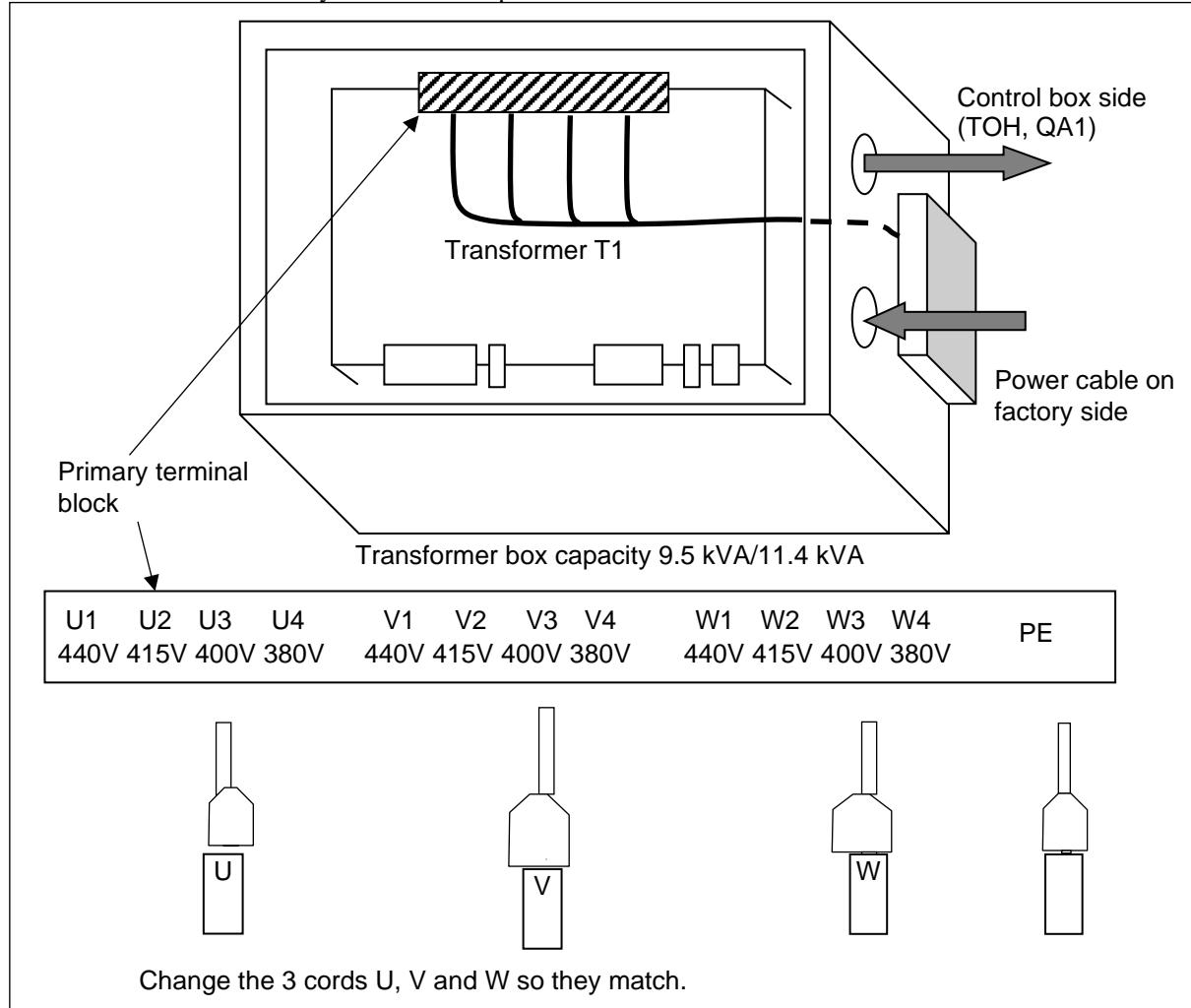
**4**

**(SAFETY INSTRUCTIONS)**

**Be careful not to disconnect or cut the ground line when opening and closing the lid because the ground line is connected to the lid of the transformer box.**

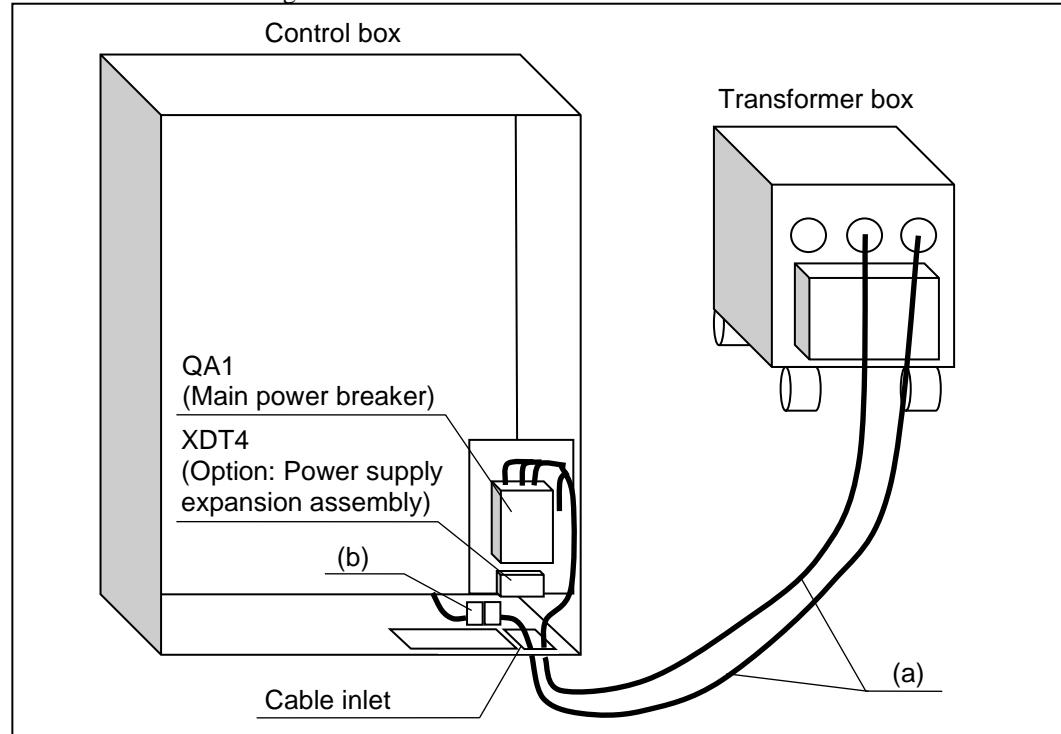
**(NOTICE)** Set up the power cable for the factory side so that it does not make contact with the transformer.

Primary terminal block position



- (4) Connect to the primary terminal block. (Connect according to the power voltage being used.)

4. Wiring from transformer box to machine's control box (400V system, EU specification)
  - (i) When using standard transformer box
    - (1) Insert the cables (a) from the transformer box into the control box.
    - (2) Connect the connector "TOH" (bipolar nylon connector).  
The connection (b) is positioned near this connection hole. Connect after disconnecting the short connector.

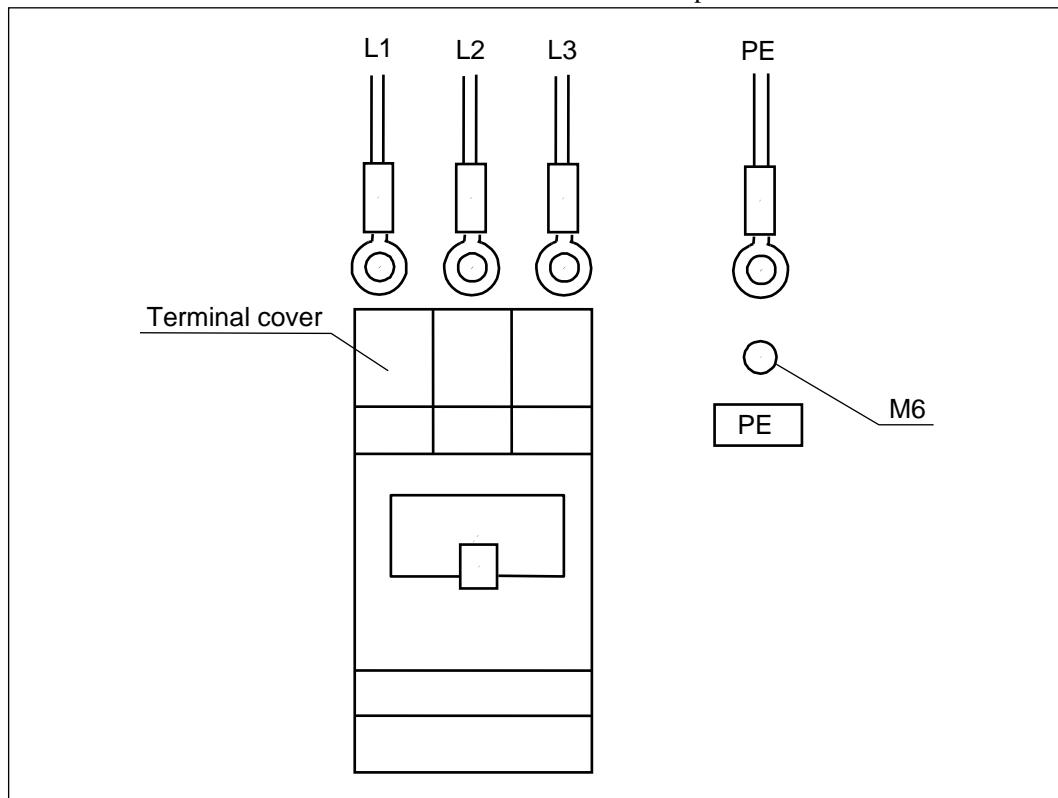


- (NOTICE) Use the cable inlet on the right end on the bottom of the control box.  
(NOTE) Use the terminal block XDT4 when equipped with the power supply expansion option.

4

(ii) Connection to main power breaker

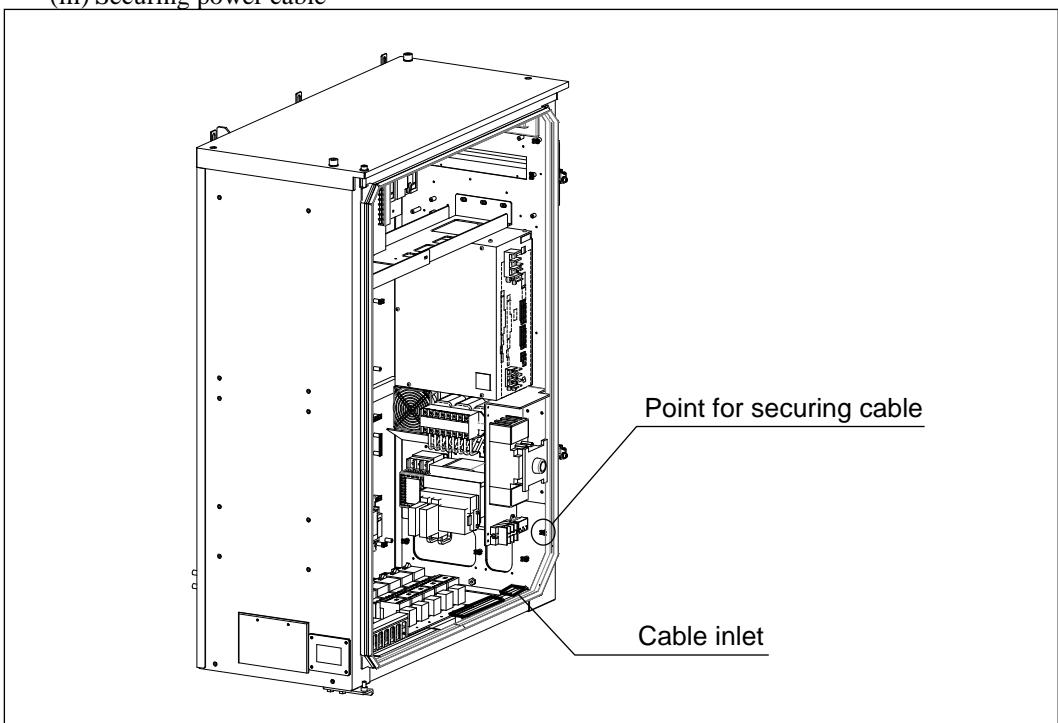
Connect the cable from the transformer box to the main power breaker.



**4**

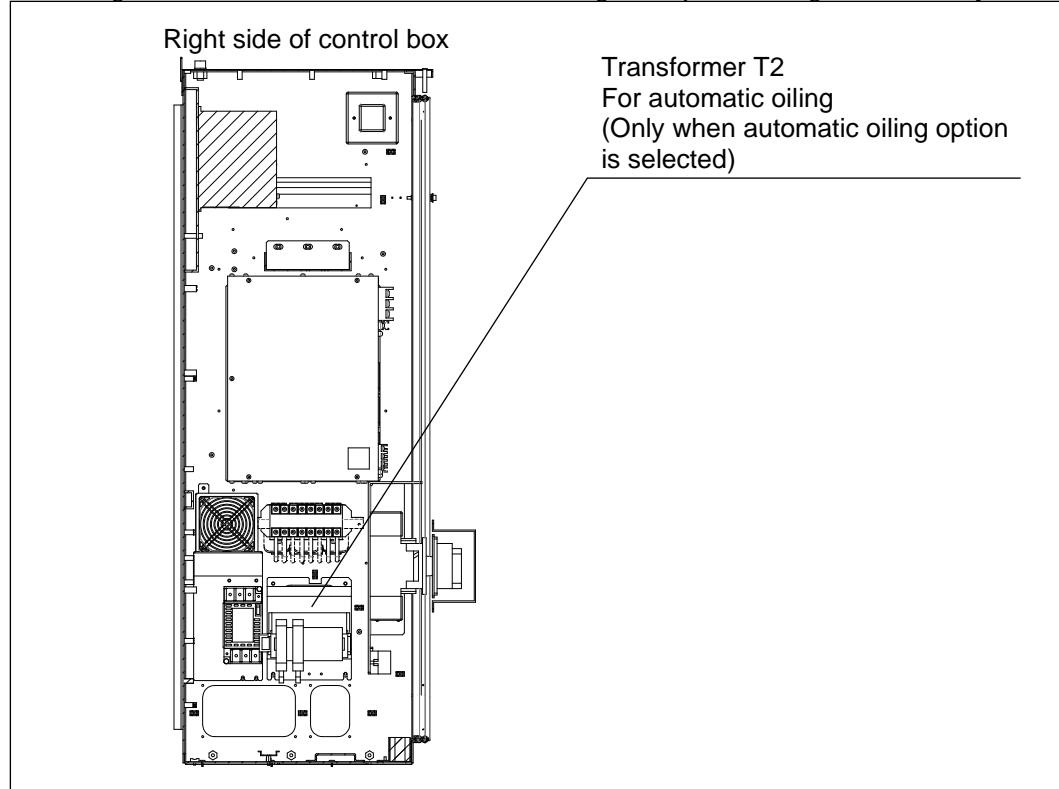
- (1) Secure the power cable firmly but make sure that there is no force applied onto the main power breaker connection. Use a tie to secure the power cable at the indicated point on the inner right side of the control box. Refer to the point for securing the power cable in the diagram below: “Securing power cable”.
- (2) After setting up the wiring and cable, attach the terminal cover on the main power breaker.

(iii) Securing power cable



5. Wiring for transformer (T2) inside machine's control box (400V system, EU specification)  
 First, turn OFF the main power breaker and the power on the factory side before working on the transformer cables and wiring.

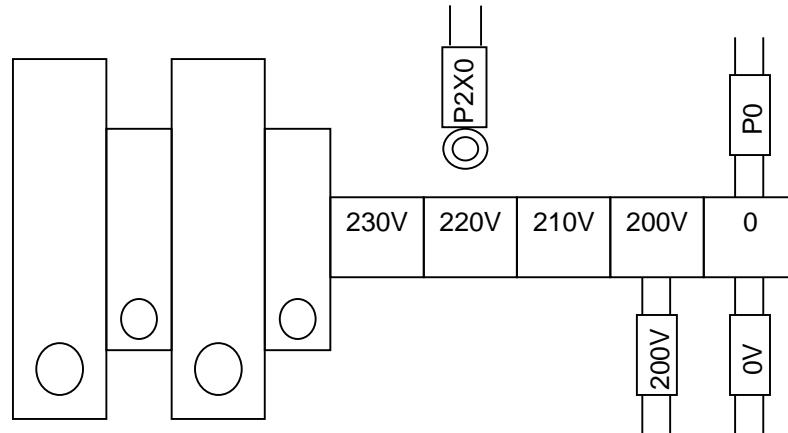
Change the connection to the transformer according to the power voltage on the factory side.



4

Wiring for transformer T2 (for automatic oiling)  
When using EU specification

T2 terminal block



(NOTICE) When using the transformer box (option), connect T2 to 220 V.

## 4.4 Piping

Take the necessary steps to prevent the following when connecting the piping.

### **WARNING**

**High-pressure air escaping from damaged sections of air hoses or from valves while setup or maintenance work is being carried out may cause injury to your eyes or ears.**

#### **[SAFETY INSTRUCTIONS]**

**Always be sure to wear protective goggles.**

**Always be sure to wear ear plugs.**

**Connecting and changing over air hoses containing high-pressure air must only be performed by a qualified technician who has been trained in handling high-pressure air with thorough knowledge of this machine.**

**Always be sure to disconnect the pressure source and reduce the pressure before connecting high-pressure air hoses.**

Turn the pressure to zero using the pressure adjustment knob on the air source regulator. Then, cut the primary pressure source before proceeding.

After the piping is completed, the air blows out from the spindle end.

This is a spindle air purge function and is not a failure or malfunction.

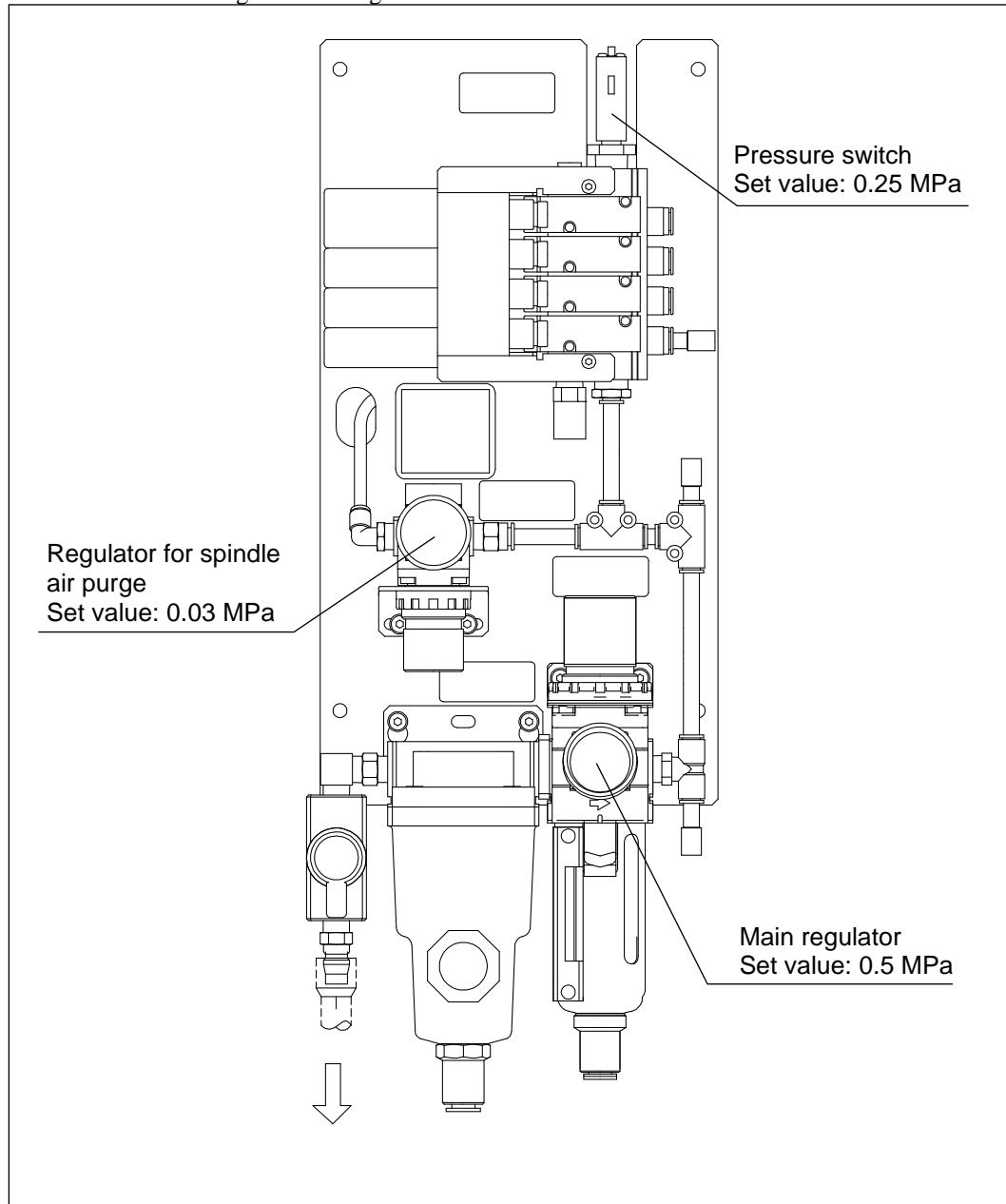
## 4.5 Setting Operating Conditions

Set the pressure switch and regulator on the back of the machine, as shown in the diagram. The air pressure on the air pressure source is normally between 0.4 and 0.6 MPa (Recommended: 0.5 MPa). The pressure on the air pressure source may significantly drop depending on the machine specifications, machining program (tool change count) and the air pressure flow rate of the peripheral equipment. Please provide an air pressure source that is higher than the recommended values.

Reference: The following values are the factory default settings.

(NOTE) Main regulator setting value: 0.5 MPa

Pressure switch and regulator setting



### Setup procedure

1. Disconnect the pipe from the pressure source and purge the remaining air inside the piping.
2. Connect the coupler socket for the hose to the coupler plug.
3. Close the manual valve.
4. Remove the cover that secures the pressure adjustment knob on the main regulator.
5. Pull the pressure adjustment knob on the main regulator to release the lock.
6. Turn the pressure adjustment knob counterclockwise all the way.
7. Perform the same tasks as in (4) through (6) on the regulator for the spindle air purge.
8. Connect the hose and the air pressure source on the factory side.
9. Supply air to the hose with a pressure of 0.4 to 0.6 MPa. (Recommended value: 0.5 MPa)
10. Open the manual valve, and make sure that no air is leaking out of the piping that was set up in steps (2) through (8).
11. Remove the cover on the main regulator.
12. Turn the pressure adjustment knob for the main regulator, adjust the pressure gauge so that the black needle reads 0.5 MPa, and then push the knob to lock.
13. Turn the pressure adjustment knob for the spindle air purge regulator, adjust the pressure gauge so that the black needle reads 0.03 MPa, and then push the knob to lock.
14. Attach the main regulator, the spindle air purge regulator, and the cover.

4

(NOTICE 1) Do not decrease the set value for the pressure switch.

If the set value for the pressure switch is decreased, it may lead to a decline in the ability to remove taper chips or shavings during a tool change, or to a decrease in clamp force when using the additional axis clamp operation.

(NOTICE 2) Ensure that the instantaneous flow rate supplied at the factory is greater than 350 L/min.

If the flow rate is less than 350 L/min, it may lead to a decline in the ability to remove taper chips or shavings during a tool change, or to a decrease in clamp force when using the additional axis clamp operation.

(NOTICE 3) Regarding impurities in the air that is supplied, make sure that the air quality satisfies the recommended values below.

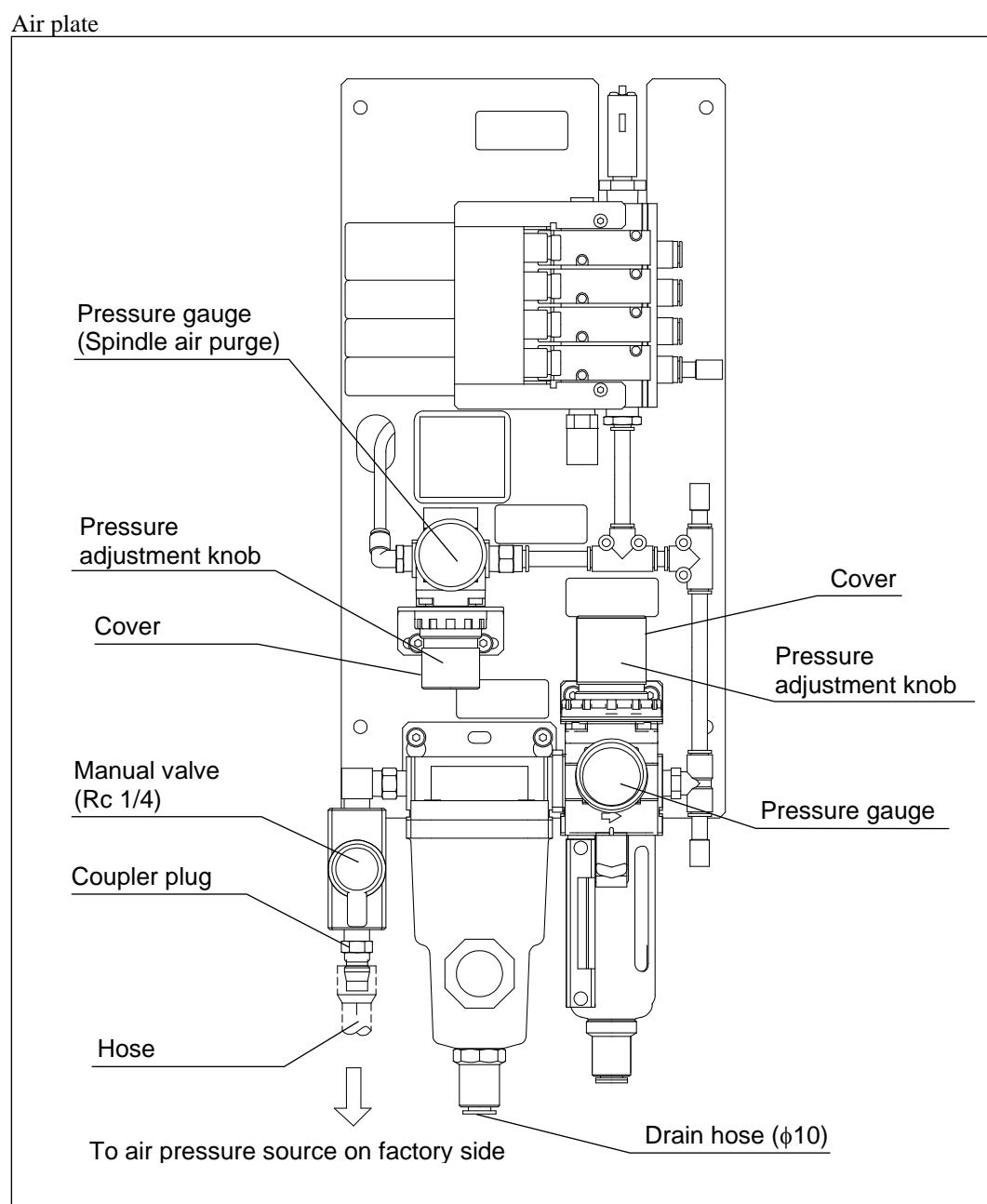
Particle size of solids: Diameter smaller than 5  $\mu\text{m}$

Atmospheric dew point: 10°C

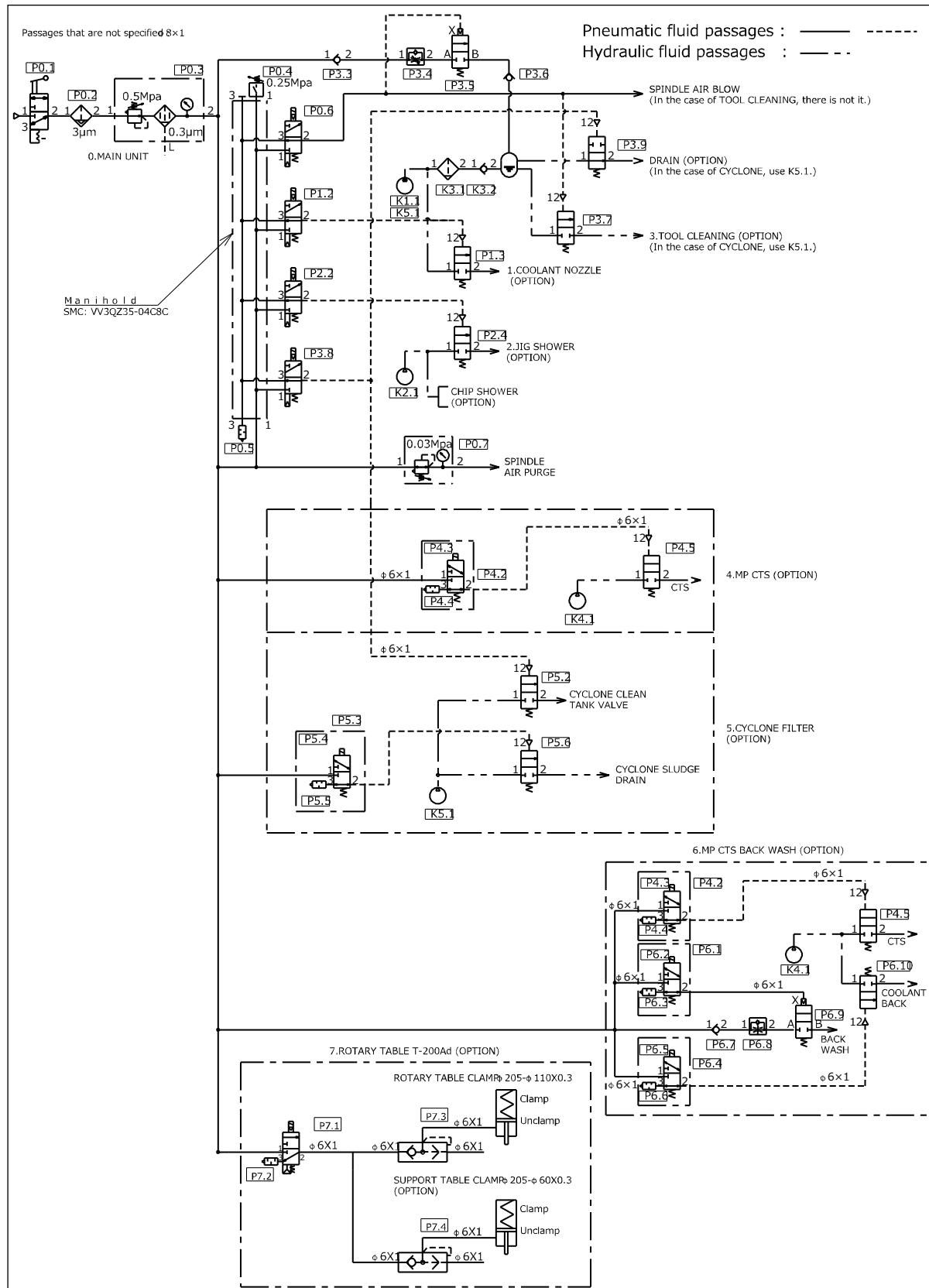
Primary oil concentration: Less than 1 mg/m<sup>3</sup> (ANR)

(NOTE) This product uses the coupler plug model KK130P-02MS made by SMC.

We recommend using a KK130S series coupler socket made by SMC. If the existing coupler socket used by the customer leaks air, replace the coupler socket with the recommended series model. (Rc 1/4)



## Chapter 4 Installation



## 4.6 Leveling

### **⚠ WARNING**

**When lifting or performing leveling work during machine setup, the machine may overturn or the jack may become loose, and a person may become trapped by the machine.**

**[SAFETY INSTRUCTIONS]**

**Only use a forklift that can bear the full weight of the machine with forks long enough to lift the machine up securely.**

**The machine should be set up on a stable, level surface.**

**Attach fixing brackets for transport when moving the machine.**

**The installer should perform leveling work on the floor, and should use tools to perform adjustments and should never place his or her hands underneath the machine.**

**The installer should use a jack at the center-front part of the machine's base.**

4

### **⚠ WARNING**

**If the door interlock mode is set to machine setup or service mode, the machine will operate even when a door is open, and you may get caught or drawn into the machine.**

**[SAFETY INSTRUCTIONS]**

**The installer or setup personnel must never leave the machine unattended while the door interlock mode is set to machine setup or service mode.**

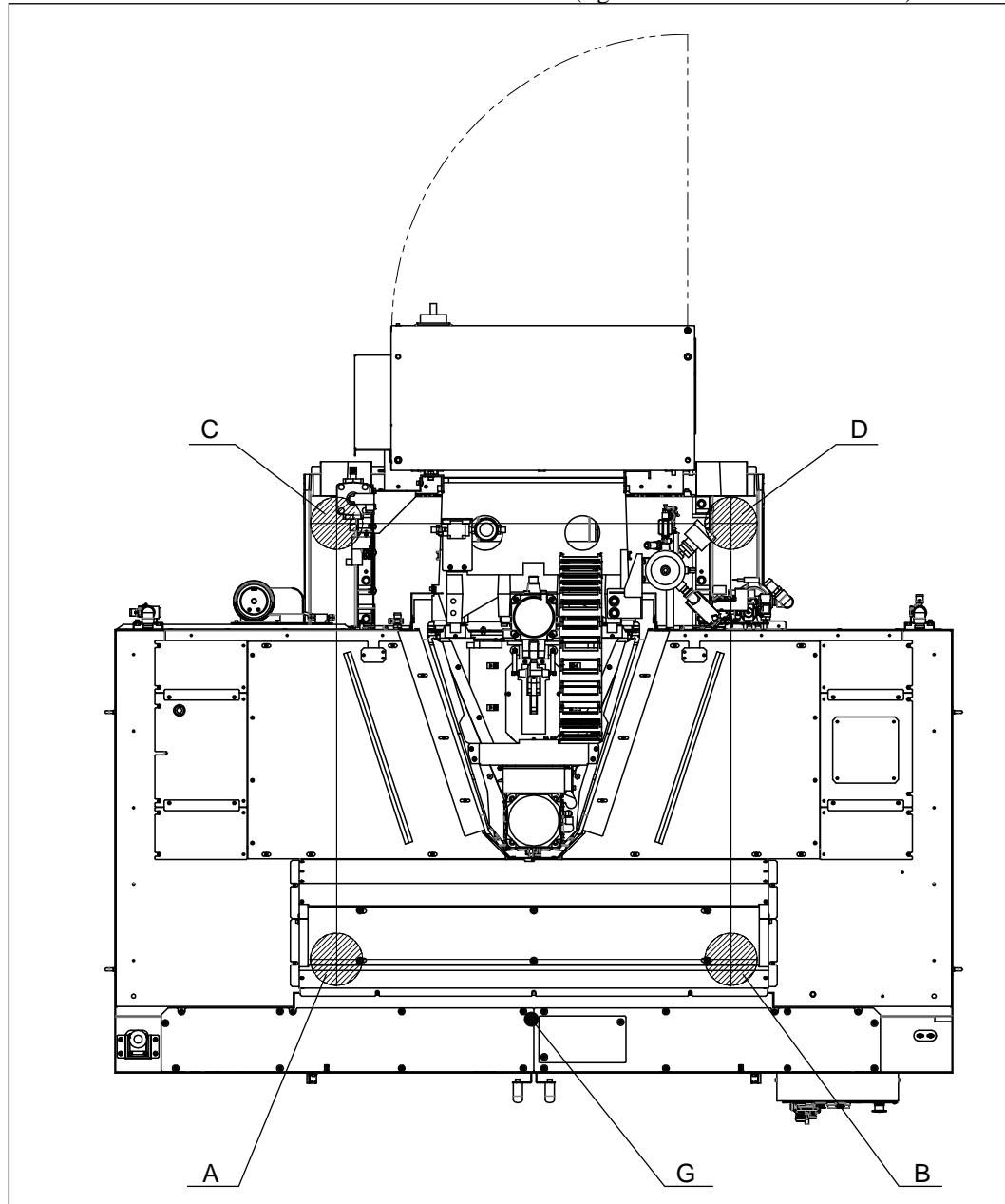
**The key for the [DOOR INTERLOCK MODE] switch should be kept by the supervisor.**

### Tools used

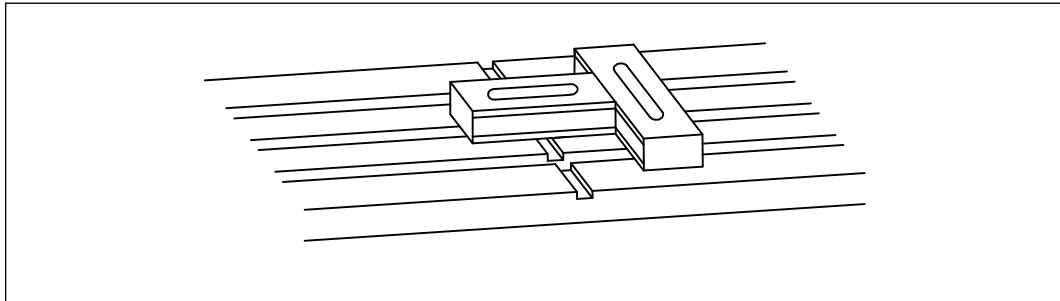
- Jack (Maximum load: 2000 kg or greater, Adjustment width: 130 to 160)
- Bubble level ([Scale/0.02]×2)

1. Move the X- and Y-axes using manual operation so that the table is positioned at the center of the stroke.  
Refer to “Chapter 5 Manual operation” in Operation Manual I for further details on manual operation.
2. Position the jack at point G, and raise the leveling bolts at points A and B so that they are higher than the leveling plate.
3. Position a bubble level on the table, and adjust the leveling bolts at points C and D so that it does not tilt more than 0.02 mm/m in all directions (right/left and forward/backward).

4



Bubble level position



4. Once the plane is adjusted so it does not tilt more than 0.02 mm/m, lightly position the leveling bolts for points A and B against the leveling plate. Then, loosen the jack at point G.
5. Use the leveling bolts for points A and B, and adjust the plane so that it does not tilt more than 0.02 mm/m in all directions (right/left and forward/backward).
6. Secure the leveling bolts with the locknuts.  
Check the horizontal plane 1 week after installation, 1 month after installation and every 6 months thereafter.  
In addition, the horizontal plane must always be checked after being exposed to major vibrations such as an earthquake or when the vibrations on the machine are significant.

## 4.7 Reset Relocation Detection Status

If a machine is equipped with a relocation detection device, when the power is turned ON after installation, the alarm <<Relocation was detected.>> is triggered, and operation is temporarily unavailable. To reset this status, a serviceman authorized by Brother Industries must confirm the installation location and perform the reset procedure. If the user provides a Brother Industries dealer with required information, such as the installation, date ahead of time, the reset procedure can be scheduled in advance. Contact a Brother Industries dealer for further details. Refer to “14.2.2 Procedure for resetting relocation detection status” for further details on resetting the relocation detection status.

(NOTE) If the alarms <<Relocation was detected>> and <<Change batteries on relocate. detect. device with power ON>> are triggered at the same time, the batteries for the relocation detection device must be replaced and the relocation detection status must be reset. Refer to “9.7.5.2 Battery alarm for relocation detection device” for further details on battery replacement.

# CHAPTER 5

## EXTERNAL I/O SIGNALS

5

- 5.1 External I/O Signal PCB Layout
  - 5.2 IO PCB and SR PCB
  - 5.3 Precautions for Use of External I/O Signals
  - 5.4 Status of External I/O Signals in Memory Operation
  - 5.5 Automatic Centering Units
- \* Refer to chapter 11 (16) for further details about EXIO unit.

## **WARNING**

**High-voltage components are present inside the control box.  
There is risk of electric shock if you touch these components by mistake.**

**[SAFETY INSTRUCTIONS]**

**Maintenance and inspection of electrical components must only be carried out by a qualified electrician who is trained in electrical safety and who has thorough knowledge of the electronic circuits in this machine.**

**Turn OFF the main power breaker, and then wait at least 20 minutes before carrying out work.**

**Attach a padlock to the main power breaker so that the power cannot be turned ON.**

**A sign or notice should be placed near the operation panel to warn others that work is in progress.**

**If leaving the machine unattended, close the control box and secure it with screws.**

5

## **WARNING**

**If the control box or operation panel is touched accidentally with wet hands while performing installation or maintenance, an electric shock or short-circuit may cause a fire.**

**[SAFETY INSTRUCTIONS]**

**Do not touch the control box and the operation panel with wet hands.**

**The cover to the control box must be closed while the machine is operating.**

**The control box and the operation panel must be kept free of coolant, water, chips and shavings.**

## **WARNING**

**If terminal connections on the PCBs or terminal block screws become loose, poor contacts may cause overheating or a fire.**

**[SAFETY INSTRUCTIONS]**

**There should be no loose screws when connecting the wiring.**

**Do not replace fuses and electrical parts that have been soldered to the inside of the unit.**

## **WARNING**

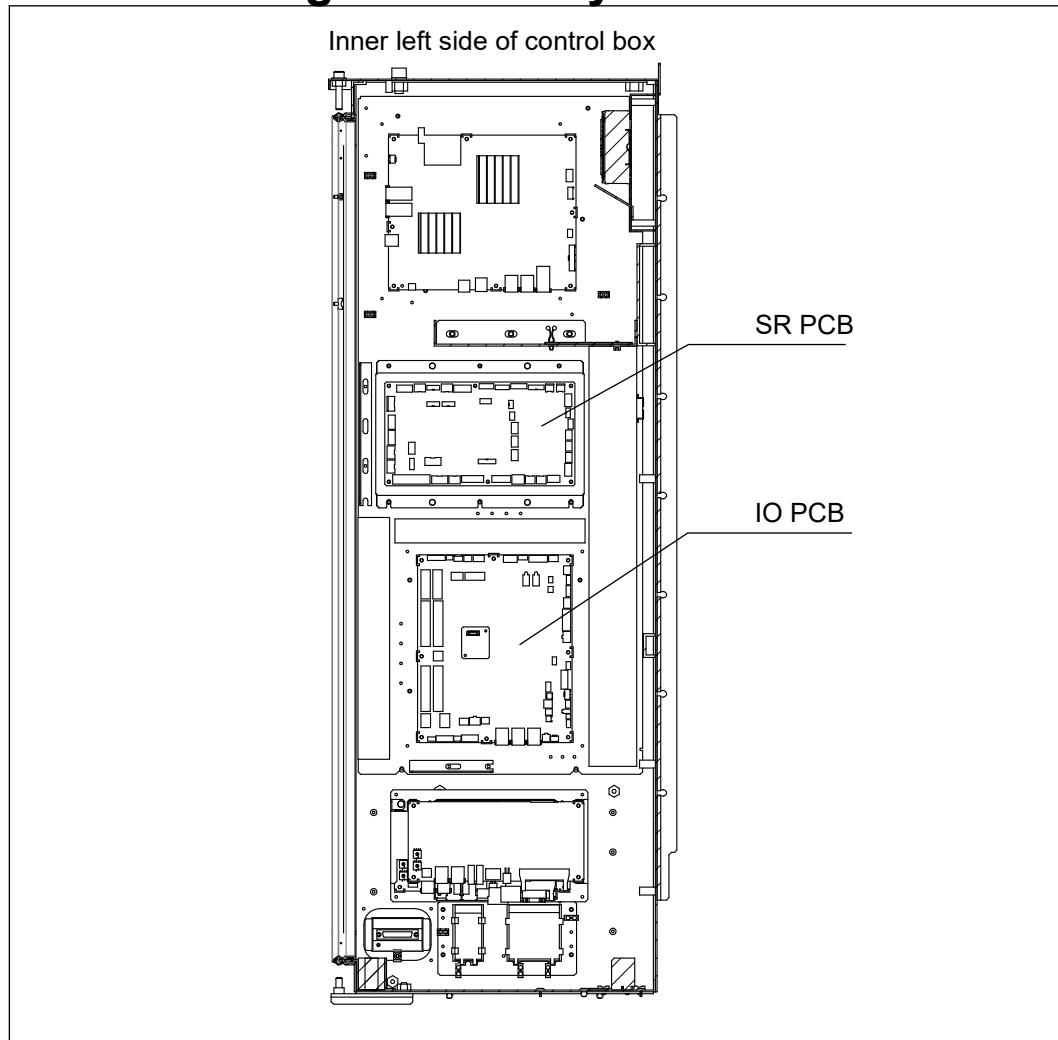
**If you touch cables which have been crushed or damaged by heavy objects, there is risk of electric shock.**

**In addition, short-circuits may occur if cables are crushed or damaged by heavy objects.**

**[SAFETY INSTRUCTIONS]**

**Cables should be gathered up or arranged to prevent them from being crushed. If a cable has become damaged, it must be replaced with a new one.**

## 5.1 External I/O Signal PCB Layout



## 5.2 IO PCB and SR PCB

A description of the external I/O signals for the IO PCB and SR PCB is noted below.

The IO PCB has various I/O terminal blocks for the external specified I/O, for the external general I/O and for the internal and table light power output. There are 3 types I/O circuits.

### Description of types

Type 1: Sink type (NPN) I/O circuit.

Type 2: Source type (PNP) I/O circuit.

Type 3: I/O circuit that can switch between sink (NPN) / source (PNP) with the SW1 on the IO PCB.

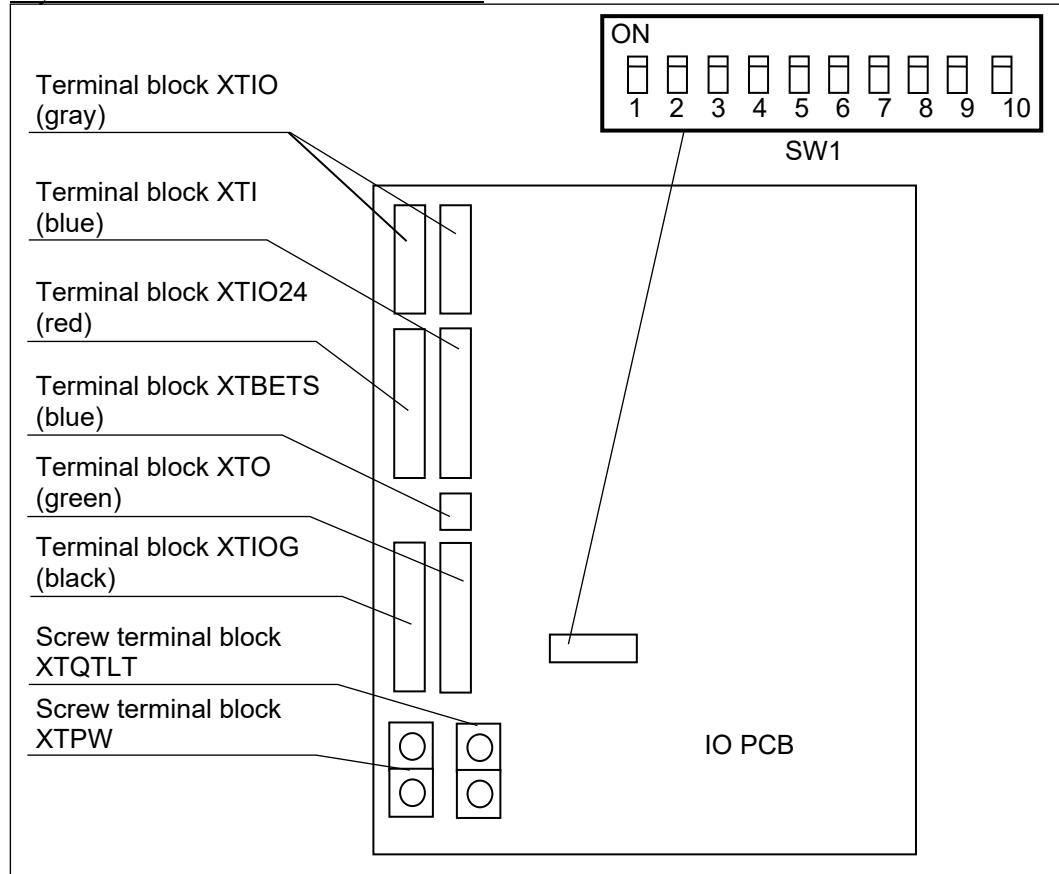
\* Refer to “5.3 Precautions for use of external I/O signals” for further details.

### Description of IO PCB power

Power supply	Description
DC24	+ power (DC24V) for normal output when breaker is ON
IO24	+ power (DC24V) on IO PCB for normal output when power SW is ON
IOG	Ground (0V) for DC24V on IO PCB
ARESN 24	+ power (DC24V) for area sensor on IO PCB
LT24	+ power (DC24V) for internal light on IO PCB
QTLT24	+ power (DC24V) for table light on IO PCB

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### Layout of IO PCB terminal blocks and SW1

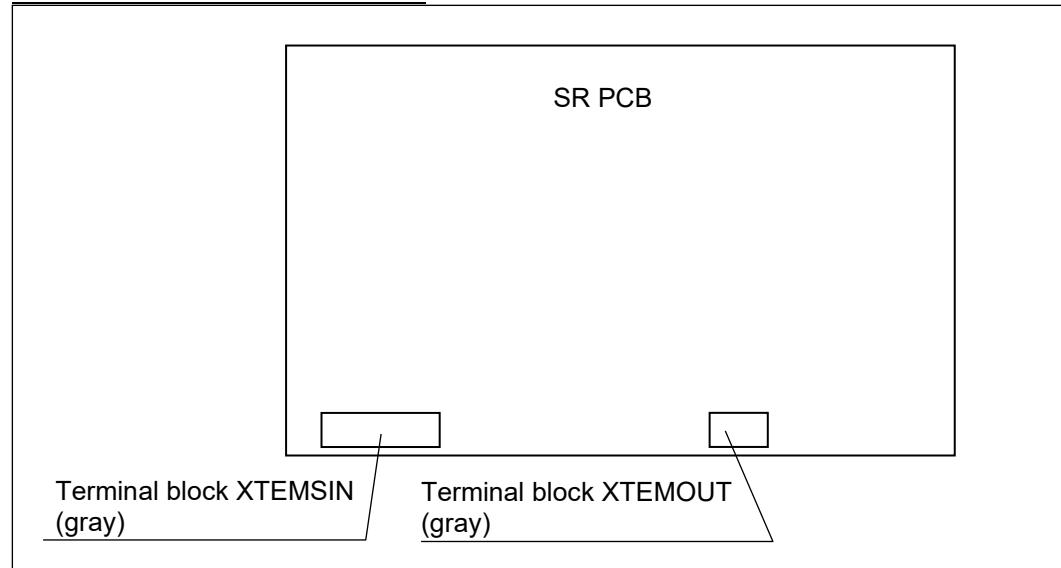


The SR PCB has an input terminal block (XTEMSIN) and an output terminal block (XTEMOUT) for the external emergency stop. The signals for these terminal blocks are controlled by the IL PCB unit.

Both terminal block circuits are designated specifically for the emergency stop (further details will be provided later on). There is a terminal designated for the emergency stop function and cannot be used for any other application.

- \* Refer to “5.3 Precautions for use of external I/O signals” for details about the external emergency stop I/O circuits.

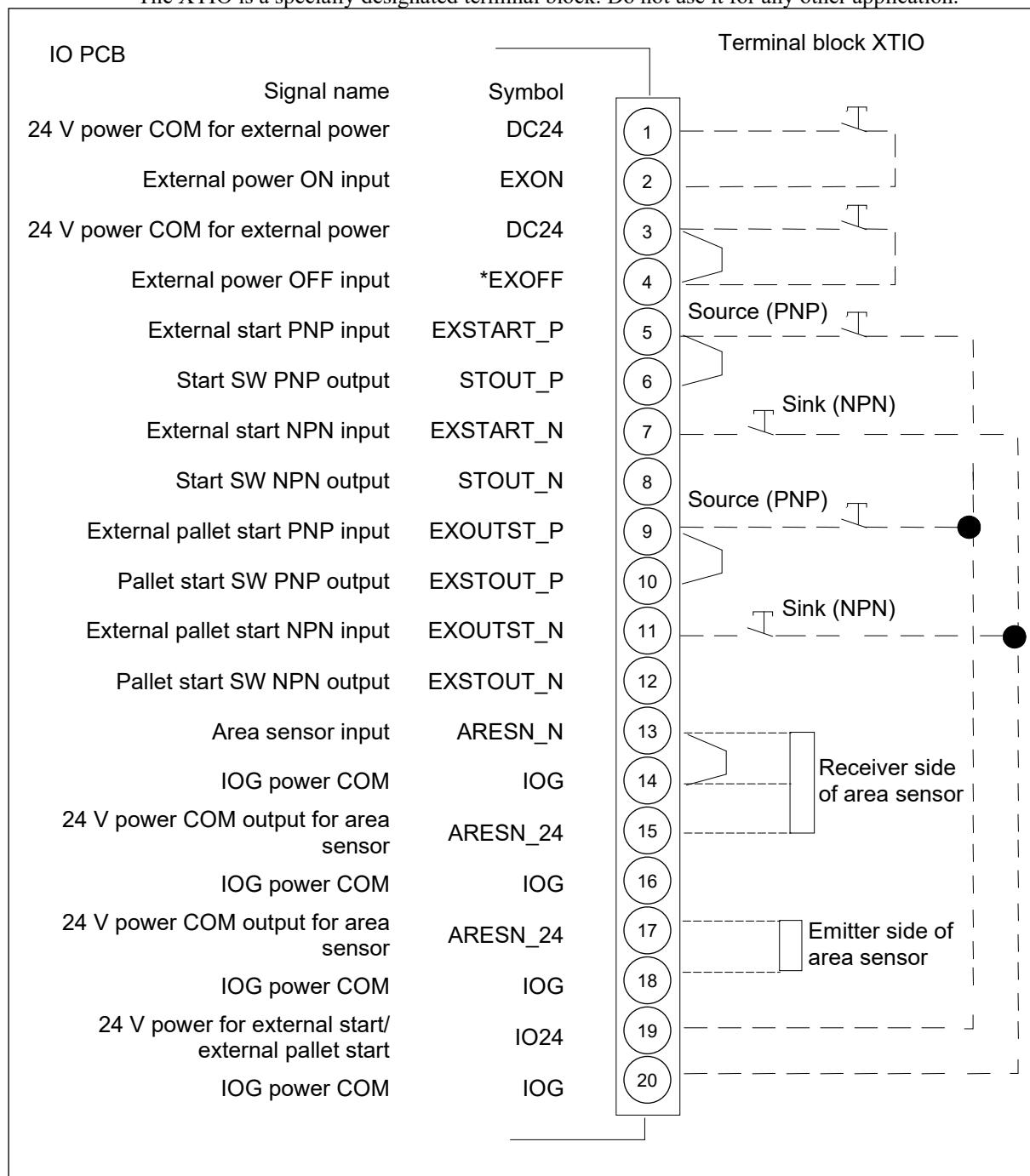
Position of the SR PCB terminal block



### 5.2.1 External Specified I/O Terminal Block for IO PCB

A description is provided about the terminal block XTIO on the IO PCB.

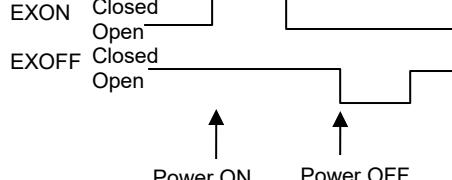
The XTIO is a specially designated terminal block. Do not use it for any other application.



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- \* When the factory default settings are configured, the following signals are short-circuited.  
XTIO terminal block on the IO PCB
  - 3-4 External power OFF
  - 5-6 [START] switch on the operation panel is enabled
  - 9-10 [PALLET START] switch on the operation panel is enabled
  - 13-14 Area sensor light blocking OFF

IO PCB					
Terminal block XTIO	Silk screen printed label:	Symbol	Signal name	Type	
2	1, 3:	DC24	24 V power for power supply	-	
4	2:	EXON	External power ON input	2	
6	4:	*EXOFF	External power OFF input	2	
8	5:	EXSTART_P	External start input	2	
10	7:	STOUT_P	Start SW output	2	
12	9:	EXSTART_N	External start input	1	
14	11:	STOUT_N	Start SW output	1	
16	13:	EXOUTST_P	External pallet start	2	
18	15:	EXSTOUT_P	Pallet start SW output	2	
20	17:	EXOUTST_N	External pallet start	1	
	19:	EXSTOUT_N	Pallet start SW output	1	
	13:	ARESN_N	Area sensor input	1	
	14, 16, 18, 20:	IOG	IOG power COM	-	
	15, 17:	OUTCOM(ARESN_24)	24 V power for area sensor	2	
	23:	OUTCOM(IO24_2)	24 V power for external start/external pallet start	-	

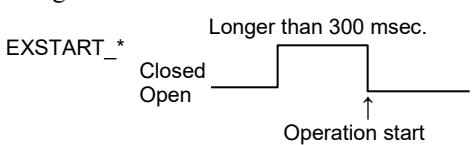
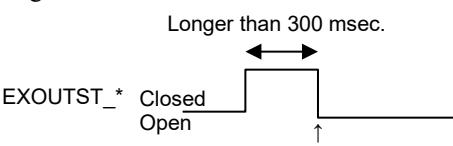
Signal	Symbol	Logic		Enabling mode				Function
		Contact a	Contact b	Manual	MDI	Memory	Program edit	
External power ON/OFF input	EXON *EXOFF *:Contact is normally closed	○ -	- ○	○ ○	○ ○	○ ○	○ ○	This signal is used when turning the power ON and OFF externally. • Signal block Longer than 300 msec.  EXON      Closed      Open EXOFF      Closed      Open  Power ON      Power OFF  (NOTICE) 1. *EXOFF is short-circuited at the factory. 2. Turn ON the [POWER] switch on the operation panel when using and turning the external power ON/OFF. 3. Use NCOK (Refer to “1.6.5 External output signals” in the Data Bank & Alarm Manual) when confirming if the power is turned ON. (NCOK turns ON approximately 50~70 seconds after the EXON input.) 4. Use an independent dry contact for both EXON and EXOFF. (Transistor input is not possible.) 5. Pin 3 – Pin 4 for XTIO should normally be shorted.  (Reference) Refer to “1.6.5 External output signals” in the Data Bank & Alarm Manual for further details.

## Chapter 5 External I/O Signals

Signal	Symbol	Logic		Enabling mode				Function
		Contact a	Contact b	Manual	MDI	Memory	Program edit	
Start SW PNP/NPN output	STOUT_P STOUT_N	○	-	○	○	○	○	<p>The signal for the [START] switch on the switch panel is output as is. When the factory default settings are configured, STOUT_P and EXSTART_P are shorted, but the signal is used when the [START] switch on the switch panel is not used or when disabling the interlock.</p> <p>Ex:</p> <ol style="list-style-type: none"> <li>When you only wish to use the external start switch</li> </ol> <p>Type 1 (Sink NPN)</p> <p>Type 2 (Source PNP)</p> <p>2. When you do not wish to start until the external preparations are in order</p> <p>(NOTICE) Pin 5 – Pin 6 for XTIO should normally be shorted.</p>

Signal	Symbol	Logic		Enabling mode				Function
		Contact a	Contact b	Manual	MDI	Memory	Program edit	
Pallet start SW PNP/NPN output	EXSTOUT_P EXSTOUT_N	○		○	○	○	○	<p>The signal for the <b>[PALLET START]</b> switch on the switch panel is output as is. When the factory default settings are configured, EXSTOUT_P and EXOUTST_P are shorted, but the signal is used when the <b>[PALLET START]</b> switch on the switch panel is not used or when disabling the interlock.</p> <p>Ex:</p> <ol style="list-style-type: none"> <li>When you only wish to use the external <b>[START]</b> switch</li> </ol> <p>Type 1 (Sink NPN)</p> <p>Operation panel <b>[PALLET START]</b> IO PCB switch</p> <p>&lt;Pallet start SW output signal&gt; EXSTOUT</p> <p>&lt;Ext. pallet start input signal&gt; EXOUTST</p> <p>External <b>[PALLET START]</b> switch (Sink NPN)</p> <p>IOG ↓</p> <p>Operation panel <b>[PALLET START]</b> IO PCB switch</p> <p>&lt;Pallet start SW output signal&gt; EXSTOUT</p> <p>&lt;Ext. pallet start input signal&gt; EXOUTST</p> <p>External <b>[PALLET START]</b> switch (Source NPN)</p> <p>IOG ↓</p> <ol style="list-style-type: none"> <li>When you do not wish to start until the external preparations are in order</li> </ol> <p>Operation panel <b>[PALLET START]</b> IO PCB switch</p> <p>&lt;Pallet start SW output signal&gt; EXSTOUT</p> <p>&lt;Ext. pallet start input signal&gt; EXOUTST</p> <p>Contact for interlock</p> <p>IOG ↓</p> <p>(NOTICE)</p> <ol style="list-style-type: none"> <li>Pin 9 – Pin 10 for XTIO should normally be shorted.</li> <li>Only valid with QT machine.</li> </ol>

## Chapter 5 External I/O Signals

Signal	Symbol	Logic		Enabling mode				Function
		Contact a	Contact b	Manual	MDI	Memory	Program edit	
External start PNP/NPN input	EXSTAR T_P EXSTAR T_N	○	-	-	○	○	-	<p>Once the contact for the signal EXSTART_P(N) has been closed, when it is opened, operation begins.</p> <p>During the following conditions, even if the signal EXSTART_P(N) is input, it is invalid.</p> <ol style="list-style-type: none"> <li>When in a mode that is not MDI operation mode, memory operation mode or editing while operating</li> <li>When the external stop (EXSTOP) is input (Reference) Refer to “1.6.5 External output signals” in the Data Bank &amp; Alarm Manual for further details.</li> <li>When the [STOP] key on the operation panel is pressed</li> <li>When the external reset signal (EXRST) is input (Reference) Refer to “1.6.5 External output signals” in the Data Bank &amp; Alarm Manual for further details.</li> <li>When the [RST] key on the operation panel is pressed</li> <li>When an alarm is triggered</li> <li>When a door is open The start signal is accepted when using an automatic door specification.</li> <li>When the servo ON is processing after the door is closed</li> </ol> <ul style="list-style-type: none"> <li>Signal block</li> </ul>  <p>(NOTE) If the start input is accepted, the [START] switch LED turns on during operation. If in edit mode while operating, wait longer than 500 msec. before inputting. Operation linked with the quick table is not possible.</p>
External pallet start PNP/NPN input	EXOUTS T_P EXOUTS T_N	○	-	-	○	○	-	<p>Once the contact for the signal EXOUTST_P(N) has been closed, when it is opened, operation can be started externally by being linked with the QT. This function is the same as the [PALLET START] switch.</p> <ul style="list-style-type: none"> <li>Signal block</li> </ul>  <p>(NOTE) Only valid with QT machine.</p>

## 5.2.2 General Purpose External I/O Terminal Blocks on IO PCB

The IO PCB has the following terminal blocks: XTI, XTO, XTIO24, XTIOG and XTBETS.

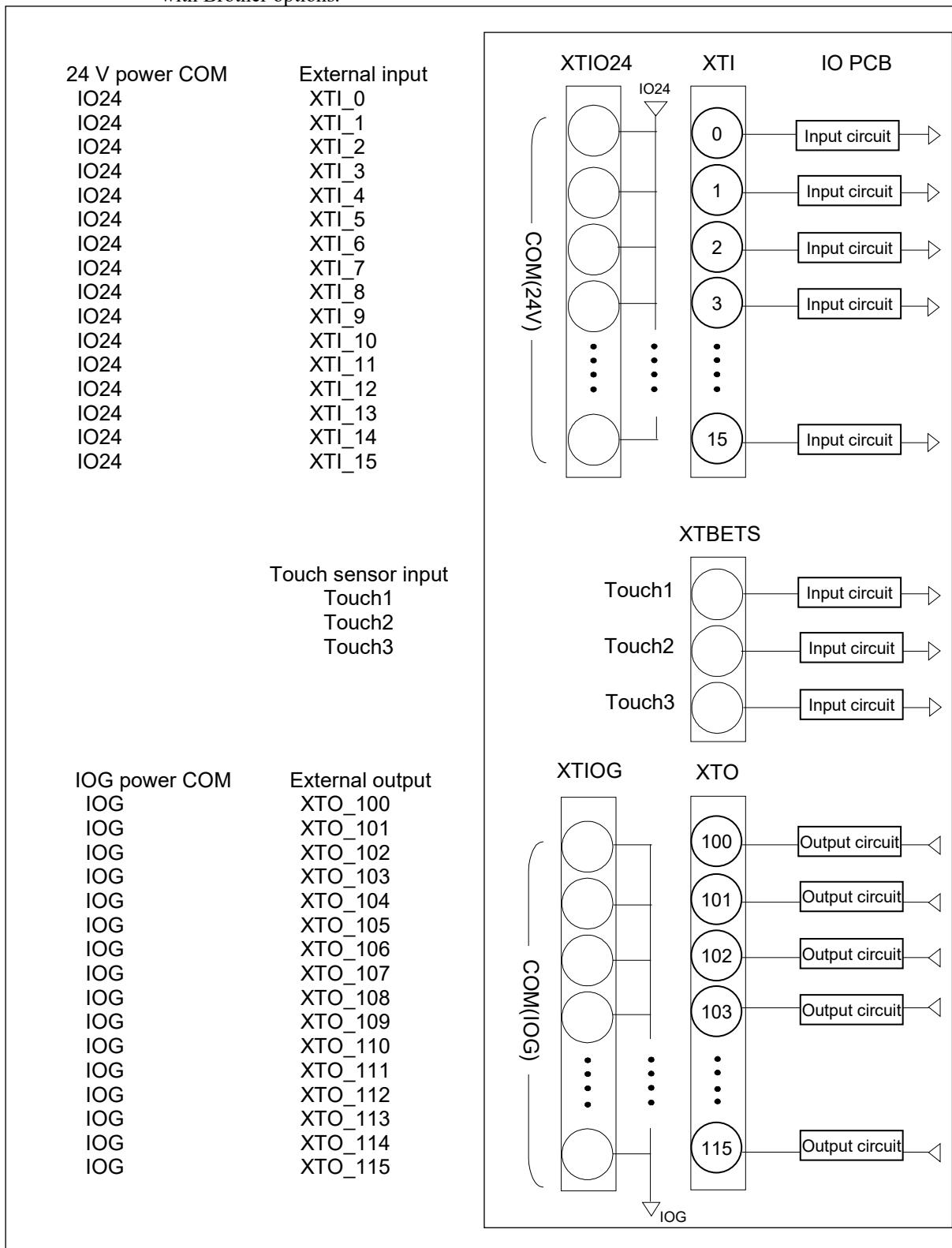
XTI is the external input terminal block, and XTO is the external output terminal block.

XTBETS is the input terminal block for the automatic centering unit, the tool breakage detector and the touch sensors.

XTIO24 and XTIOG are general purpose power terminal blocks.

Connect the I/O devices and touch sensors (which the customer must supply).

- \* Brother may need to use some of the terminals for connections when the machine is equipped with Brother options.



IO PCB

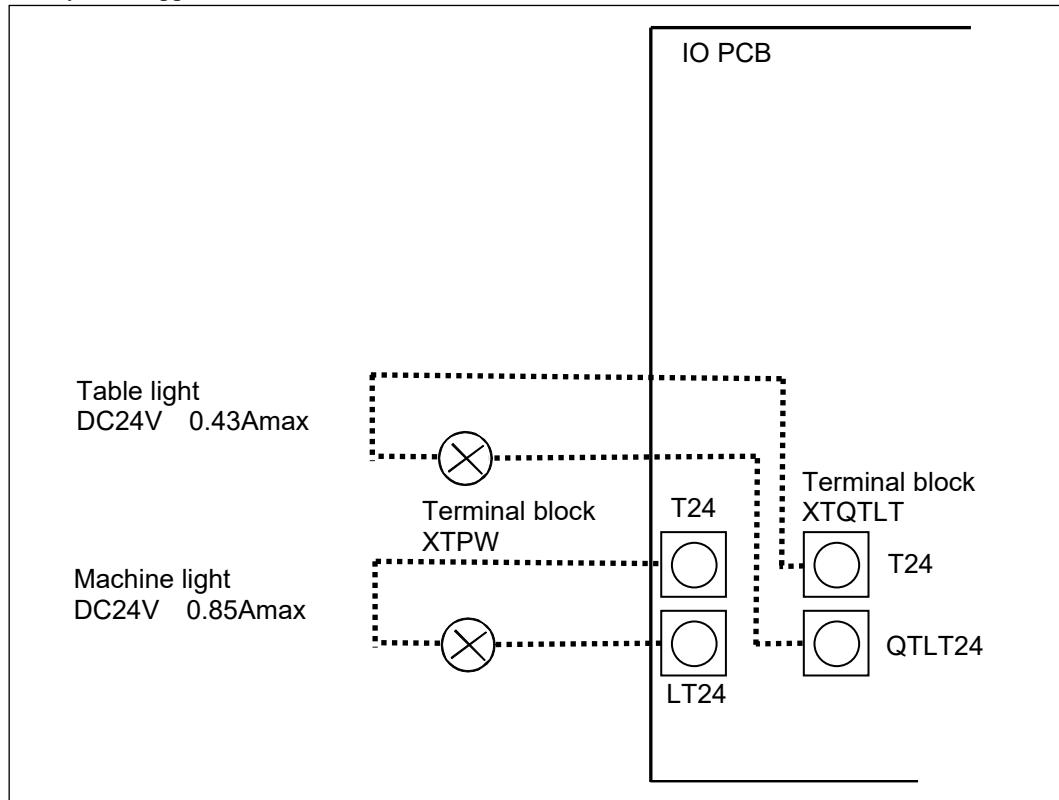
Terminal block	Silk screen printed label:	Symbol	Signal name	Type
XTI				
0	0:	XTI_0	External input No. 0	3
1	1:	XTI_1	External input No. 1	3
2	2:	XTI_2	External input No. 2	3
3	3:	XTI_3	External input No. 3	3
4	4:	XTI_4	External input No. 4	3
5	5:	XTI_5	External input No. 5	3
6	6:	XTI_6	External input No. 6	3
7	7:	XTI_7	External input No. 7	3
8	8:	XTI_8	External input No. 8	3
9	9:	XTI_9	External input No. 9	3
10	10:	XTI_10	External input No. 10	3
11	11:	XTI_11	External input No. 11	3
12	12:	XTI_12	External input No. 12	3
13	13:	XTI_13	External input No. 13	3
14	14:	XTI_14	External input No. 14	3
15	15	XTI_15	External input No. 15	3
5				
XTO				
100	100:	XTO_100	External output No. 100	3
101	101:	XTO_101	External output No. 101	3
102	102:	XTO_102	External output No. 102	3
103	103:	XTO_103	External output No. 103	3
104	104:	XTO_104	External output No. 104	3
105	105:	XTO_105	External output No. 105	3
106	106:	XTO_106	External output No. 106	3
107	107:	XTO_107	External output No. 107	3
108	108:	XTO_108	External output No. 108	3
109	109:	XTO_109	External output No. 109	3
110	110:	XTO_110	External output No. 110	3
111	111:	XTO_111	External output No. 111	3
112	112:	XTO_112	External output No. 112	3
113	113:	XTO_113	External output No. 113	3
114	114:	XTO_114	External output No. 114	3
115	115:	XTO_115	External output No. 115	3
XTIO24				
COM(24V)				
...				
COM(24V)				
*Terminal 16				
XTIOG				
COM(IOG)				
...				
COM(IOG)				
*Terminal 16				

IO PCB								
Terminal block XTBETS	Silk screen printed label:	Symbol	Signal name				Type	
	Touch1	TOUCH1	Touch sensor input No. 1				3	
	Touch2	TOUCH2	Touch sensor input No. 2				3	
	Touch3	TOUCH3	Touch sensor input No. 3				3	
Signal	Symbol	Logic		Enabling mode			Function	
		Contact a	Contact b	Manual	MDI	Memory	Edit *1	
External input	XTI_0~15	<input type="radio"/>	-	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Signal is used with the free mapping input signal terminal block. Free mapping refers to a terminal where the NC's internal function signals for the operation panel can be assigned freely. The default signals are each assigned at the factory. Refer to "1.6 External I/O signal" in the Data Bank & Alarm Manual for further details. Refer to "5.3 Precautions for use of external I/O signals" for the input characteristics.
External output	XTO_100~115	<input type="radio"/>	-	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Signal is used with the free mapping output signal terminal block. Free mapping refers to a terminal where the NC's internal function signals for the operation panel can be assigned freely. The default signals are each assigned at the factory. Refer to "1.6 External I/O signal" in the Data Bank & Alarm Manual for further details. Refer to "5.3 Precautions for use of external I/O signals" for the output characteristics.
24 V power COM	IO24	-	-	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	This COM terminal is the + power (24V) for the DC24V on the IO PCB. The signal is used as the 24 V power for a given I/O device, the automatic centering unit, the tool breakage detector and the touch sensors. Be absolutely sure to use an output current of 300 mA (maximum) per contact for the external output, 24 V power COM and the IOG power COM and a total output current of 500 mA for all ports.
IOG power COM	IOG	-	-	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	This COM terminal is the GND (0V) for the DC24V on the IO PCB. The signal is used as the GND power for a given I/O device, the automatic centering unit, the tool breakage detector and the touch sensors. 300 mA (maximum) per contact for the external output, 24 V power COM and the IOG power COM and a total output current of 500 mA for all ports.
Touch sensor input	TOUCH1~3	<input type="radio"/>	-	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Signal is used as the input signal for the automatic centering unit, the tool breakage detector and the touch sensors. Refer to "5.3 Precautions for use of external I/O signals" for the input characteristics.

### 5.2.3 Power Output Terminal Blocks for Internal Light and Table Light on IO PCB

A description is provided about the terminal blocks XTPW and XTQTLT on the IO PCB. XTPW and XTQTLT are the screw terminal blocks for the lighting equipment. Do not use them for any other application.

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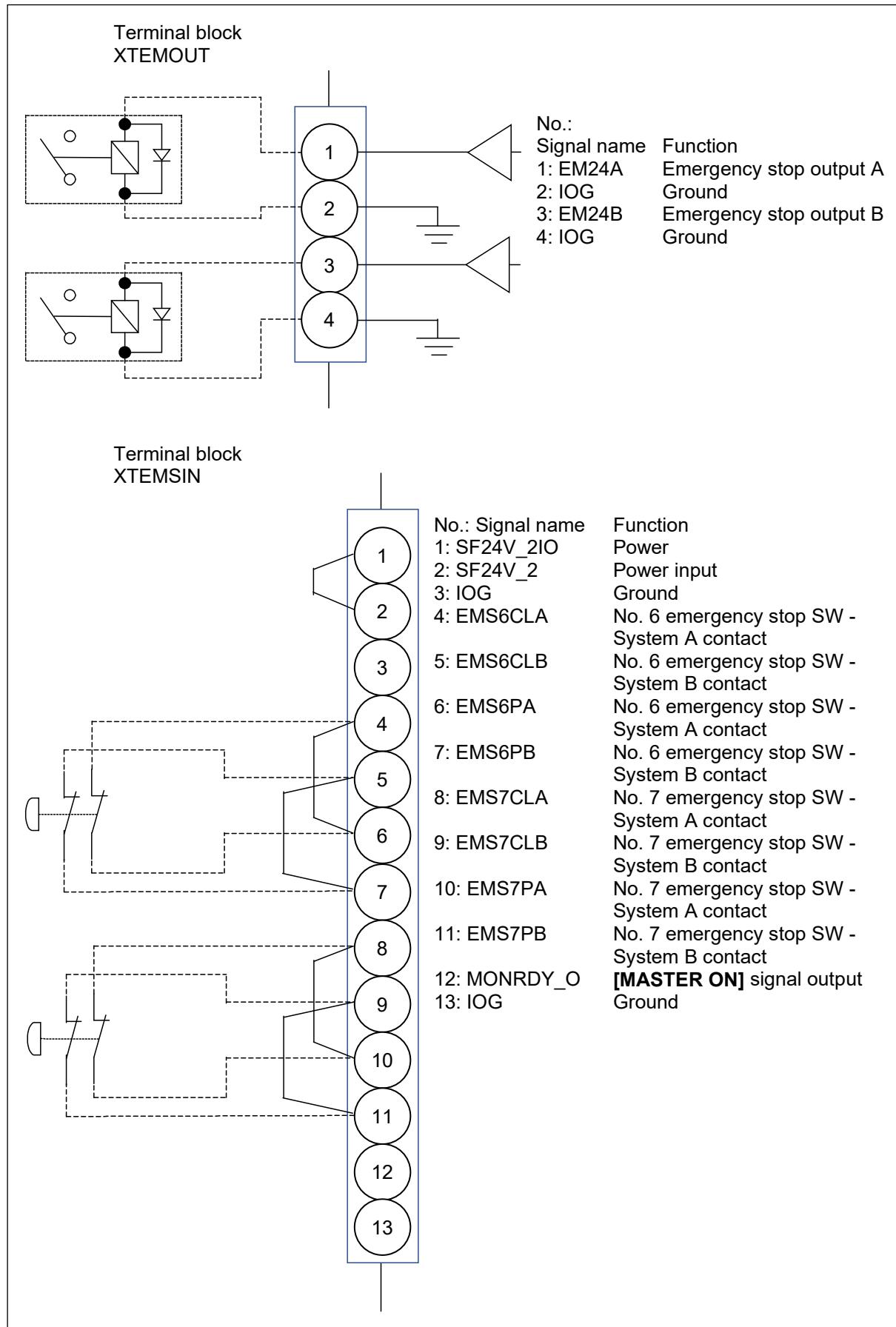


IO PCB				
Terminal block XTPW	Silk screen printed label: T24 LT24	Symbol	Signal name	Type
		IOG LT24	IOG for internal light 24 V power output for internal light	- 2
Terminal block XTQTLT	Silk screen printed label: T24 QTLT24	Symbol	Signal name	Type
		IOG QTLT24	IOG for table light 24 V power output for table light	- 2

Signal	Symbol	Logic		Enabling mode				Function
		Contact a	Contact b	Manual	MDI	Memory	Program edit	
24V/IOG power for internal light	LT24 T24(IOG)	-	-	○	○	○	○	This power is used for the machine light. When the [LIGHT] key on the operation panel is turned ON while the [POWER] is turned ON, the signal is output. DC24V 0.85A max Be absolutely sure to use DC 24 V and 0.85 A (maximum) on the lighting equipment that is connected. (NOTICE) Do not use it for any other device except the lighting equipment.
24V/IOG power for table light	QTLT24 T24(IOG)	-	-	○	○	○	○	This power is used for the table light. When the [TABLE LIGHT] key on the operation panel is pressed while the [POWER] switch is turned ON, the signal is output. Be absolutely sure to use DC 24 V and 0.43 A (maximum) on the lighting equipment that is connected. (NOTICE) Do not use it for any other device except the lighting equipment.

Be absolutely sure that the inrush current that occurs simultaneously for the connected equipment is 10A 20μs or less.

### 5.2.4 Terminal Block for External Emergency Stop SW Connections on SR PCB



Signal	Symbol	Logic		Enabling mode			Function
		Contact a	Contact b	Manual	MDI	Memory	
EM24A IOG	Emergency stop output A	<input type="radio"/>		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/> This emergency stop signal output is used on the customer side circuit where the power output is shut off during an emergency stop. This is one side of a redundant signal, and always use this signal with EM24B as a set.  The function does not assume that a motor is directly controlled by this signal.  It assumes that a relay is controlled with this signal, using a contact for the secondary side on a device supplied by the customer. The maximum relay-driven current is 0.3 A. (NOTICE) Only use this signal for the <Emergency stop signal output>.
EM24B IOG	Emergency stop output B	<input type="radio"/>		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/> This emergency stop signal output is used on the customer side circuit where the power output is shut off during an emergency stop. This is one side of a redundant signal, and always use this signal with EM24A as a set.  The function does not assume that a motor is directly controlled by this signal.  It assumes that a relay is controlled with this signal, using a contact for the secondary side on a device supplied by the customer. The maximum relay-driven current is 0.3 A. (NOTICE) Only use this signal for the <Emergency stop signal output>.
SF24V_2 IO SF24V_2 IOG	Power						This power supply line is for the brake circuit on the SR PCB. (NOTICE) Do not remove the loop.
EMS6CLA EMS6PA	No. 6 emergency stop SW - System A contact	<input type="radio"/>	<input type="radio"/> This emergency stop input recognizes that the emergency stop has been pressed when the contact is open. This is one side of a redundant signal, and always use with EMS6CLB and EMS6PB as a set. (NOTICE) Use a mechanical contact switch for the emergency stop. The setup does not support a transistor output from a safety PLC, etc. In addition, set up the wiring in the following format: EMS6CLA—Contact—EMS6PA. When a common type contact is used, an error is detected and operation stops because there is a self-diagnostics function.				

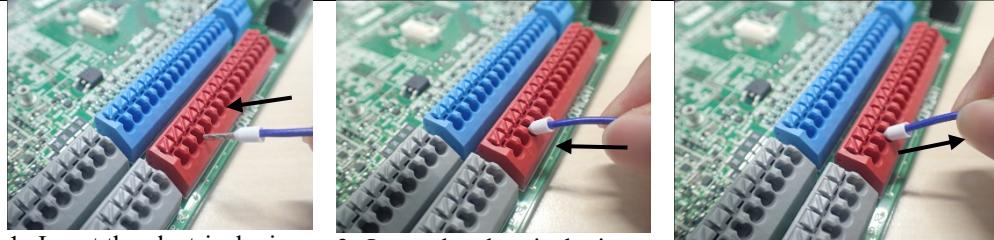
## Chapter 5 External I/O Signals

Signal	Symbol	Logic		Enabling mode			Function
		Contact a	Contact b	Manual	MDI	Memory	
EMS6CLB EMS6PB	No. 6 emergency stop SW - System B contact		○	○	○	○	This emergency stop input recognizes that the emergency stop has been pressed when the contact is open. This is one side of a redundant signal, and always use with EMS6CLA and EMS6PA as a set. <b>(NOTICE)</b> Use a mechanical contact switch for the emergency stop. The setup does not support a transistor output from a safety PLC, etc. In addition, set up the wiring in the following format: EMS6CLB—Contact—EMS6PB. When a common type contact is used, an error is detected and operation stops because there is a self-diagnostics function.
EMS7CLA EMS7PA	No. 7 emergency stop SW - System A contact		○	○	○	○	This emergency stop input recognizes that the emergency stop has been pressed when the contact is open. This is one side of a redundant signal, and always use with EMS7CLB and EMS7PB as a set. <b>(NOTICE)</b> Use a mechanical contact switch for the emergency stop. The setup does not support a transistor output from a safety PLC, etc. In addition, set up the wiring in the following format: EMS7CLA—Contact—EMS7PA. When a common type contact is used, an error is detected and operation stops because there is a self-diagnostics function.
EMS7CLB EMS7PB	No. 7 emergency stop SW - System B contact		○	○	○	○	This emergency stop input recognizes that the emergency stop has been pressed when the contact is open. This is one side of a redundant signal, and always use with EMS7CLA and EMS7PA as a set. <b>(NOTICE)</b> Use a mechanical contact switch for the emergency stop. The setup does not support a transistor output from a safety PLC, etc. In addition, set up the wiring in the following format: EMS7CLB—Contact—EMS7PB. When a common type contact is used, an error is detected and operation stops because there is a self-diagnostics function.

## 5.3 Precautions for Use of External I/O Signals

1. Use the crimp terminal NF0.5-8 (Nichifu), or FE-0.5-8N-WH (Wago), to connect to the terminal block. The electrical wire specifications that are compatible with crimp terminals are 0.5 mm<sup>2</sup> (20AWG) with an outer diameter sheath size of φ2.4 mm.

(Disconnect wiring)

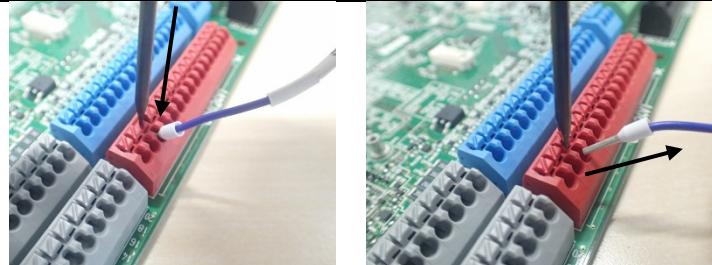


1. Insert the electrical wire into the electrical wire port.

2. Insert the electrical wire all the way so that it touches the end.

3. Lightly pull on the electrical wire to ensure the connection is secure.

(Remove electrical wiring)



1. Press the release button with a screwdriver to disconnect.

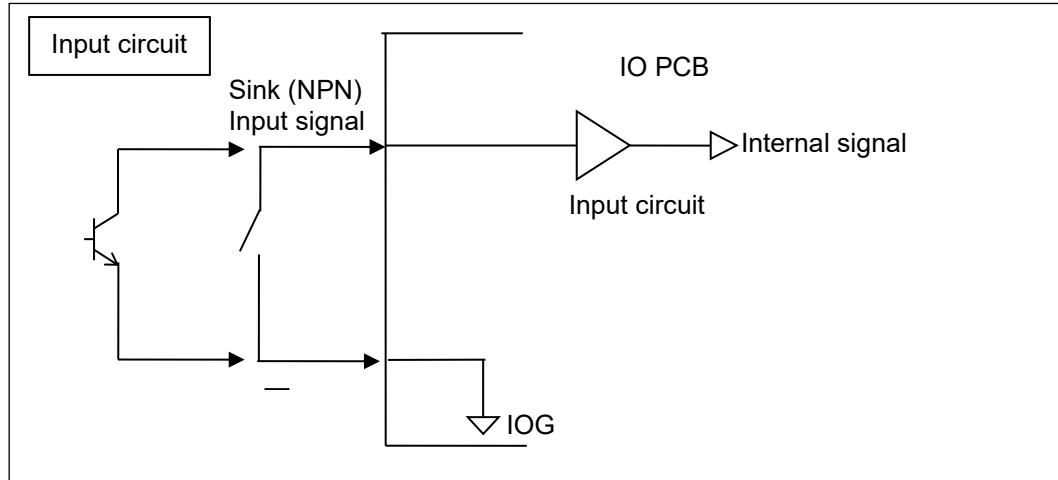
2. Pull the electrical wire while pressing the release button to disconnect the wire.

2. Refer to “5.3.3 I/O circuit type 3” for external input, external output and touch sensor input.

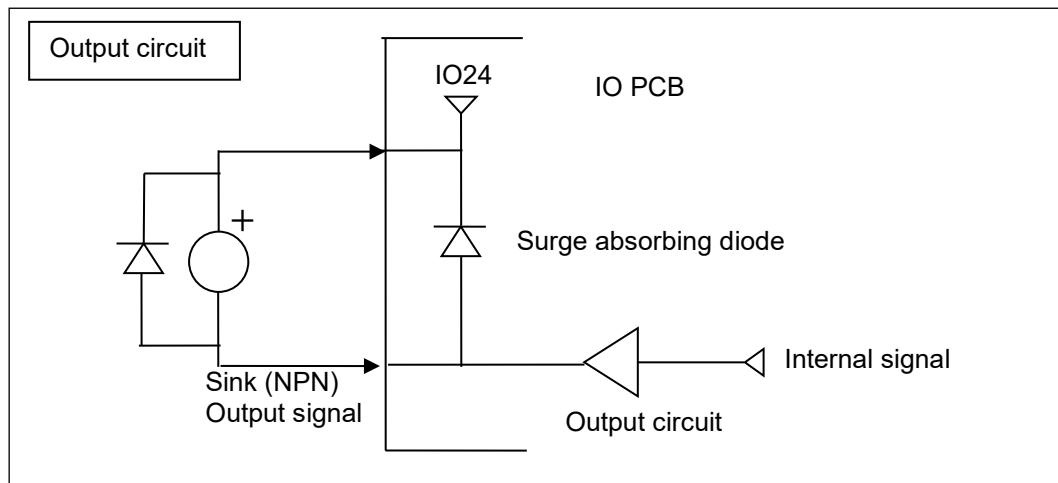
### 5.3.1 I/O Circuit Type 1

A description is provided for Type 1: Sink type (NPN) I/O circuit.

Type 1 (Sink NPN)

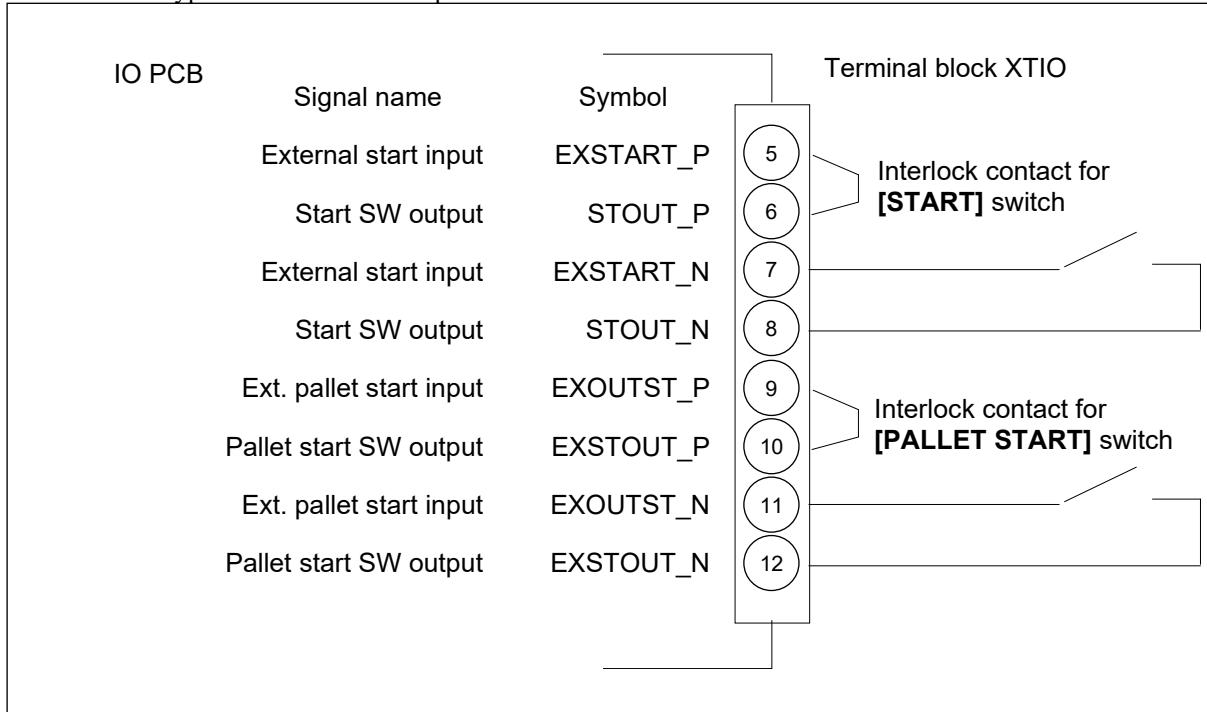


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1. The terminal block XTIO on the IO PCB is a specially designated terminal block. Do not use it for any other application.
2. The output terminal voltage is DC 24 V. The output circuit is equipped with built-in diode used for surge absorption. However, if connecting to an inductive load, connect the flyback diode nearest to the load.
3. Connect the contact input and NPN open collector transistor to the input circuit. The input current is DC 24 V 5 mA. Use a connecting device that complies with this weak current value. The input filter time constant is 1 msec (TYP). (CR filter only)
4. Be absolutely sure that the inrush current that occurs simultaneously for the connected equipment is 10 A 20  $\mu$ s or less.
5. Do not use an external power supply. Otherwise, it may cause a failure on the PCB and/or connected devices.
6. A connection example is shown on the next page.

## Type 1: Connection example of terminal block XTIO on IO PCB



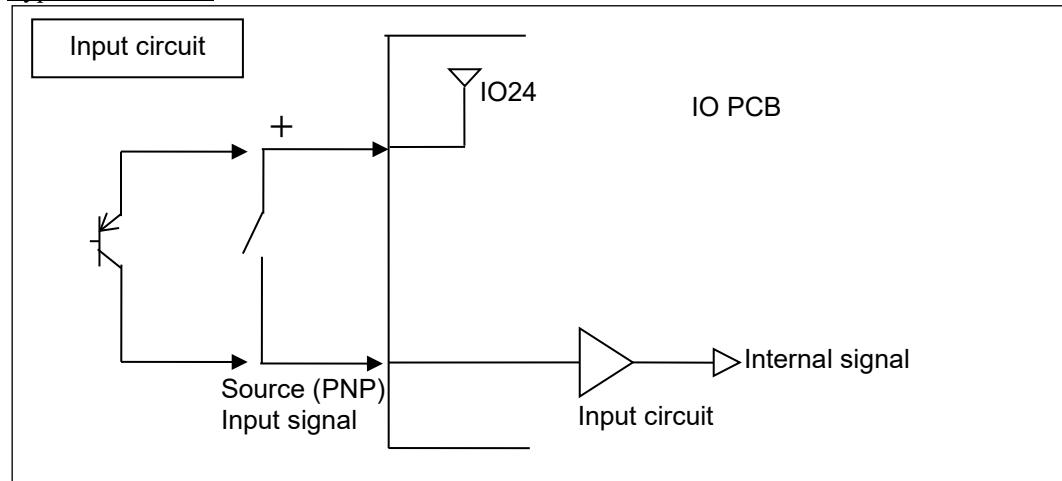
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1. If an interlock contact for the **[START]** switch is used, remove the short cable between Pin 5 and Pin 6 on the XTIO.
2. If an interlock contact for the **[PALLET START]** switch is used, remove the short cable between Pin 9 and Pin 10 on the XTIO.

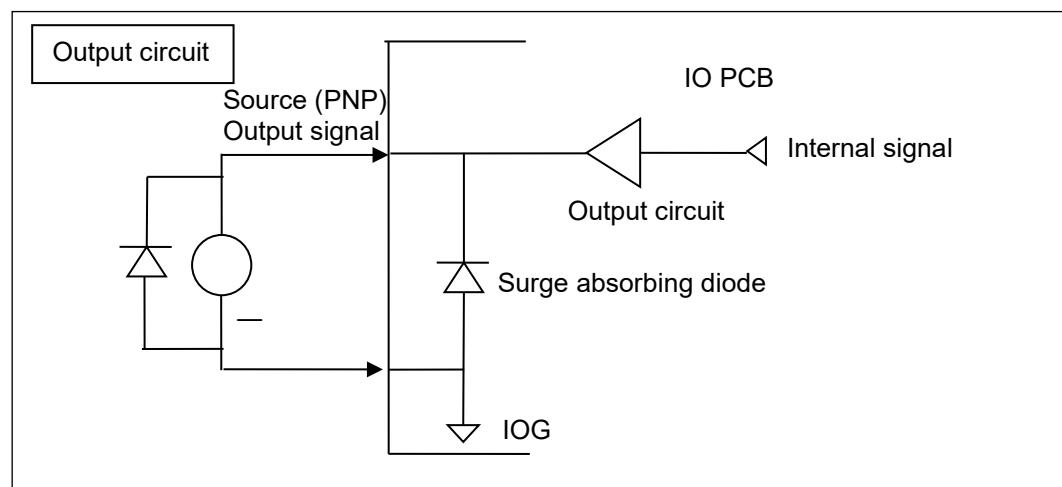
### 5.3.2 I/O Circuit Type 2

A description is provided for Type 2: Source type (PNP) I/O circuit.

Type 2 source PNP

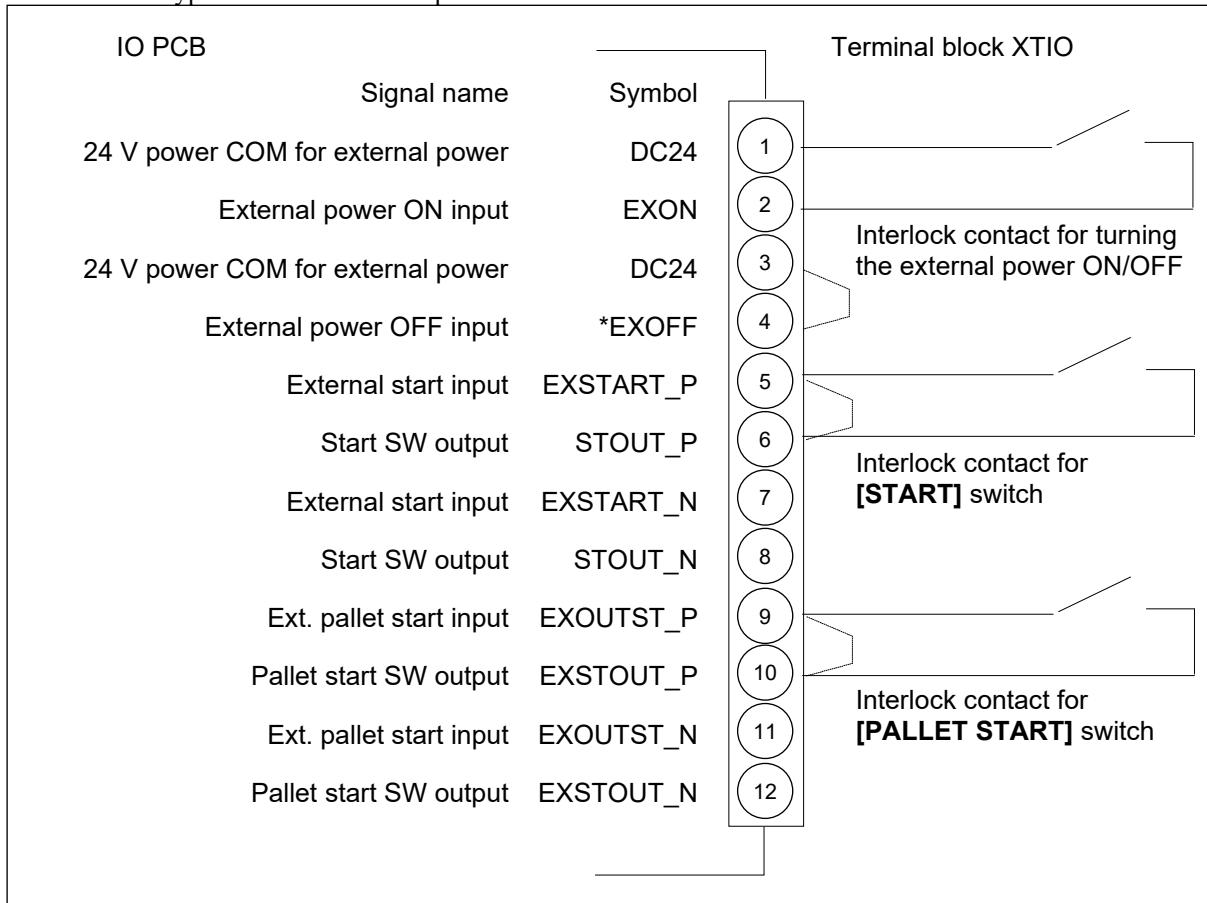


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1. The terminal block XTIO on the IO PCB is a specially designated terminal block. Do not use it for any other application.
2. The output terminal voltage is DC 24 V. The output circuit is equipped with built-in diode used for surge absorption. However, if connecting to an inductive load, connect the flyback diode nearest to the load.
3. Connect the contact input and PNP open collector transistor to the input circuit. The input current is DC 24 V 5 mA. Use a connecting device that complies with this weak current value. The input filter time constant is 1 msec (TYP). (CR filter only)
4. Be absolutely sure that the inrush current that occurs simultaneously for the connected equipment is 10 A 20  $\mu$ s or less.
5. Do not use an external power supply. Otherwise, it may cause a failure on the PCB and/or connected devices.
6. A connection example is shown on the next page.

Type 2: Connection example of terminal block XTIO on IO PCB



1. If an interlock contact for turning the external power ON/OFF is used, turn ON the **[POWER]** switch on the operation panel. Remove the short cable between Pin 3 and Pin 4 on the XTIO, or connect an interlock contact between Pin 3 and Pin 4 on the XTIO.
2. If an interlock contact for the **[START]** switch is used, remove the short cable between Pin 5 and Pin 6 on the XTIO.
3. If an interlock contact for the **[PALLET START]** switch is used, remove the short cable between Pin 9 and Pin 10 on the XTIO.

### 5.3.3 I/O Circuit Type 3

A description is provided for Type 3: I/O circuit that can switch between sink (NPN) / source (PNP).

The external input, external output and the touch sensor can switch between sink (NPN) / source (PNP) with the SW1 on the IO PCB. Configure the settings to match the connecting device.

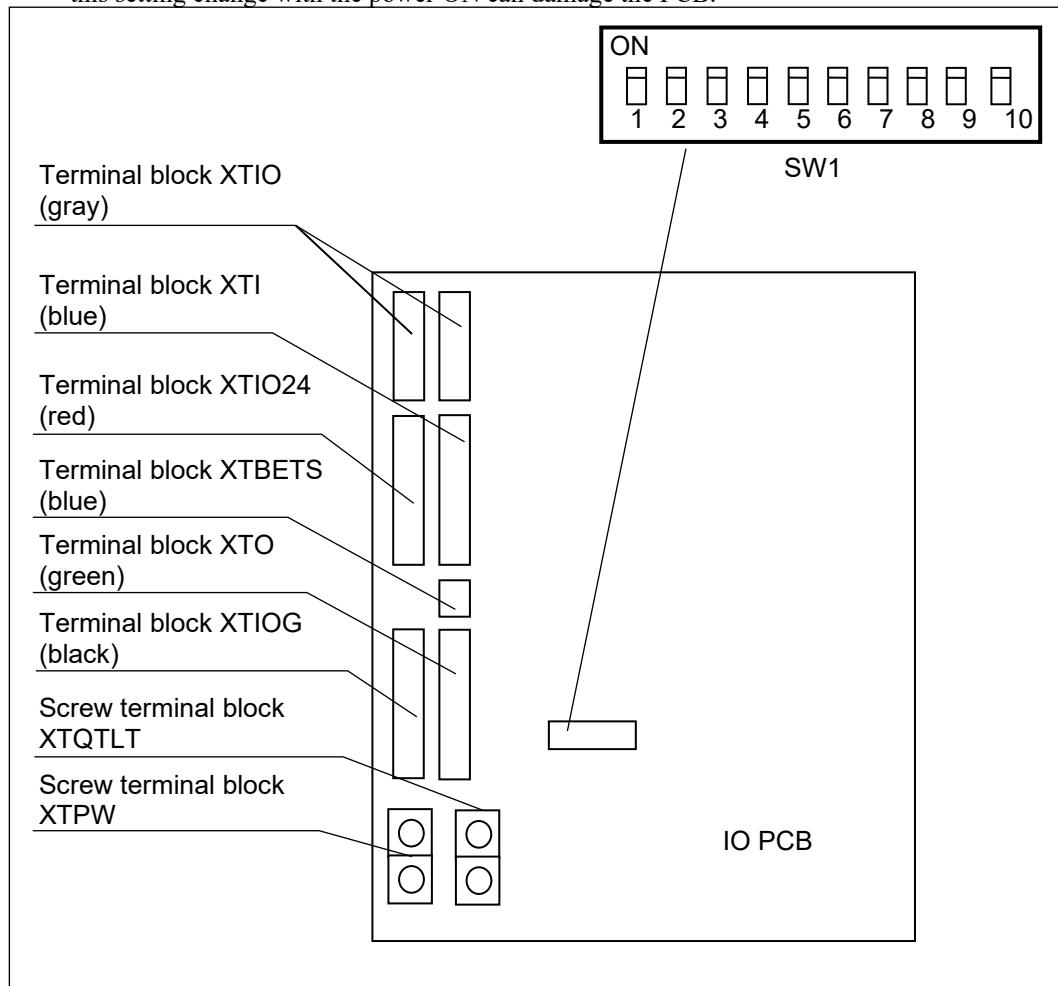
SW1 No.	Description	ON setting	OFF setting
3	External input signal XTI_0 to 7	Source (PNP)	Sink (NPN)
4	External input signal XTI_8 to 15	Source (PNP)	Sink (NPN)
5	External output signal XTO_100 to 107	Source (PNP)	Sink (NPN)
6	External output signal XTO_108 to 115	Source (PNP)	Sink (NPN)
7	Touch sensor input signal Touch1	Source (PNP)	Sink (NPN)
8	Touch sensor input signal Touch2	Source (PNP)	Sink (NPN)
9	Touch sensor input signal Touch3	Source (PNP)	Sink (NPN)

\*1 All of the numbers are set to ON in the factory-default settings.

Do not change the ON settings for SW1 No. 1, 2 and 10.

\*2 Always be sure to turn OFF the breaker when configuring the SW1 settings. If the SW settings are changed while the power is ON, the setting change will not apply. In addition, this setting change with the power ON can damage the PCB.

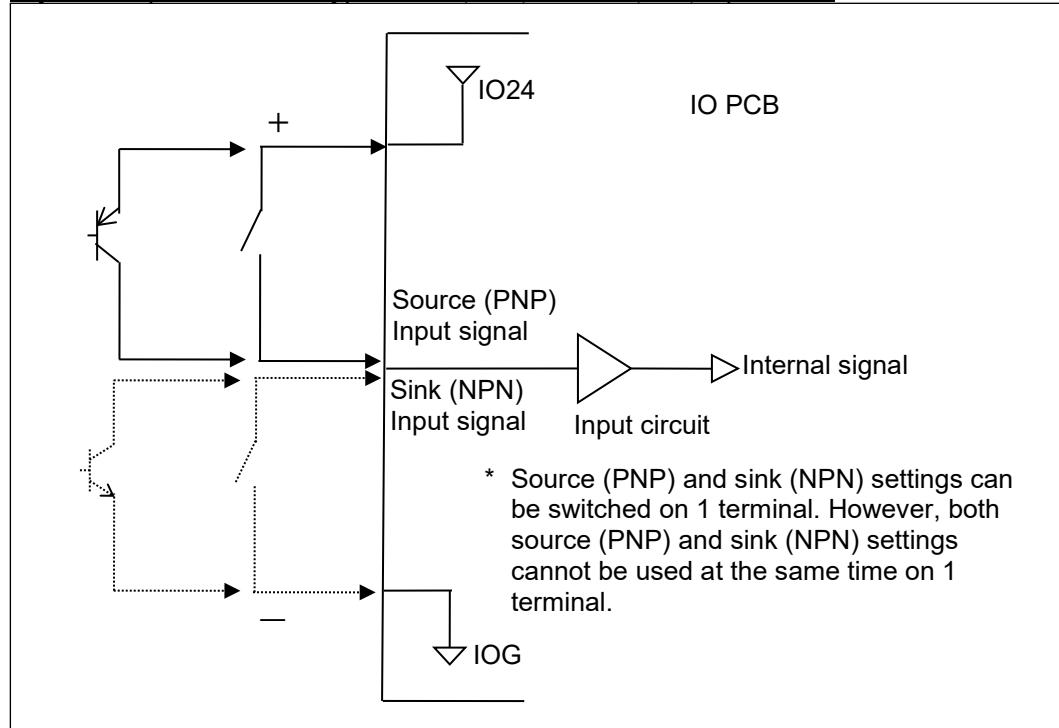
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Refer to “1.6 External I/O signal” in the Data Bank & Alarm Manual for details about the signal assignment for the external input and external output.

Refer to “6.2.1 I/O (Main)” for details about checking the status of the external input, external output and touch sensor input.

## Layout and special notes on Type 3: Sink (NPN) / Source (PNP) input circuit



1. The input current is DC24V 5mA. Use a connecting device that complies with this weak current value. The input time constant for the external input is 1 ms (TYP). The input time constant for the touch sensor input is 0.5 ms (TYP). (CR filter only)
2. When using the sink (NPN) setting, connect the contact input and NPN open collector transistor to the input circuit. When using the source (PNP) setting, connect the contact input and PNP open collector transistor.
3. Use COM (24V) on XTIO24 and COM (IOG) on XTIOG for the power supply of the connecting device.
4. Do not use an external power supply. Otherwise, it may cause a failure on the PCB and/or connected devices.
5. Make sure that the leakage current is 1.3 mA or less when the two wire type proximity switch is turned OFF.
6. A connection example is shown on the next page.

### Type 3: Connection example of sink (NPN) input setting

Connection examples and descriptions are provided for the external input and touch sensor input.

Turn the settings for SW1 No. 3, 4, 7, 8 and 9 to OFF to match a given terminal that is connected to a device.

SW1 No.	Description	ON setting	OFF setting
3	External input signal XTI_0 to 7	Source (PNP)	Sink (NPN)
4	External input signal XTI_8 to 15	Source (PNP)	Sink (NPN)
7	Touch sensor input signal Touch1	Source (PNP)	Sink (NPN)
8	Touch sensor input signal Touch2	Source (PNP)	Sink (NPN)
9	Touch sensor input signal Touch3	Source (PNP)	Sink (NPN)

Contact, switch

Sink (NPN)

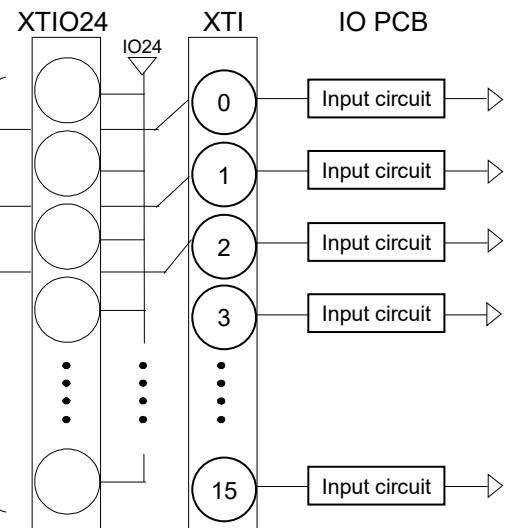
Transistor  
Sink (NPN)

Sink (NPN)

Proximity switch  
Sink (NPN)

Sink (NPN)

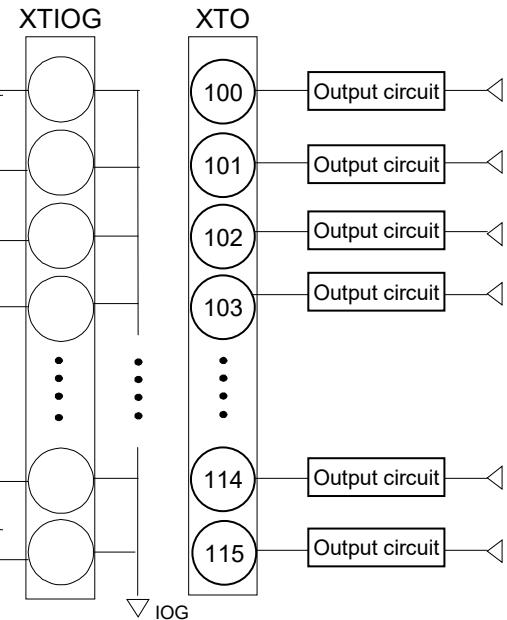
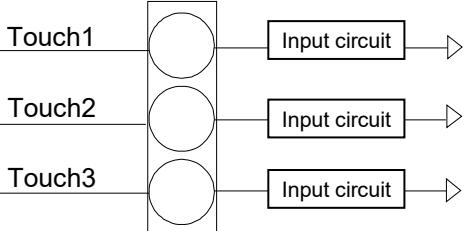
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Sink (NPN)

Sink (NPN)

Sink (NPN)

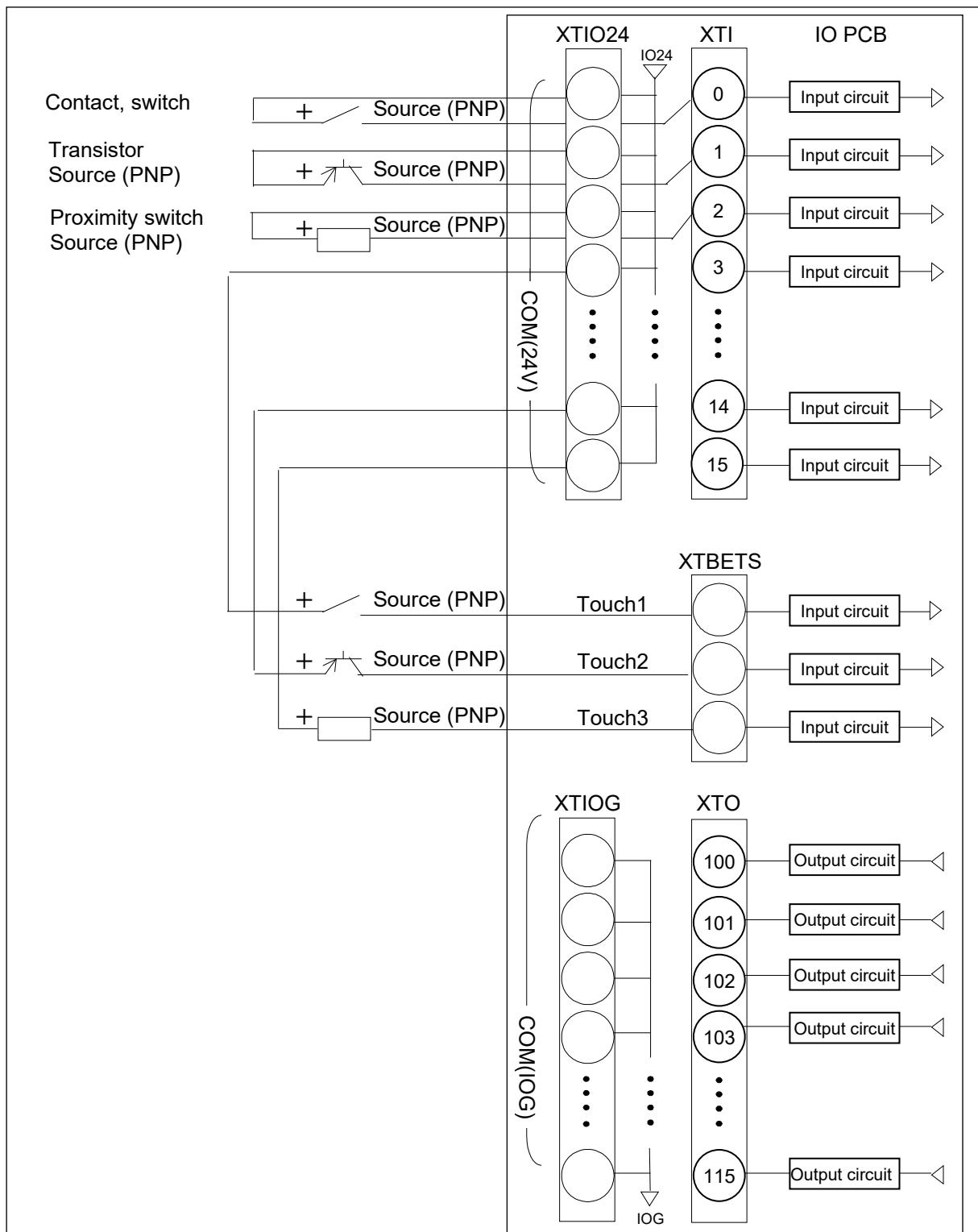


Type 3: Connection example of source (PNP) input setting

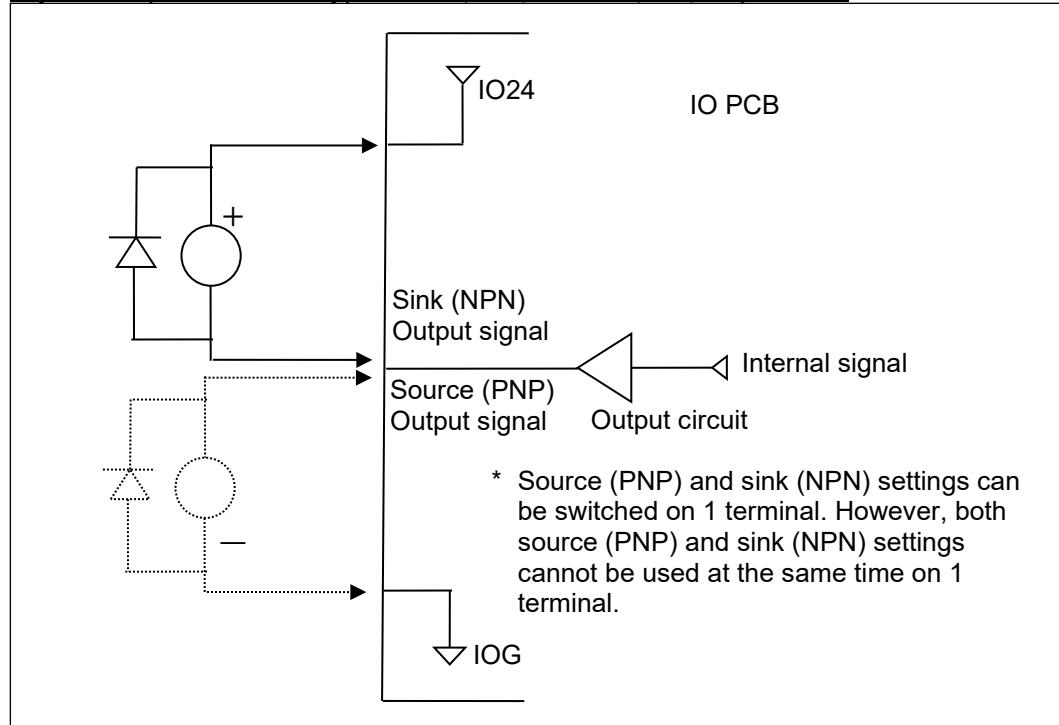
Connection examples and descriptions are provided for the the external input and touch sensor input.

Turn the settings for SW1 No. 3, 4, 7, 8 and 9 to ON to match a given terminal that is connected to a device.

SW1 No.	Description	ON setting	OFF setting
3	External input signal XTI_0 to 7	Source (PNP)	Sink (NPN)
4	External input signal XTI_8 to 15	Source (PNP)	Sink (NPN)
7	Touch sensor input signal Touch1	Source (PNP)	Sink (NPN)
8	Touch sensor input signal Touch2	Source (PNP)	Sink (NPN)
9	Touch sensor input signal Touch3	Source (PNP)	Sink (NPN)



### Layout and special notes on Type 3: Sink (NPN) / Source (PNP) output circuit



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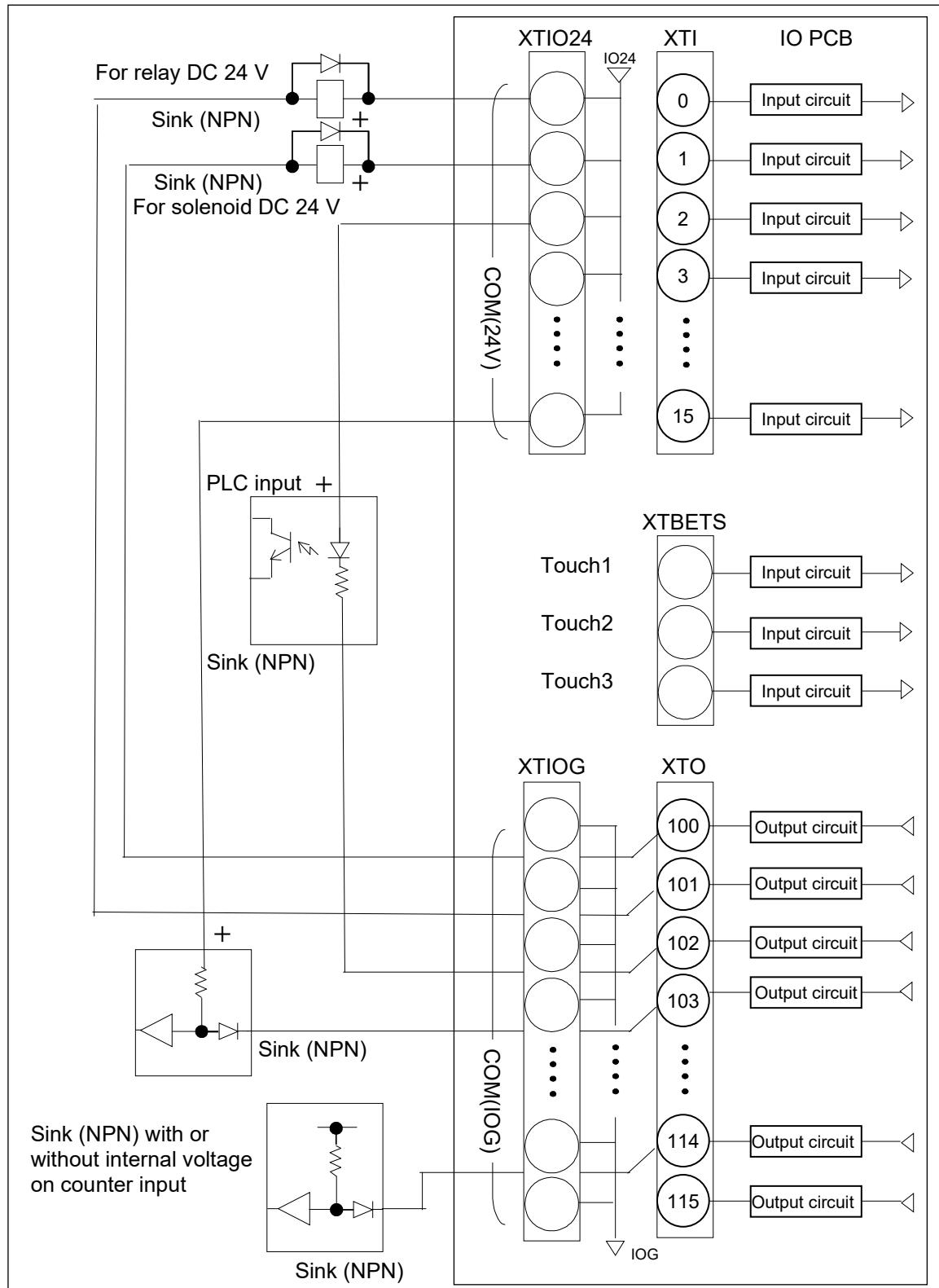
1. The output terminal voltage is DC 24 V. Be absolutely sure to use an output current of 300 mA (maximum) per contact for the external output, 24 V power COM and the IOG power COM and a total output current of 500 mA for all ports..
2. If connecting an inductive load to the output circuit, connect a flyback diode nearest to the load.
3. When using the sink (NPN) setting, do not connect a +24 V directly to the terminal for the external output. When using the source (PNP) setting, do not connect a 0 V directly to the terminal for the external output. Otherwise, it can short-circuit and damage the PCB.
4. Use COM (24V) on XTIO24 and COM (IOG) on XTIOG for the power supply of the connecting device.
5. Connect the FG line for the connecting device, to the tap for the FG connection close to the IO PCB.
6. Be absolutely sure that the inrush current that occurs simultaneously for the connected equipment is 10 A 20 µs or less.
7. Do not use an external power supply. Otherwise, it may cause a failure on the PCB and/or connected devices.
8. A connection example is shown on the next page.

Type 3: Connection example of sink (NPN) output setting

A connection example and description are provided for the external output.

Turn the settings for SW1 No. 5 and 6 to OFF to match a given terminal that is connected to a device.

SW1 No.	Description	ON setting	OFF setting
5	External output signal XTO 100 to 107	Source (PNP)	Sink (NPN)
6	External output signal XTO 108 to 115	Source (PNP)	Sink (NPN)

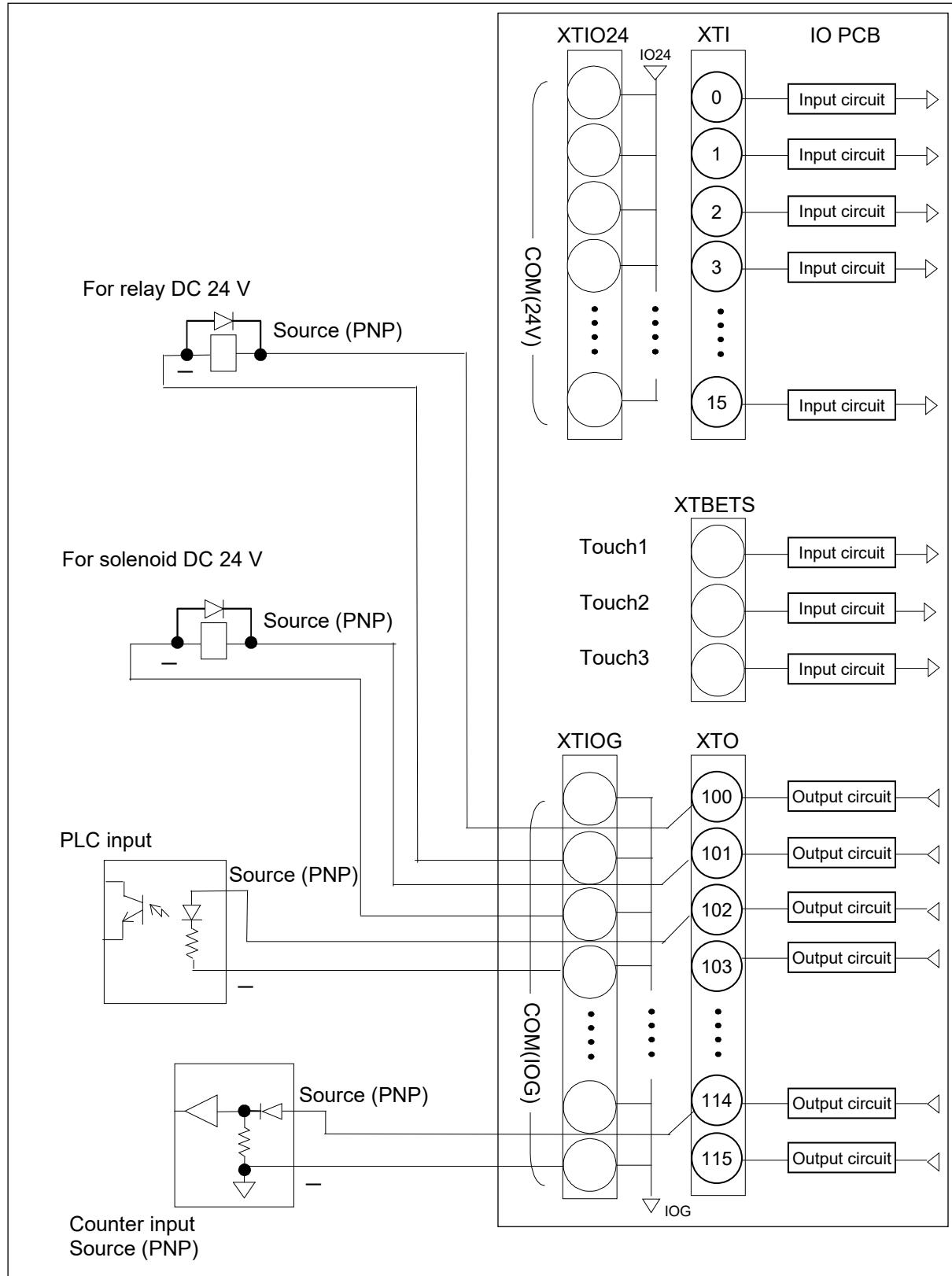


### Type 3: Connection example of source (PNP) output setting

A connection example and description are provided for the external output.

Turn the settings for SW1 No. 5 and 6 to ON to match a given terminal that is connected to a device.

SW1 No.	Description	ON setting	OFF setting
5	External output signal XTO 100 to 107	Source (PNP)	Sink (NPN)
6	External output signal XTO 108 to 115	Source (PNP)	Sink (NPN)



### 5.3.4 External Emergency Stop Input

Two emergency stop switches can be connected to XTEMSIN on the SR PCB.

The emergency stop circuit features a redundant circuit design. Always use an emergency stop switch that complies with IEC 60947-5-1, IEC 60947-5-5 and IEC 60204-1.

The signals for the emergency stop switches are controlled on the IL PCB unit. The SR PCB only relays the signals.

In order to identify when a contact is open or closed for the emergency stop switch, the IL PCB unit sends a specific waveform to each switch contact. The contact is identified as closed only when that waveform returns back to a specific receiving port. The contact is not assessed as ON or OFF only using the voltage level H/L like in the general purpose I/O. In addition, there is also no function like a COM terminal.

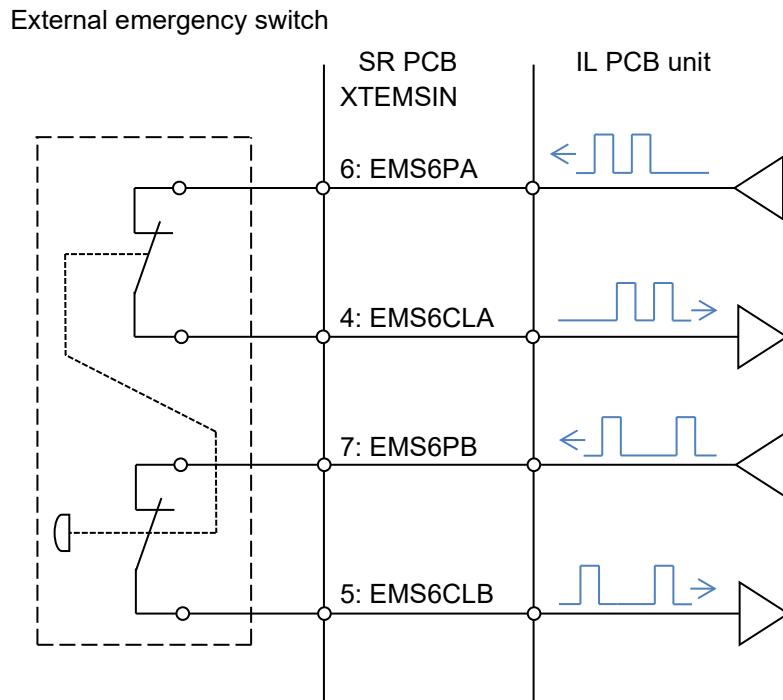
For the emergency stop input, there is an internal self-check on the IL PCB unit. Therefore, a test pulse is constantly output. Use twisted pair cable for EMS6PA and EMS6CLA as well as for EMS6PB and EMS6CLB. If twisted pair cable is not used, this may cause problems with the test pulse, which could trigger an alarm and stop the machine.

If the status of the contact inside each switch does not match, then the system identifies that the emergency stop switch has been pressed. If the mismatch status continues for more than 5 seconds, then an error is triggered and a stop is processed.

If the user does not connect an emergency stop switch, then a short-circuit line is installed on XTEMSIN.

5

Connection example



### 5.3.5 External Emergency Stop Output

The emergency stop signal is output at the XTEMOUT on the SR PCB.

The emergency stop circuit has a redundant circuit design, so there is an emergency stop output for 1 set with two system output signals for XTEMPOUT. Do not just use one system output when using this redundant circuit.

The signals for the emergency stop switches are controlled on the IL PCB unit. The SR PCB only relays the signals.

In the emergency stop output, there is a self-check pulse for the internal circuit on the IL PCB unit that is output just for a moment, when the emergency stop is released. Do not connect a capacitive load like a capacitor that interferes with the test pulse.

Set up the customer side circuit that connects to the emergency stop output so that it ignores this test pulse. If the test results in an error, then a stop is processed.

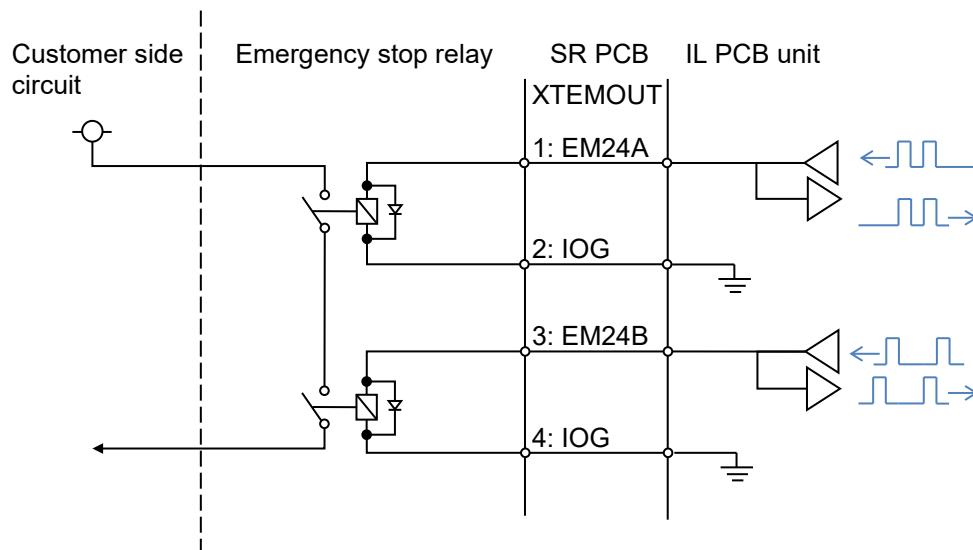
The operation check is carried out by the relay.

The minimum and maximum width of the test pulse is 0.75 ms and 2.5 ms, respectively.

This output is specifically for the emergency stop output. There is no COM terminal like function. When not using the external emergency stop output, leave the XTEMOUT circuit open.

5

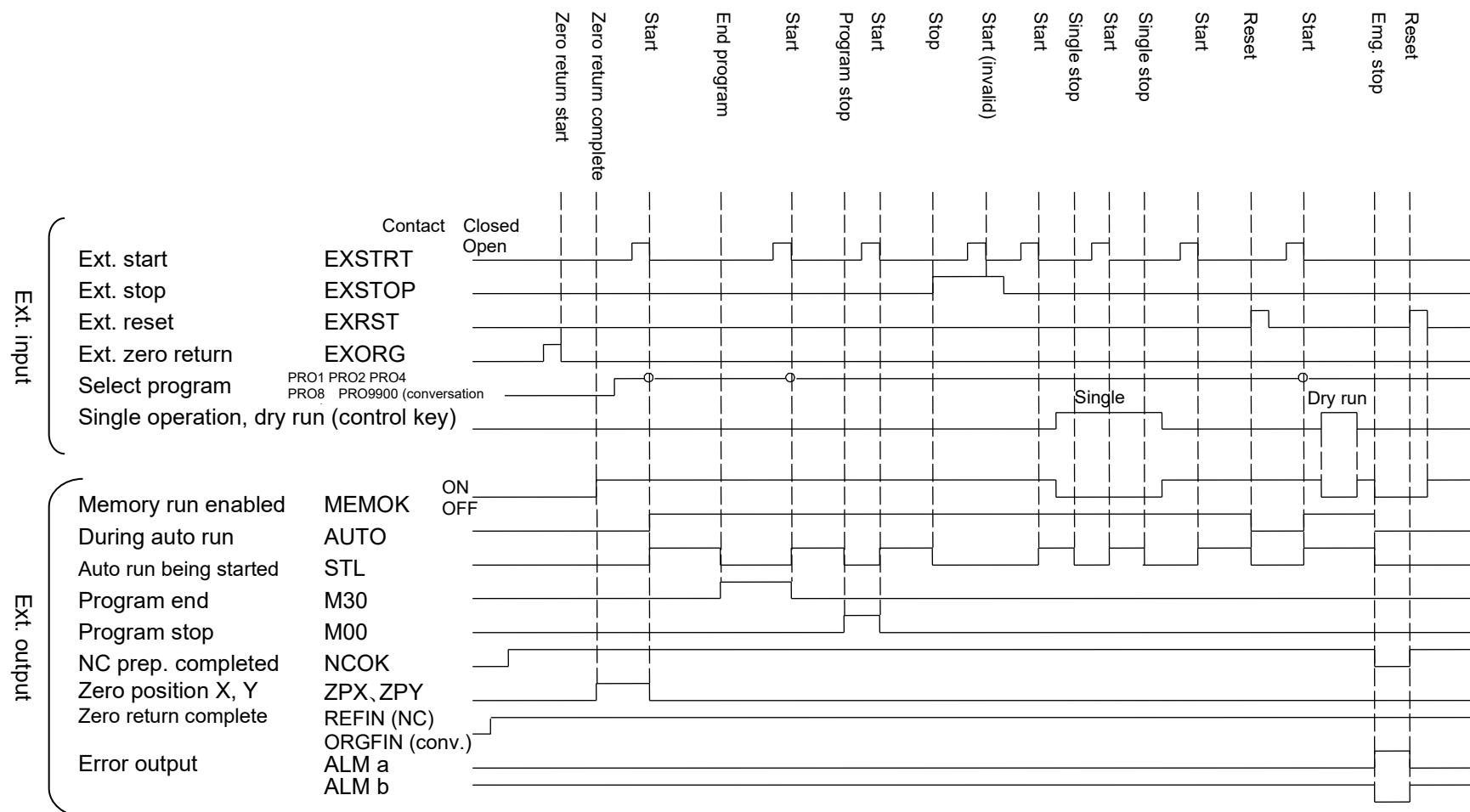
Connection example



The following shows the specifications for XTEMOUT.

- Maximum output current  
Maximum output current per output is 200 mA.
- Maximum output voltage during error  
DC 30 V may be output during an error.  
A voltage higher than DC 30 V will not output because there is an overvoltage protection circuit on the IL PCB unit.

## 5.4 Status of External I/O Signals in Memory Operation



1. Timing in the memory operation mode is shown.
2. The circle (○) marks on the Select Program signals PRO1, PRO2, PRO4, PRO8, and PRO9900 indicate that NC reads the signal.
3. Zero position outputs ZPX and ZPY are examples. They are also output when the system returns to machine zero halfway in a program. ZPZ is omitted for simplicity but behaves in like manner.
4. Single operation and dry run signals are not external input signals but the state of control key is shown for reference.

## 5.5 Automatic Centering Units

### 5.5.1 Functions

The automatic workpiece measurement function carries out automatic centering.

The customer must make arrangements for having a touch probe and relay box ready beforehand. In addition, connect to the special terminal input on the IO PCB for the touch probe contact signal.

The touch probe can be connected to a NO (normally open) device. When connecting to an NC (normally closed) device, make arrangements to use an external switching mechanism.

### 5.5.2 Wiring

There are 3 systems for the automatic centering signal input that are available on the IO PCB. It is possible to switch the I/O signal between sink (NPN) / source (PNP) with the SW1 on the IO PCB. Configure the settings to match the touch probe that is connected.

Connect the touch probe (which the customer must supply) to the terminal blocks XTBETS, XTIO24 and XTIOG on the IO PCB. Do not use an external power supply.

Refer to “5.2.2 General purpose external I/O terminal blocks on IO PCB” and “5.3 Precautions for use of external I/O signals” for further details.

5

### 5.5.3 Operation Check

Use the [JOG] key to set the touch probe so it is touching the jig or workpiece to make sure that it is working properly.

- Check on the input screen

Use the [I/O], [I], [ENT] and [PAGE DOWN] keys to display the screen below.

When using Touch1 for the terminal block XTBETS on the IO PCB

Main

FEDC BA 9 8 7 6 5 4 3 2 1 0

Input 56

\* \* \* \* \* \* \* \* \* \* \* \*

	0: When there is no contact
	1: When there is contact

When using Touch2 for the terminal block XTBETS on the IO PCB

Main

FEDC BA 9 8 7 6 5 4 3 2 1 0

Input 57

\* \* \* \* \* \* \* \* \* \* \* \*

	0: When there is no contact
	1: When there is contact

When using Touch3 for the terminal block XTBETS on the IO PCB

Main

FEDC BA 9 8 7 6 5 4 3 2 1 0

Input 58

\* \* \* \* \* \* \* \* \* \* \* \*

	0: When there is no contact
	1: When there is contact

- Check on the automatic centering screen

When there is contact (touching), the message <Detection signal ON> is displayed.

When there is no contact (not touching), no message displays.

# CHAPTER 6

## INPUT/OUTPUT

- 6.1 I/O Menu**
- 6.2 Input/Output**
- 6.3 Servo Controller**
- 6.4 External I/O Signals**
- 6.5 Software Switches**
- 6.6 Machine Diagnostics**
- 6.7 PLC**
- 6.8 Running Counters**
- 6.9 Operation Log**
- 6.10 Extension Maintenance**
- 6.11 Touch Panel Maintenance Screen**

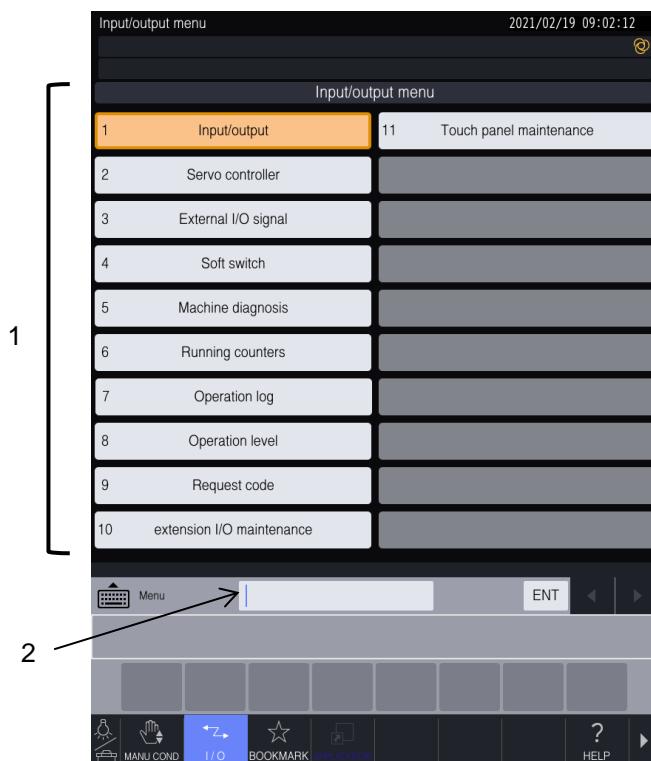
6

## 6.1 I/O Menu

### 6.1.1 Menu Selection

The following is a description for performing operations on <Input/output menu> screen.

1. Press the [I/O] key to display the <Input/output menu> screen.



6

Position	Name	Description
1	Menu	Displays the I/O menu screen.
2	Data input field	This field is for entering and selecting a menu number.

2. Select the menu using one of the following methods.
  - Enter the menu number using the number keys and press the [ENT] key.
  - Use the [CURSOR] keys to move the cursor and then press the [ENT] key.
  - Tap on the menu

## 6.2 Input/Output

The following I/O information on the machine can be referenced: main I/O, local I/O, slave status, extension I/O, fieldbus network and version.

Each type of information can be referenced using the following methods.

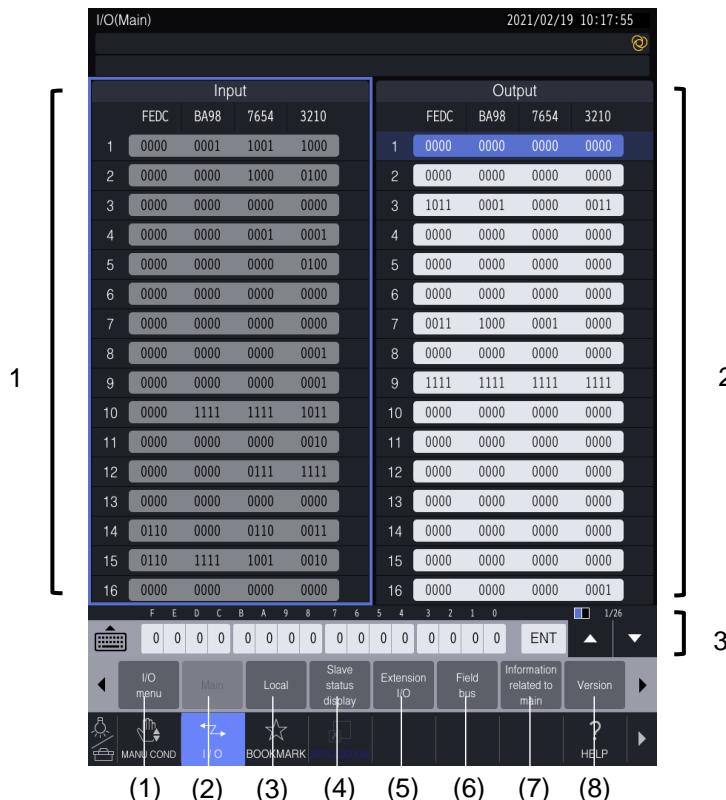
1. The user can switch between the main I/O, local I/O, slave status, extension I/O, fieldbus network and version by using the corresponding function key.
2. When the information cannot be fully displayed on 1 screen, the user can press the [Previous page] key or the [Next page] key to change the page.

### 6.2.1 I/O (Main)

The Main I/O displays the I/O signal status for the main PCB.

The input and output are displayed in their respective column on one screen.

#### 6.2.1.1 Main screen



6

Description of screen display

Position	Name	Description
1	Input signal status	Displays the number and value of the input signal.
2	Output signal status	Displays the number and value of the output signal.
3	Data input field	The user can display and change the selected output signal value.

Description of screen operation

## 1. Description of function key operations

Column	Position	Label	Description
1	(1)	[I/O menu]	Changes to the <Input/output menu> screen.
	(2)	[Main]	This screen is currently displayed. The key cannot be pressed.
	(3)	[Local]	Changes to the <I/O (local)> screen.
	(4)	[Slave status display]	Changes to the <I/O (Slave status display)> screen.
	(5)	[Extension I/O]	Changes to the <Input/output (extension I/O)> screen.
	(6)	[Fieldbus network]	Changes to the <Input/output (fieldbus network)> screen.
	(7)	[Main information screen]	<Input/output (Information related to main)> screen
	(8)	[Version]	Changes to the <I/O (version)> screen.
2	(1)	[I/O menu]	Same as the first column.
	(2)	[Commun. Error counter]	Changes to the <I/O (Commun. error counter)> screen.
	(3)	[Comm. Error counter saved value]	Changes to the <I/O (Saved value for comm. error counter)> screen.
	(4)	[Software option]	Changes to the <I/O (software option)> screen.
	(5)		
	(6)		
	(7)		
	(8)		

## 2. Description of input signal operations

- The user can tap on an input signal to select the status.
- The user can press the [Previous page] key or the [Next page] key to change the page.
- An item can be selected with the [CURSOR] keys (up and down).
- The user can move to the output signal with the [CURSOR] key (right).

## 3. Description of output signal operations

- The user can tap on an output signal to select the status.
- The user can press the [Previous page] key or the [Next page] key to change the page.
- An item can be selected with the [CURSOR] keys (up and down).
- The user can move to the input signal with the [CURSOR] key (left).

**6.2.1.2 Changing Output Values**

The following operations can be used to change the status of the output signal.

1. Move the cursor to the number that has the signal (bit) where you wish to make a change.
2. The input request field displays the 16 bits for the current status. Therefore, make the desired change and then press the [ENT] key.

### 6.2.1.3 Signal Assignment

Main input

<b>bit \ Input</b>	<b>F</b>	<b>E</b>	<b>D</b>	<b>C</b>	<b>B</b>	<b>A</b>	<b>9</b>	<b>8</b>	<b>7</b>	<b>6</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>0</b>	
<b>1</b>	-	-	-	-	-	-	-	L→M message interrupt signal	L→M message ACK& interrupt CLR signal	-	-	ECAT(IO)Sync 0 extension interrupt signal	ECAT(SV)Sync 0 extension interrupt signal	-	-	-	
<b>2</b>	-	-	-	-	-	-	-	-	-	-	FPGA→M interrupt signal 2	-	FPGA→M INTERRUPT SIGNAL 1	-	L→M exception interrupt signal	-	
<b>3</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
<b>4</b>	-	-	-	-	-	-	-	-	NC revision 3	NC revision 2	NC revision 1	NC revision 0	NC version 3	NC version 2	NC version 1	NC version 0	
<b>5</b>	-	-	-	-	-	-	-	-	-	-	-	-	FPGA version 3	FPGA version 2	FPGA version 1	FPGA version 0	
<b>6</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	CFAST connection detection	
<b>7</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
<b>8</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
<b>9</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
<b>10</b>	-	-	-	-	NC PCB X-axis acceleration sensor - 11th bit	NC PCB X-axis acceleration sensor - 10th bit	NC PCB X-axis acceleration sensor - 9th bit	NC PCB X-axis acceleration sensor - 8th bit	NC PCB X-axis acceleration sensor - 7th bit	NC PCB X-axis acceleration sensor - 6th bit	NC PCB X-axis acceleration sensor - 5th bit	NC PCB X-axis acceleration sensor - 4th bit	NC PCB X-axis acceleration sensor - 3rd bit	NC PCB X-axis acceleration sensor - 2nd bit	NC PCB X-axis acceleration sensor - 1st bit	NC PCB X-axis acceleration sensor - 0th bit	
<b>11</b>	-	-	-	-	NC PCB Y-axis acceleration sensor - 11th bit	NC PCB Y-axis acceleration sensor - 10th bit	NC PCB Y-axis acceleration sensor - 9th bit	NC PCB Y-axis acceleration sensor - 8th bit	NC PCB Y-axis acceleration sensor - 7th bit	NC PCB Y-axis acceleration sensor - 6th bit	NC PCB Y-axis acceleration sensor - 5th bit	NC PCB Y-axis acceleration sensor - 4th bit	NC PCB Y-axis acceleration sensor - 3rd bit	NC PCB Y-axis acceleration sensor - 2nd bit	NC PCB Y-axis acceleration sensor - 1st bit	NC PCB Y-axis acceleration sensor - 0th bit	
<b>12</b>	-	-	-	-	NC PCB Z-axis acceleration sensor - 11th bit	NC PCB Z-axis acceleration sensor - 10th bit	NC PCB Z-axis acceleration sensor - 9th bit	NC PCB Z-axis acceleration sensor - 8th bit	NC PCB Z-axis acceleration sensor - 7th bit	NC PCB Z-axis acceleration sensor - 6th bit	NC PCB Z-axis acceleration sensor - 5th bit	NC PCB Z-axis acceleration sensor - 4th bit	NC PCB Z-axis acceleration sensor - 3rd bit	NC PCB Z-axis acceleration sensor - 2nd bit	NC PCB Z-axis acceleration sensor - 1st bit	NC PCB Z-axis acceleration sensor - 0th bit	
<b>13</b>	-	-	-	-	-	-	-	-	NC PCB acceleration sensor internal temperature sensor - 7 bit	NC PCB acceleration sensor internal temperature sensor - 6 bit	NC PCB acceleration sensor internal temperature sensor - 5 bit	NC PCB acceleration sensor internal temperature sensor - 4 bit	NC PCB acceleration sensor internal temperature sensor - 3 bit	NC PCB acceleration sensor internal temperature sensor - 2 bit	NC PCB acceleration sensor internal temperature sensor - 1 bit	NC PCB acceleration sensor internal temperature sensor - 0 bit	
<b>14</b>	NC PCB temperature sensor - L7	NC PCB temperature sensor - L6	-	-	-	-	-	-	NC PCB temperature sensor - H7	NC PCB temperature sensor - H6	NC PCB temperature sensor - H5	NC PCB temperature sensor - H4	NC PCB temperature sensor - H3	NC PCB temperature sensor - H2	NC PCB temperature sensor - H1	NC PCB temperature sensor - H0 (Internal Diode High)	
<b>15</b>	Main CPU temperature 7	Main CPU temperature 6	Main CPU temperature 5	Main CPU temperature 4	Main CPU temperature 3	Main CPU temperature 2	Main CPU temperature 1	Main CPU temperature 0	Temperature sensor busy signal	External diode 2 short, OPEN detection	External diode 1 short, OPEN detection	Temperature sensor value upper limit	Temperature sensor value lower limit	Temperature sensor connection external diode error	Temperature sensor temperature upper limit	-	-
<b>16</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
<b>17</b>	Home	-4	+4	-Z	+Z	-Y	+Y	-X	+X	Shift	Reset	Program edit	Memory operation	MDI operation	Manual operation	Release	
<b>18</b>	Illumination sensor 1 - 15th bit	Illumination sensor 1 - 14th bit	Illumination sensor 1 - 13th bit	Illumination sensor 1 - 12th bit	Illumination sensor 1 - 11th bit	Illumination sensor 1 - 10th bit	Illumination sensor 1 - 9th bit	Illumination sensor 1 - 8th bit	Illumination sensor 1 - 7th bit	Illumination sensor 1 - 6th bit	Illumination sensor 1 - 5th bit	Illumination sensor 1 - 4th bit	Illumination sensor 1 - 3rd bit	Illumination sensor 1 - 2nd bit	Illumination sensor 1 - 1st bit	Illumination sensor 1 - 0th bit	
<b>19</b>	Illumination sensor 2 - 15th bit	Illumination sensor 2 - 14th bit	Illumination sensor 2 - 13th bit	Illumination sensor 2 - 12th bit	Illumination sensor 2 - 11th bit	Illumination sensor 2 - 10th bit	Illumination sensor 2 - 9th bit	Illumination sensor 2 - 8th bit	Illumination sensor 2 - 7th bit	Illumination sensor 2 - 6th bit	Illumination sensor 2 - 5th bit	Illumination sensor 2 - 4th bit	Illumination sensor 2 - 3rd bit	Illumination sensor 2 - 2nd bit	Illumination sensor 2 - 1st bit	Illumination sensor 2 - 0th bit	
<b>20</b>	Lathe spindle selection	Step travel	Low-speed travel	High-speed travel	Spindle stop	Spindle clockwise	Pallet index	ATC	Magazine reverse	Magazine forward	Machine zero return	Dry run	Machine lock	Single operation	OPT stop	Block skip	
<b>21</b>	-	T(=)	S()	M()	R(K)	Q(J)	P(I)	H(L)	D	F(E)	Z(W)	Y(V)	X(U)	G(C)	N(B)	O(A)	
<b>22</b>	-	-	Space (?)	/ (*)	- (+)	. (.)	0 (#)	3	2(1)	1(1)	6	5(2)	4(<)	9	8	7	
<b>23</b>	-	-	Decrease (-)	Increase (+)	Internal light	Chip shower	Coolant pump	Down cursor ↓	Up cursor ↑	Right cursor →	Left cursor ←	EOB/ENT	Back space	Delete	Cancel	Insert	
<b>24</b>	-	Feedrate override IN	Feedrate override 5	Feedrate override 4	Feedrate override 3	Feedrate override 2	Feedrate override 1	Rapid traverse override IN	Rapid traverse override 3	Rapid traverse override 2	Rapid traverse override 1	Door unlock SW2	Pallet start SW	Feed hold SW	Start SW	-	

<b>bit</b>	<b>F</b>	<b>E</b>	<b>D</b>	<b>C</b>	<b>B</b>	<b>A</b>	<b>9</b>	<b>8</b>	<b>7</b>	<b>6</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>0</b>
<b>25</b>	Chip auger manual reverse	Chip auger manual forward	Chip auger automatic/manual change	External additional axis 2 - SW	External additional axis 2 + SW	External additional axis 1 - SW	Automatic door mode SW	Automatic door close SW	Automatic door open SW	Spindle override IN	Spindle override 5	Spindle override 4	Spindle override 3	Spindle override 2	Spindle override 1	Spindle override
<b>26</b>	-	-	-	Manual pulse counter 7th bit	Manual pulse counter 6th bit	Manual pulse counter 5th bit	Manual pulse counter 4th bit	Manual pulse counter 3rd bit	Manual pulse counter 2nd bit	Manual pulse counter 1st bit	Manual pulse counter 0th bit	Manual pulse scale selection 2	Manual pulse scale selection 1	Manual pulse axis selection 3	Manual pulse axis selection 2	Manual pulse axis selection 1
<b>27</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	Data protection SW connection detection	Data protection SW mode change	Data protection SW write-protected
<b>28</b>	Acceleration sensor device selection	-	-	-	-	-	-	KY PCB temperature sensor 7th bit	KY PCB temperature sensor 6th bit	KY PCB temperature sensor 5th bit	KY PCB temperature sensor 4th bit	KY PCB temperature sensor 3rd bit	KY PCB temperature sensor 2nd bit	KY PCB temperature sensor 1st bit	KY PCB temperature sensor 0th bit	KY PCB temperature sensor
<b>29</b>	-	-	-	-	KY PCB X-axis acceleration sensor 1 - 11th bit	KY PCB X-axis acceleration sensor 1 - 10th bit	KY PCB X-axis acceleration sensor 1 - 9th bit	KY PCB X-axis acceleration sensor 1 - 8th bit	KY PCB X-axis acceleration sensor 1 - 7th bit	KY PCB X-axis acceleration sensor 1 - 6th bit	KY PCB X-axis acceleration sensor 1 - 5th bit	KY PCB X-axis acceleration sensor 1 - 4th bit	KY PCB X-axis acceleration sensor 1 - 3rd bit	KY PCB X-axis acceleration sensor 1 - 2nd bit	KY PCB X-axis acceleration sensor 1 - 1st bit	KY PCB X-axis acceleration sensor 1 - 0th bit
<b>30</b>	-	-	-	-	KY PCB X-axis acceleration sensor 2 - 11th bit	KY PCB X-axis acceleration sensor 2 - 10th bit	KY PCB X-axis acceleration sensor 2 - 9th bit	KY PCB X-axis acceleration sensor 2 - 8th bit	KY PCB X-axis acceleration sensor 2 - 7th bit	KY PCB X-axis acceleration sensor 2 - 6th bit	KY PCB X-axis acceleration sensor 2 - 5th bit	KY PCB X-axis acceleration sensor 2 - 4th bit	KY PCB X-axis acceleration sensor 2 - 3rd bit	KY PCB X-axis acceleration sensor 2 - 2nd bit	KY PCB X-axis acceleration sensor 2 - 1st bit	KY PCB X-axis acceleration sensor 2 - 0th bit
<b>31</b>	-	-	-	-	KY PCB Y-axis acceleration sensor 1 - 11th bit	KY PCB Y-axis acceleration sensor 1 - 10th bit	KY PCB Y-axis acceleration sensor 1 - 9th bit	KY PCB Y-axis acceleration sensor 1 - 8th bit	KY PCB Y-axis acceleration sensor 1 - 7th bit	KY PCB Y-axis acceleration sensor 1 - 6th bit	KY PCB Y-axis acceleration sensor 1 - 5th bit	KY PCB Y-axis acceleration sensor 1 - 4th bit	KY PCB Y-axis acceleration sensor 1 - 3rd bit	KY PCB Y-axis acceleration sensor 1 - 2nd bit	KY PCB Y-axis acceleration sensor 1 - 1st bit	KY PCB Y-axis acceleration sensor 1 - 0th bit
<b>32</b>	-	-	-	-	KY PCB Y-axis acceleration sensor 2 - 11th bit	KY PCB Y-axis acceleration sensor 2 - 10th bit	KY PCB Y-axis acceleration sensor 2 - 9th bit	KY PCB Y-axis acceleration sensor 2 - 8th bit	KY PCB Y-axis acceleration sensor 2 - 7th bit	KY PCB Y-axis acceleration sensor 2 - 6th bit	KY PCB Y-axis acceleration sensor 2 - 5th bit	KY PCB Y-axis acceleration sensor 2 - 4th bit	KY PCB Y-axis acceleration sensor 2 - 3rd bit	KY PCB Y-axis acceleration sensor 2 - 2nd bit	KY PCB Y-axis acceleration sensor 2 - 1st bit	KY PCB Y-axis acceleration sensor 2 - 0th bit
<b>33</b>	-	-	-	-	KY PCB Z-axis acceleration sensor 1 - 11th bit	KY PCB Z-axis acceleration sensor 1 - 10th bit	KY PCB Z-axis acceleration sensor 1 - 9th bit	KY PCB Z-axis acceleration sensor 1 - 8th bit	KY PCB Z-axis acceleration sensor 1 - 7th bit	KY PCB Z-axis acceleration sensor 1 - 6th bit	KY PCB Z-axis acceleration sensor 1 - 5th bit	KY PCB Z-axis acceleration sensor 1 - 4th bit	KY PCB Z-axis acceleration sensor 1 - 3rd bit	KY PCB Z-axis acceleration sensor 1 - 2nd bit	KY PCB Z-axis acceleration sensor 1 - 1st bit	KY PCB Z-axis acceleration sensor 1 - 0th bit
<b>34</b>	-	-	-	-	KY PCB Z-axis acceleration sensor 2 - 11th bit	KY PCB Z-axis acceleration sensor 2 - 10th bit	KY PCB Z-axis acceleration sensor 2 - 9th bit	KY PCB Z-axis acceleration sensor 2 - 8th bit	KY PCB Z-axis acceleration sensor 2 - 7th bit	KY PCB Z-axis acceleration sensor 2 - 6th bit	KY PCB Z-axis acceleration sensor 2 - 5th bit	KY PCB Z-axis acceleration sensor 2 - 4th bit	KY PCB Z-axis acceleration sensor 2 - 3rd bit	KY PCB Z-axis acceleration sensor 2 - 2nd bit	KY PCB Z-axis acceleration sensor 2 - 1st bit	KY PCB Z-axis acceleration sensor 2 - 0th bit
<b>35</b>	-	-	-	-	-	-	-	-	-	-	-	KEY revision 2	KEY revision 1	KEY revision 0	KEY version 2	KEY version 1
<b>36</b>	Illumination sensor 2 communication error flag	Illumination sensor 1 communication error flag	Temperature sensor communication error flag	-	Chip auger manual reverse - Short-circuit	Chip auger SW manual forward - Short-circuit	Chip auger SW automatic/manual change - Short-circuit	Door unlock SW1 - Short-circuit	Door unlock SW OPEN/CLOSE short-circuit	Automatic door SW MODE short-circuit	External IDX, turn SW OUTB short-circuit	External IDX, turn SW OUTA short-circuit	Data protection SW - Short-circuit	Pallet start SW - Short-circuit	Feed hold SW - Short-circuit	Start SW - Short-circuit
<b>37</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
<b>38</b>	-	-	-	-	-	-	-	-	-	LCD brightness duty - Bit 3	LCD brightness duty - Bit 2	LCD brightness duty - Bit 1	LCD manufacturer type 1	LCD manufacturer type 0	-	
<b>41</b>	Power 24 V overcurrent 16 (EXIO)	Power 24 V overcurrent 15 (SF24_3,TP)	Power 24 V overcurrent 14 (SF24_2)	Power 24 V overcurrent 13 (SF24_1)	Power 24 V overcurrent 12 (IO)	Power 24 V overcurrent 11 (IO)	Power 24 V overcurrent 10 (IO)	Power 24 V overcurrent 9 (IO)	Power 24 V overcurrent 8 (IO)	Power 24 V overcurrent 7 (IO)	Power 24 V overcurrent 6 (IO)	Power 24 V overcurrent 5 (IO)	Power 24 V overcurrent 4 (IO)	Power 24 V overcurrent 3 (IO)	Power 24 V overcurrent 2 (IO)	Power 24 V overcurrent 1 (IO)
<b>42</b>	-	-	-	-	Chip shower M overheated	Coolant M overheated	*Transformer overheated	*Spindle fan overheated	-	-	*Air pressure drop	-	-	Power 24 V error (AVR)	Power 24 V error (IO)	Power 24 V overcurrent 17 (External power SW, DC24)
<b>43</b>	-	-	-	-	-	-	-	Pot shutter close - Input	Pot shutter open - Input	Magazine reverse SW	Magazine turn SW	Pot bottom	Pot top	ATC arm - Shutter sensor close	ATC arm - Shutter sensor open	-
<b>44</b>	Spare input 4 (IO)	Spare input 3 (IO)	Spare input 2 (IO)	Spare input 1 (IO)	-	-	-	*Servo relay 2 contact ON	*Servo relay contact ON	-	DC power GND overcurrent 3	DC power GND overcurrent 2	DC power GND overcurrent 1	-	QT-axis unclamp end input	5th-axis unclamp input
<b>45</b>	Programmable input <015>	Programmable input <014>	Programmable input <013>	Programmable input <012>	Programmable input <011>	Programmable input <010>	Programmable input <009>	Programmable input <008>	Programmable input <007>	Programmable input <006>	Programmable input <005>	Programmable input <004>	Programmable input <003>	Programmable input <002>	Programmable input <001>	Programmable input <000>
<b>46</b>	-	-	-	-	-	-	-	Tool wash level sensor OK	-	Line filter clogged	Back wash filter clogged	Cyclone suction pump overheat	Float full	Float empty	Float low	CTS pressure SW ON

<b>bit</b>	<b>F</b>	<b>E</b>	<b>D</b>	<b>C</b>	<b>B</b>	<b>A</b>	<b>9</b>	<b>8</b>	<b>7</b>	<b>6</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>0</b>
<b>47</b>	Spare alarm signal 2	Spare alarm signal 1	-	-	-	-	-	-	Door open		*Area sensor light blocked	-	-	-	-	-
<b>48</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	Power switch OFF	External pallet start	External start
<b>49</b>	Spare input 8 (IO)	Spare input 7 (IO)	Spare input 6 (IO)	Spare input 5 (IO)	-	-	-	Chip auger thermal error	-	-	-	-	-	Automatic greasing hand SW input	Automatic oiling pressure SW ON/*Lubrication pump stop	*Automatic oiling_empty
<b>50</b>	-	-	-	-	-	-	Touch sensor 3 (DIPSW9)	Touch sensor 2 (DIPSW8)	Touch sensor 1 (DIPSW7)	General output (XTO_A,B [15]-[8])(DIPSW W6)	General output (XTO_A,B [7]-[0])(DIPSW 5)	General input (XTI_A,B [15]-[8])(DIPSW W4)	General input (XTI_A,B [7]-[0])(DIPSW 3)	Ground check	200 V error detection	
<b>51</b>					FPGA_ROM version 3	FPGA_ROM version 2	FPGA_ROM version 1	IO revision 3	IO revision 2	IO revision 1	IO revision 0	IO version 3	IO version 2	IO version 1	IO version 0	
<b>52</b>																
<b>53</b>	Option - Individual ID flag 7	Option - Individual ID flag 6	Option - Individual ID flag 5	Option - Individual ID flag 4	Option - Individual ID flag 3	Option - Individual ID flag 2	Option - Individual ID flag 1	Option - Individual ID flag 0	OPSEL point unlimited flag	OPSEL point assignment bit 6	OPSEL point assignment bit 5	OPSEL point assignment bit 4	OPSEL point assignment bit 3	OPSEL point assignment bit 2	OPSEL point assignment bit 1	OPSEL point assignment bit 0
<b>54</b>	OPSEL spare	OPSEL spare	OPSEL spare	OPSEL spare	OPSEL flag for manufacturing line	Factory code bit 2	Factory code bit 1	Factory code bit 0								
<b>55</b>	OPSEL PCBs connected_3	OPSEL PCBs connected_2	OPSEL PCBs connected_1	-	-	-	-	-	-	-	OPSEL communication error - PCB number bit 3	OPSEL communication error - PCB number bit 2	OPSEL communication error - PCB number bit 1	OPSEL communication error	OPSEL check complete	
<b>56</b>	Resolution B touch input 1-7	Resolution B touch input 1-6	Resolution B touch input 1-5	Resolution B touch input 1-4	Resolution B touch input 1-3	Resolution B touch input 1-2	Resolution B touch input 1-1	Resolution B touch input 1-0	Resolution A touch input 1-7	Resolution A touch input 1-6	Resolution A touch input 1-5	Resolution A touch input 1-4	Resolution A touch input 1-3	Resolution A touch input 1-2	Resolution A touch input 1-1	Resolution A touch input 1-0
<b>57</b>	Resolution B touch input 2-7	Resolution B touch input 2-6	Resolution B touch input 2-5	Resolution B touch input 2-4	Resolution B touch input 2-3	Resolution B touch input 2-2	Resolution B touch input 2-1	Resolution B touch input 2-0	Resolution A touch input 2-7	Resolution A touch input 2-6	Resolution A touch input 2-5	Resolution A touch input 2-4	Resolution A touch input 2-3	Resolution A touch input 2-2	Resolution A touch input 2-1	Resolution A touch input 2-0
<b>58</b>	Resolution B touch input 3-7	Resolution B touch input 3-6	Resolution B touch input 3-5	Resolution B touch input 3-4	Resolution B touch input 3-3	Resolution B touch input 3-2	Resolution B touch input 3-1	Resolution B touch input 3-0	Resolution A touch input 3-7	Resolution A touch input 3-6	Resolution A touch input 3-5	Resolution A touch input 3-4	Resolution A touch input 3-3	Resolution A touch input 3-2	Resolution A touch input 3-1	Resolution A touch input 3-0
<b>59</b>	-	-	-	-	-	-	-	-	-	-	Ground error detection (Photocoupler output)	-	-	-	-	AC power overvoltage
<b>60</b>																AC power overvoltage (DIP SW invalid)
<b>61</b>	AC power_R phase instantaneous value 2_6	AC power_R phase instantaneous value 2_5	AC power_R phase instantaneous value 2_4	AC power_R phase instantaneous value 2_3	AC power_R phase instantaneous value 2_2	AC power_R phase instantaneous value 2_1	AC power_R phase instantaneous value 2_0	AC power_R phase instantaneous value 1_sign	AC power_R phase instantaneous value 3_7	AC power_R phase instantaneous value 3_6	AC power_R phase instantaneous value 3_5	AC power_R phase instantaneous value 3_4	AC power_R phase instantaneous value 3_3	AC power_R phase instantaneous value 3_2	AC power_R phase instantaneous value 3_1	AC power_R phase instantaneous value 1_0
<b>62</b>	-	-	-	-	-	-	-	AC power_R phase instantaneous value 3_7	AC power_R phase instantaneous value 3_6	AC power_R phase instantaneous value 3_5	AC power_R phase instantaneous value 3_4	AC power_R phase instantaneous value 3_3	AC power_R phase instantaneous value 3_2	AC power_R phase instantaneous value 3_1	AC power_R phase instantaneous value 2_7	
<b>63</b>	AC power_S phase instantaneous value 2_6	AC power_S phase instantaneous value 2_5	AC power_S phase instantaneous value 2_4	AC power_S phase instantaneous value 2_3	AC power_S phase instantaneous value 2_2	AC power_S phase instantaneous value 2_1	AC power_S phase instantaneous value 2_0	AC power_S phase instantaneous value 1_sign	AC power_S phase instantaneous value 3_7	AC power_S phase instantaneous value 3_6	AC power_S phase instantaneous value 3_5	AC power_S phase instantaneous value 3_4	AC power_S phase instantaneous value 3_3	AC power_S phase instantaneous value 3_2	AC power_S phase instantaneous value 3_1	AC power_S phase instantaneous value 1_0
<b>64</b>	-	-	-	-	-	-	-	AC power_S phase instantaneous value 3_7	AC power_S phase instantaneous value 3_6	AC power_S phase instantaneous value 3_5	AC power_S phase instantaneous value 3_4	AC power_S phase instantaneous value 3_3	AC power_S phase instantaneous value 3_2	AC power_S phase instantaneous value 3_1	AC power_S phase instantaneous value 2_7	
<b>65</b>	AC power_T phase instantaneous value 2_6	AC power_T phase instantaneous value 2_5	AC power_T phase instantaneous value 2_4	AC power_T phase instantaneous value 2_3	AC power_T phase instantaneous value 2_2	AC power_T phase instantaneous value 2_1	AC power_T phase instantaneous value 2_0	AC power_T phase instantaneous value 1_sign	AC power_T phase instantaneous value 1_7	AC power_T phase instantaneous value 1_6	AC power_T phase instantaneous value 1_5	AC power_T phase instantaneous value 1_4	AC power_T phase instantaneous value 1_3	AC power_T phase instantaneous value 1_2	AC power_T phase instantaneous value 1_1	AC power_T phase instantaneous value 1_0
<b>66</b>	-	-	-	-	-	-	-	AC power_T phase instantaneous value 3_sign	AC power_T phase instantaneous value 3_7	AC power_T phase instantaneous value 3_6	AC power_T phase instantaneous value 3_5	AC power_T phase instantaneous value 3_4	AC power_T phase instantaneous value 3_3	AC power_T phase instantaneous value 3_2	AC power_T phase instantaneous value 2_7	

<b>bit</b>	<b>F</b>	<b>E</b>	<b>D</b>	<b>C</b>	<b>B</b>	<b>A</b>	<b>9</b>	<b>8</b>	<b>7</b>	<b>6</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>0</b>
<b>67</b>	-	-	AC power frequency R13	AC power frequency R12	AC power frequency R11	AC power frequency R10	AC power frequency R9	AC power frequency R8	AC power frequency R7	AC power frequency R6	AC power frequency R5	AC power frequency R4	AC power frequency R3	AC power frequency R2	AC power frequency R1	AC power frequency R0
<b>68</b>	-	-	AC power frequency S13	AC power frequency S12	AC power frequency S11	AC power frequency S10	AC power frequency S9	AC power frequency S8	AC power frequency S7	AC power frequency S6	AC power frequency S5	AC power frequency S4	AC power frequency S3	AC power frequency S2	AC power frequency S1	AC power frequency S0
<b>69</b>	-	-	AC power frequency T13	AC power frequency T12	AC power frequency T11	AC power frequency T10	AC power frequency T9	AC power frequency T8	AC power frequency T7	AC power frequency T6	AC power frequency T5	AC power frequency T4	AC power frequency T3	AC power frequency T2	AC power frequency T1	AC power frequency T0
<b>70</b>	FAN 2 speed 7	FAN 2 speed 6	FAN 2 speed 5	FAN 2 speed 4	FAN 2 speed 3	FAN 2 speed 2	FAN 2 speed 1	FAN 2 speed 0	FAN 1 speed 7	FAN 1 speed 6	FAN 1 speed 5	FAN 1 speed 4	FAN 1 speed 3	FAN 1 speed 2	FAN 1 speed 1	FAN 1 speed 0
<b>71</b>	FAN 4 speed 7	FAN 4 speed 6	FAN 4 speed 5	FAN 4 speed 4	FAN 4 speed 3	FAN 4 speed 2	FAN 4 speed 1	FAN 4 speed 0	FAN 3 speed 7	FAN 3 speed 6	FAN 3 speed 5	FAN 3 speed 4	FAN 3 speed 3	FAN 3 speed 2	FAN 3 speed 1	FAN 3 speed 0
<b>72</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>73</b>	EX 24 V PCB current consumption 7	EX 24 V PCB current consumption 6	EX 24 V PCB current consumption 5	EX 24 V PCB current consumption 4	EX 24 V PCB current consumption 3	EX 24 V PCB current consumption 2	EX 24 V PCB current consumption 1	DC 24 V output current consumption 0	DC 24 V output current consumption 7	DC 24 V output current consumption 6	DC 24 V output current consumption 5	DC 24 V output current consumption 4	DC 24 V output current consumption 3	DC 24 V output current consumption 2	DC 24 V output current consumption 1	DC 24 V output current consumption 0
<b>74</b>	Internal light current consumption 7	Internal light current consumption 6	Internal light current consumption 5	Internal light current consumption 4	Internal light current consumption 3	Internal light current consumption 2	Internal light current consumption 1	External I/O current consumption 0	External I/O current consumption 7	External I/O current consumption 6	External I/O current consumption 5	External I/O current consumption 4	External I/O current consumption 3	External I/O current consumption 2	External I/O current consumption 1	External I/O current consumption 0
<b>75</b>	DC 24 V input voltage 7	DC 24 V input voltage 6	DC 24 V input voltage 5	DC 24 V input voltage 4	DC 24 V input voltage 3	DC 24 V input voltage 2	DC 24 V input voltage 1	DC 24 V input voltage 0	-	-	-	-	Current consumption monitor error 4	Current consumption monitor error 3	Current consumption monitor error 2	Current consumption monitor error 1
<b>76</b>	Chip conveyor manual mode	Chip conveyor coolant empty	Chip conveyor error	-	-	-	-	-	-	*Interlock 2 voltage ON monitoring	*Interlock 1_3 voltage ON monitoring	*Interlock 1_2 voltage ON monitoring	*Interlock 1_1 voltage ON monitoring	*Emergency stop system voltage ON monitoring (system B)	*Emergency stop system voltage ON monitoring	
<b>77</b>	AC pulse period R5	AC pulse period R4	AC pulse period R3	AC pulse period R2	AC pulse period R1	AC pulse period R0	SYNC0 and AC pulse distance R6	SYNC0 and AC pulse distance R5	SYNC0 and AC pulse distance R4	SYNC0 and AC pulse distance R3	SYNC0 and AC pulse distance R2	SYNC0 and AC pulse distance R1	SYNC0 status R0	SYNC0 status R2	SYNC0 status R1	SYNC0 status R0
<b>78</b>	AC pulse period S5	AC pulse period S4	AC pulse period S3	AC pulse period S2	AC pulse period S1	AC pulse period S0	SYNC0 and AC pulse distance S6	SYNC0 and AC pulse distance S5	SYNC0 and AC pulse distance S4	SYNC0 and AC pulse distance S3	SYNC0 and AC pulse distance S2	SYNC0 and AC pulse distance S1	SYNC0 status S0	SYNC0 status S2	SYNC0 status S1	SYNC0 status S0
<b>79</b>	AC pulse period T5	AC pulse period T4	AC pulse period T3	AC pulse period T2	AC pulse period T1	AC pulse period T0	SYNC0 and AC pulse distance T6	SYNC0 and AC pulse distance T5	SYNC0 and AC pulse distance T4	SYNC0 and AC pulse distance T3	SYNC0 and AC pulse distance T2	SYNC0 and AC pulse distance T1	SYNC0 status T0	SYNC0 status T2	SYNC0 status T1	SYNC0 status T0
<b>80</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
<b>81</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
<b>82</b>	-	Brake surge 5	Brake surge 4	Brake surge 3	Brake surge 2	Brake surge 1	Brake coil ON 5	Brake coil ON4	Brake coil ON3	Brake coil ON2	Brake coil ON1	Brake release - System 5	Brake release - System 4	Brake release - System 3	Brake release - System 2	Brake release - System 1
<b>83</b>	-	IL 24 V overcurrent 2	IL 24 V overcurrent 1	IL 24 V voltage error	SR brake overcurrent 5	SR brake overcurrent 4	SR brake overcurrent 3	SR brake overcurrent 2	SR brake overcurrent 1	Door lock power overcurrent 2	Door lock power overcurrent 1	Brake disconnection detection 5	Brake disconnection detection 4	Brake disconnection detection 3	Brake disconnection detection 2	Brake disconnection detection 1
<b>84</b>	IOSR watchdog RX	Servo ALM	MSO indicator signal	-	-	-	-	-	-	-	SR PCB - PCB version	SR PCB - PCB version	SR PCB - PCB revision	SR PCB - PCB revision	SR PCB - PCB revision	
<b>85</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	SRIO communication receive dropout error	
<b>86</b>	SRIO_CRC receive 8	SRIO_CRC receive 7	SRIO_CRC receive 6	SRIO_CRC receive 5	SRIO_CRC receive 4	SRIO_CRC receive 3	SRIO_CRC receive 2	SRIO_CRC receive 1	SRIO_CRC send 8	SRIO_CRC send 7	SRIO_CRC send 6	SRIO_CRC send 5	SRIO_CRC send 4	SRIO_CRC send 3	SRIO_CRC send 2	SRIO_CRC send 1
<b>87</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	SRIO communication CRC error	
<b>88</b>	Global state machine loop cycle 0	Global state machine loop cycle 1	Global state machine loop cycle 2	Global state machine loop cycle 3	Global state machine loop cycle 4	Global state machine loop cycle 5	Global state machine loop cycle 6	Global state machine loop cycle 7	Free running counter 0	Free running counter 1	Free running counter 2	Free running counter 3	Free running counter 4	Free running counter 5	Free running counter 6	Free running counter 7
<b>89</b>	Emergency stop SW hand-held pulse generator - Unprocessed signal A-system	Emergency stop SW pendant - Unprocessed signal A-system	Emergency stop SW magazine panel - Unprocessed signal A-system	Emergency stop SW external start panel - Unprocessed signal A-system	Emergency stop SW chip conveyor - Unprocessed signal A-system	Emergency stop SW extension spare - Unprocessed signal A-system	Manual reset SW - Unprocessed signal B-system	Manual reset SW - Unprocessed signal A-system	FPGA state machine B-system 0	FPGA state machine B-system 1	FPGA state machine B-system 2	FPGA state machine B-system 3	FPGA state machine A-system 0	FPGA state machine A-system 1	FPGA state machine A-system 2	FPGA state machine A-system 3
<b>90</b>	MSO_SW2 unprocessed signal B-system	MSO_SW2 unprocessed signal A-system	MSO_SW1 unprocessed signal B-system	MSO_SW1 unprocessed signal A-system	TSEL2 unprocessed signal B-system	TSEL2 unprocessed signal A-system	TSEL1 unprocessed signal B-system	TSEL1 unprocessed signal A-system	Emergency stop SW main operation panel - Unprocessed signal B-system	Emergency stop SW hand-held pulse generator - Unprocessed signal B-system	Emergency stop SW extension spare - Unprocessed signal B-system	Emergency stop SW magazine panel - Unprocessed signal B-system	Emergency stop SW external start panel - Unprocessed signal B-system	Emergency stop SW chip conveyor - Unprocessed signal B-system	Emergency stop SW extension spare - Unprocessed signal B-system	Emergency stop SW main operation panel - Unprocessed signal A-system

<b>bit</b>	<b>F</b>	<b>E</b>	<b>D</b>	<b>C</b>	<b>B</b>	<b>A</b>	<b>9</b>	<b>8</b>	<b>7</b>	<b>6</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>0</b>	
<b>91</b>	Door 5 close check 2 - Unprocessed signal A-system	Door 5 close check 3 - Unprocessed signal A-system	Door 5 lock check - Unprocessed signal A-system	Door 6 close check 1 - Unprocessed signal A-system	Door 6 close check 2 - Unprocessed signal A-system	Door 6 close check 3 - Unprocessed signal A-system	Door 6 lock check - Unprocessed signal A-system	Door close check contact - Unprocessed signal A-system	Door lock check contact - Unprocessed signal A-system	Door 7 close check - Unprocessed signal A-system	Door 7 lock check - Unprocessed signal A-system	Door 8 close check - Unprocessed signal A-system	Door 8 lock check - Unprocessed signal A-system	QT clamp check - Unprocessed signal A-system	QT No.1 pallet index check - Unprocessed signal A-system	QT No.2 pallet index check - Unprocessed signal A-system	
<b>92</b>	Door 8 close check - Unprocessed signal B-system	Door 8 lock check - Unprocessed signal B-system	QT clamp check - Unprocessed signal B-system	QT No.1 pallet index check - Unprocessed signal B-system	QT No.2 pallet index check - Unprocessed signal B-system	Tool clamp check - Unprocessed signal A-system	Front door LS close check - Unprocessed signal A-system	Front door LS lock check - Unprocessed signal A-system	Left side door LS close check - Unprocessed signal A-system	Right side door LS lock check - Unprocessed signal A-system	Magazine door close check - Unprocessed signal A-system	Magazine door lock check - Unprocessed signal A-system	Magazine shutter close check - Unprocessed signal A-system	Magazine shutter close check - Unprocessed signal A-system	Door 5 close check 1 - Unprocessed signal A-system		
<b>93</b>	Right side door LS lock check - Unprocessed signal B-system	Magazine door close check - Unprocessed signal B-system	Magazine door lock check - Unprocessed signal B-system	Magazine shutter close check - Unprocessed signal B-system	Door 5 close check 1 - Unprocessed signal B-system	Door 5 close check 2 - Unprocessed signal B-system	Door 5 lock check - Unprocessed signal B-system	Door 6 close check 1 - Unprocessed signal B-system	Door 6 close check 2 - Unprocessed signal B-system	Door 6 close check 3 - Unprocessed signal B-system	Door 6 lock check - Unprocessed signal B-system	Door 2 close check - Unprocessed signal B-system	Door 2 lock check - Unprocessed signal B-system	Door 7 close check - Unprocessed signal B-system	Door 7 lock check - Unprocessed signal B-system		
<b>94</b>	Enable SW main operation panel - Unprocessed signal B-system	Enable SW pallet start panel - Unprocessed signal B-system	Enable SW magazine panel - Unprocessed signal B-system	Enable SW hand-held pulse generator - Unprocessed signal B-system	Enable SW hand-held pulse generator - Unprocessed signal A-system	Enable SW main operation panel - Unprocessed signal A-system	Enable SW pallet start panel - Unprocessed signal A-system	Enable SW magazine panel - Unprocessed signal A-system	Enable SW hand-held pulse generator - Unprocessed signal A-system	Tool clamp check - Unprocessed signal B-system	Front door LS close check - Unprocessed signal B-system	Front door LS lock check - Unprocessed signal B-system	Left side door LS close check - Unprocessed signal B-system	Left side door LS lock check - Unprocessed signal B-system	Right side door LS close check - Unprocessed signal B-system		
<b>95</b>	GOFF No.11 System B loopback	GOFF No.1 System A	GOFF No.2 System A	GOFF No.3 System A	GOFF No.4 System A	GOFF No.5 System A	GOFF No.6 System A	GOFF No.7 System A	GOFF No.8 System A	GOFF No.9 System A	GOFF No.10 System A	GOFF No.11 System A	Emergency stop for user B-system loopback	Emergency stop for user A-system output	Emergency stop power B-system loopback	Emergency stop power A-system output	
<b>96</b>	EDM No.6 System	EDM No.7 System	EDM No.8 System	EDM No.9 System	EDM No.10 System	EDM No.11 System	GOFF No.1 System B loopback	GOFF No.2 System B loopback	GOFF No.3 System B loopback	GOFF No.4 System B loopback	GOFF No.5 System B loopback	GOFF No.6 System B loopback	GOFF No.7 System B loopback	GOFF No.8 System B loopback	GOFF No.9 System B loopback	GOFF No.10 System B loopback	
<b>97</b>	-	-	-	-	-	1.2VB voltage monitoring signal	2.5VB voltage monitoring signal	3.3VB voltage monitoring signal	-	-	-	EDM No.1 System	EDM No.2 System	EDM No.3 System	EDM No.4 System	EDM No.5 System	
<b>98</b>	Emergency stop SW main operation panel - System B	Emergency stop SW hand-held pulse generator - System B	Emergency stop SW pendant - System B	Emergency stop SW magazine panel - System B	Emergency stop SW pallet start panel - System B	Emergency stop SW chip conveyor - System B	Emergency stop SW extension spare - System B	Emergency stop SW main operation panel - System A	Emergency stop SW pendant - System A	Emergency stop SW magazine panel - System A	Emergency stop SW external start panel - System A	Emergency stop SW chip conveyor - System A	Emergency stop SW extension spare - System A	Manual reset SW - System B	Manual reset SW - System A		
<b>99</b>	Door 2 lock check - System A	Door 7 close check - System A	Door 7 lock check - System A	Door 8 close check - System A	Door 8 lock check - System A	QT clamp check - System A	QT No.1 pallet index check - System A	QT No.2 pallet index check - System A	MSO_SW2 system B	MSO_SW2 system A	MSO_SW1 - System B	MSO_SW1 - System A	TSEL2 - System B	TSEL2 - System A	TSEL1 - System B	TSEL1 - System A	
<b>100</b>	Left side door close check - System A	Left side door lock check - System A	Right side door close check - System A	Right side door lock check - System A	Magazine door close check - System A	Magazine door lock check - System A	Magazine shutter close check - System A	Door 5 close check 1 - System A	Door 5 close check 2 - System A	Door 5 close check 3 - System A	Door 5 lock check - System A	Door 6 close check 1 - System A	Door 6 close check 2 - System A	Door 6 close check 3 - System A	Door 6 lock check - System A	Door 2 close check - System A	
<b>101</b>	Door 6 close check 1 - System B	Door 6 close check 2 - System B	Door 6 close check 3 - System B	Door 6 lock check - System B	Door 2 close check - System B	Door 2 lock check - System B	Door 7 close check - System B	Door 8 close check - System B	Door 8 lock check - System B	QT clamp check - System B	QT No.1 pallet index check - System B	QT No.2 pallet index check - System B	Tool clamp check - System A	Front door close check - System A	Front door lock check - System A		
<b>102</b>	Enable SW pendant - System A	Enable SW hand-held pulse generator - System A	Tool clamp check - System B	Front door close check - System B	Front door lock check - System B	Left side door close check - System B	Right side door close check - System B	Magazine door close check - System B	Magazine door lock check - System B	Magazine shutter close check - System B	Door 5 close check 1 - System B	Door 5 close check 2 - System B	Door 5 close check 3 - System B	Door 5 lock check - System B			
<b>103</b>	MSO setting - MSO service	MSO setting - MSO2	MSO setting - MSO1	Machine model setting - Other	Machine model setting - Model No.2	Machine model setting - Model No.1	Emergency stop command	Emergency stop reset operation	Enable SW main operation panel - System B	Enable SW pallet start panel - System B	Enable SW magazine panel - System B	Enable SW pendant - System B	Enable SW hand-held pulse generator - System B	Enable SW main operation panel - System A	Enable SW pallet start panel - System A	Enable SW magazine panel - System A	
<b>104</b>	Door 5 - Close check 3	Door 5 - Lock check	Door 6 - Close check 1	Door 6 - Close check 2	Door 6 - Close check 3	Door 6 - Lock check	Door 2 - Close check	Door 2 - Lock check	Door 7 - Close check	Door 7 - Lock check	Door 8 - Close check	Door 8 - Lock check	QT clamp check	QT No.1 pallet index check	QT No.2 pallet index check	MSO setting - Other	
<b>105</b>	Enable SW pallet start panel	Enable SW magazine panel	Enable SW pendant	Enable SW hand-held pulse generator	Tool clamp check	Front door - Close check	Front door - Lock check	Left side door - Close check	Right side door - Lock check	Right side door - Close check	Magazine door - Close check	Magazine door - Lock check	Magazine shutter close check	Door 5 - Close check 1	Door 5 - Close check 2		
<b>106</b>	IL voltage monitoring error	IL internal operation result	IL internal operation circuit error	SW/HDL monitoring error	GOFF signal error	EM24 for user error	Emergency stop power error	Switch signal error	-	-	-	-	-	Internal flag 2 checks manual reset switch	Internal flag 1 checks manual reset switch	Enable SW main operation panel	
<b>107</b>	Pulse test executing GOFF7	Pulse test executing GOFF8	Pulse test executing GOFF9	Pulse test executing GOFF10	Pulse test executing GOFF11	0	Output pulse test initialization	Output pulse test initialization	Output pulse test initialization	Output pulse test initialization	-	-	-	-	IL state error	IL watchdog error	IL configuration monitoring error
<b>108</b>	STO10 down counter 0	STO10 down counter 1	STO10 down counter 2	STO10 down counter 3	STO11 down counter 0	STO11 down counter 1	STO11 down counter 2	STO11 down counter 3	-	-	Pulse test executing GOFF1	Pulse test executing GOFF2	Pulse test executing GOFF3	Pulse test executing GOFF4	Pulse test executing GOFF5	Pulse test executing GOFF6	

<b>bit</b>	<b>F</b>	<b>E</b>	<b>D</b>	<b>C</b>	<b>B</b>	<b>A</b>	<b>9</b>	<b>8</b>	<b>7</b>	<b>6</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>0</b>	
<b>109</b>	STO6 down counter 0	STO6 down counter 1	STO6 down counter 2	STO6 down counter 3	STO7 down counter 0	STO7 down counter 1	STO7 down counter 2	STO7 down counter 3	STO8 down counter 0	STO8 down counter 1	STO8 down counter 2	STO8 down counter 3	STO9 down counter 0	STO9 down counter 1	STO9 down counter 2	STO9 down counter 3	
<b>110</b>	STO2 down counter 0	STO2 down counter 1	STO2 down counter 2	STO2 down counter 3	STO3 down counter 0	STO3 down counter 1	STO3 down counter 2	STO3 down counter 3	STO4 down counter 0	STO4 down counter 1	STO4 down counter 2	STO4 down counter 3	STO5 down counter 0	STO5 down counter 1	STO5 down counter 2	STO5 down counter 3	
<b>111</b>	IL PCB version 0	IL PCB version 1	IL PCB version 2	IL PCB version 3	IL PCB revision 0	IL PCB revision 1	IL PCB revision 2	IL PCB revision 3	-	-	-	-	STO1 down counter 0	STO1 down counter 1	STO1 down counter 2	STO1 down counter 3	
<b>112</b>	Emergency stop 2A - Pulse mismatch	Emergency stop 3A - Pulse mismatch	Emergency stop 4A - Pulse mismatch	Emergency stop 5A - Pulse mismatch	Emergency stop 6A - Pulse mismatch	Manual reset A - Pulse mismatch	Manual reset B - Pulse mismatch	IL PCB HDL revision 0	IL PCB HDL revision 1	IL PCB HDL revision 2	IL PCB HDL revision 3	IL PCB HDL revision 4	IL PCB HDL revision 5	IL PCB HDL revision 6	IL PCB HDL revision 7		
<b>113</b>	MSO2B - Pulse mismatch	MSO1B - Pulse mismatch	MSO2A - Pulse mismatch	MSO1A - Pulse mismatch	TSEL2B - Pulse mismatch	TSEL1B - Pulse mismatch	TSEL1A - Pulse mismatch	Emergency stop 1B - Pulse mismatch	Emergency stop 2B - Pulse mismatch	Emergency stop 3B - Pulse mismatch	Emergency stop 4B - Pulse mismatch	Emergency stop 5B - Pulse mismatch	Emergency stop 6B - Pulse mismatch	Emergency stop 7B - Pulse mismatch	Emergency stop 1A - Pulse mismatch		
<b>114</b>	Door 5 close check 2A - Pulse mismatch	Door 5 close check 3A - Pulse mismatch	Door 5 lock check A - Pulse mismatch	Door 6 close check 2A - Pulse mismatch	Door 6 close check 3A - Pulse mismatch	Door 6 lock check A - Pulse mismatch	Door 2 close check A - Pulse mismatch	Door 2 lock check A - Pulse mismatch	Door 7 close check A - Pulse mismatch	Door 7 lock check A - Pulse mismatch	Door 8 close check A - Pulse mismatch	Door 8 lock check A - Pulse mismatch	QT clamp check A - Pulse mismatch	QT No.1 pallet index check A - Pulse mismatch	QT No.2 pallet index check A - Pulse mismatch		
<b>115</b>	Door 8 close check B - Pulse mismatch	Door 8 lock check B - Pulse mismatch	QT clamp check B - Pulse mismatch	QT No.1 pallet index check B - Pulse mismatch	QT No.2 pallet index check B - Pulse mismatch	Tool clamp check A - Pulse mismatch	Front door close check A - Pulse mismatch	Front door lock check A - Pulse mismatch	Left side door close check A - Pulse mismatch	Right side door close check A - Pulse mismatch	Magazine door close check A - Pulse mismatch	Magazine door lock check A - Pulse mismatch	Magazine shutter close check A - Pulse mismatch	Magazine shutter close check A - Pulse mismatch	Door 5 close check 1A - Pulse mismatch		
<b>116</b>	Right side door lock check B - Pulse mismatch	Magazine door close check B - Pulse mismatch	Magazine door lock check B - Pulse mismatch	Magazine shutter close check B - Pulse mismatch	Door 5 close check 1B - Pulse mismatch	Door 5 close check 2B - Pulse mismatch	Door 5 lock check B - Pulse mismatch	Door 6 close check 1B - Pulse mismatch	Door 6 close check 2B - Pulse mismatch	Door 6 lock check B - Pulse mismatch	Door 6 lock check B - Pulse mismatch	Door 2 close check B - Pulse mismatch	Door 2 lock check B - Pulse mismatch	Door 7 close check B - Pulse mismatch	Door 7 lock check B - Pulse mismatch		
<b>117</b>	Enable SW main operation panel B - Pulse mismatch	Enable SW pallet start panel B - Pulse mismatch	Enable SW magazine panel B - Pulse mismatch	Enable SW hand-held pulse generator B - Pulse mismatch	Enable SW main operation panel A - Pulse mismatch	Enable SW pallet start panel A - Pulse mismatch	Enable SW magazine panel A - Pulse mismatch	Enable SW pendant A - Pulse mismatch	Enable SW hand-held pulse generator A - Pulse mismatch	Tool clamp check B - Pulse mismatch	Front door close check B - Pulse mismatch	Front door lock check B - Pulse mismatch	Left side door close check B - Pulse mismatch	Left side door lock check B - Pulse mismatch	Right side door close check B - Pulse mismatch	Right side door lock check B - Pulse mismatch	
<b>118</b>	Emergency stop 1B - Stop bit not detected	Emergency stop 2B - Stop bit not detected	Emergency stop 3B - Stop bit not detected	Emergency stop 4B - Stop bit not detected	Emergency stop 5B - Stop bit not detected	Emergency stop 6B - Stop bit not detected	Emergency stop 7B - Stop bit not detected	Emergency stop 1A - Stop bit not detected	Emergency stop 2A - Stop bit not detected	Emergency stop 3A - Stop bit not detected	Emergency stop 4A - Stop bit not detected	Emergency stop 5A - Stop bit not detected	Emergency stop 6A - Stop bit not detected	Emergency stop 7A - Stop bit not detected	Emergency stop 2A - Stop bit not detected	Emergency stop 3A - Stop bit not detected	Emergency stop 4A - Stop bit not detected
<b>119</b>	Door 2 lock check A - Stop bit not detected	Door 7 close check A - Stop bit not detected	Door 7 lock check A - Stop bit not detected	Door 8 close check A - Stop bit not detected	Door 8 lock check A - Stop bit not detected	QT clamp check A - Stop bit not detected	QT No.1 pallet index check A - Stop bit not detected	QT No.2 pallet index check A - Stop bit not detected	MSO2B - Stop bit not detected	MSO1B - Stop bit not detected	MSO2A - Stop bit not detected	MSO1A - Stop bit not detected	TSEL2B - Stop bit not detected	TSEL1B - Stop bit not detected	TSEL2A - Stop bit not detected	TSEL1A - Stop bit not detected	
<b>120</b>	Left side door close check A - Stop bit not detected	Left side door lock check A - Stop bit not detected	Right side door close check A - Stop bit not detected	Right side door lock check A - Stop bit not detected	Magazine door close check A - Stop bit not detected	Magazine door lock check A - Stop bit not detected	Magazine shutter close check A - Stop bit not detected	Door 5 close check 1A - Stop bit not detected	Door 5 close check 2A - Stop bit not detected	Door 5 close check 3A - Stop bit not detected	Door 5 lock check A - Stop bit not detected	Door 6 close check 1A - Stop bit not detected	Door 6 close check 2A - Stop bit not detected	Door 6 close check 3A - Stop bit not detected	Door 6 lock check A - Stop bit not detected	Door 6 close check 3A - Stop bit not detected	Door 2 close check A - Stop bit not detected
<b>121</b>	Door 6 close check 1B - Stop bit not detected	Door 6 close check 2B - Stop bit not detected	Door 6 close check 3B - Stop bit not detected	Door 6 lock check B - Stop bit not detected	Door 2 close check B - Stop bit not detected	Door 2 lock check B - Stop bit not detected	Door 7 close check B - Stop bit not detected	Door 7 lock check B - Stop bit not detected	Door 8 close check B - Stop bit not detected	Door 8 lock check B - Stop bit not detected	QT clamp check B - Stop bit not detected	QT No.1 pallet index check B - Stop bit not detected	QT No.2 pallet index check B - Stop bit not detected	Tool clamp check A - Stop bit not detected	Front door close check A - Stop bit not detected	Front door lock check A - Stop bit not detected	
<b>122</b>	Enable SW pendant A - Stop bit not detected	Enable SW hand-held pulse generator A - Stop bit not detected	Tool clamp check B - Stop bit not detected	Front door close check B - Stop bit not detected	Front door lock check B - Stop bit not detected	Left side door close check B - Stop bit not detected	Right side door close check B - Stop bit not detected	Right side door lock check B - Stop bit not detected	Magazine door close check B - Stop bit not detected	Magazine door lock check B - Stop bit not detected	Magazine shutter close check B - Stop bit not detected	Door 5 close check 1B - Stop bit not detected	Door 5 close check 2B - Stop bit not detected	Door 5 close check 3B - Stop bit not detected	Door 5 lock check B - Stop bit not detected		
<b>123</b>	Emergency stop 1 - Input signal error	Emergency stop 2 - Input signal error	Emergency stop 3 - Input signal error	Emergency stop 4 - Input signal error	Emergency stop 5 - Input signal error	Emergency stop 6 - Input signal error	Emergency stop 7 - Input signal error	Manual reset - Input signal error	Enable SW main operation panel B - Stop bit not detected	Enable SW pallet start panel B - Stop bit not detected	Enable SW magazine panel B - Stop bit not detected	Enable SW pendant B - Stop bit not detected	Enable SW hand-held pulse generator B - Stop bit not detected	Enable SW main operation panel A - Stop bit not detected	Enable SW pallet start panel A - Stop bit not detected	Enable SW magazine panel A - Stop bit not detected	
<b>124</b>	Door 5 close check 2 - Input signal error	Door 5 close check 3 - Input signal error	Door 5 lock check - Input signal error	Door 6 close check 1 - Input signal error	Door 6 close check 2 - Input signal error	Door 6 lock check - Input signal error	Door 2 close check - Input signal error	Door 2 lock check - Input signal error	Door 7 close check - Input signal error	Door 7 lock check - Input signal error	Door 8 close check - Input signal error	Door 8 lock check - Input signal error	QT clamp check - Input signal error	QT No.1 pallet index check - Input signal error	QT No.2 pallet index check - Input signal error		
<b>125</b>	Enable SW main operation panel - Input signal error	Enable SW pallet start panel - Input signal error	Enable SW magazine panel - Input signal error	Enable SW pendant - Input signal error	Enable SW hand-held pulse generator - Input signal error	Tool clamp check - Input signal error	Front door close check - Input signal error	Front door lock check - Input signal error	Left side door close check - Input signal error	Left side door lock check - Input signal error	Right side door close check - Input signal error	Right side door lock check - Input signal error	Magazine door close check - Input signal error	Magazine door lock check - Input signal error	Magazine shutter close check - Input signal error	Magazine shutter close check - Input signal error	Door 5 close check 1 - Input signal error
<b>126</b>	-	-	-	EM24Y pulse test monitoring	EM24X pulse test monitoring	H monitoring for EM24 operation	H monitoring for EM24 initialization	EM24L monitoring	-	-	-	Pulse error	Pallet simultaneous index	MSO short-circuit	MSO setting error	Machine model change error	

<b>bit</b>	<b>F</b>	<b>E</b>	<b>D</b>	<b>C</b>	<b>B</b>	<b>A</b>	<b>9</b>	<b>8</b>	<b>7</b>	<b>6</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>0</b>
<b>127</b>	STO4L monitoring error	STO5L monitoring error	STO6L monitoring error	STO7L monitoring error	STO8L monitoring error	STO9L monitoring error	STO10L monitoring error	STO11L monitoring error	-	-	-	-	User EM24 - Y pulse test monitoring	User EM24 - X pulse test monitoring	User EM24 - H monitoring	User EM24 - L monitoring
<b>128</b>	EDM10 - H monitoring flag	EDM11 - H monitoring flag	STO1Y superimpose monitoring error	STO2Y superimpose monitoring error	STO3Y superimpose monitoring error	STO4Y superimpose monitoring error	STO5Y superimpose monitoring error	STO6Y superimpose monitoring error	STO7Y superimpose monitoring error	STO8Y superimpose monitoring error	STO9Y superimpose monitoring error	STO10Y superimpose monitoring error	STO11Y superimpose monitoring error	STOIL monitoring error	STO2L monitoring error	STO3L monitoring error
<b>129</b>	STO5 short-circuit monitoring error	STO6 short-circuit monitoring error	STO7 short-circuit monitoring error	STO8 short-circuit monitoring error	STO9 short-circuit monitoring error	STO10 short-circuit monitoring error	STO11 short-circuit monitoring error	EDM1 - H monitoring flag	EDM2 - H monitoring flag	EDM3 - H monitoring flag	EDM4 - H monitoring flag	EDM5 - H monitoring flag	EDM6 - H monitoring flag	EDM7 - H monitoring flag	EDM8 - H monitoring flag	EDM9 - H monitoring flag
<b>130</b>	System B operation circuit data mismatch	System B operation circuit data not received	System B operation result CRC error	System B operation result not received	System B SW data CRC error	System B SW data mismatch	System B SW data not received	-	-	-	-	-	STO1 short-circuit monitoring error	STO2 short-circuit monitoring error	STO3 short-circuit monitoring error	STO4 short-circuit monitoring error
<b>131</b>	ILIO_CRC send 8	ILIO_CRC send 7	ILIO_CRC send 6	ILIO_CRC send 5	ILIO_CRC send 4	ILIO_CRC send 3	ILIO_CRC send 2	ILIO_CRC send 1	System B state machine error 2	System B state machine error 1	System B watchdog error 2	System B watchdog error 1	System B configuration monitoring error	System B 1.2V error	System B 2.5V error	System B 3.3V error
<b>132</b>	-	-	-	-	-	-	ILIO communication timestamp error	ILIO communication CRC error	ILIO_CRC receive 8	ILIO_CRC receive 7	ILIO_CRC receive 6	ILIO_CRC receive 5	ILIO_CRC receive 4	ILIO_CRC receive 3	ILIO_CRC receive 2	ILIO_CRC receive 1
<b>133</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>134</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>145</b>	EXIO PCB 16	EXIO PCB 15	EXIO PCB 14	EXIO PCB 13	EXIO PCB 12	EXIO PCB 11	EXIO PCB 10	EXIO PCB 09	EXIO PCB 08	EXIO PCB 07	EXIO PCB 06	EXIO PCB 05	EXIO PCB 04	EXIO PCB 03	EXIO PCB 02	EXIO PCB 01
<b>146</b>	EXIO PCB 32	EXIO PCB 31	EXIO PCB 30	EXIO PCB 29	EXIO PCB 28	EXIO PCB 27	EXIO PCB 26	EXIO PCB 25	EXIO PCB 24	EXIO PCB 23	EXIO PCB 22	EXIO PCB 21	EXIO PCB 20	EXIO PCB 19	EXIO PCB 18	EXIO PCB 17
<b>149</b>	-	-	-	-	DC power GND overcurrent 5 (EXIO**) (spare)	DC power GND overcurrent 4 (EXIO**)	DC power GND overcurrent 3 (EXIO**)	DC power GND overcurrent 2 (EXIO**)	DC power 24V overcurrent 6 (EXIO**) (spare)	DC power 24V overcurrent 5 (EXIO**) (spare)	DC power 24V overcurrent 4 (EXIO**) (spare)	DC power 24V overcurrent 3 (EXIO**) (spare)	DC power 24V overcurrent 2 (EXIO**) (spare)	DC power 24V overcurrent 1 (EXIO**) (spare)	DC power 24V overcurrent 0 (EXIO**) (spare)	DC power 24V overcurrent 32 (EXIO**) (spare)
<b>150</b>	FPGA_ROM version 3	FPGA_ROM version 2	FPGA_ROM version 1	FPGA_ROM version 0	General output (XTOUT [131]~[116]) (DIPSW4)	General output (XTOUT [115]~[100]) (DIPSW3)	General input (XTIN [31]~[16]) (DIPSW1)	General input (XTIN [15]~[0]) (DIPSW1)	EXIO**_revision 3	EXIO**_revision 2	EXIO**_revision 1	EXIO**_revision 0	EXIO**_revision 3	EXIO**_revision 2	EXIO**_revision 1	EXIO**_revision 0
<b>151</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>152</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

(NOTE) 153 to 404 is the same as the bit positions for 149 to 152. \*\* corresponds the EXIO PCB numbers 01 to 32.

Ex: If \*\* for input 149 is 01, it refers to the status of EXIO PCB 01.

If \*\* for input 153 is 02, it refers to the status of EXIO PCB 02.

If \*\* for input 401 is 32, it refers to the status of EXIO PCB 32.

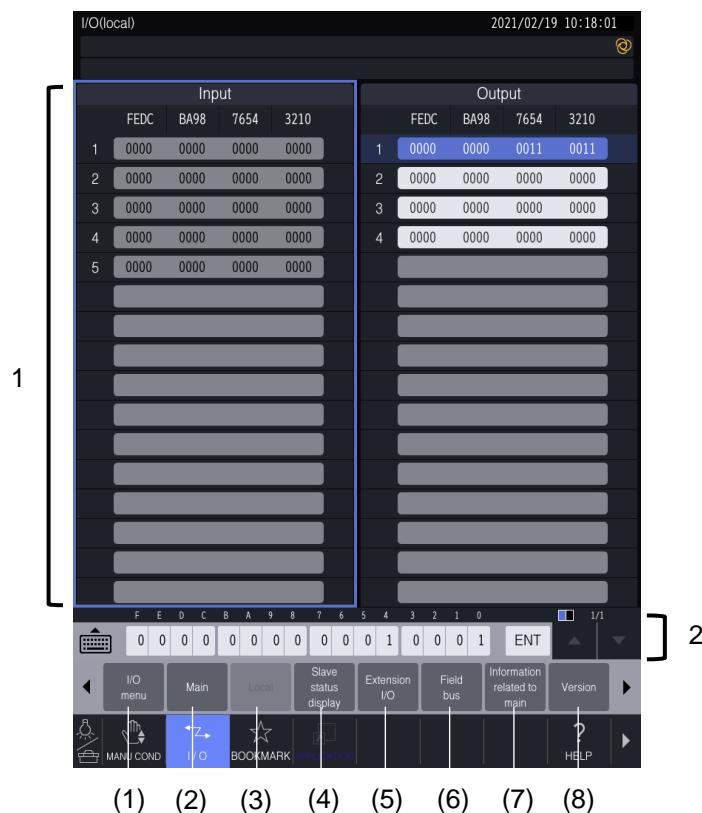
## Main output

bit Output	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	L→M message interrupt signal 1		L→M exception interrupt signal (IRQ6)		FPGA→M interrupt signal 1	FPGA→M INTERRUPT SIGNAL 2			Main DIPSW_1	-	Main DIPSW_2	-	Main DIPSW_3	-	Main DIPSW_4	L→M message ACK& interrupt CLR signal 1
3	-	-	-	M→L message interrupt signal 1	M→L message ACK& interrupt CLR signal 1	-	M→L exception interrupt signal (GPIO2_14)	-	ECAT(SV)Sync 0 interrupt signal	ECAT(IO)Sync 0 interrupt signal	-	-	-	-	-	-
4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7	-	-	Main LED_3	Main LED_4	Main LED_5	Main LED_6	-	-	-	-	Main LED_1	Main LED_2	-	-	-	-
8	-	-	-	-	-	Main LED_7	Main LED_8	-	-	-	-	-	-	-	-	-
9	0x1E0000-0x1FFFFF protect	0x1C0000-0x1DFFFF protect	0x1A0000-0x1BFFFF protect	0x180000-0x19FFFF protect	0x160000-0x17FFFF protect	0x140000-0x15FFFF protect	0x120000-0x13FFFF protect	0x100000-0x11FFFF protect	0x0E0000-0x0FFFFF protect	0x0C0000-0x0DFFFF protect	0x0A0000-0x0BFFFF protect	0x080000-0x09FFFF protect	0x060000-0x07FFFF protect	0x040000-0x05FFFF protect	0x020000-0x03FFFF protect	0x000000-0x01FFFF protect
10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	XNCRD communication check
12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	Lathe spindle selection LED	Spindle forward rotation LED	Pallet index LED	ATC LED	Magazine reverse LED	Magazine forward LED	Zero return LED	Dry run LED	Machine lock LED	Single operation LED	OPT stop LED	Block skip LED	Program edit LED	Memory operation LED	MDI operation LED	Manual operation LED
17	LCD backlight OFF	LCD brightness UP	LCD brightness CS	Buzzer	-	-	-	-	Reset LED	Chip shower LED	Coolant pump LED	Insert LED	Shift LED	Step travel LED	Low-speed travel LED	High-speed travel LED
18	-	-	DC power 5V_3 enable	Watchdog timer	Watchdog timer enable				-	-	-	Door unlock 2 LED	Door unlock 1 LED	Pallet start LED	Stop LED	Start LED
19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21	-	-	-	-	-	Servo relay ON	Pallet start output	Start signal output	-	-	-	Automatic power OFF	Power OFF permission	Alarm clear	Watchdog timer	Watchdog timer enable
22	-	-	-	-	-	ATC arm shutter close valve	ATC arm shutter open valve	Pot shutter close valve	Pot shutter open valve	-	-	-	-	Pot up valve	Pot down valve	
23	Spare output 4 (IO)	Spare output 3 (IO)	Spare output 2 (IO)	Spare output 1 (IO)	-	-	-	Spindle fan ON	Fan 4 ON	Fan 3 ON	Fan 2 ON	Fan 1 ON	Automatic greasing (oil) ON	-	-	-
24	Programmable output <115>	Programmable output <114>	Programmable output <113>	Programmable output <112>	Programmable output <111>	Programmable output <110>	Programmable output <109>	Programmable output <108>	Programmable output <107>	Programmable output <106>	Programmable output <105>	Programmable output <104>	Programmable output <103>	Programmable output <102>	Programmable output <101>	Programmable output <100>
25	-	-	Cyclone suction pump ON	Cyclone sludge discharge valve ON	Coolant valve ON M08	Chip shower pump ON	Coolant pump ON	Tool wash valve (spare) ON	Tool wash blowoff valve B ON	Jig shower valve ON	Tool wash valve/Air blast valve ON	CTS drain valve ON	Supply valve ON	CTS back wash valve ON	CTS pump ON	CTS discharge valve ON
26	Spare output 8 (PNP, NPN)	Spare output 7 (PNP, NPN)	Spare output 6 (PNP, NPN)	Spare output 5 (PNP, NPN)	-	-	-	-	-	-	-	Alarm reset (electric cylinder)	-	-	-	-
27	-	-	-	-	-	-	-	-	-	-	Table light	Internal light	Indicator – Green	Indicator – Yellow	Indicator - Red	-
28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
29	-	-	-	-	-	-	Chip auger forward	Chip auger reverse	-	-	-	-	7th-axis unclamp valve ON	5th-axis unclamp valve ON	*QT-axis unclamp output	-

<b>bit Output</b>	<b>F</b>	<b>E</b>	<b>D</b>	<b>C</b>	<b>B</b>	<b>A</b>	<b>9</b>	<b>8</b>	<b>7</b>	<b>6</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>0</b>
<b>30</b>	-	-	-	Open-phase detection T phase	Open-phase detection S phase	Open-phase detection R phase	AC power not detected (software detection)	AC power drop (software detection)	-	-	-	-	-	-	-	Chip conveyor ON
<b>31</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>32</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>33</b>	IOSR watchdog TX	-	-	-	-	Magazine chamber door - Unlock signal	Door 8 - Unlock signal	Door 7 - Unlock signal	Door 2 - Unlock signal	Door 6 - Unlock signal	Door 5 - Unlock signal	Right side door - Unlock signal	Left side door - Unlock signal	Front door - Unlock signal	Manual reset substitute signal	Manual reset substitute signal
<b>34</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	[MASTER ON] alarm linked output	[MASTER ON] indicator output

## 6.2.2 Local I/O

The I/O signal status is shown for the local PCB.



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### 6.2.2.1 Description of screen display

Position	Name	Description
1	Signal status	Displays the number and value of the input and output signals.
2	Data input field	The user can display and change the selected output signal value.

### 6.2.2.2 Description of screen operation

Description of function key operations

Same as the description of the function key operations for “6.2.1.1 Main screen”.

### 6.2.2.3 Changing Output Values

The following operations can be used to change the status of the output signal.

1. Move the cursor to the number that has the signal (bit) where you wish to make a change.
2. The input request field displays the 16 bits for the current status. Therefore, make the desired change and then press the [ENT] key.

### 6.2.2.4 Signal Assignment

Local input

bit \ Input	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
1	-	-	-	-	-	-	-	-	-	-	-	-	Local DIPSW_4 (GPIO1_19)	Local DIPSW_3 (GPIO1_18)	Local DIPSW_2 (GPIO1_29)	Local DIPSW_1 (GPIO1_28)
2	-	-	-	-	-	-	-	-	-	-	-	-	F→L spare (GPIO2_27)	F→L spare (GPIO2_25)	F→L spare (GPIO2_24)	M→L message ACK& interrupt signal (GPIO2_23)
3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	USB1_VBUS_F AULT input signal (GPIO6_15)	USB1_VBUS_F AULT input signal (GPIO6_14)
4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

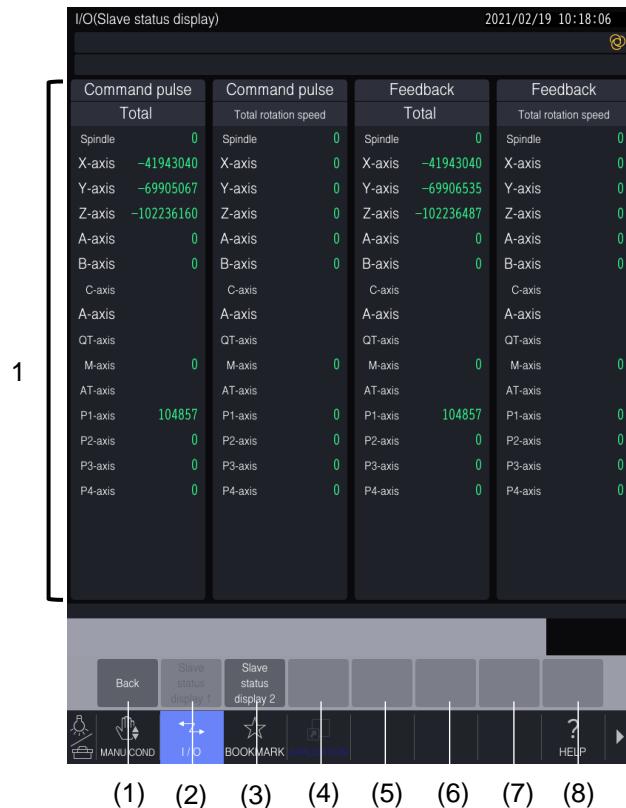
Local output

bit \ Output	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
1	-	-	-	-	-	-	-	-	Local LED_8 (GPIO2_12)	Local LED_7 (GPIO2_11)	Local LED_6 (GPIO2_9)	Local LED_5 (GPIO2_17)	Local LED_4 (GPIO2_16)	Local LED_3 (GPIO2_15)	Local LED_2 (GPIO2_14)	Local LED_1 (GPIO2_13)
2	-	-	-	-	-	-	-	-	-	-	-	-	L→M spare (GPIO4_6)	L→M exception interrupt signal (GPIO4_4)	L→M message ACK& interrupt signal (GPIO4_2)	
3	-	-	-	-	-	-	-	-	-	-	-	-	-	USB1_VBUS_EN output signal (GPIO6_13)	USB1_VBUS_EN output signal (GPIO6_12)	
4	-	-	-	-	-	-	-	-	-	-	-	-	-	L→F GPIO(GPIO7_6)	L→F MIPI_CLK output stability signal (GPIO7_5)	

### 6.2.3 Slave Status Display

The slave status is shown.

#### 6.2.3.1 Slave status display 1 screen



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Description of screen display

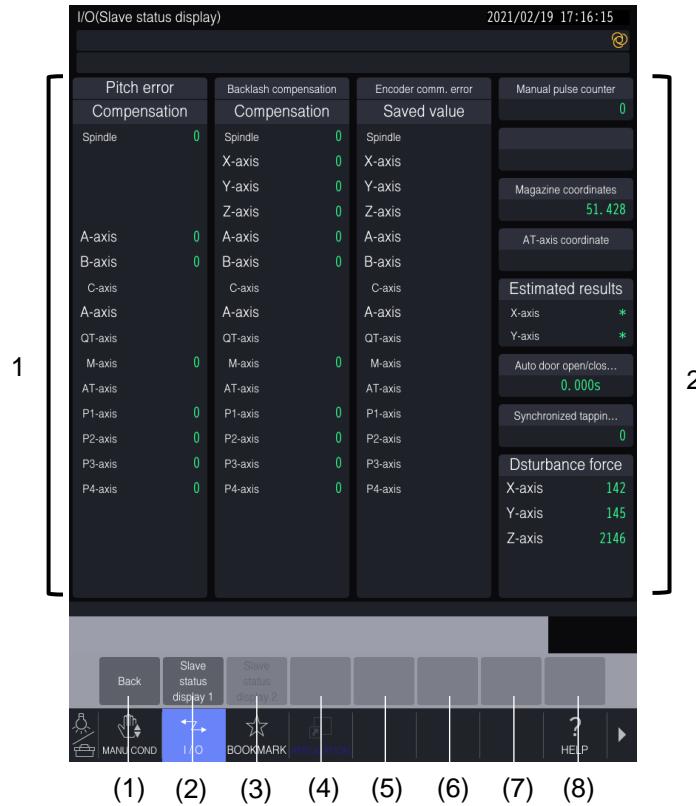
Position	Name	Description
1	Slave status	Displays the command pulse of each axis and the feedback total.

Description of screen operation

Description of function key operations

Position	Label	Description
(1)	[Back]	Goes back to the <Input/Output screen>.
(2)		
(3)	[Slave status display 2]	Changes to the <Slave status display 2> screen.
(4)		
(5)		
(6)		
(7)		
(8)		

### 6.2.3.2 Slave status display 2 screen



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Description of screen display

Position	Name	Description
1	Slave status	Displays the pitch error on each axis and the backlash compensation.
2	Supplementary information	Displays information about the slave devices.

Description of screen operationDescription of function key operations

Position	Label	Description
(1)	[Back]	Goes back to the <Input/Output screen>.
(2)	[Slave status display 1]	Changes to the <Slave status display 1> screen.
(3)		
(4)		
(5)		
(6)		
(7)		
(8)		

Estimated results

When using a machine model equipped with a movable table, turn the power ON or press the [RST] key. Then, the weight of the workpiece that is loaded on the table is estimated and displayed when the first rapid feed operation is carried out on the axis that is set in the machine parameter (system 1: common) <Axis for weight estimation>. The weight unit is in kg.

When the weight of the workpiece is not estimated, or when using a machine model equipped with a movable column, “\*” is displayed.

Synchronized Tapping Error

The number of synchronized error pulses on the 2-axis and the spindle during the tap operation is calculated, and the results are displayed in real time on the “Slave status 2” screen. A “0” is displayed when the tap operation is not in progress.

## 6.2.4 Extension I/O

The I/O signal status is shown for the EXIO PCB.

(Reference) The 4 bytes for input and output per station are shown for 64 stations.

(Extension I/O) Total of 4 pages



6

### 6.2.4.1 Description of screen display

Position	Name	Description
1	Input signal status	Displays the number and value of the input signal.
2	Output signal status	Displays the number and value of the output signal.
3	Data input field	The user can display and change the selected output signal value.

### 6.2.4.2 Description of screen operation

#### 1. Description of function key operations

Same as the description of the function key operations for “6.2.1.1 Main screen”.

#### 2. Description of input signal operations

- The user can tap on an input signal to select the status.
- The user can press the [Previous page] key or the [Next page] key to change the page.
- An item can be selected with the [CURSOR] keys (up and down).
- The user can move to the output signal with the [CURSOR] key (right).

#### 3. Description of output signal operations

- The user can tap on an output signal to select the status.
- The user can press the [Previous page] key or the [Next page] key to change the page.
- An item can be selected with the [CURSOR] keys (up and down).
- The user can move to the input signal with the [CURSOR] key (left).

The EXIO PCB station number and corresponding signal are described below.

Input			Output		
EXIO PCB station number	Terminal number for EXIO PCB	Signal	EXIO PCB station number	Terminal number for EXIO PCB	Signal
1	IN 0 - 15 IN16 - 31	1L 0 - F 1H 0 - F	1	OUT100 - 115 OUT116 - 131	1L 0 - F 1H 0 - F
2	IN 0 - 15 IN16 - 31	2L 0 - F 2H 0 - F	2	OUT100 - 115 OUT116 - 131	2L 0 - F 2H 0 - F
3	IN 0 - 15 IN16 - 31	3L 0 - F 3H 0 - F	3	OUT100 - 115 OUT116 - 131	3L 0 - F 3H 0 - F
•	•	•	•	•	•
•	•	•	•	•	•
•	•	•	•	•	•
64	IN 0 - 15 IN16 - 31	64L 0 - F 64H 0 - F	64	OUT100 - 115 OUT116 - 131	64L 0 - F 64H 0 - F

The station number can be set freely between 1 and 64 regardless of the connection order on the EXIO PCB.

However, the same station number cannot be set more than once.

In addition, the station number 64 cannot be set on machine models equipped with the lathe function.

## 6.2.5 Fieldbus Network

The communication status and the I/O signals are shown for the fieldbus network.

Refer to “Chapter 9 (15) Fieldbus network” in Operation Manual I for further details on each fieldbus network.

### 6.2.5.1 Input/Output (Fieldbus Network) Status Screen



(1) (2) (3) (4) (5) (6) (7) (8)

Description of screen display

Position	Name	Description
1	Signal status	Displays the number and value of the status signals for the fieldbus network.

### Description of screen operation

#### 1. Description of function key operations

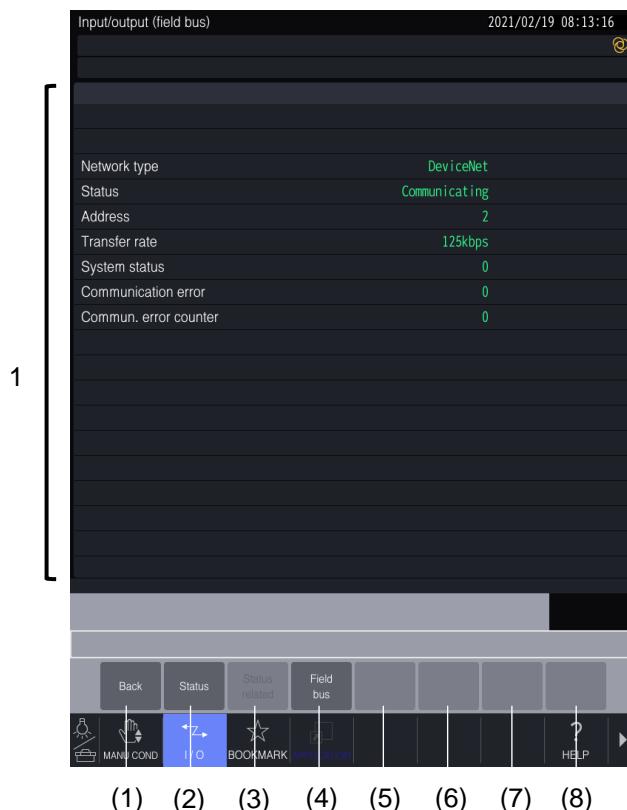
Position	Label	Description
(1)	[Back]	Goes back to the <Input/Output screen>.
(2)		
(3)	[Status related]	Changes to the <Input/output (fieldbus network) status information> screen.
(4)	[Fieldbus network]	Changes to the <Input/output (fieldbus network)> screen.
(5)		
(6)		
(7)		
(8)		

#### 2. Description of signal operations

- The user can press the [Previous page] key or the [Next page] key to change the page.
- An item can be selected with the [CURSOR] keys (up and down).

### 6.2.5.2 Input/Output (Fieldbus Network) Status Information Screen

6



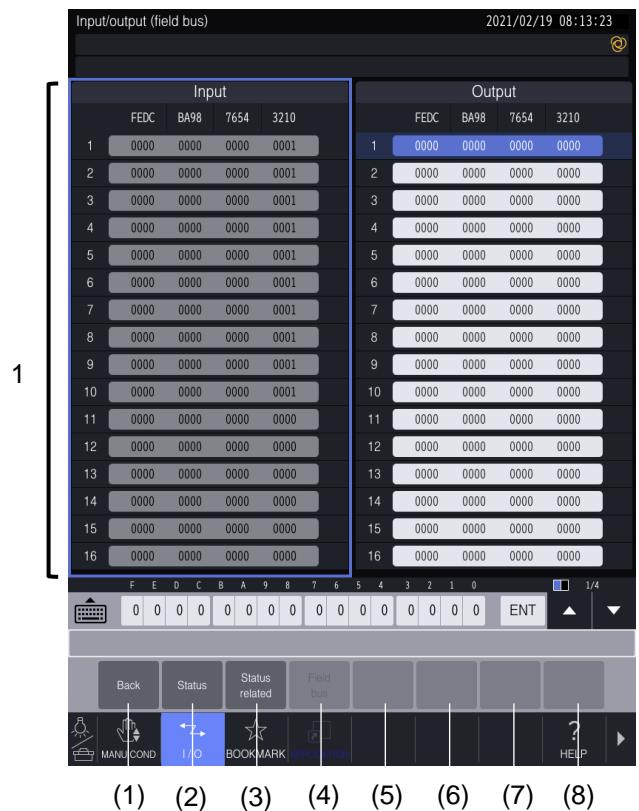
(1) (2) (3) (4) (5) (6) (7) (8)

### Description of screen display

Position	Name	Description
1	Related information	Displays status related information about the fieldbus network.

Description of screen operationDescription of function key operations

Position	Label	Description
(1)	[Back]	Goes back to the <Input/Output screen>.
(2)	[Status]	Changes to the <Input/output (fieldbus network) status> screen.
(3)		
(4)	[Fieldbus network]	Changes to the <Input/output (fieldbus network)> screen.
(5)		
(6)		
(7)		
(8)		

**6.2.5.3 Input/Output (Fieldbus Network)**

6

Description of screen display

Position	Name	Description
1	Input signal status	Displays the number and value of the status input signals for the fieldbus network.
2	Output signal status	Displays the number and value of the status output signals for the fieldbus network.

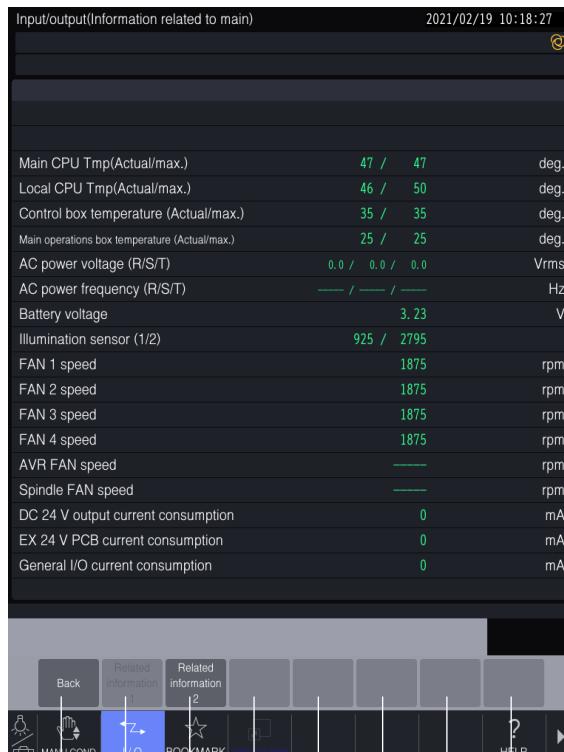
Description of screen operation

## 1. Description of function key operations

Position	Label	Description
(1)	[Back]	Goes back to the <Input/Output screen>.
(2)	[Status]	Changes to the <Input/output (fieldbus network) status> screen.
(3)	[Status related]	Changes to the <Input/output (fieldbus network) status information> screen.
(4)		
(5)		
(6)		
(7)		
(8)		

2. Description of input signal operations
  - The user can tap on an input signal to select the status.
  - The user can press the [Previous page] key or the [Next page] key to change the page.
  - An item can be selected with the [CURSOR] keys (up and down).
  - The user can move to the output signal with the [CURSOR] key (right).
3. Description of output signal operations
  - The user can tap on an output signal to select the status.
  - The user can press the [Previous page] key or the [Next page] key to change the page.
  - An item can be selected with the [CURSOR] keys (up, down, left and right).
  - The user can move to the input signal with the [CURSOR] key (left).

### 6.2.6 Information Related to Main



The screenshot shows a list of system parameters with their current values and maximum values. The parameters include:

Parameter	Value	Max Value	Unit
Main CPU Tmp(Actual/max.)	47 /	47	deg.
Local CPU Tmp(Actual/max.)	46 /	50	deg.
Control box temperature (Actual/max.)	35 /	35	deg.
Main operations box temperature (Actual/max.)	25 /	25	deg.
AC power voltage (R/S/T)	0.0 /	0.0 /	Vrms
AC power frequency (R/S/T)	— /	— /	Hz
Battery voltage	—	3.23	V
Illumination sensor (1/2)	925 /	2795	
FAN 1 speed	—	1875	rpm
FAN 2 speed	—	1875	rpm
FAN 3 speed	—	1875	rpm
FAN 4 speed	—	1875	rpm
AVR FAN speed	—	—	rpm
Spindle FAN speed	—	—	rpm
DC 24 V output current consumption	0	—	mA
EX 24 V PCB current consumption	0	—	mA
General I/O current consumption	0	—	mA

At the bottom, there is a function key bar with eight items labeled (1) through (8), each with a corresponding icon and label:

- (1) Back
- (2) Related information 1
- (3) Related information 2
- (4) BOOKMARK
- (5) APPLICATION
- (6) —
- (7) —
- (8) HELP

6

#### 6.2.6.1 Description of screen display

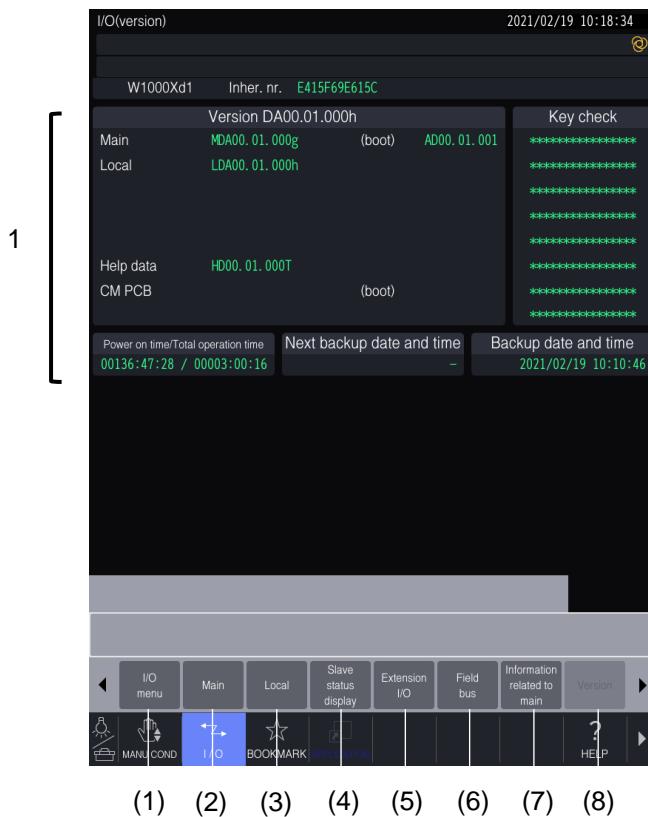
Position	Label	Description
1	Information related to main	Displays the I/O device and communication information.

#### 6.2.6.2 Description of screen operation

Description of function key operations

Position	Label	Description
(1)	[Back]	Goes back to the <Input/Output screen>.
(2)	[Related information 1]	Changes to the <Related information 1> screen.
(3)	[Related information 2]	Changes to the <Related information 2> screen.
(4)		
(5)		
(6)		
(7)		
(8)		

## 6.2.7 Version



6

### 6.2.7.1 Description of screen display

Position	Name	Description
1	Software version	Displays the information such as the software version, power ON time and operating time.

(NOTE) The machine being used may have a different model name and different software version number.

### 6.2.7.2 Description of screen operation

Description of function key operations

Same as the description of the function key operations for “6.2.1.1 Main screen”.

### 6.2.8 Communication Error Counter



6

#### 6.2.8.1 Description of screen display

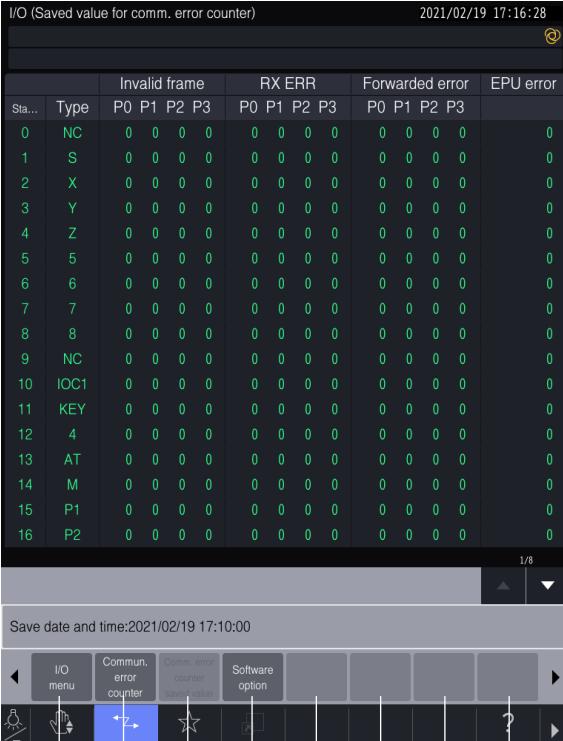
Position	Name	Description
1	Number of communication errors	Displays the number of errors for IO/servo communication by station. The counter value displayed in red indicates that the station could not acquire the counter value.

#### 6.2.8.2 Description of screen operation

Description of function key operations

Same as the description of the function key operations for “6.2.1.1 Main screen”.

## 6.2.9 Values Saved in Communication Error Counter



The screenshot shows a table titled "I/O (Saved value for comm. error counter)" with a timestamp of "2021/02/19 17:16:28". The table has columns for Invalid frame, RX ERR, Forwarded error, and EPU error, each with sub-columns for P0, P1, P2, and P3. A vertical bracket labeled "1" points to the first row of the table. Below the table is a message "Save date and time: 2021/02/19 17:10:00". At the bottom is a function key bar with icons and labels: (1) I/O menu, (2) MANU COND, (3) COMM. error counter (highlighted in blue), (4) Comm. error counter save value, (5) Software option, (6) ?, (7) HELP, and (8) BACK.

I/O (Saved value for comm. error counter)				2021/02/19 17:16:28									
Sta...	Type	Invalid frame			RX ERR			Forwarded error			EPU error		
		P0	P1	P2	P3	P0	P1	P2	P3	P0	P1	P2	P3
0	NC	0	0	0	0	0	0	0	0	0	0	0	0
1	S	0	0	0	0	0	0	0	0	0	0	0	0
2	X	0	0	0	0	0	0	0	0	0	0	0	0
3	Y	0	0	0	0	0	0	0	0	0	0	0	0
4	Z	0	0	0	0	0	0	0	0	0	0	0	0
5	5	0	0	0	0	0	0	0	0	0	0	0	0
6	6	0	0	0	0	0	0	0	0	0	0	0	0
7	7	0	0	0	0	0	0	0	0	0	0	0	0
8	8	0	0	0	0	0	0	0	0	0	0	0	0
9	NC	0	0	0	0	0	0	0	0	0	0	0	0
10	IOC1	0	0	0	0	0	0	0	0	0	0	0	0
11	KEY	0	0	0	0	0	0	0	0	0	0	0	0
12	4	0	0	0	0	0	0	0	0	0	0	0	0
13	AT	0	0	0	0	0	0	0	0	0	0	0	0
14	M	0	0	0	0	0	0	0	0	0	0	0	0
15	P1	0	0	0	0	0	0	0	0	0	0	0	0
16	P2	0	0	0	0	0	0	0	0	0	0	0	0

Save date and time: 2021/02/19 17:10:00

(1) (2) (3) (4) (5) (6) (7) (8)

6

### 6.2.9.1 Description of screen display

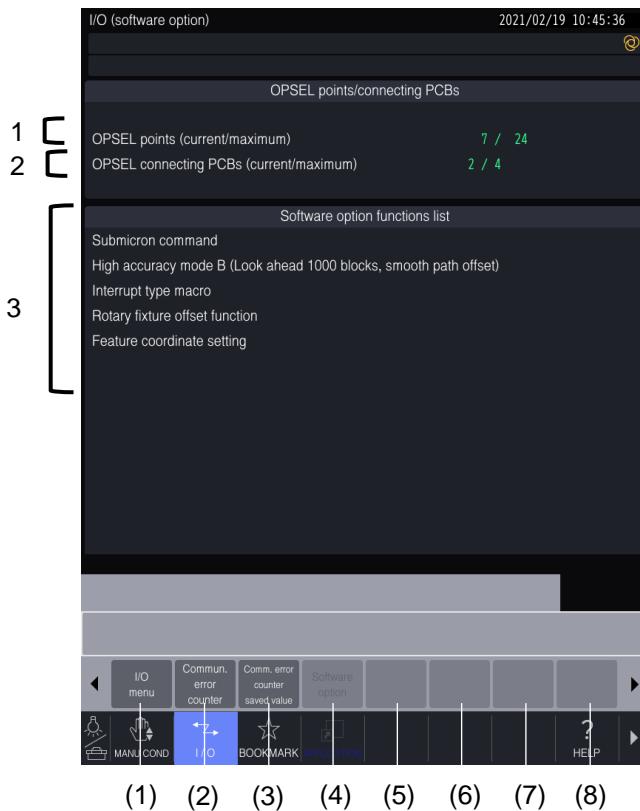
Position	Name	Description
1	Number of communication errors	Displays the error counter for the IO/servo communication that is saved. When the communication error counter increases even by one, the counter value is saved when the power is OFF.

### 6.2.9.2 Description of screen operation

Description of function key operations

Same as the description of the function key operations for “6.2.1.1 Main screen”.

### 6.2.10 Software Options



(1) (2) (3) (4) (5) (6) (7) (8)

#### 6.2.10.1 Description of screen display

Position	Name	Description
1	OPSEL points	Displays the OPSEL points currently being used and the maximum OPSEL points that are available.
2	OPSEL connecting PCBs	Displays the number of OPSEL PCBs currently connected and the maximum number of PCBs that can be connected.
3	Software option function	Displays the function name of the software option currently being used.

#### 6.2.10.2 Description of screen operation

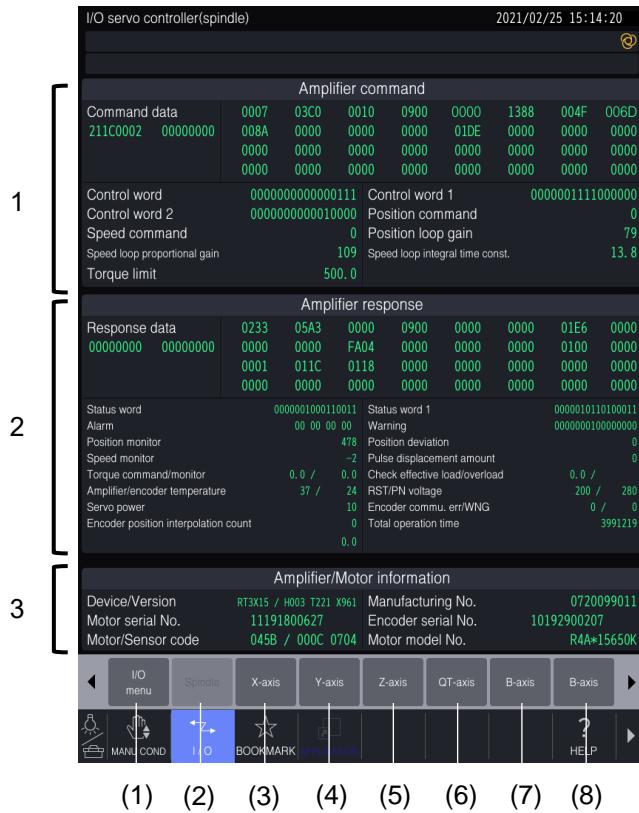
Description of function key operations

Same as the description of the function key operations for “6.2.1.1 Main screen”.

## 6.3 Servo Controller

### 6.3.1 Input/Output Servo Spindle Screen

The following screen is displayed when <Servo> is selected from the <I/O menu> screen.



6

#### 6.3.1.1 Main display area

Position	Name	Description
1	Amplifier command	Displays amplifier commands and related information.
2	Amplifier response	Displays amplifier responses and related information.
3	Amplifier/Motor information	Displays the amplifier/motor information.

#### 6.3.1.2 Function key display area

Column	Position	Label	Description
1	(1)	[I/O menu]	Changes to the <Input/output menu> screen.
	(2)	[Spindle]	Changes to the <I/O servo controller(spindle)> screen.
	(3)	[X-axis]	Changes to the <I/O servo controller(X-axis)> screen.
	(4)	[Y-axis]	Changes to the <I/O servo controller(Y-axis)> screen.
	(5)	[Z-axis]	Changes to the <I/O servo controller(Z-axis)> screen.
	(6) ~ (8)	[*-axis] *: Additional axis	Changes to the <I/O servo controller(*-axis)> screen.
2	(1)	[I/O menu]	Same as the first column.
	(2) ~ (3)	[*-axis] *: Additional axis	Changes to the <I/O servo controller(*-axis)> screen.
	(4)	[Magazine]	Changes to the <I/O servo controller(magazine)> screen.
	(5)	[P1-axis]	Changes to the <I/O servo controller(P1-axis)> screen.
	(6)	[P2-axis]	Changes to the <I/O servo controller(P2-axis)> screen.
	(7)	[P3-axis]	Changes to the <I/O servo controller(P3-axis)> screen.
	(8)	[P4-axis]	Changes to the <I/O servo controller(P4-axis)> screen.

Column	Position	Label	Description
3	(1)	[I/O menu]	Same as the first column.
	(2)	[AT-axis]	Changes to the <I/O servo controller(AT-axis)> screen.
	(3)		
	(4)		
	(5)		
	(6)		
	(7)		
	(8)		

(NOTE) Set the additional axis <Address> and <Installation position> in the machine parameter to assign the 5th through the 8th-axes from the following options: A1-axis, A2-axis, B1-axis, B2-axis, C1-axis and C2-axis.

### 6.3.1.3 Other operations

The user can change the display axes with the cursor keys as well.

## 6.3.2 Input/Output Servo: X-axis to AT-axis Screen

6



(1) (2) (3) (4) (5) (6) (7) (8)

### 6.3.2.1 Main display area

Position	Name	Description
1	Amplifier command	Displays amplifier commands and related information.
2	Amplifier response	Displays amplifier responses and related information.
3	Amplifier/Motor information	Displays the amplifier/motor information.

### 6.3.2.2 Function key display area

Column	Position	Label	Description
1	(1)	[I/O menu]	Changes to the <Input/output menu> screen.
	(2)	[Spindle]	Changes to the <I/O servo controller(spindle)> screen.
	(3)	[X-axis]	Changes to the <I/O servo controller(X-axis)> screen.
	(4)	[Y-axis]	Changes to the <I/O servo controller(Y-axis)> screen.
	(5)	[Z-axis]	Changes to the <I/O servo controller(Z-axis)> screen.
	(6) ~ (8)	[*-axis] *: Additional axis	Changes to the <I/O servo controller(*-axis)> screen.
2	(1)	[I/O menu]	Same as the first column.
	(2) ~ (3)	[*-axis] *: Additional axis	Changes to the <I/O servo controller(*-axis)> screen.
	(4)	[Magazine]	Changes to the <I/O servo controller(magazine)> screen.
	(5)	[P1-axis]	Changes to the <I/O servo controller(P1-axis)> screen.
	(6)	[P2-axis]	Changes to the <I/O servo controller(P2-axis)> screen.
	(7)	[P3-axis]	Changes to the <I/O servo controller(P3-axis)> screen.
	(8)	[P4-axis]	Changes to the <I/O servo controller(P4-axis)> screen.
	(1)	[I/O menu]	Same as the first column.
3	(2)	[AT-axis]	Changes to the <I/O servo controller(AT-axis)> screen.
	(3)		
	(4)		
	(5)		
	(6)		
	(7)		
	(8)		

(NOTE) Set the additional axis <Address> and <Installation position> in the machine parameter to assign the 5th through the 8th-axes from the following options: A1-axis, A2-axis, B1-axis, B2-axis, C1-axis and C2-axis.

### 6.3.2.3 Other operations

The user can change the display axes with the cursor keys as well.

## 6.4 External I/O Signals

The external I/O signal status is shown for the NC unit.

### 6.4.1 Input Signal

The input signal status is shown on 3 screens for input signals 1 to 3.

Press a key between the [Input signal1] key and the [Input signal3] key to display the corresponding screen.



6

Main display area

Position	Name	Description
1	Signal name	Displays the signal name.
2	Signal status	Displays the signal status (ON or OFF).

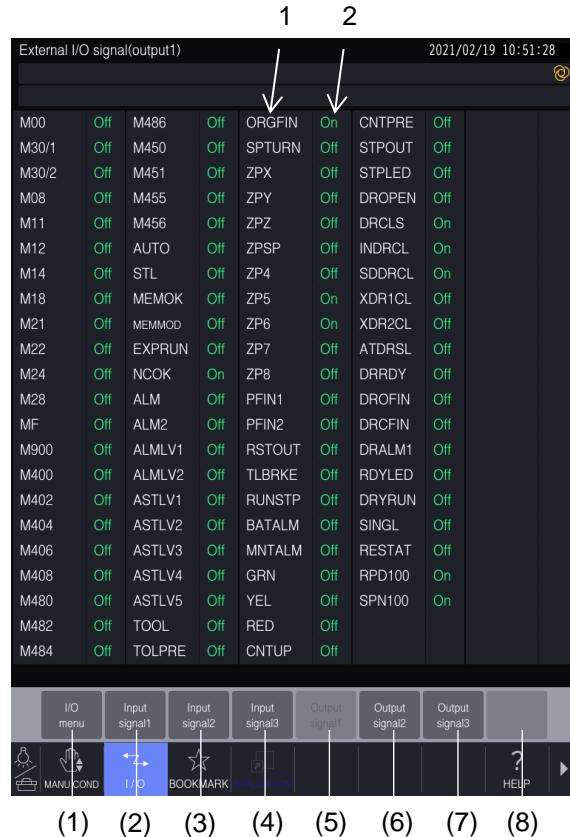
Function key display area

Column	Position	Label	Description
1	(1)	[I/O menu]	Changes to the <Input/output menu> screen.
	(2)	[Input signal1]	Changes to the <External I/O signal(input1)> screen.
	(3)	[Input signal2]	Changes to the <External I/O signal(input2)> screen.
	(4)	[Input signal3]	Changes to the <External I/O signal(input3)> screen.
	(5)	[Output signal1]	Changes to the <External I/O signal(output1)> screen.
	(6)	[Output signal2]	Changes to the <External I/O signal(output2)> screen.
	(7)	[Output signal3]	Changes to the <External I/O signal(output3)> screen.
	(8)		

## 6.4.2 Output Signal

The output signal status is shown on 3 screens for output signals 1 to 3.

Press a key between the [Output signal1] key and the [Output signal3] key to display the corresponding screen.



6

Main display area

Position	Name	Description
1	Signal name	Displays the signal name.
2	Signal status	Displays the signal status (ON or OFF).

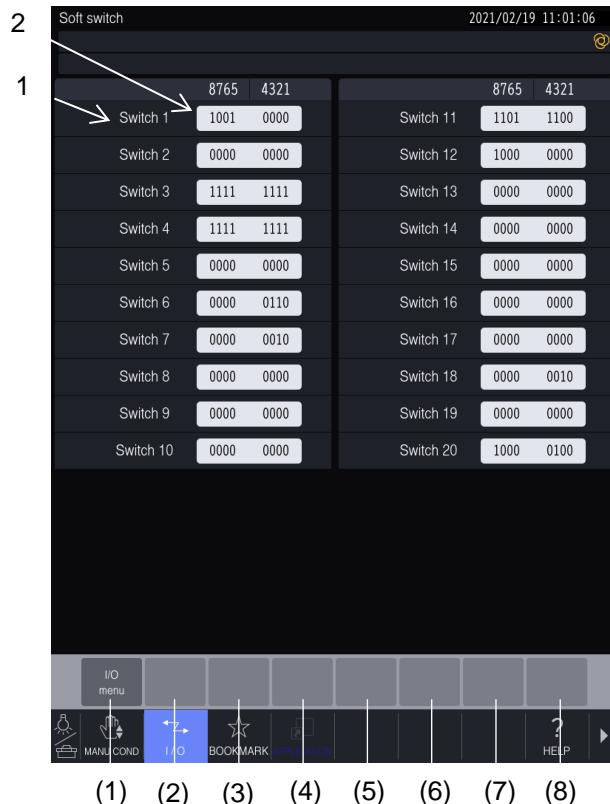
Function key display area

Column	Position	Label	Description
1	(1)	[I/O menu]	Changes to the <Input/output menu> screen.
	(2)	[Input signal1]	Changes to the <External I/O signal(input1)> screen.
	(3)	[Input signal2]	Changes to the <External I/O signal(input2)> screen.
	(4)	[Input signal3]	Changes to the <External I/O signal(input3)> screen.
	(5)	[Output signal1]	Changes to the <External I/O signal(output1)> screen.
	(6)	[Output signal2]	Changes to the <External I/O signal(output2)> screen.
	(7)	[Output signal3]	Changes to the <External I/O signal(output3)> screen.
	(8)		

## 6.5 Software Switches

### 6.5.1 Software Switch Screen

On the <Soft switch> screen, the settings for the software switches can be referenced.



6

#### 6.5.1.1 Main display area

This area displays the setting status of the software switches.

Position	Name	Description
1	Software switch number	Displays the software switch numbers.
2	Software switch setting value	Displays the set value for the software switches in binary code.

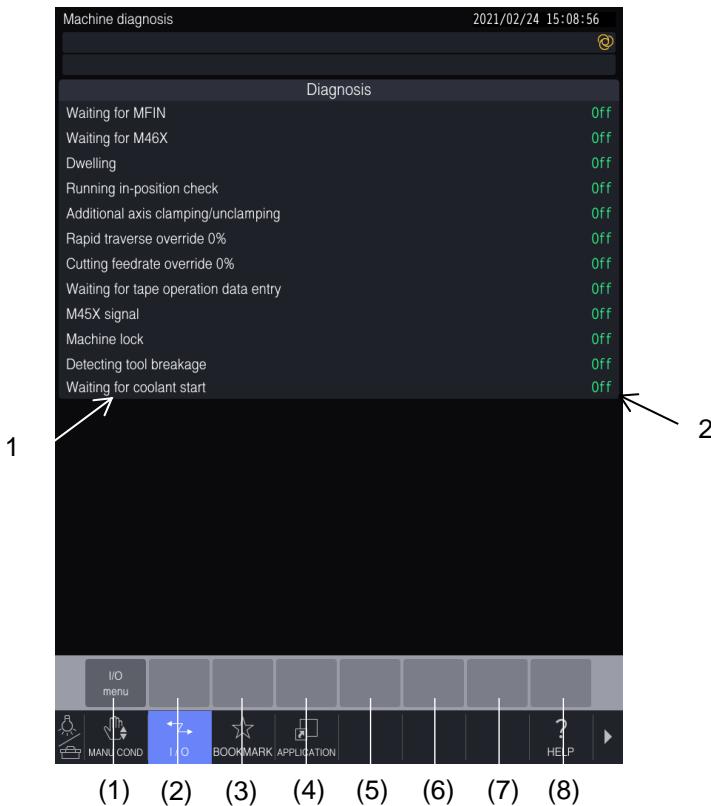
#### 6.5.1.2 Function key display area

Column	Position	Label	Description
1	(1)	[I/O menu]	Changes to the <Input/output menu> screen.
	(2)		
	(3)		
	(4)		
	(5)		
	(6)		
	(7)		
	(8)		

## 6.6 Machine Diagnostics

When the machine is not operating but the lamp for the [START] switch is lit up, a diagnostics check is carried out to find the cause.

The following screen is shown for the machine diagnostics.



6

Main display area

Position	Name	Description
1	Diagnostic item	Displays the items in the machine diagnostics.
2	Diagnostic results	Displays the results from the machine diagnostics.

Function key display area

Column	Position	Label	Description
1	(1)	[I/O menu]	Changes to the <Input/output menu> screen.
	(2)		
	(3)		
	(4)		
	(5)		
	(6)		
	(7)		
	(8)		

### 6.6.1 Display Items

The status for each display item is described in the table below.

The description below applies to the item when the <OFF> status is not displayed.

Item name	Description of display
<Waiting for MFin>	Signal status Ex: M67
<Waiting for M46X>	Waiting for signal name ON (OFF) Ex: Waiting for M460 signal ON * When waiting for multiple signals to turn ON/OFF simultaneously, the waiting status for the signal with the smallest number is given priority when displayed.
<Dwelling>	ON
<Running in-position check>	(Axis name) ON Ex: X-, Y- and Z-axes ON
<Additional axis clamping/unclamping>	Axis name clamping/unclamping Ex: A1 clamping
<Rapid traverse override 0%>	Axis name Ex: XZ6
<Cutting feedrate override 0%>	ON
<Waiting for tape operation data entry>	ON * Turns OFF before M30 is executed during operation.
<M45X signal>	Signal name Ex: M450 * When outputting the M450 signal and M451 signal simultaneously, the status for the M450 signal is given priority when displayed.
<Machine lock>	ON
<Detecting tool breakage>	ON
<Waiting for coolant start>	ON

## 6.7 PLC

Refer to the PLC System Manual.

## 6.8 Running Counters

### 6.8.1 Referencing Running Counters



6

Position	Name	Description
1	Current counter value	After being shipped from the factory or after a component is replaced, the counters such as the tool replacement counter or the counter for total travel amount on each axis are displayed.

Function key display area

Column	Position	Label	Description
1	(1)	[I/O menu]	Changes to the <Input/output menu> screen.
	(2)		
	(3)		
	(4)		
	(5)		
	(6)		
	(7)		
	(8)		

## 6.8.2 Presentation item

The following items are displayed.

The items do not change on different machine models or when there are different options.

Item name	Unit	Display description
Spindle	x1000 revs	
Spindle motor	x1000 revs	
Spindle acc./dec.	Times	<p>Displays the total number of times that the spindle accelerates or decelerates.          (NOTE)</p> <ul style="list-style-type: none"> <li>• The count does not apply to the changes in the spindle speed when using the [SPINDLE OVERRIDE] switch.</li> <li>• 1 time is counted when the spindle orientation is executed.</li> </ul> <p>0 to 999999999</p>
X-axis ball screw	m	
X-axis guide	m	
X-axis motor	x100 revs	
Y-axis ball screw	m	
Y-axis guide	m	
Y-axis motor	x100 revs	
Z-axis ball screw	m	
Z-axis guide	m	
Z-axis motor	x100 revs	
QT-axis	Rotation	
5-axis	Rotation	(NOTE) When the machine parameter (system 2: additional axis) <Optional axis> (5th to 8th-axis) is set to <Yes (lathe spindle)>, “×1000 revs” is used for the unit display.
6-axis	Rotation	
7-axis	Rotation	
8-axis	Rotation	
P1 axis motor	x100 revs	
P2 axis motor	x100 revs	
P3 axis motor	x100 revs	
P4 axis motor	x100 revs	
Tool change	Times	
Magazine turn	Pitch	
QT clamp	Times	
Pallet 1 indexing	Times	
Pallet 2 indexing	Times	
CTS coolant	hhmmss	
CTS coolant	Times	
Coolant pump ON	Times	0 to 999999999
Outer/front door closed	Times	
Outer/front door locked	Times	
Left side door closed	Times	
Left side door locked	Times	
Right side door closed	Times	
Right side door locked	Times	
Inner door closed	Times	
Inner door locked	Times	
Close outside door 1	Times	
Outside door 1 locked	Times	
Close outside door 2	Times	
Outside door 2 locked	Times	
Setup chamber left door closed	Times	
Setup chamber left door locked	Times	

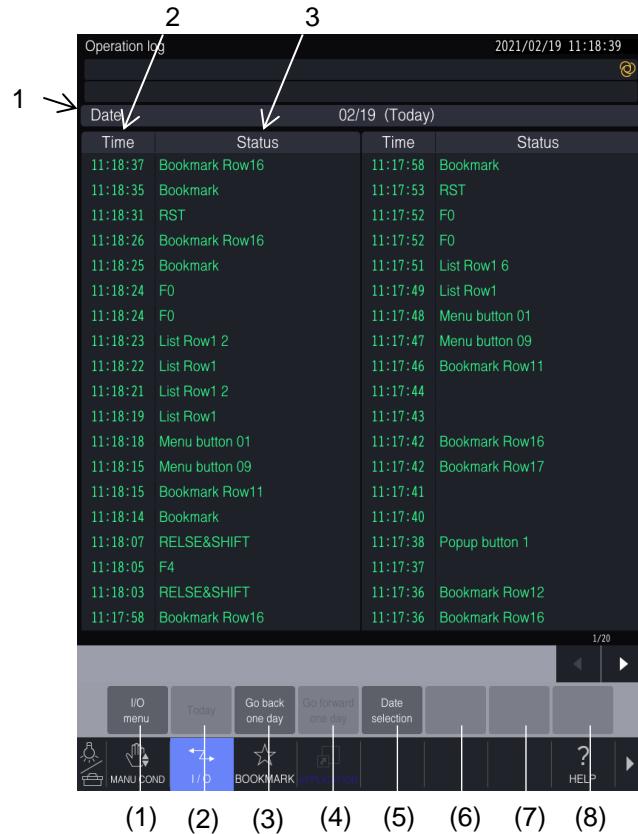
Item name	Unit	Display description
Setup chamber right door closed	Times	
Setup chamber right door locked	Times	
Magazine door closed	Times	
Magazine door locked	Times	
Magazine chamber shutter	Times	
Servo control ON	Times	Displays the total number of times that the servo relay control is changed from OFF to ON.
Brake 1 ON	Times	Displays the total number of times that the brake 1 release input signal changes the brake from a release status to ON.
Brake 2 ON	Times	Displays the total number of times that the brake 2 release input signal changes the brake from a release status to ON.
Brake 3 ON	Times	Displays the total number of times that the brake 3 release input signal changes the brake from a release status to ON.
Brake 4 ON	Times	Displays the total number of times that the brake 4 release input signal changes the brake from a release status to ON.
Brake 5 ON	Times	Displays the total number of times that the brake 5 release input signal changes the brake from a release status to ON.
Accumulated capa. Time	hhmmss	Measures the temperature inside the control box every 1 minute when the power is ON and calculates the time. 00000:00:00 to 99999:59:59
Power ON	Times	
Batteries on relocation detection device	Day	Displays the current number of days elapsed after changing the batteries on the relocation detection device. On machines not equipped with a relocation detection device, 0 is always displayed.
Tool breakage detector	Times	

## 6.9 Operation Log

The time of the key and switch operations as well as a description of the status and operation are displayed in the log.

The operation log is saved for a 30 day period in 1 day units (may be less depending on the amount of data).

The user can display the log and check a specific day by pressing one of the following keys: [Today], [Previous day] and [Next day].



2021/02/19 11:18:39

2  
Date → 02/19 (Today)  
3  
Status

Time	Status	Time	Status
11:18:37	Bookmark Row16	11:17:58	Bookmark
11:18:35	Bookmark	11:17:53	RST
11:18:31	RST	11:17:52	F0
11:18:26	Bookmark Row16	11:17:52	F0
11:18:25	Bookmark	11:17:51	List Row1 6
11:18:24	F0	11:17:49	List Row1
11:18:24	F0	11:17:48	Menu button 01
11:18:23	List Row1 2	11:17:47	Menu button 09
11:18:22	List Row1	11:17:46	Bookmark Row11
11:18:21	List Row1 2	11:17:44	
11:18:19	List Row1	11:17:43	
11:18:18	Menu button 01	11:17:42	Bookmark Row16
11:18:15	Menu button 09	11:17:42	Bookmark Row17
11:18:15	Bookmark Row11	11:17:41	
11:18:14	Bookmark	11:17:40	
11:18:07	RELSE&SHIFT	11:17:38	Popup button 1
11:18:05	F4	11:17:37	
11:18:03	RELSE&SHIFT	11:17:36	Bookmark Row12
11:17:58	Bookmark Row16	11:17:36	Bookmark Row16

1/20

(1) I/O menu (2) Today (3) Go back one day (4) Go forward one day (5) Date selection (6) (7) (8) HELP

When the [Date selection] key is pressed, the operation log displays a list of recorded operations and the corresponding dates. The user can tap on a date from the list, or the user can select a date to display and check the operation log for that date.



6

Main display area

Position	Name	Description
1	Date	Displays the day when the operation was performed.
2	Time	Displays the time when the operation was performed.
3	Operation description	Displays a description of the operation.
4	Log day	Displays the log date when the operation is recorded.

Function key display area

Column	Position	Label	Description
1	(1)	[I/O menu]	Changes to the <Input/output menu> screen.
	(2)	[Today]	Displays the user operation log for “today” (current day).
	(3)	[Previous day]	Displays the user operation log for the previous day.
	(4)	[Next day]	Displays the user operation log for the next day.
	(5)	[Date selection]	Displays a list of dates of the recorded operations.
	(6)		
	(7)		
	(8)		

(NOTE) Even if an operation is carried out on this screen, it is not displayed at this time. First, change to another screen display, and then return to this screen again to see the information updated.

### 6.9.1 Maximum Operation Count That Can Be Saved

The maximum number of operations that can be recorded in 30 day period is 150,000 operations. When the number of operations exceeds 150,000 operations, the data for older operations is deleted first and the data log for new operations is saved.

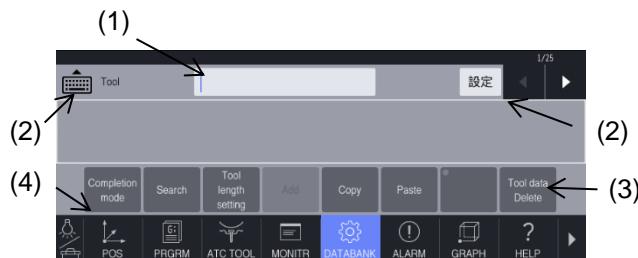
### 6.9.2 Types of Operations That Are Saved

- Operation panel key and switch operations (Text color: Green)
- Handle switch operations (Text color: Green)
- Touch panel operation (Text color: Green)
- Slave station communication commands (Text color: Green)  
(The slave station communication command is registered in the key-only log.)

- (NOTE 1) Key operations on the operation log screen, maintenance input and password input are not saved.
- (NOTE 2) Keys that are repeatedly input (cursor keys, etc.) are recorded as one operation from the time that it is pressed until released.
- (NOTE 3) Switches (such as [START] switches, etc.) are recorded as one operation from the time that it is pressed until released. The operation is recorded to the operation log when the switch is pressed.
- (NOTE 4) The handle attachment and removal operations are not recorded.
- (NOTE 5) On the touch panel, the following operations are recorded: when touching the screen with a finger, when releasing a finger after touching the screen and when pressing a key. The history of user operations for finger touch screen and release operations are not displayed on the screen. As a result, even if the maximum number of records is reached, the display may not show 150,000 records.

#### 6.9.2.1 Example of operations log for touch panel operation

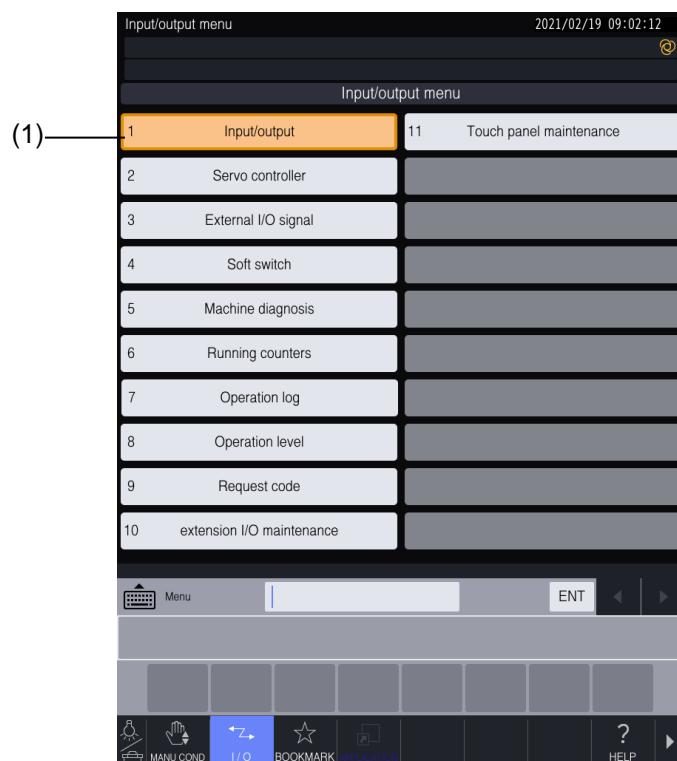
Example of data input field, function display area and control key display area



Position	Item name	Operations log example	Description
(1)	Data input field	Edit area 11	Records the target area (categorized by a number) where a character is inserted and the specific position in the character string.
(2)	Standard key	Keyboard display and settings	Records the user operations for each key function using the text for that function.
(3)	Function key	F0~F7、F8~F15	Records the operations for F0 to F7 (starting from leftmost position) in the function display area. The functions on the next page are recorded for F8 to F15. The function key numbers follow the same pattern and increase on each successive page.
(4)	Screen key	Position, program and ATC tool	Records the names of the screen keys as text in the log.

Example of main display area

- When performing operations on the menu



6

Position	Item name	Operations log example	Description
(1)	Menu item	Menu 01	Records the operations for 01 to 20 starting from the top-left position in the menu.

## Chapter 6 Input/Output

- When performing operations on the list

(1)

0001	Select mode	Memory operation mode
0002	Display home screen at power ON	No Yes
0003	Machine No.	88
0004	Table load weight	300 kg
0005	Adjust tracking accuracy by load weight	Invalid Valid
0006	Override switch	TrueValid FalseValid

(2)

	X軸	Y軸	Z軸
0001	Distance to zero point		645.0000
0002	Ball screw diameter	28.0000	28.0000
0003	Bearing position on fixed side	-1118.5000	-615.5000
0004	Bearing position on free side	102.0000	106.0000
0005	Motor installation position	Fixe...	Free side ▾

(3)

0001	Select mode	Memory operation mode
0002	Display home screen at power ON	Manual mode Memory operation mode
0003	Machine No.	oo
0004	Table load weight	300 kg
0005	Adjust tracking accuracy by load weight	Invalid Valid
0006	Override switch	TrueValid FalseValid

6

Position	Item name	Operations log example	Description
(1)	List item	Line 3 on list	Records the line number when the user taps on a list item in column 1.
(2)	List item with multiple columns (fields)	3 column display list – Line 3, column 1	Records the line number and column number when there are multiple columns (fields) for an item and the user taps on one of them.
(3)	Combo box	Line 1, selection 2 in list	When the user taps on a selection in the combo box in the list, the list information and the number of the item that was tapped is recorded.

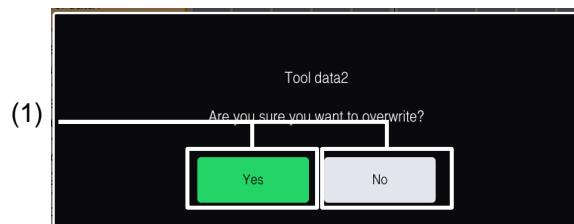
High accuracy (High accuracy A) 2021/02/19 14:31:36

	M260	M261	M262	M263
Command M code	120	60	70	120
Corner deceleration override	200	140	70	200
Arc deceleration override	200	140	70	200
Curve approximation deceleration override	200	140	70	200
Smooth path offset level	1	1	1	1
Smooth override	100	50	600	900
Cutting feed time constant selection	Group 1 ▾	Group 1 ▾	Group 1 ▾	Group 1 ▾
Minute block deletion distance	0.0000	0.0000	0.0000	0.0000
Accuracy level	0.0000	0.0000	0.0000	0.0000
Command M code	M264	M265	M266	M267
Corner deceleration override	120	600	100	100
Arc deceleration override	200	1000	100	100
Curve approximation deceleration override	200	1000	100	100
Smooth path offset level	1	1	1	1
Smooth override	2500	100	100	100
Cutting feed time constant selection	Group 1 ▾	Group 1 ▾	Group 1 ▾	Group 1 ▾
Minute block deletion distance	0.0000	0.0000	0.0000	0.0000
Accuracy level	0.0000	0.0000	0.0000	0.0000

(1)

Position	Item name	Operations log example	Description
(1)	Individualized list	Line 4, column 5 for high accuracy	The individualized list on each screen is recorded under the name for the function. When there is only 1 column, the line is displayed. When there are multiple columns, the lines and columns are displayed.

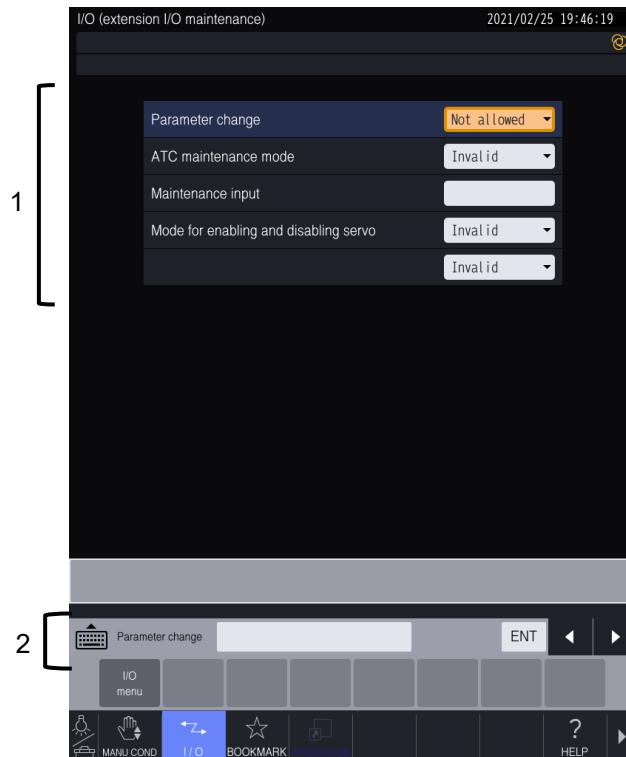
- When performing operations on the popup display



Position	Key	Operations log example	Description
(1)	Popup selections	Popup 1 and popup 2	Records the operations as popup 1 and 2 (starting from the left). If there are more than two keys, the numbers are assigned in the same way starting from the left.

## 6.10 Extension Maintenance

### 6.10.1 Extension Maintenance Screen



#### 6.10.1.1 Description of screen display

Position	Name	Description
1	Maintenance setting	Displays the settings used for maintenance.
2	Data input field	Used for entering maintenance settings.

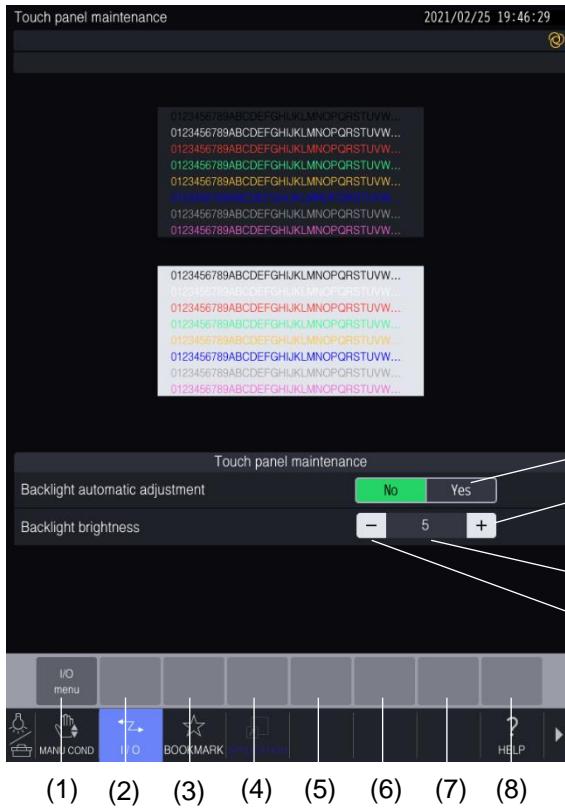
#### 6.10.1.2 Description of screen operation

##### 1. Description of function key operations

Column	Position	Label	Description
1	(1)	[I/O menu]	Changes to the <Input/output menu> screen.
	(2)		
	(3)		
	(4)		
	(5)		
	(6)		
	(7)		
	(8)		

## 6.11 Touch Panel Maintenance Screen

The following screen is displayed when <Touch panel maintenance> is selected from the <Input/output menu> screen.



6

Position	Name	Description
1	Backlight automatic adjustment	Set whether to use the backlight automatic adjustment or not. The automatic adjustment is enabled as the factory default setting. The setting is maintained even if the power is turned OFF.
2	Backlight brightness	Displays the brightness level for the backlight. The backlight can be set to 10 different levels. The factory default setting is set to level 5. The setting is maintained even if the power is turned OFF. When the backlight automatic adjustment is enabled, the character display is grayed out.
3	Brighten display	Brightens the backlight display. When the backlight automatic adjustment is enabled, the user cannot operate and brighten the display manually. This operation display is grayed out.
4	Darken display	Darkens the backlight display. When the backlight automatic adjustment is enabled, the user cannot operate and darken the display manually. This operation display is grayed out.

Column	Position	Label	Description
1	(1)	[I/O menu]	Changes to the <Input/output menu> screen.
	(2)		
	(3)		
	(4)		
	(5)		
	(6)		
	(7)		
	(8)		

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# CHAPTER 7

## MACHINE PARAMETER

7

- 7.1 Overview**
- 7.2 Machine Parameter Menu Screen**
- 7.3 Edit Screen**
- 7.4 Machine Parameters 1 (System 1)**
- 7.5 Machine Parameters 2 (System 2)**
- 7.6 Machine Parameters 3 (System 3)**
- 7.7 Machine Parameters 4 (Pitch Error Compensation)**
- 7.8 Machine Parameters 5 (Servo)**
- 7.9 Machine Parameters 6 (Automatic Thermal Distortion Compensation)**
- 7.10 Machine Parameters 7 (High Accuracy)**
- 7.11 Machine Parameters 8 (PLC)**
- 7.12 Machine Parameters 9 (Special Settings)**
- 7.13 List of Default Values for Machine Parameter (W1000Xd1)**

## 7.1 Overview

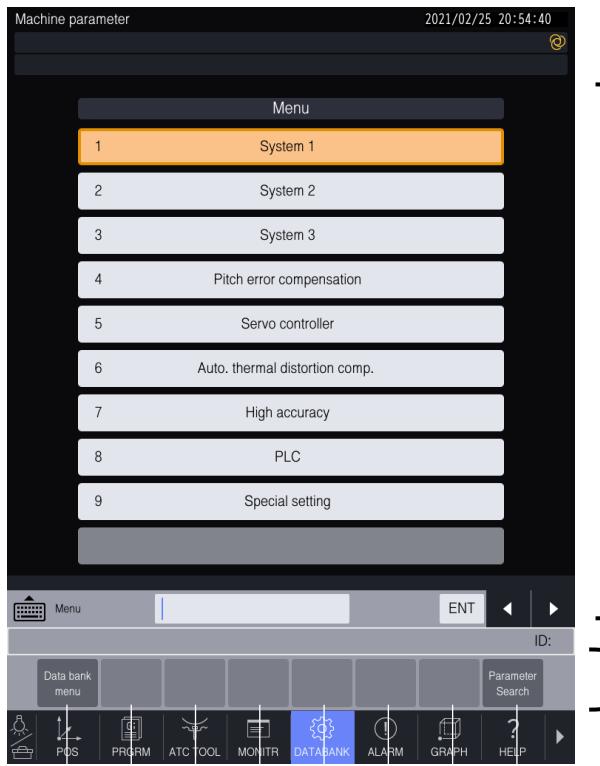
**To customer: Do not change the machine parameters.**  
**If you wish to change the parameters, always contact Brother Customer Service before making any changes.**

The machine parameters are divided into the following categories for each menu.

Menu	Category	Description
System 1	Common	Parameters related to the spindle, ATC, tap and other machine systems.
	X-, Y- and Z-axes	Parameters related to the X-, Y- and Z-axes.
	Automatic door	Parameters related to the automatic door.
System 2	Common	Parameters related to the lathe spindle and other machine systems.
	QT-axis	Parameters related to the QT-axis (4th-axis).
	Additional axis	Parameters related to the additional axes (5th to 8th-axes).
System 3	Common	Parameters related to the magazine axis and other machine systems.
Pitch error compensation	Common	Parameters related to the pitch error compensation.
	Pitch error (*-axis)	Compensation value for pitch error on QT-axis (4th-axis) and additional axis (5th to 10th-axes)
Servo	*-axis	Parameters related to servos for the spindle, X-, Y- and Z-axes, QT-axis, 5th to 10th-axes as well as the P1- to P4-axes.
Automatic thermal distortion compensation	Spindle	Parameters related to the automatic thermal distortion compensation on the spindle and lathe spindle.
	X-, Y- and Z-axes	Parameters related to the automatic thermal distortion compensation on the X-, Y- and Z-axes.
High accuracy	Common	Common parameters related to high accuracy mode A/B.
	X-, Y- and Z-axes	Parameters related to the X-, Y- and Z-axes.
	Additional axis	Parameters related to the additional axes (5th to 8th-axes).
	Machining mode(*)	Parameters related to each machining mode (standard/rough/medium rough/medium rough S/finish/finish S) for the high accuracy (machining mode) function.
	Accuracy spec. A/B/C	Parameters related to each accuracy specification mode in the high accuracy (accuracy specification) function.
PLC	PLC-axis	Parameters related to the PLC-axis.
Special setting	Positioning	Parameters related to the special settings (positioning).

## 7.2 Machine Parameter Menu Screen

The <Machine parameter menu> screen below is displayed when the [Machine parameter] is selected from the <Data bank menu> screen.



(1) (2) (3) (4) (5) (6) (7) (8)

7

Position	Name	Description
1	Menu	Displays the machine parameter menu screen.
2	Data input field	This field is for entering and selecting a menu number.

Function key display area

Column	Position	Label	Description
1	(1)	[Data bank menu]	Changes to the <Data bank menu> screen.
	(2)		
	(3)		
	(4)		
	(5)		
	(6)		
	(7)		
	(8)	[Parameter Search]	When a parameter number (8 digits) is entered into the data input field and the [Parameter Search] key is pressed, the edit screen is displayed for the specified parameter number and the cursor moves to the specified parameter number.

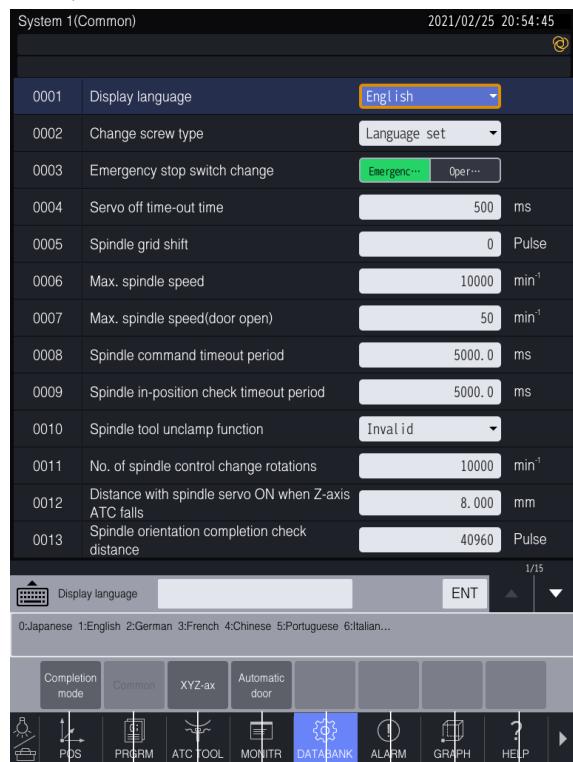
## 7.3 Edit Screen

When an item is selected from the <Menu> screen, the edit screen for that item is displayed.

### 7.3.1 <System 1> Screen

#### 7.3.1.1 Description of screen display

<System 1(Common)> screen



(1) (2) (3) (4) (5) (6) (7) (8)

7

Position	Name	Description
1	Parameter list	Displays each parameter item and the corresponding value.

## &lt;System 1(XYZ-ax)&gt; screen



		X-axis	Y-axis	Z-axis
0001	Distance to zero point			480.000
0002	Ball screw diameter	28.000	28.000	28.000
0003	Bearing position on fixed side	-1118.500	-615.500	54.500
0004	Bearing position on free side	102.000	106.000	703.500
0005	Motor installation position	0:Fixed... ▼	1:Free ... ▼	1:Free ... ▼
0006	Ball screw lead (mm)	16	12	16
0007	Marked position for adjustment	-500.000	-250.000	480.000
0008	Absolute encoder rotation direction	1:Normal... ▼	0:Normal... ▼	0:Normal... ▼
0009	Backlash compensation	0	0	0
0010	Stroke 1 (-)	-1000.000	-500.000	180.000
0011	Stroke 1 (+)	0.000	0.000	
0012	Stroke 2 (-)	0.000	0.000	0.000

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Distance to zero  
point mm ENT ▲ ▼

Completion mode Common XYZ-ax Automatic door

POS PERM ATC TOOL MONITR DATABANK ALARM GRAPH HELP

(1) (2) (3) (4) (5) (6) (7) (8)

Position	Name	Description
1	Parameter list	Displays each parameter item and the parameter value for each axis.

<System 1 (Automatic door)> screen



7

Position	Name	Description
1	Parameter list	Displays each parameter item and the corresponding value.

### 7.3.1.2 Description of screen operation

#### 1. Description of function key operations

Column	Position	Label	Description
1	(1)	[Completion mode]	Ends and exits the editing for the machine parameter (system 1).
	(2)	[Common]	Moves the cursor to the <System 1(Common)> screen header.
	(3)	[XYZ-ax]	Moves the cursor to the <System 1(XYZ-ax)> screen header.
	(4)	[Automatic door]	Moves the cursor to the <System 1 (Automatic door)> screen header.
	(5)		
	(6)		
	(7)		
	(8)		

#### 2. Description of parameter list operations

- Tap on an item to edit it.
- Press the [ENT] key to edit the corresponding item.
- An item can be selected with the [CURSOR] keys (up, down, left and right).
- The user can press the [Previous page] key or the [Next page] key to change the page.

### 3. Description of completion mode operations



Description of function key operations

7

Column	Position	Label	Description
1	(1)	[Save and end]	Saves the edited content and exits machine parameter editing. Goes back to the menu screen.
	(2)		
	(3)		
	(4)	[Cancel w/o saving changes]	Discards the edited content and exits machine parameter editing. However, the overwritten content is still valid.
	(5)		
	(6)		
	(7)	[Overwrite save]	Saves the edited content and continues with machine parameter editing. Goes back to the edit screen.
	(8)	[Edit mode]	Continues with machine parameter editing without saving the edited content. Goes back to the edit screen.

### 7.3.2 <Pitch error compensation> Screen

#### 7.3.2.1 Description of screen display

<Pitch error compensation (pitch error (QT-axis))> screen



7

Position	Name	Description
1	List of compensation values	Displays the number of the pitch error and the compensation amount or value.

The screens from the <Pitch error compensation (pitch error (5th-axis))> to the <Pitch error compensation (pitch error (10th-axis))> have the same display as <Pitch error compensation (pitch error (QT-axis))>.

&lt;Pitch error compensation (common)&gt; screen



1

Position	Name	Description
1	Parameter list	Displays each parameter item and the corresponding value.

7

### 7.3.2.2 Description of screen operation

#### 1. Description of function key operations

Column	Position	Label	Description
1	(1)	[Completion mode]	Ends and exits the editing for the machine parameter (pitch error compensation).
	(2)	[Pitch error (QT-axis)]	Moves the cursor to the <Pitch error compensation (pitch error (QT-axis))> screen header.
	(3)	[Pitch error (5th-axis)]	Moves the cursor to the <Pitch error compensation (pitch error (5th-axis))> screen header.
	(4)	[Pitch error (6th-axis)]	Moves the cursor to the <Pitch error compensation (pitch error (6th-axis))> screen header.
	(5)	[Pitch error (7th-axis)]	Moves the cursor to the <Pitch error compensation (pitch error (7th-axis))> screen header.
	(6)	[Pitch error (8th-axis)]	Moves the cursor to the <Pitch error compensation (pitch error (8th-axis))> screen header.
	(7)	[Pitch error (M-axis)]	Moves the cursor to the <Pitch error compensation (pitch error (M-axis))> screen header.
	(8)	[Pitch error (10th-axis)]	Moves the cursor to the <Pitch error compensation (pitch error (10th-axis))> screen header.
2	(1)	[Completion mode]	Ends and exits the editing for machine parameter 4 (pitch error compensation).
	(2)	[Common]	Moves the cursor to the <Pitch error compensation (common)> screen header.
	(3)		
	(4)		
	(5)		
	(6)		
	(7)		
	(8)		

2. Description of parameter list operations
  - Tap on an item to edit it.
  - Press the [ENT] key to edit the corresponding item.
  - An item can be selected with the [CURSOR] keys (up, down, left and right).
  - The user can press the [Previous page] key or the [Next page] key to change the page.

### 7.3.3 <Servo controller> Screen

#### 7.3.3.1 Description of screen display

<Servo controller (Spindle)> screen



Position	Name	Description
1	List of servo values	Displays the servo parameter number and the corresponding value.

The other screens have the same display as the <Servo controller (Spindle)> screen.

### 7.3.3.2 Description of screen operation

#### 1. Description of function key operations

Column	Position	Label	Description
1	(1)	[Completion mode]	Ends and exits the editing for the machine parameter (servo).
	(2)	[Spindle]	Moves the cursor to the <Servo controller (Spindle)> screen header.
	(3)	[X-axis]	Moves the cursor to the <Servo controller (X-axis)> screen header.
	(4)	[Y-axis]	Moves the cursor to the <Servo controller (Y-axis)> screen header.
	(5)	[Z-axis]	Moves the cursor to the <Servo controller (Z-axis)> screen header.
	(6)	[QT-axis]	Moves the cursor to the <Servo controller (QT-axis)> screen header.
	(7)	[5-axis]	Moves the cursor to the <Servo controller (5-axis)> screen header.
	(8)	[6-axis]	Moves the cursor to the <Servo controller (6-axis)> screen header.
2	(1)	[Completion mode]	Ends and exits the editing for the machine parameter (servo).
	(2)	[7-axis]	Moves the cursor to the <Servo controller (7-axis)> screen header.
	(3)	[8-axis]	Moves the cursor to the <Servo controller (8-axis)> screen header.
	(4)	[M-axis]	Moves the cursor to the <Servo controller (M-axis)> screen header.
	(5)	[10-axis]	Moves the cursor to the <Servo controller (10-axis)> screen header.
	(6)	[P1-axis]	Moves the cursor to the <Servo controller (P1-axis)> screen header.
	(7)	[P2-axis]	Moves the cursor to the <Servo controller (P2-axis)> screen header.
	(8)	[P3-axis]	Moves the cursor to the <Servo controller (P3-axis)> screen header.
3	(1)	[Completion mode]	Ends and exits the editing for the machine parameter (servo).
	(2)	[P4-axis]	Moves the cursor to the <Servo controller (P4-axis)> screen header.
	(3)		
	(4)		
	(5)		
	(6)		
	(7)		
	(8)		

#### 2. Description of parameter list operations

- Tap on an item to edit it.
- Press the [ENT] key to edit the corresponding item.
- An item can be selected with the [CURSOR] keys (up, down, left and right).
- The user can press the [Previous page] key or the [Next page] key to change the page.

### 7.3.4 <High accuracy> Screen

#### 7.3.4.1 Description of screen display

The <High accuracy (Common)> screen has the same display as the <System 1(Common)> screen.

The <High accuracy (XYZ axes)> screen and the <High accuracy (additional axis)> have the same display as the <System 1(XYZ-ax)> screen.

<High accuracy (Machining mode (Standard))> screen



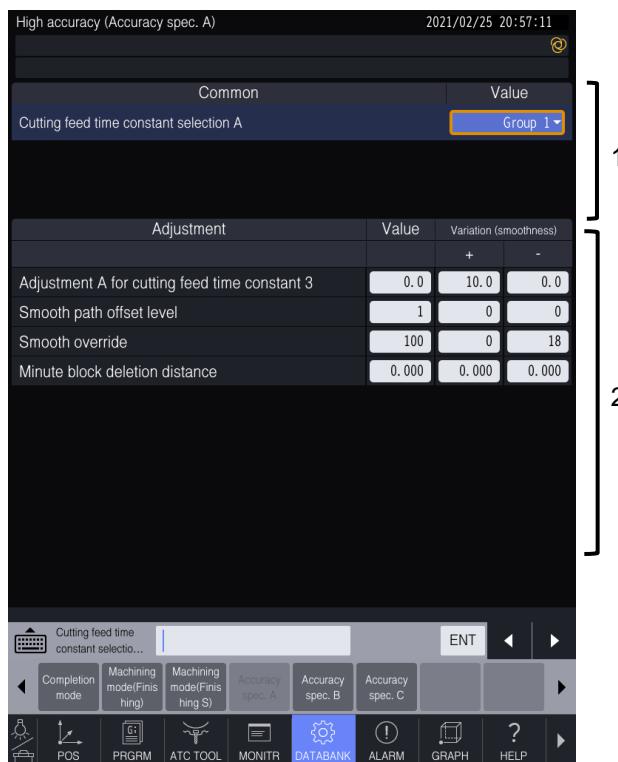
7

Position	Name	Description
1	Common parameter list	Displays each parameter item and the corresponding value used in each machining mode for the high accuracy (machining mode) function.
2	Adjustment parameter list	Displays each parameter item, the corresponding value and the adjusted amount used in each machining mode for the high accuracy (machining mode) function.

The <High accuracy (Rough/Medium rough/Medium rough S/Finishing/Finishing S)> screens have the same display as the <High accuracy (Standard)> screen.

Refer to “6.2.5 Machining mode settings” in Operation Manual II for details on the high accuracy (machining mode) function.

<High accuracy (Accuracy spec. A)> screen



Position	Name	Description
1	Common parameter list	Displays each parameter item and the corresponding value used in each accuracy specification mode for the high accuracy (accuracy specification) function.
2	Adjustment parameter list	Displays each parameter item, the corresponding value and the adjusted amount used in each accuracy specification mode for the high accuracy (accuracy specification) function.

7

The <High accuracy (Accuracy spec. B/C)> screens have the same display as the <High accuracy (Accuracy spec. A)> screen.

Refer to “6.2.5 Machining mode settings” in Operation Manual II for details on the high accuracy (accuracy specification) function.

### 7.3.4.2 Description of screen operation

#### 1. Description of function key operations

Column	Position	Label	Description
1	(1)	[Completion mode]	Ends and exits the editing for the machine parameter (servo).
	(2)	[Common]	Moves the cursor to the <High accuracy (Common)> screen header.
	(3)	[XYZ-axis]	Moves the cursor to the <High accuracy (XYZ-axis)> screen header.
	(4)	[add'l axis]	Moves the cursor to the <High accuracy (add'l axis)> screen header.
	(5)	[Machining mode (standard)]	Moves the cursor to the <High accuracy (Machining mode(Standard))> screen header.
	(6)	[Machining mode (rough)]	Moves the cursor to the <High accuracy (Machining mode(Rough))> screen header.
	(7)	[Machining mode (medium rough)]	Moves the cursor to the <High accuracy (Machining mode(Medium rough))> screen header.
	(8)	[Machining mode (medium rough S)]	Moves the cursor to the <High accuracy (Machining mode(Medium rough S))> screen header.
2	(1)	[Machining mode (finishing)]	Moves the cursor to the <High accuracy (Machining mode(Finishing))> screen header.
	(2)	[Machining mode (finishing S)]	Moves the cursor to the <High accuracy (Machining mode(Finishing S))> screen header.
	(3)	[Accuracy spec. A]	Moves the cursor to the <High accuracy (Accuracy spec. A)> screen header.
	(4)	[Accuracy spec. B]	Moves the cursor to the <High accuracy (Accuracy spec. B)> screen header.
	(5)	[Accuracy spec. C]	Moves the cursor to the <High accuracy (Accuracy spec. C)> screen header.
	(6)		
	(7)		
	(8)		

#### 2. Description of parameter list operations

- Tap on an item to edit it.
- Press the [ENT] key to edit the corresponding item.
- An item can be selected with the [CURSOR] keys (up, down, left and right).
- The user can press the [Previous page] key or the [Next page] key to change the page.

### 7.3.5 <Special setting> Screen

#### 7.3.5.1 Description of screen display

<Special setting (Positioning)> screen



7

Position	Name	Description
1	Parameter list	Displays each parameter item used with the special setting function and the value that corresponds to each level.

Refer to “Chapter 13 Special setting” for details on the special setting function.

#### 7.3.5.2 Description of screen operation

##### 1. Description of function key operations

Column	Position	Label	Description
1	(1)	[Completion mode]	Ends and exits the editing for the machine parameter (servo).
	(2)	[Positioning]	Moves the cursor to the <Special setting (Positioning)> screen header.
	(3)		
	(4)		
	(5)		
	(6)		
	(7)		
	(8)		

##### 2. Description of parameter list operations

- Tap on an item to edit it.
- Press the [ENT] key to edit the corresponding item.
- An item can be selected with the [CURSOR] keys (up, down, left and right).
- The user can press the [Previous page] key or the [Next page] key to change the page.

### 7.3.6 Edit Screen for Other Menu Items

The <System 2>, <System 3>, <Auto. thermal distortion comp.> and <PLC> screens all have the same display and operations as the <System 1> screen.

## 7.4 Machine Parameters 1 (System 1)

### 7.4.1 Common

System 1 (common)			
No.	Item name	Setting range	Description
11000001	Display language	0~9	Sets the display language <0: Japanese, 1: English, 2: German, 3: French, 4: Chinese, 5: Portuguese, 6: Italian, 7: Polish, 8: Czech and 9: Spanish>.
11000002	Change screw type	0~2	Changes the screw type for conversation. When set to <0: Language set>, the screw type depends on machine parameter (system 1: common) <Display language>. When set to <1: For Japan>, the screw type is Japanese. When set to <2: For other than Japan>, the screw type is not Japanese.
11000003	Emergency stop switch change	0~1	<0: Emergency stop, 1: Oper. preparation> Sets whether or not to register to the <Alarm history> when the emergency stop signal is issued. When the parameter is set to <0:Emergency stop>, it triggers the error <<*Emergency button activated (EMS*)>> and registers the error to the <Alarm log>. When the parameter is set to <1: Oper. preparation>, it triggers the error <<*[MASTER] is off>> but it does not register the error to the <Alarm history>.
11000004	Servo off time-out time	0~2000 msec	Sets the time allowed from when a servo OFF level alarm is triggered until the servo is actually turned OFF. If a servo OFF level alarm is triggered and the servo is still ON, even after the set time has elapsed, it forces the servo to turn OFF (turns servo OFF immediately after the alarm is triggered when set to "0").
11000005	Spindle grid shift	-999999~999999 pulses	Sets the amount of shift on the zero point position for the spindle motor. After the zero point signal is detected, this function moves the position even further in the plus (+) or minus (-) direction based on the amount of grid shift and then sets that position as the new zero point.
11000006	Max. spindle speed	1~999999 min <sup>-1</sup>	Sets the maximum speed for the spindle based on the specification.
11000007	Max. spindle speed(door open)	1~999999 min <sup>-1</sup>	Set the spindle maximum speed per the specification when a door is open.
11000008	Spindle command timeout period	0~99999 msec	Sets the time allowed to determine whether or not it reaches the command speed during spindle rotation. The check operation does not execute when the time is "0".
11000009	Spindle in-position check timeout period	0~9999 msec	Sets the time allowed for the in-position check on each axis. The check operation does not execute when the time is "0".
11000010	Spindle tool unclamp function	0~1	<0: Invalid, 1: Valid> Enables or disables the spindle tool unclamp function.
11000011	No. of spindle control change rotations	0~999999 min <sup>-1</sup>	Sets the spindle speed that changes the control mode, when changing from spindle rotation to orientation.
11000012	Distance with spindle servo ON when Z-axis ATC falls	0~999.999mm	Set the position where the servo turns ON for the spindle, using the distance from the Z-axis zero point, when the ATC falls during an ATC motion with a spindle rotation command.
11000013	Spindle orientation completion check distance	0~999999 pulses	Sets the distance and time to confirm if the spindle orientation operation is complete. The spindle orientation is determined to be complete when the spindle position deviation is within the set time and set distance.
11000014	Spindle orientation completion check time	0~9999 msec	
11000015	Spindle orientation tolerance	0~999999 pulses	Sets the tolerance for the position deviation error after the spindle orientation is complete. The error <<Spindle position shifted>> is triggered when the position deviation is higher than the set value. The check operation does not execute when the setting is <0>.
11000016	Spindle orientation monitoring time	0~9999 msec	Sets the time period for spindle orientation monitoring. The check operation does not execute when the setting is <0>.
11000017	Spindle orientation monitoring distance	0~999999 pulses	Sets the distance for spindle orientation monitoring. The check operation does not execute when the setting is <0>.
11000018	Spindle orientation monitoring torque	0~999%	Sets the torque for spindle orientation monitoring. The check operation does not execute when the setting is <0>.

System 1 (common)			
No.	Item name	Setting range	Description
11000019	Center-through-coolant option	0~1	<0: Not equipped 1: Equipped > Sets whether the system is equipped with a center-through-coolant option.
11000020	Air blow/Tool wash option	0~3	Sets the method for cleaning the end of the spindle and the clamp on the tool holder. <0: Spindle air blow type 1> <1: Tool wash type 1> <2: Spindle air blow type 2> <3: Tool wash type 2> When set to <2: Spindle air blow type 2> or <3: Tool wash type 2>, the machine parameter (system 1: common) <Air pressure check time for air blow/tool wash> and the <Air pressure check time after air blow/tool wash> are enabled.
11000021	Air blow/Tool wash control method	0~3	Sets the timing when the spindle air blow and tool cleaning turn ON during a tool change. <0: Type 1>...Turret type ATC: Turns ON after the Z-axis position rises the distance to Z-axis zero point. Arm type ATC: Turns ON when the arm turns. <1: Type 2>...Turns ON when the Z-axis position lowers from the ATC zero point. <2: Type 3>...Turns ON after the Z-axis position rises to the ATC zero point. <3: Type 4>...Changes the timing in the machine parameter <Tool wash start position>. (NOTE 1) <1: Type 2> and <2: Type 3> are only valid when using a turret type ATC. (NOTE 2) Do not set the parameter to <1: Type 2> when equipped with the tool cleaning option.
11000022	Air pressure check time for air blow/tool wash	0~999×10 msec	Sets the time it takes for the alarm <<Air pressure low>> to trigger when an air pressure drop is detected during the spindle air blow or tool wash operation. If the set time elapses when an air pressure drop is detected, the alarm <<Air pressure low>> is triggered. The check operation does not execute when the value is set to 1 or less. This parameter is valid when <Spindle air blow/tool wash> is set to <2: Spindle air blow type 2> or to <3: Tool wash type 2>.
11000023	Air pressure check time after air blow/tool wash	0~999×10 msec	Sets how long the <Check time for low pressure detect for spindle air blow/tool wash> is enabled after the spindle air blow/tool wash has been carried out. The <Check time for low pressure detect for spindle air blow/tool wash> is enabled from the time when the spindle air blow/tool wash is complete until this set time has elapsed. This parameter is valid when <Spindle air blow/tool wash> is set to <2: Spindle air blow type 2> or to <3: Tool wash type 2>.
11000024	Z-axis lowering speed when checking tool wash filter	1~999999 mm/min	This parameter cannot be used.
11000025	Tool wash start position change offset (Type 4)	0~50	Changes the timing when the tool wash turns ON, depending on the magazine rotation pitch during a single tool change operation while in memory operation and MDI operation modes. Tool wash turns ON after the Z-axis position rises to the ATC zero point, when the magazine rotation pitch is more than the set value. Tool wash turns ON after the Z-axis position rises the distance to Z-axis zero point, when the magazine rotation pitch is less than the set value. (NOTE) Only valid when the conditions below are all met. Turret type ATC model <Spindle air blow/Tool wash> is set to <1: Tool wash type 1> or <3: Tool wash type 2> <Spindle air blow/Tool cleaning control system> is set to <3: Type 4>

## Chapter 7 Machine Parameter

System 1 (common)			
No.	Item name	Setting range	Description
11000026	Tool washing liquid level sensor water supply check time (method 4)	0.1~99.9 sec	<p>Sets the water supply check time for the tool washing liquid level sensor.</p> <p>(NOTE) The setting is valid only when all of the following conditions are met.</p> <ul style="list-style-type: none"> <li>&lt;Air blow/Tool wash option&gt; is set to &lt;1: Tool wash type 1&gt; or &lt;3: Tool wash type 2&gt;</li> <li>&lt;Spindle air blow/Tool wash control method&gt; is set to &lt;3: Type 4&gt;</li> </ul>
11000027	Tool washing liquid level sensor discharge check time (method 4)	0.1~99.9 sec	<p>Sets the discharge check time for the tool washing liquid level sensor.</p> <p>(NOTE) The setting is valid only when all of the following conditions are met.</p> <ul style="list-style-type: none"> <li>&lt;Air blow/Tool wash option&gt; is set to &lt;1: Tool wash type 1&gt; or &lt;3: Tool wash type 2&gt;</li> <li>&lt;Spindle air blow/Tool wash control method&gt; is set to &lt;3: Type 4&gt;</li> </ul>
11000028	Tool wash start position	0~6	<p>When the machine parameter (system 1: common) &lt;Spindle air blow/Tool wash control method&gt; is set to &lt;3: Type 4&gt;, the tool wash turns ON from the start position specified in this parameter.</p> <p>0: Turn ON when the Z-axis position rises from the Z-axis zero point or when the Z-axis position reaches the ATC zero point, depending on the magazine turn pitches during a single tool change operation. (Turret ATC mechanism only)</p> <p>1: Rise to ATC zero point (Turret ATC mechanism only)</p> <p>2: Magazine turn (Turret ATC mechanism only)</p> <p>3: Fall to Z-axis zero point (Turret ATC mechanism only)</p> <p>4: Pot fall command (Arm ATC mechanism only)</p> <p>5: Pot end sensor detection (Arm ATC mechanism only)</p> <p>6: Arm turn (Arm ATC mechanism only)</p> <p>(NOTE)</p> <ul style="list-style-type: none"> <li>- Enabled only when equipped with the tool wash option.</li> <li>- &lt;&lt;Machine param. setting error (SYS 1)&gt;&gt; is triggered when the parameter is set that is different from the ATC mechanism.</li> <li>- For a single tool change, the following timing applies regardless of the parameter.</li> </ul> <p>Turret ATC mechanism: Fall to ATC zero point Arm ATC mechanism: Arm turn</p>
11000029	Tool wash discharge delay time	0~99×100msec	<p>Discharge tool wash after the delay specified in this parameter for the start timing of the tool wash discharge.</p> <p>When set to &lt;0&gt;, the tool wash discharges and ignores the delay time.</p> <p>When the following conditions are met, this parameter is enabled.</p> <ul style="list-style-type: none"> <li>- Machine parameter (system 1: common) &lt;Spindle air blow/Tool wash control method&gt; is set to &lt;3: Type 4&gt;</li> <li>- Machine parameter (system 1: common) &lt;Tool wash start position&gt; is not set to &lt;0&gt;</li> </ul>
11000030	Cyclone filter	0 to 1	<p>&lt;0:Not equipped 1:Equipped&gt;</p> <p>Set whether the machine is equipped with a cyclone filter option or not.</p> <p>The machine parameter (system 1: common) can be used in the following situation. Apart from that situation, when this parameter is set to &lt;1:Equipped&gt;, the alarm &lt;&lt;Machine param. setting error (SYS 1)&gt;&gt; is displayed.</p> <p>-&lt;Center-through-coolant option&gt; is set to &lt;1:Type1&gt;</p>

System 1 (common)			
No.	Item name	Setting range	Description
11000031	Chip auger	0~1	<0: No 1: Yes> Set whether the machine is equipped with a chip auger option or not. (NOTE) Apart from corresponding models, when this parameter is set to <1: Yes>, the alarm <<Machine param. setting error (SYS 1)>> is triggered.
11000032	Chip conveyor connection setting	0: None 1: Coil type 1 2: Coil type 2 3: Center trough	Set the configuration of the connected chip conveyor.
11000033	Coolant during tool change	0~1	<0: Stop, 1: Continue> Sets whether to automatically stop or not stop the coolant during a tool change.
11000034	Manual tool change position offset	-50~50	Sets the magazine position for changing the tool. The value that is set counts from the spindle position in the direction as the magazine number gets bigger.
11000035	Tool storage capacity	1~50 tools	Sets the maximum number of tools that can be stored in magazines.
11000036	Distance to ATC zero	0~9999.999 mm	Sets the Z-axis position where the tool can be changed. This parameter sets the distance from the machine parameter (system 1: X-, Y- and Z-axes) <Distance to zero point> (Z-axis).
11000037	X-axis ATC position	-9999.999~9999.999 mm	Sets the X- and Y-axes position where the tool can be changed.
11000038	Y-axis ATC position		
11000039	Distance to check spindle orientation when tools are automatically changed	0~99.999 mm	Sets the distance in order to check and make sure that the spindle orientation is complete during ATC. (Turret system only) This parameter sets the distance from the machine parameter (system 1: X-, Y- and Z-axes) <Distance to zero point> (Z-axis).
11000040	Allowable ATC home position range	0~999.999 mm	Sets the range for the Z-axis position where the magazine can turn.
11000041	ATC arm turn restricted distance (X axis)	0~9999.999 mm	The distance from the X-axis ATC position is used to specify the ATC arm turn restricted range while in ATC recovery mode. If the X-axis machine coordinate falls within the restricted range, the arm cannot be turned using [RELEASE] + [T]. However, the arm can be turned when the X-, Y- and Z-axes machine coordinates are positioned at the ATC zero point.
11000042	Operation in ATC range (when ATC rises)	0~1	<0: Type 1 1: Type 2> Set the Z-axis and magazine axis operation during a tool change (when ATC rises). If this parameter is set to <1: Type 2>, the tool change time can be made shorter. Only valid on a machine model equipped with a turret type ATC.
11000043	Operation in ATC range (when ATC falls)	0~1	<0: Type 1 1: Type 2> Set the Z-axis and magazine axis operation during a tool change (when Z-axis falls). If this parameter is set to <1: Type 2>, the tool change time can be made shorter. Only valid on a machine model equipped with a turret type ATC.
11000044	ATC speed (1 when ATC rises)	1~999999 mm/min	Set the maximum travel rate on the Z-axis when ATC rises. This parameter is enabled when the user parameter (switch 1: ATC/Magazine) <Z-axis travel method during tool change> is set to <0: Type 1>.
11000045	ATC speed (1 when ATC falls)	1~999999 mm/min	Set the maximum travel rate on the Z-axis when ATC falls. This parameter is enabled when the user parameter (switch 1: ATC/Magazine) <Z-axis travel method during tool change> is set to <0: Type 1>

System 1 (common)			
No.	Item name	Setting range	Description
11000046	ATC low speed (1 when ATC rises) (standard tool)	1~999999 mm/min	When the Z-axis rises, during a tool change, to the ATC zero point from the machine parameter (system 1: X-, Y- and Z-axes) <Distance to zero point> (Z-axis), this parameter sets the speed when traveling within the range starting from the machine parameter (system 1: common) <Low speed distance 1 when ATC rises> to the machine parameter (system 1: common) <Z-axis low speed distance 2 when ATC rises>. This parameter is enabled when the user parameter (switch 1: ATC/Magazine) <Z-axis travel method during tool change> is set to <0: Type 1> and the <Maximum tool specification settings> is set to <0: Standard tool>.
11000047	ATC low speed (1 when ATC falls) (standard tool)	1~999999 mm/min	When the Z-axis falls, during a tool change, to the ATC zero point from the machine parameter (system 1: X-, Y- and Z-axes) <Distance to zero point> (Z-axis), this parameter sets the speed when traveling within the range starting from the machine parameter (system 1: common) <Low speed distance 1 when ATC falls> to the machine parameter (system 1: common) <Z-axis low speed distance 2 when ATC falls>. This parameter is enabled when the user parameter (switch 1: ATC/Magazine) <Z-axis travel method during tool change> is set to <0: Type 1> and the <Maximum tool specification settings> is set to <0: Standard tool>.
11000048	ATC speed (2 when ATC rises)	1~999999 mm/min	Set the maximum travel rate on the Z-axis when ATC rises. This parameter is enabled when the user parameter (switch 1: ATC/Magazine) <Z-axis travel method during tool change> is set to <1: Type 2>.
11000049	ATC speed (2 when ATC falls)	1~999999 mm/min	Set the maximum travel rate on the Z-axis when ATC falls. This parameter is enabled when the user parameter (switch 1: ATC/Magazine) <Z-axis travel method during tool change> is set to <1: Type 2>.
11000050	ATC low speed (2 when ATC rises) (standard tool)	1~999999 mm/min	When the Z-axis rises, during a tool change, to the ATC zero point from the machine parameter (system 1: X-, Y- and Z-axes) <Distance to zero point> (Z-axis), this parameter sets the speed when traveling within the range starting from the machine parameter (system 1: common) <Low speed distance 1 when ATC rises> to the machine parameter (system 1: common) <Z-axis low speed distance 2 when ATC rises>. This parameter is enabled when the user parameter (switch 1: ATC/Magazine) <Z-axis travel method during tool change> is set to <1: Type 2> and the <Maximum tool specification settings> is set to <0: Standard tool>.
11000051	ATC low speed (2 when ATC falls) (standard tool)	1~999999 mm/min	When the Z-axis falls, during a tool change, from the ATC zero point to the machine parameter (system 1: X-, Y- and Z-axes) <Distance to zero point> (Z-axis), this parameter sets the speed when traveling within the range starting from the machine parameter (system 1: common) <Low speed distance 1 when ATC falls> to the machine parameter (system 1: common) <Z-axis low speed distance 2 when ATC falls>. This parameter is enabled when the user parameter (switch 1: ATC/Magazine) <Z-axis travel method during tool change> is set to <1: Type 2> and the <Maximum tool specification settings> is set to <0: Standard tool>.
11000052 11000053	Low speed distance 1 when ATC rises Low speed distance 2 when ATC rises	0~9999.999 mm	When the Z-axis falls, during a tool change, to the ATC zero point from the machine parameter (system 1: X-, Y- and Z-axes) <Distance to zero point> (Z-axis), this parameter sets the range for traveling in the machine parameter (system 1: common) <ATC low speed (1 when ATC rises) (standard tool)> or <ATC low speed (2 when ATC rises) (standard tool)>. The setting value on the bottom for distance 1 and the setting value on top for distance 2 are used to set the distance from each respective machine parameter (system 1: X-, Y- and Z-axes) <Distance to zero point> (Z-axis).

System 1 (common)			
No.	Item name	Setting range	Description
11000054 11000055	Low speed distance 1 when ATC falls Low speed distance2 when ATC falls	0~9999.999 mm	When the Z-axis falls, during a tool change, from the ATC zero point to the machine parameter (system 1: X-, Y- and Z-axes) <Distance to zero point> (Z-axis), this parameter sets the range for traveling in the machine parameter (system1: common) <ATC low speed (1 when ATC falls) (standard tool)> or <ATC low speed (2 when ATC falls) (standard tool)>. The setting value on the bottom for distance 1 and the setting value on top for distance 2 are used to set the distance from each respective machine parameter (system 1: X-, Y- and Z-axes) <Distance to zero point> (Z-axis).
11000056	ATC low speed (when ATC rises) change ratio (heavy tool)	1~100 %	When the user parameter (switch 1: ATC/Magazine) <Maximum tool specification settings> is set to <1: Heavy tool>, this parameter sets the ratio to change the value in the machine parameter (system1: common) <ATC low speed (1 when ATC rises) (standard tool)> or <ATC low speed (2 when ATC rises) (standard tool)>.
11000057	ATC low speed (when ATC falls) change ratio (heavy tool)	1~100 %	When the user parameter (switch 1: ATC/Magazine) <Maximum tool specification settings> is set to <1: Heavy tool>, this parameter sets the ratio to change the value in the machine parameter (system1: common) <ATC low speed (1 when ATC falls) (standard tool)> or <ATC low speed (2 when ATC falls) (standard tool)>.
11000058	Max. tapping speed	1~999999 min <sup>-1</sup>	Sets the maximum speed for the tapping operation.
11000059	Synchronized tapping error limit	0~999999 pulses	
11000060	Minimum tapping pitch	0~0.999mm	Set the minimum pitch for the tapping operation. When 0 is set, the pitch data is not checked.
11000061	Switch rotational frequency for tapping acceleration (high speed)	0~999999 min <sup>-1</sup>	Set the rotational frequency that switches the tapping acceleration. When set to <0> or above <Max. tapping speed>, the acceleration does not change.
11000062	Switch time constant for tapping acceleration (high speed)	0~9999 msec	Set the time constant that switches the tapping acceleration.
11000063 11000064 11000065	Tapping time constant 1 (high speed) Tapping time constant 2 (high speed) Tapping time constant 3 (high speed)	0~9999 msec	Set the time constant for acceleration and deceleration during the tapping operation. <Tapping time constant 1 (high speed)> is the time it takes to reach the command speed. <Tapping time constant 2 (high speed)> and <Tapping time constant 3 (high speed)> are the times for ideal acceleration and deceleration.
11000066	Switch rotational frequency for tapping acceleration (med. speed)	0~999999 min <sup>-1</sup>	Set the rotational frequency that switches the tapping acceleration. When set to <0> or above <Max. tapping speed>, the acceleration does not change.
11000067	Switch time constant for tapping acceleration (medium speed)	0~9999 msec	Set the time constant that switches the tapping acceleration.
11000068 11000069 11000070	Tapping time constant 1 (medium speed) Tapping time constant 2 (medium speed) Tapping time constant 3 (medium speed)	0~9999 msec	Set the time constant for acceleration and deceleration during the tapping operation. <Tapping time constant 1 (medium speed)> is the time it takes to reach the command speed. <Tapping time constant 2 (medium speed)> and <Tapping time constant 3 (medium speed)> are the times for ideal acceleration and deceleration.
11000071 11000072 11000073	Tapping time constant 1 (low speed) Tapping time constant 2 (low speed) Tapping time constant 3 (low speed)	0~9999 msec	Set the time constant for acceleration and deceleration during the tapping operation. <Tapping time constant 1 (low speed)> is the time it takes to reach the command speed. <Tapping time constant 2 (low speed)> and <Tapping time constant 3 (low speed)> are the times for ideal acceleration and deceleration.
11000074	Max. load weight	0~999 kg	Sets the maximum load weight specific to the machine.
11000075	Axis for weight estimation	0~2	<0:X-axis, 1:Y-axis, 2:X-/Y-axis> Sets which axis is used when estimating the table load weight. When set to <2:X-/Y-axis>, the axis that satisfies the estimation conditions first (between the two axes) is used.

System 1 (common)			
No.	Item name	Setting range	Description
11000076	Tolerance for mass	0~999 kg	Set the tolerance with the weight that is estimated in the user parameter (switch 1: common) <Table load weight>. The check is not executed when set to "0".
11000077	Tolerance between axes for estimated weight	0~999 (kg)	Set the tolerance or allowable error for the estimated load weight on the X- and Y-axes. When the machine parameter (system 1) <Estimated axis> is set to <2:X-/Y-axis>, the tolerance is checked. When this parameter is set to 0 (zero), the check is not carried out.
11000078	Pallet turn restricted distance (Y axis)	0~9999.999 mm	Set the pallet turn restricted range for the Y-axis using the distance from the machine parameter (system 1: X-, Y- and Z-axes) <Stroke 1 (-)> (Y-axis). This parameter is valid only when the setting <Move to safe position when turning pallet> is configured to <0: Type 1>.
11000079	Move X/Y-axis to safe position when turning pallet	0~1	<0: No, 1: Yes> Sets whether or not to move the X- and Y-axes to a safe position when turning the pallet.
11000080	Move to safe position when turning pallet	0~1	<0: Type 1> The axis is moved to a safe position away from the range where the pallet turns as established by the <Pallet turn restricted distance (Y axis)>. <1: Type 2> The axis is moved to a safe position away from the point where the pallet turns as established by the <Safe position for X-axis when turning pallet> and <Safe position for Y-axis when turning pallet>.
11000081 11000082	Move X-axis to safe position turning pallet Move Y-axis to safe position turning pallet	-9999.999~9999.999 mm	Uses machine coordinates to set a safe position for the X- and Y-axes when turning the pallet. This parameter is valid only when the setting <Move to safe position when turning pallet> is configured to <1: Type 1>.
11000083	Automatic oiling function	0~2	<0: Not equipped> <1: Type 1> Always carries out the oiling at set intervals. <2: Type 2> This function pauses operation and carries out automatic oiling while automatic operation is starting up or while the automatic operation is stopped.
11000084	Automatic oiling pause 1	1~999 min	Sets the oiling interval when the <Automatic oiling function> is set to <1: Type 1>. If set to <Type 2>, the oiling interval is set while the automatic operation is starting up.
11000085	Automatic oiling pause 2	1~999 min	Sets the oiling interval while automatic operation is stopped if the <Automatic oiling function> is set to <Type 2>.
11000086	Automatic oiling time	1~99 sec	Sets the oiling time.
11000087	Automatic oiling monitoring time	1~99 sec	Sets the wait time until the pressure sensor turns ON, after the oiling pump is turned ON.
11000088	Automatic greasing function	0~1	<0: Not equipped, 1: Equipped> Carries out automatic greasing while automatic operation is starting up and while the automatic operation is stopped (paused).
11000089	Automatic greasing pause 1	1~9999 min	Sets the greasing interval while automatic operation is starting up when the <Automatic greasing function> is set to <Greasing>.
11000090	Automatic greasing pause 2	1~9999 min	Sets the greasing interval while automatic operation is stopped when the <Automatic greasing function> is set to <Greasing>.
11000091	Automatic greasing completion monitoring time	1~999 sec	Sets the monitoring time from when the <Automatic greasing abnormal pressure monitoring time> has finished until the greasing is completed. If greasing is not performed, the alarm <<Grease was not supplied automatically>> is triggered.
11000092	Automatic greasing abnormal pressure monitoring time	1~999 sec	Sets the time to start monitoring for automatic greasing device errors after the automatic greasing pump is turned ON. If there is an error, the alarm <<Automatic greasing discharge abnormal>> is triggered.
11000093	Door close check time	1~999×10 msec	Sets the check time for determining if the door limit switch is ON.

System 1 (common)			
No.	Item name	Setting range	Description
11000094	Door unlock check time – Front door/outer door	0~999×10 msec	Set the check time for unlocking the door. The check operation does not execute when the setting is <0>.
11000095	Door unlock check time – Left side door		
11000096	Door unlock check time – Right side door		
11000097	Door unlock check time – Inner door		
11000098	Door unlock check time – Setup chamber left door		
11000099	Door unlock check time – Setup chamber right door		
11000100	Door unlock check time – Outside door 1		
11000101	Door unlock check time – Outside door 2		
11000102	Door unlock check time – Magazine door		
11000103	CPU temperature compensation	-34~34°C	Sets the compensation value for the temperature that is measured on the main CPU.
11000104	Thermal error 1 (control panel) temperature	0~99	The alarm <<Abnormal temperature rise in electrical cabinet (Stop level 3, recovery level 2)>> is triggered when the set temperature is exceeded.
11000105	Thermal error 2 (control panel) temperature	0~99	The alarm <<Abnormal temperature rise in electrical cabinet (Stop level 5, recovery level 2)>> is triggered when the set temperature is exceeded.
11000106	Periodic communication error detection count	1~99	Sets the count for consecutive alarms when periodic communication fails more than once with an IO device, with a servo amplifier or with each panel.
11000107	Servo notification delay time when AC power drops	1~99×10 msec	Sets the delay time for notifying the servo when an AC power drop is detected.
11000108	Time to delay fan 1 ON	1~999 sec	Set the time it takes from when the NC power is turned ON until fan 1 turns ON, or the time it takes from when the automatic greasing (oiling) pump is turned OFF until fan 1 turns ON. The default value is 1 sec. when the parameter is not set.
11000109	Time to delay fan 2 ON	1~999 sec	Sets the time it takes from when fan 1 is turned ON until fan 2 turns ON, or the time it takes from when the automatic greasing (oiling) pump is turned OFF until fan 2 turns ON. The default value is 2 sec. when the parameter is not set.
11000110	Time to delay fan 3 ON	1~999 sec	Sets the time it takes from when fan 2 is turned ON until fan 3 turns ON. The default value is 2 sec. when the parameter is not set.
11000111	Time to delay fan 4 ON	1~999 sec	Sets the time it takes from when fan 3 is turned ON until fan 4 turns ON. The default value is 2 sec. when the parameter is not set.
11000112	Scheduled notice to change batteries on relocation detection device	0 to 9999 days	Sets the time from when the batteries are replaced on the relocation detection device until the message <<Scheduled notice to change relocat. detect. device batteries>> is prompted. If set to 0, the message <<Scheduled notice to change batteries on relocation detection device>> does not trigger.
11000113	Scheduled timing to change batteries on relocation detection device	0 to 99 days	Sets the time from when the message <<Scheduled notice to change relocat. detect. device batteries>> is triggered until the message <<Scheduled replacement of relocat. detect. device batteries>> is prompted.
11000114	EDM1 check time	0~999×10msec	Sets the time period from when EDM1 signal on the IL PCB reports an error until the alarm <<EDM signal not checked 1>> is triggered.  In the following situations, the alarm <<EDM signal not checked 1>> does not trigger. <ul style="list-style-type: none"><li>• When the set value is &lt;0&gt;</li><li>• When the user parameter (switch 1: installation) &lt;[MASTER ON] function&gt; is set to &lt;1: Enable&gt;</li></ul>

System 1 (common)			
No.	Item name	Setting range	Description
11000115	EDM2 check time	0~999×10msec	<p>Set the time period from when the EDM2 signal on the safety control PCB reports an error until the alarm &lt;&gt;EDM signal not checked 2&gt;&gt; is triggered.</p> <p>In the following situations, the alarm &lt;&gt;EDM signal not checked 2&gt;&gt; does not trigger.</p> <ul style="list-style-type: none"> <li>• When the set value is &lt;0&gt;</li> <li>• When the user parameter (switch 1: installation) &lt;[MASTER ON] function&gt; is set to &lt;1: Enable&gt;</li> </ul>
11000116	EDM3 check time	0~999×10msec	<p>Sets the time period from when EDM3 signal on the IL PCB reports an error until the alarm &lt;&gt;EDM signal not checked 3&gt;&gt; is triggered.</p> <p>In the following situations, the alarm &lt;&gt;EDM signal not checked 3&gt;&gt; does not trigger.</p> <ul style="list-style-type: none"> <li>• When the set value is &lt;0&gt;</li> <li>• When the user parameter (switch 1: installation) &lt;[MASTER ON] function&gt; is set to &lt;1: Enable&gt;</li> </ul>
11000117	EDM4 check time	0~999×10msec	<p>Sets the time period from when EDM4 signal on the IL PCB reports an error until the alarm &lt;&gt;EDM signal not checked 4&gt;&gt; is triggered.</p> <p>In the following situations, the alarm &lt;&gt;EDM signal not checked 4&gt;&gt; does not trigger.</p> <ul style="list-style-type: none"> <li>• When the set value is &lt;0&gt;</li> <li>• When the user parameter (switch 1: installation) &lt;[MASTER ON] function&gt; is set to &lt;1: Enable&gt;</li> </ul>
11000118	EDM5 check time	0~999×10msec	<p>Sets the time period from when EDM5 signal on the IL PCB reports an error until the alarm &lt;&gt;EDM signal not checked 5&gt;&gt; is triggered.</p> <p>In the following situations, the alarm &lt;&gt;EDM signal not checked 5&gt;&gt; does not trigger.</p> <ul style="list-style-type: none"> <li>• When the set value is &lt;0&gt;</li> <li>• When the user parameter (switch 1: installation) &lt;[MASTER ON] function&gt; is set to &lt;1: Enable&gt;</li> </ul>
11000119	EDM6 check time	0~999×10msec	<p>Sets the time period from when EDM6 signal on the IL PCB reports an error until the alarm &lt;&gt;EDM signal not checked 6&gt;&gt; is triggered.</p> <p>In the following situations, the alarm &lt;&gt;EDM signal not checked 6&gt;&gt; does not trigger.</p> <ul style="list-style-type: none"> <li>• When the set value is &lt;0&gt;</li> <li>• When the user parameter (switch 1: installation) &lt;[MASTER ON] function&gt; is set to &lt;1: Enable&gt;</li> </ul>
11000120	EDM7 check time	0~999×10msec	<p>Set the time period from when the EDM7 signal on the safety control PCB reports an error until the alarm &lt;&gt;EDM signal not checked 7&gt;&gt; is triggered.</p> <p>In the following situations, the alarm &lt;&gt;EDM signal not checked 7&gt;&gt; does not trigger.</p> <ul style="list-style-type: none"> <li>• When the set value is &lt;0&gt;</li> <li>• When the user parameter (switch 1: installation) &lt;[MASTER ON] function&gt; is set to &lt;1: Enable&gt;</li> </ul>
11000121	EDM8 check time	0~999×10msec	<p>Set the time period from when the EDM8 signal on the safety control PCB reports an error until the alarm &lt;&gt;EDM signal not checked 8&gt;&gt; is triggered.</p> <p>In the following situations, the alarm &lt;&gt;EDM signal not checked 8&gt;&gt; does not trigger.</p> <ul style="list-style-type: none"> <li>• When the set value is &lt;0&gt;</li> <li>• When the user parameter (switch 1: installation) &lt;[MASTER ON] function&gt; is set to &lt;1: Enable&gt;</li> </ul>

System 1 (common)			
No.	Item name	Setting range	Description
11000122	EDM9 check time	0~999×10msec	<p>Set the time period from when the EDM9 signal on the safety control PCB reports an error until the alarm &lt;&gt;EDM signal not checked 9&gt;&gt; is triggered.</p> <p>In the following situations, the alarm &lt;&gt;EDM signal not checked 9&gt;&gt; does not trigger.</p> <ul style="list-style-type: none"> <li>• When the set value is &lt;0&gt;</li> <li>• When the user parameter (switch 1: installation) &lt;[MASTER ON] function&gt; is set to &lt;1: Enable&gt;</li> </ul>
11000123	EDM10 check time	0~999×10msec	<p>Set the time period from when the EDM10 signal on the safety control PCB reports an error until the alarm &lt;&gt;EDM signal not checked 10&gt;&gt; is triggered.</p> <p>In the following situations, the alarm &lt;&gt;EDM signal not checked 10&gt;&gt; does not trigger.</p> <ul style="list-style-type: none"> <li>• When the set value is &lt;0&gt;</li> <li>• When the user parameter (switch 1: installation) &lt;[MASTER ON] function&gt; is set to &lt;1: Enable&gt;</li> </ul>
11000124	EDM11 check time	0~999×10msec	<p>Set the time period from when the EDM11 signal on the safety control PCB reports an error until the alarm &lt;&gt;EDM signal not checked 11&gt;&gt; is triggered.</p> <p>In the following situations, the alarm &lt;&gt;EDM signal not checked 11&gt;&gt; does not trigger.</p> <ul style="list-style-type: none"> <li>• When the set value is &lt;0&gt;</li> <li>• When the user parameter (switch 1: installation) &lt;[MASTER ON] function&gt; is set to &lt;1: Enable&gt;</li> </ul>
11000125	Motor insulation resistance measurement timeout time	0.0~9.9 sec	<p>Sets the timeout time period for the motor insulation resistance measurement.</p> <p>The measurement is cancelled even if the measurement has not finished and the set time period has elapsed.</p>
11000126	Rapid feedrate when ATC monitoring parameter is automatically set	1~999999 mm/min	The parameter is used with the automatic setting operation for the ATC monitoring parameter.
11000127	Detection start height for ATC monitoring reference height	0~9999.999 mm	The parameter is used with the automatic setting operation for the ATC monitoring parameter
11000128	Detection end height for ATC monitoring reference height	0~9999.999 mm	The parameter is used with the automatic setting operation for the ATC monitoring parameter
11000129	Tolerance range 1 for ATC monitoring reference height	0~9999.999 mm	The parameter is used with the automatic setting operation for the ATC monitoring parameter
11000130	Tolerance range 2 for ATC monitoring reference height	0~9999.999 mm	The parameter is used with the automatic setting operation for the ATC monitoring parameter
11000131	LPF time constant for automatic ATC monitoring adjustment	0.0~999.9 msec	The parameter is used with the automatic setting operation for the ATC monitoring parameter
11000132	Reference start point for ATC monitoring torque detection	0~9999.999 mm	The parameter is used with the automatic setting operation for the ATC monitoring parameter
11000133	Reference end point for ATC monitoring torque detection	0~9999.999 mm	The parameter is used with the automatic setting operation for the ATC monitoring parameter
11000134	Measurement start point for ATC monitoring torque detection	0~9999.999 mm	The parameter is used with the automatic setting operation for the ATC monitoring parameter
11000135	Measurement end point for ATC monitoring torque detection	0~9999.999 mm	The parameter is used with the automatic setting operation for the ATC monitoring parameter

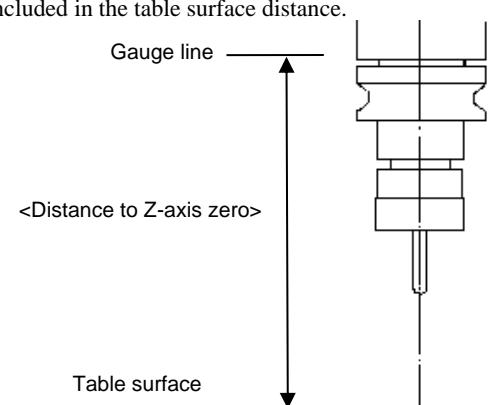
## Chapter 7 Machine Parameter

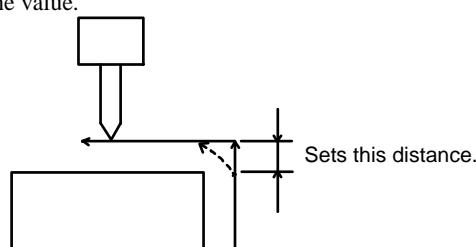
System 1 (common)			
No.	Item name	Setting range	Description
11000136	Threshold value for ATC monitoring torque detection	0~99999 N	The parameter is used with the automatic setting operation for the ATC monitoring parameter
11000137	ATC monitoring area height 1	-9999.999~9999.999 mm	This parameter is used in no tool detection / tool over key detection.
11000138	ATC monitoring area height 2	-9999.999~9999.999 mm	This parameter is used in no tool detection / tool over key detection.
11000139	ATC monitoring area height 3	-9999.999~9999.999 mm	This parameter is used in no tool detection / tool over key detection.
11000140	ATC monitoring area height 4	-9999.999~9999.999 mm	This parameter is used in no tool detection / tool over key detection.
11000141	ATC monitoring LPF time constant 1	0.0~999.9 msec	This parameter is used in no tool detection / tool over key detection.
11000142	ATC monitoring LPF time constant 2	0.0~999.9 msec	This parameter is used in no tool detection / tool over key detection.
11000143	ATC monitoring LPF delay time	0.0~999.9 msec	This parameter is used in no tool detection / tool over key detection.
11000144	Threshold value for tool missing detection (BT)	0~99999 N	This parameter is used in tool missing detection.
11000145	Threshold value for tool missing detection (BBT)	0~99999 N	This parameter is used in tool missing detection.
11000146	Safe position for Y-axis when restoring operation	-9999.999~9999.999 mm	Set the Y-axis at a machine coordinate position where the spindle orientation is possible while in ATC arm position recovery mode.
11000147	R-point lower limit for pallet loading during tool change	-9999.999~9999.999 mm	Use machine coordinate values to set the R-point lower limit for the first tool change when the user parameter (quick table) <Pallet 1 loading> or <Pallet 2 loading> is set to <1:At 1st tool change>. If the R-point position is lower than the parameter, the alarm <>Pallet turn restricted range error>> is triggered. When there is a turret type ATC mechanism, this parameter is not used.
11000148	Maximum blocks to check cutter compensation interference	3~8	Set the upper limit for the user parameter (switch 1: compensation function) <Number of blocks to check cutter compensation interference>.
11000149	FAN 1 speed detection function	0: OFF 1: ON	Set to <1: ON> in order to detect the speed for FAN 1. If the speed is less than the <FAN 1 speed error> setting for a period of time that exceeds the <FAN 1 speed error detection time>, then an alarm is triggered.
11000150	FAN 2 speed detection function	0: OFF 1: ON	Set to <1: ON> in order to detect the speed for FAN 2. If the speed is less than the <FAN 2 speed error> setting for a period of time that exceeds the <FAN 2 speed error detection time>, then an alarm is triggered.
11000151	FAN 3 speed detection function	0: OFF 1: ON	Set to <1: ON> in order to detect the speed for FAN 3. If the speed is less than the <FAN 3 speed error> setting for a period of time that exceeds the <FAN 3 speed error detection time>, then an alarm is triggered.
11000152	FAN 4 speed detection function	0: OFF 1: ON	Set to <1: ON> in order to detect the speed for FAN 4. If the speed is less than the <FAN 4 speed error> setting for a period of time that exceeds the <FAN 4 speed error detection time>, then an alarm is triggered.
11000153	AVR FAN speed detection function	0: OFF 1: ON	Set to <1: ON> in order to detect the speed for the AVR FAN. If the speed is less than the <FAN AVR speed error> setting for a period of time that exceeds the <AVR FAN speed error detection time>, then an alarm is triggered.
11000154	Spindle FAN speed detection function	0: OFF 1: ON	Set to <1: ON> in order to detect the speed for the spindle FAN. If the speed is less than the <Spindle FAN speed error> setting for a period of time that exceeds the <Spindle FAN speed error detection time>, then an alarm is triggered.
11000155	FAN 1 speed error	0 to 9999 rpm	Detects and triggers an error when FAN 1 is below the speed that is set in this parameter.
11000156	FAN 2 speed error	0 to 9999 rpm	Detects and triggers an error when FAN 2 is below the speed that is set in this parameter.
11000157	FAN 3 speed error	0 to 9999 rpm	Detects and triggers an error when FAN 3 is below the speed that is set in this parameter.

System 1 (common)			
No.	Item name	Setting range	Description
11000158	FAN 4 speed error	0 to 9999 rpm	Detects and triggers an error when FAN 4 is below the speed that is set in this parameter.
11000159	AVR FAN speed error	0 to 9999 rpm	Detects and triggers an error when the AVR FAN is below the speed that is set in this parameter.
11000160	Spindle FAN speed error	0 to 9999 rpm	Detects and triggers an error when the spindle FAN is below the speed that is set in this parameter.
11000161	FAN 1 speed error detection time	1 to 99 sec.	Triggers an alarm if the <FAN 1 speed error> is detected for a period of time that exceeds the time set in this parameter.
11000162	FAN 2 speed error detection time	1 to 99 sec.	Triggers an alarm if the <FAN 2 speed error> is detected for a period of time that exceeds the time set in this parameter.
11000163	FAN 3 speed error detection time	1 to 99 sec.	Triggers an alarm if the <FAN 3 speed error> is detected for a period of time that exceeds the time set in this parameter.
11000164	FAN 4 speed error detection time	1 to 99 sec.	Triggers an alarm if the <FAN 4 speed error> is detected for a period of time that exceeds the time set in this parameter.
11000165	AVR FAN speed error detection time	1 to 99 sec.	Triggers an alarm if the <AVR FAN speed error> is detected for a period of time that exceeds the time set in this parameter.
11000166	Spindle FAN speed error detection time	1 to 99 sec.	Triggers an alarm if the <Spindle FAN speed error> is detected for a period of time that exceeds the time set in this parameter.
11000167	NC PCB power consumption	0~99999 W	Set the power consumption on the NC PCB when it is operating.
11000168	KEY PCB power consumption	0~99999 W	Set the power consumption on the KEY PCB when it is operating.
11000169	CM PCB power consumption	0~99999 W	Set the power consumption on the CM PCB when it is operating. This setting is only valid when equipped with a CM PCB.
11000170	FC PCB power consumption	0~99999 W	Set the power consumption on the FC PCB when it is operating. This setting is only valid when equipped with a FC PCB.
11000171	LCD backlight power consumption	0~99999 W	Set the power consumption when the LCD backlight is operating at the maximum.
11000172	Automatic oiling or automatic greasing power consumption	0~99999 W	Set the power consumption for the automatic oiling or automatic greasing when it is operating.
11000173	Spindle cooling fan power consumption	0~99999 W	Set the power consumption for the spindle cooling fan when it is operating.
11000174	Servo control power consumption	0~99999 W	Set the power consumption for the control PCB in the servo amplifier when it is operating. This setting applies to the power consumption for one axis. The power consumption that drives the motor is not included here.
11000175	FE unit power consumption	0~99999 W	Set the power consumption on the FE unit when it is operating. This setting is only valid when equipped with an FE unit.
11000176	Outside door 1 settings	0: None 1: Independent 2: Machining chamber 3: Setup chamber	Set the position of outside door 1. The door signal varies depending on the set position. (NOTE 1) If set to the <3: Setup chamber> on a machine model not equipped with the quick table, the alarm <<Machine param. setting error (SYS 1)>> is triggered. (NOTE 2) If set to the <2: Machining chamber> on a machine model equipped with the quick table, the alarm <<Machine param. setting error (SYS 1)>> is triggered.
11000177	Outside door 2 settings	0: None 1: Independent 2: Machining chamber 3: Setup chamber	Set the position of outside door 2. The door signal varies depending on the set position. (NOTE 1) If set to the <3: Setup chamber> on a machine model not equipped with the quick table, the alarm <<Machine param. setting error (SYS 1)>> is triggered. (NOTE 2) If set to the <2: Machining chamber> on a machine model equipped with the quick table, the alarm <<Machine param. setting error (SYS 1)>> is triggered.

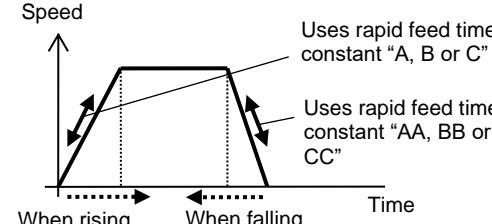
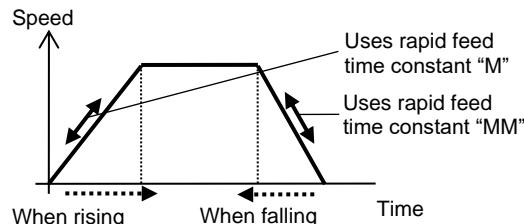
System 1 (common)			
No.	Item name	Setting range	Description
11000178	Detection time when AC power drops	0~999msec	If the AC power has an instant value that drops below the <Threshold value when AC power drops> for a period that is longer than this parameter, then the alarm <>AC power low>> is triggered. When this parameter is set to 0 (zero), then the alarm <>AC power low>> is triggered.
11000179	Threshold value when AC power drops	1~254V	If the AC power has an instant value that drops below this parameter for a period that is longer than the <Detection time when AC power drops>, then the alarm <>AC power low>> is triggered.
11000180	Detection time when no AC power detected	0~999msec	If the AC power has an instant value that falls in one of the ranges below for a period that is longer than this parameter, then the alarm <>AC power not detected>> is triggered. <ul style="list-style-type: none"> <li>• 30 V to -30 V</li> <li>• -380 V or less</li> <li>• +430 V or greater</li> </ul> When this parameter is set to 0 (zero), then the alarm <>AC power not detected>> is triggered.
11000181	Detection time for AC power phase sequence error	0~9999msec	If the AC power has a sequence error in the R-phase, S-phase and T-phase for a period that is longer than this parameter, then the alarm <>AC power phase sequence error>> is triggered. When this parameter is set to 0 (zero), then the alarm <>AC power phase sequence error>> is triggered.
11000182	Acceleration/deceleration control detection time when AC power drops	0~999 msec	Set the detection time for the power voltage that controls the acceleration/deceleration in axis travel when the AC power drops. When this parameter is set to 0 (zero), then the detection is not carried out.
11000183	Acceleration/deceleration control threshold value when AC power drops	1~999 V	Set the threshold value for the power voltage that controls the acceleration/deceleration in axis travel when the AC power drops.
11000184	Deceleration restart delay time when AC power drops	0~999 msec	Set the delay time to restart deceleration after the acceleration/deceleration was suppressed in axis travel during an AC power drop.
11000185	Tap acceleration/deceleration control when AC power drops	0~1	This parameter is reserved. Therefore, do not use it.
11000186	Brake diagnostics	0~1	<0: Enabled 1: Disabled> Set whether or not to execute the brake diagnostics.
11000187	Standard load weight	0~999 kg	Set the standard load weight for the rapid feed time constant. It is used when calculating the time constant from the user parameter (switch 1: common) <Table load weight>.
11000188	Max. spindle speed (maintenance)	1~999999 min <sup>-1</sup>	Set the maximum speed for the spindle maintenance mode based on the specification.

## 7.4.2 X-, Y- and Z-Axes

System 1 (common)			
No.	Item name	Setting range	Description
11**0001 *: X-axis → 01 Y-axis → 02 Z-axis → 03	Distance to zero point	-9999.999~9999.999 mm	The distance from the table surface to the gauge line (on the spindle end) after a machine zero return is set as <Distance to zero point> (Z-axis) The sub-table distance (special accessory) is not included in the table surface distance. 
11**0002	Ball screw diameter	0.000~99.999 mm	Sets the ball screw diameter for each axis.
11**0003	Bearing position on fixed side	-9999.999~9999.999 mm	Sets the position where the bearing is secured on each axis using the machine coordinates.
11**0004	Bearing position on free side	-9999.999~9999.999 mm	Sets the position where the bearing moves freely on each axis.
11**0005	Motor installation position	0~1	<0: Fixed side, 1: Free side (not fixed)> Sets the motor attachment side for each axis.
11**0006	Ball screw lead (mm)	1~99 mm	Sets the lead for the ball screw on each axis.
11**0007	Marked position for adjustment	-9999.999~9999.999 mm	Sets the marked position that is used for the position adjustment on each axis with the machine coordinates.
11**0008	Absolute encoder rotation direction	0~1	<0: Normal by + comd., 1: Normal by - comd.> Sets the rotational direction of the absolute encoder on each axis.
11**0009	Backlash compensation	0~99999 pulses	The backlash offset is measured regularly according to the machine usage conditions. Each axis is offset or compensated by the number of pulses when necessary.
11**0010 11**0011	Stroke 1 (-) Stroke 1 (+)	-9999.999~9999.999 mm	The travel range for each axis is set in the machine coordinate position. The <Distance to zero point> (Z-axis) is on the plus (+) side of the Z-axis.
11**0012 11**0013	Stroke 2 (-) Stroke 2 (+)	-9999.999~9999.999 mm	The restricted travel range for each axis is set in the machine coordinate position. The position inside the set range is the restricted travel area.
11**0014 11**0015	Stroke 3 (-) Stroke 3 (+)	-9999.999~9999.999 mm	The restricted travel range for each axis is set in the machine coordinate position. The position inside the set range is the restricted travel area.
11**0016 11**0017	Stroke 4 (-) Stroke 4 (+)	-9999.999~9999.999 mm	The restricted travel range for each axis is set in the machine coordinate position. The position inside the set range is the restricted travel area.
11**0018 11**0019	Stroke 5 (-) Stroke 5 (+)	-9999.999~9999.999 mm	The restricted travel range for each axis is set in the machine coordinate position. The position inside the set range is the restricted travel area.
11**0020 11**0021	Stroke 6 (-) Stroke 6 (+)	-9999.999~9999.999 mm	The restricted travel range for each axis is set in the machine coordinate position. The position inside the set range is the restricted travel area.
11**0022 11**0023	Stroke 7 (-) Stroke 7 (+)	-9999.999~9999.999 mm	The restricted travel range for each axis is set in the machine coordinate position. The position inside the set range is the restricted travel area.
11**0024 11**0025	Stroke 8 (-) Stroke 8 (+)	-9999.999~9999.999 mm	The restricted travel range for each axis is set in the machine coordinate position. The position inside the set range is the restricted travel area.
11**0026 11**0027	Stroke 9 (-) Stroke 9 (+)	-9999.999~9999.999 mm	The restricted travel range for each axis is set in the machine coordinate position. The position inside the set range is the restricted travel area.

System 1 (common)			
No.	Item name	Setting range	Description
11**0028 11**0029	Stroke 10 (-) Stroke 10 (+)	-9999.999~ 9999.999 mm	The restricted travel range for each axis is set in the machine coordinate position. The position inside the set range is the restricted travel area.
11**0030	Return distance with servo controller ON	0.001~9.999 mm	When one of the following applies and the door changes from close → open, it automatically returns to the position on the X-, Y- and Z-axes at the time when the door was closed. This setting is for the maximum distance of that return operation. The error <<*Return distance too long>> is triggered if the distance becomes longer than the set value. <ul style="list-style-type: none"> <li>• When door interlock mode is set to automatic operation</li> <li>• When door interlock mode is set to machine setup and the [ENABLE] switch is OFF</li> </ul>
11**0031	In-position check	0~1	<0: No, 1: Yes> Sets the in-position check to <No> or <Yes> after the command operation is finished.
11**0032	Block connection	0~1	<0: Yes 1: No> 0: The in-position check is not carried out when the rapid feed operation is continued on a single axis. 1: The in-position check is carried out when the rapid feed operation is continued on a single axis.
11**0033	Making block connection high speed	0~1	<0: Yes 1: No> The motion connected to the rapid feed and cutting feed is made faster for single axis travel. The set value for this parameter is enabled when <Block connection> is set to <0: No>.
11**0034	Making block connection high speed 2	0~1	<0:No 1:Yes> The connecting motion is made faster when the axis travels independently even if the blocks are separated. The set value for this parameter is enabled when <Block connection> is set to <0: No>.
11**0035	In-position check timeout period	0~9999 msec	Sets the time allowed for the in-position check on each axis. The check operation does not execute when the time is “0”.
11**0036	In-position width	0~99999 pulses	Sets the allowable range for the final position relative to the command position on each axis.
11**0037	Positioning end check distance	0~9.999 mm	When there is a successive positioning operation, this parameter sets the distance for starting the next operation, by setting a shortcut before actually reaching the end point. If this is set to a large value, the non-cutting time can be reduced, but the machine may interfere with the workpiece. Therefore, exercise caution when changing the value.  <p>It actually moves as shown by the dotted line.</p>
11**0038	Maximum cutting travel speed	1~999999 mm/min	Sets the maximum cutting feedrate on each axis.
11**0039 11**0040 11**0041	Cutting feed time const. 1 Cutting feed time const. 2 Cutting feed time const. 3	0~9999 msec	Sets the time constant for acceleration and deceleration during the cutting feed. <Cutting feed time const. 1> sets the time it takes to reach the command speed. <Cutting feed time const. 2> and <Cutting feed time const. 3> are the times for the ideal acceleration and deceleration.
11**0042	Cutting feed lower limit time constant	0~9999 msec	Set the time constant minimum for acceleration and deceleration during the cutting feed.

System 1 (common)			
No.	Item name	Setting range	Description
11**0043	Single axis cutting feed time const. 1S	0.0~9999.9 msec	Set the time constant for acceleration and deceleration during the cutting feed on a single axis. This parameter is enabled when <Time constant change for acceleration/deceleration> is set to <1: Val.>. <Single axis cutting feed time const. 1S> sets the time it takes to reach the command speed.
11**0044	Single axis cutting feed time const. 2S		<Single axis cutting feed time const. 2S> and <Single axis cutting feed time const. 3S> set the time of the ideal acceleration and deceleration.
11**0045	Single axis cutting feed time const. 3S		
11**0046	Single axis cutting feed time const. 1SS	0.0~9999.9 msec	Set the time constant for acceleration and deceleration during the cutting feed on a single axis. This parameter is enabled when <Time constant change for acceleration/deceleration> is set to <1: Val.>. <Single axis cutting feed time const. 1SS> sets the time it takes to reach the command speed.
11**0047	Single axis cutting feed time const. 2SS		<Single axis cutting feed time const. 2SS> sets the time of the ideal acceleration and deceleration.
11**0048	Single axis cutting feed lower limit time constant	0.0~9999.9 msec	Set the time constant minimum for acceleration and deceleration during the cutting feed on a single axis. This parameter is enabled when <Time constant change for acceleration/deceleration> is set to <1: Val.>.
11**0049	Skip feed acc./dec.	0~1	<0: No, 1: Yes> Sets whether to accelerate or decelerate the skip feed.
11**0050 11**0051 11**0052	Skip feed time const. 1 Skip feed time const. 2 Skip feed time const. 3	0~9999 msec	Sets the time constant for acceleration and deceleration during the skip feed. <Skip feed time const. 1> is the time it takes to reach the command speed. <Skip feed time const. 2> and <Skip feed time const. 3> are the times for ideal acceleration and deceleration.
11**0053	Manual speed	1~999999 mm/min	Sets the maximum feedrate when using manual high-speed travel.
11**0054	Rapid feedrate	1~999999 mm/min	Sets the maximum feedrate on each axis.
11**0055	Rapid feedrate(door open)	1~999999 mm/min	Sets the maximum feedrate on X-, Y- and Z-axes when a door is open. Even if the value that is entered exceeds 2000, the actual travel speed is limited to 2000 mm/min.
11**0056 ~ 11**0064	Rapid feed time constant 1A Rapid feed time constant 2A Rapid feed time constant 3A Rapid feed time constant 1B Rapid feed time constant 2B Rapid feed time constant 3B Rapid feed time constant 1C Rapid feed time constant 2C Rapid feed time constant 3C	0~9999 msec	Sets the time constant (non-linear interpolation type positioning) for acceleration and deceleration during the rapid feed operation on each axis. The number at the end of <Rapid feed time constant 1A> refers to the function type and the letters refer to the change type. <u>Numbers</u> “1” refers to the time it takes to reach the command speed. “2” and “3” refer to the time of the ideal acceleration and deceleration. <u>Letters</u> “A” refers to $  \text{travel distance}   \leq \text{time constant change distance A}$ . “B” refers to time constant change distance A $<   \text{travel distance}   \leq \text{time constant change distance B}$ . “C” refers to time constant change distance B $<   \text{travel distance}  $ , or JOG feed.

System 1 (common)			
No.	Item name	Setting range	Description
11**0065	Time constant change for acceleration/deceleration	0~1	<p>&lt;0:Inval. 1:Val.&gt; When set to &lt;0:Inval.&gt;, the time constant for acceleration/deceleration does not change. The parameter &lt;Z-axis rapid feed time const.1/2/3&gt; (letter at end is “A, B or C”) is always used. When set to &lt;1:Val.&gt;, the time constant for acceleration/deceleration changes during acceleration and deceleration when the Z-axis only travels.</p> <p><u>On Z-axis:</u> <u>When traveling below the &lt;Distance to zero point&gt; (Z-axis)</u> The parameter setting &lt;Rapid feed time constant1/2/3&gt; (Z-axis) (letter at end is “A, B or C”, or “AA, BB or CC”) changes.</p>  <p><u>When traveling above the &lt;Distance to zero point&gt; (Z-axis)</u> The parameter setting &lt;Rapid feed time constant1/2/3&gt; (Z-axis) (letter at end is “M”, or “MM”) changes.</p> 
11**0066 ~ 11**0071	Rapid feed time constant 1AA Rapid feed time constant 2AA Rapid feed time constant 1BB Rapid feed time constant 2BB Rapid feed time constant 1CC Rapid feed time constant 2CC	0~9999 msec	<p>Set the time constant for acceleration and deceleration during the rapid feed operation on each axis. This parameter is enabled when &lt;Time constant change for acceleration/deceleration&gt; is set to &lt;1: Val.&gt;.</p> <p>The number at the end of &lt;Rapid feed time constant 1AA&gt; refers to the function type and the letters refer to the change type.</p> <p><u>Numbers</u> “1” refers to the time it takes to reach the command speed. “2” refers to the time of the ideal acceleration and deceleration.</p> <p><u>Letters</u> “AA” refers to <math>  \text{travel distance}   \leq \text{time constant change distance A}</math>. “BB” refers to time constant change distance A <math>&lt;   \text{travel distance}   \leq \text{time constant change distance B}</math>. “CC” refers to time constant change distance B <math>&lt;   \text{travel distance}  </math>, or JOG feed.</p>

System 1 (common)			
No.	Item name	Setting range	Description
11**0072 11**0073	Rapid feed time constant 1M Rapid feed time constant 2M	0~9999 msec	<p>Set the time constant for acceleration and deceleration during the rapid feed operation on each axis. This parameter is enabled when &lt;Time constant change for acceleration/deceleration&gt; is set to &lt;1: Val.&gt;.</p> <p>The number at the end of &lt;Rapid feed time constant 1M&gt; refers to the function type.</p> <p><u>Numbers</u></p> <p>“1” refers to the time it takes to reach the command speed. “2” refers to the time of the ideal acceleration and deceleration.</p>
11**0074 11**0075	Rapid feed time constant 1MM Rapid feed time constant 2MM	0~9999 msec	<p>Set the time constant for acceleration and deceleration during the rapid feed operation on each axis. This parameter is enabled when &lt;Time constant change for acceleration/deceleration&gt; is set to &lt;1: Val.&gt;.</p> <p>The number at the end of &lt;Rapid feed time constant 1MM&gt; refers to the function type.</p> <p><u>Numbers</u></p> <p>“1” refers to the time it takes to reach the command speed. “2” refers to the time of the ideal acceleration and deceleration.</p>
11**0076	Minimum rapid feed time constant ratio	1~100%	Set the rapid feed time constant minimum for each axis in a ratio, when calculating the time constant from the table load weight.
11**0077 11**0078	Time constant change distance A Time constant change distance B	0~9999.999 mm	Set the distance to change the time constant for rapid feed on each axis.
11**0079	Lower limit time constant	0~9999 msec	Set the time constant minimum for acceleration and deceleration on each axis.
11**0080	Load torque for brake load test	1~999 %	Set the torque for the load applied to each axis brake in the brake load test. The set value is the ratio when the rated torque for the motor is 100%.
11**0081	Travel amount under load for brake load test	0.001~9.999 mm	Set the travel amount when applying a load on each axis brake in the brake load test.
11**0082	Allowable travel amount for brake load test	0.001~9.999 mm	Set the tolerance value for a position shift where the load is applied on each axis brake in the brake load test. After applying the load to the brake, when the travel amount exceeds the set value, the alarm <<Brake load test error on Z-axis>> is triggered.
11**0083	Delay time for brake operation	0.0~9999.9 msec	Set the time it takes from when the brake release signal for each axis turns ON until the brake is applied.
11**0084	Delay time for brake release	0.0~9999.9 msec	Set the time it takes from when the brake release signal for each axis turns OFF until the brake is released.
11**0085	Load time for brake load test	1.0~9999.9 msec	Set the time period when a load is applied on each axis brake in the brake load test.
11**0086	Timeout time for load during brake load test	0.0~9999.9 msec	Set the time allowed for the load that normally applies to each axis brake during the brake load test. The check operation does not execute when the time is “0.0”.
11**0087	Wait time before applying brake in brake load test	0.0~9999.9 msec	Set the wait time before applying the brake on each axis in the brake load test.
11**0088	Wait time before releasing brake in brake load test	0.0~9999.9 msec	Set the wait time before releasing the brake on each axis in the brake load test.
11**0089	Block connection 2	0~1	<p>&lt;0: No 1: Yes&gt;</p> <p>0: Waits for the in-position status and the acceleration/deceleration to be completed, and then starts the next operation.</p> <p>1: Starts the next operation when the in-position status is complete without waiting for acceleration/deceleration to be completed.</p>

<b>System 1 (common)</b>			
<b>No.</b>	<b>Item name</b>	<b>Setting range</b>	<b>Description</b>
11**0090	Door open time constant 1	0.0~99.9 msec	
11**0091	Door open time constant 2	0.0~99.9 msec	
11**0092	Door open time constant 3	0.0~99.9 msec	Set the acceleration and deceleration time constant for each axis when <Door interlock mode> is set to <Machine setup> and a door is open. <Door open time constant 1> is the time it takes to reach the command speed. <Door open time constant 2> and <Door open time constant 3> are the times for ideal acceleration and deceleration.
11**0093	Door open cutting feed time constant 1	0.0~99.9 msec	
11**0094	Door open cutting feed time constant 2	0.0~99.9 msec	
11**0095	Door open cutting feed time constant 3	0.0~99.9 msec	Set the acceleration and deceleration time constant for the cutting feed when <Door interlock mode> is set to <Machine setup> and a door is open. <Door open cutting feed time constant 1> is the time it takes to reach the command speed. <Door open cutting feed time constant 2> and <Door open cutting feed time constant 3> are the times for ideal acceleration and deceleration.

### 7.4.3 Automatic Door

<b>System 1 (Automatic Door)</b>			
<b>No.</b>	<b>Item name</b>	<b>Setting range</b>	<b>Description</b>
11200001	Option	0~1	<0: Not equipped 1: Equipped> Set whether or not the machine is equipped with the automatic door option. (NOTE) When set to <1: Equipped>, a control command from the built-in PLC for the P4-axis will not be accepted.
11200002	Operation time	0~99 sec.	Set the open and close operation time on the door. When the door open and close operation does not complete within the set time, the error <<Door operation timeout>> is triggered. When the time is set to 0, the next operation will not be performed until the door open and close operation is complete.
11200003	Door open operation check time	0~999 msec	Set the check time to start from when the door is unlocked and to end when the open operation starts on the automatic door.
11200004	Pulley belt	0.001~999.999mm	Set the pulley belt for the automatic door.
11200005	Absolute encoder rotation direction	0~1	<0:Normal by + comd. 1:Normal by - comd.> Set the rotational direction of the absolute encoder for the automatic door.
11200006	Door open reference position	0.000~9999.999 mm	Set the reference machine coordinate when the door open operation is completed.
11200007	Offset for door open position	-99.999~99.999 mm	Set the offset from the reference machine coordinate when the door open operation is completed.
11200008	Offset for door close position	-99.999~99.999 mm	Set the offset when the door close position is adjusted.
11200009	Door open maximum speed	1~999999 mm/min	Set the maximum travel speed for the door open operation.
11200010	Door close maximum speed	1~999999 mm/min	Set the maximum travel speed for the door close operation.
11200011	Manual speed	1~999999 mm/min	Set the maximum feedrate during manual operations (JOG, STEP and HANDLE).
11200012	Door open time constant 1	0.0~9999.9 msec	Set the time constant for the door open operation. <Door open time constant 1> is the time it takes to reach the command speed.
11200013	Door open time constant 2		<Door open time constant 2> and <Door open time constant 3> are the times for ideal acceleration and deceleration.
11200014	Door open time constant 3		
11200015	Door close time constant 1	0.0~9999.9 msec	Set the time constant for the door close operation. <Door close time constant 1> is the time it takes to reach the command speed.
11200016	Door close time constant 2		<Door close time constant 2> and <Door close time constant 3> are the times for ideal acceleration and deceleration.
11200017	Door close time constant 3		

System 1 (Automatic Door)			
No.	Item name	Setting range	Description
11200018	Manual time constant 1	0.0~400.0 msec	Set the acceleration and deceleration time constant during manual operations (JOG, STEP and HANDLE). When the manual time constants 1/2/3 settings are all “0” or are all not set, then the door motion accelerates and decelerates using the door open time constants 1/2/3 and door close time constants 1/2/3.
11200019	Manual time constant 2		
11200020	Manual time constant 3		
11200021	NC stop level for servo error	1~5	<1: Stop level 1 2: Stop level 2 3: Stop level 3 4: Stop level 4 5: Stop level 5> Set the stop level on the machine side (excluding the automatic door, PLC-axis, other axes) when a servo error is triggered on the automatic door. When not set, the default level is <5: Stop level 5>. A servo communication error and servo status error are a stop level 5 regardless of this parameter setting. A servo warning is a stop level 1 regardless of this parameter setting.  (NOTE) The operation on the machine side does not immediately stop when an automatic door servo error is triggered if this parameter is set to <3: Stop level 3>, <2: Stop level 2> or <1: Stop level 1>.
11200022	In-position timeout period	0.0~9999.9 msec	Set the time allowed for the in-position check. The check operation does not execute when the time is 0.
11200023	In-position width	0~99999999 pulses	Set the allowable range for the final position relative to the command position.
11200024	Positioning end check distance	0.0~9.999 mm	Set the allowable range for the final position when the door open/close operation is complete.
11200025	Return distance with servo controller ON	0.0001~9.999 mm	When the servo is turned ON, the machine automatically returns to the position where the servo was turned OFF the last time. This setting is for the maximum distance or range for that return operation.
11200026	Time period when door open position check is disabled	0~9999.9 msec	This time period refers to the duration (after the door open operation is completed) when the door open position check is not performed.
11200027	Door open position detection range	0.0~99.999 mm	Set the external output signal <Door open> to turn OFF if the stop position falls outside of the range: “Door open position ± this value”.
11200028	Overrun distance when stopped	0.0~99.999 mm	Stop control. Set the overrun distance for stopping.
11200029	Low-speed travel distance when stopped	0.0~99.999 mm	Stop control. Set the command value for the low speed travel distance for stopping. Set a value that does not include the overrun distance.
11200030	Low-speed travel speed when stopped	1~999999 mm/min	Stop control. Set the speed during low speed travel for stopping.
11200031	Low-speed time constant 1 when stopped	0~9999.9 msec	Stop control. Set the time constant during low speed travel for stopping. <Low-speed time constant 1 when stopped> is the time it takes to reach the command speed.
11200032	Low-speed time constant 2 when stopped		<Low-speed time constant 2 when stopped> and <Low-speed time constant 3 when stopped> are the times it takes for ideal acceleration and deceleration.
11200033	Low-speed time constant 3 when stopped		
11200034	Position check pulse	0~99999999 pulses	Set the tolerance for misalignment when the automatic door servo is ON. The alarm <<*Automatic door position shifted>> is triggered when the total value for the “Current machine coordinate ± position check pulse” is exceeded.
11200035	Stop check time when stopped	0~9999.9 msec	Stop control. Set the check time for determining whether it is stopped.
11200036	Wait time when stopped	0~9999 sec	Stop control. The alarm <<*Door open timeout>> is triggered when low speed travel for stopping does not stop even after this time has elapsed.

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System 1 (Automatic Door)			
No.	Item name	Setting range	Description
11200037	Stop time when stopped	0~9999.9 msec	Stop control. Set the time for determining whether it is stopped.
11200038	Stop position deviation when stopped	0~99999999 pulses	Stop control. Set the position deviation error for determining whether it is stopped. A stop is determined when a change in the stop deviation continues during the stop time.
11200039	Stop current reference value when stopped	0~999 %	Stop control. Set the standard value for the current command that determines whether it is stopped. A stop is determined when the current command value is more than the <Stop current reference value when stopped> and the <Stop check time when stopped> continues.

## 7.5 Machine Parameters 2 (System 2)

### 7.5.1 Common

System 2 (common)			
No.	Item name	Setting range	Description
12000001	Additional axis stroke 2	0~5	<0: No 1: QT-axis 2: 5th-axis 3: 6th-axis 4: 7th-axis 5: 8th-axis> The additional axis that is set and the range that is configured in the setting <X-, Y- and Z-axis (-)/(+) stroke 2> are a restricted travel range.
12000002	Additional axis (-) stroke 2	-9999.999~9999.999	The restricted travel range is set using the machine coordinate position for the additional axis that is set in <Additional axis stroke 2>.
12000003	Additional axis (+) stroke 2	degrees	
12000004	Additional axis stroke 3	0~5	<0: No 1: QT-axis 2: 5th-axis 3: 6th-axis 4: 7th-axis 5: 8th-axis> The additional axis that is set and the range that is configured in the setting <X-, Y- and Z-axis (-)/(+) stroke 3> are a restricted travel range.
12000005	Additional axis (-) stroke 3	-9999.999~9999.999	The restricted travel range is set using the machine coordinate position for the additional axis that is set in <Additional axis stroke 3>.
12000006	Additional axis (+) stroke 3	degrees	
12000007	Additional axis stroke 4	0~5	<0: No 1: QT-axis 2: 5th-axis 3: 6th-axis 4: 7th-axis 5: 8th-axis> The additional axis that is set and the range that is configured in the setting <X-, Y- and Z-axis (-)/(+) stroke 4> are a restricted travel range.
12000008	Additional axis (-) stroke 4	-9999.999~9999.999	The restricted travel range is set using the machine coordinate position for the additional axis that is set in <Additional axis stroke 4>.
12000009	Additional axis (+) stroke 4	degrees	
12000010	Additional axis stroke 5	0~5	<0: No 1: QT-axis 2: 5th-axis 3: 6th-axis 4: 7th-axis 5: 8th-axis> The additional axis that is set and the range that is configured in the setting <X-, Y- and Z-axis (-)/(+) stroke 5> are a restricted travel range.
12000011	Additional axis (-) stroke 5	-9999.999~9999.999	The restricted travel range is set using the machine coordinate position for the additional axis that is set in <Additional axis stroke 5>.
12000012	Additional axis (+) stroke 5	degrees	
12000013	Additional axis stroke 6	0~5	<0: No 1: QT-axis 2: 5th-axis 3: 6th-axis 4: 7th-axis 5: 8th-axis> The additional axis that is set and the range that is configured in the setting <X-, Y- and Z-axis (-)/(+) stroke 6> are a restricted travel range.
12000014	Additional axis stroke 6 (-)	-9999.999 to 9999.999	The restricted travel range is set using the machine coordinate position for the additional axis that is set in <Additional axis stroke 6>.
12000015	Additional axis stroke 6 (+)	°	
12000016	Additional axis stroke 7	0~5	<0: No 1: QT-axis 2: 5th-axis 3: 6th-axis 4: 7th-axis 5: 8th-axis> The additional axis that is set and the range that is configured in the setting <X-, Y- and Z-axis (-)/(+) stroke 7> are a restricted travel range.
12000017	Additional axis stroke 7 (-)	-9999.999 to 9999.999	The restricted travel range is set using the machine coordinate position for the additional axis that is set in <Additional axis stroke 7>.
12000018	Additional axis stroke 7 (+)	°	
12000019	Additional axis stroke 8	0~5	<0: No 1: QT-axis 2: 5th-axis 3: 6th-axis 4: 7th-axis 5: 8th-axis> The additional axis that is set and the range that is configured in the setting <X-, Y- and Z-axis (-)/(+) stroke 8> are a restricted travel range.
12000020	Additional axis stroke 8 (-)	-9999.999 to 9999.999	The restricted travel range is set using the machine coordinate position for the additional axis that is set in <Additional axis stroke 8>.
12000021	Additional axis stroke 8 (+)	°	
12000022	Additional axis stroke 9	0~5	<0: No 1: QT-axis 2: 5th-axis 3: 6th-axis 4: 7th-axis 5: 8th-axis> The additional axis that is set and the range that is configured in the setting <X-, Y- and Z-axis (-)/(+) stroke 9> are a restricted travel range.

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System 2 (common)			
No.	Item name	Setting range	Description
12000023	Additional axis stroke 9 (-)	-9999.999 to	The restricted travel range is set using the machine coordinate position for the additional axis that is set in <Additional axis stroke 9>.
12000024	Additional axis stroke 9 (+)	9999.999°	
12000025	Additional axis stroke 10	0~5	<0: No 1: QT-axis 2: 5th-axis 3: 6th-axis 4: 7th-axis 5: 8th-axis> The additional axis that is set and the range that is configured in the setting <X-, Y- and Z-axis (-)/(+) stroke 10> are a restricted travel range.
12000026	Additional axis stroke 10 (-)	-9999.999 to	The restricted travel range is set using the machine coordinate position for the additional axis that is set in <Additional axis stroke 10>.
12000027	Additional axis stroke 10 (+)	9999.999°	
12000028	Lathe spindle maximum speed	1~999999 min <sup>-1</sup>	Sets the maximum speed for the lathe spindle based on the specification.
12000029	Lathe spindle control change speed	0~999999 min <sup>-1</sup>	Sets the spindle speed that changes the control mode, when changing from lathe spindle rotation to orientation.
12000030	Turning spindle command timeout period	0~99999 msec	Sets the tolerance time to determine whether the command speed was reached during lathe spindle rotation. The time check does not execute when set to "0".
12000031	Turning spindle orientation completion check distance	0~999999 pulses	Sets the distance and time to confirm if the lathe spindle orientation operation is complete. The lathe spindle orientation is determined to be complete when the lathe spindle position deviation is within the set time and set distance.
12000032	Time to check lathe spindle orientation finish	0~9999 msec	
12000033	Thread cutting command timeout period	0~9999 msec	Specifies the time for checking if the speed for the thread cutting command was reached. When set to 0, it does not check.
12000034	Check time for thread cutting speed	0~9999 msec	Sets the time and range for determining if the speed for the thread cutting command was reached.
12000035	Allowable range for thread cutting speed	0.0~100.0%	If the following conditions are met during the check time for the thread cutting speed, then it is determined that the lathe spindle reached the command speed for thread cutting. (Conditions)   Command speed – Actual speed   ≤ Command speed × Allowable range for thread cutting speed ÷ 100
12000036	Rotation center X coordinate for tilt axis 1	-9999.999 to	Set the rotation center coordinate for the tilt axis and for the rotation axis using the machine coordinates.
12000037	Rotation center Y coordinate for tilt axis 1	9999.999 mm	
12000038	Rotation center Z coordinate for tilt axis 1		
12000039	Rotation center X coordinate for rotation axis 1		
12000040	Rotation center Y coordinate for rotation axis 1		
12000041	Rotation center Z coordinate for rotation axis 1		
12000042	Rotation center X coordinate for tilt axis 2	-9999.999 to	Use the machine coordinates to set the rotation center coordinate on the tilt axis and on the rotation axis for the additional axis on pallet 2 of a machine model equipped with a QT.
12000043	Rotation center Y coordinate for tilt axis 2	9999.999 mm	
12000044	Rotation center Z coordinate for tilt axis 2		
12000045	Rotation center X coordinate for rotation axis 2		
12000046	Rotation center Y coordinate for rotation axis 2		
12000047	Rotation center Z coordinate for rotation axis 2		

## 7.5.2 QT-axis

System 2 (common)			
No.	Item name	Setting range	Description
12040001	Quick table	0~2	<0: None, 1: Type 1, 2: Type 2> Sets whether the machine is equipped with a QT (quick table). Type 1 refers to a QT with a disc clamp mechanism, and type 2 refers to the standard QT (stop lock type).
12040002	Pallet 1 indexing angle	-9999.999~9999.999 degrees	Set the machine coordinate when indexing pallet 1 to the outside. The error <<QT-axis position shifted>> is triggered when the total value: this machine coordinate value ± the position check pulse is exceeded.
12040003	Pallet 2 indexing angle	-9999.999~9999.999 degrees	Set the machine coordinate when indexing pallet 2 to the outside. The error <<QT-axis position shifted>> is triggered when the total value: this machine coordinate value ± the position check pulse is exceeded.
12040004	Overrun angle when stopped	0.0~9.999 degrees	Stop control. Set the overrun angle for stopping.
12040005	Low-speed travel angle when stopped	0.0~9.999 degrees	Stop control Set the command value for the low speed travel distance for stopping. Set the value which does not include the overrun angle.
12040006	Low-speed rotation speed when stopped	0.1~9.9 min <sup>-1</sup>	Set the rotation speed during low speed travel for stopping.
12040007 12040008 12040009	Low-speed time constant 1 Low-speed time constant 2 Low-speed time constant 3	0~9999 msec	Stop control Set the time constant during low speed travel for stopping. <Low-speed time constant 1 when stopped> is the time it takes to reach the command speed. <Low-speed time constant 2 when stopped> and <Low-speed time constant 3 when stopped> are the times it takes for ideal acceleration and deceleration.
12040010	Check disable time when stopped	0~9999 msec	Stop control. The check is not carried out for the <Stop current detection range when stopped> during the time period: from when the current limit is changed to “3” for the stop. (NOTE) If the <Clamp mechanism> is set to <2: Type 3>, after the time period elapses starting from when the current limit is changed to “3” for the stop, the check is not carried out for the <Stop current detection range when stopped> until the clamp mechanism clamps.
12040011	Stop check time when stopped	0~9999 msec	Stop control. Set the check time for determining whether it is stopped.
12040012	Wait time when stopped	0~9999 sec	Stop control. The error <<QT-axis index timeout>> is triggered when low speed travel for stopping does not stop even after this time has elapsed.
12040013	Stop time when stopped	0~9999 msec	Stop control. Set the time for determining whether it is stopped.
12040014	Stop current detection range when stopped	0~999%	Stop control. The error <<QT-axis current error>> is triggered if the current command value is not equal to the <Current limit 3 ± this value> when stopped.
12040015	Stop position deviation when stopped	0~999 pulses	Stop control. Set the position deviation error for determining whether it is stopped. A stop is determined when a change in the stop deviation continues during the stop time.
12040016	Stop current reference value when stopped	0~999%	Stop control. Set the standard value for the current command that determines whether it is stopped. A stop is determined when the current command value is more than the <Stop current reference value when stopped> and the <Stop check time when stopped> continues.

System 2 (common)			
No.	Item name	Setting range	Description
12040017	Position check pulse during position adjustment	0~999999 pulses	Sets the pulse to check the tolerance of the QT-axis position while in battery recovery mode.
12040018	Stop check time during position adjustment	0~9999 msec	Monitors the position after the QT-axis is stopped while in expired battery recovery mode and after the set time has elapsed.
12040019	Gear ratio	1~120, 180, 360	Set the gear ratio for the QT-axis.
12040020	Absolute encoder rotation direction	0~1	<0: Normal by + comd. 1: Normal by - comd.> Set the rotational direction of the absolute encoder on the QT-axis.
12040021	Backlash compensation	0~99999 pulses	The backlash compensation is measured regularly according to the machine usage conditions. Each axis is offset or compensated by the number of pulses when necessary.
12040022	Clamp mechanism	0~2	<0: Type 1, 1: Type 2, 2: Type 3> Sets the type for the clamp mechanism on each axis. The <0: Type 1> setting is used when there is no clamp mechanism. The <1: Type 2> setting is used when there is a clamp mechanism and the servo is turned OFF during the clamp operation. The <2: Type 3> setting is used when there is a clamp mechanism and the servo is turned ON during the clamp operation.
12040023	Unclamp check input signal	0~2	<0: 0=Check, 1: 1=Check, 2: No signal> Sets the polarity of the unclamp check input signal on each axis. Selecting <2: No signal> treats the unclamp check signal as if it turned ON right after the unclamp output signal is turned ON. In addition, it also treats the clamp check signal as if it were turned ON right after the unclamp output signal is turned OFF.
12040024	Clamp check input signal	0~2	<0: Invalid, 1: 0=Check, 2: 1=Check> Set the polarity of the clamp check input signal. If the <0: Invalid> setting is selected and the clamp operation is complete, the operation is checked using the OFF status for the unclamp check input signal (not the clamp check input signal). However, this parameter setting is ignored when <Unclamp check input signal> for the axis is set to <2: No signal>.
12040025	Unclamp output signal	0~1	<0: 0=Unclamp, 1: 1=Unclamp> Set the polarity of the unclamp output signal.
12040026	Unclamp check time	0~9999 msec	Set the check time from when the unclamp check input signal is turned ON until the rotation operation is executed.
12040027	Clamp check time	0~9999 msec	Set the check time from when the clamp check input signal is turned ON until the next operation is executed.
12040028	Return angle with servo controller ON	0.001~9.999 degrees	When one of the following applies and the door changes from close → open, it automatically returns to the QT-axis position at the time when the door was closed. This setting is for the maximum angle of that return operation. The error <<*Return distance too long>> is triggered if the distance becomes longer than the set value. <ul style="list-style-type: none"> <li>• When door interlock mode is set to automatic operation</li> <li>• When door interlock mode is set to machine setup and the [ENABLE] switch is OFF</li> </ul>
12040029	In-position width	0~99999 pulses	Set the allowable range for the final position relative to the command position.
12040030	In-position check time	0~9999 msec	Set the time for checking the in-position width. If the final position, for the command position, falls within the in-position width in the set time, then the command is finished.
12040031	In-position check timeout period	0~9999 msec	Set the time allowed for the in-position check on the QT-axis. The check operation does not execute when the time is "0".

System 2 (common)			
No.	Item name	Setting range	Description
12040032	Positioning end check angle	0~9.999 degrees	When there is a successive positioning operation, this parameter sets the distance for starting the next operation, by setting a shortcut before actually reaching the end point. If the value is set too large, the non-cutting time can be reduced, but the machine may interfere with the workpiece. Therefore, exercise caution when changing the value.
12040033	Positioning check time	0~9999 msec	Set the check time starting after the rotation is complete on the QT-axis until the unclamp output signal turns OFF.
12040034	Position check pulse	0~999999 pulses	Set the tolerance for misalignment when clamped on the QT-axis.
12040035	Position check pulse (when cutting)	0 to 999999 pulses	Set the tolerance for misalignment during the cutting feed on at least 1 axis for the axes: X, Y, Z or the additional axis, while the QT-axis is clamped. When it is not set or if it is set to <0>, the same value as the setting in <Position check pulse> is used.
12040036	Time for changing position check pulse	0 to 9999 msec	Set the time to change the misalignment tolerance when cutting while the QT-axis is clamped.
12040037	Ratio to restrict speed for position deviation	1~100%	Set the value for the position deviation in a ratio to restrict the QT-axis speed. It is 100% when the setting is not configured.
12040038	Manual speed	0.1~5.0 min <sup>-1</sup>	Set the maximum rotation speed during manual (JOG, STEP and HANDLE) operation.
12040039 ~ 12040041	Manual time constant 1 Manual time constant 2 Manual time constant 3	0~400 msec	Sets the acceleration and deceleration time constant during manual operations (JOG, STEP and HANDLE). The numbers on the end refer to the function type. <u>Numbers</u> “1” refers to the time it takes to reach the command speed. “2” and “3” refer to the time of the ideal acceleration and deceleration.  It accelerates and decelerates using the rapid feed time constant 1C, 2C and 3C when the manual time constants 1, 2 and 3 settings are all 0 or are not set. Even if values greater than 100 msec. are set, they are restricted to 100 msec. when the machine is equipped with a clamp mechanism.
12040042	Rapid feedrate	0.1~9999.9 min <sup>-1</sup>	Set the maximum feedrate on the QT-axis.
12040043	Rapid feedrate (Weight 1)	0.1~9999.9min <sup>-1</sup>	Set the maximum feedrate on the QT-axis.
12040044	Rapid feedrate (Weight 2)	0.1~9999.9min <sup>-1</sup>	Set the maximum feedrate on the QT-axis.
12040045	Rapid feedrate (speed restricted)	0.1~9999.9min <sup>-1</sup>	Set the maximum travel speed on the QT-axis when the position deviation for the QT-axis does not exceed the value set in <Ratio to restrict speed for position deviation>.
12040046	Rapid feedrate (door open)	0.1~9999.9 min <sup>-1</sup>	Set the maximum feed rate on the QT-axis when a door is open.
12040047	Rapid feedrate selection	0~2	<0: Std., 1:Wt. 1, 2: Wt. 2> Select the maximum feed rate on the QT-axis depending on the load weight of the quick table.

System 2 (common)			
No.	Item name	Setting range	Description
12040048 ~ 12040056	Rapid feed time constant 1A Rapid feed time constant 2A Rapid feed time constant 3A Rapid feed time constant 1B Rapid feed time constant 2B Rapid feed time constant 3B Rapid feed time constant 1C Rapid feed time constant 2C Rapid feed time constant 3C	0~9999 msec	<p>Set the time constant for acceleration and deceleration during rapid feed.</p> <p>The number at the end of &lt;Rapid feed time constant 1A&gt; refers to the function type and the letters refer to the change type.</p> <p><u>Numbers</u> “1” refers to the time it takes to reach the command speed. “2” and “3” refer to the time of the ideal acceleration and deceleration.</p> <p><u>Letters</u> “A” enables to <math>  \text{travel distance}   \leq \text{time constant change distance A}</math>. “B” refers to time constant change distance A <math>&lt;   \text{travel distance}   \leq \text{time constant change distance B}</math>. “C” refers to time constant change distance B <math>&lt;   \text{travel distance}  </math>, or JOG feed.</p>
12040057	Minimum rapid feed time constant ratio	1~100%	Set the rapid feed time constant minimum for the QT-axis in a ratio, when calculating the time constant from the table load weight.
12040058 12040059	Time constant change distance A Time constant change distance B	0~9999.999 degrees	Set the distance to change the time constant for rapid feed on the QT-axis.
12040060	Lower limit time constant	0~9999 msec	Set the time constant minimum for acceleration and deceleration on the QT-axis.
12040061	Current check time	0~99×10 msec	<p>Sets the check time for the current, which makes sure if the time constant calculated from the workpiece weight is correct.</p> <p>The error check is not executed when set to “0”.</p>
12040062	Current tolerance	0~999%	<p>Sets the tolerance for the current, which makes sure if the time constant calculated from the workpiece weight is correct.</p> <p>The error check is not executed when set to “0”.</p> <p>If the tolerance exceeds the &lt;Current check time&gt;, the alarm &lt;&lt;*Load weight setting error&gt;&gt; is triggered.</p>
12040063 12040064 12040065	Door open time constant 1 Door open time constant 2 Door open time constant 3	0.0~99.9 msec	<p>Set the acceleration and deceleration time constant for each axis when &lt;Door interlock mode&gt; is set to &lt;Machine setup&gt; and a door is open.</p> <p>&lt;Door open time constant 1&gt; is the time it takes to reach the command speed.</p> <p>&lt;Door open time constant 2&gt; and &lt;Door open time constant 3&gt; are the times for ideal acceleration and deceleration.</p>

### 7.5.3 Additional Axis

System 2 (common)			
No.	Item name	Setting range	Description
12**0001 *: 5th-axis → 05 6th-axis → 06 7th-axis → 07 8th-axis → 08	Optional axis	0~2	
12**0002	Installation position	0~2	<p>&lt;0: No pallet, 1: Table 1, 2: Table 2&gt;</p> <p>Sets the installation position for each axis. &lt;0: No pallet&gt; selection operates following the machine program. &lt;1: Table 1&gt; and &lt;2: Table 2&gt; selections are valid for machines equipped with QT, and the machining program operates using the axis on the inner pallet. Therefore, configure the settings as follows.</p> <ul style="list-style-type: none"> <li>• Machines not equipped with QT &lt;0: No pallet&gt;</li> <li>• Machines equipped with QT &lt;1: Table 1&gt; or &lt;2: Table 2&gt;</li> </ul>

System 2 (common)			
No.	Item name	Setting range	Description
12**0003	Address	0~2	<0:A, 1:B, 2:C> Sets the address for each axis.
12**0004	Machine zero return sequence	0~5	<0: 2nd 1: 3rd 2: 4th 3: 5th 4: 6th 5: 7th> Sets the machine zero return order for each axis. The machine zero return order is as follows: 1 <sup>st</sup> is Z-axis, 2 <sup>nd</sup> is X- and Y-axes, and thereafter it follows the order per the settings.
12**0005	Gear ratio	1~120, 180, 360	Set the gear ratio for each axis.
12**0006	Absolute encoder rotation direction	0~1	<0: Normal by + comd. 1: Normal by - comd.> Sets the rotational direction of the absolute encoder on each axis.
12**0007	Normal rotation (lathe spindle)	0~1	<0: +JOG direction 1: -JOG direction> Set the forward direction when the lathe spindle is selected if the value for <Optional axis> (5th- to 8th-axis) is set to <Yes (lathe spindle)>.
12**0008	Expansion I/O board station number for positioning	0~64	Sets the EXIO PCB station number for the additional axis used for positioning. Set to "0" when not connected.
12**0009	Backlash compensation	0~99999 pulses	The backlash compensation is measured regularly according to the machine usage conditions. Each axis is offset or compensated by the number of pulses when necessary.
12**0010	Clamp mechanism	0~2	<0: Type 1, 1: Type 2, 2: Type 3> Sets the type for the clamp mechanism on each axis. The <0: Type 1> setting is used when there is no clamp mechanism. The <1: Type 2> setting is used when there is a clamp mechanism and the servo is turned OFF during the clamp operation. The <2: Type 3> setting is used when there is a clamp mechanism and the servo is turned ON during the clamp operation.
12**0011	Unclamp check input signal	0~2	<0: 0=Check, 1: 1=Check, 2: No signal> Sets the polarity of the unclamp check input signal on each axis. Selecting <2: No signal> treats the unclamp check signal as if it turned ON right after the *axis unclamp output signal is turned ON. In addition, it also treats the clamp check signal as if it were turned ON right after the *axis unclamp output signal is turned OFF.
12**0012	Clamp check input signal	0~2	<0: Invalid, 1: 0=Check, 2: 1=Check> Sets the polarity of the clamp check input signal on each axis. If the <0: Invalid> setting is selected and the clamp operation is complete, the operation is checked using the OFF status for the unclamp check input signal (not the clamp check input signal). However, this parameter setting is ignored when <Unclamp check input signal> (5th to 8th-axes) for the axis is set to <2: No signal>.
12**0013	Unclamp output signal	0~1	<0: 0=Unclamp, 1: 1=Unclamp> Sets the polarity of the unclamp output signal on each axis.
12**0014	Unclamp check time	0~9999 msec	Sets the check time from when the unclamp check input signal on each axis is turned ON until the rotation operation is executed.
12**0015	Clamp check time	0~9999 msec	Sets the check time from when the clamp check input signal on each axis is turned ON until the next operation is executed.
12**0016	Unclamp time during servo ON	0~9999 msec	Set the time for unclamping while the servo is ON, when the <Clamp mechanism> (5th- to 8th-axes) is set to <2: Type 3>. When set to "0", unclamping is not performed.
12**0017	Clamp retry attempts	0~99	Set the number of clamp retry attempts when an axis shifts out of position exceeding the <Position check pulse> after the clamp has been completed. Even after carrying out the set number of retry attempts, if the axis is still out of position and does not fall within the <Position check pulse> range, the alarm <<*-axis position shifted>> is triggered. When set to 0, it does not retry. This parameter is only valid for M type model machines.

System 2 (common)			
No.	Item name	Setting range	Description
12**0018	Clamp retry pulse	0~9999999 pulses	Execute the clamp retry operation when an axis shifts out of position exceeding the <Clamp retry pulse> after the clamp has been completed. This parameter is only valid for M type model machines.
12**0019	Allowable pulse for clamp retry	0~999999 pulses	Set the tolerance for a shift in the position when a retry attempt is made to clamp. If the position has shifted and exceeds the allowable pulse for the clamp retry attempt, the alarm <<*-axis position shifted>> is triggered. This parameter is only valid for M type model machines.
12**0020	Wait time for clamp retry start	0~9999 msec	Set the wait time during a retry attempt from when the unclamp is completed until the clamp starts. This parameter is only valid for M type model machines.
12**0021	Return angle with servo controller ON	0.001~9.999 degrees	When one of the following applies and the door changes from close → open, it automatically returns to each axis position at the time when the door was closed. This setting is for the maximum angle of that return operation. The error <<*Return distance too long>> is triggered if the distance becomes longer than the set value. <ul style="list-style-type: none"> <li>• When door interlock mode is set to automatic operation</li> <li>• When door interlock mode is set to machine setup and the [ENABLE] switch is OFF</li> </ul>
12**0022	In-position width	0~99999 pulses	Sets the allowable range for the final position relative to the command position on each axis.
12**0023	In-position check time	0~9999 msec	Sets the time for checking the in-position width on each axis. If the final position, for the command position, falls within the in-position width in the set time, then the command is finished.
12**0024	In-position check timeout period	0~9999 msec	Sets the time allowed for the in-position check on each axis. The check operation does not execute when the time is “0”.
12**0025	Positioning end check angle	0~9.999 degrees	When there is a successive positioning operation, this parameter sets the distance for starting the next operation, by setting a shortcut before actually reaching the end point. If the value is set too large, the non-cutting time can be reduced, but the machine may interfere with the workpiece. Therefore, exercise caution when changing the value.
12**0026	Positioning check time	0~9999 msec	Sets the check time starting after the rotation is complete on each axis until the unclamp output signal turns OFF.
12**0027	Position check pulse	0~999999 pulses	Sets the tolerance for misalignment when clamped on each axis.
12**0028	Position check pulse (when cutting)	0 to 999999 pulses	Set the tolerance for misalignment during the cutting feed on at least 1 axis for the axes: X, Y, Z or the additional axis, while each axis is clamped. When it is not set or if it is set to “0”, the same value as the setting in <Position check pulse> (5th to 8th-axes) is used.
12**0029	Time for changing position check pulse	0 to 9999 msec	Sets the time to change the misalignment tolerance when cutting while each axis is clamped.
12**0030	Rapid feedrate	0.1~9999.9 min <sup>-1</sup>	Sets the maximum feedrate on each axis.
12**0031	Manual speed	0.1~9999.9min <sup>-1</sup>	Set the maximum rotation speed during manual (JOG, STEP and HANDLE) operation.

System 2 (common)			
No.	Item name	Setting range	Description
12**0032 ~ 12**0034	Manual time constant 1 Manual time constant 2 Manual time constant 3	0~400 msec	<p>Sets the acceleration and deceleration time constant during manual operations (JOG, STEP and HANDLE).</p> <p>The numbers on the end refer to the function type. <u>Numbers</u> “1” refers to the time it takes to reach the command speed. “2” and “3” refer to the time of the ideal acceleration and deceleration.</p> <p>It accelerates and decelerates using the rapid feed time constant 1C, 2C and 3C when the manual time constants 1, 2 and 3 settings are all 0 or are not set. Even if values greater than 100 msec. are set, they are restricted to 100 msec. when the machine is equipped with a clamp mechanism.</p>
12**0035	Rapid feedrate (door open)	0.1~9999.9 min <sup>-1</sup>	<p>Sets the maximum feed rate on each axis when a door is open. The machine configuration may restrict the actual travel speed to a speed that is less than the set value.</p>
12**0036	Rapid feedrate (Outer pallet)	0.1 to 9999.9 min <sup>-1</sup>	<p>Sets the maximum feed rate when 5th through 8th-axes are at the outer pallet. The axes are also controlled with this speed when the pallet is not indexed.</p>
12**0037 ~ 12**0045	Rapid feed time constant 1A Rapid feed time constant 2A Rapid feed time constant 3A Rapid feed time constant 1B Rapid feed time constant 2B Rapid feed time constant 3B Rapid feed time constant 1C Rapid feed time constant 2C Rapid feed time constant 3C	0~9999 msec	<p>Set the time constant for acceleration and deceleration during the rapid feed operation on each axis.</p> <p>The number at the end of &lt;Rapid feed time constant 1A&gt; refers to the function type and the letters refer to the change type. <u>Numbers</u> “1” refers to the time it takes to reach the command speed. “2” and “3” refer to the time of the ideal acceleration and deceleration. <u>Letters</u> “A” enables to   travel distance   ≤ time constant change distance A. “B” refers to time constant change distance A &lt;   travel distance   ≤ time constant change distance B. “C” refers to time constant change distance B &lt;   travel distance  , or JOG feed.</p>
12**0046 12**0047	Time constant change distance A Time constant change distance B	0~9999.999 degrees	Set the distance to change the time constant for rapid feed on each axis.
12**0048	Lower limit time constant	0~9999 msec	Sets the time constant minimum for acceleration and deceleration on each axis.
12**0049	Maximum cutting rotation speed	0.1~9999.9min <sup>-1</sup>	Sets the maximum cutting feedrate on each axis.
12**0050	Brake	0~5	<p>&lt;0: None 1 to 5: Brake 1 to 5&gt;</p> <p>Set whether the machine is equipped or not equipped with a brake on each axis. The &lt;Brake 1 to 5&gt; selection sets which input signal for SR_BK*RLS(*:1 to 5) to check as the brake input signal. When setting the brake that is used on another axis, the alarm &lt;&lt;Machine param. setting error (SYS 2)&gt;&gt; (Stop level 5, cancel level 3) is triggered.</p>
12**0051	Brake load test	0~1	<p>&lt;0: No test, 1: Test&gt;</p> <p>Set whether or not to execute the brake load test on the each axis. Set to &lt;1: Test&gt; on axes that fall due to a dead load. When the brake load test is set to &lt;1: Test&gt; on axes where &lt;Brake&gt; (5th- to 8th-axis) is set to &lt;0: None&gt;, the alarm &lt;&lt;Machine param. setting error (SYS 2)&gt;&gt; (Stop level 4, cancel level 2) is triggered.</p>

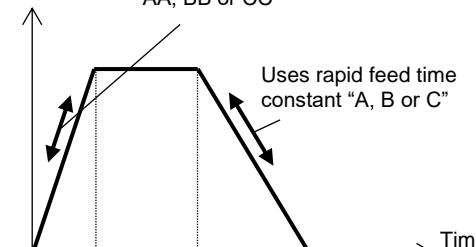
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System 2 (common)			
No.	Item name	Setting range	Description
12**0052	Load torque for brake load test	1~999 %	Set the torque for the load applied to each axis brake in the brake load test. The set value is the ratio when the rated torque for the motor is 100%.
12**0053	Travel amount under load for brake load test	0.001~9.999°	Set the travel amount where a load is applied on each axis brake in the brake load test.
12**0054	Allowable travel amount for brake load test	0.001~9.999°	Set the tolerance value for a position shift where the load is applied on each axis brake in the brake load test. After applying the load to the brake, when the travel amount exceeds the set value, the alarm <>Brake load test error on *-axis>> is triggered.
12**0055	Delay time for brake operation	0.0~9999.9 msec	Set the time it takes from when the brake release signal for each axis turns OFF until the brake is applied.
12**0056	Delay time for brake release	0.0~9999.9 msec	Set the time it takes from when the brake release signal for each axis turns ON until the brake is released.
12**0057	Load time for brake load test	1.0~9999.9 msec	Set the time period when a load is applied on each axis brake in the brake load test.
12**0058	Timeout time for load during brake load test	0.0~9999.9 msec	Set the time allowed for the load that normally applies to each axis brake during the brake load test. The check operation does not execute when the time is “0.0”.
12**0059	Marked position for adjustment	-9999.999 to 9999.999°	Set the marked position that is used for the position adjustment with the machine coordinates.
12**0060	Wait time before applying brake in brake load test	0.0~9999.9 msec	Set the wait time before applying the brake on each axis in the brake load test.
12**0061	Wait time before releasing brake in brake load test	0.0~9999.9 msec	Set the wait time before releasing the brake on each axis in the brake load test.
12**0062	Door open time constant 1	0.0~99.9 msec	Set the acceleration and deceleration time constant for each axis when <Door interlock mode> is set to <Machine setup> and a door is open. <Door open time constant 1> is the time it takes to reach the command speed. <Door open time constant 2> and <Door open time constant 3> are the times for ideal acceleration and deceleration.
12**0063	Door open time constant 2	0.0~99.9 msec	
12**0064	Door open time constant 3	0.0~99.9 msec	
12**0065	Adjustment mark	0~1	<0: No, 1: Yes> Set a mark that is used for the position adjustment on each axis.

## 7.6 Machine Parameters 3 (System 3)

### 7.6.1 Common

System 3(common)			
No.	Item name	Setting range	Description
13000001	M-axis gear ratio (numerator)	1~999	Sets the gear ratio (numerator) for the magazine axis.
13000002	M-axis gear ratio (denominator)	1~999	Sets the gear ratio (denominator) for the magazine axis.
13000003	M-axis absolute encoder rotation direction	0~1	<0: Normal by + comd., 1: Normal by - comd.> Sets the rotational direction of the absolute encoder on the magazine axis.
13000004	M-axis backlash compensation	0~99999 pulses	The backlash compensation is measured regularly according to the machine usage conditions. Each magazine axis is offset or compensated by the number of pulses when necessary.
13000005	M-axis current limit check time	0~9999 msec	Sets the check time from when the magazine operation is complete until the current limit is executed.
13000006	M-axis position check pulse	0~99999 pulses	Sets the tolerance error using pulses for detecting when the <<*Magazine position shifted>>.
13000007	M-axis tolerance	0~99999 pulses	Sets the tolerance error using pulses for detecting when the <<*Magazine number error>>.
13000008	M-axis in-position width	0~99999 pulses	Sets the allowable range for the final position relative to the command position for the magazine axis.
13000009	M-axis in-position timeout period	0~9999 msec	Sets the time allowed for the in-position check on the magazine axis. The check operation does not execute when the time is "0".
13000010	Maximum tool specification setting function	0: Disable 1: Enable	Enable or disable the setting function for the maximum tool specification.
13000011	M-axis rapid feedrate (standard tool)	0.1~500.0	Set the maximum travel speed for the magazine axis when the user parameter (switch 1: ATC/Magazine) <Maximum tool specification settings> is set to <0: Standard tool>. The unit is different depending on the magazine type. Magazine shape is a circle: min <sup>-1</sup> Other: m/min
13000012	M-axis rapid feedrate (heavy tool)	0.1~500.0	Set the maximum travel speed for the magazine axis when the user parameter (switch 1: ATC/Magazine) <Maximum tool specification settings> is set to <1: Heavy tool>. The unit is different depending on the magazine type. Magazine shape is a circle: min <sup>-1</sup> Other: m/min
13000013	M-axis rapid feedrate (door open)	0.1~500.0	Sets the maximum feedrate on the magazine axis when a door is open. The unit is different depending on the magazine type. Magazine shape is a circle: min <sup>-1</sup> Other: m/min
13000014	M-axis rapid feedrate (speed restricted) (standard tool)	0.1~500.0	Set the maximum travel speed for the magazine axis when the user parameter (switch 1: ATC/Magazine) <Maximum tool specification settings> is set to <0: Standard tool> and when the position deviation for the magazine axis exceeds the value set in <Ratio of M-axis position deviation to restrict speed>. The unit is different depending on the magazine type. Magazine shape is a circle: min <sup>-1</sup> Other: m/min
13000015	M-axis rapid feedrate (speed restricted) (heavy tool)	0.1~500.0	Set the maximum travel speed for the magazine axis when the user parameter (switch 1: ATC/Magazine) <Maximum tool specification settings> is set to <1: Heavy tool> and when the position deviation for the magazine axis exceeds the value set in <Ratio of M-axis position deviation to restrict speed (heavy tool)>. The unit is different depending on the magazine type. Magazine shape is a circle: min <sup>-1</sup> Other: m/min

System 3(common)			
No.	Item name	Setting range	Description
13000016 ~ 13000024	M-axis rapid feed time constant 1A (standard tool) M-axis rapid feed time constant 2A (standard tool) M-axis rapid feed time constant 3A (standard tool) M-axis rapid feed time constant 1B (standard tool) M-axis rapid feed time constant 2B (standard tool) M-axis rapid feed time constant 3B (standard tool) M-axis rapid feed time constant 1C (standard tool) M-axis rapid feed time constant 2C (standard tool) M-axis rapid feed time constant 3C (standard tool)	0~9999 msec	<p>Set the time constant for acceleration and deceleration of the magazine axis rapid feed when the user parameter (switch 1: ATC/Magazine) &lt;Maximum tool specification settings&gt; is set to &lt;0: Standard tool&gt;. The number at the end of &lt;M-axis rapid feed time constant 1A&gt; refers to the function type and the letters refer to the change type.</p> <p><u>Numbers</u> “1” refers to the time it takes to reach the command speed. “2” and “3” refer to the time of the ideal acceleration and deceleration.</p> <p><u>Letters</u> “A” refers to  travel distance  ≤ time constant change distance A. “B” refers to time constant change distance A &lt;  travel distance  ≤ time constant change distance B. “C” refers to time constant change distance B &lt;  travel distance , or JOG feed.</p>
13000025 ~ 13000033	M-axis rapid feed time constant 1A (heavy tool) M-axis rapid feed time constant 2A (heavy tool) M-axis rapid feed time constant 3A (heavy tool) M-axis rapid feed time constant 1B (heavy tool) M-axis rapid feed time constant 2B (heavy tool) M-axis rapid feed time constant 3B (heavy tool) M-axis rapid feed time constant 1C (heavy tool) M-axis rapid feed time constant 2C (heavy tool) M-axis rapid feed time constant 3C (heavy tool)	0~9999 msec	<p>Set the time constant for acceleration and deceleration of the magazine axis rapid feed when the user parameter (switch 1: ATC/Magazine) &lt;Maximum tool specification settings&gt; is set to &lt;0: Standard tool&gt;. The number at the end of &lt;M-axis rapid feed time constant 1A&gt; refers to the function type and the letters refer to the change type.</p> <p><u>Numbers</u> “1” refers to the time it takes to reach the command speed. “2” and “3” refer to the time of the ideal acceleration and deceleration.</p> <p><u>Letters</u> “A” refers to  travel distance  ≤ time constant change distance A. “B” refers to time constant change distance A &lt;  travel distance  ≤ time constant change distance B. “C” refers to time constant change distance B &lt;  travel distance , or JOG feed.</p>
13000034	Time constant change when M-axis accelerates/decelerates	0~1	<p>&lt;0: Invalid. 1: Valid.&gt; When set to &lt;0: Invalid&gt;, the time constant for acceleration/deceleration does not change. The parameter &lt;M-axis rapid feed time constant 1/2/3&gt; (letter at end is “A, B or C”) is always used. The parameter setting changes the &lt;M-axis rapid feed time const.1/2/3&gt; (letter at end is “A, B or C”, or “AA, BB or CC”) during acceleration and deceleration when set to &lt;1: Valid&gt;.</p> <p style="text-align: center;">Speed                  Uses rapid feed time constant “AA, BB or CC”    Time</p>

System 3(common)			
No.	Item name	Setting range	Description
13000035 ~ 13000040	M-axis rapid feed time constant 1AA (standard tool) M-axis rapid feed time constant 2AA (standard tool) M-axis rapid feed time constant 1BB (standard tool) M-axis rapid feed time constant 2BB (standard tool) M-axis rapid feed time constant 1CC (standard tool) M-axis rapid feed time constant 2CC (standard tool)	0~9999 msec	<p>Set the time constant for acceleration and deceleration during the rapid feed operation on the magazine axis. This parameter is enabled when &lt;Time constant change when M-axis accelerates/decelerates&gt; is set to &lt;1: Val.&gt;.</p> <p>The number at the end of &lt;M-axis rapid feed time constant 1AA&gt; refers to the function type and the letters refer to the change type.</p> <p><u>Numbers</u></p> <ul style="list-style-type: none"> <li>“1” refers to the time it takes to reach the command speed.</li> <li>“2” refers to the time of the ideal acceleration and deceleration.</li> </ul> <p><u>Letters</u></p> <ul style="list-style-type: none"> <li>“AA” refers to  travel distance  ≤ time constant change distance A.</li> <li>“BB” refers to time constant change distance A &lt;  travel distance  ≤ time constant change distance B.</li> <li>“CC” refers to time constant change distance B &lt;  travel distance , or JOG feed.</li> </ul>
13000041 ~ 13000046	M-axis rapid feed time constant 1AA (heavy tool) M-axis rapid feed time constant 2AA (heavy tool) M-axis rapid feed time constant 1BB (heavy tool) M-axis rapid feed time constant 2BB (heavy tool) M-axis rapid feed time constant 1CC (heavy tool) M-axis rapid feed time constant 2CC (heavy tool)	0~9999 msec	<p>Set the time constant for acceleration and deceleration during rapid feed on the magazine axis, when the user parameter (switch 1: ATC/magazine) &lt;Turret type magazine speed&gt; is set to &lt;1: High&gt;. This parameter is enabled when &lt;Time constant change when M-axis accelerates/decelerates&gt; is set to &lt;1: Val.&gt;.</p> <p>The number at the end of &lt;M-axis rapid feed time constant 1AA&gt; refers to the function type and the letters refer to the change type.</p> <p><u>Numbers</u></p> <ul style="list-style-type: none"> <li>“1” refers to the time it takes to reach the command speed.</li> <li>“2” refers to the time of the ideal acceleration and deceleration.</li> </ul> <p><u>Letters</u></p> <ul style="list-style-type: none"> <li>“AA” refers to  travel distance  ≤ time constant change distance A.</li> <li>“BB” refers to time constant change distance A &lt;  travel distance  ≤ time constant change distance B.</li> <li>“CC” refers to time constant change distance B &lt;  travel distance , or JOG feed.</li> </ul>
13000047 13000048	M-axis time constant change distance A (standard tool) M-axis time constant change distance B (standard tool)	0~9999.999	<p>Set the distance to change the time constant during rapid feed on the magazine axis when the user parameter (switch 1: ATC/Magazine) &lt;Maximum tool specification settings&gt; is set to &lt;0: Standard tool&gt;. The unit is different depending on the magazine type. Magazine shape is a circle: Degrees Other: mm</p>
13000049 13000050	M-axis time constant change distance A (heavy tool) M-axis time constant change distance B (heavy tool)	0~9999.999	<p>Set the distance to change the time constant during rapid feed on the magazine axis when the user parameter (switch 1: ATC/Magazine) &lt;Maximum tool specification settings&gt; is set to &lt;1: Heavy tool&gt;. The unit is different depending on the magazine type. Magazine shape is a circle: Degrees Other: mm</p>
13000051	M-axis lower limit time constant	0~9999 msec	Sets the time constant minimum for acceleration and deceleration on the magazine axis.
13000052	M-axis position deviation tolerance ratio (standard tool)	1~100%	<p>Set the tolerance using a ratio for position deviation on the magazine axis when the user parameter (switch 1: ATC/Magazine) &lt;Maximum tool specification settings&gt; is set to &lt;0: Standard tool&gt;. It is 100% when the setting is not configured.</p>

System 3(common)			
No.	Item name	Setting range	Description
13000053	M-axis position deviation tolerance ratio (heavy tool)	1~100%	Set the tolerance using a ratio for position deviation on the magazine axis when the user parameter (switch 1: ATC/Magazine) <Maximum tool specification settings> is set to <1: Heavy tool>. It is 100% when the setting is not configured.
13000054	Ratio of M-axis position deviation to restrict speed (standard tool)	1~100%	Set the position deviation, using a ratio, for restricting the speed on the magazine axis, when the user parameter (switch 1: ATC/Magazine) <Maximum tool specification settings> is set to <0: Standard tool>. It is 100% when the setting is not configured.
13000055	Ratio of M-axis position deviation to restrict speed (heavy tool)	1~100%	Set the position deviation, using a ratio, for restricting the speed on the magazine axis, when the user parameter (switch 1: ATC/Magazine) <Maximum tool specification settings> is set to <1: Heavy tool>. It is 100% when the setting is not configured.
13000056	Operation reference point in ATC range (Z-axis)	0~999.999mm	Set the operation reference point on the Z-axis during a tool change.
13000057 13000058	Operation reference point in ATC range (M-axis 1) Operation reference point in ATC range (M-axis 2)	0~999999 pulses	Set the operation reference point on the magazine axis during a tool change.
13000059	Operation start point in ATC range (when ATC rises) (standard tool)	0~999999 pulses	Set the operation start point during a tool change (when Z-axis rises) when the user parameter (switch 1: ATC/Magazine) <Maximum tool specification settings> is set to <0: Standard tool>.
13000060	Operation start point in ATC range (when ATC falls) (standard tool)	0~999999 pulses	Set the operation start point during a tool change (when Z-axis falls) when the user parameter (switch 1: ATC/Magazine) <Maximum tool specification settings> is set to <0: Standard tool>.
13000061	Operation start point in ATC range (when ATC rises) (heavy tool)	0~999.999 mm	Set the operation start point during a tool change (when Z-axis rises) when the user parameter (switch 1: ATC/Magazine) <Maximum tool specification settings> is set to <1: Heavy tool>.
13000062	Operation start point in ATC range (when ATC falls) (heavy tool)	0~99999999 pulses	Set the operation start point during a tool change (when Z-axis falls) when the user parameter (switch 1: ATC/Magazine) <Maximum tool specification settings> is set to <1: Heavy tool>.
13000063	Maximum deceleration in ATC range (Z-axis)	0.001~999.999 m/sec <sup>2</sup>	Set the maximum deceleration speed when decelerating.
13000064	Maximum deceleration in ATC range (M-axis)	1~999999 degrees/sec <sup>2</sup>	Set the maximum deceleration speed when decelerating.
13000065	Load torque for brake load test on M-axis	1~999 %	Set the torque for the load applied to the magazine axis brake in the brake load test. The set value is the ratio when the rated torque for the motor is 100%.
13000066	Travel amount under load for brake load test on M-axis	1~99999999 pulses	Set the travel amount where a load is applied on the magazine axis brake in the brake load test.
13000067	Allowable travel amount for brake load test on M-axis	1~99999999 pulses	Set the tolerance value for a position shift where the load is applied on the magazine axis brake in the brake load test. After applying the load to the brake, when the travel amount exceeds the set value, the alarm <<Brake load test error on M-axis>> is triggered.
13000068	Delay time for M-axis brake operation	0.0~9999.9 msec	Set the time it takes from when the brake release signal for the magazine axis turns OFF until the brake is applied.
13000069	Delay time for M-axis brake release	0.0~9999.9 msec	Set the time it takes from when the brake release signal for the magazine axis turns ON until the brake is released.
13000070	Load time for brake load test on M-axis	1.0~9999.9 msec	Set the time for the load being applied on the magazine axis brake.
13000071	Timeout time for load during brake load test on M-axis	0.0~9999.9 msec	Set the time allowed for the load that normally applies to the magazine axis brake during the brake load test. The check operation does not execute when the time is “0.0”.

System 3(common)			
No.	Item name	Setting range	Description
13000072	AT-axis rapid feedrate 1	0.1 to 9999.9 min <sup>-1</sup>	Set the maximum feedrate on the AT-axis when a standard tool is turning. ATC unit cam axis rotation: min <sup>-1</sup>
13000073	AT-axis rapid feedrate 2	0.1 to 9999.9 min <sup>-1</sup>	Set the maximum feedrate on the AT-axis when a large tool is turning. ATC unit cam axis rotation: min <sup>-1</sup>
13000074	AT-axis rapid feedrate (door open)	0.1 to 9999.9 min <sup>-1</sup>	Set the maximum feedrate on the AT-axis when a door is open. ATC unit cam axis rotation: min <sup>-1</sup>
13000075	AT-axis manual rapid feedrate	0.1 to 9999.9 min <sup>-1</sup>	Set the maximum feedrate on the AT-axis during manual operations (JOG, STEP and HANDLE). ATC unit cam axis rotation: min <sup>-1</sup>
13000076	AT-axis in-position width	0 to 999999 pulses	Set the allowable range for the final position relative to the command position on the AT-axis.
13000077	AT-axis in-position timeout period	0 to 9999 msec	Set the time for checking the in-position width on the AT-axis. The check operation does not execute when the time is “0”.
13000078	AT-axis position check pulse	0 to 999999 pulses	This parameter is used when the AT-axis motor position is out of alignment while the servo is OFF. If the AT-axis machine coordinate does not match the motor position and the difference is greater than the set value, the AT-axis machine coordinate updates to the current motor position.
13000079 ~ 13000081	AT-axis rapid feed time constant 1 AT-axis rapid feed time constant 2 AT-axis rapid feed time constant 3	0 to 9999 msec	Set the time constant for acceleration and deceleration during the rapid feed operation on the AT-axis.  The number at the end of <AT-axis rapid feed time constant 1> refers to the function type. Numbers “1” refers to the time it takes to reach the command speed. “2” and “3” refer to the time of the ideal acceleration and deceleration.
13000082 ~ 13000084	AT-axis manual time constant 1 AT-axis manual time constant 2 AT-axis manual time constant 3	0 to 9999 msec	Set the acceleration and deceleration time constant during manual operations (JOG, STEP and HANDLE) on the AT-axis.  The number at the end of <AT-axis rapid feed time constant 1> refers to the function type. Numbers “1” refers to the time it takes to reach the command speed. “2” and “3” refer to the time of the ideal acceleration and deceleration.
13000085	AT-axis lower limit time const.	0 to 9999 msec	Set the time constant minimum for acceleration and deceleration on the AT-axis.
13000086	AT-axis gear ratio (numerator)	1 to 999	Set the gear ratio (numerator) for the AT-axis.
13000087	AT-axis gear ratio (denominator)	1 to 999	Sets the gear ratio (denominator) for the AT-axis.
13000088	AT-ax.abso. encod. rotat.dir.	0 to 1	<0:Norm. by + comd. 1:Norm. by - comd.> Set the rotational direction of the absolute encoder on the AT-axis.
13000089	Lower limit for ATC arm turn speed ratio	1 to 100%	Set the lower limit for the user parameters (switch 1) <ATC arm turn speed ratio 1 (M422)> and <ATC arm turn speed ratio 2 (M423)>. It is 100% when the setting is not configured.
13000090	Return angle with AT-axis servo controller ON	0.001 to 9.999 degrees	If the AT-axis machine coordinate is not at the zero point when the servo is ON, it automatically returns to the AT-axis zero point. This setting is for the maximum angle of that return operation. The error <<Return distance too long>> is triggered if the distance becomes longer than the set value.
13000091	Return angle 1 for AT-axis	0.000 to 359.999 degrees	When the [RELEASE] and [G] are used to perform an AT-axis zero return in ATC arm position recovery mode, machine zero return is carried out in reverse for the range from 0.000 degrees to the set value. Set a value smaller than <Return angle 2 for AT-axis>.

## Chapter 7 Machine Parameter

System 3(common)			
No.	Item name	Setting range	Description
13000092	Return angle 2 for AT-axis	0.000 to 359.999 degrees	When the [RELEASE] and [G] are used to perform an AT-axis zero return in ATC arm position recovery mode, machine zero return is carried out (forward) for the range from the set value to 359.999 degrees. Set a value larger than <Return angle 1 for AT-axis>.
13000093	Spindle servo controller OFF angle for AT-axis tool change	0.000 to 359.999 degrees	Set the AT-axis angle to turn OFF the servo for the spindle during a tool change.
13000094 13000095	AT-axis restricted travel range 1 (-) AT-axis restricted travel range 1 (+)	0.000 to 359.999 degrees	Travel into the set range is prohibited during manual operations (JOG, STEP and HANDLE) on the AT-axis. However, if the command position is outside of the set range, the axis can pass through the set range. (NOTE) When the set value for the <AT-axis restricted travel range 1 (-)> is greater than the set value for <AT-axis restricted travel range 1 (+)>, this parameter is disabled.
13000096 13000097	AT-axis restricted travel range 2 (-) AT-axis restricted travel range 2 (+)	0.000 to 359.999 degrees	Travel into the set range is prohibited during manual operations (JOG, STEP and HANDLE) on the AT-axis. However, if the command position is outside of the set range, the axis can pass through the set range. (NOTE) When the set value for the <AT-axis restricted travel range 2 (-)> is greater than the set value for <AT-axis restricted travel range 2 (+)>, this parameter is disabled.
13000098	ATC shutter interlock	0~1	<0: Invalid 1: Valid> Cutting travel is carried out after waiting for the ATC shutter to close when <ATC shutter interlock> is set to <Valid>. Cutting travel is carried out without waiting for the ATC shutter to close when <ATC shutter interlock> is set to <Invalid>.
13000099	Pot rising check time 1	0~9999 msec	Set the check time from when the pot rising operation is complete until the next operation is executed.
13000100	Pot lowering check time 1	0~9999 msec	Set the check time from when the pot lowering operation is complete until the next operation is executed.
13000101	Pot operation monitor time	0~9999 msec	Set the monitoring time when the pot rising and lowering operations are not complete.
13000102	Minimum pot operation time	0~9999 msec	Set the minimum time for the pot rising and lowering operations.
13000103	Distance between magazine pots	0.001~999.999 mm	Set the distance between the magazine pots.
13000104	ATC/Pot shutter signal	0~1	Set whether to make the ATC shutter or pot shutter input/output signal valid or invalid. Set to <0: Valid> When set to <1: Invalid>, the input signal is ignored and the output signal always outputs "Open". Remove the shutter so that it does not interfere during a tool change. In addition, make sure that the chips or shavings do not get inside the magazine.
13000105	ATC arm shutter signal	0~1	Set whether to make the input/output signal for the ATC arm shutter valid or invalid. Set to <0: Valid> When set to <1: Invalid>, the input signal is ignored and the output signal always outputs "Open". Remove the shutter so that it does not interfere during a tool change. In addition, make sure that the chips or shavings do not get inside the magazine.
13000106	Pot shutter timeout period	0~999x10 msec	Set the monitoring time for the pot shutter. The alarm <<Pot shutter timeout>> is triggered when the pot shutter operation is not completed even though the set value is exceeded. The check operation does not execute when the time is "0".
13000107	Wait time before applying brake in M-axis brake load test	0.0~9999.9 msec	Set the wait time before applying the brake on the magazine axis in the brake load test.
13000108	Wait time before releasing brake in M-axis brake load test	0.0~9999.9 msec	Set the wait time before releasing the brake on the magazine axis in the brake load test.

## 7.7 Machine Parameters 4 (Pitch Error Compensation)

### 7.7.1 Common

Pitch error compensation (common)			
No.	Item name	Setting range	Description
14000001~14000005	Divisions for QT-axis pitch error correction interval Divisions for 5th-axis pitch error correction interval Divisions for 6th-axis pitch error correction interval Divisions for 7th-axis pitch error correction interval Divisions for 8th-axis pitch error correction interval	1~360	Sets the pitch error correction interval on each axis in divisions of 360°. (Ex.) When set to "24", it sets the pitch error in 15 degree intervals (360/24=15). When the 4 <sup>th</sup> -axis is used for the QT-axis, the correction interval is 180 degrees.

### 7.7.2 QT-/5th-/6th-/7th-/8th-/M-/10th-Axes

Pitch error compensation (*-axes)			
No.	Item name	Setting range	Description
	4th-axis (1~400) 5th-axis (1~400) 6th-axis (1~400) 7th-axis (1~400) 8th-axis (1~400) 9th-axis (1~400) 10th-axis (1~400)	-99999~99999 pulses	Check the pitch accuracy on each axis and set when necessary.

## 7.8 Machine Parameters 5 (Servo)

### 7.8.1 Spindle/X-/Y-/Z-/QT-/5th-/6th-/7th-/8th-/M-/10th-/ P1-/P2-/P3-/P4-

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Servo (*-axes)			
No.	Item name	Setting range	Description
	15000001~15000600 (Spindle) 15010001~15010600 (X-axis) 15020001~15020600 (Y-axis) 15030001~15030600 (Z-axis) 15040001~15040600 (4th-axis) 15050001~15050600 (5th-axis) 15060001~15060600 (6th-axis) 15070001~15070600 (7th-axis) 15080001~15080600 (8th-axis) 15090001~15090600 (9th-axis) 15100001~15100600 (10th-axis) 15110001~15110600 (P1-axis) 15120001~15120600 (P2-axis) 15130001~15130600 (P3-axis) 15140001~15140600 (P4-axis)	-2147483648~2147483647	Sets the servo related values on each axis.

## 7.9 Machine Parameters 6 (Automatic Thermal Distortion Compensation)

### 7.9.1 Spindle

Automatic thermal distortion compensation (spindle)			
No.	Item name	Setting range	Description
16000001	Spindle max. displacement const. 1 (Z-axis)	0.0001~0.9999	This parameter determines the compensation value amount for the Z-axis spindle. It is used together with spindle maximum displacement constant 2.
16000002	Spindle max. displacement const. 2 (Z-axis)	-99.9~99.9	This parameter determines the compensation value amount for the Z-axis spindle. It is used together with spindle maximum displacement constant 1.
16000003	Spindle expansion displacement const. 3 (Z-axis)	0.01~19.99	This parameter determines the time ratio for extending the Z-axis spindle.
16000004	Spindle contraction displacement const. 3 (Z-axis)	0.01~19.99	This parameter determines the time ratio for contracting the Z-axis spindle.
16000005	Spindle max. displacement const. 1 (X-axis)	-0.9999~0.9999	This parameter determines the compensation value amount for the X-axis spindle. It is used together with spindle maximum displacement constant 2.
16000006	Spindle max. displacement const. 2 (X-axis)	-99.9~99.9	This parameter determines the compensation value amount for the X-axis spindle. It is used together with spindle maximum displacement constant 1.
16000007	Spindle expansion displacement const. 3 (X-axis)	0.01~19.99	This parameter determines the time ratio for extending the X-axis spindle.
16000008	Spindle contraction displacement const. 3 (X-axis)	0.01~19.99	This parameter determines the time ratio for contracting the X-axis spindle.
16000009	Spindle max. displacement const. 1 (Y-axis)	-0.9999~0.9999	This parameter determines the compensation value amount for the Y-axis spindle. It is used together with spindle maximum displacement constant 2.
16000010	Spindle max. displacement const. 2 (Y-axis)	-99.9~99.9	This parameter determines the compensation value amount for the Y-axis spindle. It is used together with spindle maximum displacement constant 1.
16000011	Spindle expansion displacement const. 3 (Y-axis)	0.01~19.99	This parameter determines the time ratio for extending the Y-axis spindle.
16000012	Spindle contraction displacement const. 3 (Y-axis)	0.01~19.99	This parameter determines the time ratio for contracting the Y-axis spindle.
16000013	Turning spindle max. displacement constant 1 (For Z-axis)	-0.9999~0.9999	This parameter determines the compensation value amount for the Z-axis lathe spindle. It is used together with lathe spindle maximum displacement constant 2.
16000014	Turning spindle max. displacement constant 2 (For Z-axis)	-99.9~99.9	This parameter determines the compensation value amount for the Z-axis lathe spindle. It is used together with lathe spindle maximum displacement constant 1.
16000015	Turning spindle expansion displacement const. 3 (For Z-axis)	0.01~19.99	This parameter determines the time ratio for extending the Z-axis lathe spindle.
16000016	Turning spindle contraction displacement const. 3 (For Z-axis)	0.01~19.99	This parameter determines the time ratio for contracting the Z-axis lathe spindle.
16000017	Turning spindle max. displacement constant 1 (For X-axis)	-0.9999~0.9999	This parameter determines the compensation value amount for the X-axis lathe spindle. It is used together with lathe spindle maximum displacement constant 2.
16000018	Turning spindle max. displacement constant 2 (For X-axis)	-99.9~99.9	This parameter determines the compensation value amount for the X-axis lathe spindle. It is used together with lathe spindle maximum displacement constant 1.
16000019	Turning spindle expansion displacement const. 3 (For X-axis)	0.01~19.99	This parameter determines the time ratio for extending the X-axis lathe spindle.

Automatic thermal distortion compensation (spindle)			
No.	Item name	Setting range	Description
16000020	Turning spindle contraction displacement const. 3 (For X-axis)	1	This parameter determines the time ratio for contracting the X-axis lathe spindle.
16000021	Turning spindle max. displacement constant 1 (For Y-axis)	-0.9999~0.9999	This parameter determines the compensation value amount for the Y-axis lathe spindle. It is used together with lathe spindle maximum displacement constant 2.
16000022	Turning spindle max. displacement constant 2 (For Y-axis)	-99.9~99.9	This parameter determines the compensation value amount for the Y-axis lathe spindle. It is used together with lathe spindle maximum displacement constant 1.
16000023	Turning spindle expansion displacement const. 3 (For Y-axis)	0.01~19.99	This parameter determines the time ratio for extending the Y-axis lathe spindle.
16000024	Turning spindle contraction displacement const. 3 (For Y-axis)	0.01~19.99	This parameter determines the time ratio for contracting the Y-axis lathe spindle.

## 7.9.2 X-, Y- and Z-Axes

Automatic thermal distortion compensation (X-, Y- and Z-axes)			
No.	Item name	Setting range	Description
16**0001 *: X-axis → 01 Y-axis → 02 Z-axis → 03	Thermal distortion compensation coefficient A1	0.00~10.00	This parameter is for adjusting the compensation value.
16**0002	Thermal distortion compensation coefficient A2	0.00~10.00	
16**0003	Thermal distortion compensation coefficient A3	0.00~10.00	
16**0004	Thermal distortion compensation coefficient B	0.00~10.00	
16**0005	Thermal distortion compensation coefficient E	0.00~10.00	
16**0006	Thermal distortion compensation coefficient F1	0.00~10.00	
16**0007	Thermal distortion compensation coefficient F2	0.00~10.00	
16**0008	Thermal distortion compensation coefficient F3	0.00~10.00	
16**0009	Thermal distortion compensation coefficient F4	0.00~10.00	
16**0010	Thermal distortion constant A1	0.000000~10.000000	This parameter determines the compensation value amount.
16**0011	Thermal distortion constant A2	0.000000~10.000000	
16**0012	Thermal distortion constant A3	0.0000~1000.0000	
16**0013	Thermal distortion constant A4	0.0000~100.0000	
16**0014	Thermal distortion constant B	0.0000~100.0000	
16**0015	Thermal distortion constant C1	0~999999	
16**0016	Thermal distortion constant C2		
16**0017	Thermal distortion constant C3		
16**0018	Thermal distortion constant C4		
16**0019	Thermal distortion constant C5		
16**0020	Thermal distortion constant C6		
16**0021	Thermal distortion constant C7		
16**0022	Thermal distortion constant C8		
16**0023	Thermal distortion constant C9		
16**0024	Thermal distortion constant C10		
16**0025	Thermal distortion constant D1	0.0000000~1.0000000	
16**0026	Thermal distortion constant D2		
16**0027	Thermal distortion constant D3		
16**0028	Thermal distortion constant D4		
16**0029	Thermal distortion constant D5		
16**0030	Thermal distortion constant D6		
16**0031	Thermal distortion constant D7		
16**0032	Thermal distortion constant D8		
16**0033	Thermal distortion constant D9		
16**0034	Thermal distortion constant D10		
16**0035	Thermal distortion constant E	0.0000~100.0000	
16**0036	Thermal distortion constant F1	-10.000000~10.000000×10 <sup>-5</sup>	
16**0037	Thermal distortion constant F2	-10.000000~10.000000×10 <sup>-5</sup>	
16**0038	Thermal distortion constant F3	0.000000~1.000000	
16**0039	Thermal distortion constant F4	-10.00~10.00	

## 7.10 Machine Parameters 7 (High Accuracy)

### 7.10.1 Common

High accuracy (common)			
No	Item name	Setting range	Description
17000001	No. of look-ahead blocks	1~500 blocks	This is the number of look-ahead blocks in high accuracy mode B.
17000002	Speed clamp time A	0.000~0.099 sec	This time is used in speed clamp processing in high accuracy mode A. It is calculated by the small block processing. When set to “0.000”, the speed clamp is not carried out.
17000003	Speed clamp time B	0.000~0.099 sec	This time is used in speed clamp processing for high accuracy mode B. It is calculated by the small block processing. When set to “0.000”, the speed clamp is not carried out.
17000004	Smooth path offset constant A	1~5	Sets the range for how many blocks are used to calculate the approximation curve when the user parameter (high accuracy) <Smooth path offset level> increases to level 1 in high accuracy mode A.
17000005	Smooth path offset constant B	1~5	Sets the range for how many blocks are used to calculate the approximation curve when the user parameter (high accuracy) <Smooth path offset level> increases to level 1 in high accuracy mode B.
17000006	Smooth path offset level Scaling	0~99	This scaling is used for reducing the variation in the block length for smooth path offset. If the set value is made smaller, the block length variation is reduced more, but the smoothness tends to deteriorate. If the set value is made larger, the smoothness tends to improve, but the variation will increase and sometimes cause a path error. If the set value is “0”, the block length variation is not taken into account.
17000007	Minute block path approximate system	0~1	Sets the system for the minute block path approximation.
17000008	Small block deletion limit number B	0~10	Limits the number of small block that are deleted for high accuracy mode B. When set to “0”, it does not limit the number of deletions. If high speed processing mode is selected, the <Small block deletion limit number B> uses “3” as the upper limit.
17000009	High accuracy B additional axis	0~1	Sets whether the additional axis command for high accuracy mode B is valid or invalid. When set to <1: Valid>, the additional axis travel operates in high accuracy mode B. When set to <0: Invalid>, the additional axis travel does not operate in high accuracy mode B. <ul style="list-style-type: none"><li>• If a travel command is issued only for the additional axis, then high accuracy mode B is temporarily canceled only during that command.</li><li>• The feed axis and the additional axis cannot move at the same time during the cutting feed.</li></ul>
17000010	Basic setting function	0 ~ 1	<0: Invalid 1: Valid> Enable or disable the basic setting function for high accuracy mode.
17000011	No. of look ahead blocks for accuracy specification	1 ~ 500	Set the number of look-ahead blocks for the accuracy specification function.
17000012	Sampling time for accuracy specification	0.1 ~ 9999.9 msec	Set the sampling interval for the accuracy specification function.
17000013	Tolerance for accuracy specification	0.001 ~ 9.999 mm	Set the tolerance for the margin of error on the accuracy specification function.
17000014	Maximum repeat calculation for accuracy specification	0 ~ 9999	Set the maximum repeat calculation for the accuracy specification function.
17000015	Maximum speed divisions for accuracy specification	0 ~ 999	Set the maximum speed divisions for the accuracy specification function.
17000016	High accuracy B deceleration time	0 ~ 9999 msec	Set the maximum time used for deceleration on the feed axis when stopping in the middle of high accuracy B operation.
17000017	High accuracy B additional axis deceleration time	0~9999 msec	Set the maximum time used for deceleration on the additional axis when stopping in the middle of high accuracy B operation.

## 7.10.2 X-, Y- and Z-Axes

High accuracy (X-, Y- and Z-axes)			
No	Item name	Setting range	Description
17**0001 **: X-axis → 01 Y-axis → 02 Z-axis → 03	Current check time	0~999 msec	Sets the current check time for making sure if the cutting feed time constant is correct while in high accuracy mode. The check is not executed when set to “0”.
17**0002	Current tolerance	0~999%	Sets the current tolerance for checking if the cutting feed time constant is correct while in high accuracy mode. The check is not executed when set to “0”. If the tolerance is exceeded for the <*-axis current check time>, the alarm <<*-axis overload in high accuracy mode*>> is triggered.
17**0003	Maximum feedrate A	1~99999 mm/min	This is the maximum cutting feedrate for high accuracy mode A. When a feedrate command is issued that is greater than the set value, a <<Feedrate error>> is triggered.
17**0004	Reference feedrate A	1~99999 mm/min	This is used for restricting the cutting feedrate in high accuracy mode A. The cutting feedrate is restricted using a value which calculates the user parameter (high accuracy) <Smooth override type> in the following formula for the set value.  <u>When &lt;Smooth override&gt; is more than 100%</u> “Reference feedrate A” × $\sqrt{(Smooth\ override)/100}$ times <u>When &lt;Smooth override&gt; is less than 100%</u> “Reference feedrate A” × (Smooth override)/100 times  However, it clamps using <Maximum feedrate A> when the restricted speed exceeds the machine parameter (high accuracy) <Maximum feedrate A>.
17**0005	Corner deceleration time A	0~9999 msec	This time determines the deceleration time during corner deceleration in high accuracy mode A. The end point and start point distances are determined by the set value.
17**0006	Corner deceleration speed gap A	1~99999 mm/min	This corner deceleration is used in high accuracy mode A when there is a speed gap or difference with the set value, reducing the speed to the lower value.
17**0007	Corner acceleration tolerance A	0.001~99.999 m/sec <sup>2</sup>	This is used during corner deceleration processing in high accuracy mode A.
17**0008	Min. arc speed A	1~99999 mm/min	The passing speed does not go lower than the set value when calculating the passing speed for the arc in high accuracy mode A.
17**0009	Minimum involute interpolation speed A	1~99999 mm/min	The passing speed does not go lower than the set value when calculating the passing speed for involute interpolation in high accuracy mode A.
17**0010	Circular allowable acceleration A	0.001~99.999 m/sec <sup>2</sup>	This is used when calculating the passing speed for the arc in high accuracy mode A.
17**0011	Circular approximate allowable acceleration A	0.001~99.999 m/sec <sup>2</sup>	This is used when calculating the passing speed during arc approximation processing in high accuracy mode A.
17**0012	Involute interpolation acceleration A	0.001~99.999 m/sec <sup>2</sup>	This is used when calculating the passing speed for involute interpolation in high accuracy mode A.
17**0013 ~ 17**0015	High accuracy A cutting feed time const. 1(Group 1) High accuracy A cutting feed time const. 2(Group 1) High accuracy A cutting feed time const. 3(Group 1)	0~9999 msec	Sets the acceleration and deceleration time constant (Group 1) for the cutting feed in high accuracy mode A. <Cutting feed time const. 1> sets the time it takes to reach the command speed. <Cutting feed time const. 2> and <Cutting feed time const. 3> set the time of the ideal acceleration and deceleration. This time constant is used when <0: Group 1> is selected for <Cutting feed time constant selection>.
17**0016 ~ 17**0018	High accuracy A cutting feed time const. 1(Group 2) High accuracy A cutting feed time const. 2(Group 2) High accuracy A cutting feed time const. 3(Group 2)	0~9999 msec	Sets the acceleration and deceleration time constant (Group 2) for the cutting feed in high accuracy mode A.

## Chapter 7 Machine Parameter

High accuracy (X-, Y- and Z-axes)			
No	Item name	Setting range	Description
17**0019 ~ 17**0021	High accuracy A cutting feed time const. 1(Group 3)	0~9999 msec	Sets the acceleration and deceleration time constant (Group 3) for the cutting feed in high accuracy mode A.
	High accuracy A cutting feed time const. 2(Group 3)		
	High accuracy A cutting feed time const. 3(Group 3)		
17**0022	Maximum feedrate B	1~99999mm/min	This is the maximum cutting feedrate for high accuracy mode B. When a feedrate command is issued that is greater than the set value, a <>Feedrate error>> is triggered.
17**0023	Upper limit for corner acceleration B	0.001~99.999 m/sec <sup>2</sup>	Sets the upper limit value for acceleration on the corner while in high accuracy mode B.
17**0024	Speed difference (min.)	0~99999 mm/min	Sets the minimum allowable speed for the difference in speed on each axis in high accuracy mode B.
17**0025	Speed difference (max.)	0~99999 mm/min	Sets the maximum allowable speed for the difference in speed on each axis in high accuracy mode B.
17**0026	Speed difference command speed (min.)	0~99999 mm/min	When the command speed in high accuracy mode B is below the value set for this parameter, the allowable difference in speed becomes the minimum speed difference (minimum value).
17**0027	Speed difference command speed (max.)	0~99999 mm/min	When the command speed in high accuracy mode B is above the value set for this parameter, the allowable difference in speed becomes the maximum speed difference (maximum value).
17**0028	Speed to control acceleration/deceleration	0.100~99.999 m/sec <sup>2</sup>	This speed controls the allowable acceleration and deceleration in high accuracy mode B.
17**0029	Acceleration change time B	0~999 msec	Sets the time to change from constant speed to constant acceleration/deceleration.
17**0030	Min. arc speed B	1~99999 mm/min	The passing speed does not go lower than the set value when calculating the passing speed for the arc in high accuracy mode B.
17**0031	Minimum involute interpolation speed B	1~99999 mm/min	The passing speed does not go lower than the set value when calculating the passing speed for involute interpolation in high accuracy mode B.
17**0032	Circular allowable acceleration B	0.001~99.999 m/sec <sup>2</sup>	This is used when calculating the passing speed for the arc in high accuracy mode B.
17**0033	Circular approximate allowable acceleration B	0.001~99.999 m/sec <sup>2</sup>	This is used when calculating the passing speed during arc approximation processing in high accuracy mode B.
17**0034	Involute interpolation acceleration B	0.001~99.999 m/sec <sup>2</sup>	This is used when calculating the passing speed for involute interpolation in high accuracy mode B.
17**0035	Acceleration constant B1	0~99.999	This is used for acceleration and deceleration control while in high accuracy mode B.
17**0036	Acceleration constant B2	0~99.999	This is used for acceleration and deceleration control while in high accuracy mode B.
17**0037 ~ 17**0039	High accuracy B cutting feed time constant 1	0~9999 msec	Sets the acceleration and deceleration time constant for the cutting feed in high accuracy mode B. <Cutting feed time const. 1> sets the time it takes to reach the command speed. <Cutting feed time const. 2> and <Cutting feed time const. 3> set the time of the ideal acceleration and deceleration.
	High accuracy B cutting feed time constant 2		
	High accuracy B cutting feed time constant 3		

### 7.10.3 Additional Axis

High accuracy (additional axis)			
No	Item name	Setting range	Description
17**0001 *: 5th-axis → 05 6th-axis → 06 7th-axis → 07 8th-axis → 08	Current check time	0~999 msec	Sets the current check time for making sure if the acceleration setting is correct. The check is not executed when set to “0”.
17**0002	Current tolerance	0~999 %	Sets the tolerance for making sure if the acceleration setting is correct. The check is not executed when set to “0”. If the tolerance is exceeded for the <*-axis current check time> the alarm <<High accuracy mode overload>> is triggered.
17**0003	Max. feedrate B	0.1~9999.9 min <sup>-1</sup>	This is the maximum cutting feedrate for high accuracy mode B. When a feedrate command is issued that is greater than the set value, a <<Feedrate error>> is triggered.
17**0004	Speed to control acceleration/ deceleration B	1~99999 deg/sec <sup>2</sup>	This speed controls the allowable acceleration and deceleration.
17**0005	Upper limit for corner acceleration B	1~99999 deg/sec <sup>2</sup>	Sets the upper limit value for acceleration on the corner while in high accuracy mode B.
17**0006	Speed difference B (min.)	0.0~9999.9 min <sup>-1</sup>	Sets the minimum allowable speed for the difference in speed on each axis.
17**0007	Speed difference B (max.)	0.0~9999.9 min <sup>-1</sup>	Sets the maximum allowable speed for the difference in speed on each axis.
17**0008	Speed difference command speed B (min.)	0.0~9999.9 min <sup>-1</sup>	When the command speed is below the value set for this parameter, the allowable difference in speed becomes the minimum speed difference (minimum value) for the *axis.
17**0009	Speed difference command speed B (max.)	0.0~9999.9 min <sup>-1</sup>	When the command speed exceeds the value set for this parameter, the allowable difference in speed becomes the maximum speed difference (maximum value) for the *axis.

### 7.10.4 Standard, Rough, Medium Rough, Medium Rough S, Finishing and Finishing S

High accuracy (adjustment)			
No	Item name	Setting range	Description
17**0001 *: Standard → 51 Rough → 52 Medium rough → 53 Medium rough S → 54 Finishing → 55 Finishing S → 56	High accuracy mode selection	0~1	<0: High accuracy mode A 1: High accuracy mode B> Select the high accuracy mode type to be used.
17**0002	Cutting feed time constant selection A	0~2	Select the cutting feed time constant for high accuracy mode A. 0: Group 1 Use <High accuracy A cutting feed time constant 1-3 (Group 1)> in the machine parameter (high accuracy). 1: Group 2 Use <High accuracy A cutting feed time constant 1-3 (Group 2)> in the machine parameter (high accuracy). 2: Group 3 Use <High accuracy A cutting feed time constant 1-3 (Group 3)> in the machine parameter (high accuracy).
17**0003	Smooth override type B	0~1	Change the smooth override type. 0: Type 1 Even if the smooth override setting is changed, the speed difference that is permitted between blocks does not change. 1: Type 2 The speed difference that is permitted between blocks is equal to: machine parameter (high accuracy) <Speed difference> × <Smooth override value>/100. When type 2 is selected, increasing the set value for the smooth override makes it more difficult to decelerate at corners. Therefore, the machining time can be reduced.

High accuracy (adjustment)			
No	Item name	Setting range	Description
17**0004	Adjust. A for cutting feed time constant 3 (Value)	-9999~9999msec	Add a set value to the cutting feed time constant that is selected in the <Cutting feed time constant selection A>. Setting to a larger value results in smoother machining, and one that is smaller leads to highly accurate machining. When the calculation result is outside of the setting range of the <High accuracy A cutting feed time const. 3(Group*)>, the value is limited to one inside the setting range. Only valid when <High accuracy mode selection> is set to <0: High accuracy mode A>.
17**0005 ~ 17**0008	Adjust. A for cutting feed time constant 3 (amount of change)	-9999~9999msec	Set the amount of change for adjustment A in the cutting feed time constant 3, when adjusting the accuracy and smoothness by 1 level in machining mode adjustment.
17**0009	Corner deceleration override (value)	0, 10~9999 %	Automatic corner deceleration is performed at 100% based on the machine's unique deceleration rate. When a value larger than 100% is set, the deceleration rate is smaller, making machining time shorter. When a value smaller than 100% is set, the deceleration rate is larger, resulting in more accurate machining. In addition, when 0% is set, automatic corner deceleration is not performed.
17**0010 ~ 17**0013	Corner deceleration override (amount of change)	-9999~9999 %	Set the amount of change in the corner deceleration override when adjusting the accuracy and smoothness by 1 level in machining mode adjustment.
17**0014	Arc deceleration override (value)	0, 10~9999 %	When 100% is set, automatic arc deceleration is performed based on the machine's unique deceleration rate. When a value larger than 100% is set, the deceleration rate is smaller, making machining time shorter. When a value smaller than 100% is set, the deceleration rate is larger, resulting in more accurate machining. In addition, when 0% is set, automatic arc deceleration is not performed.
17**0015 ~ 17**0018	Arc deceleration override (amount of change)	-9999~9999 %	Set the amount of change in the arc deceleration override when adjusting the accuracy and smoothness by 1 level in machining mode adjustment.
17**0019	Curve approximation deceleration override (value)	0, 10~9999 %	When 100% is set, automatic curve approximation deceleration is performed based on the machine's unique deceleration rate. When a value larger than 100% is set, the deceleration rate is smaller, making machining time shorter. When a value smaller than 100% is set, the deceleration rate is larger, resulting in more accurate machining. In addition, when 0% is set, automatic curve approximation deceleration is not performed.
17**0020 ~ 17**0023	Curve approximation deceleration override (amount of change)	-9999~9999 %	Set the amount of change in the curve approximation deceleration override when adjusting the accuracy and smoothness by 1 level in machining mode adjustment.
17**0024	Accel. override B to control accel. /decel. (value)	0~9999 %	Apply the override for <Speed to control acceleration/deceleration B> in the machine parameter (high accuracy: X-, Y- and Z-axes). Setting to a value larger than 100% results in faster acceleration, and a setting smaller than 100% results in slower acceleration. When the calculation result is outside of the setting range of the <Speed to control acceleration/deceleration B>, the value is limited to one inside the setting range.
17**0025 ~ 17**0028	Accel. override B to control accel. /decel. (amount of change)	-9999~9999 %	Set the amount of change in the acceleration override B to control acceleration/deceleration when adjusting the accuracy and smoothness by 1 level in machining mode adjustment.
17**0029	Override B for acceleration change time (value)	0~9999 %	Apply the override for <Acceleration change time B> in the machine parameter (high accuracy: X-, Y- and Z-axes). Setting to a value larger than 100% results in larger acceleration change time, and a setting smaller than 100% results in smaller acceleration change time. When the calculation result is outside of the setting range of the <Acceleration change time B>, the value is limited to one inside the setting range.

High accuracy (adjustment)			
No	Item name	Setting range	Description
17**0030 ~ 17**0033	Override B for acceleration change time (amount of change)	-9999~9999 %	Set the amount of change in override B for acceleration change time, when adjusting the accuracy and smoothness by 1 level in machining mode adjustment.
17**0034	Accel.override B for add. axis accel./decel. (value)	0~9999 %	Apply the override to <Speed to control acceleration/deceleration B on *-axis> in the machine parameter (high accuracy). Setting to a value larger than 100 results in faster acceleration, and a setting smaller than 100 results in slower acceleration.
17**0035 ~ 17**0038	Accel.override B for add. axis accel./decel. (Variation)	-9999~9999 %	Set the amount of change in acceleration override B for controlling the acceleration/deceleration on the additional axis when adjusting the accuracy and smoothness by 1 level in machining mode adjustment.
17**0039	Smooth path offset level (value)	1~5	Use when the user parameter (high accuracy: common) <Smooth path offset function> is set to <1: Valid>. <u>The larger the value is, the smoother the path becomes.</u>
17**0040 ~ 17**0043	Smooth path offset level (amount of change)	-5~5	Set the amount of change in the smooth path offset level when adjusting the accuracy and smoothness by 1 level in machining mode adjustment.
17**0044	Smooth override (value)	10~9999 %	When 100%, it uses the cutting feed time constant that is selected in the <Cutting feed time constant selection>. Setting to a value larger than 100% results in smoother machining, and a setting smaller than 100% results in better accuracy. When set to <1: High accuracy mode B> in <High accuracy mode selection>, the value is limited to 100% even if the value is set to one under 100%.
17**0045 ~ 17**0048	Smooth override (amount of change)	-9999~9999 %	Set the amount of change in the smooth override when adjusting the accuracy and smoothness by 1 level in machining mode adjustment.
17**0049	Minute block deletion distance (value)	0~2.000 mm	If the travel distance of one block is less than the parameter value, the block is deleted.
17**0050 ~ 17**0053	Minute block deletion distance (amount of change)	-2.000~2.000 mm	Set the amount of change in the minute block deletion distance when adjusting the accuracy and smoothness by 1 level in machining mode adjustment.

## 7.10.5 Accuracy Specification A, Accuracy Specification B and Accuracy Specification C

High accuracy (Accuracy specification)			
No	Item name	Setting range	Description
17**0001 * Accuracy specification A → 57 Accuracy specification B → 58 Accuracy specification C → 59	Cutting feed time constant selection A	0~2	Select the cutting feed time constant for high accuracy mode A. 0: Group 1 Use <High accuracy A cutting feed time constant 1-3 (Group 1)> in the machine parameter (high accuracy). 1: Group 2 Use <High accuracy A cutting feed time constant 1-3 (Group 2)> in the machine parameter (high accuracy). 2: Group 3 Use <High accuracy A cutting feed time constant 1-3 (Group 3)> in the machine parameter (high accuracy).
17**0002	Adjust. A for cutting feed time constant 3 (value)	-9999~9999 msec	Add a set value to the cutting feed time constant that is selected in the <Cutting feed time constant selection A>. Setting to a larger value results in smoother machining, and one that is smaller leads to highly accurate machining. When the calculation result is outside of the setting range of the <High accuracy A cutting feed time const. (Group*)>, the value is limited to one inside the setting range.
17**0003 17**0004	Adjust. A for cutting feed time constant 3 (amount of change)	-9999~9999 msec	Set the amount of change for adjustment A in the cutting feed time constant 3, when adjusting the smoothness by 1 level in accuracy specification mode.
17**0005	Smooth path offset level (value)	1~5	Use when the user parameter <Smooth path offset function> is set to <1: Valid>. <u>The larger the value is, the smoother the path becomes.</u>
17**0006 17**0007	Smooth path offset level (amount of change)	-5~5	Set the amount of change in the smooth path offset level when adjusting the accuracy and smoothness by 1 level in accuracy specification mode.
17**0008	Smooth override (value)	10~9999 %	When 100%, it uses the cutting feed time constant that is selected in the <Cutting feed time constant selection>. Setting to a value larger than 100% results in smoother machining, and a setting smaller than 100% results in better accuracy.
17**0009 17**0010	Smooth override (amount of change)	-9999~9999 %	Set the amount of change in the smooth override when adjusting the accuracy and smoothness by 1 level in accuracy specification mode.
17**0011	Minute block deletion distance (value)	0~2.000 mm	If the travel distance of one block is less than the parameter value, the block is deleted.
17**0012 17**0013	Minute block deletion distance (amount of change)	-2.000~2.000 mm	Set the amount of change in the minute block deletion distance when adjusting the accuracy and smoothness by 1 level in accuracy specification mode.

## 7.11 Machine Parameters 8 (PLC)

No.	Item name	Setting range	Description
18**0001 **: P1-axis → 11 P2-axis → 12 P3-axis → 13 P4-axis → 14	Optional axis	0~1	
18**0002	Type	0~1	<0: Linear axis, 1: Rotation axis> Linear axis: Displays and controls the axis using the mm/inch system. Rotation axis: Displays and controls the axis using the degree system.
18**0003	Axis installation position	0~4	<0: Individual, 1: Table 1, 2: Table 2, 3: Outside 1, 4: Outside 2> Sets the installation position for each axis. Depending on the installation position, the conditions vary for servo OFF and stoppage during an open door operation. The <0: Individual> selection is valid for machines without QT and is set when installing inside the machine. <1: Table 1> and <2: Table 2> selections are valid for machines with QT and are set when installing on pallet 1 or 2. <3: Outside 1> and <4: Outside 2> selections are set when installing outside of the machine. The servo turns OFF when the input signals <IL_DR5A1> and <IL_DR5B1> turn ON for the selection <3: Outside 1>, or when the input signals <IL_DR6A1> and <IL_DR6B1> turn ON for the selection <4: Outside 2>. The parameter settings are used only for speed control and during a PLC-axis stop as specified by the safety specifications (i.e. when the door is opened). The address in the coordinate display is not configured by this parameter setting.
18**0004	Backlash compensation	0~99999 pulses	The backlash offset is measured regularly according to the machine usage conditions. Each axis is offset or compensated by the number of pulses when necessary.
18**0005	Lead/gear ratio	1~999 mm 1~999	Linear axis: Sets the lead on each axis (distance traveled for 1 motor rotation). Rotation axis: Sets the gear ratio on each axis (motor speed required for the axis to rotate 360 degrees).
18**0006	Absolute encoder rotation direction	0~1	<0: Forw. with +command, 1: Forw. with -command> Sets the rotational direction of the absolute encoder on each axis.
18**0007	Brake	0~5	<0: None, 1 to 5: Brake 1 to 5> Sets whether the machine is equipped or not equipped with a brake on each axis. The <Brake 1 to 5> selection sets which input signal for SR_BK*RLS_N (*:1 to 5) to check as the brake input signal. If another setting other than <0: Type 1> is selected for the <P1 to P4 axes clamp mechanism>, and this parameter is not set to <0: None>, the alarm <<Machine parameter setting error (PLC)>> (Stop level 5, recovery level 3) is triggered.
18**0008	Clamp mechanism	0~2	<0: Type 1, 1: Type 2, 2: Type 3> Sets the type for the clamp mechanism on each axis. The <0: Type 1> setting is used when there is no clamp mechanism. The <1: Type 2> setting is used when there is a clamp mechanism and the servo is turned OFF during the clamp operation. The <2: Type 3> setting is used when there is a clamp mechanism and the servo is turned ON during the clamp operation. If another setting other than <0: None> is selected for the <P1 to P4 axes brake>, and this parameter is not set to <0: Type 1>, the alarm <<Machine parameter setting error (PLC)>> (Stop level 5, recovery level 3) is triggered.

## Chapter 7 Machine Parameter

No.	Item name	Setting range	Description
18**0009	Unclamp check input signal	0~1	<0:Confirm with 0, 1: Confirm with 1> Sets the polarity of the unclamp confirmation input signal on each axis.
18**0010	Clamp check input signal	0~2	<0: Invalid, 1: Confirm with 0, 2: Confirm with 1> Sets the polarity of the clamp confirmation input signal on each axis. If the <0: Invalid> setting is selected and the clamp operation is complete, the operation is confirmed using the OFF status for the unclamp confirmation input signal (not the clamp confirmation input signal).
18**0011	Unclamp output signal	0~1	<0: 0=Unclamp, 1: 1=Unclamp> Sets the polarity of the unclamp output signal on each axis.
18**0012	Unclamp check time	0~9999 msec	Sets the confirmation time from when the unclamp confirmation input signal on each axis turns ON until the rotation operation is executed.
18**0013	Clamp check time	0~9999 msec	Sets the confirmation time from when the clamp confirmation input signal on each axis turns ON until the next operation is executed.
18**0014	Position check pulse	0~999999 pulses	Sets the tolerance for misalignment when clamped on each axis.
18**0015	NC stop level for servo error	1~5	<1: Stop level 1, 2: Stop level 2, 3: Stop level 3, 4: Stop level 4, 5: Stop level 5> Sets the stop level on the machine side (excluding the PLC-axis, other axes) when a servo error is triggered on the PLC-axis. When not set, the default level is <5: Stop level 5>.  A servo communication error and servo status error are a stop level 5 regardless of this parameter setting. A servo warning is a stop level 1 regardless of this parameter setting. (NOTE) The operation on the machine side does not immediately stop when a PLC-axis servo error is triggered if this parameter is set to <3: Stop level 3>, <2: Stop level 2> or <1: Stop level 1>. Be careful of interference between moving parts controlled by the PLC-axis and the machine.
18**0016	In-position timeout period	0~9999 msec	Sets the time allowed for the in-position check on each axis. The check operation does not execute when the time is “0”.
18**0017	Positioning end check distance/ angle	0.001~9.999 mm 0.001~9.999 degrees	Sets the allowable range for the final position when the position operation is finished.
18**0018	Positioning check time	0~9999 msec	Sets the confirmation time starting after the rotation is complete on each axis until the unclamp output signal turns OFF.
18**0019	Rapid feedrate	1~9999999 mm/min 1~9999999 deg/min	Sets the maximum feedrate on each axis.
18**0020	Manual speed	1~9999999 mm/min 1~9999999 deg/min	Sets the maximum feed rate on each axis during manual operations (JOG, STEP and HANDLE).
18**0021 ~ 18**0023	Manual time constant 1 Manual time constant 2 Manual time constant 3	0~400 msec	Sets the acceleration and deceleration time constant on each axis during manual operations (JOG, STEP and HANDLE).  It accelerates and decelerates using the rapid feed time constant 1, 2 and 3 when the manual time constants 1, 2 and 3 settings are all 0 or are not set. Even if values greater than 100 msec. are set, they are restricted to 100 msec. when the machine is equipped with a clamp mechanism. It accelerates and decelerates using the rapid feed time constant 1, 2 and 3 when a JOG command is issued from the internal PLC.

No.	Item name	Setting range	Description
18**0024	Rapid feedrate (door open)	1~9999999 mm/min 1~9999999 deg/min	Sets the maximum feed rate on each axis when a door is open. When the <P1 to P4-axes type> is set to <0: Linear axis>, even if the value that is entered exceeds 2000, the actual feed rate is limited 2000 mm/min. When the <P1 to P4-axes type> is set to <1: Rotation axis>, even if the value that is entered exceeds 18000, the actual feed rate is limited to 18000 mm/min.
18**0025	Rapid feedrate (Outer pallet)	1~9999999 mm/min 1~9999999 deg/min	Sets the maximum feedrate when P1 through P4 axes are at the outer pallet. The axes are also controlled with this speed when the pallet is not indexed.
18**0026 ~ 18**0028	Rapid feed time constant 1 Rapid feed time constant 2 Rapid feed time constant 3	0~9999 msec	Sets the time constant for acceleration and deceleration during the rapid feed operation on each axis.
18**0029	Brake load test	0~1	<0: No test, 1: Test> Set whether or not to execute the brake load test on the each axis. Set to <1: Test> on axes that fall due to a dead load. When the brake load test is set to <1: Test> on axes where <Brake> (P1 to P4-axes) is set to <0: None>, the alarm <<Machine param. setting error (PLC)>> (Stop level 5, recovery level 3) is triggered.
18**0030	Load torque for brake load test	1~999%	Set the torque for the load applied to each axis brake in the brake load test. The set value is the ratio when the rated torque for the motor is 100%.
18**0031	Travel amount under load for brake load test	0.001~9.999 mm 0.001~9.999 degrees	Set the travel amount that applies a load on each axis brake.
18**0032	Allowable travel amount for brake load test	0.001~9.999 mm 0.001~9.999 degrees	Set the tolerance value for the shift in position when the load is applied to each axis brake. After applying the load to the brake, when the travel amount exceeds the set value, the alarm <<Brake load test error on P*-axis>> is triggered.
18**0033	Delay time for brake operation	0.0~9999.9 msec	Set the time it takes from when the brake release signal for each axis turns OFF until the brake is applied.
18**0034	Delay time for brake release	0.0~9999.9 msec	Set the time it takes from when the brake release signal for each axis turns ON until the brake is released.
18**0035	Load time for brake load test	1.0~9999.9 msec	Set the time for the load being applied on each axis brake.
18**0036	Timeout time for load during brake load test	0.0~9999.9 msec	Set the time allowed for the load that normally applies to each axis brake during the brake load test. The check operation does not execute when the time is “0.0”.
18**0037	Wait time before applying brake in brake load test	0.0~9999.9 msec	Set the wait time before applying the brake on each axis in the brake load test.
18**0038	Wait time before releasing brake in brake load test	0.0~9999.9 msec	Set the wait time before releasing the brake on each axis in the brake load test.
18**0039	Door open time constant 1	0.0~99.9 msec	Set the acceleration and deceleration time constant for each axis when <Door interlock mode> is set to <Machine setup> and a door is open. <Door open time constant 1> is the time it takes to reach the command speed. <Door open time constant 2> and <Door open time constant 3> are the times for ideal acceleration and deceleration.
18**0040	Door open time constant 2	0.0~99.9 msec	
18**0041	Door open time constant 3	0.0~99.9 msec	
18**0042	Adjustment mark	0~1	<0: No, 1: Yes> Set a mark that is used for the position adjustment on each axis.
18**0043	Marked position for adjustment	-9999.999~9999.999 mm -9999.999 to 9999.999 degrees	Set the marked position that is used for the position adjustment on each axis with the machine coordinates.

## 7.12 Machine Parameters 9 (Special Settings)

### Rapid feed level 1

No.	Item name	Setting range	Description
19610001	X-axis rapid feed time const. 1A		Refer to the descriptions for the machine parameters with the same name in “7.4 Machine parameter 1 (system 1)” for further details.
19610002	X-axis rapid feed time const. 2A		
19610003	X-axis rapid feed time const. 3A		
19610004	Y-axis rapid feed time const. 1A		
19610005	Y-axis rapid feed time const. 2A		
19610006	Y-axis rapid feed time const. 3A		
19610007	Z-axis rapid feed time const. 1A		
19610008	Z-axis rapid feed time const. 2A		
19610009	Z-axis rapid feed time const. 3A		
19610010	X-axis rapid feed time const. 1B		
19610011	X-axis rapid feed time const. 2B		
19610012	X-axis rapid feed time const. 3B		
19610013	Y-axis rapid feed time const. 1B		
19610014	Y-axis rapid feed time const. 2B		
19610015	Y-axis rapid feed time const. 3B		
19610016	Z-axis rapid feed time const. 1B		
19610017	Z-axis rapid feed time const. 2B		
19610018	Z-axis rapid feed time const. 3B		
19610019	X-axis rapid feed time const. 1C		
19610020	X-axis rapid feed time const. 2C		
19610021	X-axis rapid feed time const. 3C		
19610022	Y-axis rapid feed time const. 1C		
19610023	Y-axis rapid feed time const. 2C		
19610024	Y-axis rapid feed time const. 3C		
19610025	Z-axis rapid feed time const. 1C		
19610026	Z-axis rapid feed time const. 2C		
19610027	Z-axis rapid feed time const. 3C		
19610028	X-axis time const. change distance A		
19610029	X-axis time const. change distance B		
19610030	Y-axis time const. change distance A		
19610031	Y-axis time const. change distance B		
19610032	Z-axis time const. change distance A		
19610033	Z-axis time const. change distance B		
19610034	X-axis lower limit time const.		
19610035	Y-axis lower limit time const.		
19610036	Z-axis lower limit time const.		
19610037	Z-axis rapid traverse rate (when ATC rises 2)		
19610038	Z-axis rapid traverse rate (when ATC falls 2)		
19610039	ATC low speed (2 when ATC rises) (Standard tool)		
19610040	ATC low speed (2 when ATC falls) (Standard tool)		
19610041 ~ 19610043	X-axis rapid feed time const. FFGN1 Y-axis rapid feed time const. FFGN1 Z-axis rapid feed time const. FFGN1	0 to 100	Sets the constant for the rapid feed operation. When set to a larger value, the position deviation becomes smaller, but the machine vibrations may become bigger. Valid only when <Rapid feed control type 1> is set to “0”.
19610044	Z-axis rapid feed time const. FFGN3	0 to 100	Sets the constant for the cutting feed operation only for the Z-axis. When set to a larger value, the position deviation becomes smaller, but the machine vibrations may become bigger. Valid only when <Z-axis rapid feed control type 2> is set to “0”.
19610045 ~ 19610047	X-axis rapid feed time const. OFLV Y-axis rapid feed time const. OFLV Z-axis rapid feed time const. OFLV	1 to 2147483647	Sets the tolerance for the position deviation. <>Servo error (Position deviation large)>> is triggered when the position deviation is higher than the set value.

No.	Item name	Setting range	Description
19610048 ~ 19610050	X-axis rapid feed time const. TVI1 Y-axis rapid feed time const. TVI1 Z-axis rapid feed time const. TVI1	0.3 to 1000.0	Sets the constant for the rapid feed operation. When set to a smaller value, the response improves, but the machine vibrations may become bigger.
19610051 ~ 19610053	X-axis rapid feed time const. TVI2 Y-axis rapid feed time const. TVI2 Z-axis rapid feed time const. TVI2	0.3 to 1000.0	This parameter is reserved. Therefore, do not use it.
19610054 ~ 19610056	X-axis rapid feed control type 1 Y-axis rapid feed control type 1 Z-axis rapid feed control type 1	0 to 1	Sets the control type for the rapid feed operation. When set to “1”, the position deviation becomes smaller, but the machine vibrations may become bigger.
19610057	Z-axis rapid feed control type 2	0 to 1	Sets the control type for the cutting feed operation only for the Z-axis. When set to “1” or “2”, the position deviation becomes smaller, but the machine vibrations may become bigger.

**Rapid feed level 2**

No.	Item name	Setting range	Description
19620001	X-axis rapid feed time const. 1A	Refer to the setting range for the machine parameters with the same name in machine parameter 1 (system 1).	Refer to the descriptions for the machine parameters with the same name in “7.4 Machine parameter 1 (system 1)” for further details.
19620002	X-axis rapid feed time const. 2A		
19620003	X-axis rapid feed time const. 3A		
19620004	Y-axis rapid feed time const. 1A		
19620005	Y-axis rapid feed time const. 2A		
19620006	Y-axis rapid feed time const. 3A		
19620007	Z-axis rapid feed time const. 1A		
19620008	Z-axis rapid feed time const. 2A		
19620009	Z-axis rapid feed time const. 3A		
19620010	X-axis rapid feed time const. 1B		
19620011	X-axis rapid feed time const. 2B		
19620012	X-axis rapid feed time const. 3B		
19620013	Y-axis rapid feed time const. 1B		
19620014	Y-axis rapid feed time const. 2B		
19620015	Y-axis rapid feed time const. 3B		
19620016	Z-axis rapid feed time const. 1B		
19620017	Z-axis rapid feed time const. 2B		
19620018	Z-axis rapid feed time const. 3B		
19620019	X-axis rapid feed time const. 1C		
19620020	X-axis rapid feed time const. 2C		
19620021	X-axis rapid feed time const. 3C		
19620022	Y-axis rapid feed time const. 1C		
19620023	Y-axis rapid feed time const. 2C		
19620024	Y-axis rapid feed time const. 3C		
19620025	Z-axis rapid feed time const. 1C		
19620026	Z-axis rapid feed time const. 2C		
19620027	Z-axis rapid feed time const. 3C		
19620028	X-axis time const. change distance A		
19620029	X-axis time const. change distance B		
19620030	Y-axis time const. change distance A		
19620031	Y-axis time const. change distance B		
19620032	Z-axis time const. change distance A		
19620033	Z-axis time const. change distance B		
19620034	X-axis lower limit time const.		
19620035	Y-axis lower limit time const.		
19620036	Z-axis lower limit time const.		
19620037	Z-axis rapid traverse rate (when ATC rises 2)		
19620038	Z-axis rapid traverse rate (when ATC falls 2)		
19620039	ATC low speed (2 when ATC rises)		
19620040	ATC low speed (2 when ATC falls)		

## Chapter 7 Machine Parameter

No.	Item name	Setting range	Description
19620041 ~ 19620043	X-axis rapid feed time const. FFGN1 Y-axis rapid feed time const. FFGN1 Z-axis rapid feed time const. FFGN1	0 to 100	Sets the constant for the rapid feed operation. When set to a larger value, the position deviation becomes smaller, but the machine vibrations may become bigger. Valid only when <*-ax.rpd. control type 1> is set to <0>.
19620044	Z-axis rapid feed time const. FFGN3	0 to 100	Sets the constant for the cutting feed operation only for the Z-axis. When set to a larger value, the position deviation becomes smaller, but the machine vibrations may become bigger. Valid only when <Z-axis rapid feed control type 2> is set to <0>.
19620045 ~ 19620047	X-axis rapid feed time const. OFLV Y-axis rapid feed time const. OFLV Z-axis rapid feed time const. OFLV	1 to 2147483647	Sets the tolerance for the position deviation. <<Servo error (Position deviation large)>> is triggered when the position deviation is higher than the set value.
19620048 ~ 19620050	X-axis rapid feed time const. TVI1 Y-axis rapid feed time const. TVI1 Z-axis rapid feed time const. TVI1	0.3 to 1000.0	Sets the constant for the rapid feed operation. When set to a smaller value, the response improves, but the machine vibrations may become bigger.
19620051 ~ 19620053	X-axis rapid feed time const. TVI2 Y-axis rapid feed time const. TVI2 Z-axis rapid feed time const. TVI2	0.3 to 1000.0	This parameter is reserved. Therefore, do not use it.
19620054 ~ 19620056	X-axis rapid feed control type 1 Y-axis rapid feed control type 1 Z-axis rapid feed control type 1	0 to 1	Sets the control type for the rapid feed operation. When set to “1”, the position deviation becomes smaller, but the machine vibrations may become bigger.
19620057	Z-axis rapid feed control type 2	0 to 1	Sets the control type for the cutting feed operation only for the Z-axis. When set to “1”, the position deviation becomes smaller, but the machine vibrations may become bigger.

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### Rapid feed level 3

No.	Item name	Setting range	Description
19630001	X-axis rapid feed time const. 1A	Refer to the setting range for the machine parameters with the same name in machine parameter 1 (system 1).	Refer to the descriptions for the machine parameters with the same name in “7.4 Machine parameter 1 (system 1)” for further details.
19630002	X-axis rapid feed time const. 2A		
19630003	X-axis rapid feed time const. 3A		
19630004	Y-axis rapid feed time const. 1A		
19630005	Y-axis rapid feed time const. 2A		
19630006	Y-axis rapid feed time const. 3A		
19630007	Z-axis rapid feed time const. 1A		
19630008	Z-axis rapid feed time const. 2A		
19630009	Z-axis rapid feed time const. 3A		
19630010	X-axis rapid feed time const. 1B		
19630011	X-axis rapid feed time const. 2B		
19630012	X-axis rapid feed time const. 3B		
19630013	Y-axis rapid feed time const. 1B		
19630014	Y-axis rapid feed time const. 2B		
19630015	Y-axis rapid feed time const. 3B		
19630016	Z-axis rapid feed time const. 1B		
19630017	Z-axis rapid feed time const. 2B		
19630018	Z-axis rapid feed time const. 3B		
19630019	X-axis rapid feed time const. 1C		
19630020	X-axis rapid feed time const. 2C		
19630021	X-axis rapid feed time const. 3C		
19630022	Y-axis rapid feed time const. 1C		
19630023	Y-axis rapid feed time const. 2C		
19630024	Y-axis rapid feed time const. 3C		
19630025	Z-axis rapid feed time const. 1C		
19630026	Z-axis rapid feed time const. 2C		
19630027	Z-axis rapid feed time const. 3C		
19630028	X-axis time const. change distance A		
19630029	X-axis time const. change distance B		

No.	Item name	Setting range	Description
19630030	Y-axis time const. change distance A		
19630031	Y-axis time const. change distance B		
19630032	Z-axis time const. change distance A		
19630033	Z-axis time const. change distance B		
19630034	X-axis lower limit time const.		
19630035	Y-axis lower limit time const.		
19630036	Z-axis lower limit time const.		
19630037	Z-axis rapid traverse rate (when ATC rises 2)		
19630038	Z-axis rapid traverse rate (when ATC falls 2)		
19630039	ATC low speed (2 when ATC rises)		
19630040	ATC low speed (2 when ATC falls)		
19630041 ~ 19630043	X-axis rapid feed time const. FFGN1 Y-axis rapid feed time const. FFGN1 Z-axis rapid feed time const. FFGN1	0 to 100	Sets the constant for the rapid feed operation. When set to a larger value, the position deviation becomes smaller, but the machine vibrations may become bigger. Valid only when <Rapid feed control type 1> is set to “0”.
19630044	Z-axis rapid feed time const. FFGN3	0 to 100	Sets the constant for the cutting feed operation only for the Z-axis. When set to a larger value, the position deviation becomes smaller, but the machine vibrations may become bigger. Valid only when <Z-axis rapid feed control type 2> is set to “0”.
19630045 ~ 19630047	X-axis rapid feed time const. OFLV Y-axis rapid feed time const. OFLV Z-axis rapid feed time const. OFLV	1 to 2147483647	Sets the tolerance for the position deviation. <<Servo error (Position deviation large)>> is triggered when the position deviation is higher than the set value.
19630048 ~ 19630050	X-axis rapid feed time const. TVI1 Y-axis rapid feed time const. TVI1 Z-axis rapid feed time const. TVI1	0.3 to 1000.0	Sets the constant for the rapid feed operation. When set to a smaller value, the response improves, but the machine vibrations may become bigger.
19630051 ~ 19630053	X-axis rapid feed time const. TVI2 Y-axis rapid feed time const. TVI2 Z-axis rapid feed time const. TVI2	0.3 to 1000.0	This parameter is reserved. Therefore, do not use it.
19630054 ~ 19630056	X-axis rapid feed control type 1 Y-axis rapid feed control type 1 Z-axis rapid feed control type 1	0 to 2	Sets the control type for the rapid feed operation. When set to “1” or “2”, the position deviation becomes smaller, but the machine vibrations may become bigger.
19630057	Z-axis rapid feed control type 2	0 to 2	Sets the control type for the cutting feed operation only for the Z-axis. When set to “1” or “2”, the position deviation becomes smaller, but the machine vibrations may become bigger.

## 7.13 List of Default Values for Machine Parameter (W1000Xd1)

System 1(Common)

No.	Item	10K	10K(High torque)	16K
11000001	Display language		0	
11000002	Change screw type		0	
11000003	Emergency stop switch change		0	
11000004	Servo off time-out time		500	
11000005	Spindle grid shift		0	
11000006	Max. spindle speed	10000	10000	16000
11000007	Max. spindle speed(door open)		50	
11000008	Spindle command timeout period		5000.0	
11000009	Spindle in-position check timeout period		5000.0	
11000010	Spindle tool unclamp function		0	
11000011	No. of spindle control change rotations	10000	10000	16000
11000012	Distance with spindle servo ON when Z-axis ATC falls		8.0	
11000013	Spindle orientation completion check distance		40960	
11000014	Spindle orientation completion check time		30.0	
11000015	Spindle orientation tolerance		40960	
11000016	Spindle orientation monitoring time		0.0	
11000017	Spindle orientation monitoring distance		0	
11000018	Spindle orientation monitoring torque		0	
11000019	Center-through-coolant option		0	
11000020	Air blow/Tool wash option		2	
11000021	Air blow/Tool wash control method		1	
11000022	Air pressure check time for air blow/tool wash		40	
11000023	Air pressure check time after air blow/tool wash		20	
11000024	Z-axis lowering speed when checking tool wash filter		1700.0	
11000025	Tool wash start position change offset(Type4)		3	
11000026	Tool washing liquid level sensor water supply check time(Type4)		13.0	
11000027	Tool washing liquid level sensor discharge check time(Type4)		7.5	
11000028	Tool wash start position		0	
11000029	Tool wash discharge delay time		0	
11000030	Cyclone filter		0	
11000031	Chip auger		0	
11000032	Chip conveyor connection setting		0	
11000033	Coolant during tool change		0	
11000034	Manual tool change position offset		3	
11000035	Tool storage capacity		14 (14tools) 21 (21tools)	
11000036	Distance to ATC zero		137.0	
11000037	X-axis ATC position		9999.999	
11000038	Y-axis ATC position		9999.999	
11000039	Distance to check spindle orientation when tools automatically changed		0.0	
11000040	Tolerance for ATC zero point range		10.0	
11000041	ATC arm turn restricted distance (X axis)		0.0	
11000042	Operation in ATC range (when ATC rises)		1	
11000043	Operation in ATC range (when ATC falls)		1	
11000044	ATC speed (1 when ATC rises)		50000.0	
11000045	ATC speed (1 when ATC falls)		50000.0	
11000046	ATC low speed (1 when ATC rises)(Standard tool)		25500.0	
11000047	ATC low speed (1 when ATC falls)(Standard tool)		28000.0	
11000048	ATC speed (2 when ATC rises)		35000.0	
11000049	ATC speed (2 when ATC falls)		35000.0	
11000050	ATC low speed (2 when ATC rises)(Standard tool)		8000.0	
11000051	ATC low speed (2 when ATC falls)(Standard tool)		12000.0	
11000052	Low speed distance 1 when ATC rises		34.5	

No.	Item	10K	10K(High torque)	16K
11000053	Low speed distance 2 when ATC rises	44.5		
11000054	Low speed distance 1 when ATC falls	34.5		
11000055	Low speed distance 2 when ATC falls	49.5		
11000056	ATC low speed (when ATC rises) change ratio (heavy tool)	80		
11000057	ATC low speed (when ATC falls) change ratio (heavy tool)	80		
11000058	Max. tapping speed	6000		
11000059	Synchronized tapping error limit	4194304		
11000060	Minimum tapping pitch	0.095		
11000061	Switch rotational frequency for tapping acceleration (high speed)	4175	2130	0
11000062	Switch time constant for tapping acceleration (high speed)	88.0	62.0	0.0
11000063	Tapping time const. 1 (High speed)	121.0	97.0	137.0
11000064	Tapping time const. 2 (High speed)	15.0	31.0	21.0
11000065	Tapping time const. 3 (High speed)	0.0		
11000066	Switch rotational frequency for tapping acceleration (medium speed)	4400	3500	0
11000067	Switch time constant for tapping acceleration (medium speed)	106.0	85.0	0.0
11000068	Tapping time constant 1 (medium speed)	128.0	117.0	180.0
11000069	Tapping time constant 2 (medium speed)	20.0	32.0	27.0
11000070	Tapping time constant 3 (medium speed)	0.0		
11000071	Tapping time constant 1 (low speed)	229.0	181.0	300.0
11000072	Tapping time constant 2 (low speed)	34.0	27.0	45.0
11000073	Tapping time constant 3 (low speed)	0.0		
11000074	Max. load weight	400		
11000075	Axis for weight estimation	0		
11000076	Tolerance for weight estimation	30		
11000077	Tolerance between axes for estimated weight	30		
11000078	Pallet turn restricted distance (Y axis)	0.0		
11000079	Move X/Y-axis to safe position when turning pallet	0		
11000080	Move to safe position when turning pallet	0		
11000081	Move X-axis to safe position turning pallet	0.0		
11000082	Move Y-axis to safe position turning pallet	0.0		
11000083	Automatic oiling function	0		
11000084	Automatic oiling pause 1	9		
11000085	Automatic oiling pause 2	70		
11000086	Automatic oiling time	15		
11000087	Automatic oiling monitoring time	60		
11000088	Automatic greasing function	0		
11000089	Automatic greasing pause 1	150		
11000090	Automatic greasing pause 2	4320		
11000091	Automatic greasing completion monitoring time	120		
11000092	Automatic greasing abnormal pressure monitoring time	10		
11000093	Door close check time	25		
11000094	Door unlock check time – Front door/Outer door	200		
11000095	Door unlock check time – Left side door	0		
11000096	Door unlock check time – Right side door	0		
11000097	Door unlock check time – Inner door	0		
11000098	Door unlock check time – Setup chamber left door	0		
11000099	Door unlock check time – Setup chamber right door	0		
11000100	Door unlock check time – Outside door 1	0		
11000101	Door unlock check time – Outside door 2	0		
11000102	Door unlock check time – Magazine door	0		
11000103	CPU temperature compensation	0		
11000104	Thermal error 1 (control box) temperature	73		
11000105	Thermal error 2 (control box) temperature	83		
11000106	Periodic communication error detection count	2		
11000107	Servo notification delay time when AC power drops	20		
11000108	Time to delay fan 1 ON	2		
11000109	Time to delay fan 2 ON	2		

## Chapter 7 Machine Parameter

No.	Item	10K	10K(High torque)	16K
11000110	Time to delay fan 3 ON	2		
11000111	Time to delay fan 4 ON	2		
11000112	Scheduled notice to change batteries on relocation detection device	1825		
11000113	Scheduled timing to change batteries on relocation detection device	10		
11000114	EDM1 check time	500		
11000115	EDM2 check time	500		
11000116	EDM3 check time	500		
11000117	EDM4 check time	0		
11000118	EDM5 check time	0		
11000119	EDM6 check time	0		
11000120	EDM7 check time	0		
11000121	EDM8 check time	0		
11000122	EDM9 check time	0		
11000123	EDM10 check time	0		
11000124	EDM11 check time	0		
11000125	Motor insulation resistance measurement timeout time	5.0		
11000126	Rapid feedrate when ATC monitoring parameter is automatically set	500.0		
11000127	Detection start height for ATC monitoring reference height	10.0		
11000128	Detection end height for ATC monitoring reference height	70.0		
11000129	Tolerance range 1 for ATC monitoring reference height	33.4		
11000130	Tolerance range 2 for ATC monitoring reference height	37.8		
11000131	LPF time constant for automatic ATC monitoring adjustment	350.0		
11000132	Reference start point for ATC monitoring torque detection	5.0		
11000133	Reference end point for ATC monitoring torque detection	10.0		
11000134	Measurement start point for ATC monitoring torque detection	125.0		
11000135	Measurement end point for ATC monitoring torque detection	130.0		
11000136	Threshold value for ATC monitoring torque detection	400		
11000137	ATC monitoring area height 1	-14.0		
11000138	ATC monitoring area height 2	-3.0		
11000139	ATC monitoring area height 3	3.0		
11000140	ATC monitoring area height 4	14.0		
11000141	ATC monitoring LPF time constant 1	16.5		
11000142	ATC monitoring LPF time constant 2	0.0		
11000143	ATC monitoring LPF delay time	10.5		
11000144	Threshold value for tool missing detection (BT)	2834		
11000145	Threshold value for tool missing detection (BBT)	3305		
11000146	Safe position for Y-axis when restoring operation	0.0		
11000147	R-point lower limit for pallet loading during tool change	0.0		
11000148	Maximum blocks to check cutter compensation interference	8		
11000149	FAN 1 speed detection function	1		
11000150	FAN 2 speed detection function	1		
11000151	FAN 3 speed detection function	1		
11000152	FAN 4 speed detection function	1		
11000153	AVR FAN speed detection function	0		
11000154	Spindle FAN speed detection function	0		
11000155	FAN 1 speed error	1000		
11000156	FAN 2 speed error	1000		
11000157	FAN 3 speed error	1000		
11000158	FAN 4 speed error	1000		
11000159	AVR FAN speed error	1000		
11000160	Spindle FAN speed error	1000		
11000161	FAN 1 speed error detection time	30		
11000162	FAN 2 speed error detection time	30		
11000163	FAN 3 speed error detection time	30		
11000164	FAN 4 speed error detection time	30		
11000165	AVR FAN speed error detection time	30		
11000166	Spindle FAN speed error detection time	30		
11000167	NC PCB power consumption	20		

No.	Item	10K	10K(High torque)	16K
11000168	KEY PCB power consumption	8		
11000169	CM PCB power consumption	5		
11000170	FC PCB power consumption	3		
11000171	LCD backlight power consumption	11		
11000172	Automatic oiling or automatic greasing power consumption	0		
11000173	Spindle cooling fan power consumption	20		
11000174	Servo control power consumption	11		
11000175	FE unit power consumption	0		
11000176	Outside door 1 settings	0		
11000177	Outside door 2 settings	0		
11000178	Detection time when AC power drops	100		
11000179	Threshold value when AC power drops	215		
11000180	Detection time when no AC power detected	100		
11000181	Detection time for AC power phase sequence error	1000		
11000182	Acceleration/deceleration control detection time when AC power drops	2		
11000183	Acceleration/deceleration control threshold value when AC power drops	198		
11000184	Deceleration restart delay time when AC power drops	0		
11000185	Tap acceleration/deceleration control when AC power drops	0		
11000186	Brake diagnostics	1		
11000187	Standard load weight	300		
11000188	Max. spindle speed (maintenance)	2000		

**System 1(XYZ-ax)**

Servo parameter number: X-axis11010000's, Y-axis11020000's, Z-axis11030000's

No.	Item	X-axis	Y-axis	Z-axis
????0001	Distance to zero point			480.0(Standard) 630.0(High column150) 730.0(High column250)
????0002	Ball screw diameter	28.0	28.0	28.0
????0003	Bearing position on fixed side	-1118.5	-615.5	54.5(Standard) 204.5(High column150) 304.5(High column250)
????0004	Bearing position on free side	102.0	106.0	703.5(Standard) 853.5(High column150) 953.5(High column250)
????0005	Motor installation position	0	1	1
????0006	Ball screw lead (mm)	16.0	12.0	16.0
????0007	Marked position for adjustment	-500.0	-250.0	480.0(Standard) 630.0(High column150) 730.0(High column250)
????0008	Absolute encoder rotation direction	1	0	0
????0009	Backlash compensation	0	0	0
????0010	Stroke 1 (-)	-1000.0	-500.0	180.0(Standard) 330.0(High column150) 430.0(High column250)
????0011	Stroke 1 (+)	0.0	0.0	
????0012	Stroke 2 (-)	0.0	0.0	0.0
????0013	Stroke 2 (+)	0.0	0.0	0.0
????0014	Stroke 3 (-)	0.0	0.0	0.0
????0015	Stroke 3 (+)	0.0	0.0	0.0
????0016	Stroke 4 (-)	0.0	0.0	0.0
????0017	Stroke 4 (+)	0.0	0.0	0.0
????0018	Stroke 5 (-)	0.0	0.0	0.0
????0019	Stroke 5 (+)	0.0	0.0	0.0
????0020	Stroke 6 (-)	0.0	0.0	0.0
????0021	Stroke 6 (+)	0.0	0.0	0.0
????0022	Stroke 7 (-)	0.0	0.0	0.0

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No.	Item	X-axis	Y-axis	Z-axis
????0023	Stroke 7 (+)	0.0	0.0	0.0
????0024	Stroke 8 (-)	0.0	0.0	0.0
????0025	Stroke 8 (+)	0.0	0.0	0.0
????0026	Stroke 9 (-)	0.0	0.0	0.0
????0027	Stroke 9 (+)	0.0	0.0	0.0
????0028	Stroke 10 (-)	0.0	0.0	0.0
????0029	Stroke 10 (+)	0.0	0.0	0.0
????0030	Return distance with servo controller ON	2.0		
????0031	In-position check	1		
????0032	Block connection			0
????0033	Making block connection high speed			0
????0034	Making block connection high speed 2			1
????0035	In-position timeout period	5000.0	5000.0	5000.0
????0036	In-position width	8000	10486	8000
????0037	Positioning end check distance	0.3	0.3	0.3
????0038	Maximum cutting travel speed	10000.0	10000.0	20000.0
????0039	Cutting feed time const. 1	92.0		
????0040	Cutting feed time const. 2	35.0		
????0041	Cutting feed time const. 3	29.0		
????0042	Cutting feed lower limit time constant	20.0		
????0043	Single axis cutting feed time const. 1S			38.0
????0044	Single axis cutting feed time const. 2S			0.0
????0045	Single axis cutting feed time const. 3S			30.0
????0046	Single axis cutting feed time const. 1SS			20.0
????0047	Single axis cutting feed time const. 2SS			0.0
????0048	Single axis cutting feed lower limit time constant			18.0
????0049	Skip feed acceleration/deceleration	1		
????0050	Skip feed time const. 1	92.0		
????0051	Skip feed time const. 2	35.0		
????0052	Skip feed time const. 3	29.0		
????0053	Manual speed	4000.0		
????0054	Rapid feedrate	50000.0	50000.0	56000.0
????0055	Rapid feedrate(door open)	2000.0		
????0056	Rapid feed time constant 1A	208.0	280.0	400.0
????0057	Rapid feed time constant 2A	0.0	36.0	0.0
????0058	Rapid feed time constant 3A	25.0	37.0	0.0
????0059	Rapid feed time constant 1B	158.0	277.0	56.0
????0060	Rapid feed time constant 2B	9.0	24.0	0.0
????0061	Rapid feed time constant 3B	36.0	39.0	36.0
????0062	Rapid feed time constant 1C	182.0	244.0	56.0
????0063	Rapid feed time constant 2C	37.0	20.0	0.0
????0064	Rapid feed time constant 3C	1.0	41.0	36.0
????0065	Time constant change for acceleration/deceleration			1
????0066	Rapid feed time constant 1AA			400.0
????0067	Rapid feed time constant 2AA			0.0
????0068	Rapid feed time constant 1BB			39.0
????0069	Rapid feed time constant 2BB			0.0
????0070	Rapid feed time constant 1CC			39.0
????0071	Rapid feed time constant 2CC			0.0
????0072	Rapid feed time constant 1M			56.0
????0073	Rapid feed time constant 2M			0.0
????0074	Rapid feed time constant 1MM			39.0
????0075	Rapid feed time constant 2MM			0.0
????0076	Minimum rapid feed time constant ratio	51	64	
????0077	Time constant change distance A	7.0	6.0	2.767
????0078	Time constant change distance B	17.0	12.0	0.0
????0079	Lower limit time constant	39.0	41.0	40.0
????0080	Load torque for brake load test			64

No.	Item	X-axis	Y-axis	Z-axis
????0081	Travel amount under load for brake load test			0.3
????0082	Allowable travel amount for brake load test			0.15
????0083	Delay time for brake operation			300.0
????0084	Delay time for brake release			25.0
????0085	Load time for brake load test			1000.0
????0086	Timeout time for load during brake load test			5000.0
????0087	Wait time before applying brake in brake load test			500.0
????0088	Wait time before releasing brake in brake load test			0.0
????0089	Block connection 2	1		
????0090	Door open time constant 1	70.0	70.0	30.0
????0091	Door open time constant 2	35.0	35.0	15.0
????0092	Door open time constant 3	0.0	0.0	0.0
????0093	Door open cutting feed time constant 1	30.0		
????0094	Door open cutting feed time constant 2	15.0		
????0095	Door open cutting feed time constant 3	0.0		

**System 1 (Automatic door)**

No.	Item	10K	10K(High torque)	16K
11200001	Option		0	
11200002	Operation time		5	
11200003	Door open operation check time		0	
11200004	Pulley belt		8.18	
11200005	Absolute encoder rotation direction		1	
11200006	Door open reference position		580.0	
11200007	Offset for door open position		0.0	
11200008	Offset for door close position		1.5	
11200009	Door open maximum speed		33000.0	
11200010	Door close maximum speed		33000.0	
11200011	Manual speed		1000.0	
11200012	Door open time constant 1		600.0	
11200013	Door open time constant 2		300.0	
11200014	Door open time constant 3		0.0	
11200015	Door close time constant 1		600.0	
11200016	Door close time constant 2		300.0	
11200017	Door close time constant 3		0.0	
11200018	Manual time constant 1		400.0	
11200019	Manual time constant 2		200.0	
11200020	Manual time constant 3		0.0	
11200021	NC stop level for servo error		5	
11200022	In-position timeout period		5000.0	
11200023	In-position width		320000	
11200024	Positioning end check distance		3.0	
11200025	Return distance with servo controller ON		2.0	
11200026	Time period when door open position check is disabled		10.0	
11200027	Door open position detection range		10.0	
11200028	Overrun distance when stopped		3.0	
11200029	Low-speed travel distance when stopped		5.0	
11200030	Low-speed travel speed when stopped		4500.0	
11200031	Low-speed time constant 1 when stopped		80.0	
11200032	Low-speed time constant 2 when stopped		0.0	
11200033	Low-speed time constant 3 when stopped		0.0	
11200034	Position check pulse		640000	
11200035	Stop check time when stopped		1.0	
11200036	Wait time when stopped		2	
11200037	Stop time when stopped		10.0	
11200038	Stop position deviation when stopped		128000	
11200039	Stop current reference value when stopped		50	

**System 2(Common)**

No.	Item	10K	10K(High torque)	16K
12000001	Additional axis stroke 2		0	
12000002	Additional axis (-) stroke 2		0.0	
12000003	Additional axis (+) stroke 2		0.0	
12000004	Additional axis stroke 3		0	
12000005	Additional axis (-) stroke 3		0.0	
12000006	Additional axis (+) stroke 3		0.0	
12000007	Additional axis stroke 4		0	
12000008	Additional axis (-) stroke 4		0.0	
12000009	Additional axis (+) stroke 4		0.0	
12000010	Additional axis stroke 5		0	
12000011	Additional axis (-) stroke 5		0.0	
12000012	Additional axis (+) stroke 5		0.0	
12000013	Additional axis stroke 6		0	
12000014	Additional axis (-) stroke 6		0.0	
12000015	Additional axis (+) stroke 6		0.0	
12000016	Additional axis stroke 7		0	
12000017	Additional axis (-) stroke 7		0.0	
12000018	Additional axis (+) stroke 7		0.0	
12000019	Additional axis stroke 8		0	
12000020	Additional axis (-) stroke 8		0.0	
12000021	Additional axis (+) stroke 8		0.0	
12000022	Additional axis stroke 9		0	
12000023	Additional axis (-) stroke 9		0.0	
12000024	Additional axis (+) stroke 9		0.0	
12000025	Additional axis stroke 10		0	
12000026	Additional axis (-) stroke 10		0.0	
12000027	Additional axis (+) stroke 10		0.0	
12000028	Lathe spindle maximum speed	2000		
12000029	Lathe spindle control change speed	2000		
12000030	Lathe spindle command time-out period	5000.0		
12000031	Lathe spindle orientation completion check distance	800		
12000032	Time to check lathe spindle orientation finish	30.0		
12000033	Thread cutting command timeout period	5000.0		
12000034	Check time for thread cutting speed	0.0		
12000035	Allowable range for thread cutting speed	0.0		
12000036	Rotation center X coordinate for tilt axis 1			
12000037	Rotation center Y coordinate for tilt axis 1			
12000038	Rotation center Z coordinate for tilt axis 1			
12000039	Rotation center X coordinate for rotation axis 1			
12000040	Rotation center Y coordinate for rotation axis 1			
12000041	Rotation center Z coordinate for rotation axis 1			
12000042	Rotation center X coordinate for tilt axis 2			
12000043	Rotation center Y coordinate for tilt axis 2			
12000044	Rotation center Z coordinate for tilt axis 2			
12000045	Rotation center X coordinate for rotation axis 2			
12000046	Rotation center Y coordinate for rotation axis 2			
12000047	Rotation center Z coordinate for rotation axis 2			

**System 2(QT-axis)**

Servo parameter number: QT-axis12040000's

No.	Item	QT-axis
????0001	Quick table	0
????0002	Pallet 1 indexing angle	0.0
????0003	Pallet 2 indexing angle	-180.0
????0004	Overrun angle when stopped	0.0
????0005	Low-speed travel angle when stopped	0.0
????0006	Low-speed rotation speed when stopped	0.1

No.	Item	QT-axis
????0007	Low-speed time constant 1 when stopped	40.0
????0008	Low-speed time constant 2 when stopped	20.0
????0009	Low-speed time constant 3 when stopped	0.0
????0010	Check disable time when stopped	0.0
????0011	Stop check time when stopped	0.0
????0012	Wait time when stopped	0
????0013	Stop time when stopped	0.0
????0014	Stop current detection range when stopped	0
????0015	Stop position deviation when stopped	0
????0016	Stop current reference value when stopped	0
????0017	Position check pulse during position adjustment	0
????0018	Stop check time during position adjustment	0.0
????0019	Gear ratio	90
????0020	Absolute encoder rotation direction	0
????0021	Backlash compensation	0
????0022	Clamp mechanism	1
????0023	Unclamp check input signal	0
????0024	Clamp check input signal	0
????0025	Unclamp output signal	1
????0026	Unclamp check time	200.0
????0027	Clamp check time	50.0
????0028	Return angle with servo controller ON	0.3
????0029	In-position width	800
????0030	In-position check time	0.0
????0031	In-position timeout period	5000.0
????0032	Positioning end check angle	0.3
????0033	Positioning check time	0.0
????0034	Position check pulse	2000
????0035	Position check pulse (when cutting)	0
????0036	Time for changing position check pulse	0.0
????0037	Ratio to restrict speed for position deviation	100
????0038	Manual speed	0.1
????0039	Manual time constant 1	0.0
????0040	Manual time constant 2	0.0
????0041	Manual time constant 3	0.0
????0042	Rapid feedrate	33.3
????0043	Rapid feedrate (Wt.1)	0.1
????0044	Rapid feedrate (Wt.2)	0.1
????0045	Rapid feedrate (speed restricted)	0.1
????0046	Rapid feedrate(door open)	8.0
????0047	Rapid feedrate selection	0
????0048	Rapid feed time constant 1A	200.0
????0049	Rapid feed time constant 2A	50.0
????0050	Rapid feed time constant 3A	0.0
????0051	Rapid feed time constant 1B	200.0
????0052	Rapid feed time constant 2B	50.0
????0053	Rapid feed time constant 3B	0.0
????0054	Rapid feed time constant 1C	200.0
????0055	Rapid feed time constant 2C	50.0
????0056	Rapid feed time constant 3C	0.0
????0057	Minimum rapid feed time constant ratio	100
????0058	Time constant change distance A	0.0
????0059	Time constant change distance B	0.0
????0060	Lower limit time constant	20.0
????0061	Current check time	0
????0062	Current tolerance	0
????0063	Door open time constant 1	30.0
????0064	Door open time constant 2	15.0
????0065	Door open time constant 3	0.0

## Chapter 7 Machine Parameter

Servo parameter number: 5-axis12050000's, 6-axis12060000's, 7-axis12070000's,  
8-axis12080000's

No.	Item	5-axis	6-axis	7-axis	8-axis
????0001	Optional axis	0	0	0	0
????0002	Installation position	0	0	0	0
????0003	Address	0	0	1	1
????0004	Machine zero return sequence	2	2	2	2
????0005	Gear ratio	90	90	90	90
????0006	Absolute encoder rotation direction	0	0	0	0
????0007	Normal rotation (lathe spindle)	0	0	0	0
????0008	Expansion I/O board station number for positioning	61	62	63	64
????0009	Backlash compensation	0	0	0	0
????0010	Clamp mechanism	1	1	1	1
????0011	Unclamp check input signal	0	0	0	0
????0012	Clamp check input signal	0	0	0	0
????0013	Unclamp output signal	1	1	1	1
????0014	Unclamp check time	200.0	200.0	200.0	200.0
????0015	Clamp check time	50.0	50.0	50.0	50.0
????0016	Unclamp time during servo ON	0.0	0.0	0.0	0.0
????0017	Clamp retry attempts			0	
????0018	Clamp retry pulse			0	
????0019	Allowable pulse for clamp retry			0	
????0020	Wait time for clamp retry start			0.0	
????0021	Return angle with servo controller ON	0.3			
????0022	In-position width	800	800	800	800
????0023	In-position check time	0.0	0.0	0.0	0.0
????0024	In-position check timeout period	5000.0	5000.0	5000.0	5000.0
????0025	Positioning end check angle	0.3	0.3	0.3	0.3
????0026	Positioning check time	0.0	0.0	0.0	0.0
????0027	Position check pulse	16000	16000	16000	16000
????0028	Position check pulse (when cutting)	0	0	0	0
????0029	Time for changing position check pulse	0.0	0.0	0.0	0.0
????0030	Rapid feedrate	33.3	33.3	33.3	33.3
????0031	Manual speed	33.3	33.3	33.3	33.3
????0032	Manual time constant 1	0.0	0.0	0.0	0.0
????0033	Manual time constant 2	0.0	0.0	0.0	0.0
????0034	Manual time constant 3	0.0	0.0	0.0	0.0
????0035	Rapid feedrate (door open)	8.0	8.0	8.0	8.0
????0036	Rapid feedrate (Outer pallet)	0.1	0.1	0.1	0.1
????0037	Rapid feed time constant 1A	200.0	200.0	200.0	200.0
????0038	Rapid feed time constant 2A	50.0	50.0	50.0	50.0
????0039	Rapid feed time constant 3A	0.0	0.0	0.0	0.0
????0040	Rapid feed time constant 1B	200.0	200.0	200.0	200.0
????0041	Rapid feed time constant 2B	50.0	50.0	50.0	50.0
????0042	Rapid feed time constant 3B	0.0	0.0	0.0	0.0
????0043	Rapid feed time constant 1C	200.0	200.0	200.0	200.0
????0044	Rapid feed time constant 2C	50.0	50.0	50.0	50.0
????0045	Rapid feed time constant 3C	0.0	0.0	0.0	0.0
????0046	Time constant change distance A	0.0	0.0	0.0	0.0
????0047	Time constant change distance B	0.0	0.0	0.0	0.0
????0048	Lower limit time constant	20.0	20.0	20.0	20.0
????0049	Maximum cutting rotation speed	33.3	33.3	33.3	33.3
????0050	Brake	0	0	0	0
????0051	Brake load test	0	0	0	0
????0052	Load torque for brake load test	70	70	70	70
????0053	Travel amount under load for brake load test	0.3	0.3	0.3	0.3
????0054	Allowable travel amount for brake load test	0.15	0.15	0.15	0.15
????0055	Delay time for brake operation	300.0	300.0	300.0	300.0
????0056	Delay time for brake release	25.0	25.0	25.0	25.0

No.	Item	5-axis	6-axis	7-axis	8-axis
????0057	Load time for brake load test	1000.0	1000.0	1000.0	1000.0
????0058	Timeout time for load during brake load test	5000.0	5000.0	5000.0	5000.0
????0059	Marked position for adjustment				
????0060	Wait time before applying brake in brake load test	1000.0	1000.0	1000.0	1000.0
????0061	Wait time before releasing brake in brake load test	0.0	0.0	0.0	0.0
????0062	Door open time constant 1	30.0	30.0	30.0	30.0
????0063	Door open time constant 2	15.0	15.0	15.0	15.0
????0064	Door open time constant 3	0.0	0.0	0.0	0.0
????0065	Adjustment mark	0	0	0	0

**System 3(Common)**

No.	Item	10K	10K(High torque)	16K
13000001	M-axis gear ratio (numerator)		150	
13000002	M-axis gear ratio (denominator)		1	
13000003	M-axis absolute encoder rotation direction		1	
13000004	M-axis backlash compensation		0	
13000005	M-axis current limit check time		1000.0	
13000006	M-axis position check pulse		128000	
13000007	M-axis tolerance		128000	
13000008	M-axis in-position width		128000	
13000009	M-axis in-position timeout period		5000.0	
13000010	Maximum tool specification setting function		1	
13000011	M-axis rapid feedrate(Standard tool)		40.0 (14tools) 33.4 (21tools)	
13000012	M-axis rapid feedrate (heavy tool)		20.0 (14tools) 18.0 (21tools)	
13000013	M-axis rapid feedrate (door open)		0.5	
13000014	M-axis rapid feedrate (speed restricted)(Standard tool)		20.0	
13000015	M-axis rapid feedrate (speed restricted)(heavy tool)		10.0	
13000016	M-axis rapid feed time const. 1A(Standard tool)		140.0 (14tools) 141.0 (21tools)	
13000017	M-axis rapid feed time const. 2A(Standard tool)		70.0 (14tools) 16.0 (21tools)	
13000018	M-axis rapid feed time const. 3A(Standard tool)		0.0 (14tools) 55.0 (21tools)	
13000019	M-axis rapid feed time const. 1B(Standard tool)		140.0 (14tools) 141.0 (21tools)	
13000020	M-axis rapid feed time const. 2B(Standard tool)		70.0 (14tools) 16.0 (21tools)	
13000021	M-axis rapid feed time const. 3B(Standard tool)		0.0 (14tools) 55.0 (21tools)	
13000022	M-axis rapid feed time const. 1C(Standard tool)		160.0 (14tools) 175.0 (21tools)	
13000023	M-axis rapid feed time const. 2C(Standard tool)		68.0 (14tools) 26.0 (21tools)	
13000024	M-axis rapid feed time const. 3C(Standard tool)		0.0 (14tools) 55.0 (21tools)	
13000025	M-axis rapid feed time const. 1A (heavy tool)		140.0 (14tools) 141.0 (21tools)	
13000026	M-axis rapid feed time const. 2A (heavy tool)		70.0 (14tools) 16.0 (21tools)	
13000027	M-axis rapid feed time const. 3A (heavy tool)		0.0 (14tools) 55.0 (21tools)	
13000028	M-axis rapid feed time const. 1B (heavy tool)		140.0 (14tools) 141.0 (21tools)	
13000029	M-axis rapid feed time const. 2B (heavy tool)		70.0 (14tools) 16.0 (21tools)	

## Chapter 7 Machine Parameter

No.	Item	10K	10K(High torque)	16K
13000030	M-axis rapid feed time const. 3B (heavy tool)	0.0 (14tools) 55.0 (21tools)		
13000031	M-axis rapid feed time const. 1C (heavy tool)	160.0 (14tools) 175.0 (21tools)		
13000032	M-axis rapid feed time const. 2C (heavy tool)	68.0 (14tools) 26.0 (21tools)		
13000033	M-axis rapid feed time const. 3C (heavy tool)	0.0 (14tools) 55.0 (21tools)		
13000034	Time constant change when M-axis accelerates/decelerates	1		
13000035	M-axis rapid feed time constant 1AA(Standard tool)	140.0 (14tools) 125.0 (21tools)		
13000036	M-axis rapid feed time constant 2AA(Standard tool)	70.0 (14tools) 0.0 (21tools)		
13000037	M-axis rapid feed time constant 1BB(Standard tool)	140.0 (14tools) 125.0 (21tools)		
13000038	M-axis rapid feed time constant 2BB(Standard tool)	70.0 (14tools) 0.0 (21tools)		
13000039	M-axis rapid feed time constant 1CC(Standard tool)	160.0 (14tools) 149.0 (21tools)		
13000040	M-axis rapid feed time constant 2CC(Standard tool)	68.0 (14tools) 0.0 (21tools)		
13000041	M-axis rapid feed time constant 1AA (heavy tool)	140.0 (14tools) 125.0 (21tools)		
13000042	M-axis rapid feed time constant 2AA (heavy tool)	70.0 (14tools) 0.0 (21tools)		
13000043	M-axis rapid feed time constant 1BB (heavy tool)	140.0 (14tools) 125.0 (21tools)		
13000044	M-axis rapid feed time constant 2BB (heavy tool)	70.0 (14tools) 0.0 (21tools)		
13000045	M-axis rapid feed time constant 1CC (heavy tool)	160.0 (14tools) 149.0 (21tools)		
13000046	M-axis rapid feed time constant 2CC (heavy tool)	68.0 (14tools) 0.0 (21tools)		
13000047	M-axis time const. change distance A(Standard tool)	0.0 (14tools) 25.714 (21tools)		
13000048	M-axis time const. change distance B(Standard tool)	38.571 (14tools) 42.857 (21tools)		
13000049	M-axis time const. change distance A (heavy tool)	0.0 (14tools) 25.714 (21tools)		
13000050	M-axis time const. change distance B (heavy tool)	38.571 (14tools) 42.857 (21tools)		
13000051	M-axis lower limit time constant	20.0		
13000052	M-axis position deviation tolerance ratio (Standard tool)	50		
13000053	M-axis position deviation tolerance ratio (heavy tool)	50		
13000054	Ratio of M-axis position deviation to restrict speed (Standard tool)	25		
13000055	Ratio of M-axis position deviation to restrict speed (heavy tool)	25		
13000056	Operation reference point in ATC range (Z-axis)	50.87		
13000057	Operation reference point in ATC range (M-axis 1)	795168 (14tools) 524288 (21tools)		
13000058	Operation reference point in ATC range (M-axis 2)	128000		
13000059	Operation start point in ATC range (when ATC rises)(Standard tool)	30.0 (14tools) 27.0 (21tools)		
13000060	Operation start point in ATC range (when ATC falls)(Standard tool)	1600000 (14tools) 1000000 (21tools)		
13000061	Operation start point in ATC range (when ATC rises)(heavy tool)	31.0		
13000062	Operation start point in ATC range (when ATC falls)(heavy tool)	1100000 (14tools) 850000 (21tools)		
13000063	Maximum deceleration in ATC range (Z-axis)	999.999		
13000064	Maximum deceleration in ATC range (M-axis)	999999.0		

No.	Item	10K	10K(High torque)	16K
13000065	Load torque for brake load test on M-axis		68 (14tools) 49 (21tools)	
13000066	Travel amount under load for brake load test on M-axis	128000		
13000067	Allowable travel amount for brake load test on M-axis	64000		
13000068	Delay time for M-axis brake operation	300.0		
13000069	Delay time for M-axis brake release	25.0		
13000070	Load time for brake load test on M-axis	1000.0		
13000071	Timeout time for load during brake load test on M-axis	5000.0		
13000072	AT-axis rapid feedrate 1			
13000073	AT-axis rapid feedrate 2			
13000074	AT-axis rapid feedrate (door open)			
13000075	AT-axis manual speed			
13000076	AT-axis in-position width			
13000077	AT-axis in-position timeout period			
13000078	AT-axis position check pulse			
13000079	AT-axis rapid feed time constant 1			
13000080	AT-axis rapid feed time constant 2			
13000081	AT-axis rapid feed time constant 3			
13000082	AT-axis manual time constant 1			
13000083	AT-axis manual time constant 2			
13000084	AT-axis manual time constant 3			
13000085	AT-axis lower limit time constant			
13000086	AT-axis gear ratio (numerator)			
13000087	AT-axis gear ratio (denominator)			
13000088	AT-ax.abso.encod.rotat.dir.			
13000089	Lower limit for ATC arm turn speed ratio			
13000090	Return angle with AT-axis servo controller ON			
13000091	Return angle 1 for AT-axis			
13000092	Return angle 2 for AT-axis			
13000093	Spindle servo controller OFF angle for AT-axis tool change			
13000094	AT-axis restricted travel range 1(-)			
13000095	AT-axis restricted travel range 1(+)			
13000096	AT-axis restricted travel range 2(-)			
13000097	AT-axis restricted travel range 2(+)			
13000098	ATC shutter interlock	1		
13000099	Pot rising check time	200		
13000100	Pot lowering check time	100		
13000101	Pot operation monitor time	2000		
13000102	Minimum pot operation time	250		
13000103	Distance between magazine pots	63.5		
13000104	ATC/Pot shutter signal	0		
13000105	ATC arm shutter signal	0		
13000106	Pot shutter timeout period			
13000107	Wait time before applying brake in M-axis brake load test	700.0		
13000108	Wait time before releasing brake in M-axis brake load test	0.0		

**Pitch error correction interval divisions**

No.	Item	10K	10K(High torque)	16K
14000001	Divisions for QT-axis pitch error correction interval	24		
14000002	Divisions for 5th-axis pitch error correction interval	24		
14000003	Divisions for 6th-axis pitch error correction interval	24		
14000004	Divisions for 7th-axis pitch error correction interval	24		
14000005	Divisions for 8th-axis pitch error correction interval	24		

**Pitch error compensation**

No.	Item	10K	10K(High torque)	16K
	4-axis (1 ~ 400)		0	
	5-axis (1 ~ 400)		0	
	6-axis (1 ~ 400)		0	
	7-axis (1 ~ 400)		0	
	8-axis (1 ~ 400)		0	
	9-axis (1 ~ 400)		0	
	10-axis (1 ~ 400)		0	
	X-right angle (1 ~ 1500)		0	
	Y-right angle (1 ~ 1500)		0	

**Servo controller(Spindle~Z-axis)**

Servo parameter number: Spindle15000000's, X-axis15010000's, Y-axis15020000's,  
Z-axis15030000's

No.	Spindle 10K	Spindle 10K (High torque)	Spindle 16K	X-axis	Y-axis	Z-axis
????0001	40	40	40	54	54	54
????0002	100	100	100	54	54	54
????0003	30	30	30	54	54	54
????0004	30	30	30			40
????0005	70	70	70	54	54	54
????0006	70	70	70	54	54	54
????0007	30	30	30			
????0008						
????0009						
????0010						
????0011	100	100	180	500	500	160
????0012	100	150	180	500	500	160
????0013	100	100	100	500	500	160
????0014	100	100	100			160
????0015	170	150	220			
????0016	100	100	100			
????0017	100	100	100			
????0018						
????0019						
????0020						
????0021	180	180	180	30	30	25
????0022	180	60	180	30	30	25
????0023	180	180	180	30	30	25
????0024	180	180	180	15	15	10
????0025	60	60	60			25
????0026	180	180	180			
????0027	180	180	180			
????0028						
????0029						
????0030						
????0031				0	0	0
????0032				0	0	0
????0033						0
????0034						0
????0035						
????0036						
????0037						
????0038						
????0039						
????0040						
????0041	5000	5000	5000	5000	5000	5000
????0042	5000	5000	5000			
????0043	5000	5000	5000			

No.	Spindle 10K	Spindle 10K (High torque)	Spindle 16K	X-axis	Y-axis	Z-axis
????0044	5000	5000	5000			
????0045	5000	5000	5000			
????0046	5000	5000	5000			
????0047	5000	5000	5000			
????0048	5000	5000	5000			
????0049						
????0050						
????0051						
????0052						
????0053						
????0054						
????0055						
????0056						
????0057						
????0058						
????0059						
????0060						
????0061						
????0062						
????0063						
????0064						
????0065						
????0066						
????0067						
????0068						
????0069						
????0070						
????0071						
????0072						
????0073						
????0074						
????0075						
????0076						
????0077						
????0078						
????0079						
????0080						
????0081						
????0082						
????0083						
????0084						
????0085						
????0086						
????0087						
????0088						
????0089						
????0090						
????0091						
????0092						
????0093						
????0094						
????0095						
????0096						
????0097						
????0098						
????0099						
????0100						
????0101	9	9	9	9	9	9

## Chapter 7 Machine Parameter

No.	Spindle 10K	Spindle 10K (High torque)	Spindle 16K	X-axis	Y-axis	Z-axis
????0102	2	2	2	2	2	2
????0103	0	0	0	0	0	0
????0104	5	5	5	5	5	5
????0105						
????0106						
????0107						
????0108						
????0109						
????0110						
????0111	0	0	0	0	0	0
????0112	0	0	0	0	0	0
????0113	4000	4000	4000	4000	4000	4000
????0114	100	100	100	100	100	100
????0115	0	0	0	0	0	0
????0116	0	0	0	100	100	100
????0117	500	500	500	800	800	800
????0118	600	600	600	1600	1600	1600
????0119	5000	5000	5000	5000	5000	5000
????0120	640	660	700	1600	930	840
????0121	820	880	870	700	1010	870
????0122	610	620	640	716	2100	1330
????0123	4000	4000	4000	2300	2700	2250
????0124	4000	4000	4000	2900	145	125
????0125	4000	4000	4000	110	250	250
????0126	4000	4000	4000	330	420	370
????0127	0	0	0	0	0	0
????0128	4000	4000	4000	4000	4000	4000
????0129	4000	4000	4000	4000	4000	4000
????0130	100	100	100	100	100	100
????0131	300	300	300	300	300	300
????0132	50	50	50	50	50	50
????0133	30	30	30	30	30	30
????0134	4000	4000	4000	4000	4000	4000
????0135	800	800	800	800	800	800
????0136	800	800	800	800	800	800
????0137	5000	5000	5000	5000	5000	5000
????0138	10240	10240	10240	500	500	500
????0139	50	50	50	50	50	50
????0140	50	50	50	50	50	50
????0141	1000	1000	1000	1000	1000	1000
????0142	3	3	3	5	5	5
????0143	1	1	1	2	2	2
????0144	0	0	0	0	0	0
????0145	0	0	0	0	0	300
????0146	0	0	0	0	0	25
????0147	1000	1000	1000	1000	1000	20
????0148	294	675	294	400	400	400
????0149	2147483647	2147483647	2147483647	2147483647	2147483647	2147483647
????0150	90	90	90	90	90	90
????0151	150	150	150	150	150	150
????0152	2	2	2	2	2	2
????0153	0	0	0	0	0	0
????0154	0	0	0	2	2	2
????0155	0	0	0	0	6	14
????0156	14	10	12	8	0	8
????0157	0	0	0	0	6	8
????0158	0	0	0	10	14	13
????0159	0	0	0	12	15	15

No.	Spindle 10K	Spindle 10K (High torque)	Spindle 16K	X-axis	Y-axis	Z-axis
????0160	0	0	0	14	14	14
????0161	0	0	0	64	60	0
????0162	20	20	20	8	12	20
????0163	0	0	0	0	0	0
????0164	500	500	500	500	500	500
????0165	0	0	0	0	0	0
????0166	4000	4000	4000	4000	4000	4000
????0167	1000	1000	1000	400	600	470
????0168	100	100	100	100	100	100
????0169	50	50	50	50	50	50
????0170	64	64	64	64	64	64
????0171	500	500	500	0	0	0
????0172	400	400	500	0	0	0
????0173	4000	2000	4000	0	0	0
????0174	1	1	1	1	1	1
????0175	2000	2000	2000	2000	2000	2000
????0176	90	90	90	90	90	90
????0177	80	35	83	80	80	80
????0178	45	35	55	30	30	30
????0179	1000	700	1000	500	500	500
????0180	60	50	45	200	200	200
????0181	3700	10800	2600	8670	8670	8670
????0182	9300	17000	6800	10110	10110	10110
????0183	10500	11730	10400	11000	11000	11000
????0184	11000	15810	12300	13500	13500	13500
????0185	10700	13000	10450	11500	11500	11500
????0186	13500	15000	11800	14500	14500	14500
????0187	50	50	50	20	20	20
????0188	90	80	90	90	90	90
????0189	120	120	120	120	120	120
????0190	200	200	200	200	200	200
????0191	200	200	200	200	200	200
????0192	4000	4000	4000	200	160	250
????0193	0	0	0	60	100	80
????0194	9	9	9	9	9	9
????0195	0	0	0	0	0	455
????0196						
????0197						
????0198	4000	4000	4000	400	600	700
????0199	0	0	0	50	80	50
????0200	4000	4000	4000	50	30	70
????0201	0	0	0	50	10	20
????0202	0	0	0	0	0	0
????0203	0	0	0	0	0	0
????0204	0	0	0	0	1	0
????0205	0	0	0	0	255	255
????0206	0	0	0	255	0	0
????0207	0	0	0	0	0	0
????0208	0	0	0	3	4	4
????0209						
????0210	0	0	0	0	0	1
????0211	0	0	0	0	0	0
????0212	0	0	0	0	0	0
????0213	1	1	1	1	1	1
????0214	0	0	0	0	0	0
????0215	0	0	0	0	0	0
????0216	1	1	1	1	1	1
????0217	0	0	0	0	0	0

## Chapter 7 Machine Parameter

No.	Spindle 10K	Spindle 10K (High torque)	Spindle 16K	X-axis	Y-axis	Z-axis
????0218	1	1	1	1	1	1
????0219	0	0	0	0	0	0
????0220	2	2	2	2	2	2
????0221	0	0	0	0	0	0
????0222	0	0	0	0	0	0
????0223	0	0	0	1	1	1
????0224	1	1	1	1	1	1
????0225	0	0	0	0	0	0
????0226	0	0	1	2	2	2
????0227	32768	32768	32768	32768	32768	32768
????0228	32768	32768	32768	32768	32768	32768
????0229	32768	32768	32768	32768	32768	32768
????0230	17037	17037	17037	17037	17037	17037
????0231	7	7	7	7	7	7
????0232	3	3	3	2	2	2
????0233	-4	-4	-4	-4	-4	-4
????0234	-1	-1	-1	-1	-1	-1
????0235	230000000	230000000	230000000	660000	880000	740000
????0236	2048	2048	2048	8000	10480	8000
????0237	50	50	50	50	50	50
????0238	50	50	50	50	50	50
????0239	0	0	0	0	0	0
????0240	224	224	224	224	224	224
????0241	-1	-1	-1	596867030	511001949	1329715942
????0242	-1	-1	-1	596867030	511001949	1329715942
????0243	-1	-1	-1	596867030	511001949	1329715942
????0244	5000	5000	5000	5000	5000	5000
????0245	5000	5000	5000	5000	5000	5000
????0246	0	0	0	0	0	0
????0247	1	1	1	0	0	0
????0248						
????0249						
????0250						
????0251						
????0252						
????0253						
????0254						
????0255						
????0256						
????0257						
????0258						
????0259						
????0260						
????0261						
????0262						
????0263						
????0264						
????0265						
????0266						
????0267						
????0268						
????0269						
????0270						
????0271						
????0272						
????0273						
????0274						
????0275						

No.	Spindle 10K	Spindle 10K (High torque)	Spindle 16K	X-axis	Y-axis	Z-axis
????0276						
????0277						
????0278						
????0279						
????0280						
????0281						
????0282						
????0283						
????0284						
????0285						
????0286						
????0287						
????0288						
????0289						
????0290						
????0291						
????0292						
????0293						
????0294						
????0295						
????0296						
????0297						
????0298						
????0299						
????0300						
????0301						
????0302						
????0303						
????0304						
????0305						
????0306						
????0307						
????0308						
????0309						
????0310						
????0311						
????0312						
????0313						
????0314						
????0315						
????0316						
????0317						
????0318						
????0319						
????0320						
????0321	0	0	0	12	12	1212
????0322	0	0	0	0	0	0
????0323	0	0	0	0	0	0
????0324	0	0	0	1000	1000	1000
????0325	0	0	0	1000	1000	1000
????0326	0	0	0	0	0	0
????0327	0	0	0	0	0	0
????0328	0	0	0	500	500	500
????0329	0	0	0	0	0	0
????0330				0	0	0
????0331				0	0	0
????0332				150	150	0
????0333						

## Chapter 7 Machine Parameter

No.	Spindle 10K	Spindle 10K (High torque)	Spindle 16K	X-axis	Y-axis	Z-axis
????0334						
????0335						
????0336						
????0337						
????0338						
????0339						
????0340						
????0341				1000050	1000050	1000050
????0342				14500	10400	7100
????0343				529189	596463	220000
????0344				0	0	0
????0345				0	0	0
????0346				165310	89660	0
????0347				0	0	0
????0348						
????0349						
????0350						
????0351				1000050	1000050	1000050
????0352				17000	18000	9900
????0353				529189	596463	220000
????0354				0	0	0
????0355				0	0	0
????0356				0	0	0
????0357				0	0	0
????0358						
????0359						
????0360						
????0361	0	0	0	3	3	3
????0362	0	0	0	0	0	0
????0363	0	0	0	0	0	0
????0364	0	0	0	0	0	0
????0365	0	0	0	0	0	0
????0366	0	0	0	1000	1000	1000
????0367	0	0	0	10000	15000	4579
????0368	0	0	0	12000	6600	3898
????0369	0	0	0	3000	11600	3606
????0370	0	0	0	200	1000	329
????0371	0	0	0	8000	5383	12339
????0372	0	0	0	20000	41594	23604
????0373	0	0	0	0	0	0
????0374	0	0	0	0	0	0
????0375	0	0	0	25000	5383	41715
????0376	0	0	0	800000	800000	800000
????0377	0	0	0	104856	139808	104856
????0378						
????0379						
????0380						
????0381						
????0382						
????0383						
????0384						
????0385						
????0386						
????0387						
????0388						
????0389						
????0390						
????0391						

No.	Spindle 10K	Spindle 10K (High torque)	Spindle 16K	X-axis	Y-axis	Z-axis
????0392						
????0393						
????0394						
????0395						
????0396						
????0397						
????0398						
????0399						
????0400						
????0401	0	0	0	0	0	0
????0402	0	0	0	1	1	1
????0403	0	0	0	0	0	0
????0404	0	0	0	0	0	0
????0405	0	0	0	0	0	0
????0406						
????0407						
????0408						
????0409						
????0410						
????0411						
????0412						
????0413						
????0414						
????0415						
????0416						
????0417						
????0418						
????0419						
????0420						
????0421	1014100	1014150	1014150			
????0422	0	0	0			
????0423	20000	12000	17000			
????0424	0	0	0			
????0425	0	0	0			
????0426	0	0	0			
????0427	0	0	0			
????0428	0	0	0			
????0429	0	0	0			
????0430	4000	4000	4000			
????0431	6000	6000	6000			
????0432						
????0433						
????0434						
????0435						
????0436						
????0437						
????0438						
????0439						
????0440						
????0441				0	0	0
????0442				0	0	0
????0443				0	0	0
????0444				0	0	0
????0445				0	0	0
????0446	30000	30000	30000			
????0447						
????0448						
????0449						

## Chapter 7 Machine Parameter

No.	Spindle 10K	Spindle 10K (High torque)	Spindle 16K	X-axis	Y-axis	Z-axis
????0450						
????0451						
????0452						
????0453						
????0454						
????0455						
????0456						
????0457						
????0458						
????0459						
????0460						
????0461						
????0462						
????0463						
????0464						
????0465						
????0466						
????0467						
????0468						
????0469						
????0470						
????0471						
????0472						
????0473						
????0474						
????0475						
????0476						
????0477						
????0478						
????0479						
????0480						
????0481						
????0482						
????0483						
????0484						
????0485						
????0486						
????0487						
????0488						
????0489						
????0490						
????0491						
????0492						
????0493						
????0494						
????0495						
????0496						
????0497						
????0498						
????0499						
????0500						
????0501						
????0502						
????0503						
????0504						
????0505						
????0506						
????0507						

No.	Spindle 10K	Spindle 10K (High torque)	Spindle 16K	X-axis	Y-axis	Z-axis
????0508						
????0509						
????0510						
????0511						
????0512						
????0513						
????0514						
????0515						
????0516						
????0517						
????0518						
????0519						
????0520						
????0521						
????0522						
????0523						
????0524						
????0525						
????0526						
????0527						
????0528						
????0529						
????0530						
????0531						
????0532						
????0533						
????0534						
????0535						
????0536						
????0537						
????0538						
????0539						
????0540						
????0541						
????0542						
????0543						
????0544						
????0545						
????0546						
????0547						
????0548						
????0549						
????0550						
????0551						
????0552						
????0553						
????0554						
????0555						
????0556						
????0557						
????0558						
????0559						
????0560						
????0561						
????0562						
????0563						
????0564						
????0565						

## Chapter 7 Machine Parameter

No.	Spindle 10K	Spindle 10K (High torque)	Spindle 16K	X-axis	Y-axis	Z-axis
????0566						
????0567						
????0568						
????0569						
????0570						
????0571						
????0572						
????0573						
????0574						
????0575						
????0576						
????0577						
????0578						
????0579						
????0580						
????0581						
????0582						
????0583						
????0584						
????0585						
????0586	0	0	0	0	0	0
????0587				240000	320000	240000
????0588	0	0	0	0	0	0
????0589						
????0590						
????0591						
????0592	0	0	0	0	0	0
????0593	0	0	0	1000000	1000000	1000000
????0594	0	0	0	0	0	0
????0595	0	0	0	1	1	1
????0596						
????0597	500000	500000	600000	0	0	0
????0598	250	250	250	0	0	0
????0599	0	0	0	0	0	0
????0600	0	0	0	0	0	0

7

### Servo controller(4-axis~8-axis)

Servo parameter number: 4-axis15040000's, 5-axis15050000's, 6-axis15060000's,  
7-axis15070000's, 8-axis15080000's

No.	4-axis	5-axis	6-axis	7-axis	8-axis
????0001	40	40	40	40	40
????0002	40	40	40	40	40
????0003	40	40	40	40	40
????0004	40	40	40	40	40
????0005		30	30	30	30
????0006		30	30	30	30
????0007		40	40	40	40
????0008					
????0009					
????0010					
????0011	100	100	100	100	100
????0012	100	100	100	100	100
????0013	100	100	100	100	100
????0014	100	100	100	100	100
????0015		50	50	50	50
????0016		50	50	50	50
????0017		100	100	100	100
????0018					

No.	4-axis	5-axis	6-axis	7-axis	8-axis
????0019					
????0020					
????0021	200	200	200	200	200
????0022	200	200	200	200	200
????0023	200	200	200	200	200
????0024	200	200	200	200	200
????0025		200	200	200	200
????0026		200	200	200	200
????0027		200	200	200	200
????0028		200	200	200	200
????0029					
????0030					
????0031	50	50	50	50	50
????0032	100	100	100	100	100
????0033					
????0034					
????0035					
????0036					
????0037					
????0038					
????0039					
????0040					
????0041	5000	5000	5000	5000	5000
????0042	5000	5000	5000	5000	5000
????0043	5000	5000	5000	5000	5000
????0044		5000	5000	5000	5000
????0045					
????0046					
????0047					
????0048					
????0049					
????0050					
????0051					
????0052					
????0053					
????0054					
????0055					
????0056					
????0057					
????0058					
????0059					
????0060					
????0061					
????0062					
????0063					
????0064					
????0065					
????0066					
????0067					
????0068					
????0069					
????0070					
????0071					
????0072					
????0073					
????0074					
????0075					
????0076					
????0077					

## Chapter 7 Machine Parameter

No.	4-axis	5-axis	6-axis	7-axis	8-axis
????0078					
????0079					
????0080					
????0081					
????0082					
????0083					
????0084					
????0085					
????0086					
????0087					
????0088					
????0089					
????0090					
????0091					
????0092					
????0093					
????0094					
????0095					
????0096					
????0097					
????0098					
????0099					
????0100					
????0101	9	9	9	9	9
????0102	2	2	2	2	2
????0103	0	0	0	0	0
????0104	5	5	5	5	5
????0105					
????0106					
????0107					
????0108					
????0109					
????0110					
????0111	5	5	5	5	5
????0112	0	0	0	0	0
????0113	4000	4000	4000	4000	4000
????0114	0	0	0	0	0
????0115	0	0	0	0	0
????0116	0	0	0	0	0
????0117	1500	1500	1500	1500	1500
????0118	600	600	600	600	600
????0119	5000	5000	5000	5000	5000
????0120	4000	4000	4000	4000	4000
????0121	4000	4000	4000	4000	4000
????0122	4000	4000	4000	4000	4000
????0123	4000	4000	4000	4000	4000
????0124	4000	4000	4000	4000	4000
????0125	4000	4000	4000	4000	4000
????0126	4000	4000	4000	4000	4000
????0127	0	0	0	0	0
????0128	4000	4000	4000	4000	4000
????0129	4000	4000	4000	4000	4000
????0130	100	100	100	100	100
????0131	300	300	300	300	300
????0132	50	50	50	50	50
????0133	30	30	30	30	30
????0134	4000	4000	4000	4000	4000
????0135	800	800	800	800	800
????0136	800	800	800	800	800

No.	4-axis	5-axis	6-axis	7-axis	8-axis
????0137	3000	3000	3000	3000	3000
????0138	500	500	500	500	500
????0139	50	50	50	50	50
????0140	50	50	50	50	50
????0141	1000	1000	1000	1000	1000
????0142	5	5	5	5	5
????0143	2	2	2	2	2
????0144	0	0	0	0	0
????0145	0	0	0	0	0
????0146	0	0	0	0	0
????0147	1000	1000	1000	1000	1000
????0148	400	250	250	250	250
????0149	2147483647	2147483647	2147483647	2147483647	2147483647
????0150	90	90	90	90	90
????0151	150	150	150	150	150
????0152	2	2	2	2	2
????0153	0	0	0	0	0
????0154	0	0	0	0	0
????0155	0	0	0	0	0
????0156	0	0	0	0	0
????0157	0	0	0	0	0
????0158	0	0	0	0	0
????0159	0	0	0	0	0
????0160	0	0	0	0	0
????0161	0	0	0	0	0
????0162	20	20	20	20	20
????0163	0	0	0	0	0
????0164	500	500	500	500	500
????0165	0	0	0	0	0
????0166	4000	4000	4000	4000	4000
????0167	4000	4000	4000	4000	4000
????0168	0	0	0	0	0
????0169	50	50	50	50	50
????0170	64	64	64	64	64
????0171	0	0	0	0	0
????0172	0	0	0	0	0
????0173	0	0	0	0	0
????0174	1	1	1	1	1
????0175	2000	2000	2000	2000	2000
????0176	90	90	90	90	90
????0177	80	80	80	80	80
????0178	30	30	30	30	30
????0179	500	500	500	500	500
????0180	200	200	200	200	200
????0181	8670	8670	8670	8670	8670
????0182	10110	10110	10110	10110	10110
????0183	11000	11000	11000	11000	11000
????0184	13500	13500	13500	13500	13500
????0185	11500	11500	11500	11500	11500
????0186	14500	14500	14500	14500	14500
????0187	20	20	20	20	20
????0188	90	90	90	90	90
????0189	120	120	120	120	120
????0190	200	200	200	200	200
????0191	200	200	200	200	200
????0192	4000	4000	4000	4000	4000
????0193	0	0	0	0	0
????0194	9	9	9	9	9
????0195	0	0	0	0	0

## Chapter 7 Machine Parameter

No.	4-axis	5-axis	6-axis	7-axis	8-axis
????0196					
????0197					
????0198	4000	4000	4000	4000	4000
????0199	0	0	0	0	0
????0200	4000	4000	4000	4000	4000
????0201	0	0	0	0	0
????0202	0	0	0	0	0
????0203	0	0	0	0	0
????0204	0	0	0	0	0
????0205	0	0	0	0	0
????0206	0	0	0	0	0
????0207	0	0	0	0	0
????0208					
????0209					
????0210		0			
????0211	0	0	0	0	0
????0212	0	0	0	0	0
????0213	1	1	1	1	1
????0214	0	0	0	0	0
????0215	0	0	0	0	0
????0216	1	1	1	1	1
????0217	0	0	0	0	0
????0218	1	1	1	1	1
????0219	0	0	0	0	0
????0220	2	2	2	2	2
????0221	0	0	0	0	0
????0222	0	0	0	0	0
????0223	1	1	1	1	1
????0224	1	1	1	1	1
????0225	0	0	0	0	0
????0226	0	0	0	0	0
????0227	32768	32768	32768	32768	32768
????0228	32768	32768	32768	32768	32768
????0229	32768	32768	32768	32768	32768
????0230	17037	17037	17037	17037	17037
????0231	7	7	7	7	7
????0232	3	3	3	3	3
????0233	-4	-4	-4	-4	-4
????0234	-1	-1	-1	-1	-1
????0235	5000000	5000000	5000000	5000000	5000000
????0236	20	20	20	20	20
????0237	50	50	50	50	50
????0238	50	50	50	50	50
????0239	0	0	0	0	0
????0240	224	224	224	224	224
????0241	-1	-1	-1	-1	-1
????0242	-1	-1	-1	-1	-1
????0243	-1	-1	-1	-1	-1
????0244	5000	5000	5000	5000	5000
????0245	5000	5000	5000	5000	5000
????0246	0	0	0	0	0
????0247	0	0	0	0	0
????0248					
????0249					
????0250					
????0251					
????0252					
????0253					
????0254					

No.	4-axis	5-axis	6-axis	7-axis	8-axis
????0255					
????0256					
????0257					
????0258					
????0259					
????0260					
????0261					
????0262					
????0263					
????0264					
????0265					
????0266					
????0267					
????0268					
????0269					
????0270					
????0271					
????0272					
????0273					
????0274					
????0275					
????0276					
????0277					
????0278					
????0279					
????0280					
????0281					
????0282					
????0283					
????0284					
????0285					
????0286					
????0287					
????0288					
????0289					
????0290					
????0291					
????0292					
????0293					
????0294					
????0295					
????0296					
????0297					
????0298					
????0299					
????0300					
????0301					
????0302					
????0303					
????0304					
????0305					
????0306					
????0307					
????0308					
????0309					
????0310					
????0311					
????0312					
????0313					

## Chapter 7 Machine Parameter

No.	4-axis	5-axis	6-axis	7-axis	8-axis
????0314					
????0315					
????0316					
????0317					
????0318					
????0319					
????0320					
????0321	0	0	0	0	0
????0322	0	0	0	0	0
????0323	0	0	0	0	0
????0324	0	0	0	0	0
????0325	0	0	0	0	0
????0326	0	0	0	0	0
????0327	0	0	0	0	0
????0328	0	0	0	0	0
????0329	0	0	0	0	0
????0330	0	0	0	0	0
????0331	0	0	0	0	0
????0332	0	0	0	0	0
????0333					
????0334					
????0335					
????0336					
????0337					
????0338					
????0339					
????0340					
????0341	0	0	0	0	0
????0342	0	0	0	0	0
????0343	0	0	0	0	0
????0344	0	0	0	0	0
????0345	0	0	0	0	0
????0346	0	0	0	0	0
????0347	0	0	0	0	0
????0348					
????0349					
????0350					
????0351	0	0	0	0	0
????0352	0	0	0	0	0
????0353	0	0	0	0	0
????0354	0	0	0	0	0
????0355	0	0	0	0	0
????0356	0	0	0	0	0
????0357	0	0	0	0	0
????0358					
????0359					
????0360					
????0361	0	0	0	0	0
????0362	0	0	0	0	0
????0363	0	0	0	0	0
????0364	0	0	0	0	0
????0365	0	0	0	0	0
????0366	0	0	0	0	0
????0367	0	0	0	0	0
????0368	0	0	0	0	0
????0369	0	0	0	0	0
????0370	0	0	0	0	0
????0371	0	0	0	0	0
????0372	0	0	0	0	0

No.	4-axis	5-axis	6-axis	7-axis	8-axis
????0373	0	0	0	0	0
????0374	0	0	0	0	0
????0375	0	0	0	0	0
????0376	0	0	0	0	0
????0377	0	0	0	0	0
????0378					
????0379					
????0380					
????0381					
????0382					
????0383					
????0384					
????0385					
????0386					
????0387					
????0388					
????0389					
????0390					
????0391					
????0392					
????0393					
????0394					
????0395					
????0396					
????0397					
????0398					
????0399					
????0400					
????0401	0	0	0	0	0
????0402	0	0	0	0	0
????0403	0	0	0	0	0
????0404	0	0	0	0	0
????0405	0	0	0	0	0
????0406					
????0407					
????0408					
????0409					
????0410					
????0411					
????0412					
????0413					
????0414					
????0415					
????0416					
????0417					
????0418					
????0419					
????0420					
????0421					
????0422					
????0423					
????0424					
????0425					
????0426					
????0427					
????0428					
????0429					
????0430					
????0431					

## Chapter 7 Machine Parameter

No.	4-axis	5-axis	6-axis	7-axis	8-axis
????0432					
????0433					
????0434					
????0435					
????0436					
????0437					
????0438					
????0439					
????0440					
????0441	0	0	0	0	0
????0442	0	0	0	0	0
????0443	0	0	0	0	0
????0444	0	0	0	0	0
????0445	0	0	0	0	0
????0446					
????0447					
????0448					
????0449					
????0450					
????0451					
????0452					
????0453					
????0454					
????0455					
????0456					
????0457					
????0458					
????0459					
????0460					
????0461					
????0462					
????0463					
????0464					
????0465					
????0466					
????0467					
????0468					
????0469					
????0470					
????0471					
????0472					
????0473					
????0474					
????0475					
????0476					
????0477					
????0478					
????0479					
????0480					
????0481					
????0482					
????0483					
????0484					
????0485					
????0486					
????0487					
????0488					
????0489					
????0490					

No.	4-axis	5-axis	6-axis	7-axis	8-axis
????0491					
????0492					
????0493					
????0494					
????0495					
????0496					
????0497					
????0498					
????0499					
????0500					
????0501					
????0502					
????0503					
????0504					
????0505					
????0506					
????0507					
????0508					
????0509					
????0510					
????0511					
????0512					
????0513					
????0514					
????0515					
????0516					
????0517					
????0518					
????0519					
????0520					
????0521					
????0522					
????0523					
????0524					
????0525					
????0526					
????0527					
????0528					
????0529					
????0530					
????0531					
????0532					
????0533					
????0534					
????0535					
????0536					
????0537					
????0538					
????0539					
????0540					
????0541					
????0542					
????0543					
????0544					
????0545					
????0546					
????0547					
????0548					
????0549					

## Chapter 7 Machine Parameter

No.	4-axis	5-axis	6-axis	7-axis	8-axis
????0550					
????0551					
????0552					
????0553					
????0554					
????0555					
????0556					
????0557					
????0558					
????0559					
????0560					
????0561					
????0562					
????0563					
????0564					
????0565					
????0566					
????0567					
????0568					
????0569					
????0570					
????0571					
????0572					
????0573					
????0574					
????0575					
????0576					
????0577					
????0578					
????0579					
????0580					
????0581					
????0582					
????0583					
????0584					
????0585					
????0586	0	0	0	0	0
????0587		210000	210000	210000	210000
????0588	0	0	0	0	0
????0589					
????0590					
????0591					
????0592	0	0	0	0	0
????0593	1000000	1000000	1000000	1000000	1000000
????0594	0	0	0	0	0
????0595	0	0	0	0	0
????0596					
????0597	0	0	0	0	0
????0598	0	0	0	0	0
????0599	0	0	0	0	0
????0600	0	0	0	0	0

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### Servo controller(M-axis~P4th-axis)

Servo parameter number: M-axis15090000's, P1st-axis15110000's, P2nd-axis15120000's,  
P3rd-axis15130000's, P4th-axis15140000's

No.	M-axis	P1st-axis	P2nd-axis	P3rd-axis	P4th-axis
????0001	40	40	40	40	40
????0002		40	40	40	40
????0003		40	40	40	40

No.	M-axis	P1st-axis	P2nd-axis	P3rd-axis	P4th-axis
????0004					
????0005					
????0006					
????0007					
????0008					
????0009					
????0010					
????0011	500(14tools) 400(21tools)	50	50	50	200
????0012	500(14tools) 400(21tools)	50	50	50	200
????0013		50	50	50	200
????0014					
????0015					
????0016					
????0017					
????0018					
????0019					
????0020					
????0021	100(14tools) 100(21tools)	200	200	200	100
????0022	100(14tools) 100(21tools)	200	200	200	100
????0023		200	200	200	100
????0024					
????0025					
????0026					
????0027					
????0028					
????0029					
????0030					
????0031	90	50	50	50	50
????0032					
????0033					
????0034					
????0035					
????0036					
????0037					
????0038					
????0039					
????0040					
????0041	5000	5000	5000	5000	2000
????0042	5000	5000	5000	5000	700
????0043					700
????0044					
????0045					
????0046					
????0047					
????0048					
????0049					
????0050					
????0051					
????0052					
????0053					
????0054					
????0055					
????0056					
????0057					
????0058					

## Chapter 7 Machine Parameter

No.	M-axis	P1st-axis	P2nd-axis	P3rd-axis	P4th-axis
????0059					
????0060					
????0061					
????0062					
????0063					
????0064					
????0065					
????0066					
????0067					
????0068					
????0069					
????0070					
????0071					
????0072					
????0073					
????0074					
????0075					
????0076					
????0077					
????0078					
????0079					
????0080					
????0081					
????0082					
????0083					
????0084					
????0085					
????0086					
????0087					
????0088					
????0089					
????0090					
????0091					
????0092					
????0093					
????0094					
????0095					
????0096					
????0097					
????0098					
????0099					
????0100					
????0101	9	9	9	9	9
????0102	2	2	2	2	2
????0103	0	0	0	0	0
????0104	5	5	5	5	5
????0105					
????0106					
????0107					
????0108					
????0109					
????0110					
????0111	10	20	20	20	20
????0112	0	0	0	0	0
????0113	4000	4000	4000	4000	4000
????0114	100(14tools) 100(21tools)	0	0	0	100
????0115	0	0	0	0	0
????0116	0	0	0	0	0

No.	M-axis	P1st-axis	P2nd-axis	P3rd-axis	P4th-axis
????0117	500	1500	1500	1500	1500
????0118	1600	600	600	600	1600
????0119	5000	5000	5000	5000	5000
????0120	4000	4000	4000	4000	4000
????0121	4000	4000	4000	4000	4000
????0122	4000	4000	4000	4000	4000
????0123	4000	4000	4000	4000	4000
????0124	4000	4000	4000	4000	4000
????0125	4000	4000	4000	4000	4000
????0126	4000	4000	4000	4000	4000
????0127	0	0	0	0	0
????0128	4000	4000	4000	4000	4000
????0129	4000	4000	4000	4000	4000
????0130	100	100	100	100	100
????0131	300	300	300	300	300
????0132	50	50	50	50	50
????0133	30	30	30	30	30
????0134	4000	4000	4000	4000	4000
????0135	800	800	800	800	800
????0136	800	800	800	800	800
????0137	2000	3000	3000	3000	3000
????0138	4000	500	500	500	500
????0139	50	50	50	50	50
????0140	50	50	50	50	50
????0141	1000	1000	1000	1000	1000
????0142	4	5	5	5	5
????0143	2	2	2	2	2
????0144	0	0	0	0	0
????0145	300	0	0	0	0
????0146	25	0	0	0	0
????0147	500	1000	1000	1000	1000
????0148	400	250	250	250	400
????0149	2147483647	2147483647	2147483647	2147483647	2147483647
????0150	90	90	90	90	90
????0151	150	150	150	150	150
????0152	2	2	2	2	2
????0153	0	0	0	0	0
????0154	0	0	0	0	0
????0155	0	0	0	0	0
????0156	0	0	0	0	0
????0157	0	0	0	0	0
????0158	0	0	0	0	0
????0159	0	0	0	0	0
????0160	0	0	0	0	0
????0161	0	1	1	1	0
????0162	20	20	20	20	20
????0163	0	0	0	0	0
????0164	500	500	500	500	500
????0165	0	0	0	0	0
????0166	4000	4000	4000	4000	4000
????0167	4000	4000	4000	4000	4000
????0168	0	0	0	0	0
????0169	50	50	50	50	50
????0170	64	64	64	64	64
????0171	0	0	0	0	0
????0172	0	0	0	0	0
????0173	0				0
????0174	1				1
????0175	2000				2000

## Chapter 7 Machine Parameter

No.	M-axis	P1st-axis	P2nd-axis	P3rd-axis	P4th-axis
????0176	90				90
????0177	80				80
????0178	30				30
????0179	500				500
????0180	200				200
????0181	8670	8670	8670	8670	8670
????0182	10110	10110	10110	10110	10110
????0183	11000	11000	11000	11000	11000
????0184	13500	13500	13500	13500	13500
????0185	11500	11500	11500	11500	11500
????0186	14500	14500	14500	14500	14500
????0187	20				20
????0188	90				90
????0189	120				120
????0190	200				200
????0191	200				200
????0192	4000	4000	4000	4000	4000
????0193	0	0	0	0	0
????0194	9	9	9	9	9
????0195	0	0	0	0	0
????0196					
????0197					
????0198	4000				10
????0199	0				0
????0200	4000				4000
????0201	0				0
????0202	0				0
????0203	0				0
????0204	0				0
????0205	0				0
????0206	0				0
????0207	0				0
????0208	0(14tools) 3(21tools)	0	0	0	0
????0209					
????0210	0				0
????0211	0	0	0	0	0
????0212	0	0	0	0	0
????0213	1	1	1	1	1
????0214	0	0	0	0	0
????0215	0	0	0	0	0
????0216	1	1	1	1	1
????0217	0	0	0	0	0
????0218	1	1	1	1	1
????0219	0	0	0	0	0
????0220	2	2	2	2	2
????0221	0	0	0	0	0
????0222	0	0	0	0	0
????0223	1	1	1	1	1
????0224	1	1	1	1	1
????0225	1	0	0	0	0
????0226	2	0	0	0	0
????0227	32768	32768	32768	32768	32768
????0228	32768	32768	32768	32768	32768
????0229	32768	32768	32768	32768	32768
????0230	17037	17037	17037	17037	17037
????0231	7	7	7	7	7
????0232	2	3	3	3	2
????0233	-4	0	0	0	-4

## Chapter 7 Machine Parameter

No.	M-axis	P1st-axis	P2nd-axis	P3rd-axis	P4th-axis
????0234	-1	0	0	0	-1
????0235	20480000	5000000	5000000	5000000	6408712
????0236	128000	20	20	20	20
????0237	50	50	50	50	50
????0238	50	50	50	50	50
????0239	0	0	0	0	0
????0240	224	224	224	224	224
????0241	163840000(14tools) 95169669(21tools)	0	0	0	117505460
????0242	163840000(14tools) 95169669(21tools)	0	0	0	117505460
????0243	163840000(14tools) 95169669(21tools)	0	0	0	117505460
????0244	5000	5000	5000	5000	5000
????0245	5000	5000	5000	5000	5000
????0246	0	0	0	0	0
????0247	0	0	0	0	0
????0248					
????0249					
????0250					
????0251					
????0252					
????0253					
????0254					
????0255					
????0256					
????0257					
????0258					
????0259					
????0260					
????0261					
????0262					
????0263					
????0264					
????0265					
????0266					
????0267					
????0268					
????0269					
????0270					
????0271					
????0272					
????0273					
????0274					
????0275					
????0276					
????0277					
????0278					
????0279					
????0280					
????0281					
????0282					
????0283					
????0284					
????0285					
????0286					
????0287					
????0288					
????0289					

## Chapter 7 Machine Parameter

No.	M-axis	P1st-axis	P2nd-axis	P3rd-axis	P4th-axis
????0290					
????0291					
????0292					
????0293					
????0294					
????0295					
????0296					
????0297					
????0298					
????0299					
????0300					
????0301					
????0302					
????0303					
????0304					
????0305					
????0306					
????0307					
????0308					
????0309					
????0310					
????0311					
????0312					
????0313					
????0314					
????0315					
????0316					
????0317					
????0318					
????0319					
????0320					
????0321	0	0	0	0	0
????0322	0	0	0	0	0
????0323	0	0	0	0	0
????0324	0	0	0	0	0
????0325	0	0	0	0	0
????0326	0	0	0	0	0
????0327	0	0	0	0	0
????0328	0	0	0	0	0
????0329	0	0	0	0	0
????0330					
????0331					
????0332					
????0333					
????0334					
????0335					
????0336					
????0337					
????0338					
????0339					
????0340					
????0341					
????0342					
????0343					
????0344					
????0345					
????0346					
????0347					
????0348					

No.	M-axis	P1st-axis	P2nd-axis	P3rd-axis	P4th-axis
????0349					
????0350					
????0351					
????0352					
????0353					
????0354					
????0355					
????0356					
????0357					
????0358					
????0359					
????0360					
????0361	0	0	0	0	0
????0362	0	0	0	0	0
????0363	0	0	0	0	0
????0364	0	0	0	0	0
????0365	0	0	0	0	0
????0366	0	0	0	0	0
????0367	0	0	0	0	0
????0368	0	0	0	0	0
????0369	0	0	0	0	0
????0370	0	0	0	0	0
????0371	0	0	0	0	0
????0372	0	0	0	0	0
????0373	0	0	0	0	0
????0374	0	0	0	0	0
????0375	0	0	0	0	0
????0376	0	0	0	0	0
????0377	0	0	0	0	0
????0378					
????0379					
????0380					
????0381					
????0382					
????0383					
????0384					
????0385					
????0386					
????0387					
????0388					
????0389					
????0390					
????0391					
????0392					
????0393					
????0394					
????0395					
????0396					
????0397					
????0398					
????0399					
????0400					
????0401	0	0	0	0	0
????0402	0	0	0	0	0
????0403	0	0	0	0	0
????0404	0	0	0	0	0
????0405	0	0	0	0	0
????0406					
????0407					

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No.	M-axis	P1st-axis	P2nd-axis	P3rd-axis	P4th-axis
????0408					
????0409					
????0410					
????0411					
????0412					
????0413					
????0414					
????0415					
????0416					
????0417					
????0418					
????0419					
????0420					
????0421					
????0422					
????0423					
????0424					
????0425					
????0426					
????0427					
????0428					
????0429					
????0430					
????0431					
????0432					
????0433					
????0434					
????0435					
????0436					
????0437					
????0438					
????0439					
????0440					
????0441	0	0	0	0	
????0442	0	0	0	0	
????0443	0	0	0	0	
????0444	0	0	0	0	
????0445	0	0	0	0	
????0446	0	0	0	0	
????0447					
????0448					
????0449					
????0450					
????0451					
????0452					
????0453					
????0454					
????0455					
????0456					
????0457					
????0458					
????0459					
????0460					
????0461					
????0462					
????0463					
????0464					
????0465					
????0466					

No.	M-axis	P1st-axis	P2nd-axis	P3rd-axis	P4th-axis
????0467					
????0468					
????0469					
????0470					
????0471					
????0472					
????0473					
????0474					
????0475					
????0476					
????0477					
????0478					
????0479					
????0480					
????0481					
????0482					
????0483					
????0484					
????0485					
????0486					
????0487					
????0488					
????0489					
????0490					
????0491					
????0492					
????0493					
????0494					
????0495					
????0496					
????0497					
????0498					
????0499					
????0500					
????0501					
????0502					
????0503					
????0504					
????0505					
????0506					
????0507					
????0508					
????0509					
????0510					
????0511					
????0512					
????0513					
????0514					
????0515					
????0516					
????0517					
????0518					
????0519					
????0520					
????0521					
????0522					
????0523					
????0524					
????0525					

## Chapter 7 Machine Parameter

No.	M-axis	P1st-axis	P2nd-axis	P3rd-axis	P4th-axis
????0526					
????0527					
????0528					
????0529					
????0530					
????0531					
????0532					
????0533					
????0534					
????0535					
????0536					
????0537					
????0538					
????0539					
????0540					
????0541					
????0542					
????0543					
????0544					
????0545					
????0546					
????0547					
????0548					
????0549					
????0550					
????0551					
????0552					
????0553					
????0554					
????0555					
????0556					
????0557					
????0558					
????0559					
????0560					
????0561					
????0562					
????0563					
????0564					
????0565					
????0566					
????0567					
????0568					
????0569					
????0570					
????0571					
????0572					
????0573					
????0574					
????0575					
????0576					
????0577					
????0578					
????0579					
????0580					
????0581					
????0582					
????0583					
????0584					

No.	M-axis	P1st-axis	P2nd-axis	P3rd-axis	P4th-axis
????0585					
????0586	0	0	0	0	0
????0587	192000	190000	190000	190000	480000
????0588	0	0	0	0	0
????0589					
????0590					
????0591					
????0592	0	0	0	0	0
????0593	1000000	1000000	1000000	1000000	1000000
????0594	0	0	0	0	0
????0595	0	0	0	0	0
????0596					
????0597	0	0	0	0	0
????0598	0	0	0	0	0
????0599	0	0	0	0	0
????0600	0	0	0	0	0

**Auto. thermal distortion comp.(Spindle)**

Servo parameter number: Spindle16000000's

No.	Item	Spindle 10K	Spindle 10K (High torque)	Spindle 16K
????0001	Spindle max. displacement const. 1(Z-ax)	0.0012	0.0022	0.0015
????0002	Spindle max. displacement const. 2(Z-ax)	0.0	0.0	0.0
????0003	Spindle expansion displacement const. 3(Z-ax)	2.34	1.16	1.6
????0004	Spindle contraction displacement const. 3(Z-ax)	2.34	1.16	1.6
????0005	Spindle max. displacement const. 1(X-ax)	0.0	0.0	0.0
????0006	Spindle max. displacement const. 2(X-ax)	0.0	0.0	0.0
????0007	Spindle expansion displacement const. 3(X-ax)	0.01	0.01	0.01
????0008	Spindle contraction displacement const. 3(X-ax)	0.01	0.01	0.01
????0009	Spindle max. displacement const. 1(Y-ax)	0.003	0.0031	0.0027
????0010	Spindle max. displacement const. 2(Y-ax)	0.0	0.0	0.0
????0011	Spindle expansion displacement const. 3(Y-ax)	0.44	0.32	0.43
????0012	Spindle contraction displacement const. 3(Y-ax)	0.44	0.32	0.43
????0013	Lathe spindle max. displacement const. 1(Z-ax)	0.0	0.0	0.0
????0014	Lathe spindle max. displacement const. 2(Z-ax)	0.0	0.0	0.0
????0015	Lathe spindle expansion displacement const. 3(Z-ax)	0.01	0.01	0.01
????0016	Lathe spindle contraction displacement const. 3(Z-ax)	0.01	0.01	0.01
????0017	Lathe spindle max. displacement const. 1(X-ax)	0.0	0.0	0.0
????0018	Lathe spindle max. displacement const. 2(X-ax)	0.0	0.0	0.0
????0019	Lathe spindle expansion displacement const. 3(X-ax)	0.01	0.01	0.01
????0020	Lathe spindle contraction displacement const. 3(X-ax)	0.01	0.01	0.01
????0021	Lathe spindle max. displacement const. 1(Y-ax)	0.0	0.0	0.0
????0022	Lathe spindle max. displacement const. 2(Y-ax)	0.0	0.0	0.0
????0023	Lathe spindle expansion displacement const. 3(Y-ax)	0.01	0.01	0.01
????0024	Lathe spindle contraction displacement const. 3(Y-ax)	0.01	0.01	0.01

**Therm. distortion comp. (XYZ axes)**

Servo parameter number: X-axis16010000's, Y-axis16020000's, Z-axis16030000's

No.	Item	X-axis	Y-axis	Z-axis
????0001	Thermal distortion compensation coefficient A1	1.0	1.0	1.0
????0002	Thermal distortion compensation coefficient A2	1.0	1.0	1.0
????0003	Thermal distortion compensation coefficient A3	1.0	1.0	1.0
????0004	Thermal distortion compensation coefficient B	1.0	1.0	1.0
????0005	Thermal distortion compensation coefficient E	1.0	1.0	1.0
????0006	Thermal distortion compensation coefficient 1	1.0	1.0	1.0
????0007	Thermal distortion compensation coefficient 2	1.0	1.0	1.0
????0008	Thermal distortion compensation coefficient 3	1.0	1.0	1.0
????0009	Thermal distortion compensation coefficient 4	1.0	1.0	1.0
????0010	Thermal distortion constant A1	0.019324	0.008372	0.014595
????0011	Thermal distortion constant A2	0.016582	0.013608	0.003656

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No.	Item	X-axis	Y-axis	Z-axis
????0012	Thermal distortion constant A3	77.7481	70.9901	78.0239
????0013	Thermal distortion constant A4	1.0	1.0	1.0
????0014	Thermal distortion constant B	0.82	1.0	1.04
????0015	Thermal distortion constant C1	0	0	0
????0016	Thermal distortion constant C2	50	50	50
????0017	Thermal distortion constant C3	10000	10000	10000
????0018	Thermal distortion constant C4	15000	15000	15000
????0019	Thermal distortion constant C5	20000	20000	20000
????0020	Thermal distortion constant C6	25000	25000	25000
????0021	Thermal distortion constant C7	30000	30000	30000
????0022	Thermal distortion constant C8	35000	35000	35000
????0023	Thermal distortion constant C9	40000	40000	40000
????0024	Thermal distortion constant C10	50000	50000	50000
????0025	Thermal distortion constant D1	0.0011954	0.0005977	0.0011954
????0026	Thermal distortion constant D2	0.0008997	0.0012853	0.0012853
????0027	Thermal distortion constant D3	0.0008997	0.0012853	0.0012853
????0028	Thermal distortion constant D4	0.0008997	0.0012853	0.0012853
????0029	Thermal distortion constant D5	0.0008997	0.0012853	0.0012853
????0030	Thermal distortion constant D6	0.0008997	0.0012853	0.0012853
????0031	Thermal distortion constant D7	0.0008997	0.0012853	0.0012853
????0032	Thermal distortion constant D8	0.0008997	0.0012853	0.0012853
????0033	Thermal distortion constant D9	0.0008997	0.0012853	0.0012853
????0034	Thermal distortion constant D10	0.0008997	0.0012853	0.0012853
????0035	Thermal distortion constant E	0.11	0.13	0.12
????0036	Thermal distortion constant F1	0.0	0.0	0.0
????0037	Thermal distortion constant F2	0.0	0.238802	0.0
????0038	Thermal distortion constant F3	0.0	0.056345	0.0
????0039	Thermal distortion constant F4	0.0	-1.0	0.0

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### High accuracy (Common)

No.	Item	10K	10K(High torque)	16K
17000001	No. of look-ahead blocks B	1000		
17000002	Speed clamp time A	0.0		
17000003	Speed clamp time B	0.5		
17000004	Smooth path offset constant A	1		
17000005	Smooth path offset constant B	1		
17000006	Smooth path offset multiplying factor	3		
17000007	Minute block path approximate system	0		
17000008	Small block deletion limit number B	7		
17000009	High accuracy B additional axes	0		
17000010	Basic setting function	1		
17000011	No. of look ahead blocks for accuracy specification	50		
17000012	Sampling time for accuracy specification	1.0		
17000013	Tolerance for accuracy specification	0.001		
17000014	Maximum repeat calculation for accuracy specification	10		
17000015	Maximum speed divisions for accuracy specification	10		
17000016	High accuracy B deceleration time	269.0		
17000017	High accuracy B additional axis deceleration time			

**High accuracy (XYZ axes)**

Servo parameter number: X-axis17010000's, Y-axis17020000's, Z-axis17030000's

No.	Item	X-axis	Y-axis	Z-axis
????0001	Current check time	0.0	0.0	0.0
????0002	Current tolerance	0	0	0
????0003	Max. feedrate A	20000.0		
????0004	Reference feedrate A	10000.0		
????0005	Corner dec. time A	0.0		
????0006	Corner dec. speed gap A	200.0		
????0007	Corner acc. tolerance A	0.007		
????0008	Min. arc speed A	200.0		
????0009	Minimum involute interpolation speed A	200.0		
????0010	Arc acc. tolerance A	0.049		
????0011	Arc approx. acc. tolerance A	0.049		
????0012	Involute interpolation acceleration A	0.049		
????0013	High accuracy A cutting feed time const. 1(Group 1)	92.0		
????0014	High accuracy A cutting feed time const. 2(Group 1)	35.0		
????0015	High accuracy A cutting feed time const. 3(Group 1)	29.0		
????0016	High accuracy A cutting feed time const. 1(Group 2)	121.0		
????0017	High accuracy A cutting feed time const. 2(Group 2)	35.0		
????0018	High accuracy A cutting feed time const. 3(Group 2)	35.0		
????0019	High accuracy A cutting feed time const. 1(Group 3)	121.0		
????0020	High accuracy A cutting feed time const. 2(Group 3)	35.0		
????0021	High accuracy A cutting feed time const. 3(Group 3)	18.0		
????0022	Max. feedrate B	30000.0	30000.0	30000.0
????0023	Upper limit for corner acceleration B	0.826	0.826	0.826
????0024	Speed difference B(min.)	200.0	200.0	200.0
????0025	Speed difference B(max.)	200.0	200.0	200.0
????0026	Speed difference command speed B(min.)	0.0	0.0	0.0
????0027	Speed difference command speed B(max.)	30000.0	30000.0	30000.0
????0028	Speed to control acceleration/deceleration B	1.836	1.836	1.836
????0029	Acceleration change time B	80.0		
????0030	Min. arc speed B	200.0		
????0031	Minimum involute interpolation speed B	200.0		
????0032	Arc acc. tolerance B	0.198		
????0033	Arc approx. acc. tolerance B	0.198		
????0034	Involute interpolation acceleration B	0.198		
????0035	Acceleration constant B1	0.991	0.688	8.68
????0036	Acceleration constant B2	0.0	0.0	0.0
????0037	High accuracy B cutting feed time const. 1	35.0		
????0038	High accuracy B cutting feed time const. 2	0.0		
????0039	High accuracy B cutting feed time const. 3	0.0		

**High accuracy (additional axis)**Servo parameter number: 5-axis17050000's, 6-axis17060000's, 7-axis17070000's,  
8-axis17080000's

No.	Item	5-axis	6-axis	7-axis	8-axis
????0001	Current check time	0.0	0.0	0.0	0.0
????0002	Current tolerance	0	0	0	0
????0003	Max. feedrate B	33.3	33.3	33.3	33.3
????0004	Speed to control acceleration/deceleration B	7293.0	7293.0	7293.0	7293.0
????0005	Upper limit for corner acceleration B	30.0	30.0	30.0	30.0
????0006	Speed difference B(min.)	0.1	0.1	0.1	0.1
????0007	Speed difference B(max.)	0.1	0.1	0.1	0.1
????0008	Speed difference command speed B(min.)	0.0	0.0	0.0	0.0
????0009	Speed difference command speed B(max.)	33.3	33.3	33.3	33.3

**High accuracy (Machining mode(Standard))**

No.	Item	10K	10K(High torque)	16K
17510001	High accuracy mode selection		1	
17510002	Cutting feed time constant selection A		0	
17510003	Smooth override type B		0	
17510004	Adjust. A for cutting feed time constant 3(Value)	0.0		
17510005	Adjust. A for cutting feed time constant 3(Variation (Accuracy+))	0.0		
17510006	Adjust. A for cutting feed time constant 3(Variation (Accuracy-))	0.0		
17510007	Adjust. A for cutting feed time constant 3(Variation (smoothness+))	0.0		
17510008	Adjust. A for cutting feed time constant 3(Variation (smoothness-))	0.0		
17510009	Corner deceleration override(Value)	290		
17510010	Corner deceleration override(Variation (Accuracy+))	-39		
17510011	Corner deceleration override(Variation (Accuracy-))	0		
17510012	Corner deceleration override(Variation (smoothness+))	-10		
17510013	Corner deceleration override(Variation (smoothness-))	0		
17510014	Arc deceleration override(Value)	500		
17510015	Arc deceleration override(Variation (Accuracy+))	-70		
17510016	Arc deceleration override(Variation (Accuracy-))	-200		
17510017	Arc deceleration override(Variation (smoothness+))	0		
17510018	Arc deceleration override(Variation (smoothness-))	0		
17510019	Curve approximation deceleration override(Value)	500		
17510020	Curve approximation deceleration override(Variation (Accuracy+))	-70		
17510021	Curve approximation deceleration override(Variation (Accuracy-))	-200		
17510022	Curve approximation deceleration override(Variation (smoothness+))	0		
17510023	Curve approximation deceleration override(Variation (smoothness-))	0		
17510024	Accel. override B to control accel./decel.(Value)	170		
17510025	Accel. override B to control accel./decel.(Variation (Accuracy+))	0		
17510026	Accel. override B to control accel./decel.(Variation (Accuracy-))	0		
17510027	Accel. override B to control accel./decel.(Variation (smoothness+))	-23		
17510028	Accel. override B to control accel./decel.(Variation (smoothness-))	-29		
17510029	Override B for acceleration change time(Value)	44		
17510030	Override B for acceleration change time(Variation (Accuracy+))	0		
17510031	Override B for acceleration change time(Variation (Accuracy-))	0		
17510032	Override B for acceleration change time(Variation (smoothness+))	11		
17510033	Override B for acceleration change time(Variation (smoothness-))	0		
17510034	Accel.override B for add. axis accel./decel.(Value)	100		
17510035	Accel.override B for add. axis accel./decel.(Variation (Accuracy+))	0		
17510036	Accel.override B for add. axis accel./decel.(Variation (Accuracy-))	0		
17510037	Accel.override B for add. axis accel./decel.(Variation (smoothness+))	0		
17510038	Accel.override B for add. axis accel./decel.(Variation (smoothness-))	0		
17510039	Smooth path offset level(Value)	1		
17510040	Smooth path offset level(Variation (Accuracy+))	0		
17510041	Smooth path offset level(Variation (Accuracy-))	0		
17510042	Smooth path offset level(Variation (smoothness+))	0		
17510043	Smooth path offset level(Variation (smoothness-))	0		
17510044	Smooth override(Value)	100		
17510045	Smooth override(Variation (Accuracy+))	0		
17510046	Smooth override(Variation (Accuracy-))	0		
17510047	Smooth override(Variation (smoothness+))	40		
17510048	Smooth override(Variation (smoothness-))	0		
17510049	Minute block deletion distance(Value)	0.01		
17510050	Minute block deletion distance(Variation (Accuracy+))	0.0		
17510051	Minute block deletion distance(Variation (Accuracy-))	0.0		
17510052	Minute block deletion distance(Variation (smoothness+))	0.0		
17510053	Minute block deletion distance(Variation (smoothness-))	0.0		

**High accuracy (Machining mode(Rough))**

No.	Item	10K	10K(High torque)	16K
17520001	High accuracy mode selection	0		
17520002	Cutting feed time constant selection A	0		
17520003	Smooth override type B	0		
17520004	Adjust. A for cutting feed time constant 3(Value)	0.0		
17520005	Adjust. A for cutting feed time constant 3(Variation (Accuracy+))	0.0		
17520006	Adjust. A for cutting feed time constant 3(Variation (Accuracy-))	0.0		
17520007	Adjust. A for cutting feed time constant 3(Variation (smoothness+))	0.0		
17520008	Adjust. A for cutting feed time constant 3(Variation (smoothness-))	0.0		
17520009	Corner deceleration override(Value)	820		
17520010	Corner deceleration override(Variation (Accuracy+))	-41		
17520011	Corner deceleration override(Variation (Accuracy-))	-41		
17520012	Corner deceleration override(Variation (smoothness+))	0		
17520013	Corner deceleration override(Variation (smoothness-))	0		
17520014	Arc deceleration override(Value)	3000		
17520015	Arc deceleration override(Variation (Accuracy+))	-150		
17520016	Arc deceleration override(Variation (Accuracy-))	-160		
17520017	Arc deceleration override(Variation (smoothness+))	0		
17520018	Arc deceleration override(Variation (smoothness-))	0		
17520019	Curve approximation deceleration override(Value)	3000		
17520020	Curve approximation deceleration override(Variation (Accuracy+))	-150		
17520021	Curve approximation deceleration override(Variation (Accuracy-))	-160		
17520022	Curve approximation deceleration override(Variation (smoothness+))	0		
17520023	Curve approximation deceleration override(Variation (smoothness-))	0		
17520024	Accel. override B to control accel./decel.(Value)	0		
17520025	Accel. override B to control accel./decel.(Variation (Accuracy+))	0		
17520026	Accel. override B to control accel./decel.(Variation (Accuracy-))	0		
17520027	Accel. override B to control accel./decel.(Variation (smoothness+))	0		
17520028	Accel. override B to control accel./decel.(Variation (smoothness-))	0		
17520029	Override B for acceleration change time(Value)	0		
17520030	Override B for acceleration change time(Variation (Accuracy+))	0		
17520031	Override B for acceleration change time(Variation (Accuracy-))	0		
17520032	Override B for acceleration change time(Variation (smoothness+))	0		
17520033	Override B for acceleration change time(Variation (smoothness-))	0		
17520034	Accel.override B for add. axis accel./decel.(Value)	100		
17520035	Accel.override B for add. axis accel./decel.(Variation (Accuracy+))	0		
17520036	Accel.override B for add. axis accel./decel.(Variation (Accuracy-))	0		
17520037	Accel.override B for add. axis accel./decel.(Variation (smoothness+))	0		
17520038	Accel.override B for add. axis accel./decel.(Variation (smoothness-))	0		
17520039	Smooth path offset level(Value)	1		
17520040	Smooth path offset level(Variation (Accuracy+))	0		
17520041	Smooth path offset level(Variation (Accuracy-))	0		
17520042	Smooth path offset level(Variation (smoothness+))	0		
17520043	Smooth path offset level(Variation (smoothness-))	0		
17520044	Smooth override(Value)	64		
17520045	Smooth override(Variation (Accuracy+))	0		
17520046	Smooth override(Variation (Accuracy-))	0		
17520047	Smooth override(Variation (smoothness+))	8		
17520048	Smooth override(Variation (smoothness-))	0		
17520049	Minute block deletion distance(Value)	0.01		
17520050	Minute block deletion distance(Variation (Accuracy+))	0.0		
17520051	Minute block deletion distance(Variation (Accuracy-))	0.0		
17520052	Minute block deletion distance(Variation (smoothness+))	0.0		
17520053	Minute block deletion distance(Variation (smoothness-))	0.0		

**High accuracy (Machining mode(Medium rough))**

No.	Item	10K	10K(High torque)	16K
17530001	High accuracy mode selection	0		
17530002	Cutting feed time constant selection A	0		
17530003	Smooth override type B	0		
17530004	Adjust. A for cutting feed time constant 3(Value)	0.0		
17530005	Adjust. A for cutting feed time constant 3(Variation (Accuracy+))	0.0		
17530006	Adjust. A for cutting feed time constant 3(Variation (Accuracy-))	0.0		
17530007	Adjust. A for cutting feed time constant 3(Variation (smoothness+))	0.0		
17530008	Adjust. A for cutting feed time constant 3(Variation (smoothness-))	0.0		
17530009	Corner deceleration override(Value)	410		
17530010	Corner deceleration override(Variation (Accuracy+))	-41		
17530011	Corner deceleration override(Variation (Accuracy-))	-41		
17530012	Corner deceleration override(Variation (smoothness+))	0		
17530013	Corner deceleration override(Variation (smoothness-))	0		
17530014	Arc deceleration override(Value)	1500		
17530015	Arc deceleration override(Variation (Accuracy+))	-154		
17530016	Arc deceleration override(Variation (Accuracy-))	-150		
17530017	Arc deceleration override(Variation (smoothness+))	0		
17530018	Arc deceleration override(Variation (smoothness-))	0		
17530019	Curve approximation deceleration override(Value)	1500		
17530020	Curve approximation deceleration override(Variation (Accuracy+))	-154		
17530021	Curve approximation deceleration override(Variation (Accuracy-))	-150		
17530022	Curve approximation deceleration override(Variation (smoothness+))	0		
17530023	Curve approximation deceleration override(Variation (smoothness-))	0		
17530024	Accel. override B to control accel./decel.(Value)	0		
17530025	Accel. override B to control accel./decel.(Variation (Accuracy+))	0		
17530026	Accel. override B to control accel./decel.(Variation (Accuracy-))	0		
17530027	Accel. override B to control accel./decel.(Variation (smoothness+))	0		
17530028	Accel. override B to control accel./decel.(Variation (smoothness-))	0		
17530029	Override B for acceleration change time(Value)	0		
17530030	Override B for acceleration change time(Variation (Accuracy+))	0		
17530031	Override B for acceleration change time(Variation (Accuracy-))	0		
17530032	Override B for acceleration change time(Variation (smoothness+))	0		
17530033	Override B for acceleration change time(Variation (smoothness-))	0		
17530034	Accel.override B for add. axis accel./decel.(Value)	100		
17530035	Accel.override B for add. axis accel./decel.(Variation (Accuracy+))	0		
17530036	Accel.override B for add. axis accel./decel.(Variation (Accuracy-))	0		
17530037	Accel.override B for add. axis accel./decel.(Variation (smoothness+))	0		
17530038	Accel.override B for add. axis accel./decel.(Variation (smoothness-))	0		
17530039	Smooth path offset level(Value)	1		
17530040	Smooth path offset level(Variation (Accuracy+))	0		
17530041	Smooth path offset level(Variation (Accuracy-))	0		
17530042	Smooth path offset level(Variation (smoothness+))	0		
17530043	Smooth path offset level(Variation (smoothness-))	0		
17530044	Smooth override(Value)	64		
17530045	Smooth override(Variation (Accuracy+))	0		
17530046	Smooth override(Variation (Accuracy-))	0		
17530047	Smooth override(Variation (smoothness+))	8		
17530048	Smooth override(Variation (smoothness-))	10		
17530049	Minute block deletion distance(Value)	0.01		
17530050	Minute block deletion distance(Variation (Accuracy+))	0.0		
17530051	Minute block deletion distance(Variation (Accuracy-))	0.0		
17530052	Minute block deletion distance(Variation (smoothness+))	0.0		
17530053	Minute block deletion distance(Variation (smoothness-))	0.0		

**High accuracy (Machining mode(Medium rough S))**

No.	Item	10K	10K(High torque)	16K
17540001	High accuracy mode selection	0		
17540002	Cutting feed time constant selection A	0		
17540003	Smooth override type B	0		
17540004	Adjust. A for cutting feed time constant 3(Value)	21.0		
17540005	Adjust. A for cutting feed time constant 3(Variation (Accuracy+))	0.0		
17540006	Adjust. A for cutting feed time constant 3(Variation (Accuracy-))	0.0		
17540007	Adjust. A for cutting feed time constant 3(Variation (smoothness+))	5.0		
17540008	Adjust. A for cutting feed time constant 3(Variation (smoothness-))	4.0		
17540009	Corner deceleration override(Value)	730		
17540010	Corner deceleration override(Variation (Accuracy+))	-88		
17540011	Corner deceleration override(Variation (Accuracy-))	-29		
17540012	Corner deceleration override(Variation (smoothness+))	0		
17540013	Corner deceleration override(Variation (smoothness-))	0		
17540014	Arc deceleration override(Value)	2250		
17540015	Arc deceleration override(Variation (Accuracy+))	-306		
17540016	Arc deceleration override(Variation (Accuracy-))	-220		
17540017	Arc deceleration override(Variation (smoothness+))	0		
17540018	Arc deceleration override(Variation (smoothness-))	0		
17540019	Curve approximation deceleration override(Value)	2250		
17540020	Curve approximation deceleration override(Variation (Accuracy+))	-306		
17540021	Curve approximation deceleration override(Variation (Accuracy-))	-220		
17540022	Curve approximation deceleration override(Variation (smoothness+))	0		
17540023	Curve approximation deceleration override(Variation (smoothness-))	0		
17540024	Accel. override B to control accel./decel.(Value)	0		
17540025	Accel. override B to control accel./decel.(Variation (Accuracy+))	0		
17540026	Accel. override B to control accel./decel.(Variation (Accuracy-))	0		
17540027	Accel. override B to control accel./decel.(Variation (smoothness+))	0		
17540028	Accel. override B to control accel./decel.(Variation (smoothness-))	0		
17540029	Override B for acceleration change time(Value)	0		
17540030	Override B for acceleration change time(Variation (Accuracy+))	0		
17540031	Override B for acceleration change time(Variation (Accuracy-))	0		
17540032	Override B for acceleration change time(Variation (smoothness+))	0		
17540033	Override B for acceleration change time(Variation (smoothness-))	0		
17540034	Accel.override B for add. axis accel./decel.(Value)	100		
17540035	Accel.override B for add. axis accel./decel.(Variation (Accuracy+))	0		
17540036	Accel.override B for add. axis accel./decel.(Variation (Accuracy-))	0		
17540037	Accel.override B for add. axis accel./decel.(Variation (smoothness+))	0		
17540038	Accel.override B for add. axis accel./decel.(Variation (smoothness-))	0		
17540039	Smooth path offset level(Value)	1		
17540040	Smooth path offset level(Variation (Accuracy+))	0		
17540041	Smooth path offset level(Variation (Accuracy-))	0		
17540042	Smooth path offset level(Variation (smoothness+))	0		
17540043	Smooth path offset level(Variation (smoothness-))	0		
17540044	Smooth override(Value)	100		
17540045	Smooth override(Variation (Accuracy+))	0		
17540046	Smooth override(Variation (Accuracy-))	0		
17540047	Smooth override(Variation (smoothness+))	0		
17540048	Smooth override(Variation (smoothness-))	0		
17540049	Minute block deletion distance(Value)	0.05		
17540050	Minute block deletion distance(Variation (Accuracy+))	0.0		
17540051	Minute block deletion distance(Variation (Accuracy-))	0.0		
17540052	Minute block deletion distance(Variation (smoothness+))	0.0		
17540053	Minute block deletion distance(Variation (smoothness-))	0.0		

**High accuracy (Machining mode(Finishing))**

No.	Item	10K	10K(High torque)	16K
17550001	High accuracy mode selection		1	
17550002	Cutting feed time constant selection A		0	
17550003	Smooth override type B		0	
17550004	Adjust. A for cutting feed time constant 3(Value)	0.0		
17550005	Adjust. A for cutting feed time constant 3(Variation (Accuracy+))	0.0		
17550006	Adjust. A for cutting feed time constant 3(Variation (Accuracy-))	0.0		
17550007	Adjust. A for cutting feed time constant 3(Variation (smoothness+))	0.0		
17550008	Adjust. A for cutting feed time constant 3(Variation (smoothness-))	0.0		
17550009	Corner deceleration override(Value)	195		
17550010	Corner deceleration override(Variation (Accuracy+))	-20		
17550011	Corner deceleration override(Variation (Accuracy-))	0		
17550012	Corner deceleration override(Variation (smoothness+))	-10		
17550013	Corner deceleration override(Variation (smoothness-))	0		
17550014	Arc deceleration override(Value)	100		
17550015	Arc deceleration override(Variation (Accuracy+))	-10		
17550016	Arc deceleration override(Variation (Accuracy-))	-80		
17550017	Arc deceleration override(Variation (smoothness+))	0		
17550018	Arc deceleration override(Variation (smoothness-))	0		
17550019	Curve approximation deceleration override(Value)	100		
17550020	Curve approximation deceleration override(Variation (Accuracy+))	-10		
17550021	Curve approximation deceleration override(Variation (Accuracy-))	-80		
17550022	Curve approximation deceleration override(Variation (smoothness+))	0		
17550023	Curve approximation deceleration override(Variation (smoothness-))	0		
17550024	Accel. override B to control accel./decel.(Value)	170		
17550025	Accel. override B to control accel./decel.(Variation (Accuracy+))	0		
17550026	Accel. override B to control accel./decel.(Variation (Accuracy-))	0		
17550027	Accel. override B to control accel./decel.(Variation (smoothness+))	-7		
17550028	Accel. override B to control accel./decel.(Variation (smoothness-))	-29		
17550029	Override B for acceleration change time(Value)	44		
17550030	Override B for acceleration change time(Variation (Accuracy+))	0		
17550031	Override B for acceleration change time(Variation (Accuracy-))	0		
17550032	Override B for acceleration change time(Variation (smoothness+))	2		
17550033	Override B for acceleration change time(Variation (smoothness-))	0		
17550034	Accel.override B for add. axis accel./decel.(Value)	100		
17550035	Accel.override B for add. axis accel./decel.(Variation (Accuracy+))	0		
17550036	Accel.override B for add. axis accel./decel.(Variation (Accuracy-))	0		
17550037	Accel.override B for add. axis accel./decel.(Variation (smoothness+))	0		
17550038	Accel.override B for add. axis accel./decel.(Variation (smoothness-))	0		
17550039	Smooth path offset level(Value)	1		
17550040	Smooth path offset level(Variation (Accuracy+))	0		
17550041	Smooth path offset level(Variation (Accuracy-))	0		
17550042	Smooth path offset level(Variation (smoothness+))	0		
17550043	Smooth path offset level(Variation (smoothness-))	0		
17550044	Smooth override(Value)	100		
17550045	Smooth override(Variation (Accuracy+))	0		
17550046	Smooth override(Variation (Accuracy-))	0		
17550047	Smooth override(Variation (smoothness+))	40		
17550048	Smooth override(Variation (smoothness-))	0		
17550049	Minute block deletion distance(Value)	0.01		
17550050	Minute block deletion distance(Variation (Accuracy+))	0.0		
17550051	Minute block deletion distance(Variation (Accuracy-))	0.0		
17550052	Minute block deletion distance(Variation (smoothness+))	0.0		
17550053	Minute block deletion distance(Variation (smoothness-))	0.0		

**High accuracy (Machining mode(Finishing S))**

No.	Item	10K	10K(High torque)	16K
17560001	High accuracy mode selection		1	
17560002	Cutting feed time constant selection A		0	
17560003	Smooth override type B		0	
17560004	Adjust. A for cutting feed time constant 3(Value)		0.0	
17560005	Adjust. A for cutting feed time constant 3(Variation (Accuracy+))		0.0	
17560006	Adjust. A for cutting feed time constant 3(Variation (Accuracy-))		0.0	
17560007	Adjust. A for cutting feed time constant 3(Variation (smoothness+))		0.0	
17560008	Adjust. A for cutting feed time constant 3(Variation (smoothness-))		0.0	
17560009	Corner deceleration override(Value)		95	
17560010	Corner deceleration override(Variation (Accuracy+))		-10	
17560011	Corner deceleration override(Variation (Accuracy-))		0	
17560012	Corner deceleration override(Variation (smoothness+))		-7	
17560013	Corner deceleration override(Variation (smoothness-))		-10	
17560014	Arc deceleration override(Value)		200	
17560015	Arc deceleration override(Variation (Accuracy+))		-20	
17560016	Arc deceleration override(Variation (Accuracy-))		-60	
17560017	Arc deceleration override(Variation (smoothness+))		0	
17560018	Arc deceleration override(Variation (smoothness-))		0	
17560019	Curve approximation deceleration override(Value)		200	
17560020	Curve approximation deceleration override(Variation (Accuracy+))		-20	
17560021	Curve approximation deceleration override(Variation (Accuracy-))		-60	
17560022	Curve approximation deceleration override(Variation (smoothness+))		0	
17560023	Curve approximation deceleration override(Variation (smoothness-))		0	
17560024	Accel. override B to control accel./decel.(Value)		100	
17560025	Accel. override B to control accel./decel.(Variation (Accuracy+))		0	
17560026	Accel. override B to control accel./decel.(Variation (Accuracy-))		0	
17560027	Accel. override B to control accel./decel.(Variation (smoothness+))		-14	
17560028	Accel. override B to control accel./decel.(Variation (smoothness-))		-7	
17560029	Override B for acceleration change time(Value)		60	
17560030	Override B for acceleration change time(Variation (Accuracy+))		0	
17560031	Override B for acceleration change time(Variation (Accuracy-))		0	
17560032	Override B for acceleration change time(Variation (smoothness+))		12	
17560033	Override B for acceleration change time(Variation (smoothness-))		2	
17560034	Accel.override B for add. axis accel./decel.(Value)		100	
17560035	Accel.override B for add. axis accel./decel.(Variation (Accuracy+))		0	
17560036	Accel.override B for add. axis accel./decel.(Variation (Accuracy-))		0	
17560037	Accel.override B for add. axis accel./decel.(Variation (smoothness+))		0	
17560038	Accel.override B for add. axis accel./decel.(Variation (smoothness-))		0	
17560039	Smooth path offset level(Value)		1	
17560040	Smooth path offset level(Variation (Accuracy+))		0	
17560041	Smooth path offset level(Variation (Accuracy-))		0	
17560042	Smooth path offset level(Variation (smoothness+))		0	
17560043	Smooth path offset level(Variation (smoothness-))		0	
17560044	Smooth override(Value)		100	
17560045	Smooth override(Variation (Accuracy+))		0	
17560046	Smooth override(Variation (Accuracy-))		0	
17560047	Smooth override(Variation (smoothness+))		40	
17560048	Smooth override(Variation (smoothness-))		0	
17560049	Minute block deletion distance(Value)		0.01	
17560050	Minute block deletion distance(Variation (Accuracy+))		0.0	
17560051	Minute block deletion distance(Variation (Accuracy-))		0.0	
17560052	Minute block deletion distance(Variation (smoothness+))		0.0	
17560053	Minute block deletion distance(Variation (smoothness-))		0.0	

**High accuracy (Accuracy spec. A)**

No.	Item	10K	10K(High torque)	16K
17570001	Cutting feed time constant selection A	0		
17570002	Adjust. A for cutting feed time constant 3(Value)	0.0		
17570003	Adjust. A for cutting feed time constant 3(Variation (smoothness+))	10.0		
17570004	Adjust. A for cutting feed time constant 3(Variation (smoothness-))	0.0		
17570005	Smooth path offset level(Value)	1		
17570006	Smooth path offset level(Variation (smoothness+))	0		
17570007	Smooth path offset level(Variation (smoothness-))	0		
17570008	Smooth override(Value)	100		
17570009	Smooth override(Variation (smoothness+))	0		
17570010	Smooth override(Variation (smoothness-))	18		
17570011	Minute block deletion distance(Value)	0.0		
17570012	Minute block deletion distance(Variation (smoothness+))	0.0		
17570013	Minute block deletion distance(Variation (smoothness-))	0.0		

**High accuracy (Accuracy spec. B)**

No.	Item	10K	10K(High torque)	16K
17580001	Cutting feed time constant selection A	0		
17580002	Adjust. A for cutting feed time constant 3(Value)	0.0		
17580003	Adjust. A for cutting feed time constant 3(Variation (smoothness+))	10.0		
17580004	Adjust. A for cutting feed time constant 3(Variation (smoothness-))	0.0		
17580005	Smooth path offset level(Value)	1		
17580006	Smooth path offset level(Variation (smoothness+))	0		
17580007	Smooth path offset level(Variation (smoothness-))	0		
17580008	Smooth override(Value)	100		
17580009	Smooth override(Variation (smoothness+))	0		
17580010	Smooth override(Variation (smoothness-))	18		
17580011	Minute block deletion distance(Value)	0.0		
17580012	Minute block deletion distance(Variation (smoothness+))	0.0		
17580013	Minute block deletion distance(Variation (smoothness-))	0.0		

**High accuracy (Accuracy spec. C)**

No.	Item	10K	10K(High torque)	16K
17590001	Cutting feed time constant selection A	0		
17590002	Adjust. A for cutting feed time constant 3(Value)	0.0		
17590003	Adjust. A for cutting feed time constant 3(Variation (smoothness+))	10.0		
17590004	Adjust. A for cutting feed time constant 3(Variation (smoothness-))	0.0		
17590005	Smooth path offset level(Value)	1		
17590006	Smooth path offset level(Variation (smoothness+))	0		
17590007	Smooth path offset level(Variation (smoothness-))	0		
17590008	Smooth override(Value)	100		
17590009	Smooth override(Variation (smoothness+))	0		
17590010	Smooth override(Variation (smoothness-))	18		
17590011	Minute block deletion distance(Value)	0.0		
17590012	Minute block deletion distance(Variation (smoothness+))	0.0		
17590013	Minute block deletion distance(Variation (smoothness-))	0.0		

**PLC**

Servo parameter number: P1st-axis18110000's, P2nd-axis18120000's, P3rd-axis18130000's,  
P4th-axis18140000's

No.	Item	P1st-axis	P2nd-axis	P3rd-axis	P4th-axis
????0001	Optional axis	0	0	0	0
????0002	Type	0	0	0	0
????0003	Installation position	0	0	0	0
????0004	Backlash compensation	0	0	0	0
????0005	Lead/gear ratio	20	20	20	20
????0006	Absolute encoder rotation direction	0	0	0	0
????0007	Brake	0	0	0	0
????0008	Clamp mechanism	0	0	0	0
????0009	Unclamp check input signal	0	0	0	0
????0010	Clamp check input signal	0	0	0	0
????0011	Unclamp output signal	1	1	1	1
????0012	Unclamp check time	200.0	200.0	200.0	200.0
????0013	Clamp check time	50.0	50.0	50.0	50.0
????0014	Position check pulse	16000	16000	16000	16000
????0015	NC stop level for servo error	5	5	5	5
????0016	In-position timeout period	5000.0	5000.0	5000.0	5000.0
????0017	Positioning end check distance/angle	0.3	0.3	0.3	0.3
????0018	Positioning check time	0.0	0.0	0.0	0.0
????0019	Rapid feedrate	10000.0	10000.0	10000.0	10000.0
????0020	Manual speed	10000.0	10000.0	10000.0	10000.0
????0021	Manual time constant 1	200.0	200.0	200.0	200.0
????0022	Manual time constant 2	50.0	50.0	50.0	50.0
????0023	Manual time constant 3	0.0	0.0	0.0	0.0
????0024	Rapid feedrate(door open)	2000.0	2000.0	2000.0	2000.0
????0025	Rapid feedrate(Outer pallet)	1.0	1.0	1.0	1.0
????0026	Rapid feed time constant 1	200.0	200.0	200.0	200.0
????0027	Rapid feed time constant 2	50.0	50.0	50.0	50.0
????0028	Rapid feed time constant 3	0.0	0.0	0.0	0.0
????0029	Brake load test	0	0	0	0
????0030	Load torque for brake load test	70	70	70	70
????0031	Travel amount under load for brake load test	0.3	0.3	0.3	0.3
????0032	Allowable travel amount for brake load test	0.15	0.15	0.15	0.15
????0033	Delay time for brake operation	300.0	300.0	300.0	300.0
????0034	Delay time for brake release	25.0	25.0	25.0	25.0
????0035	Load time for brake load test	1000.0	1000.0	1000.0	1000.0
????0036	Timeout time for load during brake load test	5000.0	5000.0	5000.0	5000.0
????0037	Wait time before applying brake in brake load test	1000.0	1000.0	1000.0	1000.0
????0038	Wait time before releasing brake in brake load test	0.0	0.0	0.0	0.0
????0039	Door open time constant 1	30.0	30.0	30.0	30.0
????0040	Door open time constant 2	15.0	15.0	15.0	15.0
????0041	Door open time constant 3	0.0	0.0	0.0	0.0
????0042	Adjustment mark	0	0	0	0
????0043	Marked position for adjustment				

**Special setting(Level 1)**

No.	Item	10K	10K(High torque)	16K
19610001	X-ax. rapid time const. 1A			
19610002	X-ax. rapid time const. 2A			
19610003	X-ax. rapid time const. 3A			
19610004	Y-axis rapid feed time const. 1A			
19610005	Y-axis rapid feed time const. 2A			

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No.	Item	10K	10K(High torque)	16K
19610006	Y-axis rapid feed time const. 3A			
19610007	Z-axis rapid feed time const. 1A			
19610008	Z-axis rapid feed time const. 2A			
19610009	Z-axis rapid feed time const. 3A			
19610010	X-ax. rapid time const. 1B			
19610011	X-ax. rapid time const. 2B			
19610012	X-ax. rapid time const. 3B			
19610013	Y-axis rapid feed time const. 1B			
19610014	Y-axis rapid feed time const. 2B			
19610015	Y-axis rapid feed time const. 3B			
19610016	Z-axis rapid feed time const. 1B			
19610017	Z-axis rapid feed time const. 2B			
19610018	Z-axis rapid feed time const. 3B			
19610019	X-ax. rapid time const. 1C			
19610020	X-ax. rapid time const. 2C			
19610021	X-ax. rapid time const. 3C			
19610022	Y-axis rapid feed time const. 1C			
19610023	Y-axis rapid feed time const. 2C			
19610024	Y-axis rapid feed time const. 3C			
19610025	Z-axis rapid feed time const. 1C			
19610026	Z-axis rapid feed time const. 2C			
19610027	Z-axis rapid feed time const. 3C			
19610028	X-ax.time const.chg.dist.A			
19610029	X-ax.time const.chg.dist.B			
19610030	Y-axis time const. change distance A			
19610031	Y-axis time const. change distance B			
19610032	Z-axis time const. change distance A			
19610033	Z-axis time const. change distance B			
19610034	X-ax.lower.limit.time const.			
19610035	Y-axis lower limit time const.			
19610036	Z-axis lower limit time const.			
19610037	ATC speed (2 when ATC rises)			
19610038	ATC speed (2 when ATC falls)			
19610039	ATC low speed (2 when ATC rises)(Standard tool)			
19610040	ATC low speed (2 when ATC falls)(Standard tool)			
19610041	X-ax.rpd.feed const. FFGN1			
19610042	Y-ax.rpd.feed const. FFGN1			
19610043	Z-ax.rpd.feed const. FFGN1			
19610044	Z-ax.rpd.feed const. FFGN3			
19610045	X-ax.rpd.feed const. OFLV			
19610046	Y-ax.rpd.feed const. OFLV			
19610047	Z-ax.rpd.feed const. OFLV			
19610048	X-ax.rpd.feed const. TVI1			
19610049	Y-ax.rpd.feed const. TVI1			
19610050	Z-ax.rpd.feed const. TVI1			
19610051	X-ax.rpd.feed const. TVI2			
19610052	Y-ax.rpd.feed const. TVI2			
19610053	Z-ax.rpd.feed const. TVI2			
19610054	X-ax.rpd. control type 1			
19610055	Y-ax.rpd. control type 1			
19610056	Z-ax.rpd. control type 1			
19610057	Z-ax.rpd. control type 2			

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### Special setting(Level 2)

No.	Item	10K	10K(High torque)	16K
19620001	X-ax. rapid time const. 1A			
19620002	X-ax. rapid time const. 2A			
19620003	X-ax. rapid time const. 3A			

No.	Item	10K	10K(High torque)	16K
19620004	Y-axis rapid feed time const. 1A			
19620005	Y-axis rapid feed time const. 2A			
19620006	Y-axis rapid feed time const. 3A			
19620007	Z-axis rapid feed time const. 1A			
19620008	Z-axis rapid feed time const. 2A			
19620009	Z-axis rapid feed time const. 3A			
19620010	X-ax. rapid time const. 1B			
19620011	X-ax. rapid time const. 2B			
19620012	X-ax. rapid time const. 3B			
19620013	Y-axis rapid feed time const. 1B			
19620014	Y-axis rapid feed time const. 2B			
19620015	Y-axis rapid feed time const. 3B			
19620016	Z-axis rapid feed time const. 1B			
19620017	Z-axis rapid feed time const. 2B			
19620018	Z-axis rapid feed time const. 3B			
19620019	X-ax. rapid time const. 1C			
19620020	X-ax. rapid time const. 2C			
19620021	X-ax. rapid time const. 3C			
19620022	Y-axis rapid feed time const. 1C			
19620023	Y-axis rapid feed time const. 2C			
19620024	Y-axis rapid feed time const. 3C			
19620025	Z-axis rapid feed time const. 1C			
19620026	Z-axis rapid feed time const. 2C			
19620027	Z-axis rapid feed time const. 3C			
19620028	X-ax.time const.chg.dist.A			
19620029	X-ax.time const.chg.dist.B			
19620030	Y-axis time const. change distance A			
19620031	Y-axis time const. change distance B			
19620032	Z-axis time const. change distance A			
19620033	Z-axis time const. change distance B			
19620034	X-ax.lowr.limt.time const.			
19620035	Y-axis lower limit time const.			
19620036	Z-axis lower limit time const.			
19620037	ATC speed (2 when ATC rises)			
19620038	ATC speed (2 when ATC falls)			
19620039	ATC low speed (2 when ATC rises)(Standard tool)			
19620040	ATC low speed (2 when ATC falls)(Standard tool)			
19620041	X-ax.rpd.feed const. FFGN1			
19620042	Y-ax.rpd.feed const. FFGN1			
19620043	Z-ax.rpd.feed const. FFGN1			
19620044	Z-ax.rpd.feed const. FFGN3			
19620045	X-ax.rpd.feed const. OFLV			
19620046	Y-ax.rpd.feed const. OFLV			
19620047	Z-ax.rpd.feed const. OFLV			
19620048	X-ax.rpd.feed const. TVI1			
19620049	Y-ax.rpd.feed const. TVI1			
19620050	Z-ax.rpd.feed const. TVI1			
19620051	X-ax.rpd.feed const. TVI2			
19620052	Y-ax.rpd.feed const. TVI2			
19620053	Z-ax.rpd.feed const. TVI2			
19620054	X-ax.rpd. control type 1			
19620055	Y-ax.rpd. control type 1			
19620056	Z-ax.rpd. control type 1			
19620057	Z-ax.rpd. control type 2			

**Special setting(Level 3)**

No.	Item	10K	10K(High torque)	16K
19630001	X-ax. rapid time const. 1A			

## Chapter 7 Machine Parameter

No.	Item	10K	10K(High torque)	16K
19630002	X-ax. rapid time const. 2A			
19630003	X-ax. rapid time const. 3A			
19630004	Y-axis rapid feed time const. 1A			
19630005	Y-axis rapid feed time const. 2A			
19630006	Y-axis rapid feed time const. 3A			
19630007	Z-axis rapid feed time const. 1A			
19630008	Z-axis rapid feed time const. 2A			
19630009	Z-axis rapid feed time const. 3A			
19630010	X-ax. rapid time const. 1B			
19630011	X-ax. rapid time const. 2B			
19630012	X-ax. rapid time const. 3B			
19630013	Y-axis rapid feed time const. 1B			
19630014	Y-axis rapid feed time const. 2B			
19630015	Y-axis rapid feed time const. 3B			
19630016	Z-axis rapid feed time const. 1B			
19630017	Z-axis rapid feed time const. 2B			
19630018	Z-axis rapid feed time const. 3B			
19630019	X-ax. rapid time const. 1C			
19630020	X-ax. rapid time const. 2C			
19630021	X-ax. rapid time const. 3C			
19630022	Y-axis rapid feed time const. 1C			
19630023	Y-axis rapid feed time const. 2C			
19630024	Y-axis rapid feed time const. 3C			
19630025	Z-axis rapid feed time const. 1C			
19630026	Z-axis rapid feed time const. 2C			
19630027	Z-axis rapid feed time const. 3C			
19630028	X-ax.time const.chg.dist.A			
19630029	X-ax.time const.chg.dist.B			
19630030	Y-axis time const. change distance A			
19630031	Y-axis time const. change distance B			
19630032	Z-axis time const. change distance A			
19630033	Z-axis time const. change distance B			
19630034	X-ax.lowr.limt.time const.			
19630035	Y-axis lower limit time const.			
19630036	Z-axis lower limit time const.			
19630037	ATC speed (2 when ATC rises)			
19630038	ATC speed (2 when ATC falls)			
19630039	ATC low speed (2 when ATC rises)(Standard tool)			
19630040	ATC low speed (2 when ATC falls)(Standard tool)			
19630041	X-ax.rpd.feed const. FFGN1			
19630042	Y-ax.rpd.feed const. FFGN1			
19630043	Z-ax.rpd.feed const. FFGN1			
19630044	Z-ax.rpd.feed const. FFGN3			
19630045	X-ax.rpd.feed const. OFLV			
19630046	Y-ax.rpd.feed const. OFLV			
19630047	Z-ax.rpd.feed const. OFLV			
19630048	X-ax.rpd.feed const. TVI1			
19630049	Y-ax.rpd.feed const. TVI1			
19630050	Z-ax.rpd.feed const. TVI1			
19630051	X-ax.rpd.feed const. TVI2			
19630052	Y-ax.rpd.feed const. TVI2			
19630053	Z-ax.rpd.feed const. TVI2			
19630054	X-ax.rpd. control type 1			
19630055	Y-ax.rpd. control type 1			
19630056	Z-ax.rpd. control type 1			
19630057	Z-ax.rpd. control type 2			

# CHAPTER 8

## CHECK & RECOVERY

- 8.1    **Checking Spindle, X-, Y- and Z-axis Positioning After Servo Alarm**
- 8.2    **Back Up Data (Connect USB Memory)**

## 8.1 Checking Spindle, X-, Y- and Z-axis Positioning After Servo Alarm

### ⚠ WARNING

If the door interlock mode is set to machine setup or service mode, the machine will operate even when a door is open, and you may get caught or drawn into the machine.

#### [SAFETY INSTRUCTIONS]

The installer or setup personnel must never leave the machine unattended while the door interlock mode is set to machine setup or service mode.

The key for the [DOOR INTERLOCK MODE] switch should be kept by the supervisor.

Always check the spindle positioning as well as the X-, Y- and Z-axes and magazine positioning when a servo error is displayed due to an overload on the servo motor, caused by interference between a tool, workpiece and/or jig, or caused by excessive machining conditions, etc.

#### 1. Checking the spindle positioning

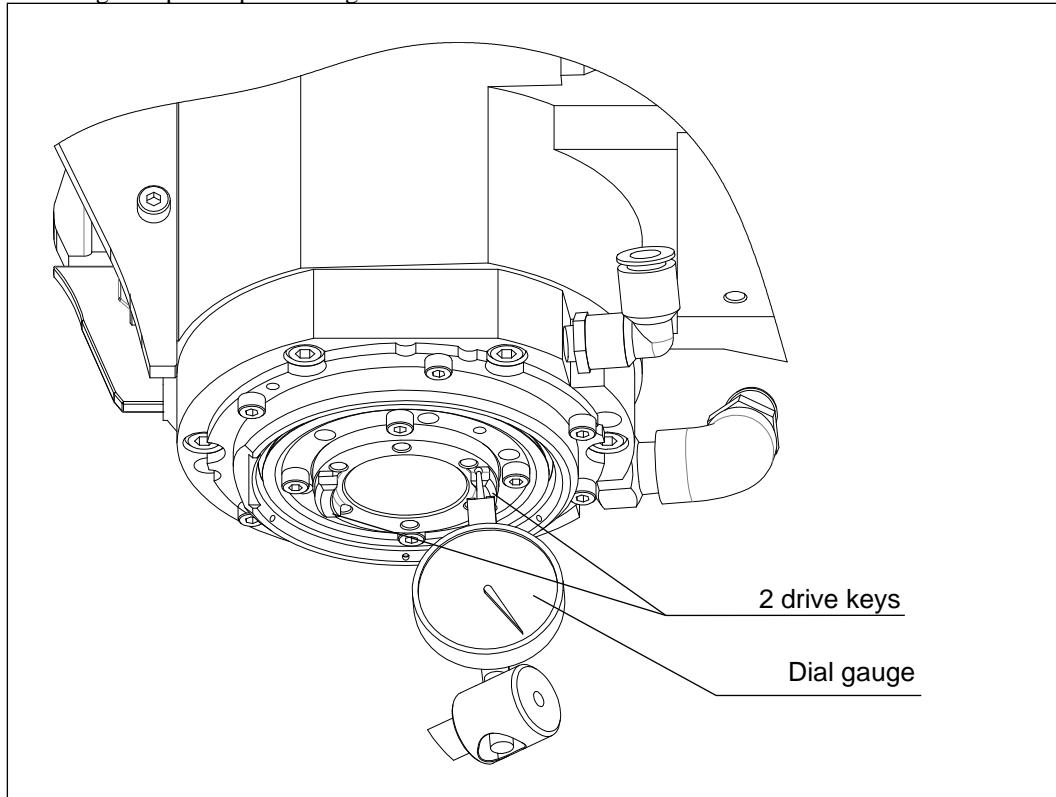
First, turn OFF the power and then turn it back ON before proceeding to the next operation.

- (1) Press the [MANU] key to switch to manual operation mode.
- (2) Move the axis to a safe area and perform a machine zero return.
- (3) Press the [ATC] key once to perform the spindle positioning operation.
- (4) Set the dial gauge onto the table, and position the end against the side of the drive key on the end of the spindle.
- (5) Move the spindle in the Y-axis direction, and make sure that the line that connects the two drive key sides runs parallel with the Y-axis (parallelism is less than 0.1 mm).  
If the parallelism with the Y-axis is greater than 0.1 mm, there is most likely a failure or malfunction.  
Contact Brother if this applies.

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(Reference) The spindle positioning is based on the line that connects the two drive key sides (on both sides of the spindle end) running parallel with the Y-axis motion.

## Checking the spindle positioning



## 2. Checking the X-, Y-, and Z-axes positioning

First, turn OFF the power and then turn it back ON before proceeding to the next operation.

- (1) Press the [MANU] key to switch to manual operation mode.
- (2) Move the axis to a safe area and perform a machine zero return.
- (3) Press the [MEM] key to switch to memory operation mode.
- (4) Press the [SINGL] key.
- (5) Execute a program 1 block at a time to check the positioning of the X-, Y- and Z-axes.

## 8.2 Back Up Data (Connect USB Memory)

### **⚠ WARNING**

High-voltage components are present inside the control box.  
There is risk of electric shock if you touch these components by mistake.

#### [SAFETY INSTRUCTIONS]

Maintenance and inspection of electrical components must only be carried out by a qualified electrician who is trained in electrical safety and who has thorough knowledge of the electronic circuits in this machine.

Turn OFF the main power breaker, and then wait at least 20 minutes before carrying out work.

Attach a padlock to the main power breaker so that the power cannot be turned ON.

A sign or notice should be placed near the operation panel to warn others that work is in progress.

If leaving the machine unattended, close the control box and secure it with screws.

### **⚠ WARNING**

If the control box or operation panel is touched accidentally with wet hands while performing installation or maintenance, an electric shock or short-circuit may cause a fire.

#### [SAFETY INSTRUCTIONS]

Do not touch the control box and the operation panel with wet hands.

The cover to the control box must be closed while the machine is operating.

The control box and the operation panel must be kept free of coolant, water, chips and shavings.

### **⚠ WARNING**

If you touch cables which have been crushed or damaged by heavy objects, there is risk of electric shock.

In addition, short-circuits may occur if cables are crushed or damaged by heavy objects.

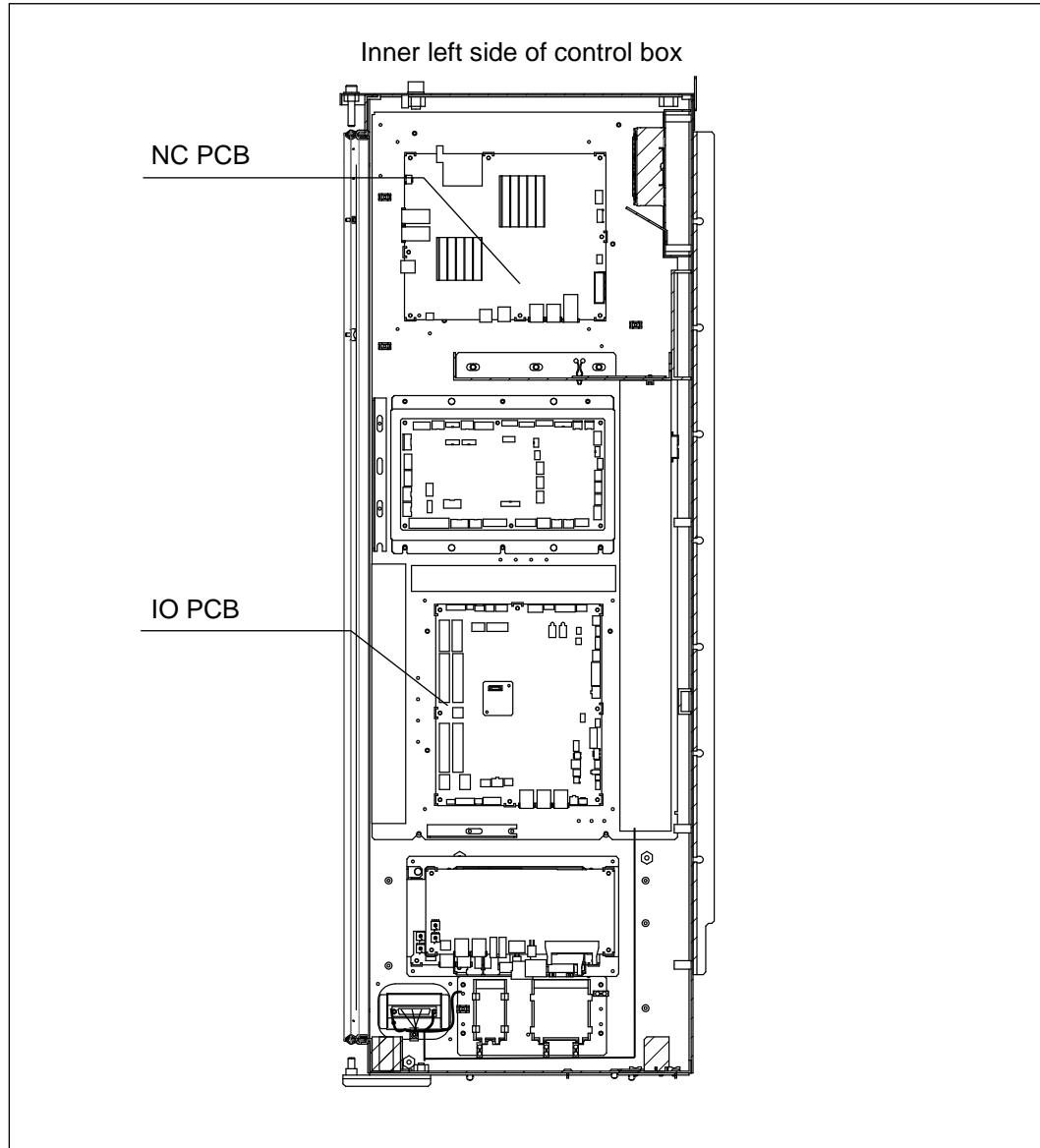
#### [SAFETY INSTRUCTIONS]

Cables should be gathered up or arranged to prevent them from being crushed. If a cable has become damaged, it must be replaced with a new one.

(NOTE) Refer to “5.2 Automatic data backup” in the Operation Manual II for details on the data backup operations.

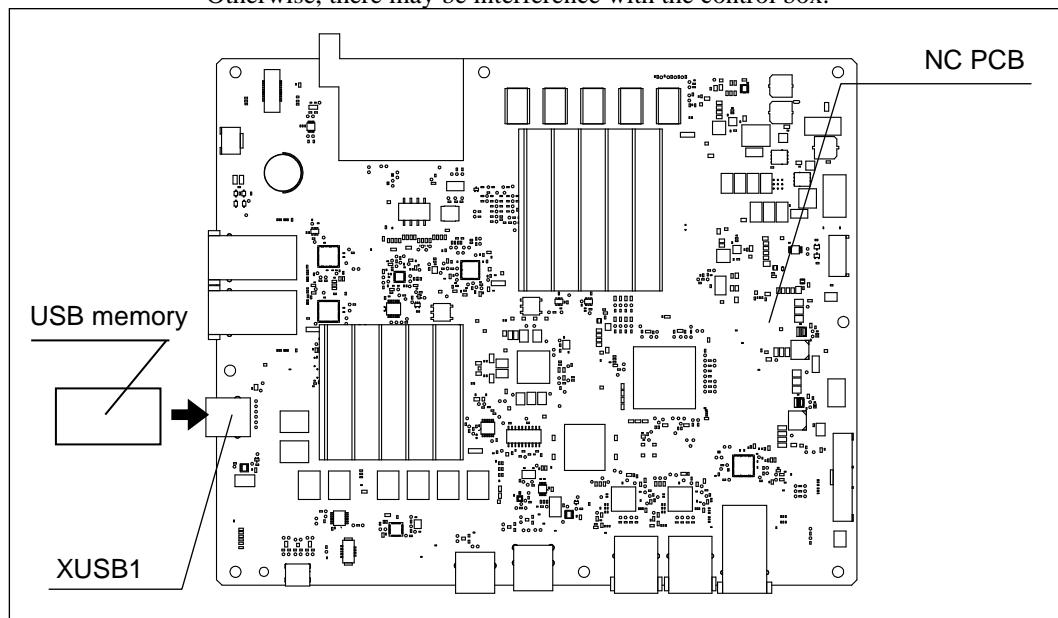
1. Turn the [POWER] switch OFF.  
Make sure that the power has turned OFF, and then turn OFF the main power breaker.
2. Open the control box door.
3. Make sure that the LED on the NC PCB and IO PCB is turned off.

Left side of control box



## Chapter 8 Check & Recovery

4. Connect the USB memory to the XUSB1 connector on the NC PCB.  
(NOTICE) Choose a USB memory device with a total length that is less than 30 mm.  
Otherwise, there may be interference with the control box.



# CHAPTER 9

## INSPECTION

- 9.1      Periodic Machine Inspections**
- 9.2      Inspecting Machine Lubrication**
- 9.3      Key Check**
- 9.4      Touch Panel Check**
- 9.5      Brake Load Test**
- 9.6      Periodic Machine Cleaning**
- 9.7      Replacing Consumable Parts**
- 9.8      Consumable Parts List**

## 9.1 Periodic Machine Inspections

### **⚠ WARNING**

If an air blower or similar equipment is used to remove chips or shavings, they may shoot out and get into your eyes.

#### [SAFETY INSTRUCTIONS]

Chips or shavings should not be blown off the machine using an air blower or similar equipment.

### **⚠ WARNING**

If you put any parts of your body inside the machine while the maintenance cover has been removed for setup or maintenance work, you may get caught or drawn into the machine if the machine is operated by mistake.

#### [SAFETY INSTRUCTIONS]

Do not put any part of your body inside the machine while it is operating.

Turn OFF the main power breaker before removing the maintenance cover.

Attach a padlock to the main power breaker so that the power cannot be turned ON.

A sign or notice should be placed near the operation panel of the machine to warn others that work is in progress.

### **⚠ WARNING**

High-voltage components are present inside the control box. There is risk of electric shock if you touch these components by mistake.

#### [SAFETY INSTRUCTIONS]

Maintenance and inspection of electrical components must only be carried out by a qualified electrician who is trained in electrical safety and who has thorough knowledge of the electronic circuits in this machine.

Turn OFF the main power breaker, and then wait at least 20 minutes before carrying out work.

Attach a padlock to the main power breaker so that the power cannot be turned ON.

A sign or notice should be placed near the operation panel to warn others that work is in progress.

If leaving the machine unattended, close the control box and secure it with screws.

## **WARNING**

**If the control box or operation panel is touched accidentally with wet hands while performing installation or maintenance, an electric shock or short-circuit may cause a fire.**

**[SAFETY INSTRUCTIONS]**

**Do not touch the control box and the operation panel with wet hands.**

**The cover to the control box must be closed while the machine is operating.**

**The control box and the operation panel must be kept free of coolant, water, chips and shavings.**

## **WARNING**

**If any modifications are carried out, such as disabling the limit switch for the door interlock, the safety devices may stop operating. Therefore, the machine may operate even when a door is open, and you may get caught or drawn into the machine.**

**[SAFETY INSTRUCTIONS]**

**Do not perform any unauthorized modifications on the safety devices.**

**Do not secure the safety devices in such a way that will prevent them from operating.**

**If any operator finds that an unauthorized modification on the machine, they should notify the supervisor immediately, without operating the machine.**

**If modifications are necessary, contact Brother Industries to obtain written approval before proceeding.**

## **WARNING**

**If a machine with an inner door is used without locking that inner door, then the door could open up during operation and objects could shoot out causing injury.**

**[SAFETY INSTRUCTIONS]**

**If there is an inner door, lock the inner door with the key before using the machine.**

**Always lock the doors after installation and maintenance work.**

**If there is an inner door, do not open the inner door while the axis in the machining room is operating.**

## **WARNING**

**If the door interlock mode is set to machine setup or service mode, the machine will operate even when a door is open, and you may get caught or drawn into the machine.**

**[SAFETY INSTRUCTIONS]**

**The installer or setup personnel must never leave the machine unattended while the door interlock mode is set to machine setup or service mode.**

**The key for the [DOOR INTERLOCK MODE] switch should be kept by the supervisor.**

**This section describes the maintenance and inspection of the machine. Regular maintenance and periodic inspections are required to maintain high accuracy and to prevent machine failures or malfunctions from occurring.**

- In order to prevent problems caused by the adhesion of oil, water and chips or shavings, do not use compressed air or a cleaning gun to clean or remove shavings and chips from the machine unit (operation panel, control box or moving parts such as the ball screw, guide, magazine, ATC, spindle, etc.).
- If there is an abnormal noise or vibration, troubleshoot and identify the cause. Contact Brother when necessary.
- Use Brother approved or designated parts when replacing a part. Using other parts not approved or designated by Brother can cause failure or malfunction.
- Perform regular machine maintenance and periodic inspections based on the check list.

Periodic inspection check list

Period	Inspection item
Daily	<ol style="list-style-type: none"> <li>1. Make sure that the safety devices are mounted securely and correctly. *1</li> <li>2. Make sure that the safety devices operate correctly. *1</li> <li>3. Make sure that the safety labels have not been removed or are peeling off from their designated locations on the machine.</li> <li>4. Make sure that there are no abnormal noises during ATC. *2</li> <li>5. Make sure that the cooling fan for the spindle motor is operating properly.</li> <li>6. Make sure that there is no dust or damage on the taper parts of the spindle. *3</li> <li>7. Make sure that there are no abnormal noises while the spindle is rotating. *4</li> <li>8. Make sure that the spindle is properly oriented during the positioning operation.</li> <li>9. Make sure that no chips or shavings are left inside the machine cover.</li> <li>10. Make sure that no chips or shavings are left in the chip pan.</li> <li>11. Make sure that the X- and Y-axes telescopic covers are not damaged.</li> <li>12. Make sure that there is nothing wrong with the rubber part on the telescopic cover joint (wiper).</li> <li>13. Make sure that the fluid level sensor for the tool cleaning system is working properly. *5</li> <li>14. Make sure that there are no chips or shavings between the right and left doors or on the rear side.</li> <li>15. Make sure that the indicator for the CTS line filter does not have a red display.</li> <li>16. Make sure there are no cracks, damage, deformation or discoloration on the viewing window inside the machining chamber. *6</li> <li>17. Make sure that there is no rust on the machine.           <p>* Rust may form on parts that are not coated or treated depending on the environment. In particular, when conducting dry machining, apply an anti-corrosive agent regularly to ensure rust does not form.</p> </li> <li>18. Make sure that oil is not dripping from where the fan chassis (attached to outside of cabinet) is installed. *7</li> <li>19. Is the touch panel dirty? *8</li> <li>20. Make sure that the none of the 3 locations on the SPD screen have turned red. (Normally green) *9</li> </ol>

Period	Inspection item
Monthly	<ol style="list-style-type: none"> <li>1. Make sure that the horizontal plane on the machine is within 0.02 mm/m on both the X- and Y-axes.</li> <li>2. Make sure that there are no problems when moving the full stroke on the X-, Y- and Z-axes.</li> <li>3. Clean and remove any chips or shavings inside the X- and Y-axes covers. (Refer to "9.6 Periodic machine cleaning" for further details.)</li> <li>4. Make sure that the spindle motor fan is operating normally.</li> <li>5. Make sure that inside the coolant tank is clean. (Refer to "Chapter 11 (1) Coolant unit → 1.Handling precautions → 2.Maintenance" for further details on tank cleaning.)</li> </ol>
Every 3 months or after 500 hours of operation time (whichever is shorter)	<p>Use the grease gun to lubricate the ball screw and guide sections. In addition, if the message &lt;&lt;Maintenance (GREASING XYZ AXIS)&gt;&gt; appears (Z-axis: every 100 km), lubricate with grease. (Refer to "9.2.2 Reset procedure for the maintenance notice (for greasing manually)" )</p> <ul style="list-style-type: none"> <li>* Greasing the Z-axis every 100 km is the recommended value in our sample program.</li> </ul>
Every year	<p>Make sure that there are no foreign objects or contaminants (such as carbide or metal particles) close to the exhaust holes on the main power breaker. *10</p> <p>Use a grease gun to lubricate the linear guide block for the automatic door. Refer to "Chapter 11 (8) Automatic door" for details on lubrication.</p>

\*1 Make sure that the axis does not operate using manual operation when the door is open while in automatic operation mode.

In addition, make sure that the emergency stop works on the machine when the emergency stop switch is pressed.

\*2 Press the [ATC] key in manual mode to check during ATC.

Refer to "5.7 ATC" in Operation Manual I for further details on the [ATC] key operation.

\*3 When the taper on the end of the spindle is dented or damaged, the spindle runout may become worse.

In addition, the spindle runout may become worse if one of the following causes applies.

- Collision
- Foreign objects stuck on spindle taper
- Dented pull stud
- Scratch on steel ball for clamp axis

\*4 An abnormal noise generated by the spindle is divided into two categories shown below.

(1) Abnormal noise where the volume and level change depending on the spindle speed  
There is a scratch on the ball for the bearing or orbital plane. Consider replacing the spindle.

(2) Abnormal noise is intermittent

The noise may occur even on a normal spindle, where there is no problem with the spindle's lifespan or functionality, etc. The noise may be resolved by performing a spindle test run, because the holder that comes into contact with the rolling element or bearing ring is greased.

\*5 Checking the fluid level sensor operation for the tool cleaning system

1. Turn ON the [CLT.P] key.

2. Execute M295 in MDI operation.

- If the coolant level inside the coolant chamber is above the fluid level sensor, the discharge operation is carried out.
- If the coolant level inside the coolant chamber is below the fluid level sensor, the water supply operation is carried out.
- If the alarm <<The tool washing liquid surface sensor is normal>> is triggered, the fluid level sensor is normal.
- If the alarm <<Tool washing liquid surface sensor is abnormal>> is triggered, the filter may be clogged or the fluid level sensor may be defective.

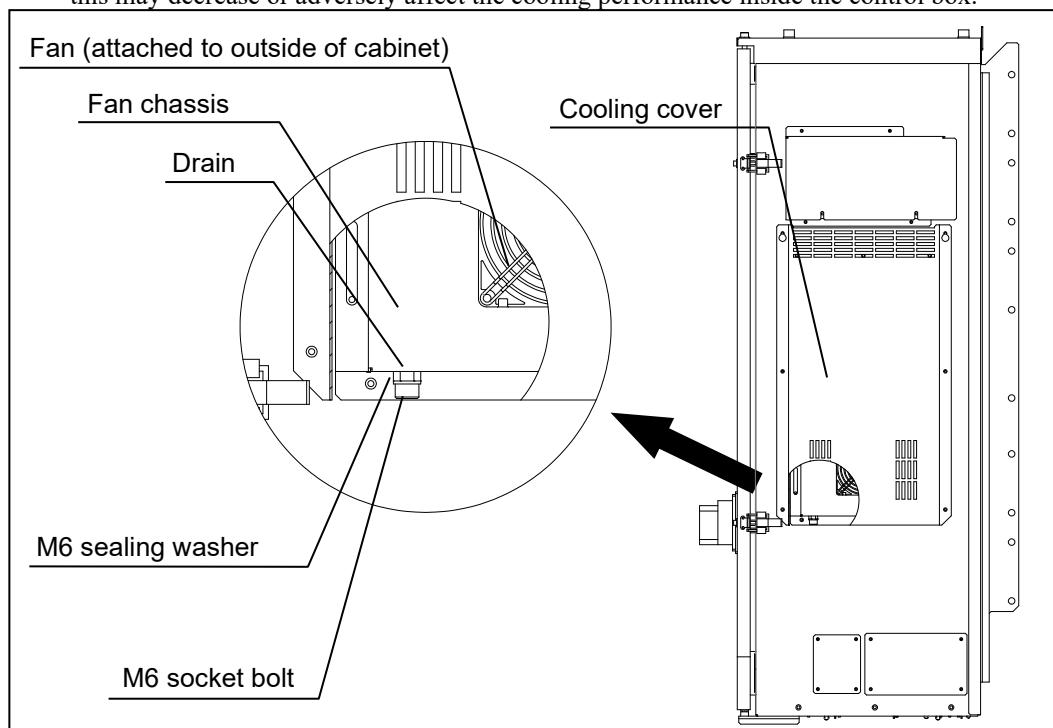
A diagnostics check (M295) of the fluid level sensor can be used even in memory operation.  
Example of use:

1. Parameter setting
  - Set the user parameter (switch 1) <<Faulty tool wash coolant level sensor check interval>> to “200 times”.
2. Input M295 into the memory operation program.
3. Perform memory operation.

When M295 executes 200 times, the fluid level sensor diagnostics check is carried out.

(NOTE) When the power is turned ON, if M295 executes 1 time, the fluid level sensor diagnostics check is carried out.

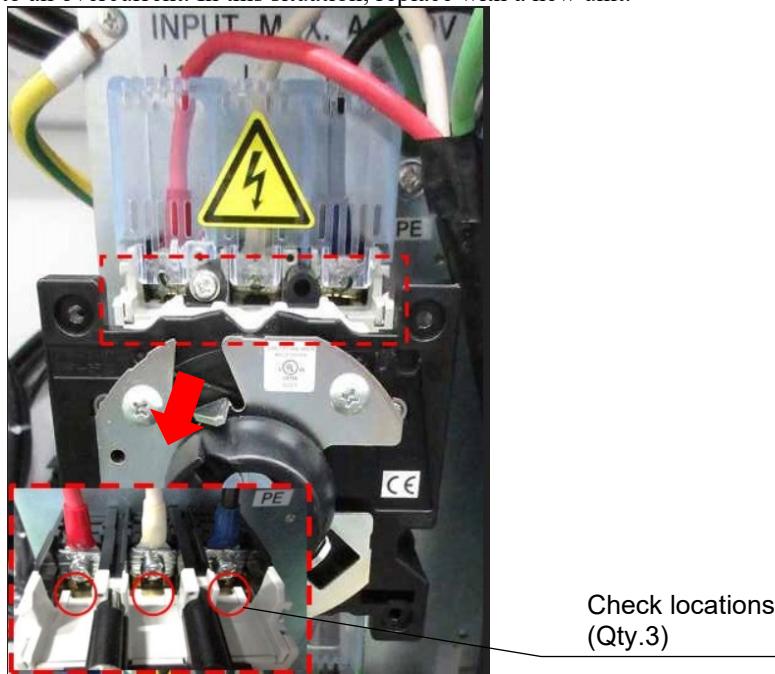
- \*6 We recommend cleaning regularly in order to ensure visibility or early detection of any problem with the viewing window. If the surface is dirty, wet a soft cloth with water or with a neutral detergent (diluted about 200 times with water) and carefully wipe down the window. Using an undiluted solution can cause the window to crack. Never use a detergent with abrasives (such as a cleanser), a scrub brush or a coarse fabric. Otherwise, it can cause a scratch or crack on the window.
- \*7 The fan may suck in oil mist and oil may build up in the fan chassis (attached to outside of cabinet). To discharge the oil, use a hexagonal wrench (Allen key) to loosen the M6 socket bolt on the drain, and then discharge the oil that is built up. After the coolant discharges, tighten the M6 socket bolt on the drain.  
Do not apply fan filters (cloth filters) to the openings or slits on the coolant cover, because this may decrease or adversely affect the cooling performance inside the control box.



- \*8 If the touch panel is dirty, the panel may not respond to tap or touch operations and then lead to an accidental operation. Therefore, use a soft cloth to wipe off the dirt or dust.
- \*9 SPD check points



- \*10 Soot or metal particles have built up close to the exhaust holes if the breaker has shut off due to an overcurrent. In this situation, replace with a new unit.



**9**

**Perform the inspection and maintenance work tasks below on a daily basis in order to prevent a fire and minimize damage in the event of a fire.**

1. Coolant tank
  - Is the coolant level inside the normal range?
  - Is there coolant leaking from the tank?
  - Are there chips or shavings building up around the coolant pump?
  - Is the coolant tank filter clogged?
2. Coolant supply system (coolant pump)
  - Is there any abnormal vibration, noise, or heat coming from the supply system?
  - Is the flow rate normal?
  - Is there coolant leaking from any of the pipes?
3. Coolant nozzle
  - Is there enough coolant being discharged?
  - Is there coolant being supplied to the machining points?
4. Mounting workpiece
  - Is the workpiece mounted properly for the tool or chuck?
5. Tool status
  - Is the tip of the blade becoming more damaged or worn?
  - Are any chips or shavings entangled on the tool?
  - Is the tool properly mounted onto the tool holder?
6. Chip discharge
  - Are there chips or shavings building up inside the machine or in the discharge path?
  - Are the chips or shavings discharging normally on the chip conveyor?
7. Power cable
  - Is the power cable pinched, flattened or bent?
  - Is there any damage to the sheath on the power cable, or is any conductor exposed?
8. Control box, operations box and terminal box
  - Is there any dust or oil that has contaminated the terminals?
  - Are there any loose terminals or connectors?
  - Is the filter for the cooling system, etc., dirty?
  - Is the outlet for maintenance being used regularly?
  - Are there multiple plugs connected to the outlet used for maintenance?
9. Oil-based types
  - Is the quality of the coolant, lubricating oil and hydraulic fluid appropriate?
10. Cleaning
  - Remove chips or shavings from inside the machine.
  - Clean the mist collector and exhaust duct, etc.
  - Clean the inside of the control box, operations box and terminal box.
  - Wipe off any oil on and around the machine uni

## 9.2 Inspecting Machine Lubrication

### **⚠ WARNING**

**There are movable parts inside the machine such as the spindle head and table, and your body may get caught on them if you go inside the machine.**

#### **[SAFETY INSTRUCTIONS]**

**Do not go inside the machine.**

**When a worker must unavoidably go inside the machine, always notify the supervisor. After removing the maintenance cover, use a fixing bracket (for transport) to secure the door and/or use a bolt to keep the door open, so as to avoid being trapped inside.**

**If you go inside the machine, turn OFF the main power breaker, and then attach a padlock to the main power breaker so that the power cannot be turned ON.**

**The operator should visually check to make sure that there is nobody inside the machine before starting the machine.**

**A sign or notice should be placed near the operation panel to warn others that work is in progress.**

Lubricant helps reduce wear on the machine caused by friction. Lubricant helps extend the life of the machine as well as maintain the machining accuracy of the machine.

### 9.2.1 Greasing Timing

For manual greasing specifications

After installing the machine, replenish the grease every 100 km as a point of reference (either every 3 months or after 500 hours of operation, whichever comes first). Replenish the grease as needed if the grease gets dirty. The machine is lubricated at the factory before shipment.

In the factory default settings, the following message <<Maintenance (GREASING XYZ AXIS)>> is set to appear every 100 km (Z-axis) to prompt the user to replenish the grease. When the aforementioned message appears, refer to “9.2.2 Reset procedure for the maintenance notice (for greasing manually)”, and replenish the grease.

In addition, if the machine unit system is set to inch, it will appear every 3,937,000 inches.

The tubing may break or rupture if the discharge pressure exceeds 2.5 MPa.

Adjust the discharge pressure setting under 2.5 MPa when using it.

In addition, when lubricating manually, slowly inject the grease and make sure the discharge is not too high.

## 9.2.2 Reset Procedure for Maintenance notice (for Greasing Manually)

In the factory default settings, the following message <<Maintenance (GREASING XYZ AXIS)>> is set to appear every 100 km (Z-axis) to prompt the user to replenish the grease. If the aforementioned message appears, use the following procedure to replenish the grease and clear or reset the message.

1. Switch to manual mode, move the X-, Y- and Z-axes to a position to make it easier to replenish the grease, and then open the front door.
  2. Turn OFF the power switch on the operation panel, and then turn OFF the main power breaker.
  3. Replenish the grease on the X-, Y- and Z-axes.
  4. Turn ON the main power breaker, and then turn ON the power switch for the operation panel.
  5. Press [8] and [ENT] on the production monitor screen to display the maintenance notice screen. Use the [↓] (down) key to display the No.1 item. The current value has exceeded 100,000. Therefore, move the cursor key to the current value, enter [0] and press the [ENT] key. The message will clear and reset.
  6. After replenishing the grease, do not operate the machine right away. Be sure to perform the test run operation so the grease spreads out to ensure smooth operation.
  7. The grease on the X-, Y- and Z-axes has been replenished.
- \* Refer to “4.5.10 Maintenance notice” in Operation Manual I for further details on the maintenance notice function.

## 9.2.3 Compatible Grease

1. Use one of the following 4 greases designated by Brother on the linear guide and ball screw.

Product name	Manufacturer
Multemp LRL3	Kyodo Yushi
Unirex N2	Exxon Mobil
Alvania grease S No.2	Showa Shell Sekiyu
Multinoc grease	JX Nippon Oil & Energy

We recommend using Kyodo Yushi Multitemp LRL3 grease for the ball screw when machining accuracy is a specific requirement.

The machine is lubricated with the same grease at the factory before shipment.

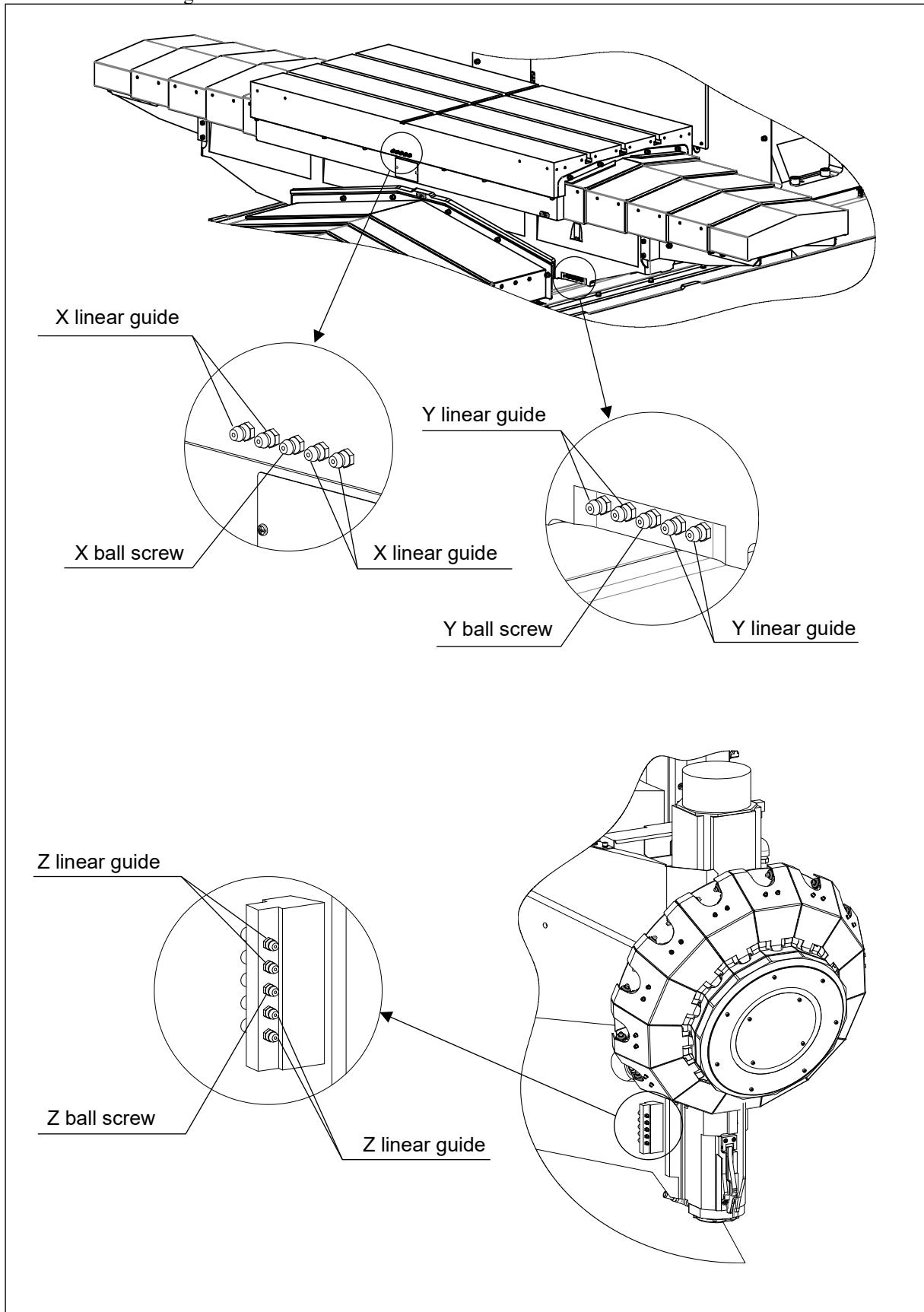
9

(NOTICE) Do not use other greases not designated here, otherwise it can cause failure or malfunction.

## 9.2.4 Greasing Locations

1. Replenishing grease on the X-, Y- and Z-axes  
Open the front door and inject grease.  
Replenishing amount  
Linear guide: 1 to 2 g  
Ball screw: 5 to 6 g

Greasing locations



## 9.3 Key Check

Follow the procedure below to switch to key check mode to perform the key check.

While the EMERGENCY switch is pressed down, press the [RELEASE] key and the [FEED HOLD] switch at the same time and turn ON the power.

The version display will appear on the I/O screen.

In key check mode, all key processing is disabled, and the user can only perform the check based on the key check table. Press the [RST] key to cancel key check mode.

Key check table

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0																
1																
2	L.SP	STEP	JOG	RPD	SP.STOP	SP.CW	P.INDX	ATC	MAG.R	MAG.F	Z.RTN	DRY	M.LCK	SINGL	OP.STP	B.SKIP
3		T(=)	S()	M()	R(K)	Q(J)	P(I)	H(L)	D	F(E)	Z(W)	Y(V)	X(U)	G(C)	N(B)	O(A)
4		_(?)	/(*)	-(+)	.()	O(#)	3	2([])	1([)]	6	5(>)	4(<)	9	8	7	
5			-	+	CHP.F	CLT.P	CURSOR ↓	CURSOR ↑	CURSOR →	CURSOR ←	EOB/ENT	BACK SPACE	DEL	CAN	INS	
6																
7	Home	-4	+4	-Z	+Z	-Y	+Y	-X	+X	SHIFT	RST	EDIT	MEM	MDI	MANU	RELEASE

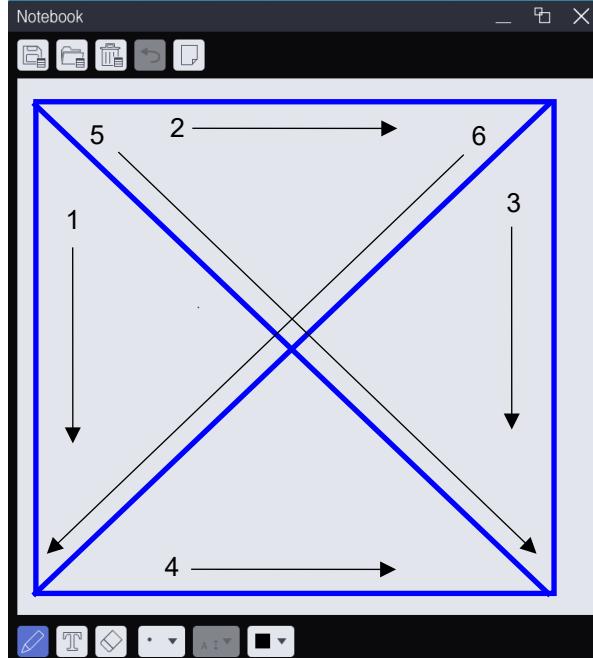
## 9.4 Touch Panel Check

First, select the notebook from the accessories in the sub tools on the bottom of the screen to launch the notebook accessories. Refer to “3.4.3.2 Sub tool keys” in Operation Manual I for further details.

Maximize the graph area, and draw a line as shown in the figure below.

Draw a line slowly (about 10 cm/second).

If the line draws normally (without any breaks), then there is no problem.



## 9.5 Brake Load Test

The description in this chapter is omitted because this product is not equipped with this function.

## 9.6 Periodic Machine Cleaning

### **⚠ WARNING**

If an air blower or similar equipment is used to remove chips or shavings, they may shoot out and get into your eyes.

**[SAFETY INSTRUCTIONS]**

Chips or shavings should not be blown off the machine using an air blower or similar equipment.

### **⚠ WARNING**

If you put any parts of your body inside the machine while the maintenance cover has been removed for setup or maintenance work, you may get caught or drawn into the machine if the machine is operated by mistake.

**[SAFETY INSTRUCTIONS]**

Do not put any part of your body inside the machine while it is operating.

Turn OFF the main power breaker before removing the maintenance cover.

Attach a padlock to the main power breaker so that the power cannot be turned ON.

A sign or notice should be placed near the operation panel of the machine to warn others that work is in progress.

### **⚠ WARNING**

If the door interlock mode is set to machine setup or service mode, the machine will operate even when a door is open, and you may get caught or drawn into the machine.

**[SAFETY INSTRUCTIONS]**

The installer or setup personnel must never leave the machine unattended while the door interlock mode is set to machine setup or service mode.

The key for the [DOOR INTERLOCK MODE] switch should be kept by the supervisor.

### **⚠ WARNING**

If the maintenance cover is removed, coolant coming from inside the machine when it is operating may get into your eyes, or the tools or workpieces may shoot out causing injury.

**[SAFETY INSTRUCTIONS]**

All operators should check to make sure that the maintenance cover is properly attached before turning ON the power.

Attach the maintenance cover after the installation or maintenance work is complete.

The supervisor must attach the maintenance cover.

**⚠️ WARNING**

There are movable parts inside the machine such as the spindle head and table, and your body may get caught on them if you go inside the machine.

**[SAFETY INSTRUCTIONS]**

Do not go inside the machine.

When a worker must unavoidably go inside the machine, always notify the supervisor. After removing the maintenance cover, use a fixing bracket (for transport) to secure the door and/or use a bolt to keep the door open, so as to avoid being trapped inside.

If you go inside the machine, turn OFF the main power breaker, and then attach a padlock to the main power breaker so that the power cannot be turned ON.

The operator should visually check to make sure that there is nobody inside the machine before starting the machine.

A sign or notice should be placed near the operation panel to warn others that work is in progress.

### 9.6.1 Cleaning Inside Telescopic Cover

The telescopic covers protect components such as the ball screws, linear guides and motors from coolant and chips or shavings.

Nevertheless, it is impossible to fully prevent chips or shavings from getting inside the covers. In order to maintain the original performance, it is necessary to clean inside the covers once a month following the procedures given below.

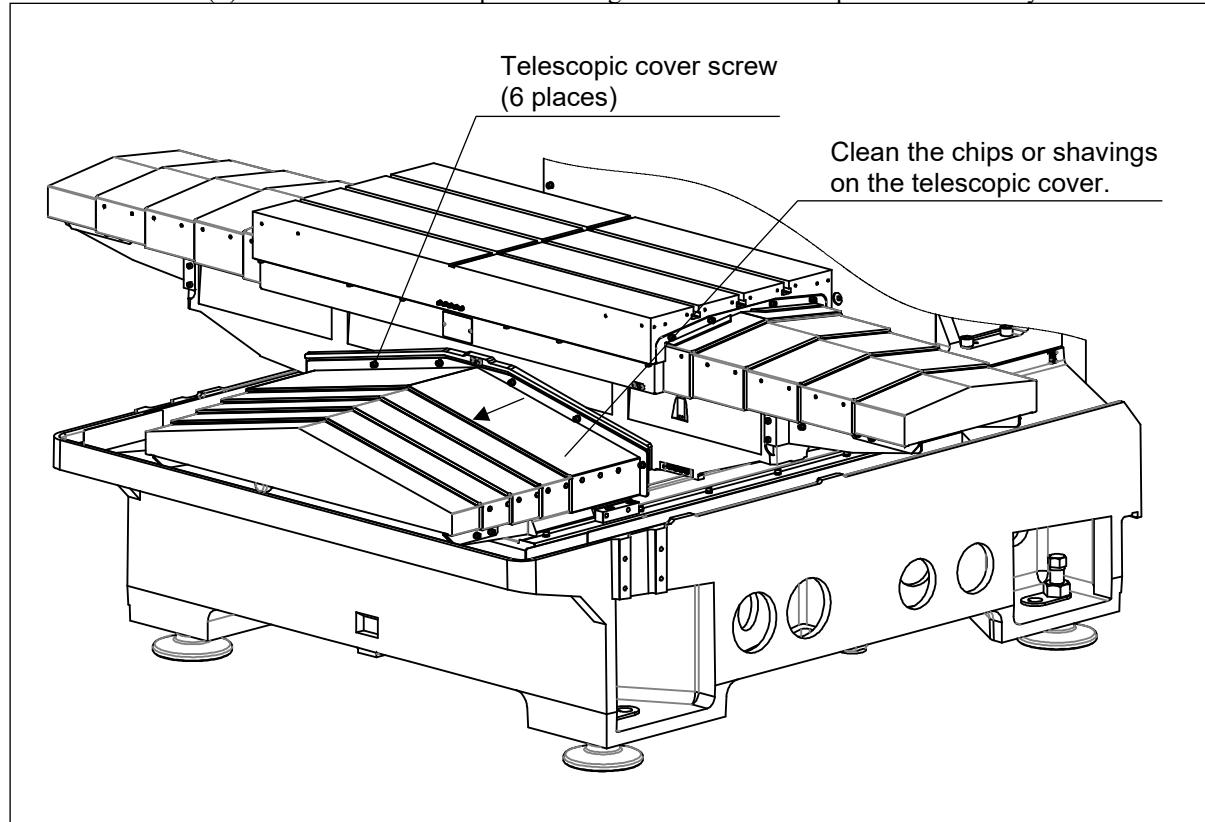
#### (SAFETY INSTRUCTIONS)

**Be sure to turn OFF the power and the breaker when carrying out this work.**

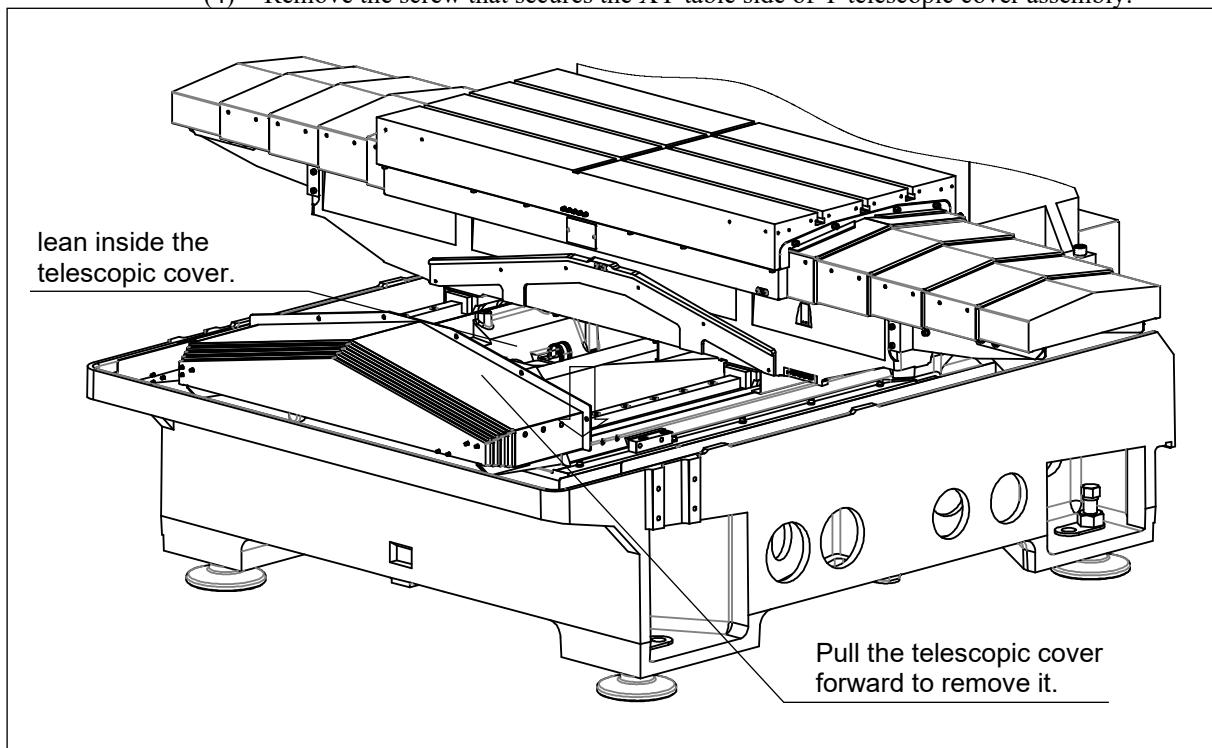
(NOTICE) When cleaning inside the telescopic covers, avoid using devices such as air blowers to scatter the chips and shavings, nor should you use devices, such as a cleaning gun, that might wash away the grease from the ball screws and linear guides. Otherwise, it may cause machine failure or malfunction.

#### 1. Y-axis

- (1) Use manual operation to move the XY table in the Y minus direction (the direction which extends the telescopic cover) up to the end of the stroke.
- (2) Turn OFF the power to the machine.
- (3) Clean off all the chips or shavings from the Y telescopic cover assembly.



- (4) Remove the screw that secures the XY table side of Y telescopic cover assembly.



- (5) Pull the telescopic cover forward to remove it. (Refer to the diagram above)
- (6) Clean out all the chips or shavings from inside the telescopic cover.
- (7) After all workers have moved to a safe location, turn ON the power for the machine.
- (8) Use manual operation to move the XY table to the center ( $Y = -200$ ) and retract the telescopic cover.
- (9) After cleaning is finished, turn OFF the power. (When installing the telescopic cover, install it while it is in a retracted state.)
- (10) Reattach the telescopic cover screws.  
The appropriate tightening torque for the screw is: 11.6 Nm (118 kgf·cm).

## 2. X-axis

Clean following the same procedure as for the Y-axis.

**(NOTICE)** When installing the X telescopic cover assembly, move the XY table to the side for the cover to be installed. Then, install the cover while it is retracted.

## 9.7 Replacing Consumable Parts

### **⚠ WARNING**

If you put any parts of your body inside the machine while the maintenance cover has been removed for setup or maintenance work, you may get caught or drawn into the machine if the machine is operated by mistake.

**[SAFETY INSTRUCTIONS]**

Do not put any part of your body inside the machine while it is operating.

Turn OFF the main power breaker before removing the maintenance cover.

Attach a padlock to the main power breaker so that the power cannot be turned ON.

A sign or notice should be placed near the operation panel of the machine to warn others that work is in progress.

### **⚠ WARNING**

When replacing parts or disconnecting hoses from the coolant equipment, the coolant may shoot out and injure your eyes.

**[SAFETY INSTRUCTIONS]**

Always be sure to wear protective goggles.

Purge all remaining pressure before carrying out such work.

Handle the hoses carefully so that they are not subjected to any impacts.

If coolant gets into your eyes, rinse with clean water and then seek medical advice.

### **⚠ WARNING**

If the door interlock mode is set to machine setup or service mode, the machine will operate even when a door is open, and you may get caught or drawn into the machine.

**[SAFETY INSTRUCTIONS]**

The installer or setup personnel must never leave the machine unattended while the door interlock mode is set to machine setup or service mode.

The key for the [DOOR INTERLOCK MODE] switch should be kept by the supervisor.

### **⚠ WARNING**

If the maintenance cover is removed, coolant coming from inside the machine when it is operating may get into your eyes, or the tools or workpieces may shoot out causing injury.

**[SAFETY INSTRUCTIONS]**

All operators should check to make sure that the maintenance cover is properly attached before turning ON the power.

Attach the maintenance cover after the installation or maintenance work is complete.

The supervisor must attach the maintenance cover.

**⚠ WARNING**

There are movable parts inside the machine such as the spindle head and table, and your body may get caught on them if you go inside the machine.

**[SAFETY INSTRUCTIONS]**

Do not go inside the machine.

When a worker must unavoidably go inside the machine, always notify the supervisor. After removing the maintenance cover, use a fixing bracket (for transport) to secure the door and/or use a bolt to keep the door open, so as to avoid being trapped inside.

If you go inside the machine, turn OFF the main power breaker, and then attach a padlock to the main power breaker so that the power cannot be turned ON.

The operator should visually check to make sure that there is nobody inside the machine before starting the machine.

A sign or notice should be placed near the operation panel to warn others that work is in progress.

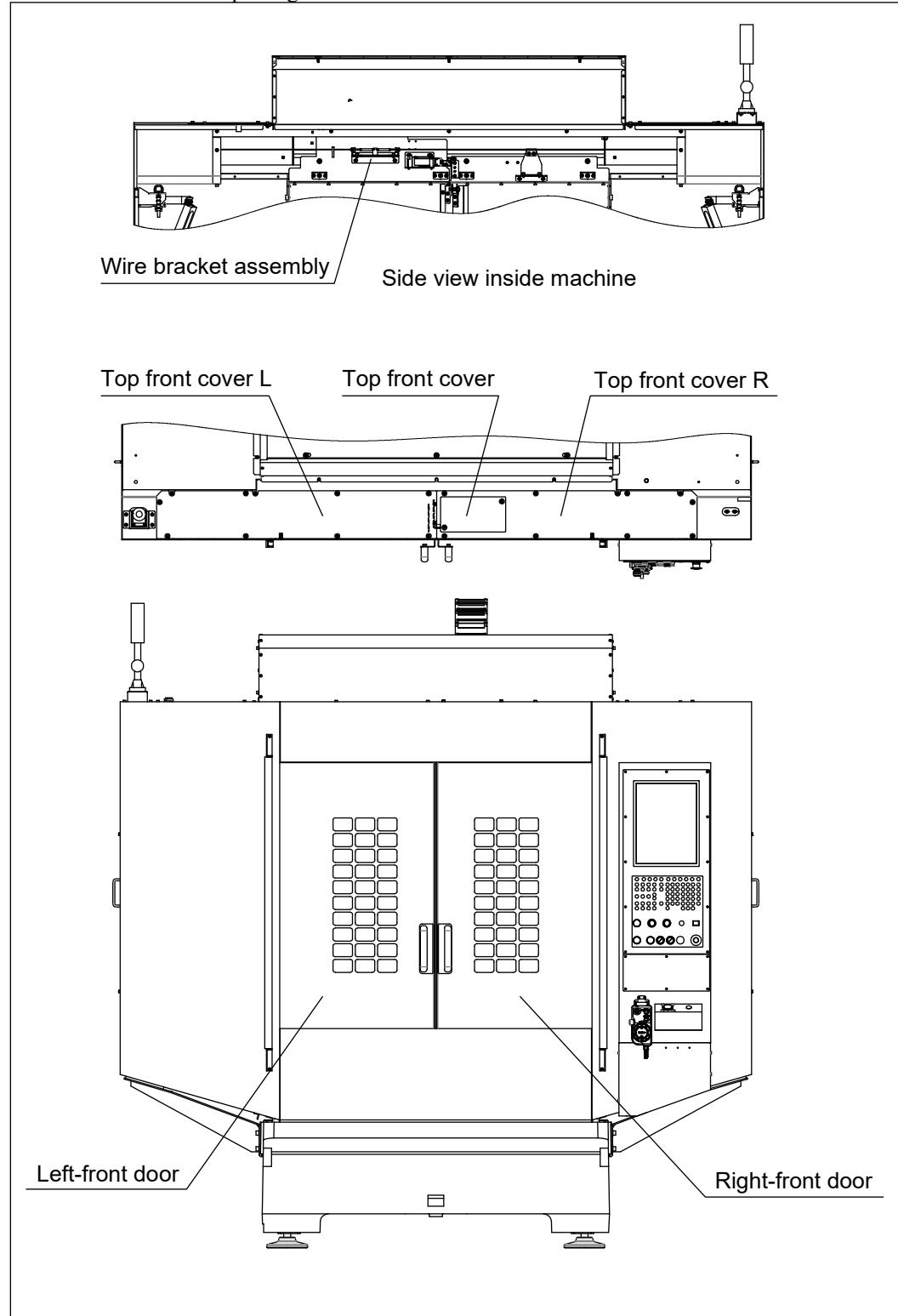
## 9.7.1 Replacing Door Parts

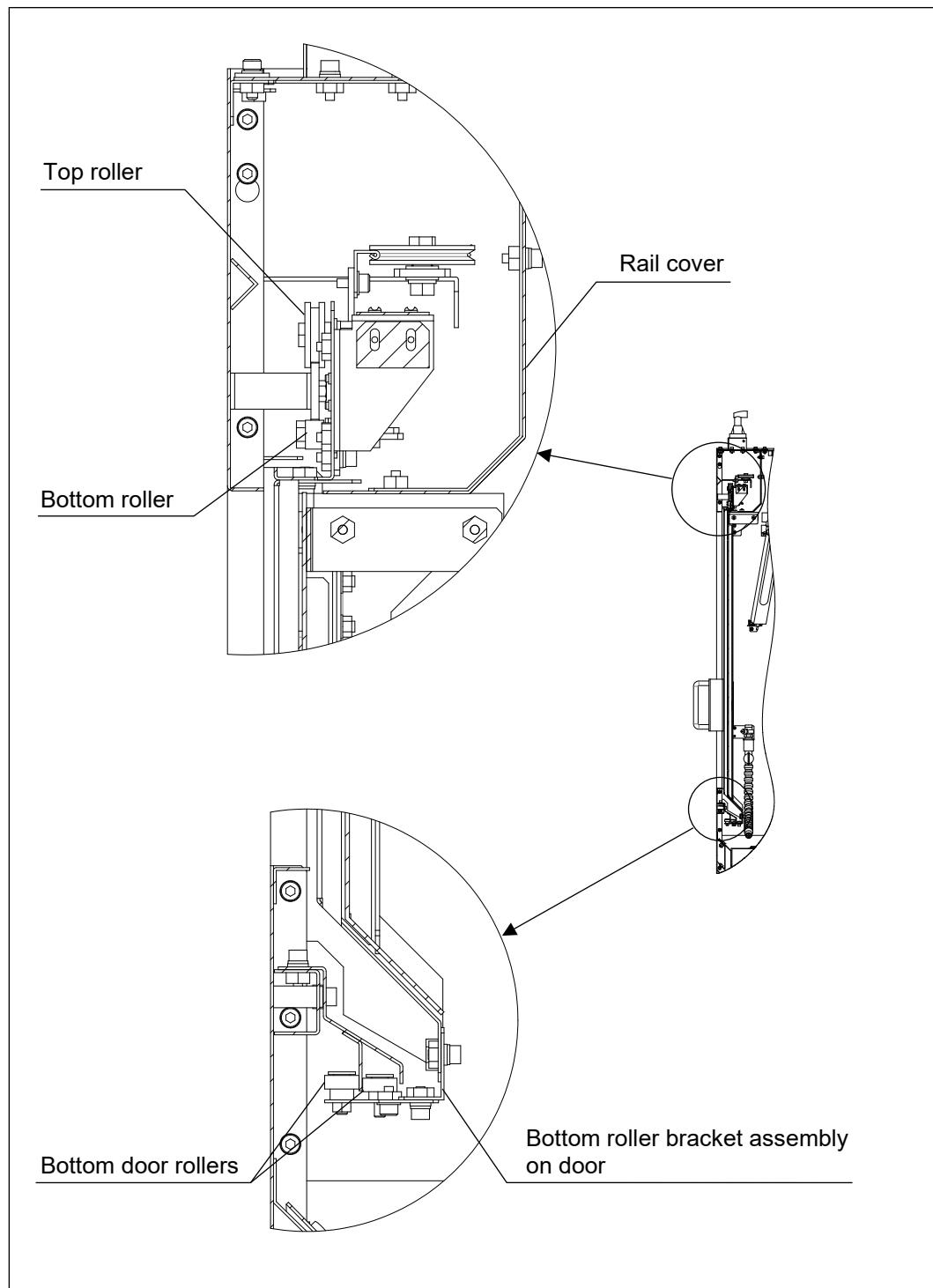
### 9.7.1.1 Replacing Door Rollers

After the machine has been used for a long period of time, the door rollers may become worn and cause the doors to move less smoothly. In this situation, use the following procedure to replace the door rollers.

Front door

1. Turn OFF the power, and set the main power breaker to OFF.
2. Remove the six bolts with washers (M6×16), and then remove the rail cover.
3. Refer to “9.7.1.2 Replacing the door wires” to remove the door wires.





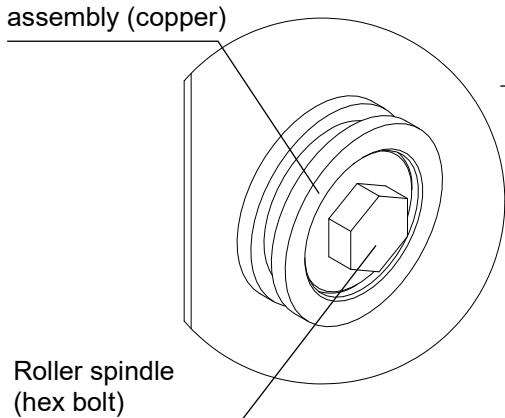
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4. Loosen the bolts with a washer M6×16 and the nuts on the two bottom roller support assemblies out of a total of four door rollers, which are on the top of the right door. Lower the roller support assemblies to the slot on the very bottom.
5. Lift up the right door slightly to disengage the top two rollers from their rails.
6. Remove the bottom left roller and the bottom right roller assemblies from the left and right doors.
7. Remove the left door from the machine in the same way as for the right door.

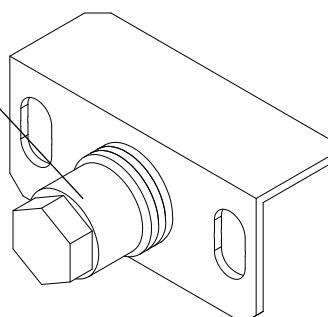
## Chapter 9 Inspection

- After the right and left doors have been removed from the machine, remove the rollers required to replace the top of the right and left doors from their roller spindles (hexagonal bolts). Then, replace them with new rollers. The roller support assemblies will require adjustment, so tighten them just enough so they stay in place.

Door roller S2C assembly (copper)

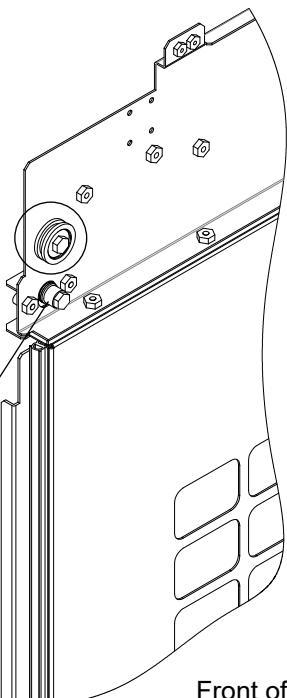


Roller 16 (plastic)



Roller spindle (hex bolt)

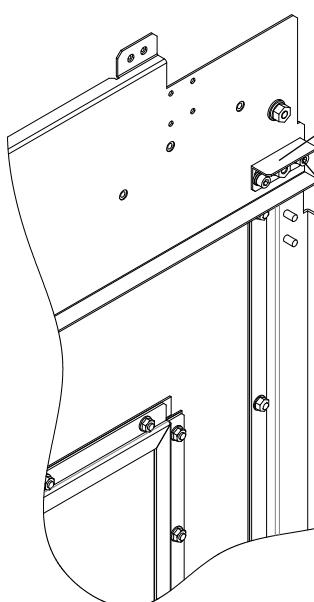
9  
Roller 16 (plastic)



Front of door

Roller support assembly

M6×16



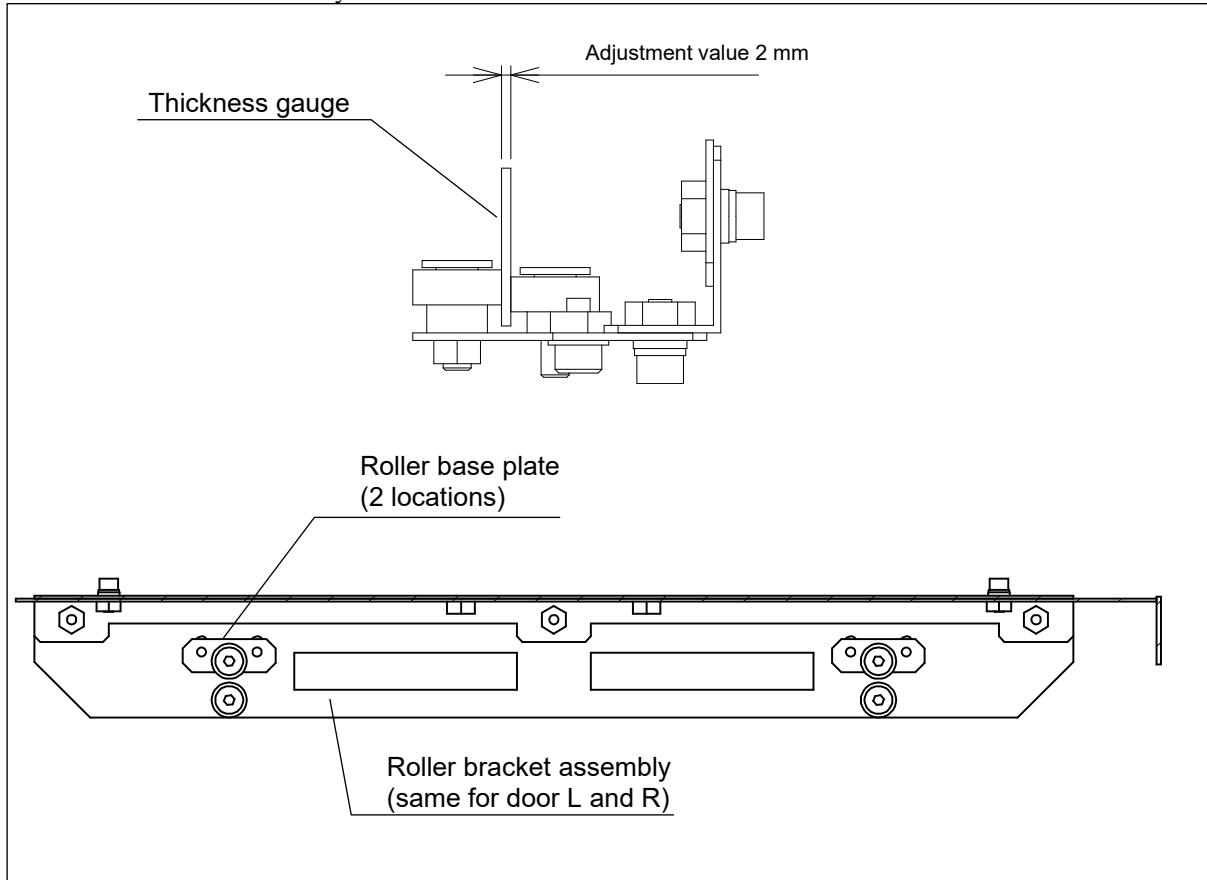
Back of door

- Replace the eight rollers at the bottom of the doors.

When replacing the door rollers, replace the rollers without loosening the bolts (Qty.2) that secure the roller base plate.

If the bolts (Qty.2) that secure the roller base plate need to be loosened to replace the door rollers, the clearance between the rollers needs to be adjusted.

\* When adjusting the clearance between the rollers, use the thickness gauge or similar instrument to measure between the rollers, and then use the two bolts to secure the roller base plate. (Shown in figure) After adjusting the clearance, attach the roller bracket assembly.



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- Reinstall the right and left doors by following the above procedure in reverse. The bottom rollers on the top of the right and left doors are tightened into slots. Gently push the bottom rollers against the rail and tighten them.

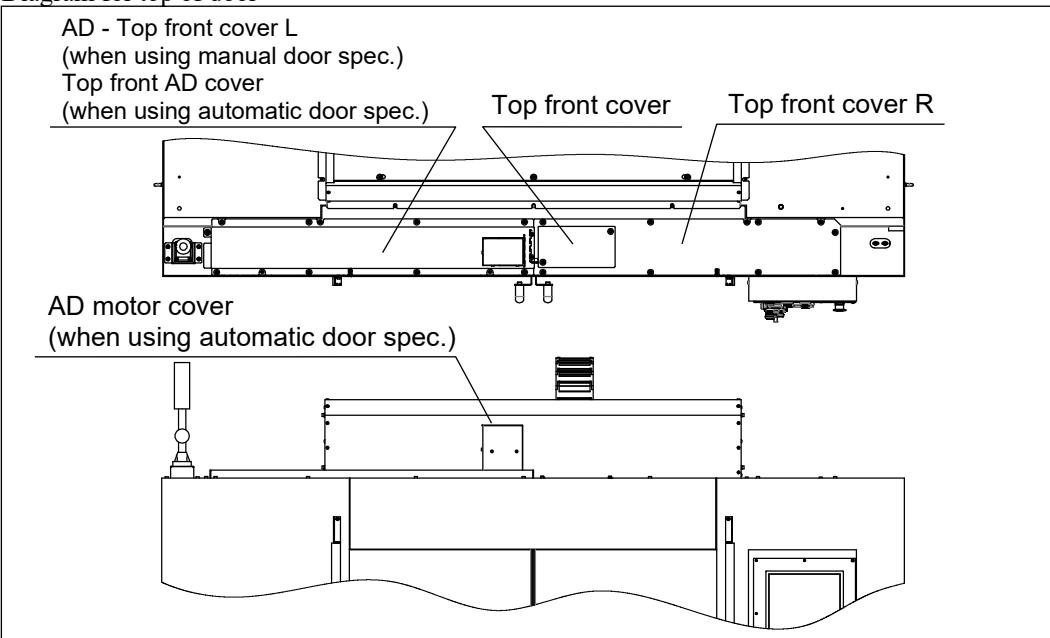
Refer to “9.7.1.2 Replacing the door wires” to reinstall the door wires.

After installation is complete, make sure that the doors move smoothly.

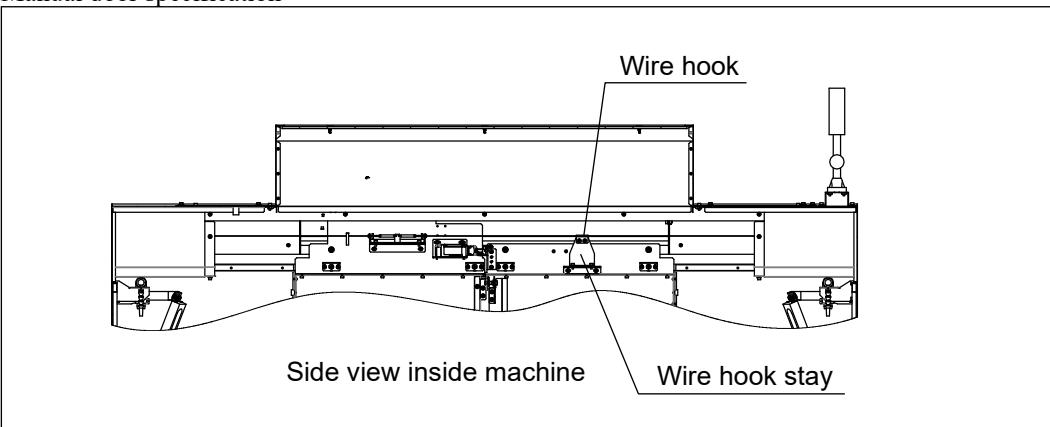
- Finally, attach the rail cover and the top right, left covers on the front door

### 9.7.1.2 Replacing Door Wires

Diagram for top of door

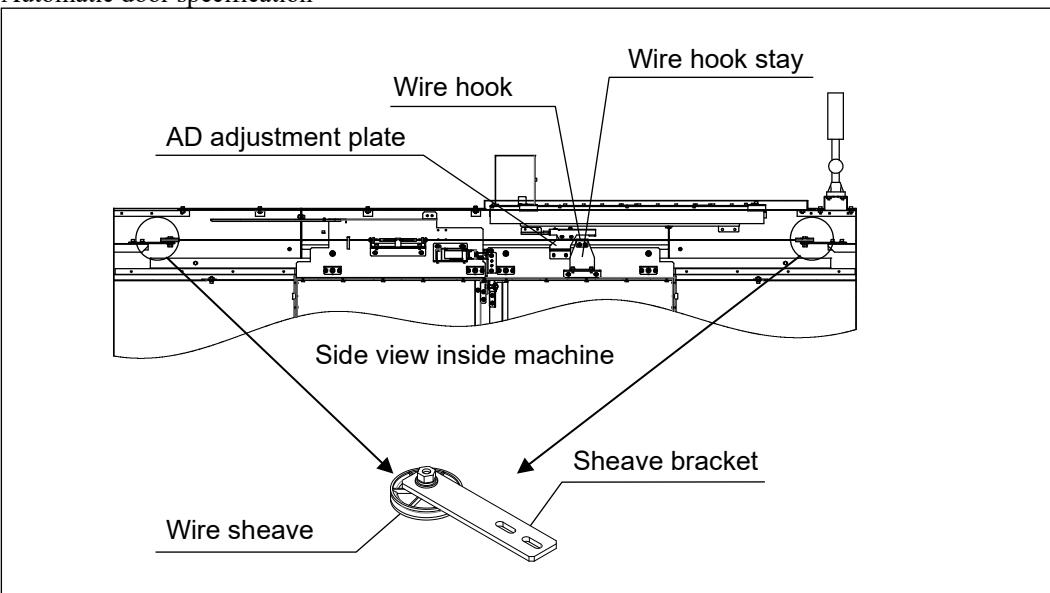


Manual door specification

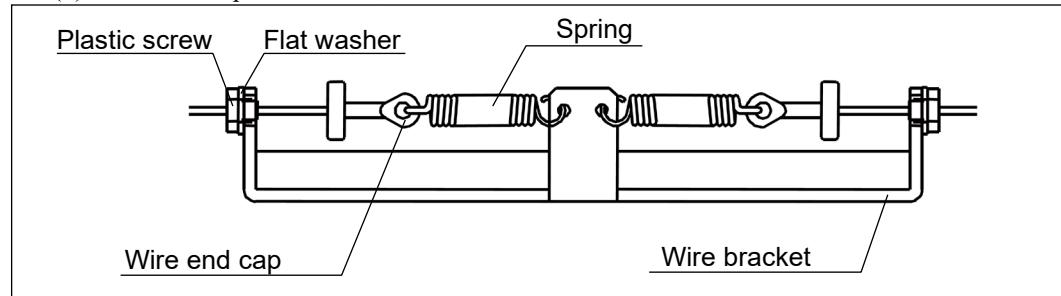


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Automatic door specification

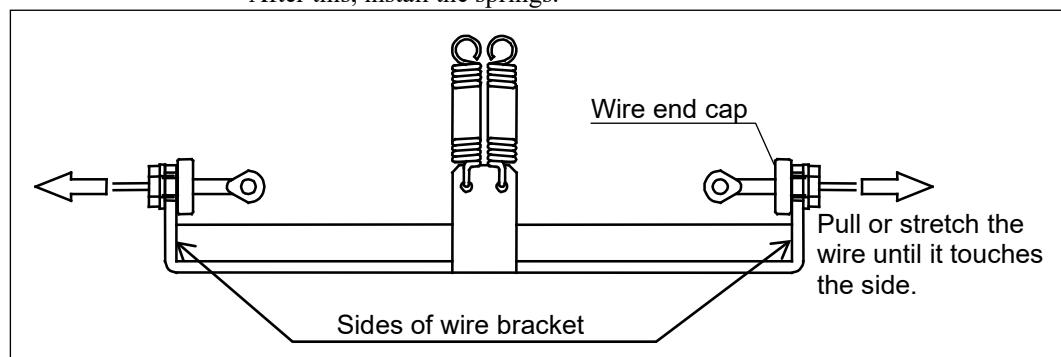


1. Removing the door wires
  - (1) Remove the six bolts with washers ( $M6 \times 16$ ), and then remove the rail cover.
  - (2) Remove the wire hook stay (AD fitting) and the 2 hexagonal slotted bolts ( $M6 \times 12$ ) which secure the wire hooks. Then, detach the wire from the door.
  - (3) Loosen the 4 hexagonal slotted bolts ( $M6 \times 12$ ) which secure the sheave bracket, and then slide the wire sheaves at both ends toward the inside.
  - (4) Remove the hook at the wire end of the spring from the wire end cap.
  - (5) Remove the wires from the wire sheaves.
  - (6) Remove the plastic screws, and then remove the wires from the wire bracket.



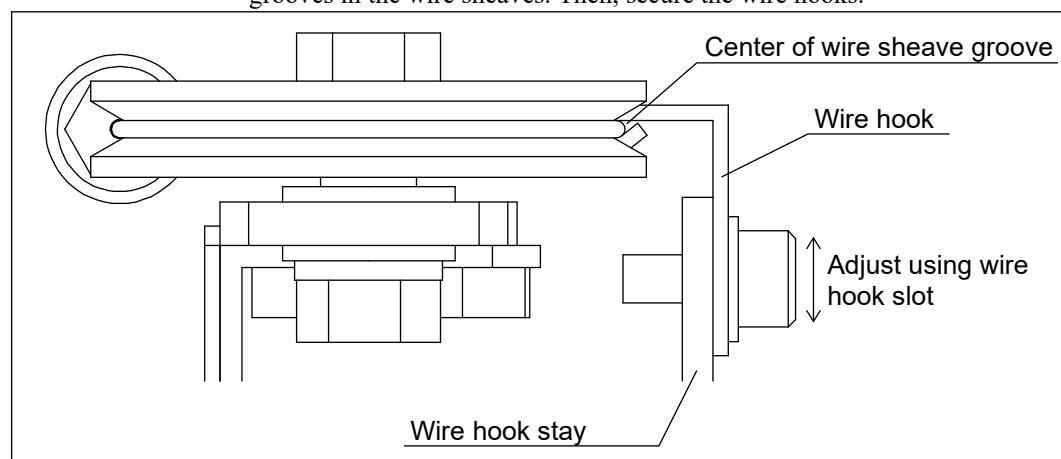
2. Installing the door wires
  - (1) Install the door wires by following the removal procedure in reverse, while taking note of the following.

(NOTE 1) When securing the sheave brackets, hook the wires onto the sheaves and slide the wire sheaves toward the outside. Next, use the slots in the sheave brackets to adjust it so that the wires are stretched to their maximum (stretched so that the wire end caps are touching the sides of the wire bracket as shown in the diagram below). Then, secure the wire sheaves. After this, install the springs.



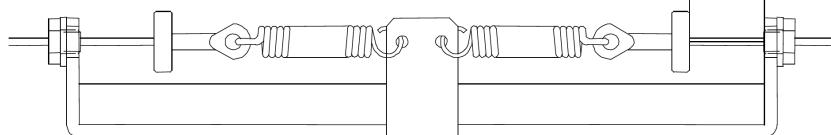
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(NOTE 2) When installing the wire hooks to the wire hook stays, use the slots in the wire hooks to adjust it so that the centers of the wires are aligned with the grooves in the wire sheaves. Then, secure the wire hooks.



(NOTE 3) After installing the springs, make sure that there is a gap of 2 to 4 mm between the wire end caps and the sides of the wire bracket. If the gaps are in between 2 to 4 mm, refer to Note 1 above to adjust the slots in the wire hooks to stretch the wires once again.

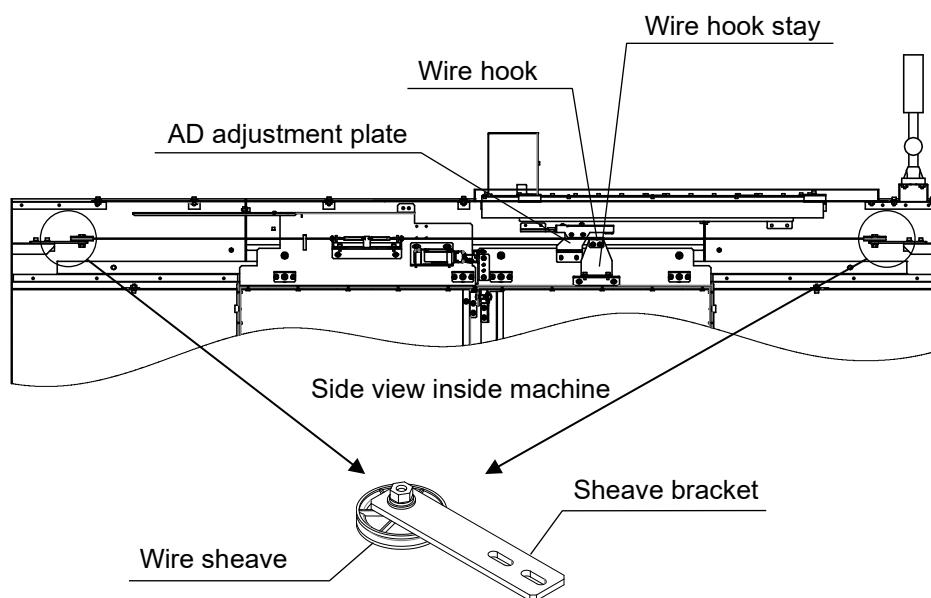
Make sure that the gap is between 2 to 4 mm



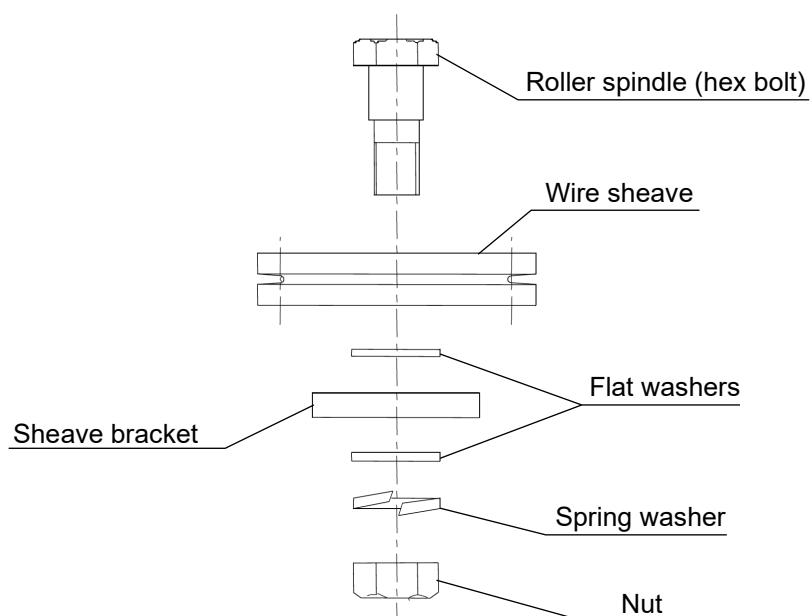
(2) After installation is complete, make sure that the doors move smoothly.

### 9.7.1.3 Replacing Wire Sheaves

#### 1. Removing the wire sheaves



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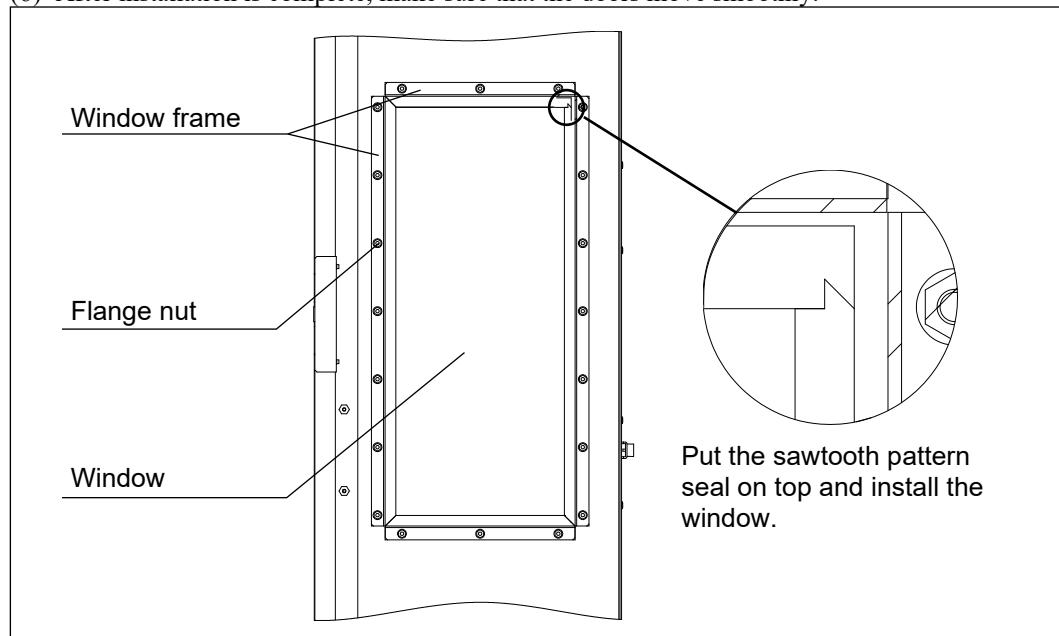


- (1) Refer to “1. Removing the door wires” in section “9.7.1.2 Replacing the door wires” to remove the door wires.
  - (2) Remove the bolts with washers (M6×16), and then remove the left and right sheave brackets.
  - (3) Pull off the sheaves from the roller spindles to remove them from both sheave brackets. Then, replace them with new sheaves.
2. Installing wire sheaves
    - (1) Follow the removal procedure in reverse to install the wire sheaves.
    - (2) Refer to “2. Installing the door wires” in section “9.7.1.2 Replacing the door wires” to install the door wires.
    - (3) After installation is complete, make sure that the doors move smoothly.

#### 9.7.1.4 Replace window

If you find a problem such as a crack, damage, deformation or discoloration, replace the window right away.

- (1) Turn OFF the power, and set the main power breaker to OFF.
- (2) Remove the flange nut.
- (3) Remove the window and the window frame.
- (4) Check the top and bottom of the new window, and install the window and the window frame.
- (5) Tighten the flange nut to secure the window. The tightening torque is: 5.78 Nm (59 kgf·cm).
- (6) After installation is complete, make sure that the doors move smoothly.

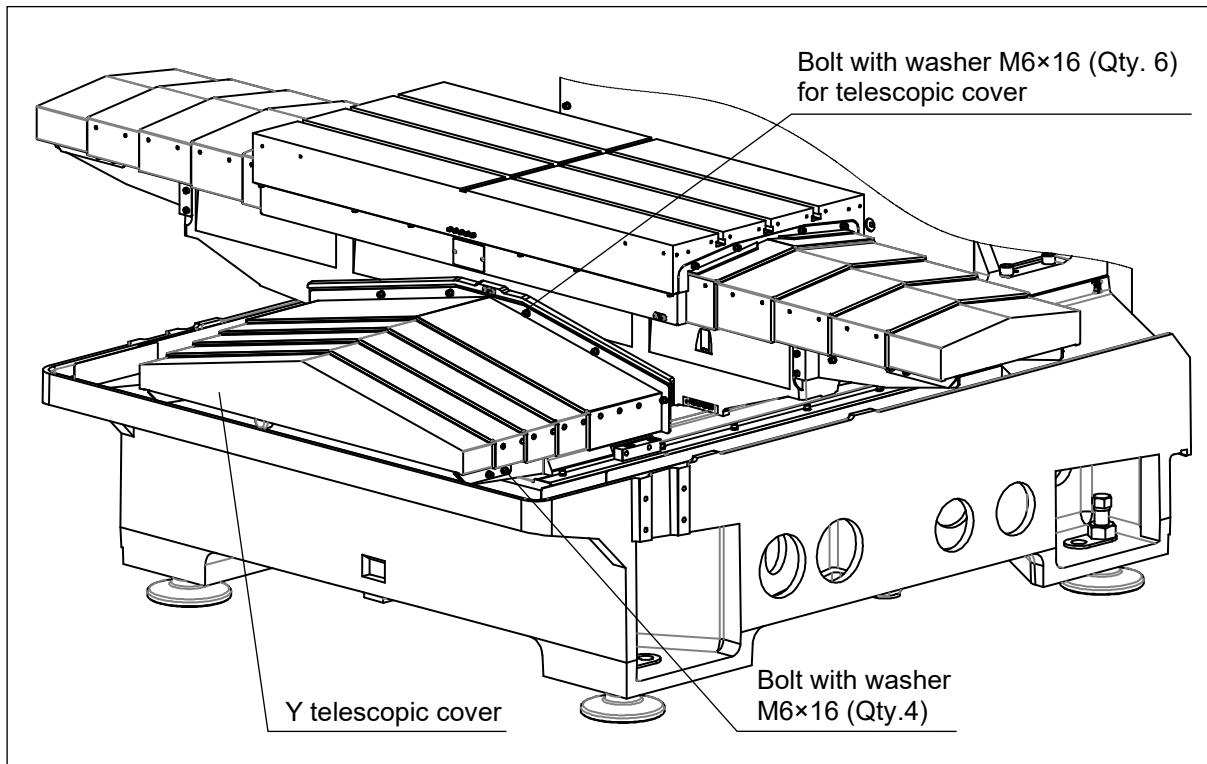


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#### 9.7.2 Replacing Telescopic Covers

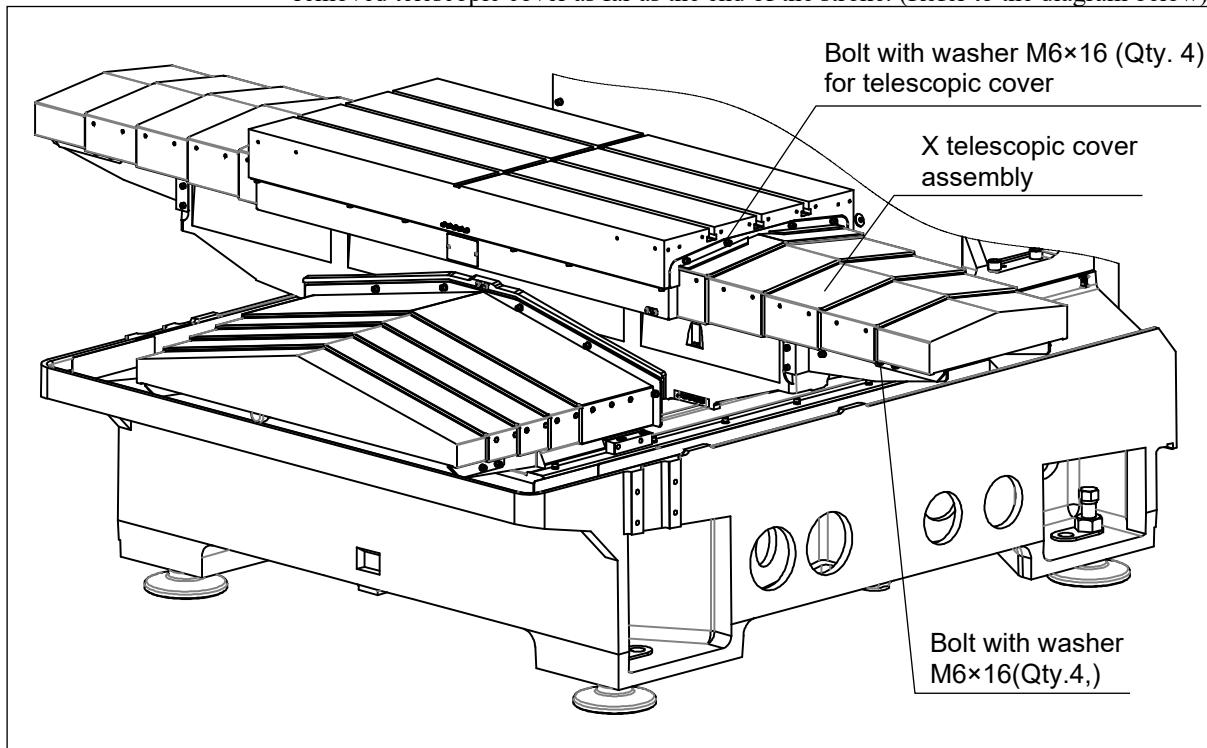
When replacing the telescopic covers, it is recommended that you clean inside the telescopic covers at the same time (Refer to “2. Cleaning the telescopic covers”).

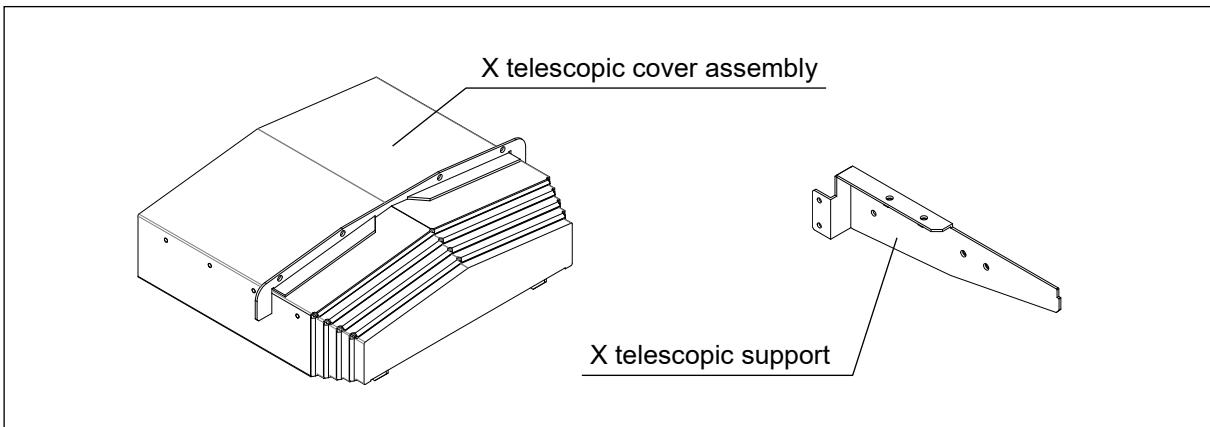
1. Removing the telescopic covers
  - 1-1 Y-axis
    - (1) Use manual operation to move the XY table in the Y minus direction (the direction which extends the telescopic cover) up to the end of the stroke.
    - (2) Turn OFF the power and the breaker.
    - (3) Remove the 4 bolts with washers (M6×16) which secure the XY table side of the Y telescopic cover assembly.
    - (4) Remove the bolts with washers (M6×16) which secure the Y telescopic cover assembly on the side.
    - (5) Retract the Y telescopic cover assembly and lift it up to remove.



1-2 X-axis

- (1) Use manual operation to move the XY table in the direction which would extend the removed telescopic cover as far as the end of the stroke. (Refer to the diagram below)





- (2) Turn OFF the power and the breaker.
  - (3) Remove the bolts with washers (M6×16) which secure the XY table side of the telescopic cover assembly.
  - (4) Remove the bolts with washers (M6×16) which secure the telescopic cover on the side.
  - (5) Retract the telescopic cover and lift it up to remove.
2. Cleaning the telescopic covers  
Use a cloth or rag to wipe down the telescopic covers that were removed.
3. Installing the telescopic covers
- 3-1 Y-axis
- (1) Install the new telescopic cover on the side to the telescopic support using the bolts with washers (M6×16).
  - (2) Turn ON the power. Then, use manual operation to move the XY table to the side of the telescopic over where you wish to install so that the telescopic cover is retracted.
  - (3) Turn OFF the power.
  - (4) Secure the middle table side with the bolts.  
(Tightening torque for bolts with washers (M6×16): 11.6 Nm (118 kgf·cm))
  - (5) Make sure that the telescopic cover moves smoothly.
- 3-2 X-axis
- (1) Install the telescopic cover on the side to the telescopic support using the bolts with washers (M6×16).
  - (2) Turn ON the power. Then, use manual operation to move the XY table to the side of the telescopic over where you wish to install so that the telescopic cover is retracted.
  - (3) Turn OFF the power.
  - (4) Secure the XY table side with the bolts.  
(Tightening torque for bolts with washers (M6×16): 11.6 Nm (118 kgf·cm))
  - (5) Make sure that the telescopic cover moves smoothly.
4. Final step
- After all the telescopic covers have been installed, make sure that no tools or any other items have been left inside the machine.
  - While standing in a safe position, turn ON the power.
  - Use manual operation to move the XY table to check the telescopic covers.
  - If you notice any abnormal noise or operation, check the installation of the telescopic covers again.

### 9.7.3 Wiper Replacement on the Telescopic Covers

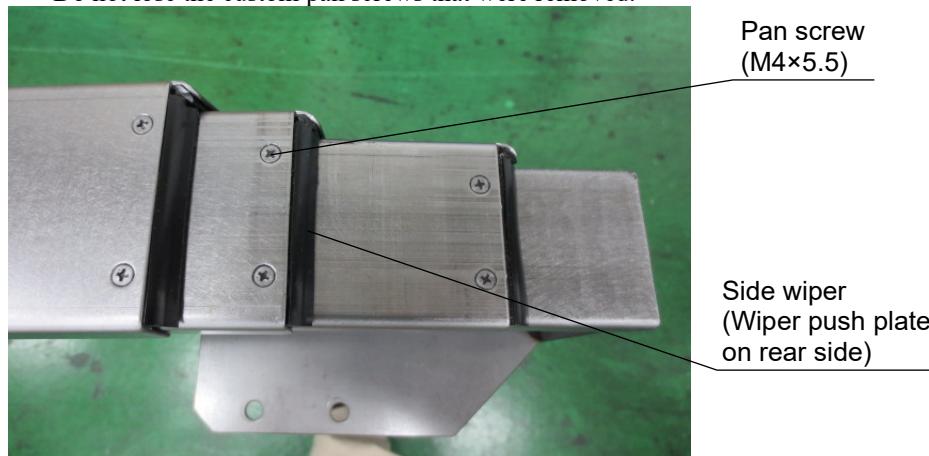
If the wiper for the telescopic cover comes loose or becomes damaged, or if you hear a collision sound like metal parts colliding during the telescopic cover operation, the wiper should be replaced immediately by following the procedure given below.

#### 1. X-axis

##### Replacement procedure

- (1) Remove the telescopic cover from the machine. Remove the telescopic cover from the machine. Refer to “3. Removing the telescopic covers” in the section “9.7.2 Replacing telescopic covers” for further details on removal.
- (2) Disassemble the telescopic cover piece by piece.
  - Turn the removed telescopic cover upside down.
  - Remove the pan screws ( $M4 \times 5.5$ ) for securing the wiper on the side at the level where the wiper is being replaced.

Do not lose the custom pan screws that were removed.



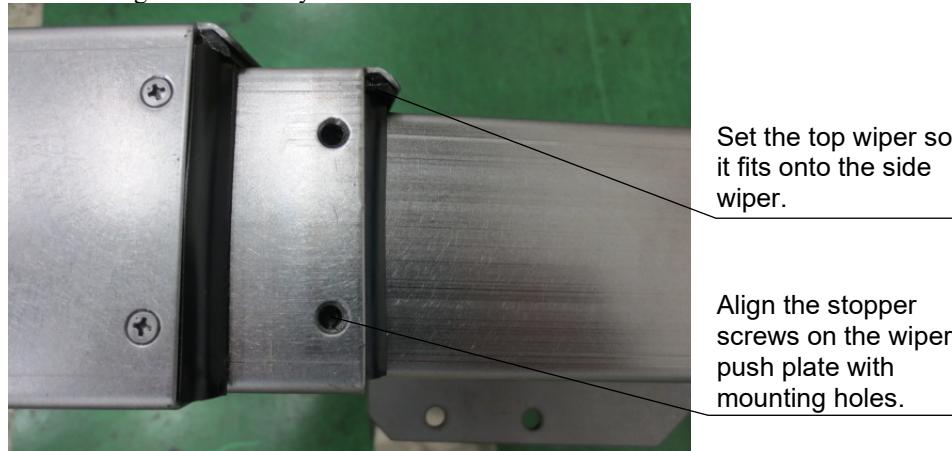
- Remove the side wiper and the wiper push plate.
- Pull the inside part of the telescopic cover out from the outside part of the telescopic cover.

- (3) Pull the top wiper, being replaced, from the end to remove. There are no screws.



- (4) Fit a new top wiper on, starting from the end and pressing it in as you attach it. Be sure to use the right length because the wiper length is different for each level. Make sure that the wiper is fitted securely onto the groove.
- (5) Fit the inside part of the telescopic cover onto the outside part of the telescopic cover. Since the wipers have a stroke margin, make sure that the wipers do not get caught when installing them.

- (6) Insert the new side wiper and the wiper push plate into the side of the telescopic cover. The side wiper and wipe push plate are the same for the left and right sides, but be careful with the length because they are different at each level.



- (7) Use the pan screws ( $M4 \times 5.5$ ) that were removed to secure the side wiper.  
The tightening torque is:  $1.0 \pm 0.2$  Nm.
- (8) In order to break-in the wipers, apply Alvania grease to the sliding surfaces of the telescopic cover.
- (9) Refer to “3. Installing telescopic covers” in the section “9.7.2 Replacing telescopic covers” for further details when installing the telescopic covers.

2. Y-axis

Replace the wiper following the same procedure for the X-axis.

3. Final step

- After all the telescopic covers have been installed, make sure that no tools or any other items have been left inside the machine.
- While standing in a safe position, turn ON the power.
- Use manual operation to move the XY table to check the operation of the telescopic covers.
- If you notice any abnormal noise or operation, check the installation of the telescopic covers again.

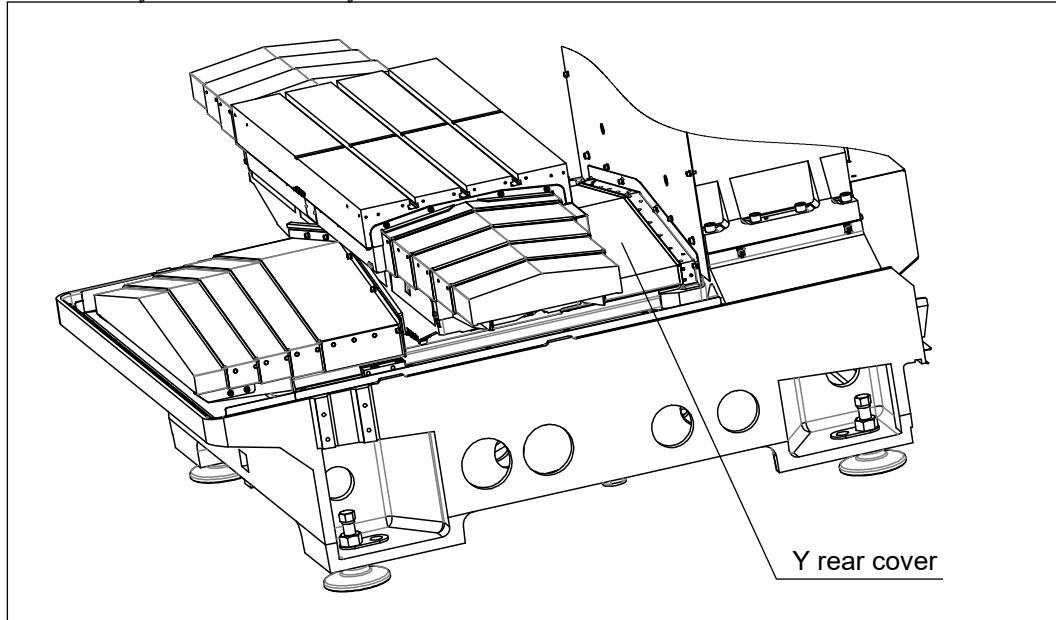
### 9.7.4 Replacing the Y Rear Cover Assembly

After the machine has been used for a long period of time, the Y rear cover assembly may become worn and make an abnormal noise or move less smoothly. If you notice that the cover is worn when cleaning inside it, replace the Y rear cover assembly by following the procedure given below.

#### Replacement procedure

- (1) Use manual operation to move the XY table in the Y plus direction (toward the front doors) until the end of the stroke.
- (2) Turn OFF the power and the breaker.
- (3) Remove the Y rear cover assembly.
- (4) Install the new Y rear cover assembly.  
At this time, tighten the bolts gently to secure the XY table and column sides so that they will not move.
- (5) Turn ON the power and the breaker. Then, use manual operation to move the XY table in the Y minus direction to the -350 position.
- (6) Turn OFF the power and the breaker.
- (7) Tighten the bolts to secure the XY table and column sides so that they will not move.  
XY table side: Hexagonal slotted bolt (M6×12) tightening torque 11.6 Nm (118 kgf·cm)  
Column side: Bolt with washer (M6×12) tightening torque 11.6 Nm (118 kgf·cm)
- (8) Turn ON the power. Then, use manual operation to move the XY table in the Y-axis direction and make sure that it does not make any abnormal noise. If it makes an abnormal noise, turn OFF the power and the breaker. Then, adjust the installation positions for the Y rear cover assembly and the Y rear stay.

9



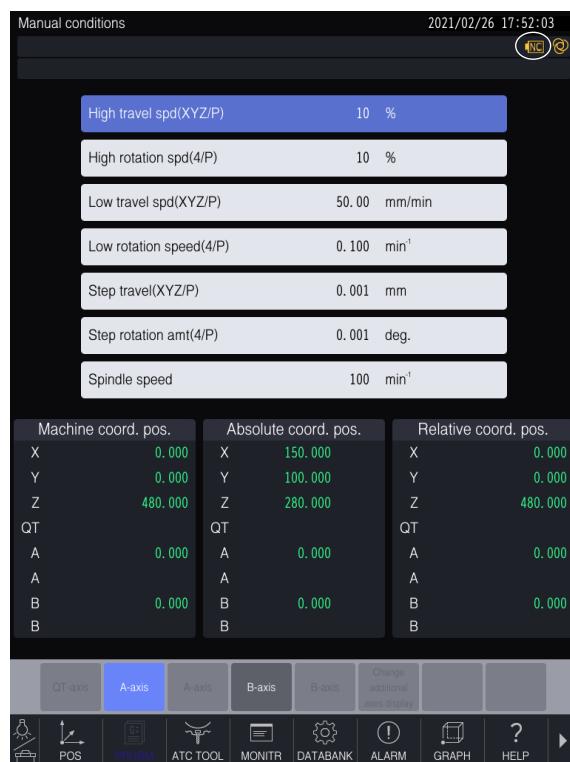
## 9.7.5 Battery Replacement

### 9.7.5.1 Battery alarm on clock function

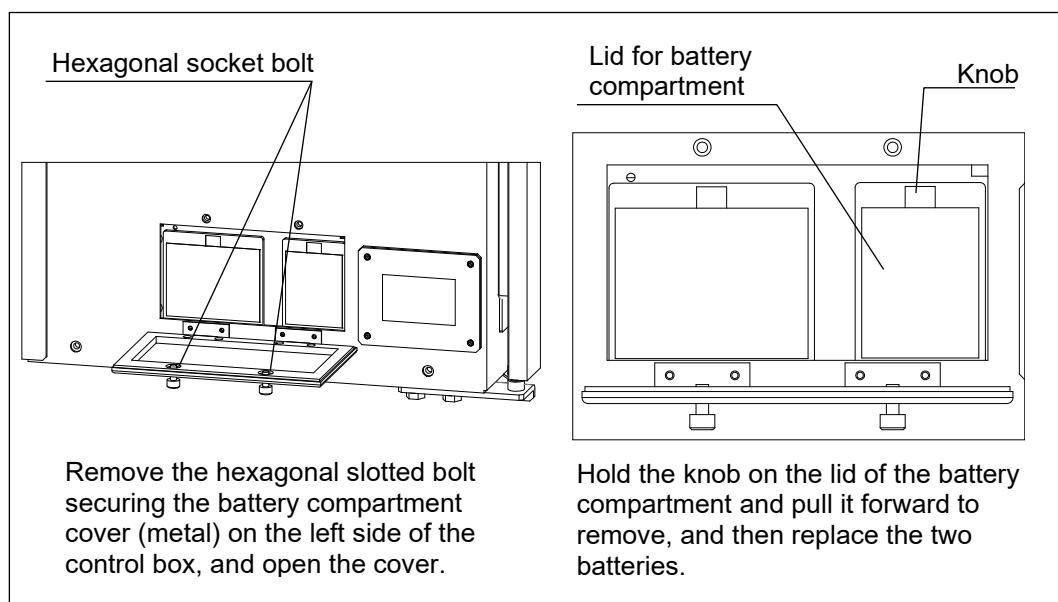
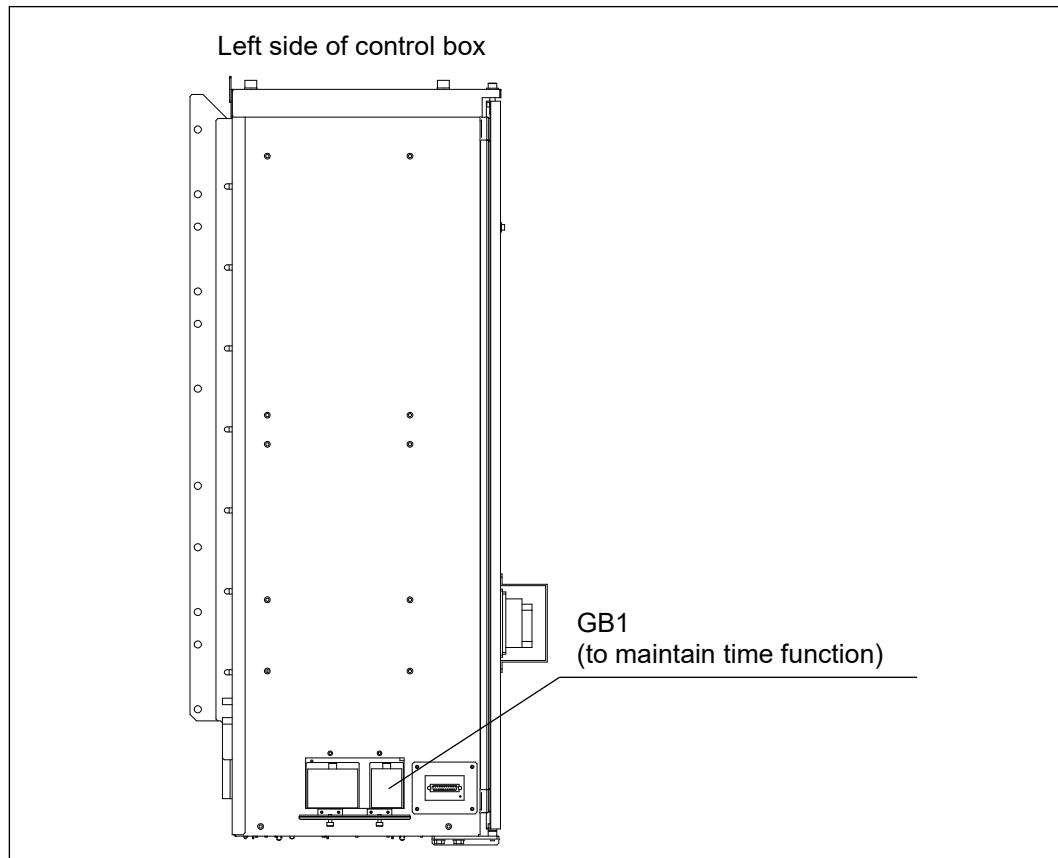
This machine uses batteries to maintain the clock function. When the voltage of the batteries becomes low, the battery alarm indicator appears in the top-right corner of the screen as shown below. If this indicator appears, the batteries must be replaced.

Use the following batteries.

#### 1.5 V AA-size alkaline batteries



- The battery alarm indicator NC appears.  
Replace the two batteries for GB1 (batteries for clock function).



- (NOTICE) Leave the [POWER] switch ON when replacing the batteries. Always be sure to insert the batteries so that they face in the directions indicated on the lid of the battery compartment. If the power is OFF when the batteries are replaced, the set time will be erased. After replacing the batteries, close the lid of the battery compartment. Also, close the battery compartment cover (metal) and secure it with the hexagonal slotted bolt. This is to prevent oil mist from getting inside. After replacing the batteries, press the [RST] key to clear the battery alarm icon.

### 9.7.5.2 Battery Alarm for Relocation Detection Device

**Always leave the machine's [POWER] switch ON when replacing the batteries for the relocation detection device. If the batteries are replaced for the relocation detection device while the machine's [POWER] switch is turned OFF, operation is disabled temporarily (the same as when the alarm <<Relocation was detected>> triggers and relocation is detected) until a worker designated by Brother performs the reset procedure.**

On machines equipped with a relocation detection device, the device is powered by batteries. If the voltage for the relocation detection device batteries drops, the alarm <<Change batteries on relocat. detect. device with power ON>> is triggered. When this alarm is triggered, replace the batteries right away.

Note, the OM (BX11F) for the PLC function can be used to monitor whether the alarm <<Change batteries on relocat. detect. device with power ON>> is triggered or not.

Use the following batteries.

1.5 V AA-size alkaline batteries – Qty.4

(NOTICE) If the alarm <<Change batteries on relocat. detect. device with power ON>> is triggered, replace the batteries right away. In addition, when the voltage drops, operation is disabled temporarily (the same as when the alarm <<Relocation was detected>> triggers and relocation is detected) until a worker designated by Brother performs the reset procedure.

#### 1. Periodic battery replacement message

The operator message <<Scheduled notice to change relocat. detect. device batteries>> appears and prompts the user to replace the batteries once a certain time period has elapsed after replacing the batteries.

In addition, once a certain time period has elapsed after the operator message <<Scheduled notice to change relocat. detect. device batteries>> appears, the alarm <<Scheduled replacement of relocat. detect. device batteries>> is triggered and operation is disabled until the batteries are replaced.

(NOTICE) If the operator message <<Scheduled notice to change relocat. detect. device batteries>> appears or if the alarm <<Scheduled replacement of relocat. detect. device batteries>> is triggered, replace the batteries right away.

9

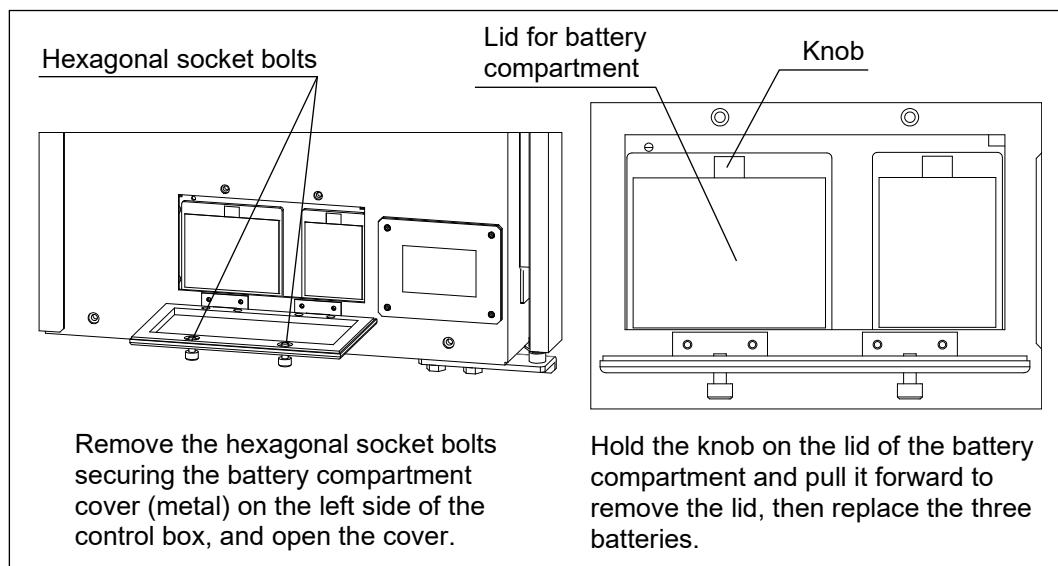
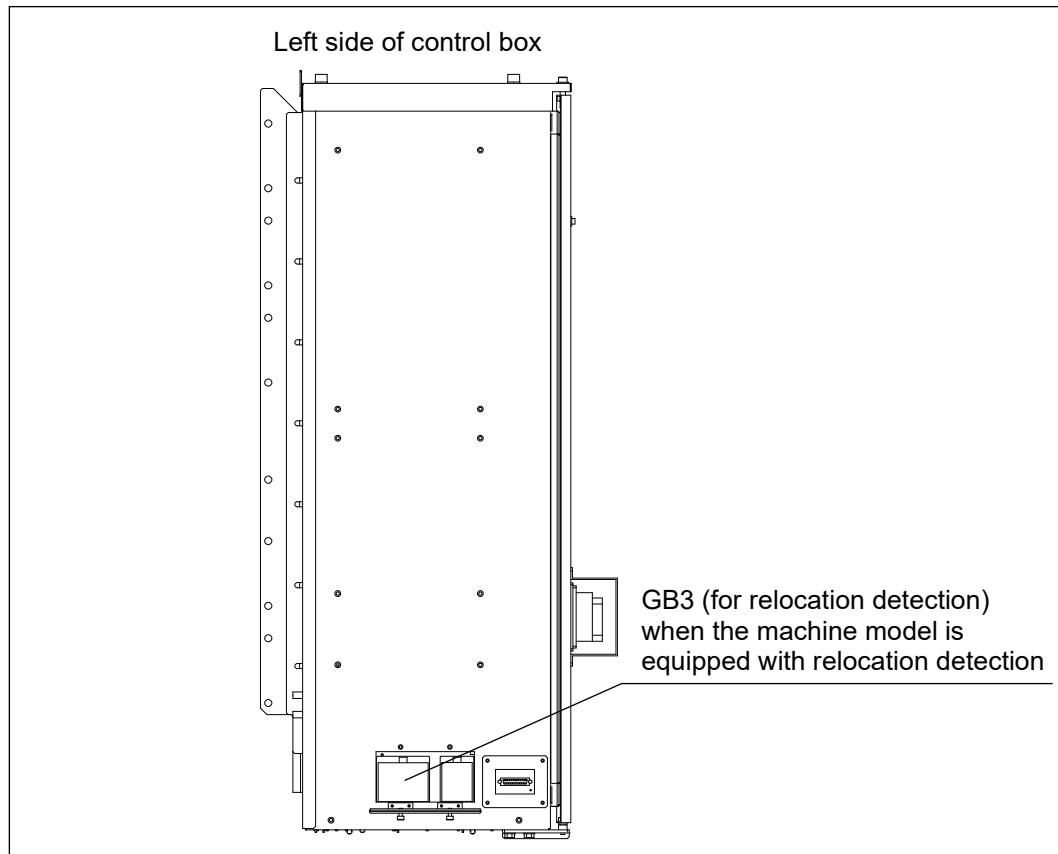
After the batteries are replaced, the current number of days that have elapsed is displayed in the <Batteries on relocation detection device> on the <Running counters> screen.

After the batteries are replaced, the <Batteries on relocation detection device> resets to 0.

#### 2. Battery replacement procedure

For battery replacement, follow the procedure below to replace the batteries for the relocation detection device.

- (1) Leave the [POWER] switch turned ON, and remove all the batteries for the relocation detection device.
- (2) Check if the alarm <<Change batteries on relocat. detect. device with power ON>> triggers.
- (3) Install new batteries for the relocation detection device.
- (4) Press the [RST] key and check if the alarm <<Change batteries on relocat. detect. device with power ON>> resets.



9

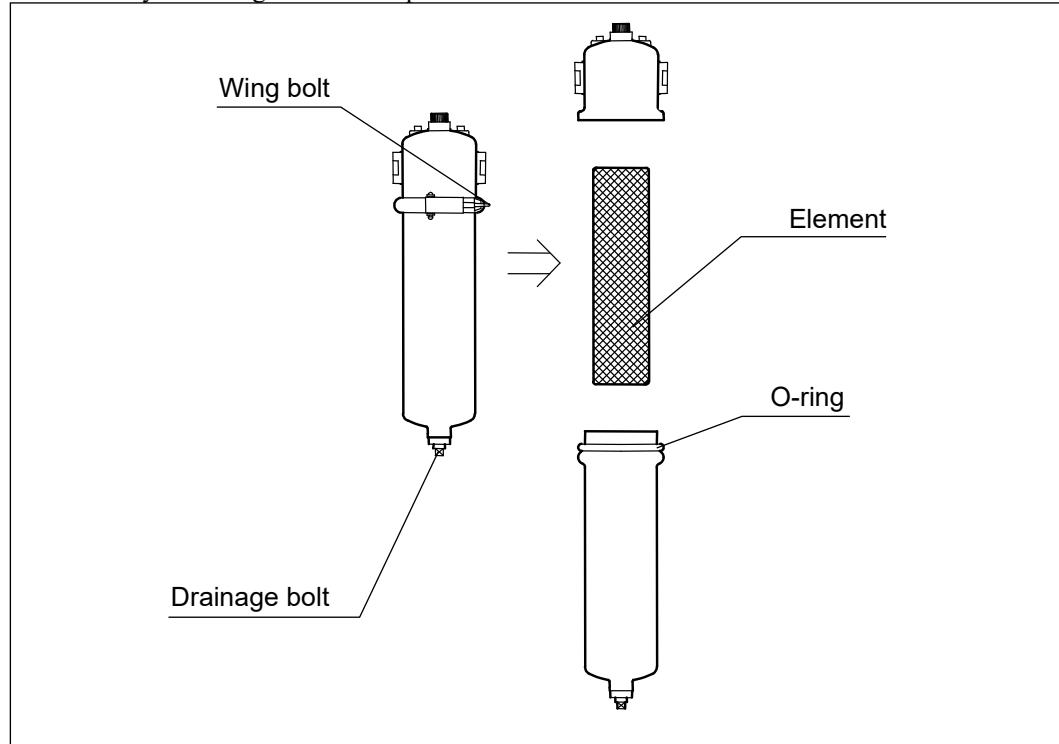
(NOTICE 1) When new batteries are installed in step 3 without checking if the alarm <<Change batteries on relocat. detect. device with power ON>> has triggered in step 2, the new batteries will not be recognized. Even after executing step 4, the operator message <<Scheduled notice to change relocat. detect. device batteries>> may still appear, or the alarm <<Scheduled replacement of relocat. detect. device batteries>> may still trigger. Always check if the alarm in step 2 <<Change batteries on relocat. detect. device with power ON>> triggers.

(NOTICE 2) Always be sure to insert the batteries so that they face in the directions indicated on the lid of the battery compartment. After replacing the batteries, close the lid of the battery compartment. Also, close the battery compartment cover (metal) and secure it with the hexagonal socket bolts in order to prevent oil mist from getting inside.

(NOTE) Use new batteries to replace all the batteries inside the battery compartment on the relocation detection device.

### 9.7.6 Replacing Tool Cleaning Filter Element

1. Turn OFF the power to the machine.
2. Loosen the drainage bolt on the line filter and drain the coolant.
3. Loosen the wing bolt, and then remove the bottom of the filter.
4. Replace the element.
5. Install by following the removal procedure in reverse.



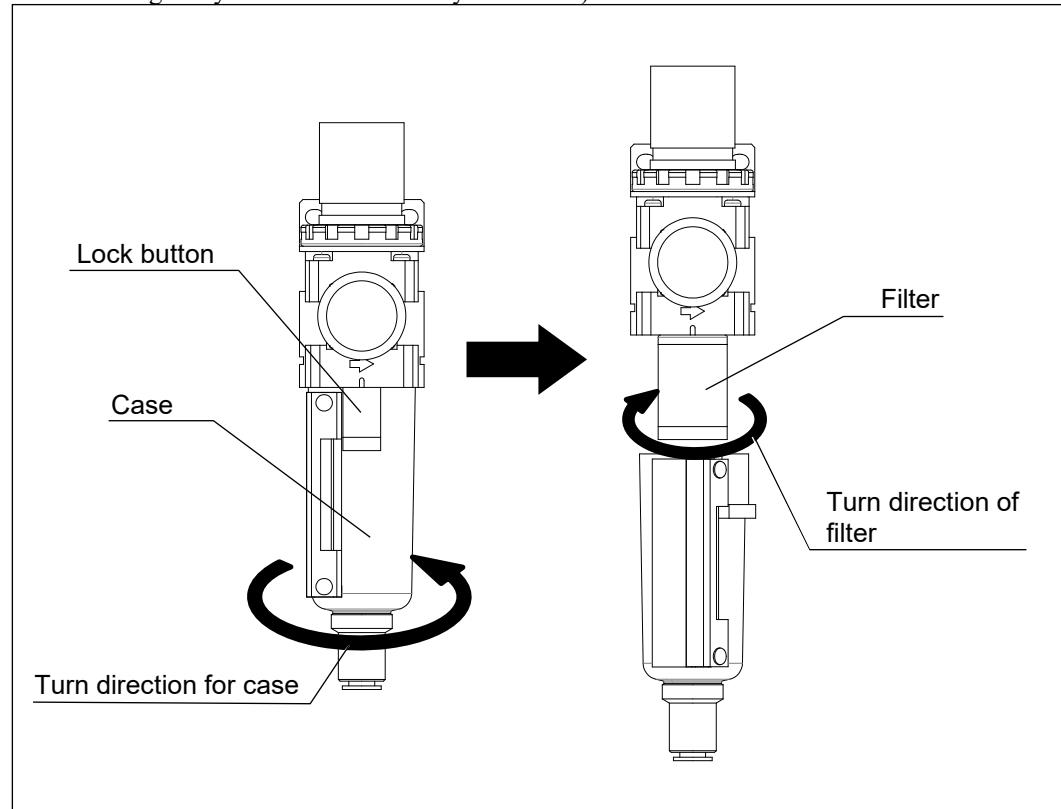
Replacement timing: Every 3 months

### 9.7.7 Replacing CTS Line Filter and Back Wash Filter

\* Refer to "Chapter 11 (2) CTS (Coolant-through-spindle) device".

### 9.7.8 Replacing regulator filter for mist separator

1. Turn OFF the power to the machine.
2. Close the ball valve, and stop the air supply.
  - \* Make sure that the air pressure is completely purged before proceeding to the next step.
3. Turn the case while pulling the lock button on the case in order to remove it.
4. When the filter comes out, remove it and replace it with a new one.
5. After replacement, attach the case following the instructions in step 3 in reverse order. Then, supply the air, and make sure that there are no leaks.  
(Reattach the case securely. If the machine is used without the case firmly reattached, then an air leakage may occur or the case may fall down.)

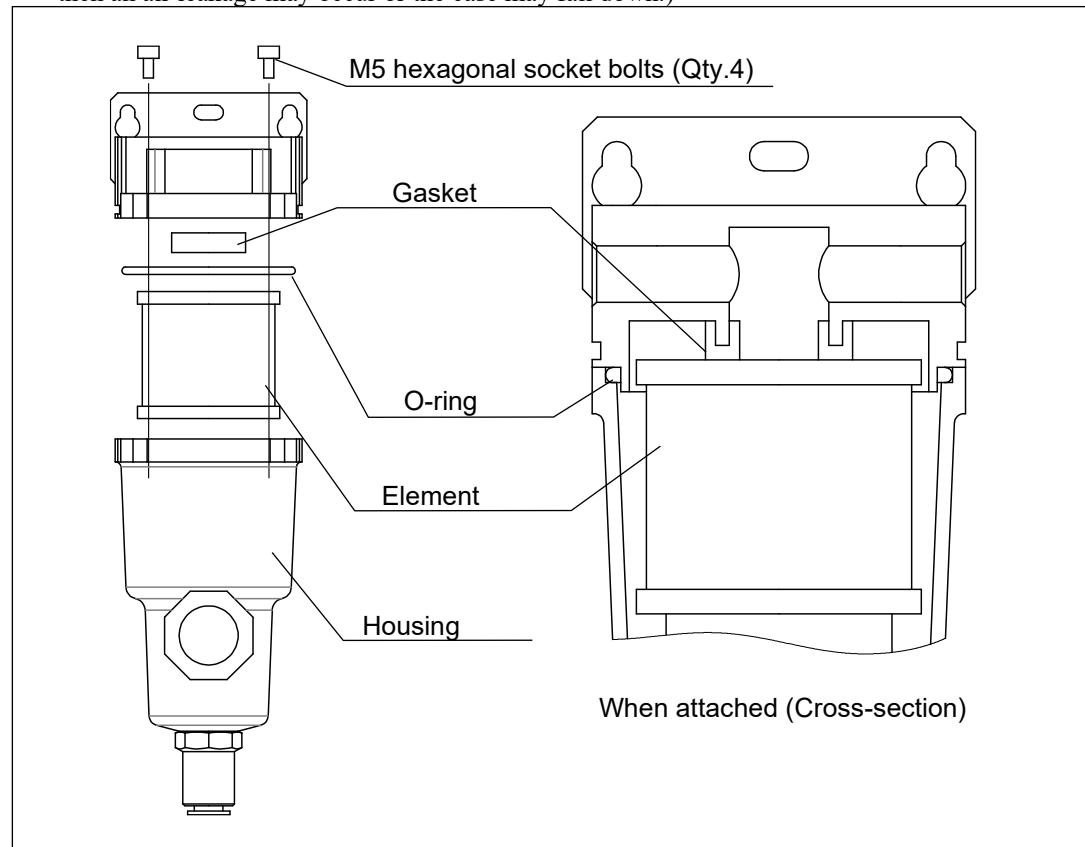


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Replacement timing guide: 1 year after use (The timing of the replacement may vary depending on the usage conditions of the customer).

### 9.7.9 Replacing Main Line Filter Element

1. Turn OFF the power to the machine.
2. Close the ball valve, and stop the air supply.
  - \* Make sure that the air pressure is completely purged before proceeding to the next step.
3. Remove the M5 hexagonal socket bolts (Qty.4), and then separate the housing.
4. Replace the element, gasket and O-ring with new parts.
  - \* When separating the housing, the element is left on the bottom side of the main line filter (housing side). The gasket is left on the top side and the O-ring is left either on the top or bottom side.
5. After replacement, attach the housing starting from the instructions in step 3 and go in reverse order. Then, supply the air, and make sure that there are no leaks.  
(Reattach the housing securely. If the machine is used without the housing firmly reattached, then an air leakage may occur or the case may fall down.)



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Replacement timing guide: 2 years of use (The timing of the replacement may vary depending on the usage conditions of the customer).

### 9.7.10 Replacing Sludge Filter for Cyclone Filter Device

- \* Refer to "Chapter 11 (3) Cyclone Filter Device" for further details.

## 9.8 Consumable Parts List

This list contains information on parts that decline in performance as a result of normal use.

To order replacement parts, contact the place of purchase or use the contact details on the back cover.

Please specify both the part name and part code when ordering parts. The quantities given in this list indicate the number of corresponding parts used in a single machine. Refer to the parts list at the end of this manual to verify the part names.

Furthermore, supply of these parts generally is no longer available 13 years after manufacturing is discontinued.

Refer to "9.7 Replacing consumable parts" for details on replacing these parts.

Section	Name	Part code	Qty.	Notes
9.7.1.1	ROLLER 16	6B1160001	4	
	DOOR ROLLER ASSY, S2C	6A7473001	4	
9.7.1.2	DOOR WIRE ASSY S X1-SL	6C0091001	1	
9.7.1.3	WIRE SHEAVE D50 POM	6B6962001	2	
9.7.1.4	DOOR WINDOW 628×268 ASSY	6B4413001	2	
	SIDE WINDOW 628×268 ASSY	6C4734001	4	
9.7.3	WIPER X TELESCOPIC SUPPLY SX1SL	6C0259001	2	
	WIPER Y TELESCOPIC SUPPLY SX1SL	6C0260001	1	
9.7.4	Y REAR ASSY SK3	6D0197001	1	
9.7.5.1	ALKALI CELL AA BATTERY 1.5V		2	Commercially available batteries can be used Used to maintain the time function
9.7.5.2	ALKALI CELL AA BATTERY 1.5V		4	Commercially available batteries can be used For the relocation device
9.7.6	FILTER ELEMENT EHM15R10AX	652860001	1	For tool cleaning
9.7.7	LINE FILTER ELEMENT ST	618491001	1	For line filter
	BACK WASH ELEMENT	618497001	1	For back wash filter
9.7.8	FILTER ELEMENT AFM30P-060AS	6B9668001	1	For mist separator regulator
9.7.9	FILTER ELEMENT AFF-EL4B	6C4866001	1	For main line filter
9.7.10	SLUDGE FILTER	6C4865001	1	For cyclone filter device
*	SWITCH DOOR LOCK LS HS5L	6D0117001	1	Tool life count: 2 million

- \* Replace when the tool life count has been exceeded as per the usage frequency of the door.  
Contact our sales office because technical support is required for the replacement procedure.

# CHAPTER 10

## DISPOSAL

### 10.1 Important Notes About Disposal

10

## 10.1 Important Notes About Disposal

### **⚠ WARNING**

High-voltage components are present inside the control box.  
There is risk of electric shock if you touch these components by mistake.

#### [SAFETY INSTRUCTIONS]

Maintenance and inspection of electrical components must only be carried out by a qualified electrician who is trained in electrical safety and who has thorough knowledge of the electronic circuits in this machine.

Turn OFF the main power breaker, and then wait at least 20 minutes before carrying out work.

Attach a padlock to the main power breaker so that the power cannot be turned ON.

A sign or notice should be placed near the operation panel to warn others that work is in progress.

If leaving the machine unattended, close the control box and secure it with screws.

### **⚠ WARNING**

If the control box or operation panel is touched accidentally with wet hands while performing installation or maintenance, an electric shock or short-circuit may cause a fire.

#### [SAFETY INSTRUCTIONS]

Do not touch the control box and the operation panel with wet hands.

The cover to the control box must be closed while the machine is operating.

The control box and the operation panel must be kept free of coolant, water, chips and shavings.

### **⚠ WARNING**

If the machine is moved while the cables are still connected, an open circuit may cause electric shock.

#### [SAFETY INSTRUCTIONS]

The installer must disconnect all cables from the main machine unit, the coolant tank, the chip conveyor and the peripheral equipment before moving the machine.

The installer must disconnect all primary cables from the main machine unit before moving the machine.

## **⚠ WARNING**

**When replacing parts or disconnecting hoses from the coolant equipment, the coolant may shoot out and injure your eyes.**

**[SAFETY INSTRUCTIONS]**

**Always be sure to wear protective goggles.**

**Purge all remaining pressure before carrying out such work.**

**Handle the hoses carefully so that they are not subjected to any impacts.**

**If coolant gets into your eyes, rinse with clean water and then seek medical advice.**

## **⚠ WARNING**

**High-pressure air escaping from damaged sections of air hoses or from valves while setup or maintenance work is being carried out may cause injury to your eyes or ears.**

**[SAFETY INSTRUCTIONS]**

**Always be sure to wear protective goggles.**

**Always be sure to wear ear plugs.**

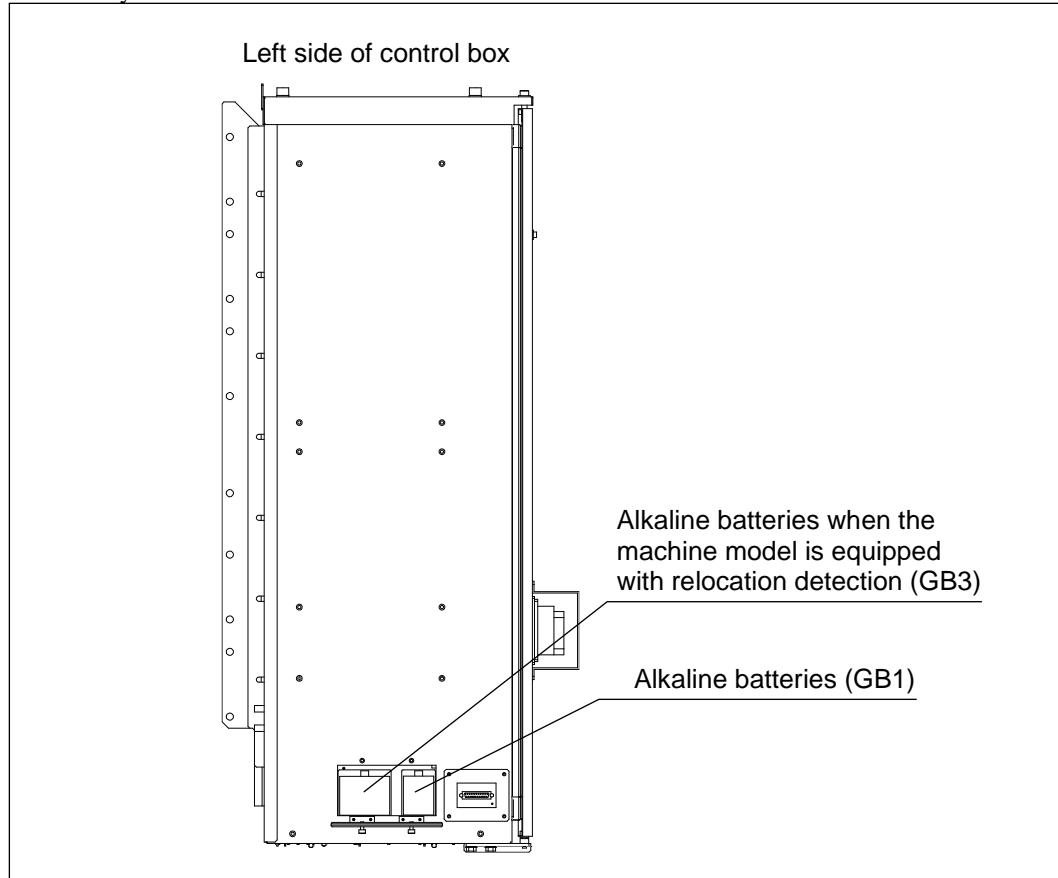
**Connecting and changing over air hoses containing high-pressure air must only be performed by a qualified technician who has been trained in handling high-pressure air with thorough knowledge of this machine.**

**Always be sure to disconnect the pressure source and reduce the pressure before connecting high-pressure air hoses.**

Follow the directions and precautions below when disposing of the machine.

- First, turn OFF the main power breaker and power breaker that supplies power to the machine. Then, remove the primary cables and wires before disposing.
- Turn the pressure to zero using the pressure adjustment knob on the air source regulator. Then, cut the primary pressure source before disposing of the piping and tubing.
- Be careful when handling heavy objects.
- For disassembly and disposal, only ask a waste disposal company or contractor that fully understands the risks involved with disassembling large industrial machinery to carry it out.
- Do no flush coolant down the sewer or drain.
- Do no flush lubricant (that was replaced) down the sewer or drain.
- Ask a waste disposal company or contractor to properly dispose of the coolant and lubricant.
- Follow all national laws, local government regulations, etc., during disposal.

1. Battery installation location inside control box



(1) 台湾

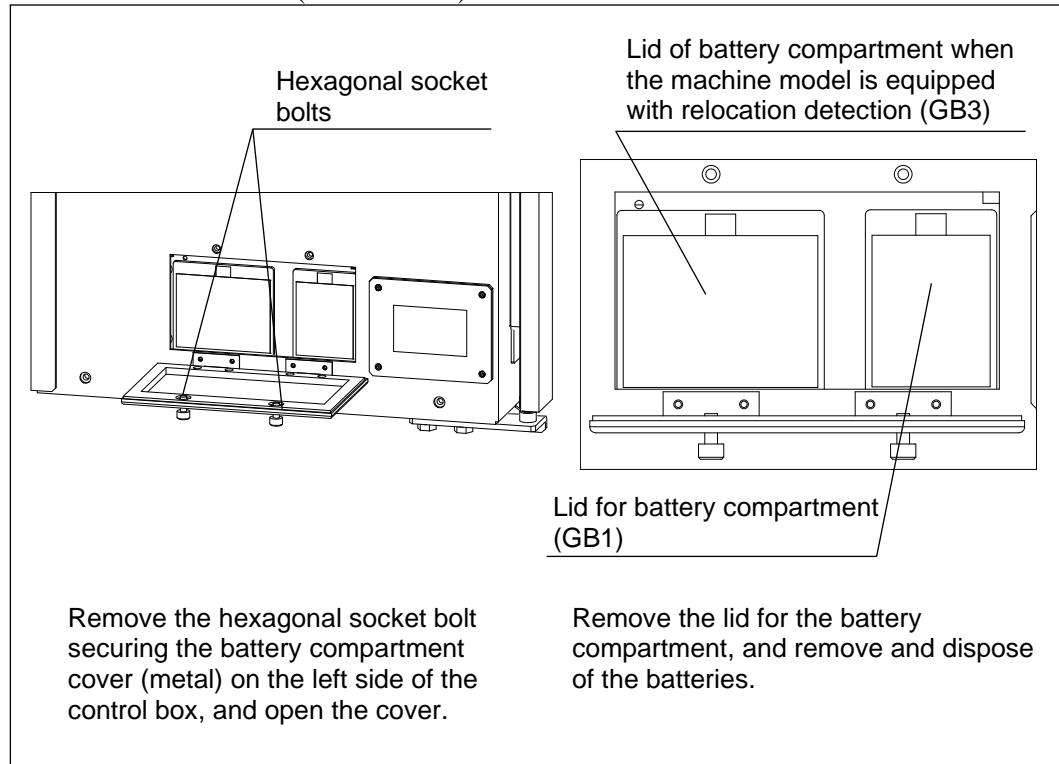
電池用完, 請資源回收!!



廢電池請回收

10

2. How to dispose of batteries
  - Alkaline batteries (GB1 and GB3)



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# CHAPTER 11 (1)

## COOLANT UNIT

- 1 Handling Precautions
- 2 Functions
- 3 External View
- 4 Specifications
- 5 Wiring
- 6 Motor Protection Unit for Pump
- 7 Operation

# 1 Handling Precautions

## **DANGER**

If oil-based coolants are used during cutting, the cutting area may become hot and sparks may be generated.

### [SAFETY INSTRUCTIONS]

If there is no fire alarm box, fire extinguishing equipment or exhaust system installed and the machine is filled with an oil-based coolant, do not operate the machine and notify the supervisor.

When using oil-based coolants, a fire alarm box, fire extinguishing equipment and exhaust equipment must be set up.

An operator must always monitor the machine while cutting is in progress.

## **WARNING**

High-voltage components are present inside the control box.

There is risk of electric shock if you touch these components by mistake.

### [SAFETY INSTRUCTIONS]

Maintenance and inspection of electrical components must only be carried out by a qualified electrician who is trained in electrical safety and who has thorough knowledge of the electronic circuits in this machine.

Turn OFF the main power breaker, and then wait at least 20 minutes before carrying out work.

Attach a padlock to the main power breaker so that the power cannot be turned ON.

A sign or notice should be placed near the operation panel to warn others that work is in progress.

If leaving the machine unattended, close the control box and secure it with screws.

## **WARNING**

If the control box or operation panel is touched accidentally with wet hands while performing installation or maintenance, an electric shock or short-circuit may cause a fire.

### [SAFETY INSTRUCTIONS]

Do not touch the control box and the operation panel with wet hands.

The cover to the control box must be closed while the machine is operating.

The control box and the operation panel must be kept free of coolant, water, chips and shavings.

**⚠ WARNING**

If terminal connections on the PCBs or terminal block screws become loose, poor contacts may cause overheating or a fire.

**[SAFETY INSTRUCTIONS]**

There should be no loose screws when connecting the wiring.  
Do not replace fuses and electrical parts that have been soldered to the inside of the unit.

**⚠ WARNING**

If the thermal settings are changed, the protection equipment may not operate and may cause a fire.

**[SAFETY INSTRUCTIONS]**

The installer must check the setting values of the protection unit.

**⚠ WARNING**

If you touch cables which have been crushed or damaged by heavy objects, there is risk of electric shock.

In addition, short-circuits may occur if cables are crushed or damaged by heavy objects.

**[SAFETY INSTRUCTIONS]**

Cables should be gathered up or arranged to prevent them from being crushed. If a cable has become damaged, it must be replaced with a new one.

**⚠ WARNING**

If the machine is used in conditions where coolant mist may be generated and there is no mist collector present or the mist collector performance is poor, the coolant mist may be inhaled and have adverse effects on your health.

**[SAFETY INSTRUCTIONS]**

Check the safety data sheet (SDS) for the coolant being used, and adopt the required safety measures.

When using the CTS device or if there is coolant mist, always be sure to use a mist collector with sufficient extraction capacity.

Clean the filter for the mist collector regularly.

This function uses standard control program 10 for the built-in PLC function.  
This function assumes that the executing task assigns the control program that is included as part of the factory-default settings.  
Therefore, when using this system, do not change execution settings for standard control program 10 and standard task 3.  
In addition, do not change the corresponding contact.  
If a control program and/or a task execution setting is changed, operation will no longer be covered under the warranty.  
In addition, do not perform the debug function (stop, ON/OFF for related contacts, etc.) for the standard control program 10 while this function is operating.

1. Coolant
  - (1) We recommend using water-soluble coolant in order to prevent fires from igniting and/or spreading.
  - (2) To select a coolant, ask the coolant dealer about the coolant's lubrication quality, corrosion prevention, bubbling prevention and safety.  
Do not use chemical solutions (synthetic coolants). They provide poor lubrication and strip coating off the machine, possibly leading to machine damage.
  - (3) Depending on the coolant type, usage and other factors, bubbles may form in the coolant inside the tank. If this occurs, use an anti-foaming agent or other countermeasures such as reducing the discharge amount.
  - (4) Only use a water soluble oil agent on the chip shower (for flushing chips or shavings). If a water insoluble oil agent is used, sufficient coolant cannot be supplied because there is too much viscous resistance in the coolant.  
When using this type of coolant, switch the [CHP.F] key to OFF on the operation panel. And, make sure that the chip shower does not discharge even if there is a program command to do so.
  - (5) Do no flush coolant down the sewer or drain.  
Ask a waste disposal company or contractor to properly dispose of the coolant.
  - (6) Depending on the coolant type, it may have elements that adversely affect or make parts, such as the guide, more susceptible to corrosion. Contact the coolant manufacturer for further details before use.  
Move each axis the full breadth of its stroke once a day to ensure lubrication and prevent rust from forming on the linear guide and ball screw.  
If performed before and after operation, it is more effective.
  - (7) Water soluble coolant that has been broken down by bacteria, etc., can cause a bad smell, environmental deterioration and other problems. The quality may also deteriorate, causing rust, which can lead to machine damage.  
If the coolant has deteriorated, stop using it and replace all the coolant with new coolant.
  - (8) Skim the oil in the coolant tank regularly in order to control the amount of sludge that is generated. The amount of sludge that is generated can be controlled by reducing the amount of oil in the coolant fluid.
  - (9) Never use a coolant that contains highly reactive (\*) sulfur, because it can cause corrosion on metal components (including on the PCB) and lead to machine malfunction.  
\* Reactive...Degree of reaction with metals such as copper and silver.
  - (10)Never use a water-soluble coolant with high alkalinity because it may deteriorate materials such as plastic.
  - (11)Never use a coolant that contains chlorine because it may deteriorate materials such as plastic and rubber.
  - (12)When changing the coolant from a water-soluble coolant to an oil-based one, perform the following countermeasures because there is a heightened risk of a fire.
    - When the oil-based coolant has a high viscosity, replace the pump with a larger capacity one to ensure the appropriate discharge volume.
    - Install a mist collector in order to remove mist which can lead to a fire.
    - Install an automatic fire extinguishing system that can quickly extinguish a fire in the event that one breaks out.
    - The burning or combustion conditions and fire extinguishing method varies depending on the machining materials and coolant types. Therefore, be sure to check the safety data sheet (SDS) issued by the material manufacturer and coolant manufacturer, and use the appropriate coolant.

(NOTICE) Oil-based coolant cannot be used on the CTS.  
Be sure to use a special mist collector when machining combustible materials. If an appropriate mist collector is not used, a fire or explosion may occur.  
In addition, always be sure to install a fire damper when using a mist collector.

## 2. Maintenance

When the coolant supply is weak, the coolant may not reach and hit the machining points sufficiently and therefore lead to a fire. Clean the inside of the tank regularly and check the coolant level inside the tank in order to ensure a stable coolant supply. In addition, inspect the discharge volume from the nozzle on a daily basis.

### (1) Cleaning chip pan

Remove chips or shavings any time that they build up in the chip pan for the coolant tank. If the chips or shavings build up too much, the coolant may overflow outside the tank from the chip pan.

### (2) Cleaning filter

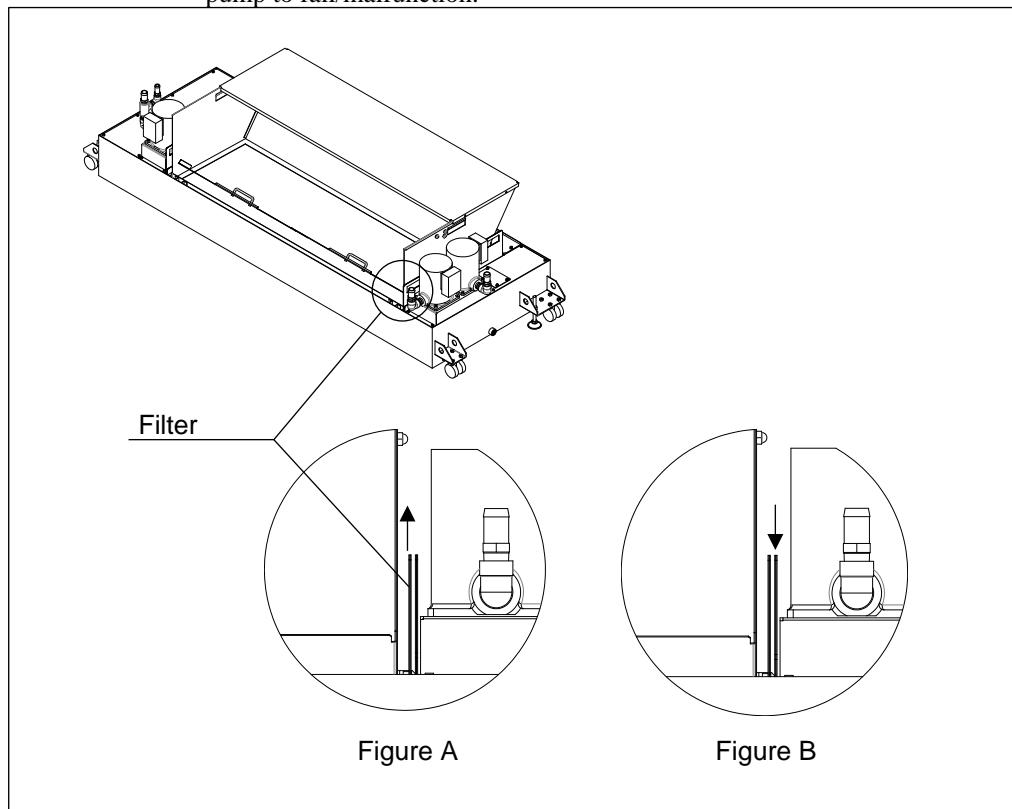
Clean the filter regularly because the coolant may not discharge properly or well if the filter becomes clogged.

Follow the cleaning procedure below to clean the filter.

#### Filter cleaning procedure

- i) Remove the filter from inside the tank (waste water tank side), and clean the filter. (Figure A)
  - ii) Put the filter that was removed in step (i) into the clean water tank side. (Figure B)
  - iii) Clean the other filter as well following steps (i) and (ii).
- \* When there is a filter on the right and left, clean the filter on both the right and left sides.

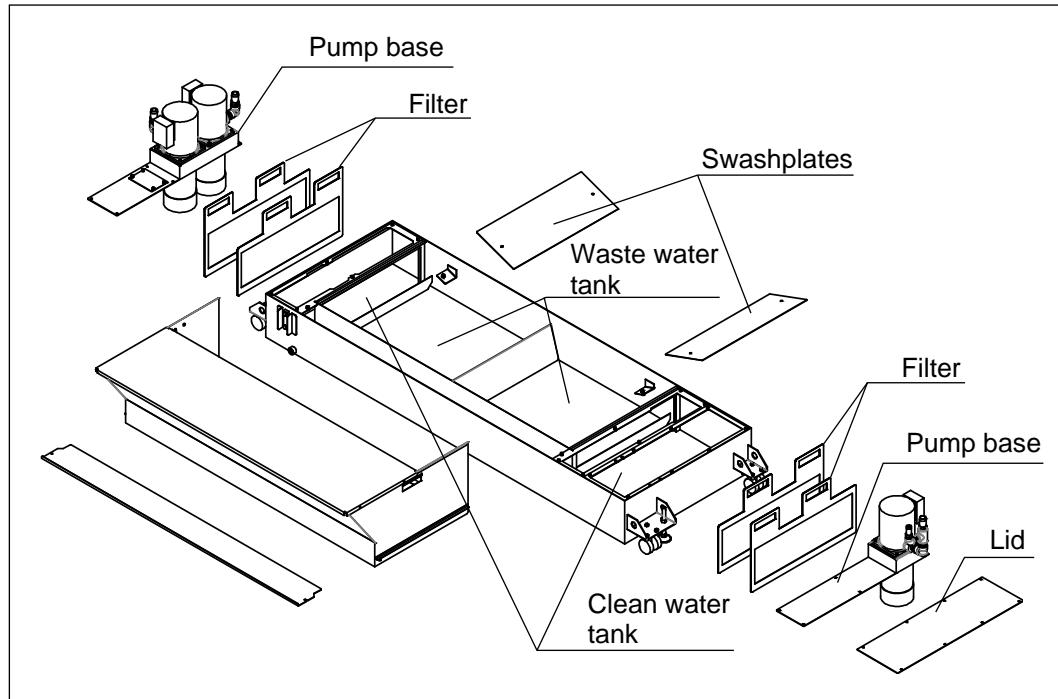
**(NOTICE)** If both filters are removed at the same time, it may cause the pump to get contaminated with foreign objects, the nozzle to become clogged and/or the pump to fail/malfunction.



(3) Replacing entire coolant volume and cleaning tank

In order to achieve the best performance for the coolant and the coolant tank, check the quality of the coolant (check the concentration and pH according to the coolant manufacturer's specifications, check for odors, etc.) about once a week. In addition, periodically replace the entire volume of the coolant.

When replacing the coolant, remove the pump and lid as indicated in the figure below, and clean the inside (bottom of the waste water tank and clean water tank, etc.) of the tank unit.

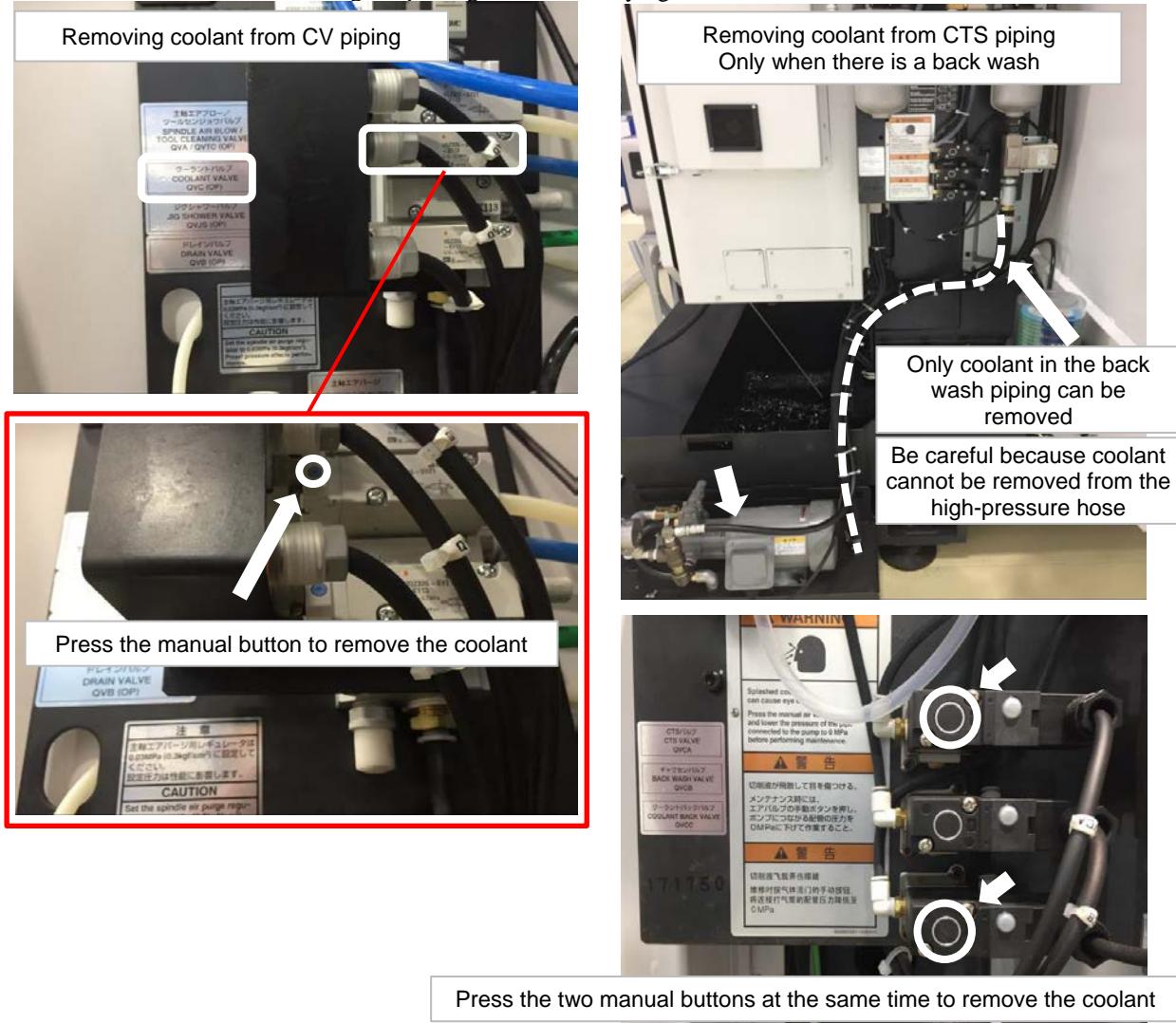


\* The configuration or parts that are attached may differ from the diagram depending on the model and specification.

<Special notes when cleaning coolant tank>

The coolant in the hose may leak out when disconnecting the hose from the tank. Therefore, follow the procedure below to remove the coolant.

- \*1 There may be items here that are not on the actual equipment depending on the specification.
- \*2 Even if the coolant is removed, have a container or rag on hand to catch and/or clean any coolant leaking or spouting out when carrying out the work tasks.



### 3. Special notes when using

- (1) Coolant may shoot outside of the machine from the top of the machine cover depending on how the coolant is used and the cutting conditions. In this situation, there is a ceiling cover option available which can be used to prevent coolant from shooting out.
- (2) Adjust the tips of the nozzles for the upper chip shower inside the machine so that they run along the side of the machine cover. (Particularly, the nozzles on the side close to the front door)

If the nozzles are at a longer distance from the machine cover, when the door is opened, the coolant that splashes off the telescopic cover or off the table surface may shoot outside of the machine.

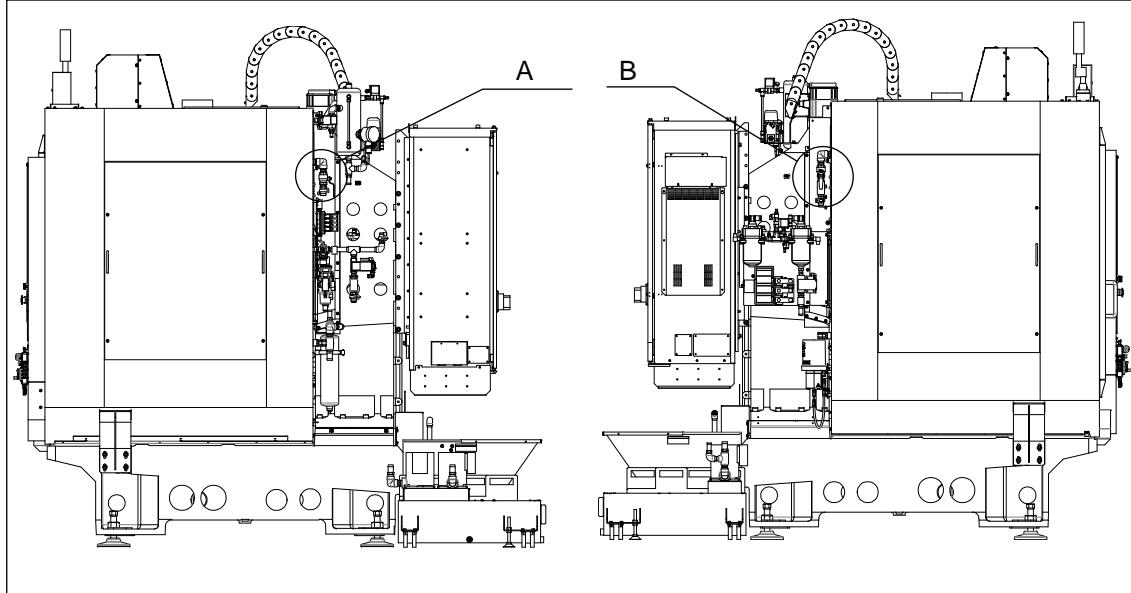
Note, open the maintenance cover to perform the adjustment from the side, particularly when adjusting the direction of the nozzles on the deep end.

#### (SAFETY INSTRUCTIONS)

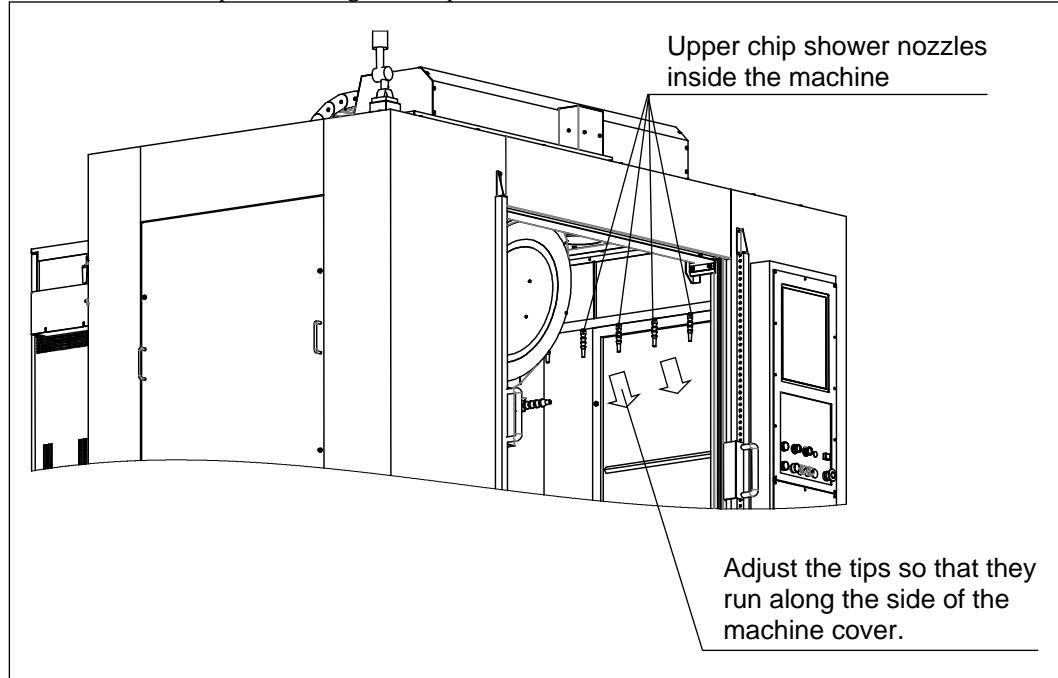
**If making adjustments from the side is difficult or awkward and you want to make adjustments from inside the machine, always be sure to wear protective equipment such as safety footwear and a helmet. In addition, before beginning work, turn OFF the main power breaker, and then attach a padlock to the main power breaker so that the power cannot be turned ON. A sign or notice should be placed near the operation panel to warn others that work is in progress.**

## Chapter 11 Options

- (3) If the nozzles for the upper chip shower inside the machine are adjusted so the coolant directly hits the edge of the maintenance cover from inside the machine, the force of the coolant may cause it to leak outside of the machine. In this situation, adjust the direction of the nozzles so that they are directed away from the edge of the maintenance cover, or adjust the ball valves (A and B in figure below) for the upper chip shower.



- (4) When a coolant pump that is not made by Brother is installed on the coolant tank, the force of the coolant may cause it to leak outside of the machine. In this situation, restrict each valve to adjust the flow rate.
- (5) Adjust the direction of the nozzles for the chip shower at the top inside the machine, so that the chips or shavings built up inside the machine can be collected in the coolant tank.



Coolant tank volume and weight

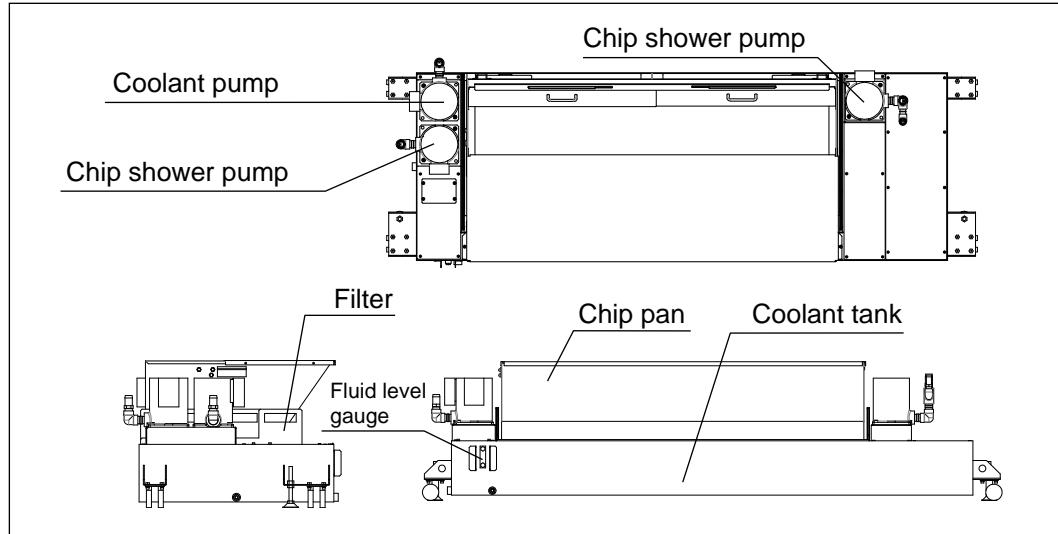
Specifications	Weight (Without coolant) Unit: kg
200L Nozzle, shower, CTS, cyclone	180

## 2 Functions

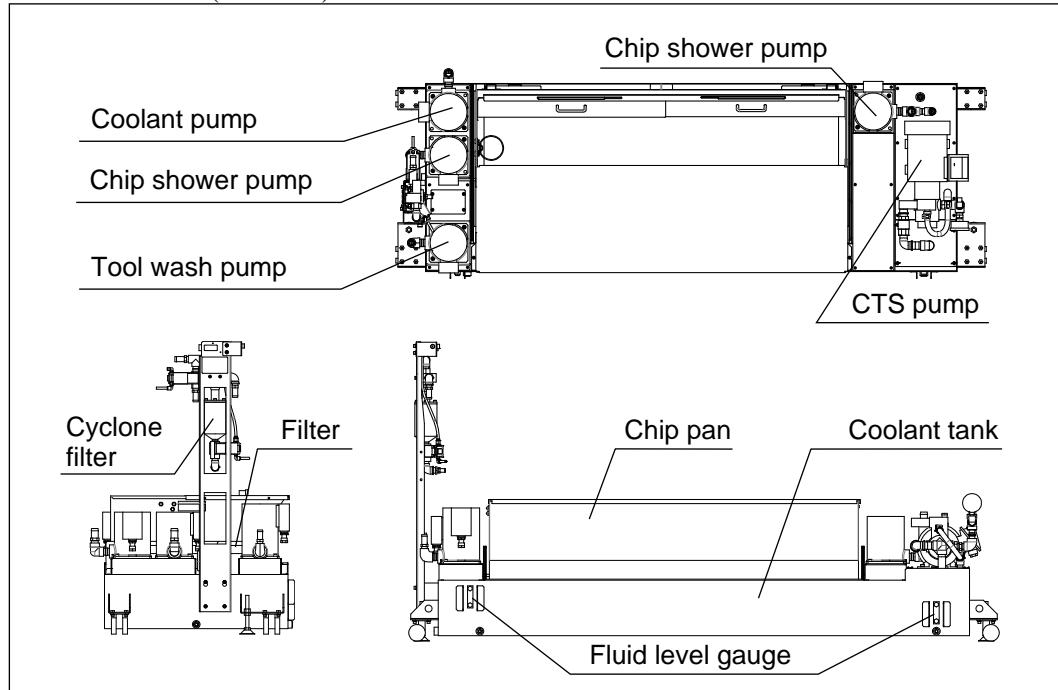
1. Coolant  
The function of the coolant is to cool the tools and workpieces and to remove chips or shavings.
2. Chip shower  
The function of the chip shower is to feed chips, which build up inside the machining chamber during machining and cleaning, to the chip pan that is installed at the rear of the machine.

## 3 External View

200L coolant tank

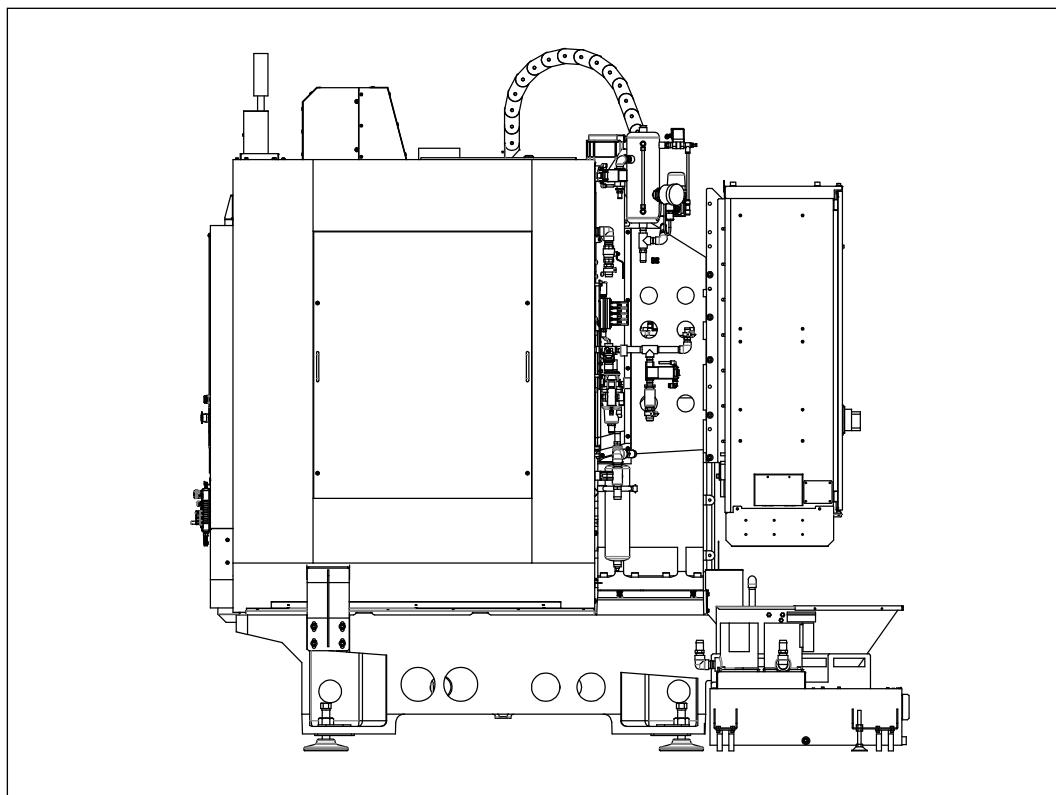
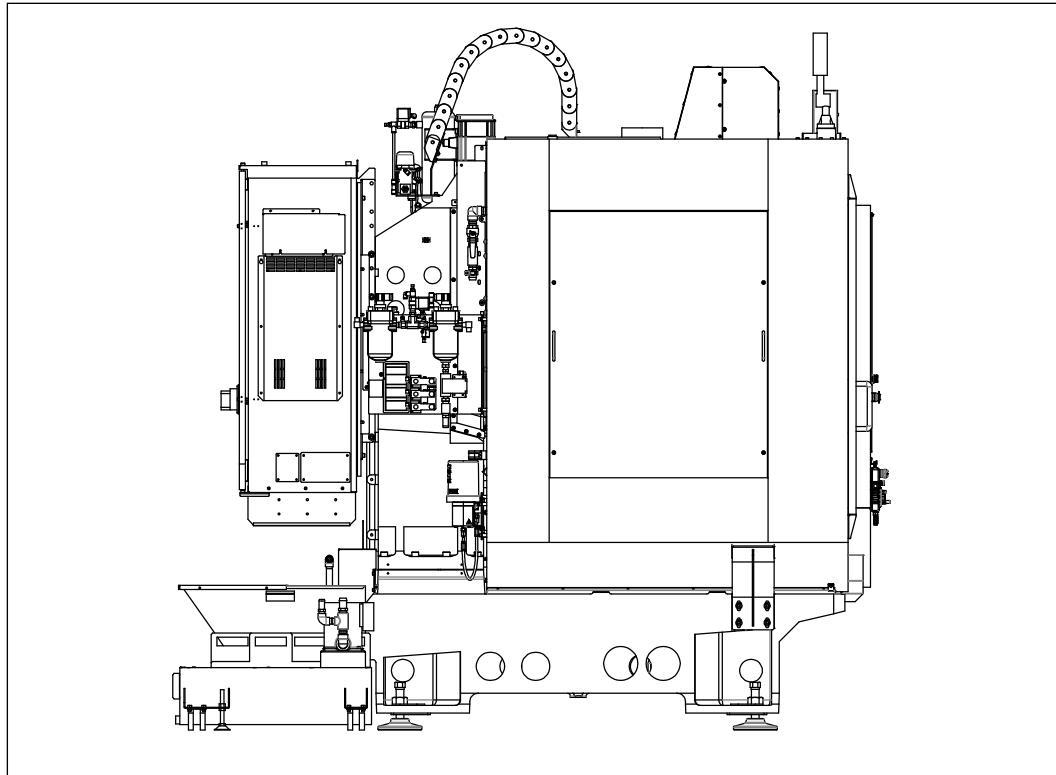


200L coolant tank (with CTS)



## Chapter 11 Options

External view of tank installed

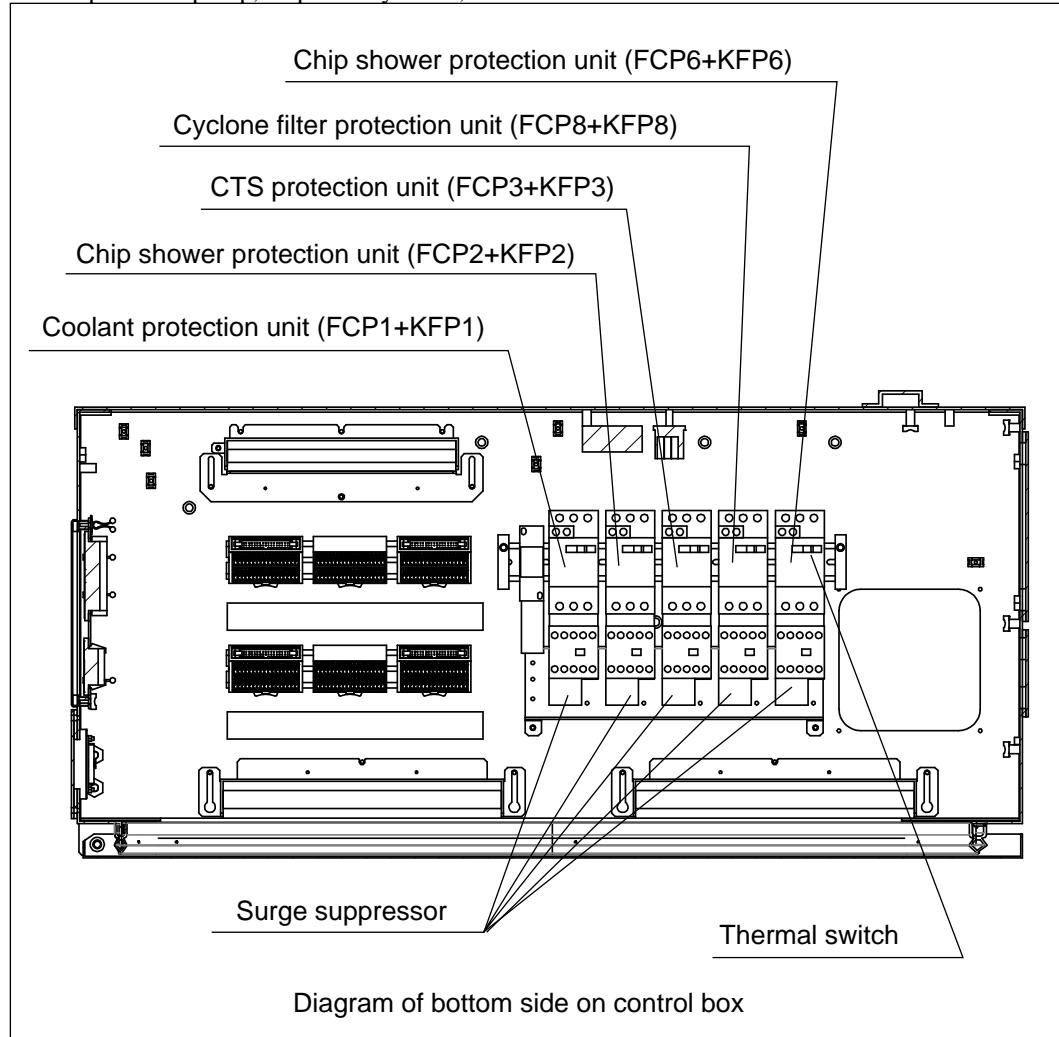


## 4 Specifications

The coolant unit which is installed may vary depending on the machine specifications.  
Contact Brother for further details.

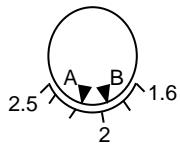
## 5 Wiring

1. Connect the coolant pump cable and the chip shower pump cable to the relay terminals No. 2, No. 4 and No. 6 on the coolant protection unit and chip shower protection unit.  
Tighten each cable without removing the surge suppressor, and match the terminal block names with the cable wire marker names when connecting.  
Connect the ground terminal to the tap hole used for the front ground on the coolant protection unit.
2. Connect the coolant pump cable and the chip shower pump cable to the coolant pump and the chip shower pump, respectively. Also, connect the coolant valve cable to the coolant valve.

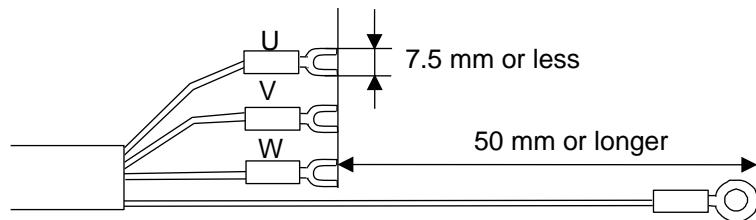


## Chapter 11 Options

Enlargement of dial for setting rated current



Motor cable terminal setup for pump – Example of recommended setup



U, V and W: Y terminal for M3  
Outer diameter - 7.5 mm or smaller  
PE: Round terminal for M4

# 6 Motor Protection Unit for Pump

## 1. Rated current setting

Match the dial mark “A” to the “Set value”.

(NOTICE) The rated current setting value varies depending on the power voltage, frequency and the pump capacity.

If the setting is wrong, the overload detection may not function properly and cause a burnout on the pump motor. Therefore, configure the settings correctly.

Set value for rated current

Pump capacity	Frequency	When there is no transformer box			When there is a transformer box
		AC 200 V input	AC 220 V input	AC 230 V input	
250 W FCP1, FCP2, FCP6	50 Hz	1.2 A	1.2 A	1.3 A	1.2 A
	60 Hz	1.5 A	1.5 A	1.6 A	1.5 A

Refer to “Chapter 11 (2) CTS device (COOLANT-THROUGH-SPINDLE)” for further details about the FCP3 set value. Refer to “Chapter 11 (3) Cyclone filter device” for further details about the FCP8 set value.

Refer to “Chapter 4 Installation” to check if there is a transformer box. Refer to the pump unit’s nameplate to check the pump capacity.

## 2. Processing when the motor protection unit for the pump is activated

When the coolant pump and chip shower pump become overloaded and trip the motor protection unit, the alarms <<\*\*Thermal error (coolant)>> and <<\*\*Thermal error (chip shower)>> are triggered.

In terms of causes, the coolant viscosity may be too high or the power voltage may not be correct.

For recovery, first, troubleshoot and remove the cause, and then press the reset button (turn the switch ON) on the protection unit that tripped.

(NOTE 1) The thermal switch may turn off during transport.

During installation, check the position and turn ON the switch when necessary.

(NOTE 2) The positioning of the motor protection unit for the pump may shift during transport.

During installation, check the position and move it back to its original position when necessary.

# 7 Operation

## 7.1 Coolant Pump

Turning ON the coolant pump

- After pressing the [CLT.P] key on the operation panel, the key lamp lights up and the coolant motor starts.

Turning OFF the coolant pump

- After pressing the [CLT.P] key on the operation panel, the key lamp turns off and the coolant motor stops.

(NOTE) If the [EMERGENCY] switch is pressed, the hardware control turns it “OFF”.

### 7.1.1 Coolant Pump Standby Function

In the following situations, the coolant pump automatically turns OFF and the lamp for [CLT.P] key flashes.

- When the user parameter (switch 1: installation) <Automatic coolant off time> has elapsed and the machine is not operating.
  - When the key is ON (with ALM signal ON) and a stop level 5 alarm or the alarm <<Standby mode>> is triggered.
  - When the [CLT.P] key is pressed while the key is OFF (with ALM signal ON) and a stop level 5 alarm is triggered.
- \* <<Door open>> is a stop level 5 alarm. The ALM does not turn ON because the CTS back wash and drain cycle must be carried out.

Follow the procedure below to turn the coolant pump ON when the above conditions apply.

- (Reset the stop level 5 alarm.) Then, press the [CLT.P] key twice to turn the pump ON again.
- Start (Pallet start) memory or MDI operation. (Note that operation starts right after the user parameter (switch 1: installation) <Coolant delay time> has elapsed.)

## 7.2 Coolant Valve

Discharging the coolant

- Turn OFF the power to the machine.
- Turn the coolant pump ON.
- Press the [MDI] key to switch to the <MDI operation> screen.
- Make sure that the front door is closed (NOTE 1).

#### For NC language

- Press the [CAN] key to clear the editing area.
- Use the number keys to enter “M8”.

#### For conversation language

- Use the [CURSOR] key to move the cursor to <Coolant>.
- Use the number keys to enter “1” (1: ON) and press the [ENT] key.
- Press the [START] switch to discharge the coolant.

(NOTE 1) If the front door is open, the coolant will not discharge.

The valve is turned OFF in the ladder control and hardware control when the [DOOR INTERLOCK MODE] switch is set to automatic operation or machine setup. The valve is turned OFF using ladder control when in service mode.

If it starts to discharge before opening a door, close the door and restart in MDI mode (because memory operation is not available) to open the valve using ladder control and to discharge again. (Note that this does not apply when the machine’s factory default settings for the ladder have been overwritten.)

## Stopping coolant discharge

1. Press the [**MDI**] key to switch to the MDI operation mode screen.

For NC language

2. Press the [**CAN**] key to clear the editing area.
3. Use the number keys to enter “M9”.

For conversation language

2. Use the [**CURSOR**] key to move the cursor to <Coolant>.
3. Use the number keys to enter “0” (0: OFF) and press the [**ENT**] key.
4. Press the [**START**] switch to stop coolant discharge.

(NOTE 2) For the following situations, the valve turns “OFF” and the coolant stops.

- When [**RST**] key is pressed.
- When the [**M.LCK**] is ON.
- When memory operation is finished.
- When an M00/M01 command (NC language) is given, and when the program (conversation) is stopped.
- When a stop level 5 alarm is triggered.
- When machine parameter (system 1: common) <Coolant during tool change> is set to <0: Stop> and the tool is changed.
- When the user parameter (tool breakage detection) <Tool breakage detection coolant OFF (Type 3)> is set to <1: Yes> in conversation language, and the tool breakage detection (Type 3) operation is activated.

(NOTE 3) In the following situations, the valve turns “ON” and the coolant discharges.

- When the <Coolant during tool change> is set to <0: Stop> and the tool change operation is completed, if the coolant is already discharging at the beginning of the tool change operation.
- When the coolant begins to discharge before the program stop in conversation and operation is restarted.
- When the <Tool breakage detection coolant OFF (Type 3)> is set to <1: Yes> in conversation and the tool breakage detection operation is completed, if coolant is already discharging when the tool breakage detection (Type 3) operation is activated.
- When operation is restarted if the user parameter (switch 1: operation) <Coolant return method for program stop> is set to <0: Method 1> in NC language and the coolant discharges before the program stop.

## 7.3 Chip Shower

Discharging the chip shower

1. Turn OFF the power to the machine.
2. Turn ON the [CHP.F] key on the operation panel. The key lamp lights up.
3. Press the [MDI] key to switch to the MDI operation mode screen.
4. Make sure that the front door is closed (NOTE).

For NC language

5. Press the [CAN] key to clear the editing area.
6. Use the number keys to enter “M400”.

For conversation language

5. Use the [CURSOR] keys to move the cursor to <Ext. signal>.
6. Use the number keys to enter “400” and press the [ENT] key.
7. After pressing the [START] switch, the chip shower motor starts and the chip shower begins to discharge.
8. After the [CHP.F] key is turned OFF, the key lamp turns off and the chip shower stops. If the [CHP.F] key is turned ON again, the chip shower begins to discharge again.
9. Press the [RST] key to stop the chip shower pump and the chip shower.

(NOTE) If the front door is open, the chip shower will not discharge.

The pump power is turned OFF in the ladder control and hardware control when the [DOOR INTERLOCK MODE] switch is set to automatic operation or machine setup. The valve is turned OFF using ladder control when in service mode.

If it starts to discharge before opening the door, restart in MDI mode (because memory operation is not available) to discharge again using ladder control. (Note that this does not apply when the machine’s factory default settings for the ladder have been overwritten.)

Stopping chip shower discharge

1. Press the [MDI] key to switch to the MDI operation mode screen.

For NC language

2. Press the [CAN] key to clear the editing area.
3. Use the number keys to enter “M401”.

For conversation language

2. Use the [CURSOR] keys to move the cursor to <Ext. signal>.
  3. Use the number keys to enter “401” and press the [ENT] key.
  4. Press the [START] switch to stop the chip shower.
- \* After the user parameter (switch 1: installation) <Chip shower retention time> has elapsed, the chip shower turns OFF.

## CHAPTER 11 (2)

### CTS DEVICE (COOLANT-THROUGH-SPINDLE)

- 1 Handling Precautions
- 2 Functions
- 3 External View
- 4 Specifications
- 5 Piping
- 6 Wiring
- 7 Installation Check
- 8 Inspection and Consumable Parts
- 9 External Appearance of Pull Stud
- 10 Parameters

# 1 Handling Precautions

## **DANGER**

If oil-based coolants are used during cutting, the cutting area may become hot and sparks may be generated.

### [SAFETY INSTRUCTIONS]

Do not use oil-based coolants when there is no fire alarm box, fire extinguishing equipment or exhaust system installed.

An operator must always monitor the machine while cutting is in progress.

## **WARNING**

High-voltage components are present inside the control box. There is risk of electric shock if you touch these components by mistake.

### [SAFETY INSTRUCTIONS]

Maintenance and inspection of electrical components must only be carried out by a qualified electrician who is trained in electrical safety and who has thorough knowledge of the electronic circuits in this machine.

Turn OFF the main power breaker, and then wait at least 20 minutes before carrying out work.

Attach a padlock to the main power breaker so that the power cannot be turned ON.

A sign or notice should be placed near the operation panel to warn others that work is in progress.

If leaving the machine unattended, close the control box and secure it with screws.

## **WARNING**

If the control box or operation panel is touched accidentally with wet hands while performing installation or maintenance, an electric shock or short-circuit may cause a fire.

### [SAFETY INSTRUCTIONS]

Do not touch the control box and the operation panel with wet hands.

The cover to the control box must be closed while the machine is operating.

The control box and the operation panel must be kept free of coolant, water, chips and shavings.

## **WARNING**

If terminal connections on the PCBs or terminal block screws become loose, poor contacts may cause overheating or a fire.

### [SAFETY INSTRUCTIONS]

There should be no loose screws when connecting the wiring.

Do not replace fuses and electrical parts that have been soldered to the inside of the unit.

## **⚠ WARNING**

**If the thermal settings are changed, the protection equipment may not operate and may cause a fire.**

**[SAFETY INSTRUCTIONS]**

**The installer must check the setting values of the protection unit.**

## **⚠ WARNING**

**If you touch cables which have been crushed or damaged by heavy objects, there is risk of electric shock.**

**In addition, short-circuits may occur if cables are crushed or damaged by heavy objects.**

**[SAFETY INSTRUCTIONS]**

**Cables should be gathered up or arranged to prevent them from being crushed. If a cable has become damaged, it must be replaced with a new one.**

## **⚠ WARNING**

**If the machine is used in conditions where coolant mist may be generated and there is no mist collector present or the mist collector performance is poor, the coolant mist may be inhaled and have adverse effects on your health.**

**[SAFETY INSTRUCTIONS]**

**Check the safety data sheet (SDS) for the coolant being used, and adopt the required safety measures.**

**When using the CTS device or if there is coolant mist, always be sure to use a mist collector with sufficient extraction capacity.**

**Clean the filter for the mist collector regularly.**

This function uses standard control program 10 for the built-in PLC function. This function assumes that the executing task assigns the control program that is included as part of the factory-default settings. Therefore, when using this system, do not change execution settings for standard control program 10 and standard task 3. In addition, do not change the corresponding contact. If a control program and/or a task execution setting is changed, operation will no longer be covered under the warranty. In addition, do not perform the debug function (stop, ON/OFF for related contacts, etc.) for the standard control program 10 while this function is operating.

1. Air source

- (1) Use an air source with the following capacity: 130 L/min (ANR) or greater.
- (2) Use clean air without any oil content or moisture per the following.

Impurities in compressed air	Standard value
Solids	5 µm or smaller
Moisture	Dew point under pressure: Less than 10°C
Oil concentration	1 mg/m³ or less (ANR)

2. Coolant

- (1) We recommend using water-soluble coolant in order to prevent fires from igniting and/or spreading.

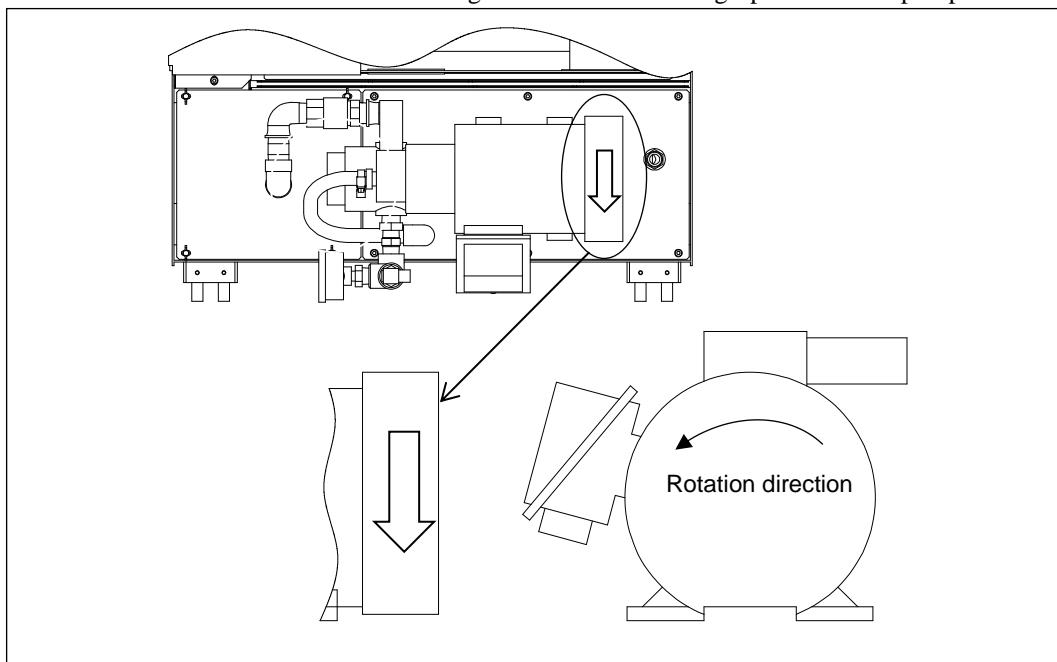
- (2) To select a coolant, ask the coolant dealer about the coolant's lubrication quality, corrosion prevention, bubbling prevention and safety.  
Do not use chemical solutions (synthetic coolants). They provide poor lubrication and strip coating off the machine, possibly leading to machine damage.
- (3) Depending on the coolant type, usage and other factors, bubbles may form in the coolant inside the tank. If this occurs, use an anti-foaming agent or other countermeasures such as reducing the discharge amount.
- (4) Do no flush coolant down the sewer or drain.  
Ask a waste disposal company or contractor to properly dispose of the coolant.
- (5) Depending on the coolant type, it may have elements that adversely affect or make parts, such as the guide, more susceptible to corrosion. Contact the coolant manufacturer for further details before use.  
Move each axis the full breadth of its stroke once a day to ensure lubrication and prevent rust from forming on the linear guide and ball screw.  
If performed before and after operation, it is more effective.
- (6) Water soluble coolant that has been broken down by bacteria, etc., can cause a bad smell, environmental deterioration and other problems. The quality may also deteriorate, causing rust, which can lead to machine damage.  
If the coolant has deteriorated, stop using it and replace all the coolant with new coolant.
- (7) Skim the oil in the coolant tank regularly in order to control the amount of sludge that is generated. The amount of sludge that is generated can be controlled by reducing the amount of oil in the coolant fluid.
- (8) Never use a coolant that contains highly active\* sulfur, because it can cause corrosion on metal components (including on the PCB) and lead to machine malfunction.  
\* Active...Degree of reaction with metals such as copper and silver.
- (9) Never use a water-soluble coolant with high alkalinity because it may deteriorate materials such as plastic.
- (10) Never use a coolant that contains chlorine because it may deteriorate materials such as plastic and rubber.

(NOTICE) Oil-based coolant cannot be used on the CTS. Be sure to use a special mist collector when machining combustible materials. If an appropriate mist collector is not used, a fire or explosion may occur.  
In addition, always be sure to install a fire damper when using a mist collector.

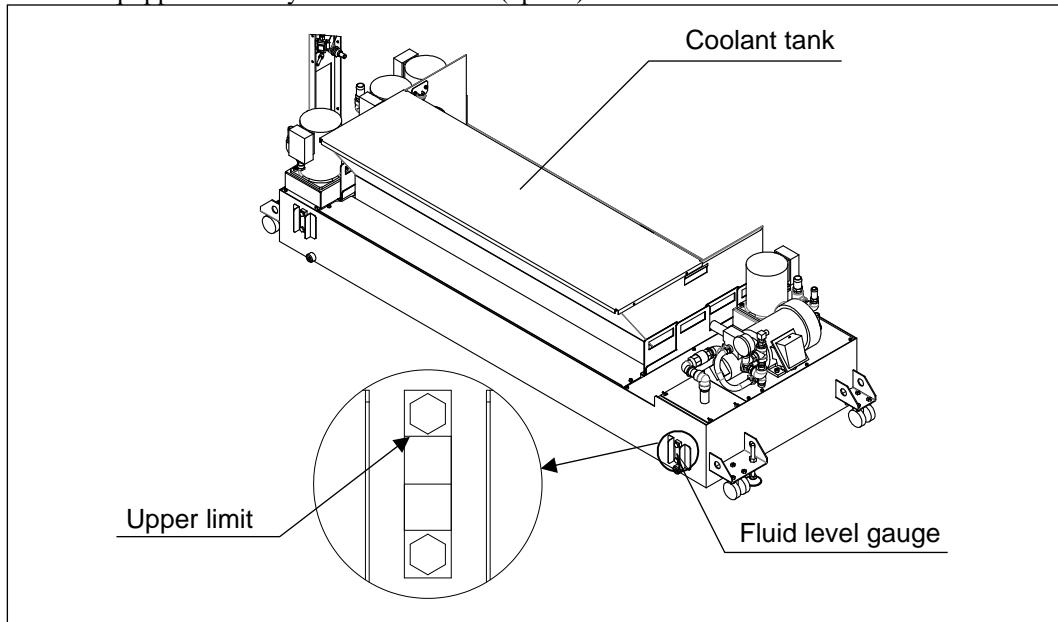
3. This system
  - (1) This system supplies coolant from the spindle motor and inside the spindle to the holder and tool.
  - (2) This system is specifically for water soluble cutting fluid. Never use oil-based coolant.
  - (3) This system is comprised of a coolant tank and discharge control piping.  
Replacing with or connecting to units that are not specified by Brother requires separate confirmation.  
For the high-pressure CTS system, the customer must make arrangements to use other specifications apart from line filters and high-pressure coolant spindles.
4. Tool and tool holder
  - (1) Use a pull stud for the coolant-through-spindle device following the Brother specification as noted in the external view of the pull stud. In addition, use a tool that has a hole which runs or passes through it. (Refer to "3.7.2 Tool holder limits" in Operation Manual I for further details.)  
If CTS coolant is discharged on a tool holder that does not have a coolant-through-spindle feature, a CTS error is triggered after discharge.  
Furthermore, never discharge CTS coolant on a tool holder that does not have a coolant-through-spindle feature. Otherwise, it may damage the machine.
  - (2) When the fluid-passing hole in a tool has a small internal diameter, the alarm "IO2011 CTS pressure has not lowered" may trigger. When a tool that has a fluid-passing hole with a small diameter is used at the end of the program, perform the ATC operation after the machining has ended. Or, when the built up pressure does not release properly (because the hole diameter is small), change the parameters according to the usage conditions of the user.  
(Refer to "10 Parameters".)

## 5. Installation

- (1) When installing, make sure that the CTS pump rotates in the direction of the arrow.  
\* The customer must make arrangements to order the high-pressure CTS pump.



- (2) Do no remove the ceiling cover because chips, shavings or coolant may shoot out with strong force.
- (3) Refill with coolant until the coolant level reaches the top of the coolant tank's level gauge. Refer to "Chapter 11 (3) Cyclone filter device" for details on the fluid level when equipped with a cyclone filter device (option).



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- (4) Refer to the external view of the coolant tank in a separate section, and position it so that the piping, wiring or other items do not get caught on anything.

## 6. Usage

- (1) It may not discharge with maximum pressure on a tool holder with a large discharge hole diameter.
- (2) Do not let the CTS pump idle, and do not operate with coolant that is mixed with air. Otherwise, it can damage the device or machine.
- (3) Make sure that the filter piping is securely connected during operation.

### 7. Maintenance

#### (1) Cleaning chip pan

Remove chips or shavings any time that they build up in the chip pan for the coolant tank. If the chips or shavings build up too much, the coolant may overflow outside the tank from the chip pan.

#### (2) Cleaning filter

Clean the filter regularly because the coolant may not discharge properly or well if the filter becomes clogged.

Follow the cleaning procedure below to clean the filter.

##### Filter cleaning procedure

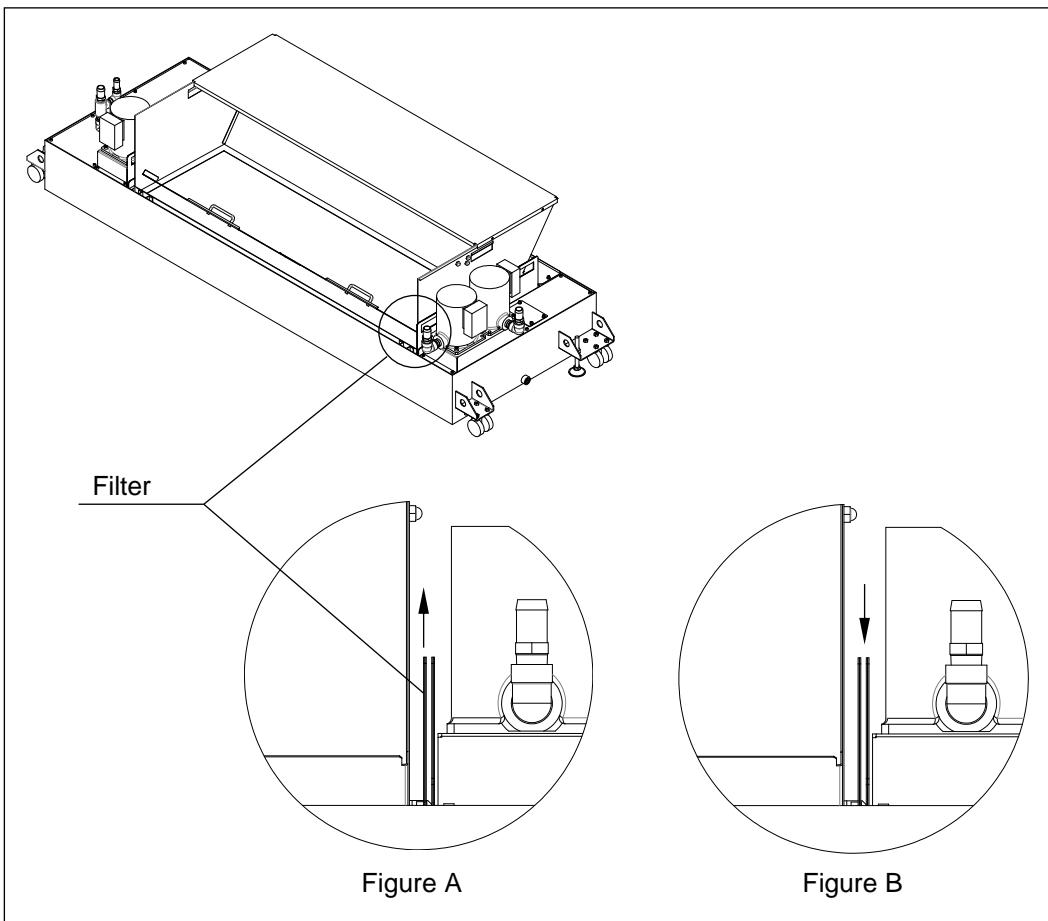
i) Remove the filter from inside the tank (waste water tank side), and clean the filter. (Figure A)

ii) Put the filter that was removed in step (i) into the clean water tank side. (Figure B)

iii) Clean the other filter as well following steps (i) and (ii).

\* When there is a filter on the right and left, clean the filter on both the right and left sides.

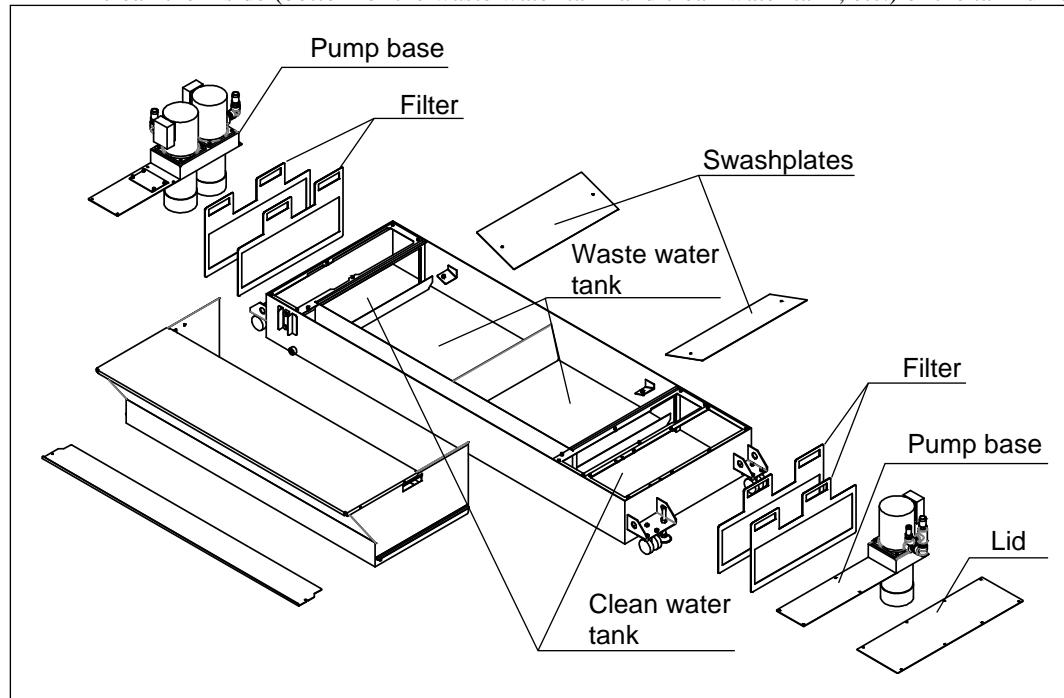
**(NOTICE)** If both filters are removed at the same time, it may cause the pump to get contaminated with foreign objects, the nozzle to become clogged and/or the pump to fail/malfunction.



## (3) Replacing entire coolant volume and cleaning tank

In order to achieve the best performance for the coolant and the coolant tank, check the quality of the coolant (check the concentration and pH according to the coolant manufacturer's specifications, check for odors, etc.) about once a week. In addition, periodically replace the entire volume of the coolant.

When replacing the coolant, remove the pump and lid as indicated in the figure below, and clean the inside (bottom of the waste water tank and clean water tank, etc.) of the tank unit.

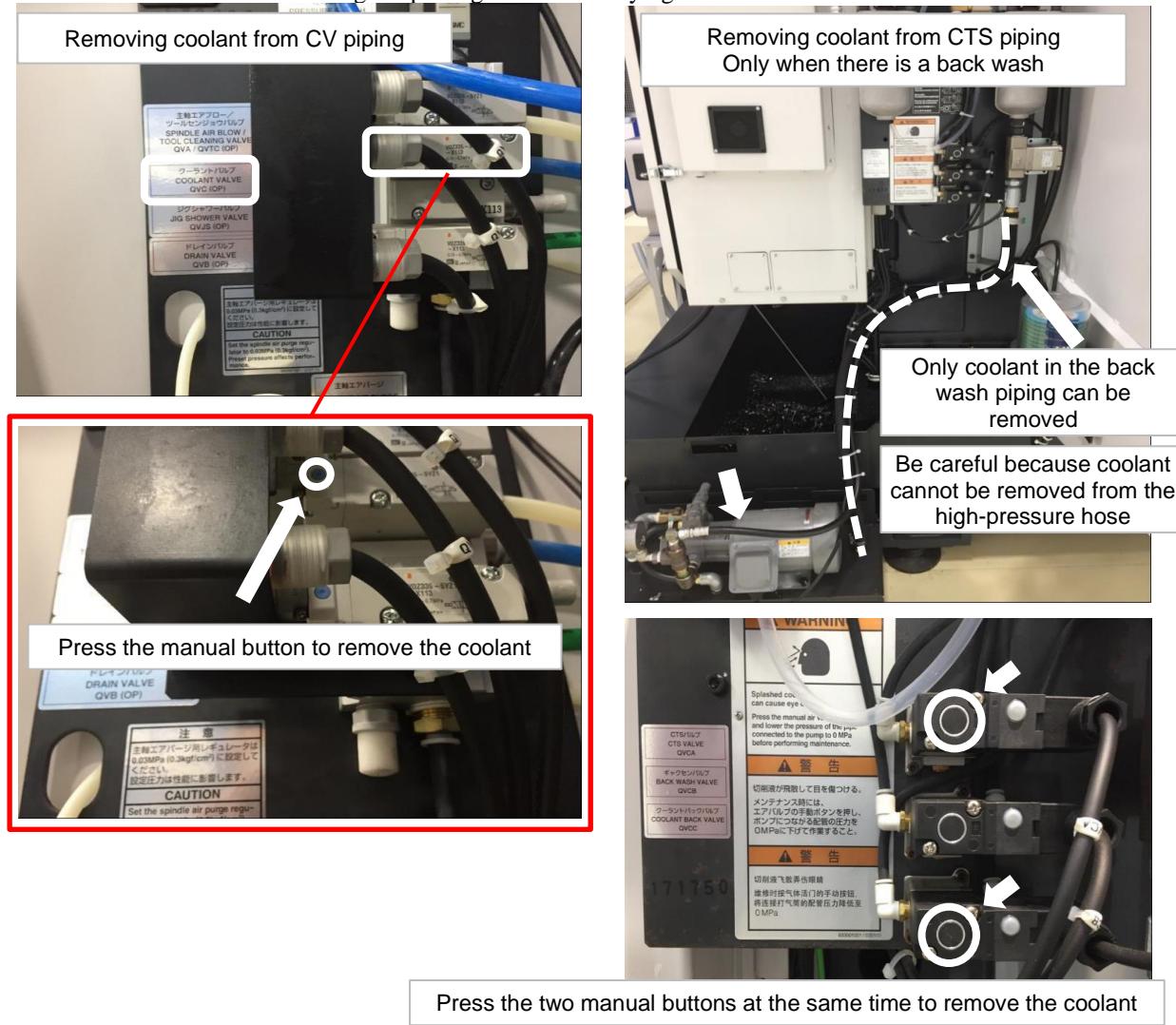


- \* The configuration or parts that are attached may differ from the diagram depending on the model and specification.  
(The diagram is based on a W1000Xd1 200L tank.)

<Special notes when cleaning coolant tank>

The coolant in the hose may leak out when disconnecting the hose from the tank. Therefore, follow the procedure below to remove the coolant.

- \*1 There may be items here that are not on the actual equipment depending on the specification.
- \*2 Even if the coolant is removed, have a container or rag on hand to catch and/or clean any coolant leaking or spouting out when carrying out the work tasks.

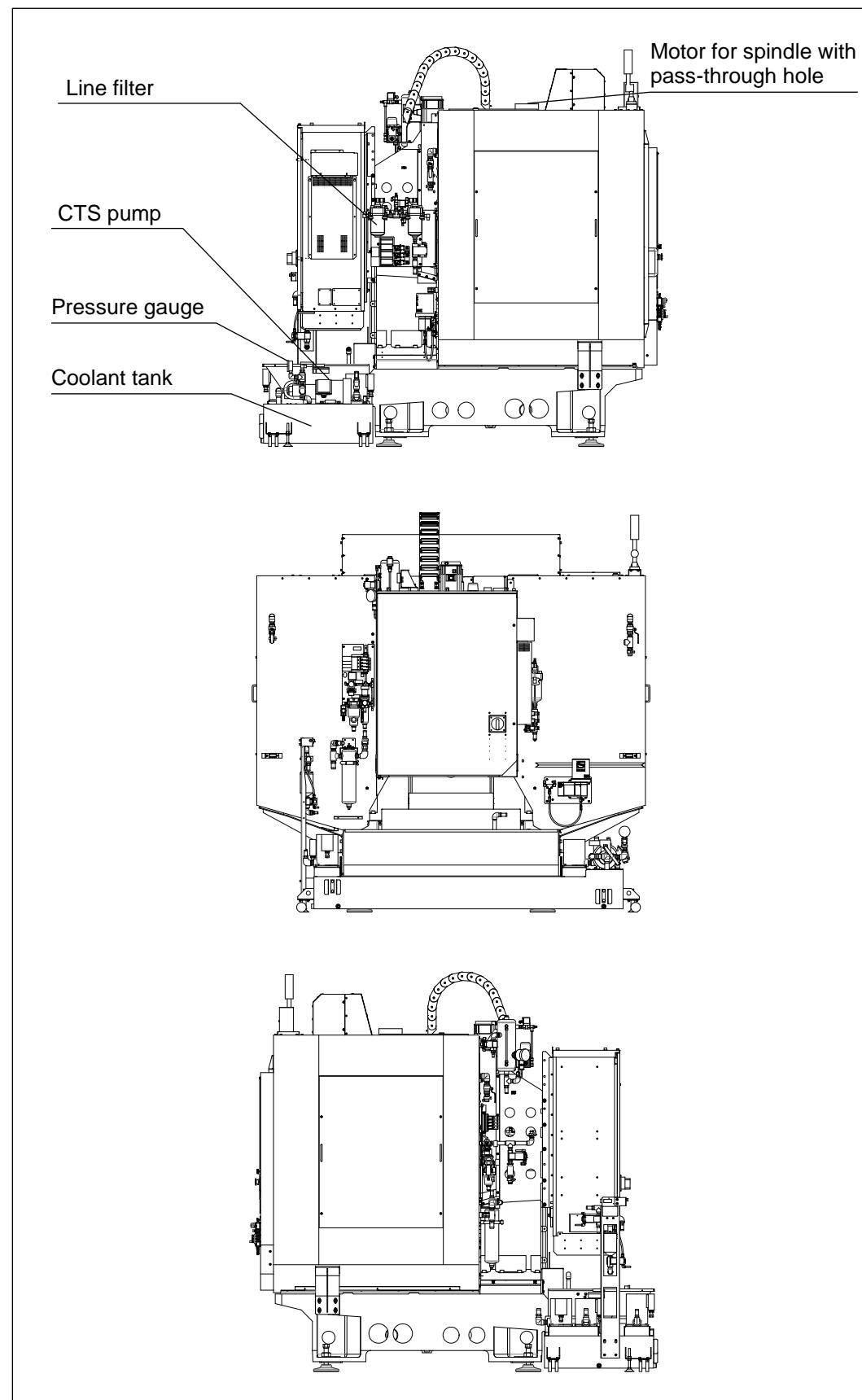


- (4) The timing to replace the coolant varies depending on the usage conditions.
- (5) Refill with coolant until the coolant level reaches the top of the level gauge for the coolant tank. Refer to "Chapter 11 (3) Cyclone filter device" for details on the fluid level when equipped with a cyclone filter device (option).

## 2 Functions

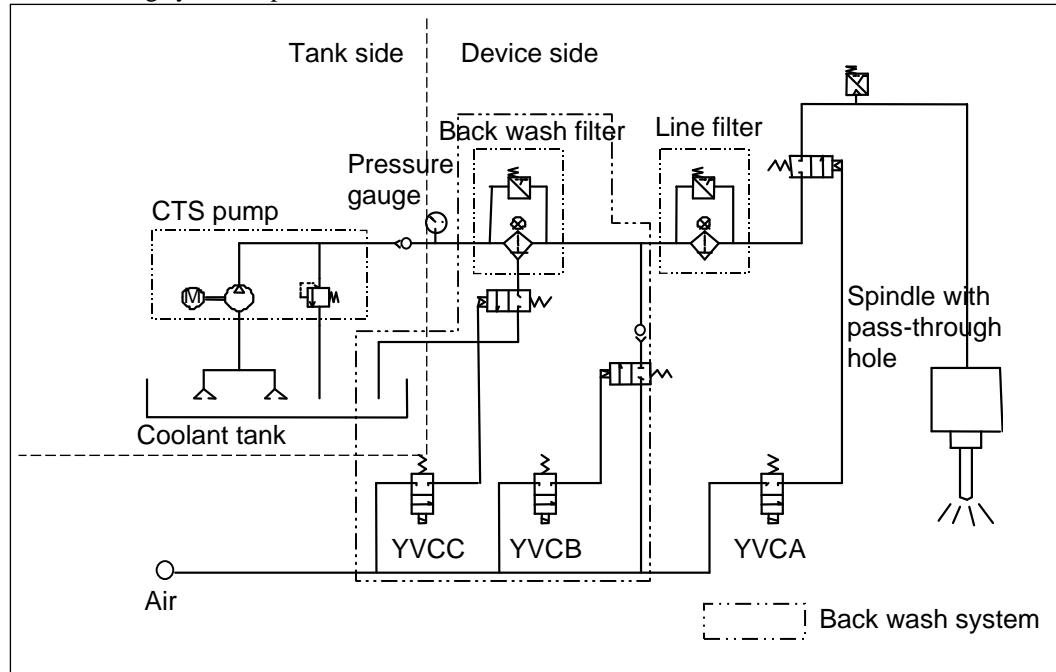
The CTS device is to be used with a special tool and functions to discharge the coolant from the tip of the tool.

### 3 External View



## Chapter 11 Options

The following system is provided for the CTS device.



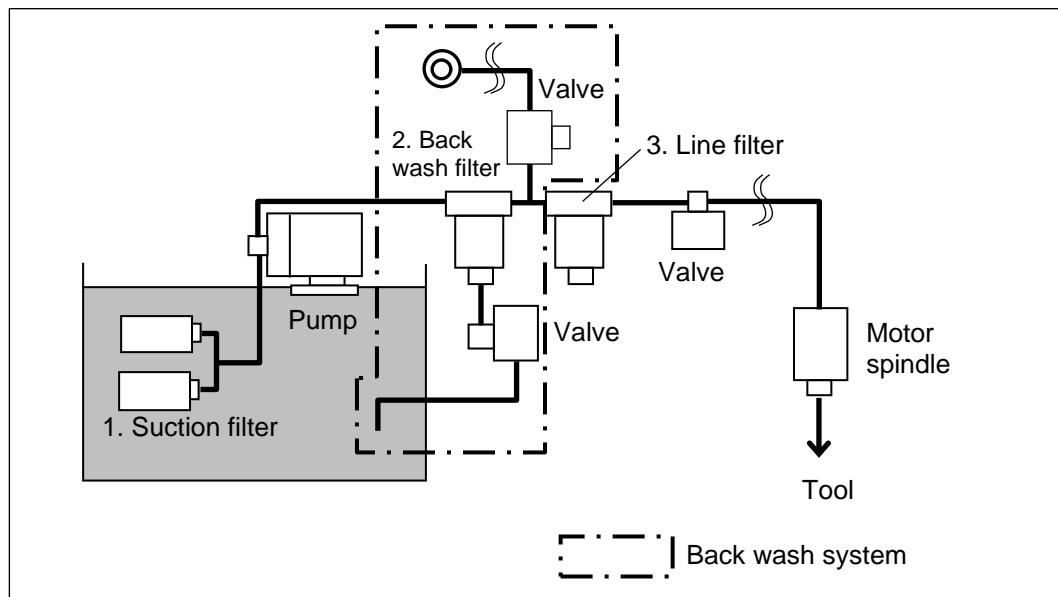
## 4 Specifications

	Manufacturer	Model number	Spec.
CTS pump	Teral Inc.	TRP-MHG10-DBT-65FKC-CVM	650W 10L/min 1.5MPa 200/220V 50Hz 200/220/230V 60Hz
Line filter	Taisei Kogyo	T-UL-03A-20U-DK-L Element replacement P-T-UL-03A-20U	Filtration precision 20 µm Material Filter paper Pressure-resistance 3.5 MPa Differential pressure switch Operates with 0.3 MPa
Line filter (for high-pressure CTS)	Taisei Kogyo	G-UM-03-20UW-EK Element replacement P-G-UM-03-20UW	Filtration precision 20 µm Material SUS Pressure-resistance 7.0MPa Differential pressure switch Operates with 0.3 MPa
Pressure switch	Sanwa Electric	SPS-8WP-PA20	Operation pressure 0.5 to 0.7MPa Pressure-resistance 21 MPa
Back wash filter (When equipped with back wash system)	Taisei Kogyo	Z-BP08100-40UW-DK-L Element replacement P-AP03804-40UW	Filtration precision 40 µm Material SUS Pressure-resistance 3.5 MPa Differential pressure switch Operates with 0.3 MPa
Coolant			Water soluble cutting fluid
Pull stud	Nikken Kosakusho Works, Big Daishowa Seiki, Yukiwa Seiko, NT Tool, etc.		Special pull stud per Brother specification (Refer to “3.7.2 Tool holder limits” in Operation Manual I for further details about the specifications.)

Filter system

System overview (Specification with back wash)





**1. Suction filter**

This filter is primarily used to prevent large chips or shavings from entering and contaminating the inside of the piping, etc., in order to protect the pump.

**2. Back wash filter**

This filter is used to clean by performing an automatic back wash operation on the filter element.

The back wash timing can be set at any given time after each program is finished.

A differential pressure switch that detects clogs is built into the system, and an error message is displayed during an alarm when there is a clog.

(Refer to “Chapter 9 (2) CTS device (coolant-through-spindle)” in Operation Manual I for further details about the operation procedure.)

(NOTE) If the system is not equipped with a back wash filter, set up a filter according to the machining conditions.

**3. Line filter**

A differential pressure switch that detects clogs is built into the system, and an error message is displayed during an alarm when there is a clog.

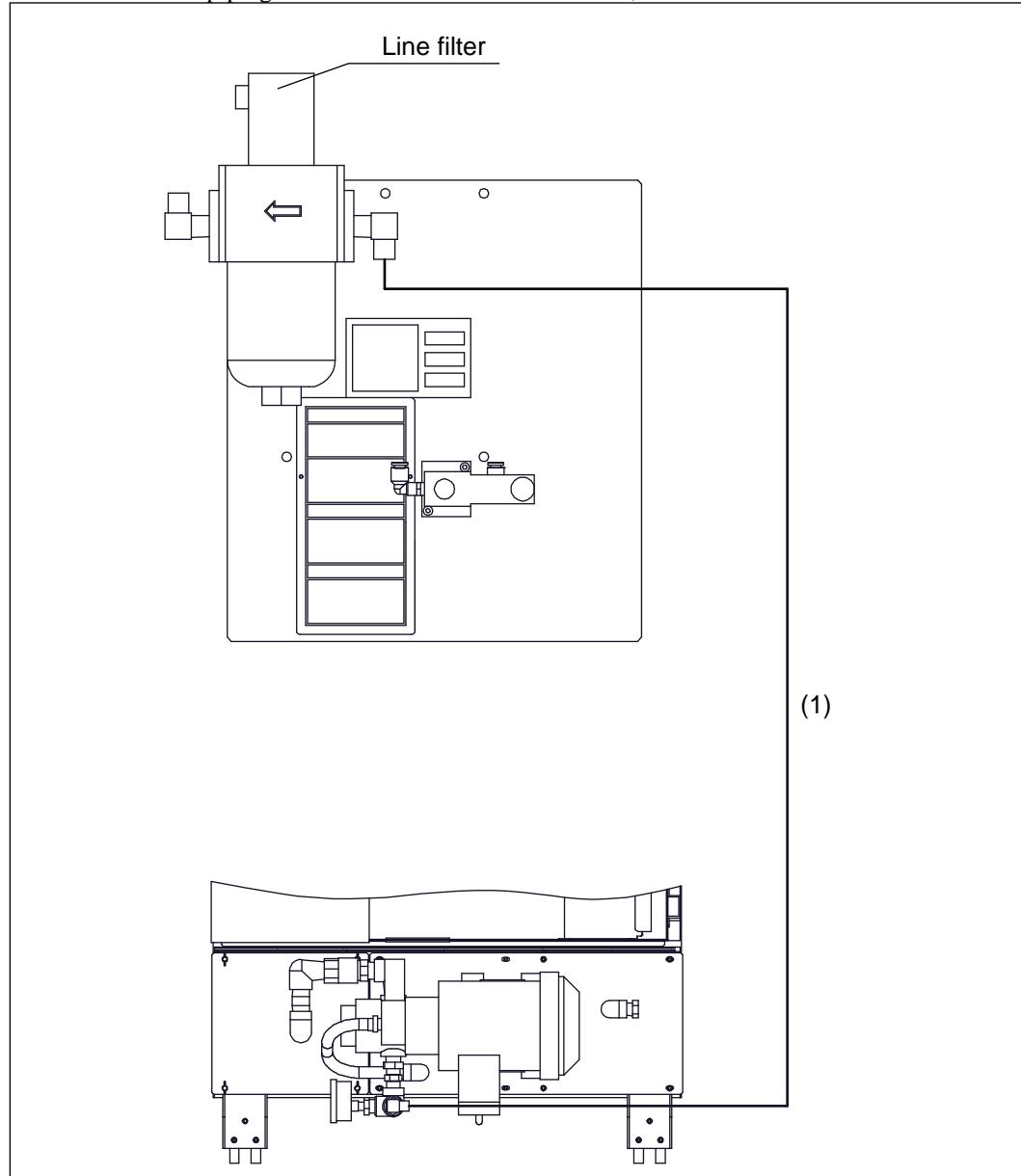
(Refer to “8.1.2.1 Replacing line filter element” for further details.)

(NOTE) The back wash filter and line filter require periodic inspection and maintenance. Replace the filters as needed depending on the amount of chips or shavings and the frequency of use and operation.

## 5 Piping

1. From CTS pump to line filter
  - \* Refer to the connection manual for details on the high-pressure CTS.

Make sure that the piping connections are secure. Otherwise, it can lead to fluid leaks.

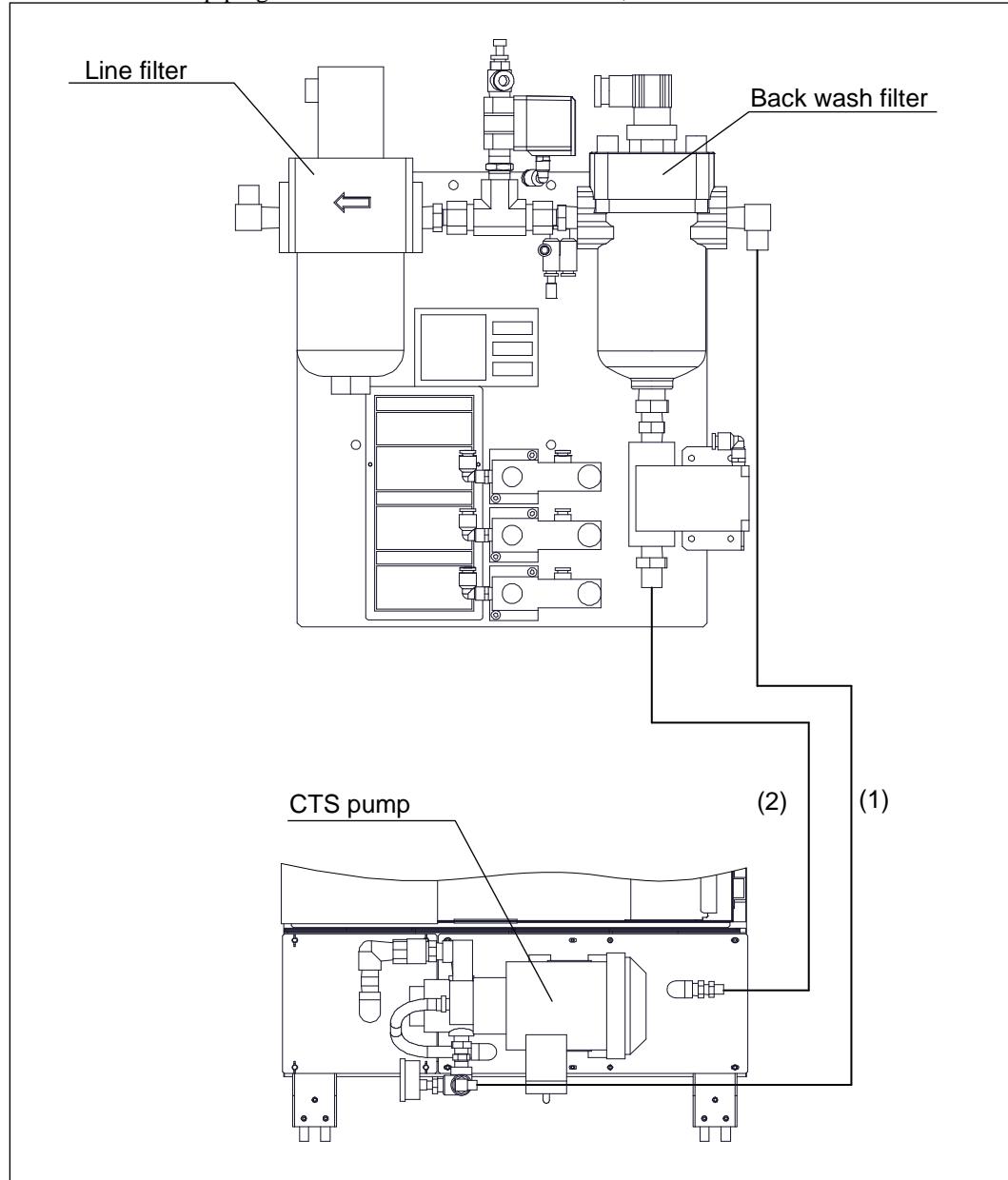


## Chapter 11 Options

When equipped with a back wash filter

1. From CTS pump to back wash filter
2. From back wash filter to coolant tank

Make sure that the piping connections are secure. Otherwise, it can lead to fluid leaks.



# 6 Wiring

- \* Refer to the connection manual for details on the high-pressure CTS.
- The following wiring procedure must always be carried out by a certified electrician.
- 1. First, turn OFF the main power breaker and power breaker that supplies power to the pump before performing work.
- 2. Connect the CTS pump motor cable to the terminal block for the CTS protection unit (KFP3). Tighten the cables without removing the surge suppressor, and match the terminal block names with the cable wire marker names when connecting.  
Connect the ground terminal to the tap hole used for the front ground on the CTS protection unit.
- 3. Connect the motor cable to the CTS pump terminal block.  
Match the terminal block names with the cable wire marker names when connecting.

## 6.1 Motor Protection Unit

1. Rated current setting  
Match the dial mark “A” to the “Set value”.  
(NOTICE) The rated current setting value varies depending on the power voltage and frequency.  
If the setting is wrong, the detection overload may not function properly and cause a burnout on the pump motor.  
Therefore, configure the settings correctly.

Rated current setting values

Pump capacity	Frequency	When there is no transformer box			When there is a transformer box
		AC 200 V input	AC 220 V input	AC 230 V input	
650W	50 Hz	3.4 A	3.4 A	-	3.4 A
FCP3	60 Hz	3.2 A	3.0 A	3.1 A	3.0 A

Refer to “Chapter 11 (1) Coolant unit” for further details on the FCP1, FCP2 and FCP6 set values. Refer to “Chapter 11 (3) Cyclone filter device” for further details about the FCP8 set value.

Refer to “Chapter 4 Installation” to check if there is a transformer box.

2. Check pump rotational direction  
Make sure that the rotational direction of the CTS pump matches the direction indicated on the pump. If it is rotating in reverse, first, turn OFF the power and breaker. Then, switch the U and V phase on the terminal block for the motor, and check the direction again.

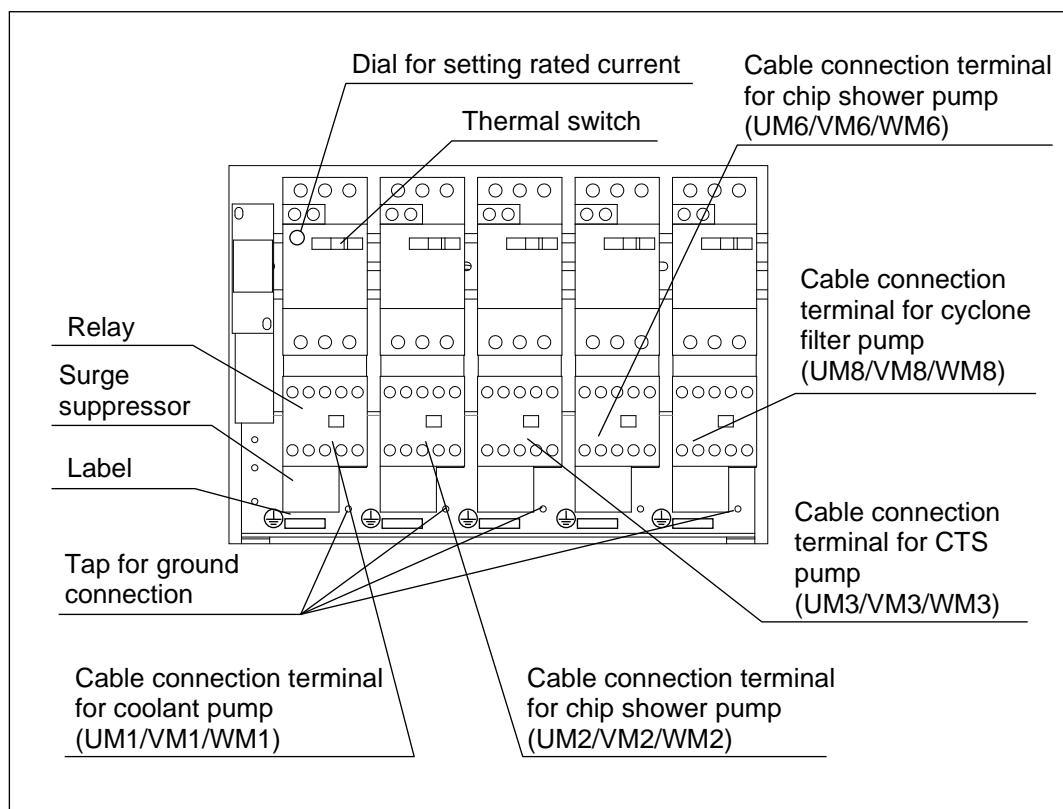
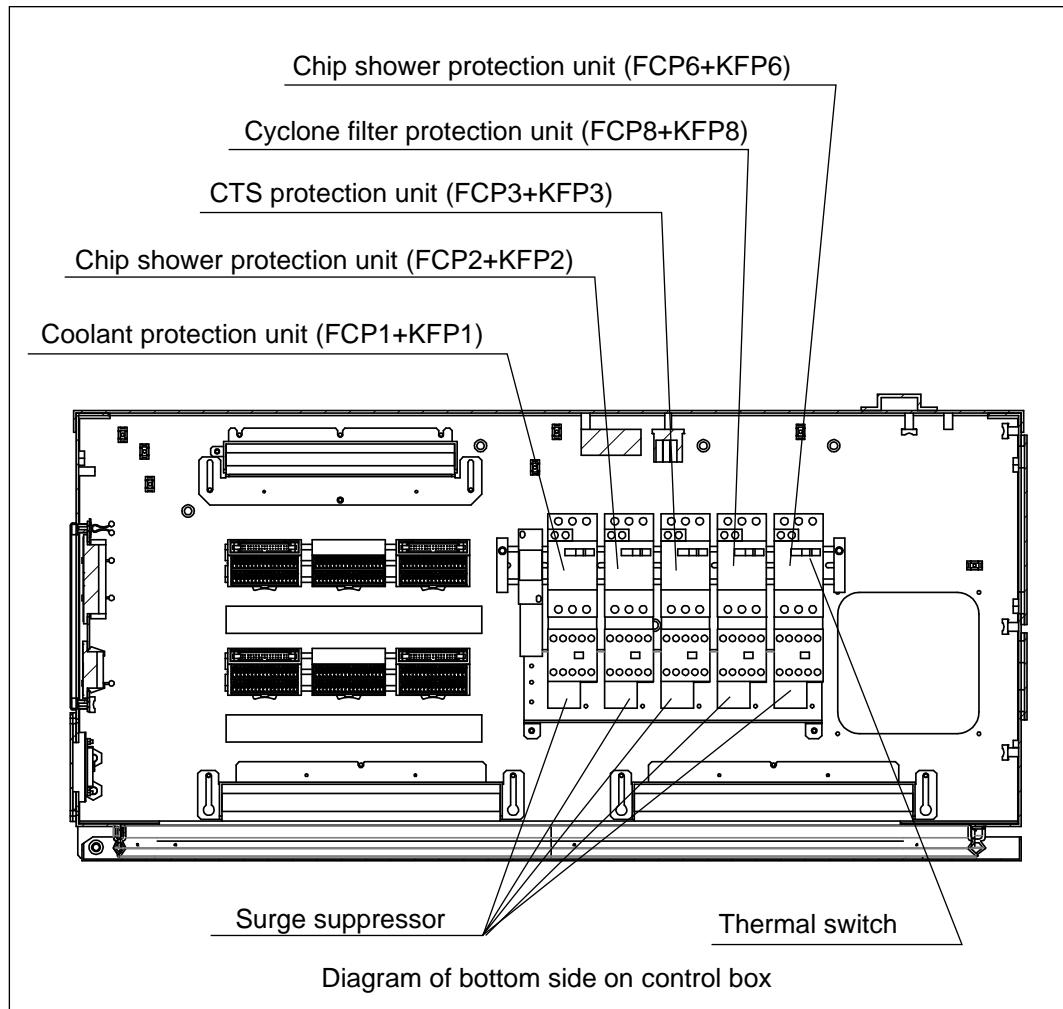
(NOTICE 1) Make sure that the CTS pump is rotating in the indicated direction.  
If the pump is rotating in the opposite direction by mistake, the alarm <<\*Tool washing liquid surface sensor is abnormal>> or <<CTS pressure has not increased>> may trigger.

(NOTICE 2) When checking the rotation direction, make sure that coolant is in the tank.

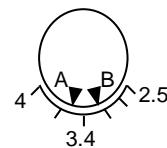
3. Procedure when activated  
If an excessive load is applied to the CTS pump motor, the alarm <<\*Thermal error (coolant)>> is triggered. In terms of causes, the coolant viscosity may be too high or the power voltage may not be correct. For recovery, first, troubleshoot and remove the cause, and then press the reset button on the protection unit that tripped.

(NOTE 1) The thermal switch may turn off during transport.  
During installation, check the position and turn ON the switch when necessary.

(NOTE 2) The positioning of the motor protection unit for the pump may shift during transport.  
During installation, check the position and move it back to its original position when necessary.

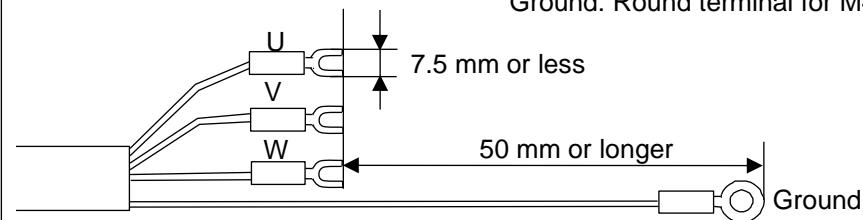


Enlargement of dial for setting rated current



Motor cable terminal setup – Example of recommended setup

U, V and W: Y terminal for M3  
Outer diameter - 7.5 mm or smaller  
Ground: Round terminal for M4



## 7 Installation Check

Make sure that the pipe work and wiring is finished before filling the coolant tank with coolant.  
 \* Refer to the connection manual for details on the high-pressure CTS.

1. CTS pump motor check
  - (1) Turn OFF the power to the machine.  
 Make sure that the front door and the maintenance cover are all fully closed.
  - (2) Turn ON the [CLT.P] key on the operation panel.  
 The key lamp lights up and coolant will flow.
  - (3) Press the [MDI] key to switch to the MDI operation mode screen.

For NC language

- (4) Press the [CAN] key to clear the editing area.  
 Use the number keys to enter “M494”.

For conversation language

- (4) Use the [CURSOR] keys to move the cursor to external signal.  
 Use the number keys to enter “494” and press the [ENT] key.
- (5) Press the start switch.  
 The CTS pump motor starts and coolant begins to flow from the spindle.  
 If the motor does not start, check the wiring connection on the motor terminal block.

- (NOTICE) If the system is not equipped with a back wash filter, change the user parameter setting <Back washing at end of program> to <0>. (Refer to “Chapter 1 Data bank” in the Data Bank & Alarm Manual for further details.) If the user parameter is set to “1”, the CTS pump will be activated after the program finishes.

2. Piping check
  - (1) The CTS pump starts to operation as noted in the procedure above.
  - (2) Make sure that coolant does not leak from the connections on the piping per the setup in section 4: Piping Procedure.

- (NOTICE 1) This system holds the coolant in the piping and maintains the internal pressure so that the coolant comes out of the spindle immediately after the discharge command is issued. As a result, the first two to four times when the system starts up right after setting up the piping, the error <<\*CTS pressure has not increased>> is triggered because there isn’t any coolant in the piping. Press the [RST] key to reset the error, and continue to repeat the ON operation until the error stops occurring.

- (NOTICE 2) This function’s operation is performed in standard control program 10 for the built-in PLC function. If a ladder program is changed, an unexpected operation or malfunction can occur. Only change the ladder program if you have thorough knowledge of the specifications.

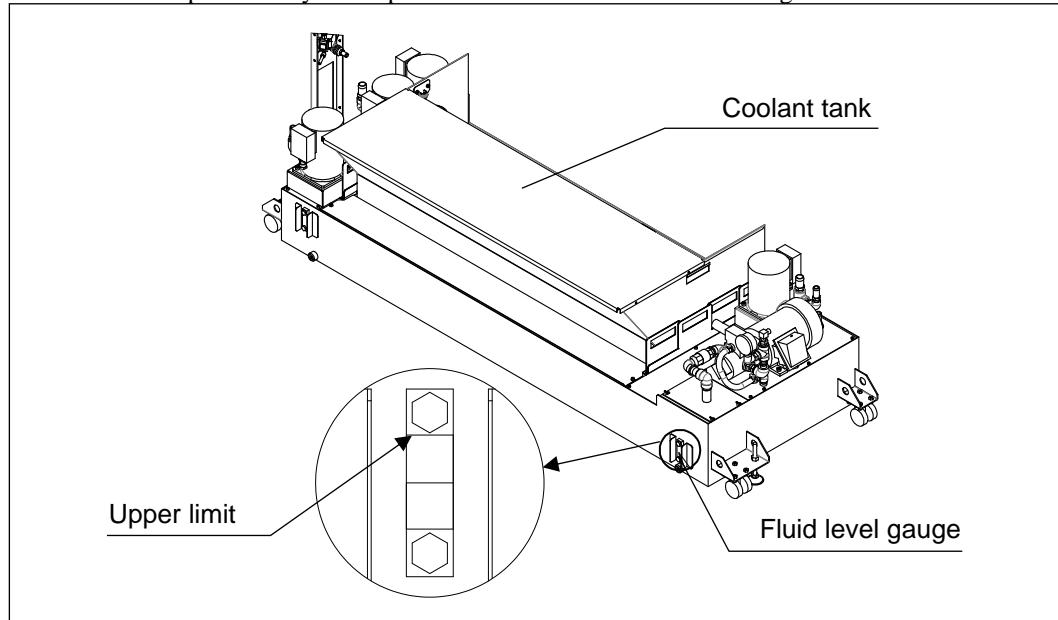
# 8 Inspection and Consumable Parts

## 8.1 Inspection Items

### 8.1.1 Replenishing Coolant

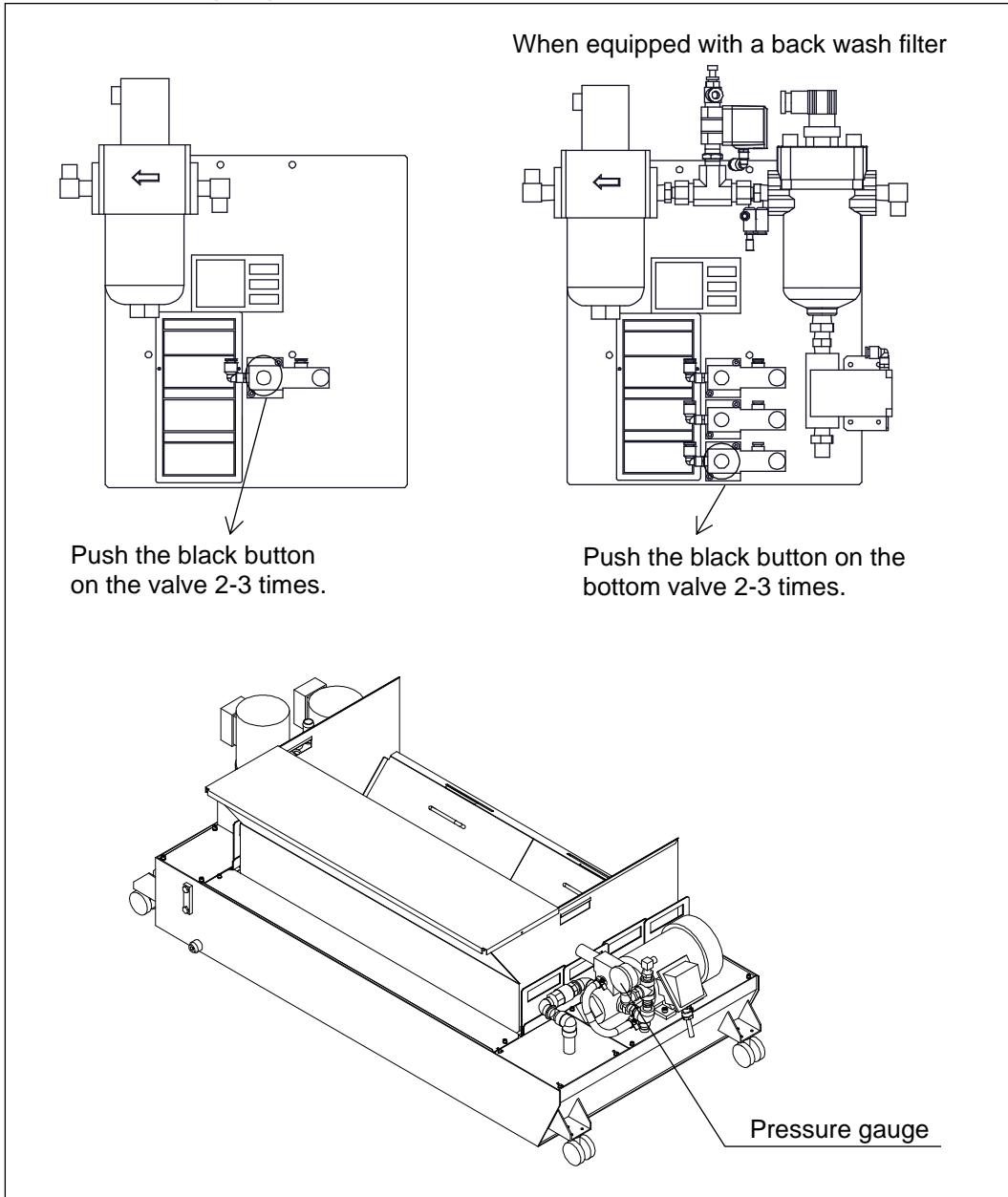
The coolant's fluid level in the tank should be at the top (full).

Check this level periodically and replenish it with more coolant when it goes down.



When replacing the filter and cleaning, always purge the residual pressure.

### 8.1.1.1 Purging Residual Pressure

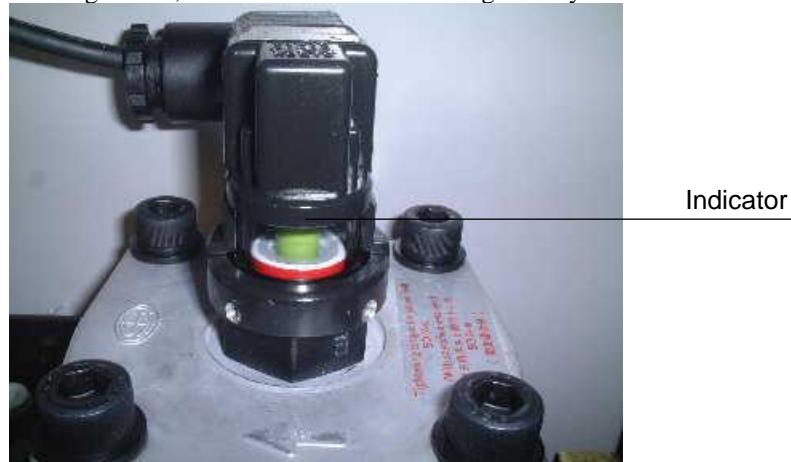


## 8.1.2 Line Filter

The line filter detects a difference in pressure between the inlet and outlet.

If a clog occurs, the alarm message <<Line filter error>> is displayed on the machine. Clean the filter beforehand because a block stop will occur on the machine.

If a clog occurs, the line filter indicator will gradually turn red.



### 8.1.2.1 Replacing Line Filter Element

We recommend replacing the line filter element if there is a clog.

1. Always make sure that the pressure gauge for the pump reads 0 MPa before beginning work.
2. Loosen the indicator screws. (Qty. 2)



3. Remove the top part of the indicator by pulling it out straight up.



## Chapter 11 Options

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4. Loosen the hexagonal slotted bolts (Qty.4) slowly and evenly. If there is any pressure left inside, the cutting oil may shoot out and injure your eyes. Gradually open a small space between the lid and the unit to make sure that there is no residual pressure before opening it all the way.



5. Remove the lid by pulling it out straight up.



6. Pull out the filter element from the bottom. Be careful when removing the filter element, as the coolant inside the element may shoot out when the element is pulled out.



7. Press in the new filter element all the way as it was in step 5.



8. First, make sure there are no chips or shavings that are sticking to the under part of the lid and the top part of the unit. Then, make sure that the O-ring is fitted securely. Finally, insert the lid so it is straight, following the reverse in step 4.
9. Tighten the hexagonal slotted bolts evenly, following the reverse in step 4. Always make sure that the specified torque is 50 Nm.



10. Make sure that the coolant flow follows the arrow on the filter lid as indicated in the picture.  
(From right to left)

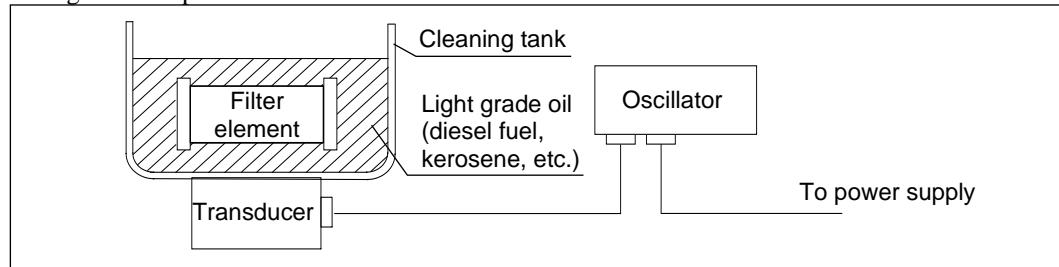


11. Once the CTS coolant starts to flow after a few minutes, make sure that the CTS coolant is not leaking from the lid on the line filter.

### 8.1.3 Cleaning the Back Wash Filter

The filter is an internal pressure type filter. If the internal pressure builds up to 0.3 MPa, the alarm message <<Back wash filter error>> is displayed on the machine. Make sure to check periodically with the indicator provided when a block stop occurs.

When back wash is carried out regularly, the filter will not clog if the system detects filter errors during normal operation.



Refer to “8.1.2.1 Replacing line filter element” for further details on replacing the filter element.

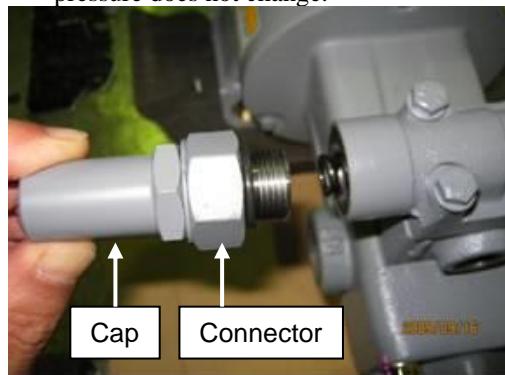
### 8.1.4 Cleaning the Relief Valve

If small particle size chips or shavings pass through the suction filter and contaminate the CTS pump, or if the CTS pump is not operating, deposits could build up on the sliding section of the relief valve depending on the coolant status. This may cause poor performance and create excessive pressure inside the CTS piping. The system, such as the pump or pressure gauge, may get damaged. Therefore, perform maintenance regularly every 1 to 3 months following the procedure below.

1. Refer to “8.1.1.1 Purging residual pressure” and always make sure that the residual pressure on the pump reads 0 MPa before beginning work.
2. Remove the return line (pipe) for the relief valve.



3. Remove the connector with the cap attached.  
\* Make sure that the cap and adjustment bolt inside the cap are not loose to ensure the set pressure does not change.



4. Remove the spring from the valve case.



5. Remove the poppet valve from the valve case.



6. Remove the M6 bolts (Qty.4) attached to the relief valve, and remove the valve case.



7. After disassembling the relief valve, air blow or clean the spring, poppet valve, the inside of the valve case and the inside of the connector. Make sure that there are no chips, shavings or other foreign objects are left inside the valve case.

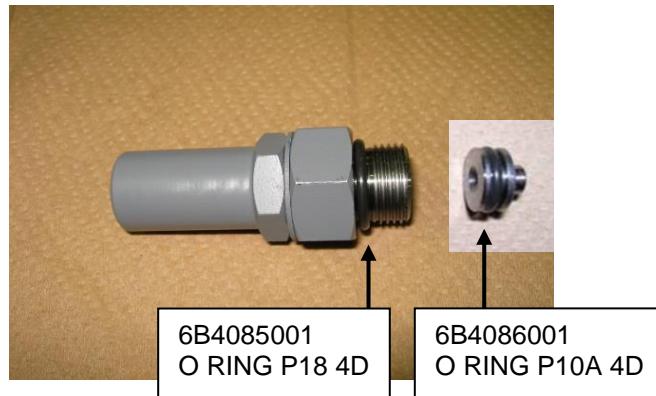
\* Use refined oil such as paraffin oil to clean the parts.

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## Chapter 11 Options

8. Insert the poppet valve inside the valve case. Make sure that the poppet valve slides smoothly at this time.
9. Insert the spring into the poppet valve's inner diameter that is inside the valve case.
10. Lightly screw the connector onto the valve case to hold it in place.
  - \* Make sure that there is nothing wrong with the O-ring on the connector's thread (replace when damaged) and that the spring holder has not fallen out.
  - \* Screw in being careful that the protruding part of the spring holder fits into the spring's inner diameter.



11. Secure the subplate on the pump casing and then attach the valve case that was assembled using the M6 bolts (Qty.4) to reattach it to its original position. (Recommended tightening torque: 4.1 to 5.3 Nm)
  - \* Make sure that the direction of the relief valve and the arrow on the subplate are oriented downward.
  - \* Make sure that the sealing sheet (sheet packing) is positioned in the same way as before. (One above and one below the subplate)
12. Tighten the connector all the way. (Recommended tightening torque: 35 to 48 Nm)

(NOTICE 1) Just in case a fluid leak were to occur, an oil pan, oil absorption pad or rag should be placed around the pump.

(NOTICE 2) Take the necessary precautions to ensure that the relief valve parts and pump that were disassembled and cleaned do not get dirty or contaminated before re-attachment.

(Reference) The Brother part numbers are noted in the table below for the seals used for replacement.

Main component	Subparts	Qty.
6B4088001 RELIEF VALVE PACKING ASSY	6B4085001 O RING P18 4D	1
	6B4086001 O RING P10A 4D	1
	6B4087001 SHEET PACKING TRP-HG-75B	2

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## 8.2 Consumable Parts

The consumable parts are listed below. Replace the parts periodically.

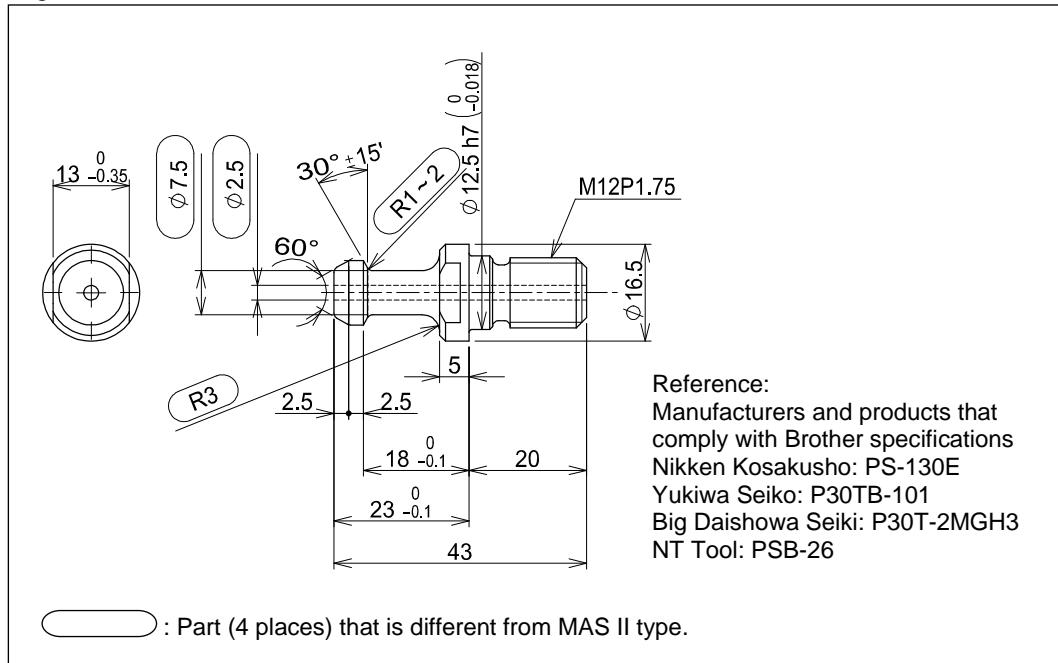
The parts marked with an asterisk (\*) should be replaced by Brother maintenance service staff or service staff that have received Brother maintenance training.

	Manufacturer	Model number	Replacement timing	Brother part No.	
Line filter	Element	Taisei Kogyo	P-T-UL-03A-20U	As necessary	618491001
Line filter (for high-pressure)	Element	Taisei Kogyo	P-G-UM-03-20UW	As necessary	655607001
*CTS pump	Pump unit	Teral Inc.		As necessary	618492001
Back wash element	Element	Taisei Kogyo	P-AP03804-40UW	As necessary	618497001

## 9 External Appearance of Pull Stud

The only tool holder that can be used with this system is a BT30 holder with an internal fluid passage channel.

Use a pull stud and tool that have an internal fluid passage channel (hole) as indicated in the diagram below.



# 10 Parameters

Machine parameter (System 1: common)

Item name	Description	Factory-set value
Center-through-coolant option	<0: None 1: Equipped > Sets whether the system is equipped with a center-through-coolant option.	1

User parameter (Switch 1: installation)

Item name	Description	Factory-set value
Back washing at end of program	Sets whether the back washing cycle is performed when the program is completed. When <1: Yes> is selected with a CTS command included in the program (when coolant ON command has been issued), the back washing cycle is performed at the end of the program.	1
CTS pressurize check delay time	Sets the delay time until the check for the pump pressure starts, after the center-through-coolant is turned ON from the signal output M494. If set to 0, the check is not performed. (NOTICE) This set value is sent to the built-in PLC, and the function is available on the internal PLC circuit. If the default PLC program is changed, the function may not operate as intended following this set value.	1.0 sec.
CTS depressurize check delay time	Sets the delay time until the check for the pump pressure starts, after the center-through-coolant is turned OFF. If set to 0, the check is not performed. (NOTICE) This set value is sent to the built-in PLC, and the function is available on the internal PLC circuit. If the default PLC program is changed, the function may not operate as intended following this set value.	1.0 sec.
CTS pressure bleed time	Sets the time to purge or bleed the pressure inside the piping after the center-through-coolant is turned OFF. (NOTICE) This set value is sent to the built-in PLC, and the function is available on the internal PLC circuit. If the default PLC program is changed, the function may not operate as intended following this set value.	0.0 sec.

## CHAPTER 11 (3)

### CYCLONE FILTER DEVICE

- 1 Handling Precautions
- 2 Function
- 3 External View
- 4 Specifications
- 5 Piping
- 6 Wiring
- 7 Operation Check
- 8 Maintenance
- 9 Replacement Procedure for Consumable Parts

# 1 Handling Precautions

## **WARNING**

High-voltage components are present inside the control box. There is risk of electric shock if you touch these components by mistake.

### [SAFETY INSTRUCTIONS]

Maintenance and inspection of electrical components must only be carried out by a qualified electrician who is trained in electrical safety and who has thorough knowledge of the electronic circuits in this machine.

Turn OFF the main power breaker, and then wait at least 20 minutes before carrying out work.

Attach a padlock to the main power breaker so that the power cannot be turned ON.

A sign or notice should be placed near the operation panel to warn others that work is in progress.

If leaving the machine unattended, close the control box and secure it with screws.

## **WARNING**

If the control box or operation panel is touched accidentally with wet hands while performing installation or maintenance, an electric shock or short-circuit may cause a fire.

### [SAFETY INSTRUCTIONS]

Do not touch the control box and the operation panel with wet hands.

The cover to the control box must be closed while the machine is operating.

The control box and the operation panel must be kept free of coolant, water, chips and shavings.

## **WARNING**

If terminal connections on the PCBs or terminal block screws become loose, poor contacts may cause overheating or a fire.

### [SAFETY INSTRUCTIONS]

There should be no loose screws when connecting the wiring.

Do not replace fuses and electrical parts that have been soldered to the inside of the unit.

## **WARNING**

If the thermal settings are changed, the protection equipment may not operate and may cause a fire.

### [SAFETY INSTRUCTIONS]

The installer must check the setting values of the protection unit.

## **WARNING**

**If you touch cables which have been crushed or damaged by heavy objects, there is risk of electric shock.**

**In addition, short-circuits may occur if cables are crushed or damaged by heavy objects.**

**[SAFETY INSTRUCTIONS]**

**Cables should be gathered up or arranged to prevent them from being crushed. If a cable has become damaged, it must be replaced with a new one.**

## **WARNING**

**When replacing parts or disconnecting hoses from the coolant equipment, the coolant may shoot out and injure your eyes.**

**[SAFETY INSTRUCTIONS]**

**Always be sure to wear protective goggles.**

**Purge all remaining pressure before carrying out such work.**

**Handle the hoses carefully so that they are not subjected to any impacts.**

**If coolant gets into your eyes, rinse with clean water and then seek medical advice.**

## **WARNING**

**If the machine is used in conditions where coolant mist may be generated and there is no mist collector present or the mist collector performance is poor, the coolant mist may be inhaled and have adverse effects on your health.**

**[SAFETY INSTRUCTIONS]**

**Check the safety data sheet (SDS) for the coolant being used, and adopt the required safety measures.**

**When using the CTS device or if there is coolant mist, always be sure to use a mist collector with sufficient extraction capacity.**

**Clean the filter for the mist collector regularly.**

This function uses standard control program 10 for the built-in PLC function. This function assumes that the executing task assigns the control program that is included as part of the factory-default settings.

Therefore, when using this system, do not change execution settings for standard control program 10 and standard task 3.

In addition, do not change the corresponding contact.

If a control program and/or a task execution setting is changed, operation will no longer be covered under the warranty.

In addition, do not perform the debug function (stop, ON/OFF for related contacts, etc.) for the standard control program 10 while this function is operating.

## Chapter 11 Options

1. Air source
  - (1) Use an air source with the following capacity: 130 L/min (ANR) or greater.
  - (2) Use clean air without any oil content or moisture.
2. Coolant
  - (1) This system is specifically for water soluble cutting fluid. Do not use oil-based coolant, because it has a high viscosity and the performance of the cyclone function (that separates chips or shavings using centrifugal force) declines.
  - (2) To select a coolant, ask the coolant dealer about the coolant's lubrication quality, corrosion prevention, bubbling prevention and safety.  
Do not use a chemical solution (synthetic coolant). They provide poor lubrication and strip coating off the machine, possibly leading to machine damage.
  - (3) Depending on the coolant type, usage and other factors, bubbles may form in the coolant inside the tank. If this occurs, use an anti-foaming agent or other countermeasures such as reducing the discharge amount.
  - (4) Do no flush coolant down the sewer or drain.  
Ask a waste disposal company or contractor to properly dispose of the coolant.
  - (5) Depending on the coolant type, it may have elements that adversely affect or make parts, such as the guide, more susceptible to corrosion. Contact the coolant manufacturer for further details before use.  
Move each axis the full breadth of its stroke once a day to ensure lubrication and prevent rust from forming on the linear guide and ball screw.  
If performed before and after operation, it is more effective.
  - (6) Water soluble coolant that has been broken down by bacteria, etc., can cause a bad smell, environmental deterioration and other problems. The quality may also deteriorate, causing rust, which can lead to machine damage.  
If the coolant has deteriorated, stop using it and replace all the coolant with new coolant.
3. Tank cleaning  
Refer to "Chapter 11 (1) Coolant Unit" and "Chapter 11 (2) CTS Device(COOLANT-THROUGH-SPINDLE)" for further details on the coolant tank cleaning method.
4. Special notes when using  
The coolant discharges regularly from the sludge discharge hose during machine operation.  
When removing chips or shavings after they have built up in the chip pan, do it when the machine is stopped.  
After cleaning is complete, open the manual valve again.  
Do not use materials that are lighter than aluminum, because they cannot be filtered.  
  
(NOTICE 1) When the machine is used while the outlet for sludge discharge hose is blocked by chips or shavings, it will cause the chips or shavings to build up in the sludge pod. Then, the line filter for the tool wash system may get clogged or the sludge may contaminate and get inside the clean tank.  
(NOTICE 2) When tool cleaning is linked up and used, the clean tank may become empty depending on the conditions.

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Coolant tank volume and weight

Specifications	Weight (Without coolant) Unit: kg
200L (for W1000Xd1)	Nozzle, shower and CTS

## 2 Function

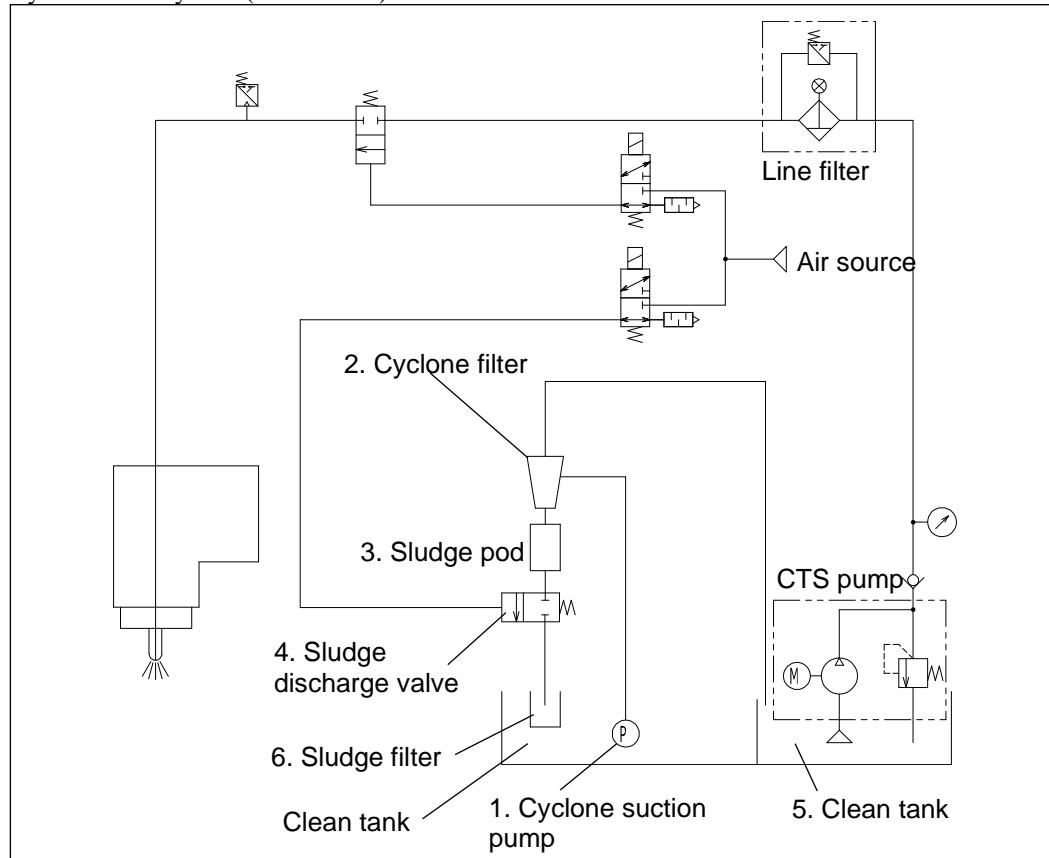
The cyclone filter device removes the chips or shavings from the coolant using a cyclone filter.

The cyclone filter device supports the following 2 types of options.

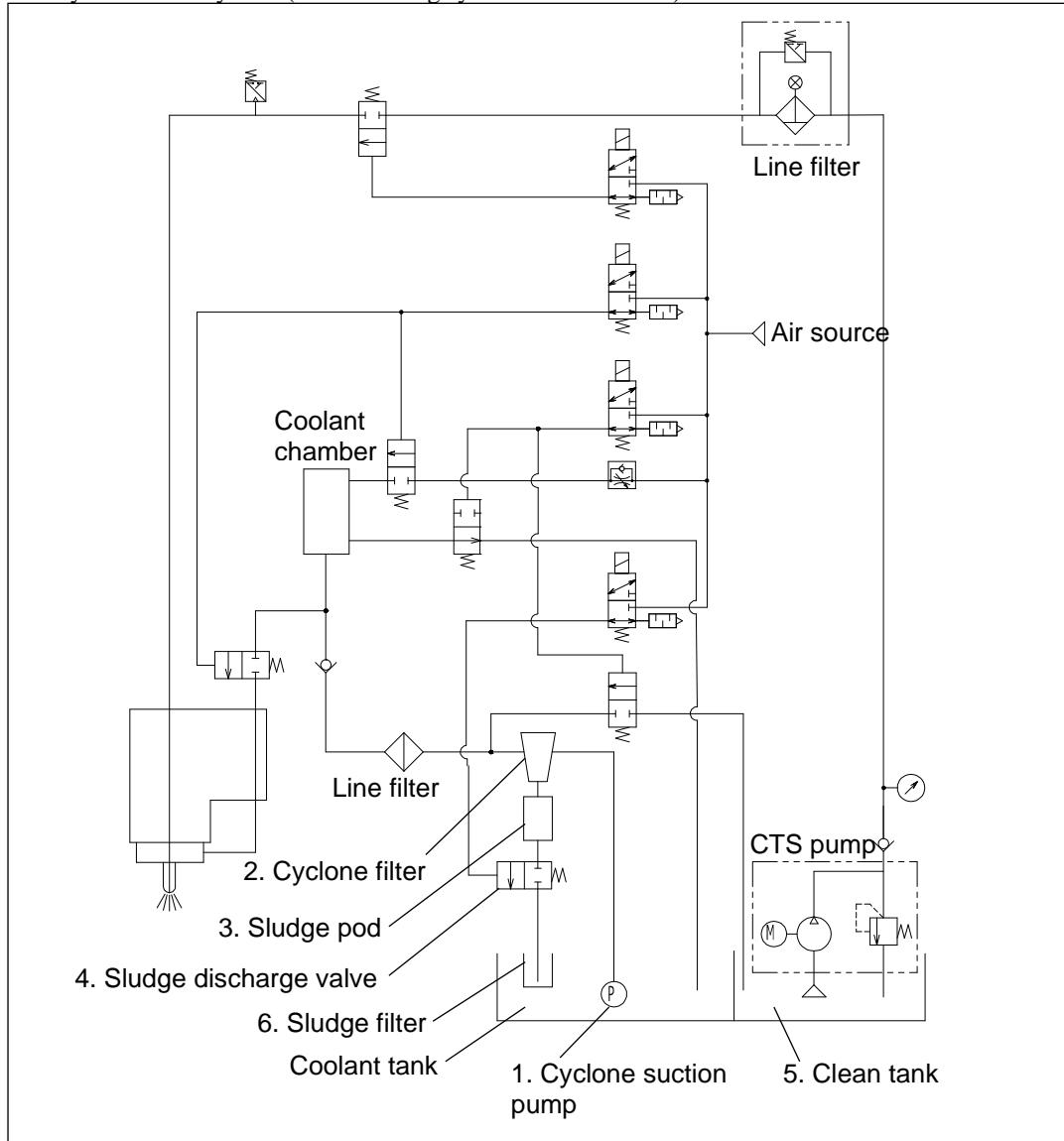
- CTS device
- Tooling cleaning system + CTS device

(NOTE) The cyclone filter device specification does not include a back wash filter.

Cyclone filter system (CTS device)



Cyclone filter system (Tool cleaning system + CTS device)



1. Cyclone suction pump  
This pump supplies coolant to the clean tank.
2. Cyclone filter  
The centrifugal force removes the chips or shavings from the coolant that is drawn up.
3. Sludge pod  
The pod temporarily holds the removed chips or shavings.
4. Sludge discharge valve  
This valve is periodically activated to discharge the chips or shavings from the sludge pod into the tank.
5. Clean tank  
This tank holds the filtered coolant.
6. Sludge filter  
This filter collects sludge that is discharged from the sludge pod.

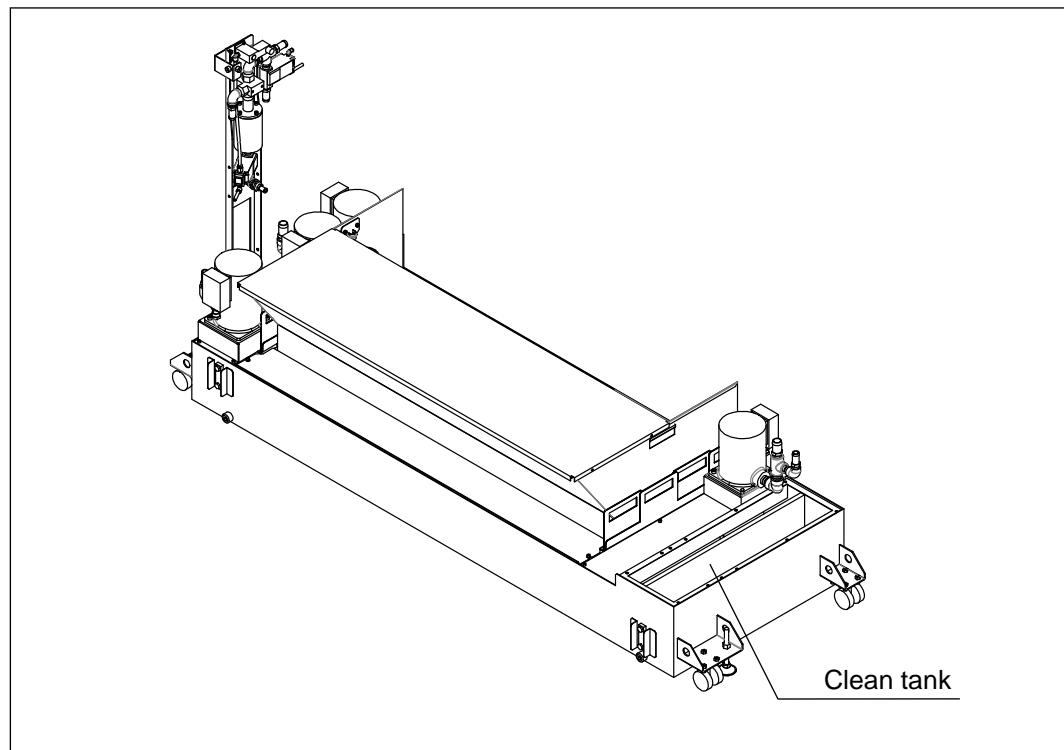
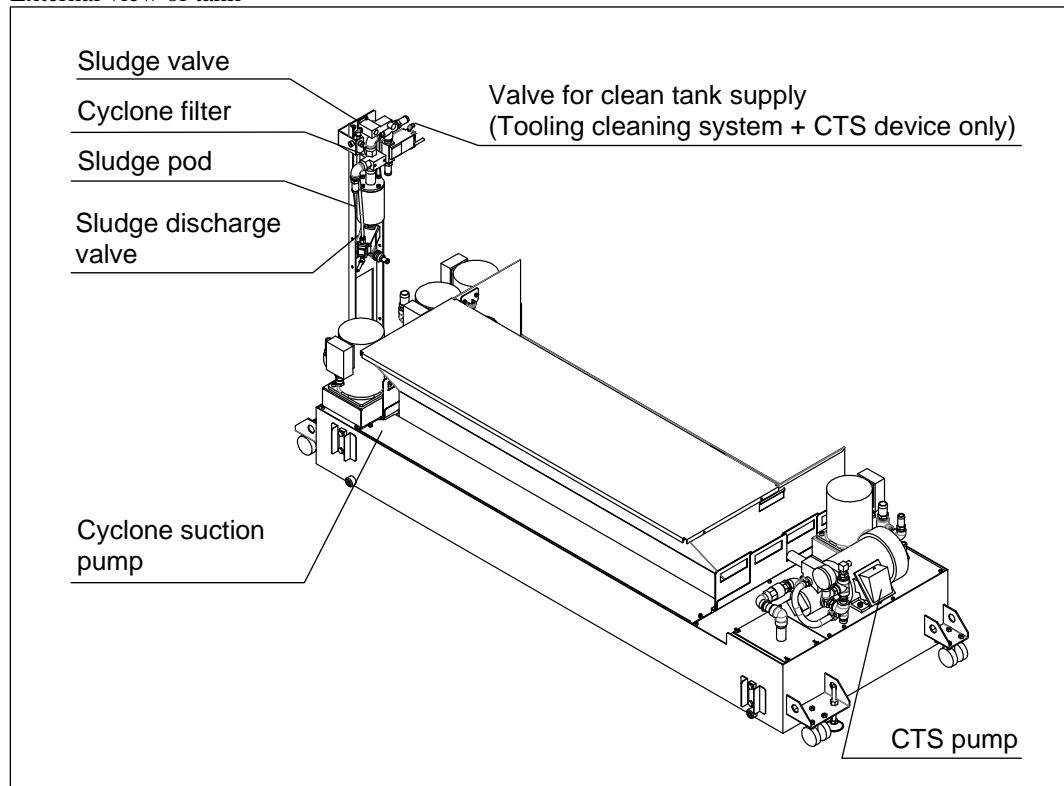
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Supplying to clean tank  
Turning ON the coolant pump key starts the supply to the clean tank.

Sludge discharge operation  
The sludge discharge operation in the cyclone filter device is linked with the end of the memory operation (M30 output).

### 3 External View

External view of tank



## 4 Specifications

		Spec.
Cyclone suction pump		Rated output :250W Total dynamic head :10 m Flow rate :50 L/min (50 Hz), 80 L/min (60 Hz) Voltage :200/220 (50 Hz), 200/220/230V (60Hz)
Cyclone filter		Filtration efficiency when supply pressure is 0.15 MPa, and clean flow rate is 32 L/min: 20 µm :61% 40 µm :93% * Test powder: AL powder * Power frequency: 60 Hz

## 5 Piping

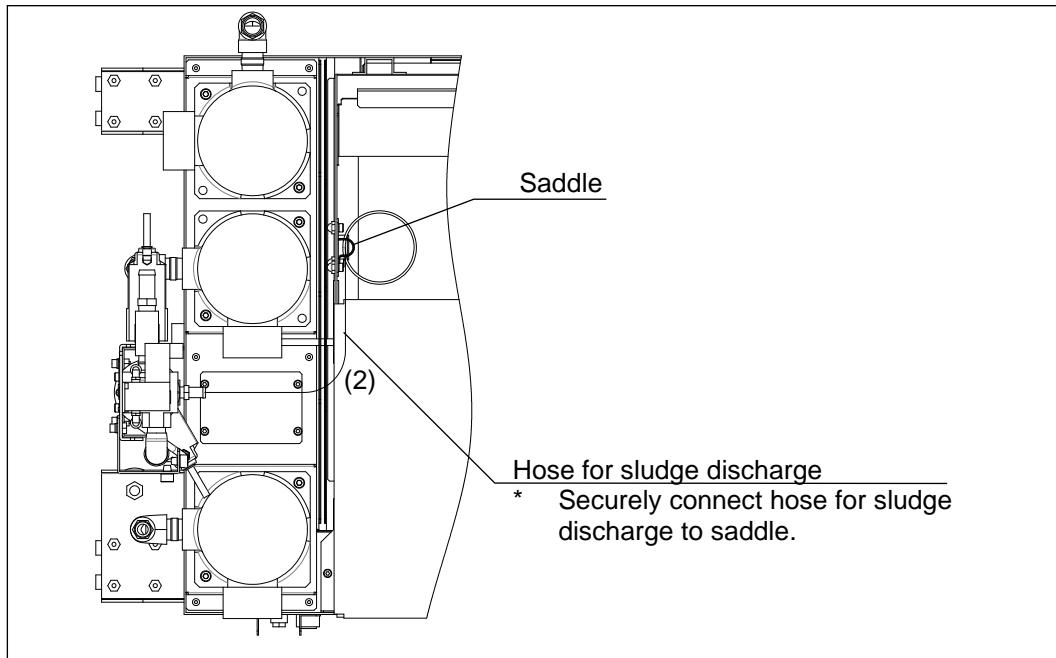
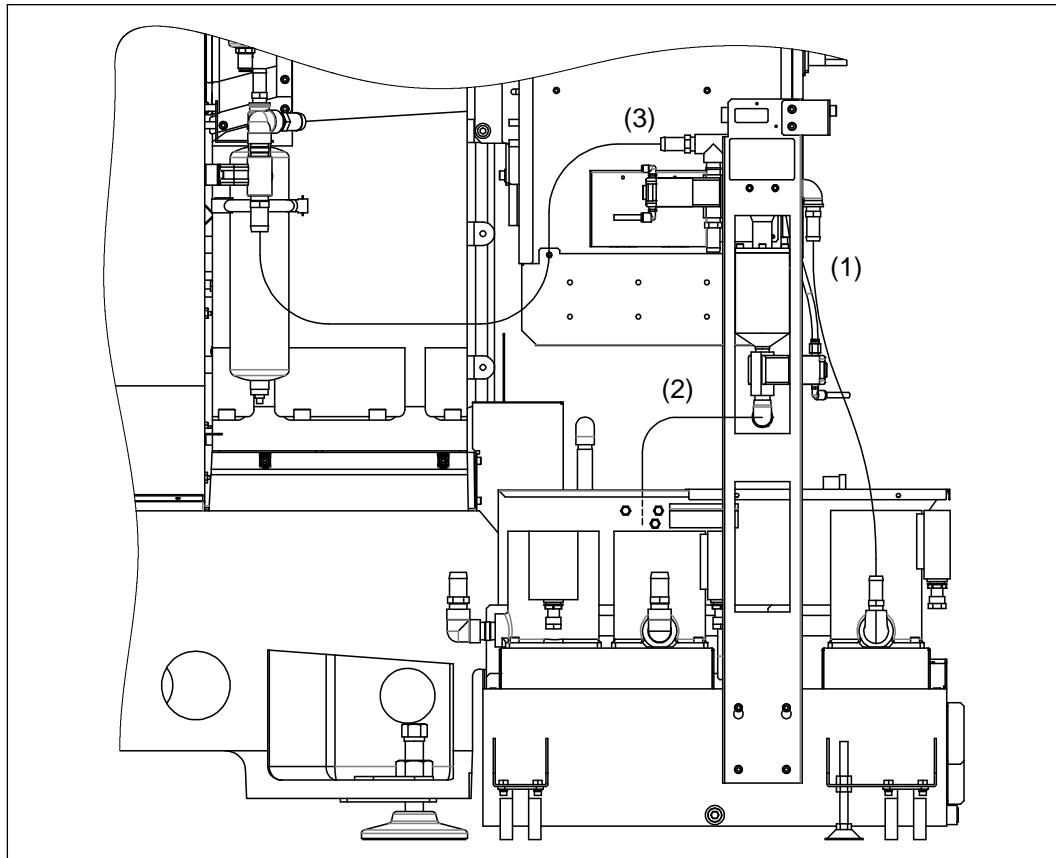
Make sure that the piping connections are secure. Otherwise, it can lead to fluid leaks.

1. Piping from cyclone suction pump to cyclone filter
2. Piping from sludge pod to chip pan
3. Piping from cyclone filter to line filter for tool cleaning (Tool cleaning system + CTS device only)

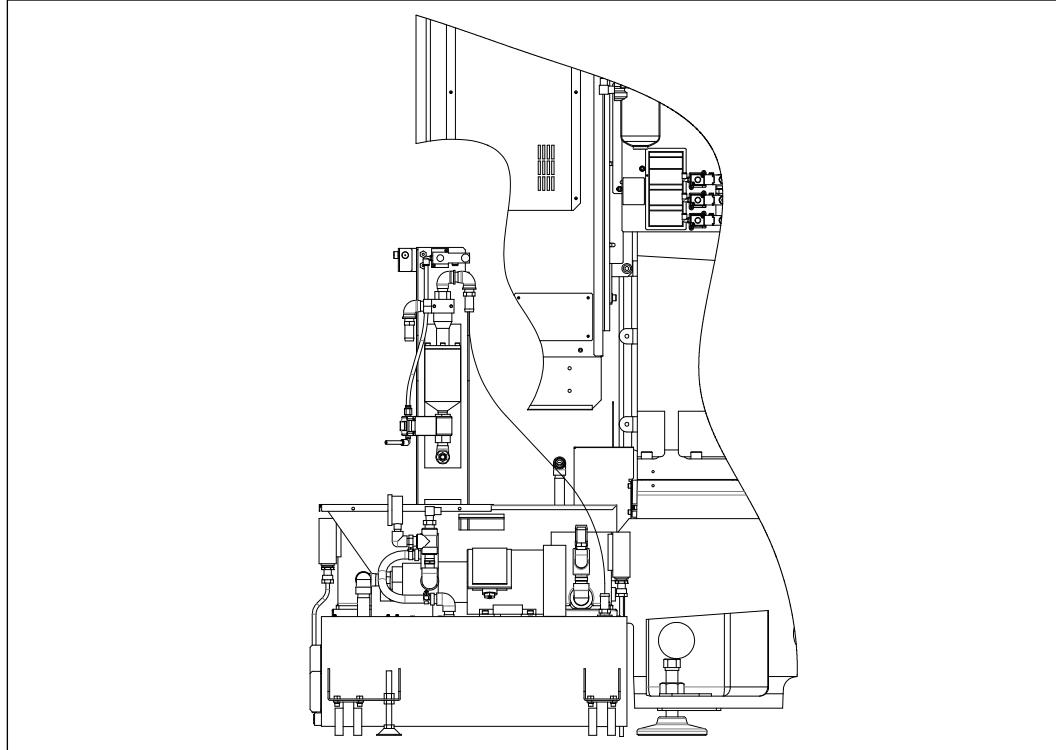
Pay attention to the following points when connecting the piping and hosing.

- (1) Keep a gap of 150 mm between the machine unit and the tank, and cut off any extra hose so the hosing does not sag. (Refer to the picture below)
- (2) Bundle and tie the drain hose for the tool wash with the other hoses in intervals of 200 mm.
- (3) After moving the tank to the specified position, make sure that the drain hose does not come into contact with the panel edges or the casting surfaces and that the hose is not bent.  
If the hose is bent, fix the position where it is tied or adjust the route.
- (4) Make sure that during operation the drain hose does not vibrate excessively and/or hit the panel edges or the casting surfaces. If there is excessive vibration or interference, fix the position where it is tied or adjust the route.

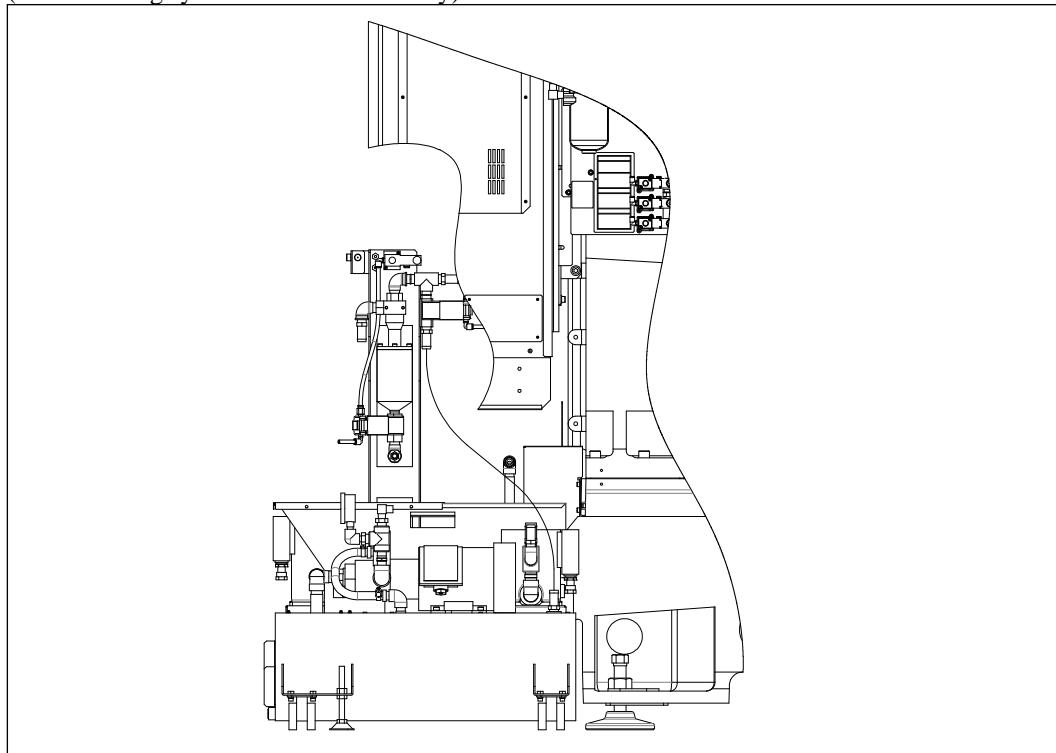




4. Piping from cyclone filter to clean tank  
(CTS device only)

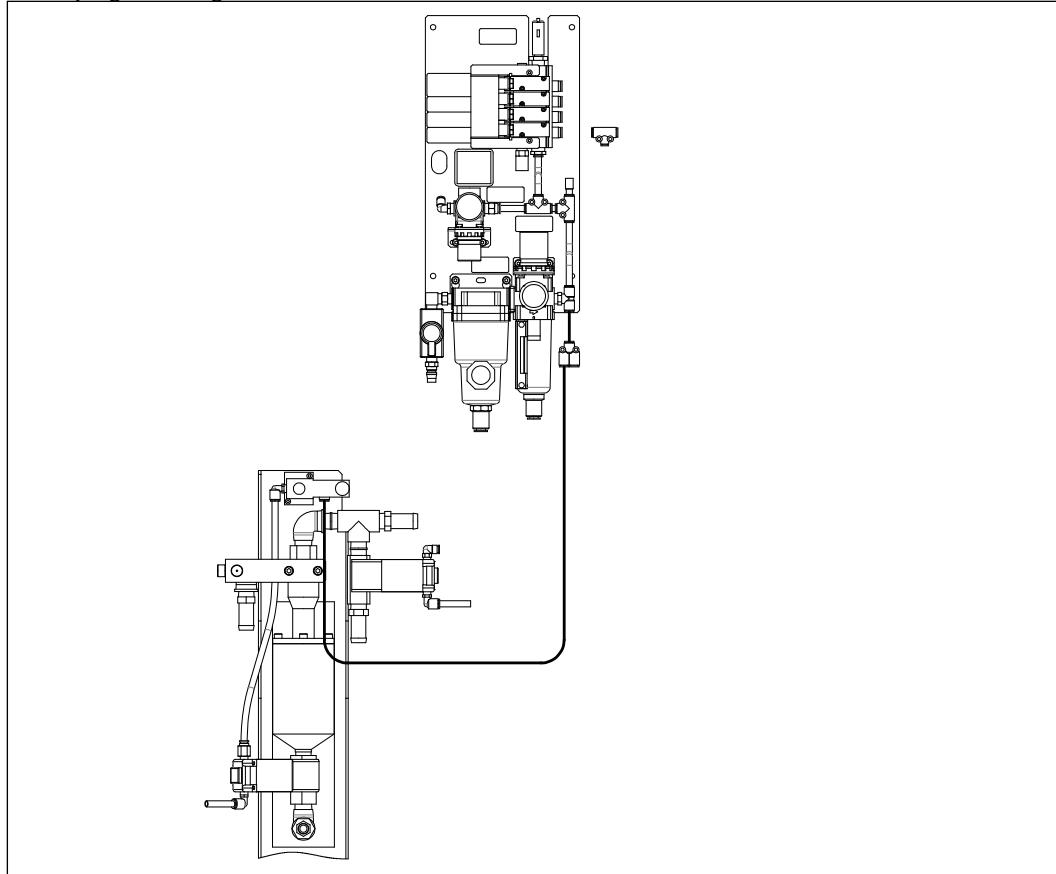


(Tool cleaning system + CTS device only)

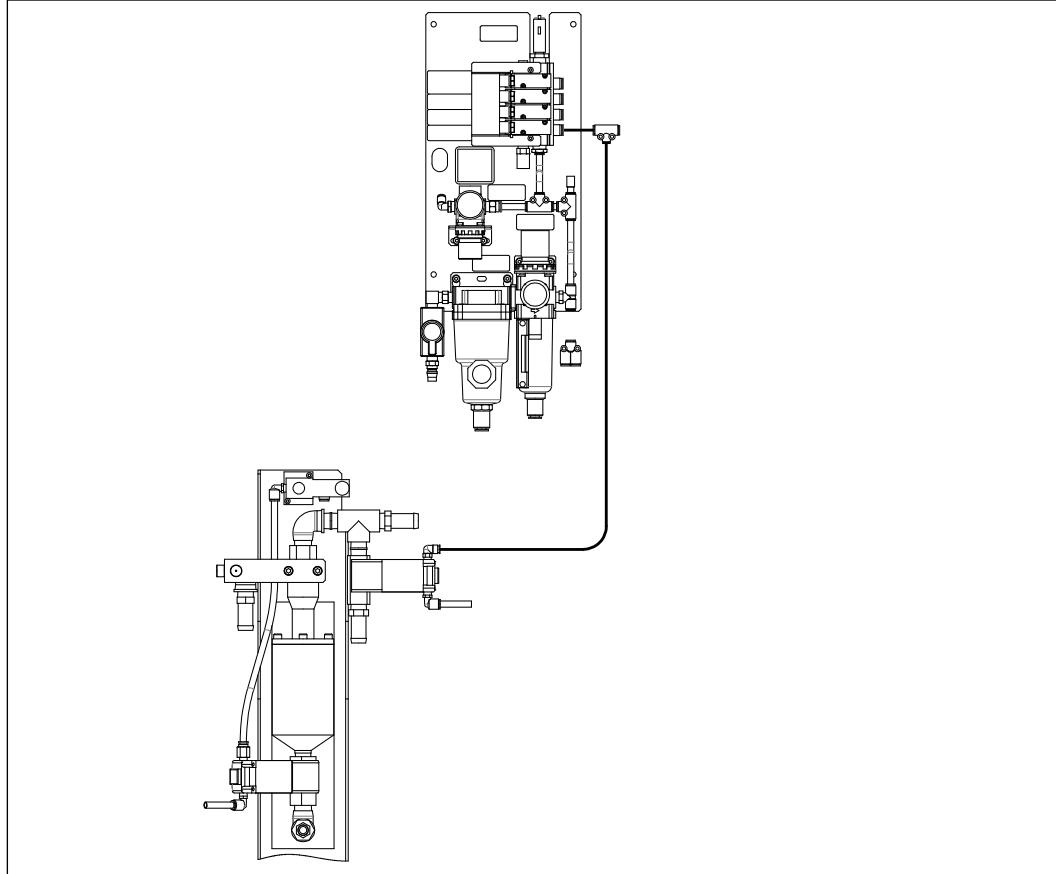


## Chapter 11 Options

### 5. Piping for sludge valve



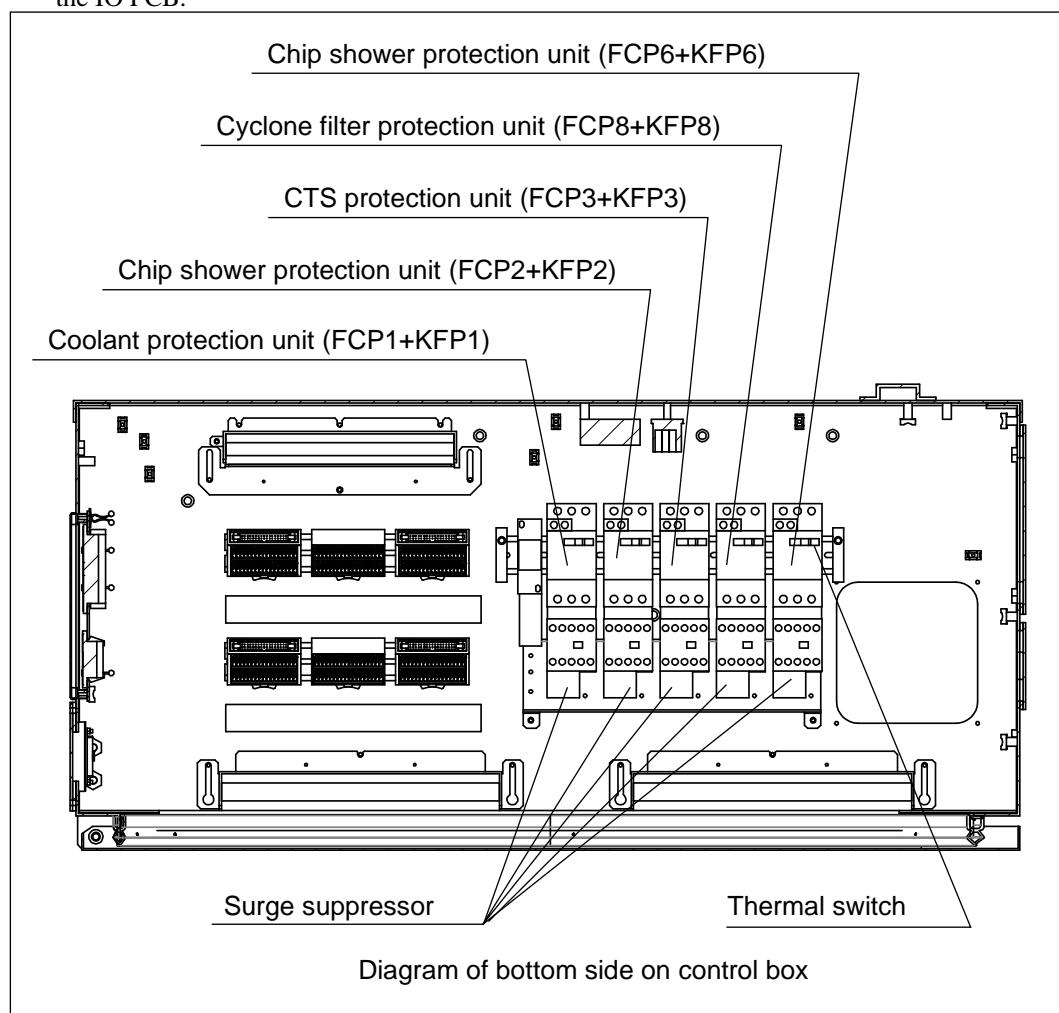
### 6. Valve piping for clean tank supply (Tool cleaning system + CTS device only)



## 6 Wiring

High-voltage components are present inside the control box. Wiring work must only be carried out by a qualified electrician or trained technician. Otherwise, there is risk of electric shock. Such work must only be carried out by a qualified electrician who is trained in electrical safety and who has thorough knowledge of the electronic circuits in this machine.

1. Turn OFF the power switch on the operation panel.
2. Turn OFF the main power breaker on the control box.
3. Connect the cable for the cyclone suction pump to the terminal block on the cyclone filter protection unit.  
Tighten each cable without removing the surge suppressor, and match the terminal block names with the cable wire marker names when connecting.  
Connect the ground terminal to the tap hole used for the front ground on the cyclone filter protection unit.
4. Connect the cable for the cyclone suction pump to the cyclone suction pump, and connect the cable for the sludge discharge valve from the sludge discharge valve to the XQVD connector on the IO PCB.



## 6.1 Motor Protection Unit

### 1. Rated current setting

- (NOTICE) The rated current setting value varies depending on the power voltage and frequency.  
If the setting is wrong, the detection overload may not function properly and cause a burnout on the pump motor.  
Therefore, configure the settings correctly.

Rated current setting values

Pump capacity	Frequency	When there is no T1 power transformer			When there is a T1 power transformer
		AC 200V input	AC 220V input	AC 230V input	
250W	50Hz	1.6A	1.6A	-	1.6A
FCP8	60Hz	1.8A	1.7A	1.7A	1.7A

Refer to “Chapter 11 (1) Coolant unit” for further details on the FCP1, FCP2 and FCP6 set values. Refer to “Chapter 11 (2) CTS device (COOLANT-THROUGH-SPINDLE)” for further details about the FCP3 set value.

Refer to “Chapter 4 Installation” to check if there is a T1 power transformer.

### 2. Check pump rotational direction

Make sure that the rotational direction of the pump matches the direction indicated on the pump. If it is rotating in reverse, first, turn OFF the power and main power breaker. Then, switch the U and V phase on the terminal block for the motor, and check the direction again.

- (NOTICE 1) Make sure that the cyclone suction pump is rotating in the indicated direction. If the pump is rotating in the opposite direction by mistake, the alarm <<\*Tool washing liquid surface sensor is abnormal>> or <<CTS pressure has not increased>> may trigger.

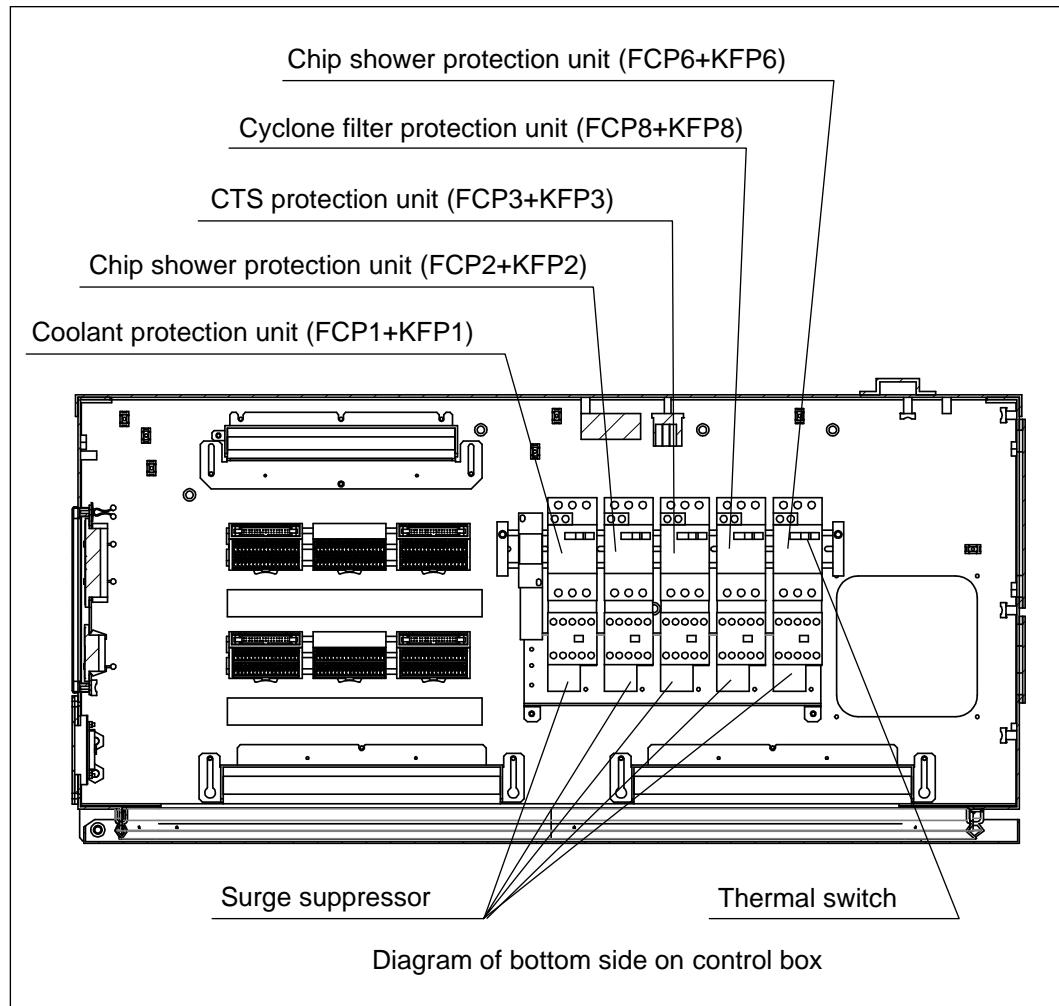
(NOTICE 2) When checking the rotation direction, make sure that coolant is in the tank.

### 3. Procedure when activated

If an excessive load is applied to the pump motor, the alarm <<\*Thermal error (cyclone coolant drawn up)>> is triggered. In terms of causes, the coolant viscosity may be too high or the power voltage may not be correct. For recovery, first, troubleshoot and remove the cause, and then turn the switch OFF and ON for the protection unit that tripped.

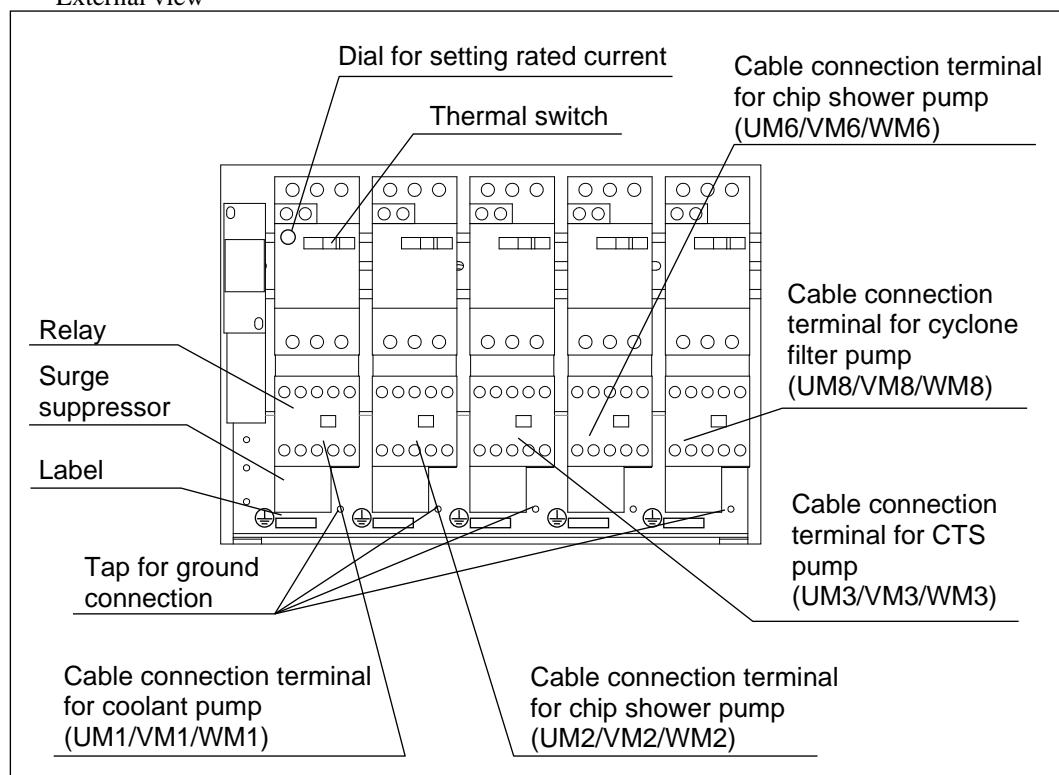
- (NOTE 1) The thermal switch may turn off during transport.  
During installation, check the position and turn ON the switch when necessary.

(NOTE 2) The positioning of the motor protection unit for the pump may shift during transport.  
During installation, check the position and move it back to its original position when necessary.



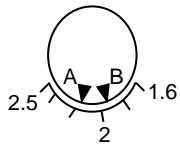
External view of protection unit

- External view



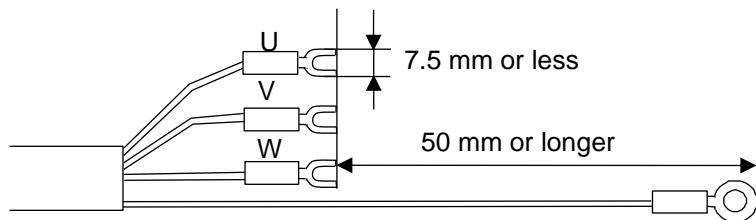
## Chapter 11 Options

Enlargement of dial for setting rated current



Match the dial mark "A" to the "Set value".

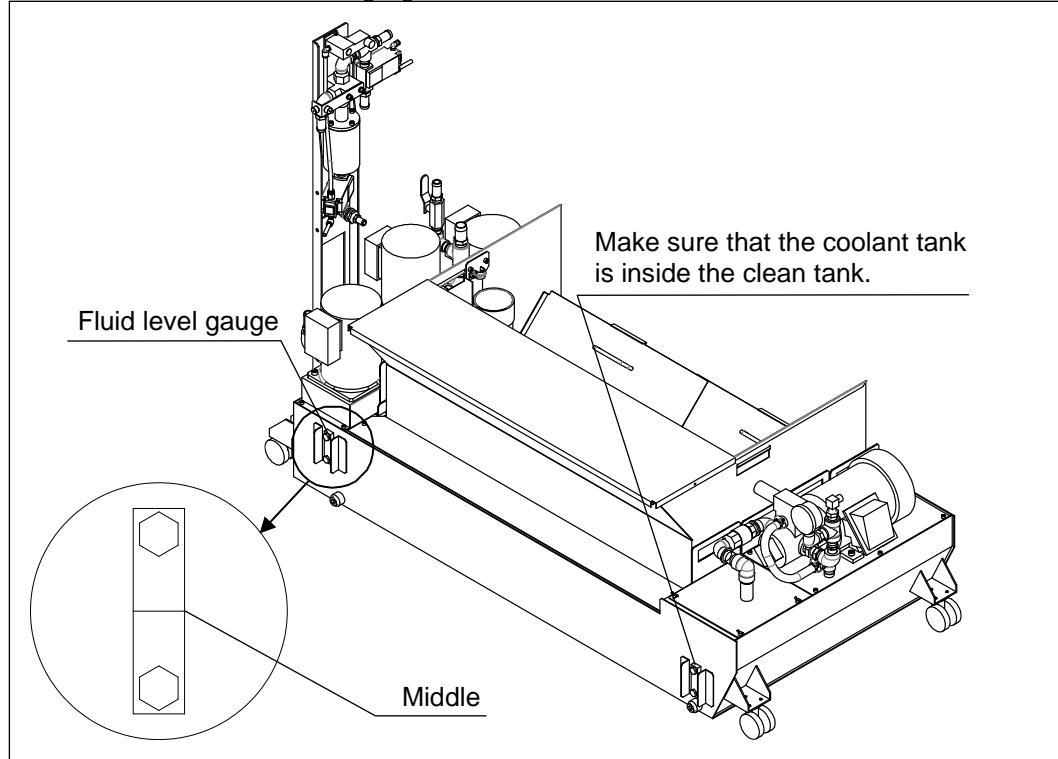
Pump cable terminal setup – Example of recommended setup



U, V and W : Y terminal for M3  
Outer diameter - 7.5 mm or smaller  
PE : Round terminal for M4

## 7 Operation Check

Make sure that the pipe work and wiring is finished before filling the coolant tank with coolant. As a guide for the fluid level on the cyclone filter device, make sure that the coolant in the clean tank is at the middle of the fluid level gauge.



Check supply to clean tank (at installation)

- (1) Turn ON the power to the machine.
- (2) Turn ON the [CLT.P] key on the operation panel.

When the cyclone suction pump begins to operate, it starts to supply to the clean tank.

Make sure that the coolant level appears in the fluid level gauge.

## 8 Maintenance

### Replacing line filter element

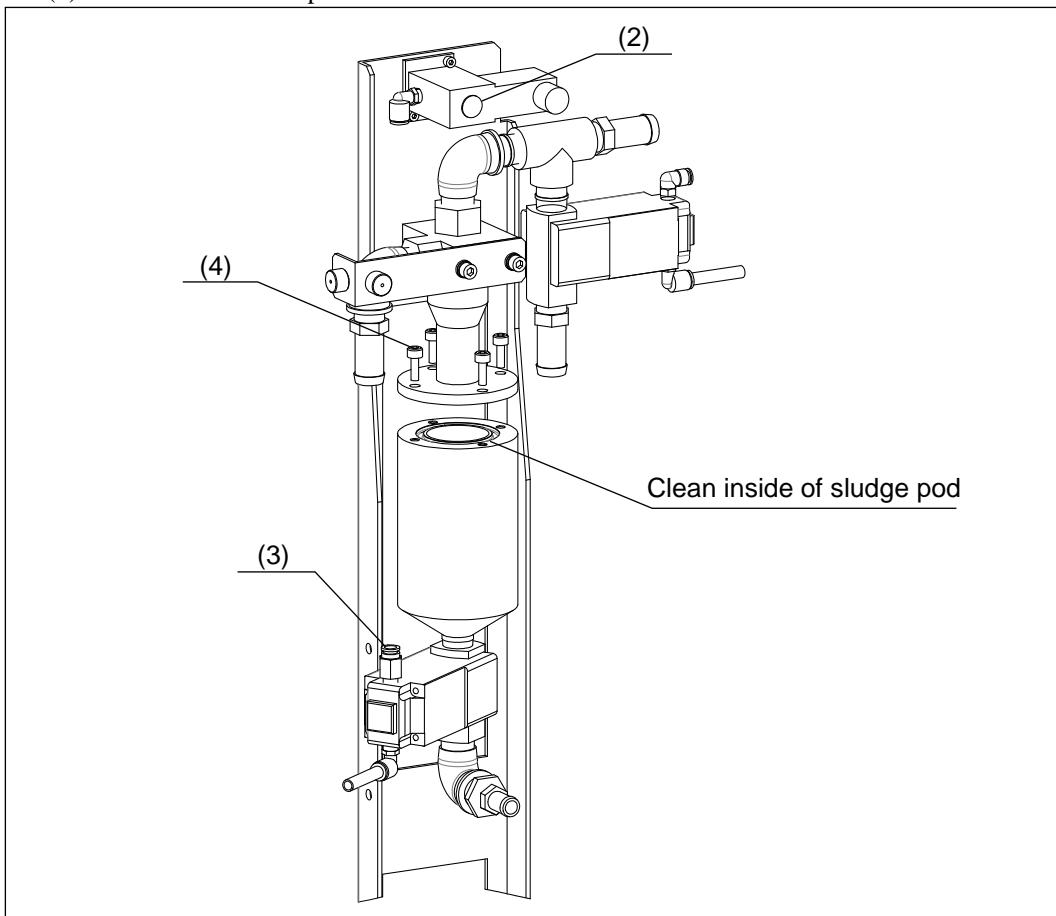
Refer to "Chapter 11 (1) Coolant Unit" for further details on replacing the line filter element for the tool cleaning system.

Refer to "Chapter 11 (2) CTS Device (COOLANT-THROUGH-SPINDLE)" for further details on replacing the line filter element for the CTS device.

### Cleaning sludge pod

When coolant discharge from the sludge discharge hose is poor, clean the inside of the sludge pod.

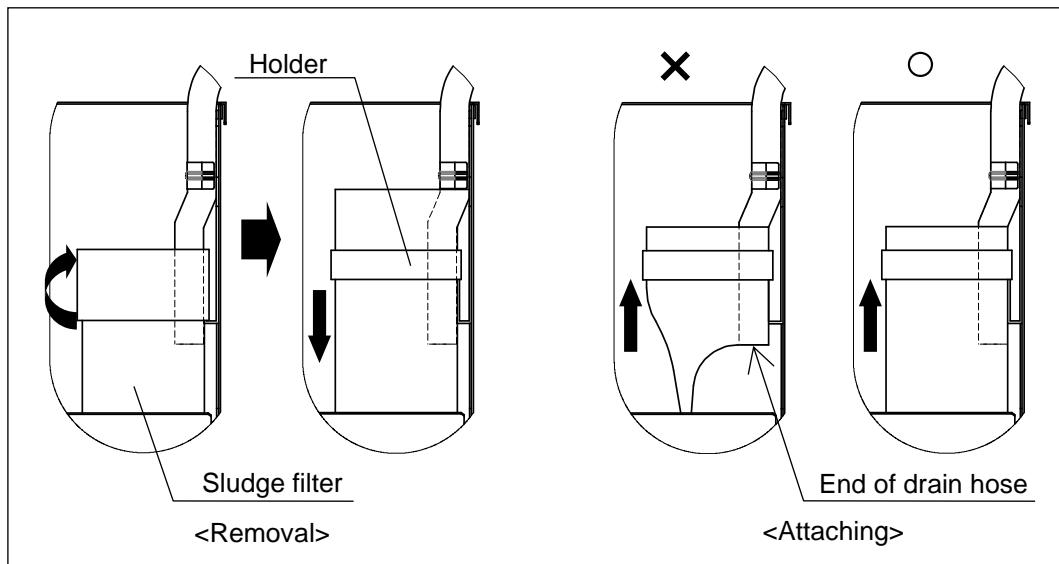
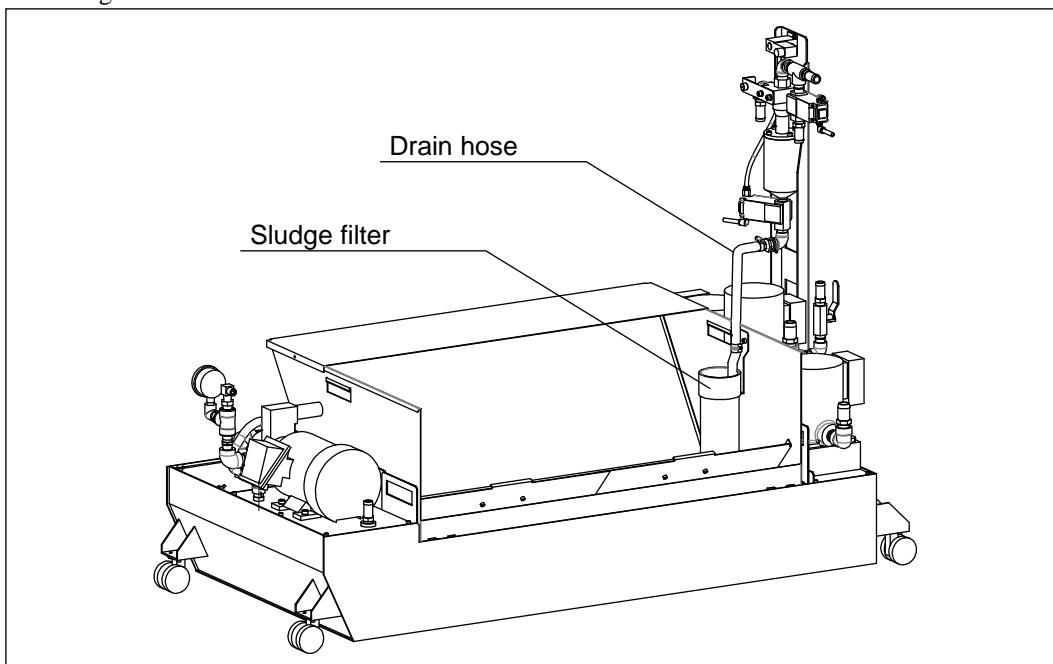
- (1) Turn ON the power to the machine.
- (2) Press the black button on the electromagnetic valve in the figure below to discharge the coolant.
- (3) Disconnect the tube on the air valve side.
- (4) Remove the bolts (4 places) that join the cyclone and sludge pod.
- (5) Remove the sludge pod and clean the inside of the pod.
- (6) Follow the removal procedure in reverse to install.



## 9 Replacement Procedure for Consumable Parts

Consumable parts	Cleaning or replacement timing	Brother part No.
Sludge filter	<u>Timing guide for cleaning (removing sludge)</u> Visually inspect the port to the sludge filter and clean when sludge has built up <u>Timing guide for replacement</u> Replace when there is a hole in the filter	6C4865-001

1. Turn OFF the power to the machine.
2. Untuck the top of the sludge filter, and pull down to remove from the holder.
3. Attach the cleaned sludge filter (sludge removed) or new sludge filter following the removal procedure in reverse. At this time, be careful not to get the end of the drain hose caught on the sludge filter.



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# CHAPTER 11 (4)

## TOOL CLEANING SYSTEM

- 1 Handling Precautions
- 2 Functions
- 3 Piping
- 4 Parameters
- 5 Operation Check
- 6 Adjusting Fluid Level Sensor
- 7 Maintenance
- 8 Replacing Line Filter Element
- 9 Consumable Parts
- 10 Coolant Tank System Setup by Customer

# 1 Handling Precautions

## **⚠ WARNING**

**When replacing parts or disconnecting hoses from the coolant equipment, the coolant may shoot out and injure your eyes.**

### [SAFETY INSTRUCTIONS]

**Always be sure to wear protective goggles.**

**Purge all remaining pressure before carrying out such work.**

**Handle the hoses carefully so that they are not subjected to any impacts.**

**If coolant gets into your eyes, rinse with clean water and then seek medical advice.**

This function uses standard control program 10 for the built-in PLC function.  
This function assumes that the executing task assigns the control program that is included as part of the factory-default settings.

Therefore, when using this system, do not change execution settings for standard control program 10 and standard task 3.

In addition, do not change the corresponding contact.

If a control program and/or a task execution setting is changed, operation will no longer be covered under the warranty.

In addition, do not perform the debug function (stop, ON/OFF for related contacts, etc.) for the standard control program 10 while this function is operating.

1. If the [CLT.P] key on the operation panel is not turned ON (key lamp lights up when ON), the tool cleaning system will not operate.  
Always turn ON the [CLT.P] key.
2. This tool cleaning system uses a fluid level sensor to monitor the coolant stored inside the coolant chamber. If the fluid level sensor is not ON (red) during the ATC operation, the coolant will not discharge.
3. Use an air source with the following capacity: 130 L/min (ANR) or greater.  
Use clean air without any oil content or moisture.

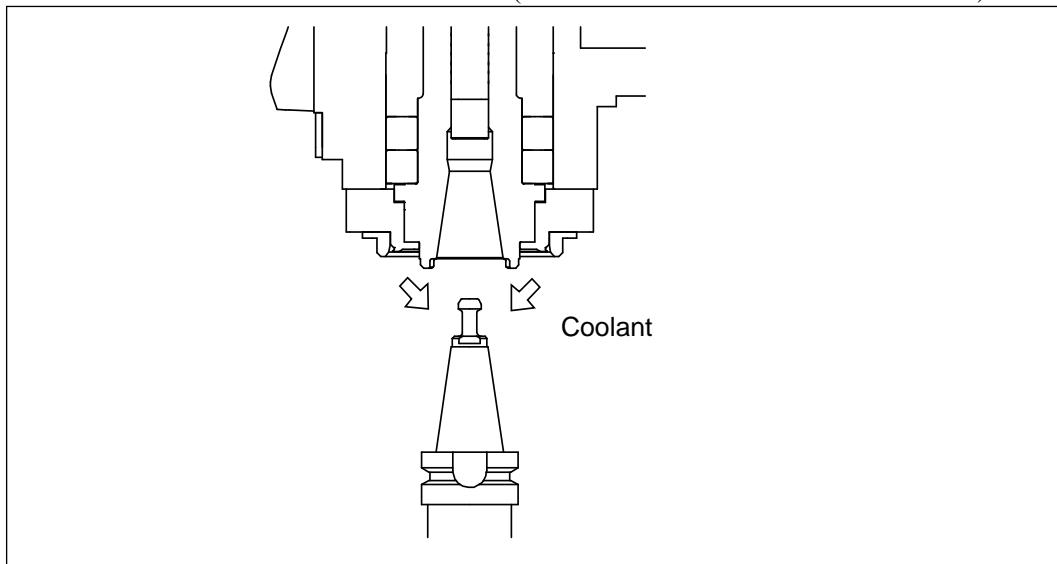
Impurities in compressed air	Standard value
Solids	5 µm or smaller
Moisture	Dew point under pressure: 10°C
Oil concentration	1 mg/m <sup>3</sup> or less (ANR)

(NOTE) The fluid level detected by the fluid level sensor varies depending on the type of coolant. Before using this tool wash system, always make sure that the fluid level sensor is working correctly with the coolant to be used by following the operation check procedure after installation (Refer to "Chapter 5 Operation check").

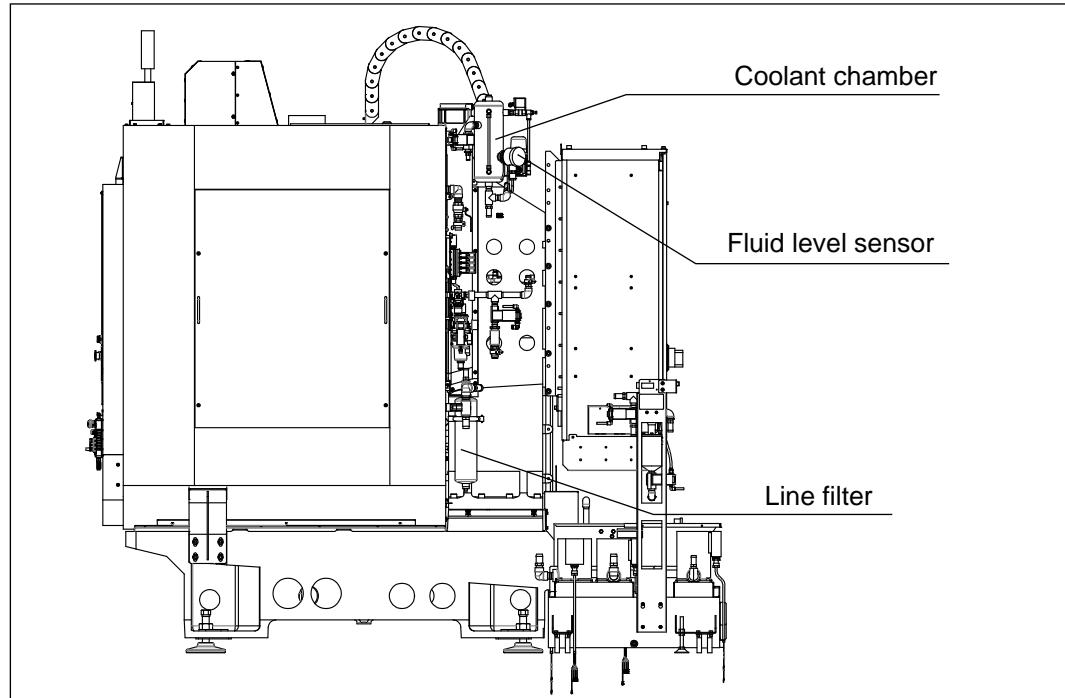
## 2 Functions

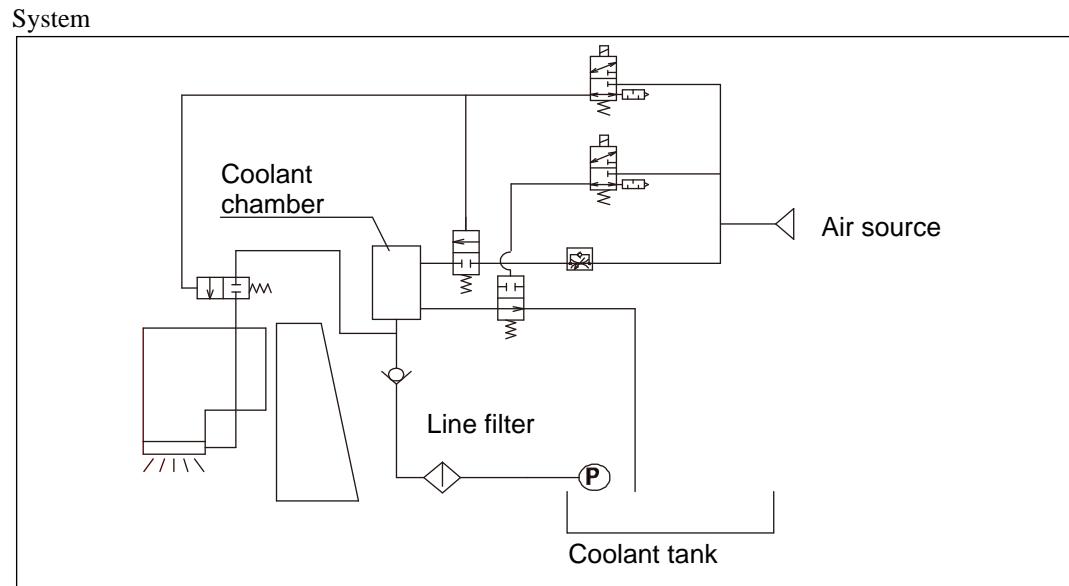
In this system, the coolant is cleaned as it passes through a line filter and is discharged from the spindle tip's perimeter. It keeps the tip of the spindle and the clamping surfaces of the tool holder clean.

- (NOTICE 1) Depending on the usage conditions, it may not be able to remove chips or shavings that are stuck on the spindle tip or tool holder. This system is unable to completely prevent chip biting from occurring.
- (NOTICE 2) When the element on the line filter becomes dirty, the amount of coolant supplied to the coolant chamber decreases. If the coolant does not fill up to the minimum level detected by the fluid level sensor inside the coolant chamber, an alarm is output. To monitor clogging on the line filter, the user parameter can be set to monitor the fluid level inside the coolant chamber. (Refer to "4 Parameters" for further details.)



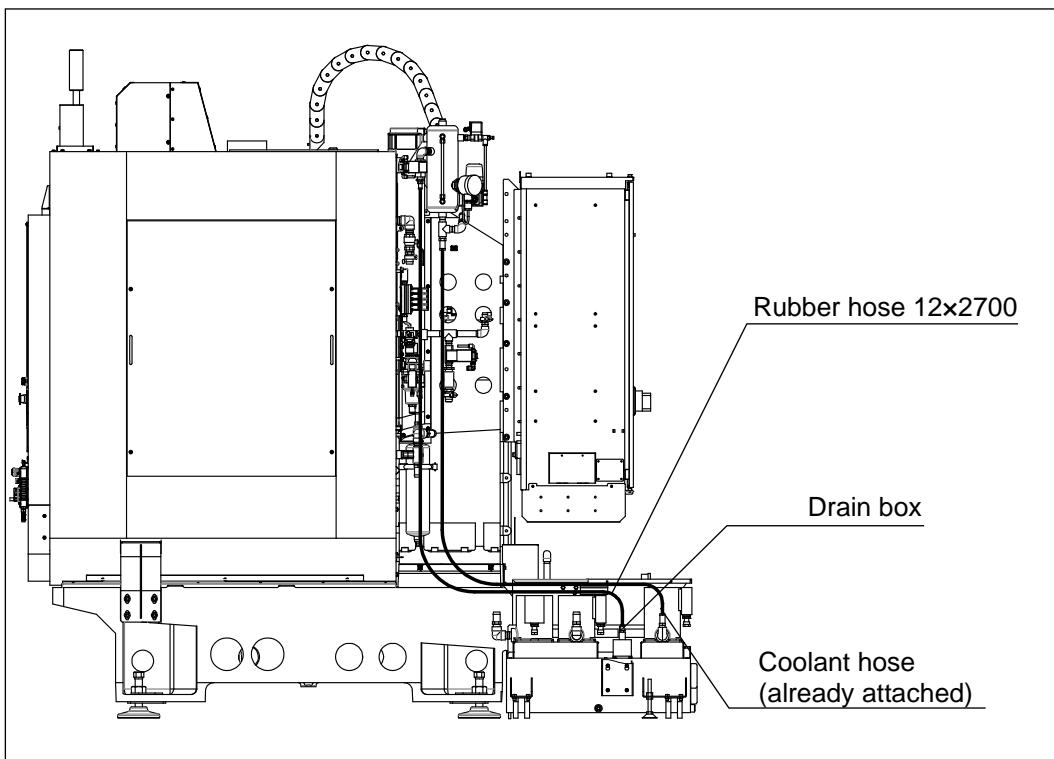
External view





### 3 Piping

1. Connect the coolant pump and hose that comes out from the left side at the rear of the machine. Refer to “Chapter 11 (3) Cyclone filter device” when equipped with a cyclone filter (option).
2. Connect a 12×2700 hose to the drain box that is attached to the coolant tank. Pay attention to the following points when connecting the piping and hosing.
  - (1) Keep a gap of 150 mm between the machine unit and the tank, and cut off any extra hose so the hosing does not sag. (Refer to the picture below)
  - (2) Bundle and tie the drain hose for the tool wash with the other hoses in intervals of 200 mm.
  - (3) After moving the tank to the specified position, make sure that the drain hose does not come into contact with the panel edges or the casting surfaces and that the hose is not bent. If the hose is bent, fix the position where it is tied or adjust the route.
  - (4) Make sure that during operation the drain hose does not vibrate excessively and/or hit the panel edges or the casting surfaces. If there is excessive vibration or interference, fix the position where it is tied or adjust the route.



# 4 Parameters

User parameter 1(Switch 1: installation)

Item name	Description	Factory-set value
Faulty tool wash coolant level alarm stop (Type 4)	<p>Set the alarm stop level for an abnormal tool wash coolant level (quantity).</p> <p>If the parameter is set to “0”, the tool wash does not turn OFF after the alarm &lt;&lt;The tool washing liquid surface is abnormal.&gt;&gt; is triggered. Operation does not stop.</p> <p>If the parameter is set to “1”, the tool wash turns OFF after the alarm &lt;&lt;The tool washing liquid surface is abnormal.&gt;&gt; is triggered. Operation stops immediately.</p> <p>(NOTE) The setting is valid only when all of the following conditions are met.</p> <p>Machine parameter (system 1: common) &lt;Air blow/Tool wash option&gt; is set to &lt;1: Tool wash type 1&gt; or &lt;3: Tool wash type 2&gt; Machine parameter (system 1: common) &lt;Spindle air blow/Tool wash control method&gt; is set to &lt;3: Type 4&gt;</p>	1
Tool wash filter clogging warning alarm stop level (Type 4)	<p>Sets the alarm stop level for the tool wash filter clogging warning.</p> <p>If the parameter is set to “0”, operation does not stop.</p> <p>If the parameter is set to “1”, operation stops after 1 cycle.</p> <p>(NOTE) The setting is valid only when all of the following conditions are met.</p> <p>Machine parameter (system 1: common) &lt;Air blow/Tool wash option&gt; is set to &lt;1: Tool wash type 1&gt; or &lt;3: Tool wash type 2&gt; Machine parameter (system 1: common) &lt;Spindle air blow/Tool wash control method&gt; is set to &lt;3: Type 4&gt;</p>	0
No. of tool wash filter clogging warning checks (Type 4)	<p>Set frequencies of confirmation for tool wash filter clogging notice.</p> <p>The parameter sets the number of checks on the tool wash level sensor. If successive errors occur on the sensor during those checks, the alarm &lt;&lt;Tool wash filter clogging is predicted.&gt;&gt; is triggered.</p> <p>If the parameter is set to “0”, it does not perform any clogging checks.</p> <p>(NOTE) The setting is valid only when all of the following conditions are met.</p> <p>Machine parameter (system 1: common) &lt;Air blow/Tool wash option&gt; is set to &lt;1: Tool wash type 1&gt; or &lt;3: Tool wash type 2&gt; Machine parameter (system 1: common) &lt;Spindle air blow/Tool wash control method&gt; is set to &lt;3: Type 4&gt;</p>	1
Faulty tool wash coolant level sensor check interval (Type 4)	<p>Sets the interval for checks (M295) performed on tool wash coolant level sensor for errors.</p> <p>If the parameter is set to “0”, it does not check for an error or fault on the tool wash level sensor during memory operation.</p> <p>(NOTE) The setting is valid only when all of the following conditions are met.</p> <p>Machine parameter (system 1: common) &lt;Air blow/Tool wash option&gt; is set to &lt;1: Tool wash type 1&gt; or &lt;3: Tool wash type 2&gt; Machine parameter (system 1: common) &lt;Spindle air blow/Tool wash control method&gt; is set to &lt;3: Type 4&gt;</p>	200

# 5 Operation Check

Fluid level sensor operation check

1. Turn ON the [CLT.P] key.
2. Look at the fluid level gauge for the coolant chamber. Make sure that the coolant is supplied into the chamber and that the fluid level is above the height of the fluid level sensor.
3. Fluid level sensor LED
4. Execute “M295” in MDI operation.  
If the alarm <<The tool washing liquid surface sensor is normal.>> is triggered, the fluid level sensor is normal.  
If the alarm <<Tool washing liquid surface sensor is abnormal.>> is triggered, the fluid level sensor requires adjustment.

(NOTE) Refer to “6 Adjusting fluid level sensor” for further details on adjusting the fluid level sensor.

Overall system operation check

1. Turn ON the [CLT.P] key.
2. Execute “G100T101” in MDI operation.  
(At this time, a pot that is not No.1 is indexed.)
3. Make sure that the coolant for the tool wash is discharging during the tool change.

(NOTE) This function’s operation is performed in standard control program 10 for the built-in PLC function.  
If a ladder program is changed, an unexpected operation or malfunction can occur.  
Only change the ladder program if you have thorough knowledge of the specifications.

# 6 Adjusting Fluid Level Sensor

Adjusting the sensor's sensitivity

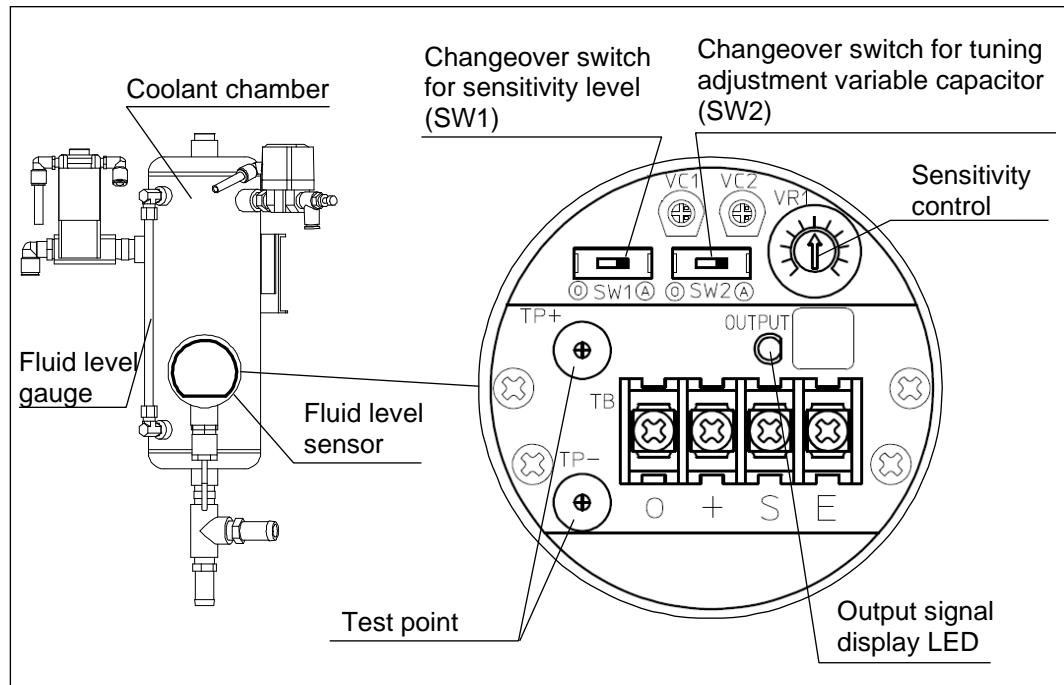
1. Close the front door and the maintenance cover.
2. Remove the housing cover on the tail end of the sensor.

#### When using a water-soluble coolant

3. Make sure that the changeover switch (SW1) for the sensitivity level and the changeover switch (SW2) for the tuning adjustment variable capacitor are both on the A side on the sensor PCB. (Factory default is set to side A.)
  4. Make sure that the sensitivity control (VR) is positioned in the 12 o'clock direction on the sensor PCB. (Factory default is set in the 12 o'clock direction.)
  5. Turn ON the [CLT.P] key on the machine operation panel.
  6. Turn ON the [EMERGENCY] switch.
  7. Turn OFF the [EMERGENCY] switch, and press [RST].
- Look at the fluid level gauge for the coolant chamber. Make sure that the coolant is supplied into the chamber and that the fluid level is above the height of the fluid level sensor.  
 If the fluid is not supplied, the tool cleaning filter may be clogged, etc. (Refer to "7 Maintenance" for further details.)
8. Make sure that the output signal display LED (red) is lit up on the sensor PCB.  
 If the LED is not lit up, use a small screwdriver to slowly turn the sensitivity control (VR) to the right and stop when the output signal display LED (red) lights up.
  9. Execute "M295" in MDI operation.  
 If the alarm <<The tool washing liquid surface sensor is normal.>> is triggered, the fluid level sensor adjustment is complete.  
 Attach the housing cover securely on the tail end of the sensor.

#### When using an oil-based coolant

3. Make sure that the changeover switch (SW1) for the sensitivity level and the changeover switch (SW2) for the tuning adjustment variable capacitor are both on the O side on the sensor PCB. (Factory default is set to side A.)
  4. Use the small screwdriver to slowly turn the sensitivity control (VR) all the way to the left on the sensor PCB. (Factory default is set in the 12 o'clock direction.)
  5. Turn ON the [CLT.P] key on the machine operation panel.
  6. Turn ON the [EMERGENCY] switch.
  7. Turn OFF the [EMERGENCY] switch, and press [RST].
- Look at the fluid level gauge for the coolant chamber. Make sure that the coolant is supplied into the chamber and that the fluid level is above the height of the fluid level sensor.  
 If the fluid is not supplied, the tool cleaning filter may be clogged, etc.  
 (Refer to "7 Maintenance" for further details.)
8. Turn OFF the [CLT.P] key on the machine operation panel.
  9. Press the tool wash valve push button on the air panel. Look at the fluid level gauge on the coolant chamber and lower the fluid level so that it is approximately 20 mm above the height of the sensor.
  10. Make sure that the output signal display LED (red) is lit up on the sensor PCB.  
 If the LED is not lit up, use a small screwdriver to slowly turn the sensitivity control (VR) to the right and stop when the output signal display LED (red) lights up.
  11. Execute "M295" in MDI operation.  
 If the alarm <<The tool washing liquid surface sensor is normal.>> is triggered, the fluid level sensor adjustment is complete.  
 Attach the housing cover securely on the tail end of the sensor.



## 7 Maintenance

When the element on the line filter becomes dirty, the amount of coolant supplied to the coolant chamber decreases and an alarm is output.

Replace the element with a new one approximately every 3 months.

(The timing to replace the element is affected by the condition of the coolant and how dirty it is.)

### (SAFETY INSTRUCTIONS)

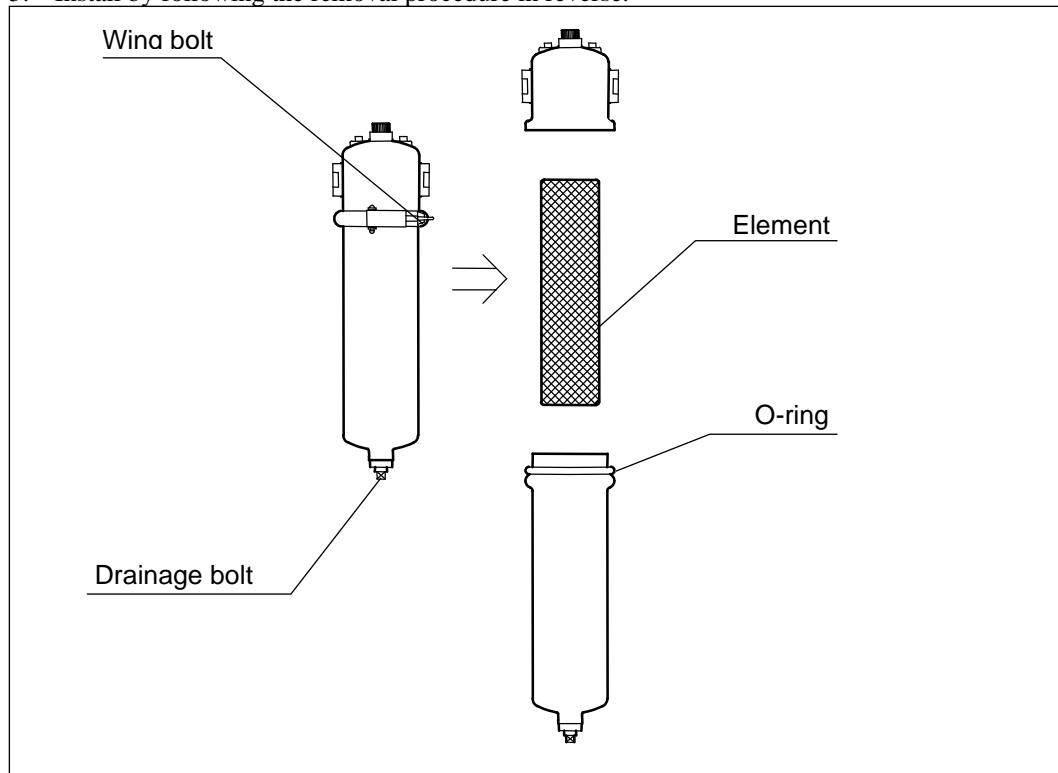
**When the tool wash parts or piping are replaced, the cutting fluid can shoot out and injure your eyes. Always be sure to purge any remaining pressure inside the coolant chamber and wear protective goggles before performing this task.**

Purge method for residual pressure in coolant chamber

- Turn OFF the main power to the machine. Or, press the emergency button on the front of the machine.  
(Turn OFF the main power or press the emergency stop button to release or open the drain valve that purges the pressure.)
- \* When the drain valve may be broken, purge the residual pressure by slowly removing the socket plug PT1/2 on the top of the coolant chamber.  
When removing the socket plug, after purging the pressure, always be sure to apply new thread sealing tape and plug it.

## 8 Replacing Line Filter Element

1. Turn OFF the power to the machine.
2. Loosen the drainage bolt on the line filter and drain the coolant.
3. Loosen the wing bolt, and then remove the bottom of the filter.
4. Replace the element.
5. Install by following the removal procedure in reverse.



11

## 9 Consumable Parts

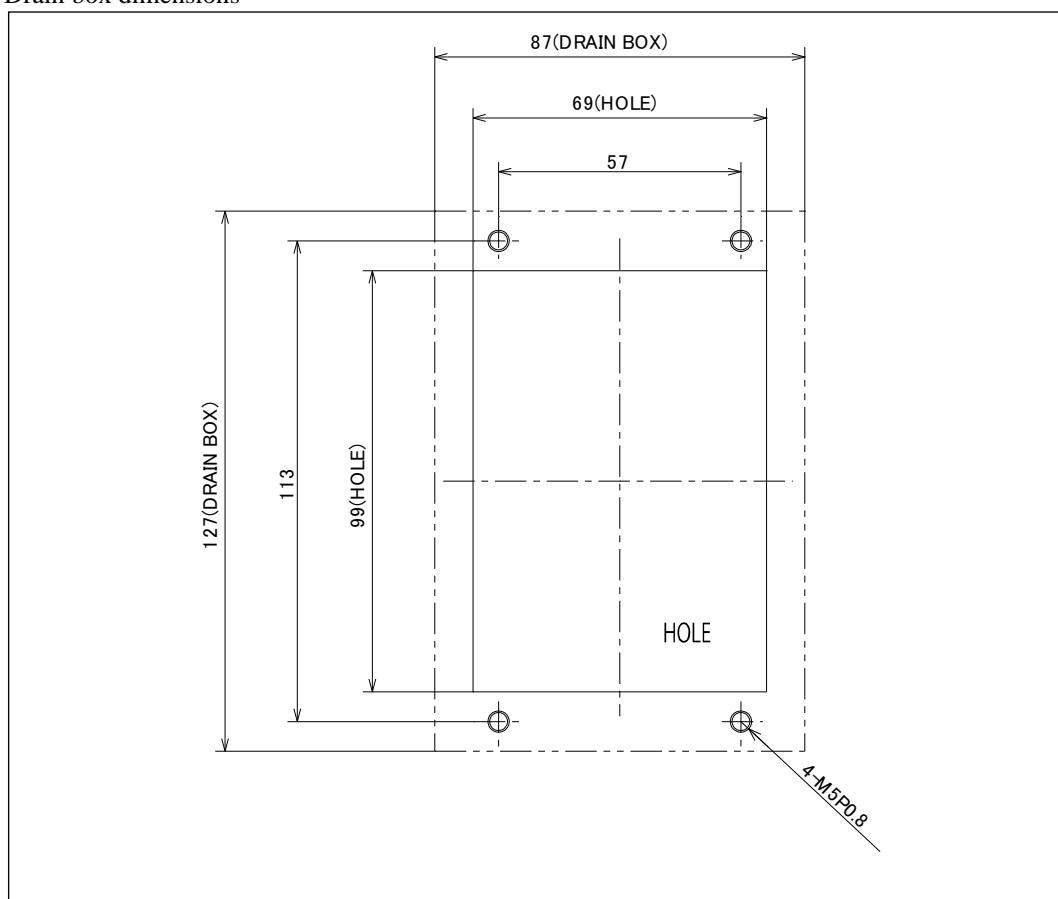
	Manufacturer	Model number	Replacement timing	Brother part No.
Filter element	SMC	EHM15R10A	Every three months	652860-001

# 10 Coolant Tank System Setup by Customer

The tool cleaning system is specifically designed for the standard coolant tank made by Brother. If the customer sets up and connects the system using a different coolant tank, please be aware of the following points.

- Make sure that the pressure applied to the input on the line filter is 0.3 MPa or less. In particular, make sure that the pressure does not increase during shut-off operation. When the applied pressure exceeds the air source (0.4 to 0.6 MPa), the coolant may flow in reverse on the valves and cause damage.
- Use a coolant pump that can handle a flow rate of 4.4 L/min or greater. When using a coolant pump with the lower flow rate capacity, the alarm “Tool wash filter clogging is predicted.” may be triggered.
- Set up a drain hole on the coolant tank. (Refer to the “Drain box dimensions” in the diagram below.) In addition, make sure that the system setup does not blow up coolant with air pressure when draining, or make sure that coolant does not leak from the coolant tank even if coolant is blown up.

Drain box dimensions



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# CHAPTER 11 (5)

## AUTOMATIC OILING DEVICE

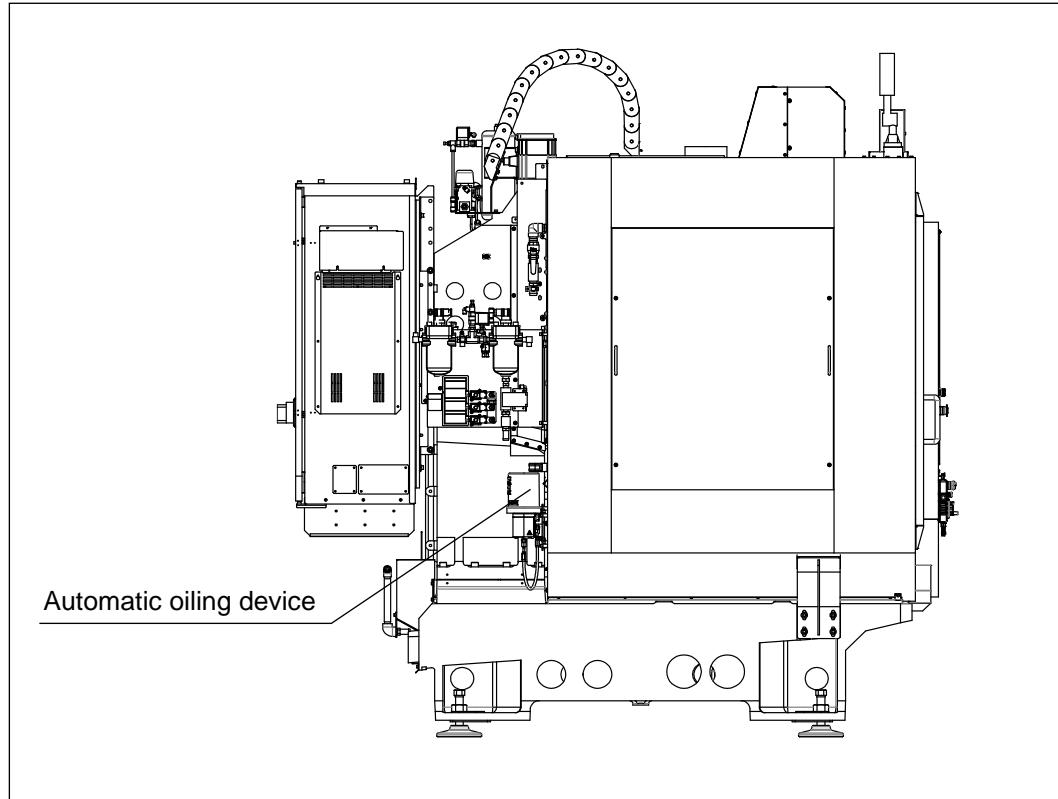
- 1 Functions
- 2 External View
- 3 Specifications
- 4 Parameters
- 5 Recommended Lubricants

# 1 Functions

This automatic oiling device regularly lubricates the ball screws and linear guides for the X-, Y- and Z-axes.

(NOTICE) There is no oil collection mechanism set up for lubricant that comes out of the automatic oiling device, because this machine uses the ball screws and the linear guides as the basic grease lubrication. The device cannot prevent lubricant from contaminating the cutting fluid.

# 2 External View

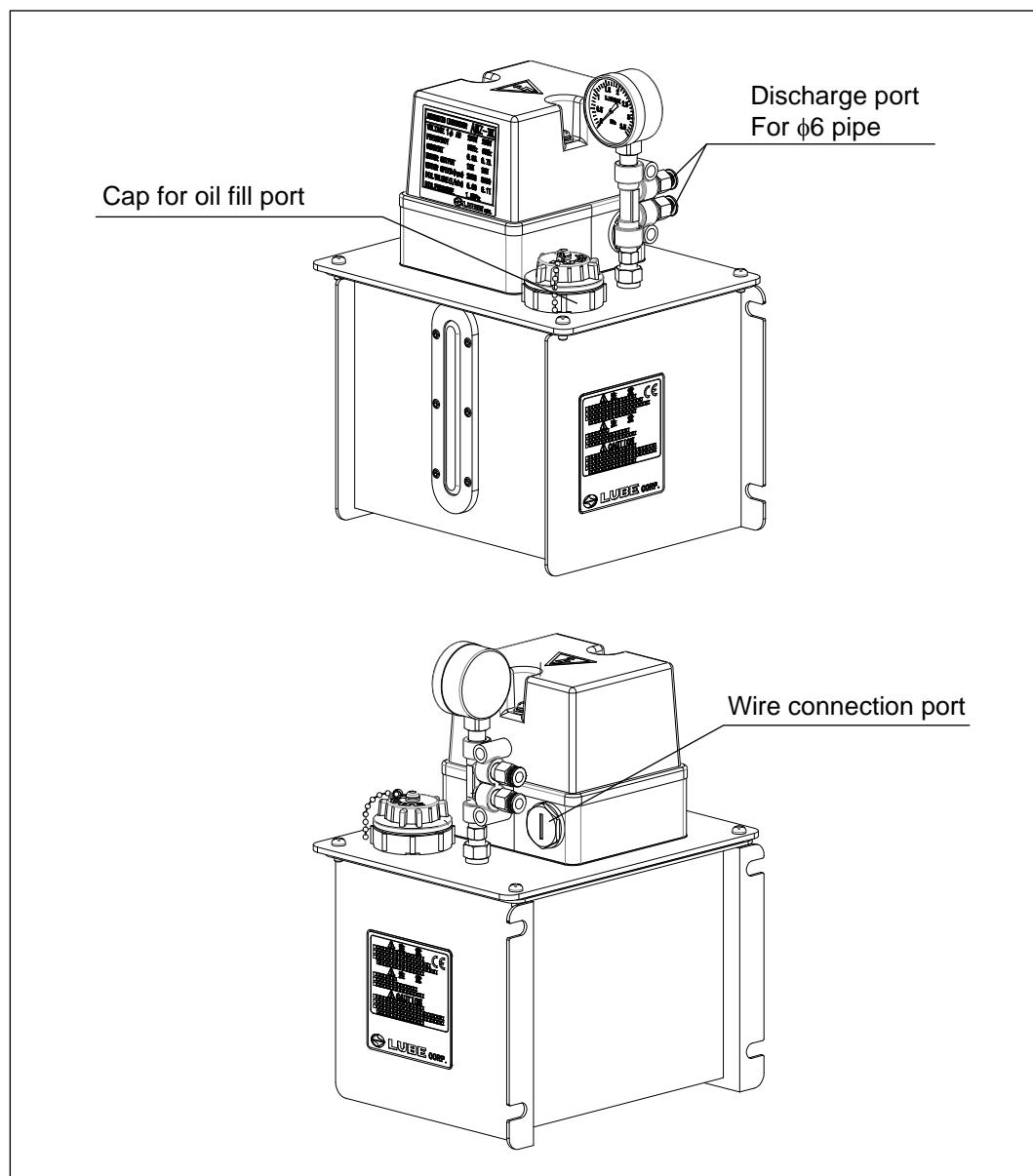


### 3 Specifications

Lubrication unit (manufactured by LUBE)

Model		AMZ-III-100SL-20L
Pump	Discharge flow rate	110 mL/min(60Hz) 90 mL/min(50Hz)
	Discharge pressure	1.5 MPa
Tank	Total volume	3.2 L
	Effective volume	2.1 L

Discharge flow rate	0.03 mL/cycle	0.1 mL/cycle
Operating pressure		1 MPa
Return pressure		0.3 MPa
Used on	X-, Y- and Z-axis guides	X-, Y- and Z-axis ball screws



## 4 Parameters

- Automatic oiling function

Machine parameter(System 1: common)

Item name	Description
Automatic oiling function	0: Not equipped 1: Type 1 Always carries out the oiling at set intervals. 2: Type 2 Carries out automatic oiling while automatic operation is starting up and while the automatic operation is stopped (paused).
Automatic oiling pause 1	Set the oiling interval when the <Automatic oiling function> is set to type 1. If set to type 2, the oiling interval is set while the automatic operation is starting up.
Automatic oiling pause 2	Set the oiling interval while automatic operation is stopped when the <Automatic oiling function> is set to type 2.
Automatic oiling time	Sets the oiling time.
Automatic oiling monitoring time	Set the wait time until the pressure sensor turns ON, after the oiling pump is turned ON.

- Common

User parameter(Switch 1: installation)

Item name	Description
Oiling/greasing when power is turned on	If the automatic oiling or greasing function is enabled, this sets the oiling or greasing type when the power is turned ON. Type 1: Performs the oiling or greasing during the pause time after the last oiling or greasing when the power is turned ON. Type 2: Performs oiling or greasing when the power is turned ON.  When the alarm <<Execute automatic oiling / greasing cycle ON command.>> is triggered and then the power is turned OFF, the next time that the power is turned ON, the oiling and greasing operation are carried out regardless of the above settings.

## 5 Recommended Lubricants

We recommend using a standard lubricant for machine tools or a lubricant for sliding surfaces that is equivalent to ISO grade VG68.

Recommended oil: Uniway XS68 (JX Nippon Oil & Energy)

Mobil Vactra Oil No.2 (Exxon Mobil)

Shell Tonna S3 M68 (Showa Shell Sekiyu)

Brother recommends this oil as a lubricant with good thermal displacement properties.

We recommend this lubricant for users who wish to focus on the amount of thermal displacement on the ball screws.

Alternatively, refer to the lubrication label which is affixed to the control box.

# CHAPTER 11 (6)

## AUTOMATIC GREASING DEVICE

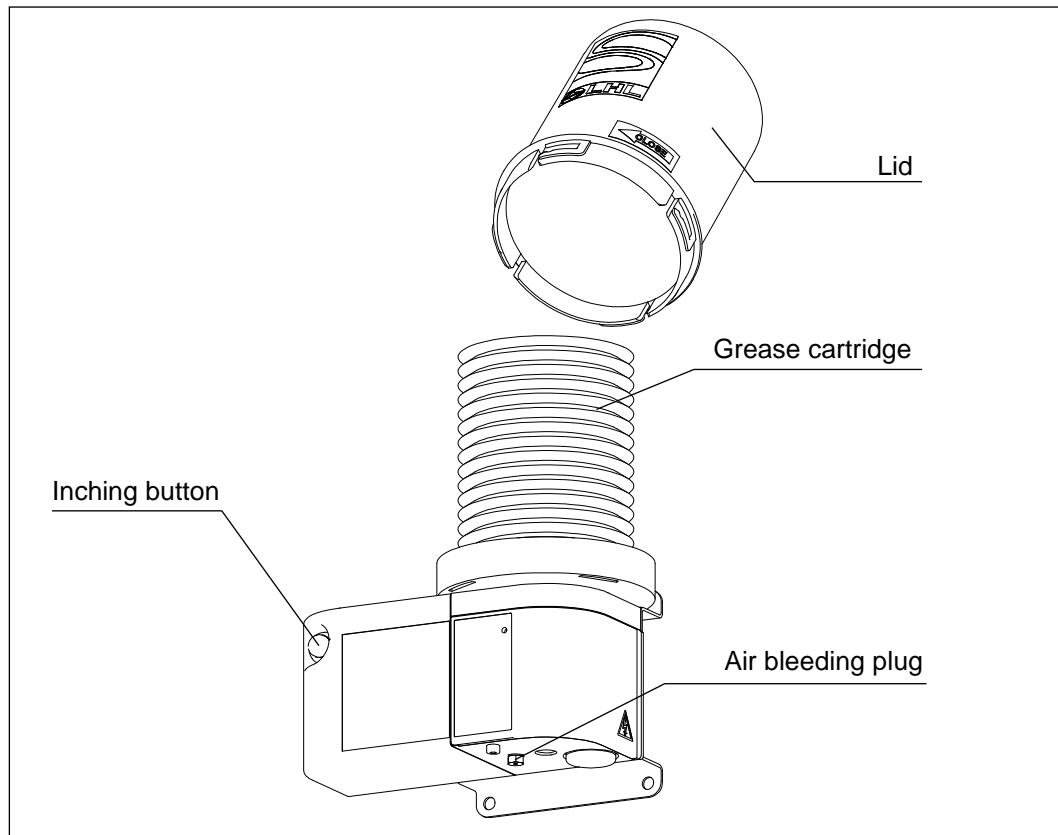
- 1 Functions
- 2 External View
- 3 Specifications
- 4 Parameters
- 5 Replenishing Grease

# 1 Functions

This automatic greasing device regularly lubricates the ball screws and linear guides for the X-, Y- and Z-axes.

- (NOTICE 1) \* Always use the following grease on this system.  
Using another grease will cause a problem or malfunction on this system.  
Description: Lube LHL-X100
- \* The operating temperature under warranty for this system is: 0° to 40°C.
  - \* If the ambient temperature drops below 0°C, warm up the machine for approximately 10 to 15 minutes before starting your work. This is to reduce the viscosity for the automatic greasing.
- (NOTICE 2) There is no oil collection mechanism set up for lubricant that comes out of the automatic greasing device, because this machine uses the ball screw and the linear guide as the basic grease lubrication. The device cannot prevent lubricant from contaminating the cutting fluid.

# 2 External View



# 3 Specifications

Lubrication unit (manufactured by Lube Corporation)

	Model	P207F
Pump	Discharge flow rate	7 ml/min
	Discharge pressure	8 MPa
Grease	Name	Lube LHL-X100 (Cartridge replacement type)
	Total volume	700 ml

Distributor

Model	MG2C-5	MG2C-10
Discharge flow rate	0.05 ml/cycle	0.1 ml/cycle
Operating pressure		2.5 MPa
Returning pressure		1.4 MPa
Used on	X-, Y- and Z-axes guides	X-, Y- and Z-axes ball screws

## 4 Parameters

- Automatic greasing function

Machine parameter (System 1: common)

Item name	Description
Automatic greasing function	0: Not equipped 1: Equipped Carries out automatic oiling while automatic operation is starting up and while the automatic operation is stopped (paused).
Automatic greasing pause 1	Sets the greasing interval while automatic operation is starting up when the <Automatic greasing function> is enabled.
Automatic greasing pause 2	Sets the greasing interval while automatic operation is stopped when the <Automatic greasing function> is enabled.
Automatic greasing completion monitoring time	Sets the monitoring time for automatic greasing errors to monitor until greasing ends. If greasing is not performed, the alarm <>Grease was not supplied automatically<> is triggered.
Automatic greasing abnormal pressure monitoring time	Sets the monitoring time for automatic greasing device errors to start monitoring from when the automatic greasing pump is turned ON. If there is an error, the alarm <>Automatic greasing discharge abnormal<> is triggered.

- Common

User parameter (Switch 1: installation)

Item name	Description
Oiling/greasing when power is turned on	If the automatic oiling or greasing function is enabled, this sets the oiling or greasing type when the power is turned ON.  Type 1 Performs the oiling or greasing during the pause time after the last oiling or greasing when the power is turned ON.  Type 2 Performs oiling or greasing when the power is turned ON.  If the power is turned OFF while the message <>Execute the automatic oiling / greasing cycle ON command<> is triggered, the oiling or greasing is carried out the next time the power is turned ON regardless of the setting noted above.

# 5 Replenishing Grease

If the grease inside the cartridge becomes low, the alarm <<Change grease (automatic greasing)>> is triggered and the machine stops. Replace the grease cartridge to replenish the grease in the automatic greasing device. In order to prevent the grease from being contaminated, the cartridge cannot be replenished with grease.

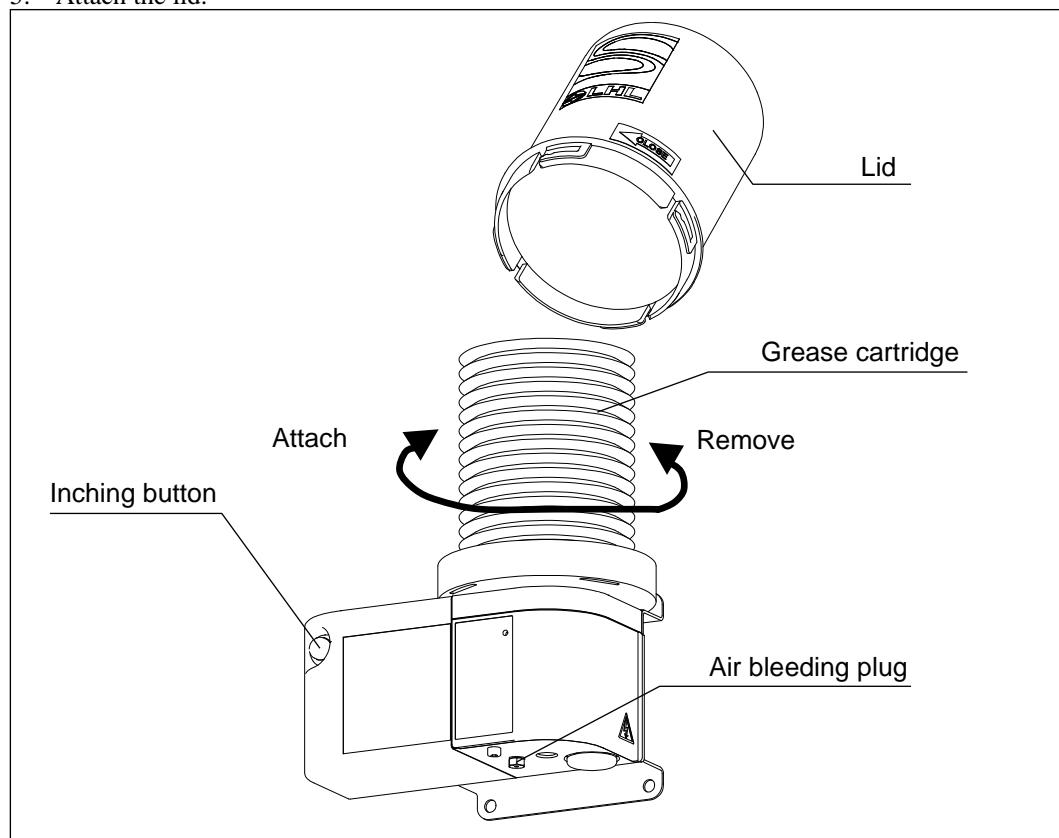
## 5.1 Replacement Procedure

1. Remove the lid.
2. Remove the empty cartridge. Turn the cartridge to remove it.
3. Push in and hold the new cartridge in position to attach it to the pump in order to ensure that air does not get inside. After fitting the cartridge on, turn to secure it.
4. Purge the air. (Refer to the next page)

### (SAFETY INSTRUCTIONS)

**The air from the air bleeding valve and the grease may shoot out due to the pressure flow. Always wear protective goggles when performing the air purging task.**

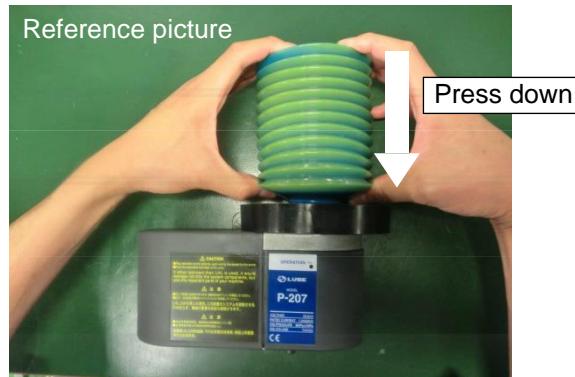
5. Attach the lid.



## Chapter 11 Options

### Air bleeding procedure for automatic lubrication pump

1. Use a spanner, etc., to loosen the air bleeding valve on the pump by turning it approximately 1 time around in a counterclockwise direction.
2. Use the inching button to run the pump for approximately 2 minutes.  
(NOTICE) If grease does not discharge even after operating the pump for 2 minutes, run the pump again while pressing down on the grease cartridge until grease discharges.
3. If the discharge problem persists even after the performing the aforementioned steps, turn the main power to the pump OFF and ON, and then purge the air.
  - (i) Turn the power ON, and then turn the power OFF after more than 10 seconds has elapsed from when the pump began to operate.
  - (ii) Turn the power ON after more than 5 seconds has elapsed.
  - (iii) Repeat steps (i) and (ii) 5 times.
4. If the discharge problem persists even after the steps taken in 3 above, purge the air following the procedure in 3 above but while pressing down the grease cartridge as shown in the reference picture.



5. Stop the pump only if grease begins to discharge from the air bleeding valve.
6. Manually turn the air bleeding valve in a clockwise direction to close it, and then turn it approximately 1/18 of a turn (5 N•m).
7. After the air is purged, always run the pump for 1 cycle, and then make sure that the pressure increases.

## 5.2 How to Purchase

Always use the following grease.

- (NOTICE 1) Always use the following grease on this system.  
Using another grease will cause a problem or malfunction on this system.  
Description: Lube LHL-X100
- (NOTICE 2) The operating temperature under warranty for this system is: 0° to 40°C.
- (NOTICE 3) If the ambient temperature drops below 0°C, warm up the machine for approximately 10 to 15 minutes before starting your work. This is to reduce the viscosity for the automatic greasing.

Contact the following dealers to purchase grease.

(When purchasing inside Japan)  
Lube Corporation headquarters  
TEL: 03-3204-8431 FAX: 03-3204-8520

(When purchasing outside of Japan)  
Asia

Country	Company	Telephone	Fax
China	LUBE LUBRICATING SYSTEM (SHANGHAI) Co., LTD	+86-21-5868-3818	+86-21-5868-3880
Hong Kong	Gangfa International Trading CO., LTD.	+852-2806-3220 or 3226	+852-2510-7978
Taiwan	JIAN YANG INTERNATIONAL CORPORATION	+886-2-8712-7066	+886-2-8712-7062
Korea (Seoul)	DONG IN C&T CORPORATION	+82-2-2163-8670	-
Korea (Changwon)	DAEIL HYDRAULIC CO.	+82-551-267-6137	+551-267-6138

South Asia, South East Asia, Australia, New Zealand, Africa

Country	Company	Telephone	Fax
India Sri Lanka Bangladesh	LUBE AUTOMATIC SYSTEMS Private Limited	+91-2502-3209-03	+91-2502-3209-03
	Gurgaon Branch Office	+91-9096-99-6242	-
	Bangalore Branch Office	+91-9699-9710-47	-
Thailand	WORLD PUMPS (THAILAND) CO., LTD.	+66-993-6835-6	+66-993-6278
Malaysia	INNOMOTION INDUSTRIES (M) SDN BHD (226100-V)	+60-3-8961-3079 or 3080	+60-3-8961-3081
Indonesia	PT. SOMAGEDE INDONESIA	+62-21-641-0730	+62-21-6401572
Singapore	ADEX ZONEX PTE. LTD.	+65-6558-7789	+65-6558-7977
Australia	ALLTEK MACHINE TOOL SERVICES PTY. LTD.	+61-3-9588-1870	+61-3-9588-1851
New Zealand	CNC SERVICE LTD.	+649-521-6366	+649-521-6367
South Africa	PLUTO ENGINEERING cc	+27-41-966-1099	+27-41-966-1099

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America

Country	Company	Telephone	Fax
USA	LUBE USA, INC.	+1-864-297-3950 +1-800-326-3765	+1-864-242-1652
Canada Mexico			
Brazil	Mitsui Motion Maquinas S.A.	+55(11)2095 7975	+55(11)2095 7979

## Chapter 11 Options

Europa, Russia, Middle East

Country	Company	Telephone	Fax
Europa (Belgium, Finland, Norway)	KAA-Europa GmbH	+49-2267-8729-13	+49-2267-8729-26
Germany	Alzeyer Werkzeugmaschinen Service (AWS) GmbH	+49-6731-45350	+49-6731-45336
France	CODAITEC	+33-1-64-26-18-88	+33-1-60-20-41-35
Italy (Florence)	MALLARDI S.R.L.	+39-55-887-7767	+39-55-882163
Italy (Milan)	S.A.T. ENGINEERING S.R.L.	+39-2-45713516	+39-2-45714435
Spain	LAUTECNIC	+34-93-504-16-89	+34-93-504-10-51
Sweden	AC Maskin Service AB	+46-587-151-00	+46-587-51-25
Russia	CFTechnologies	+7(495)995-71-08	+7(495)995-71-09
Irland	J.L GOOR LTD.	+353-1-2868103	+353-1-2769110
Israel	AZUR TECHNOLOGY & MARKETING (1979) LTD.	+972-9-7443-111	+972-9-7440-338

The grease can also be purchased from Brother.

Part No.	Part description
6B6536001	CARTRIDGE GREASE X100

## CHAPTER 11 (7)

### HANDLE (MANUAL PULSE GENERATOR PSRD100A)

- 1 Handling Precautions
- 2 Functions
- 3 External View
- 4 Installation Procedure
- 5 Operation Check
- 6 Signal Input Check

# 1 Handling Precautions

## **⚠ WARNING**

High-voltage components are present inside the control box. There is risk of electric shock if you touch these components by mistake.

### [SAFETY INSTRUCTIONS]

Maintenance and inspection of electrical components must only be carried out by a qualified electrician who is trained in electrical safety and who has thorough knowledge of the electronic circuits in this machine.

Turn OFF the main power breaker, and then wait at least 20 minutes before carrying out work.

Attach a padlock to the main power breaker so that the power cannot be turned ON.

A sign or notice should be placed near the operation panel to warn others that work is in progress.

If leaving the machine unattended, close the control box and secure it with screws.

## **⚠ WARNING**

If the control box or operation panel is touched accidentally with wet hands while performing installation or maintenance, an electric shock or short-circuit may cause a fire.

### [SAFETY INSTRUCTIONS]

Do not touch the control box and the operation panel with wet hands.

The cover to the control box must be closed while the machine is operating.

The control box and the operation panel must be kept free of coolant, water, chips and shavings.

## **⚠ WARNING**

If the door interlock mode is set to machine setup or service mode, the machine will operate even when a door is open, and you may get caught or drawn into the machine.

### [SAFETY INSTRUCTIONS]

The installer or setup personnel must never leave the machine unattended while the door interlock mode is set to machine setup or service mode.

The key for the [DOOR INTERLOCK MODE] switch should be kept by the supervisor.

**⚠ WARNING**

**There are movable parts inside the machine such as the spindle head and table, and your body may get caught on them if you go inside the machine.**

**[SAFETY INSTRUCTIONS]**

**Do not go inside the machine.**

**When a worker must unavoidably go inside the machine, always notify the supervisor. After removing the maintenance cover, use a fixing bracket (for transport) to secure the door and/or use a bolt to keep the door open, so as to avoid being trapped inside.**

**If you go inside the machine, turn OFF the main power breaker, and then attach a padlock to the main power breaker so that the power cannot be turned ON.**

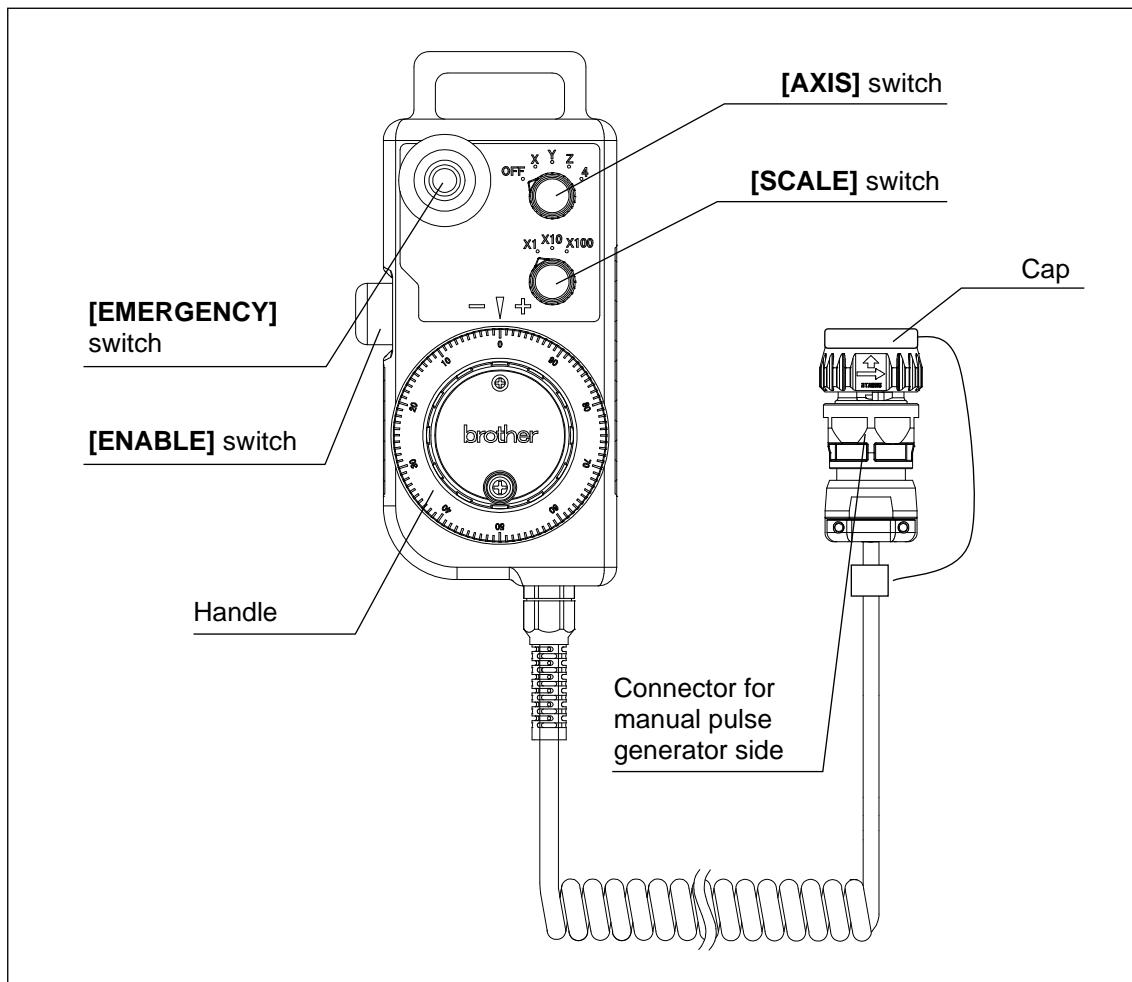
**The operator should visually check to make sure that there is nobody inside the machine before starting the machine.**

**A sign or notice should be placed near the operation panel to warn others that work is in progress.**

## 2 Functions

The manual pulse generator carries out axis travel manually based on the scaling for the X-, Y- and Z-axes.

### 3 External View



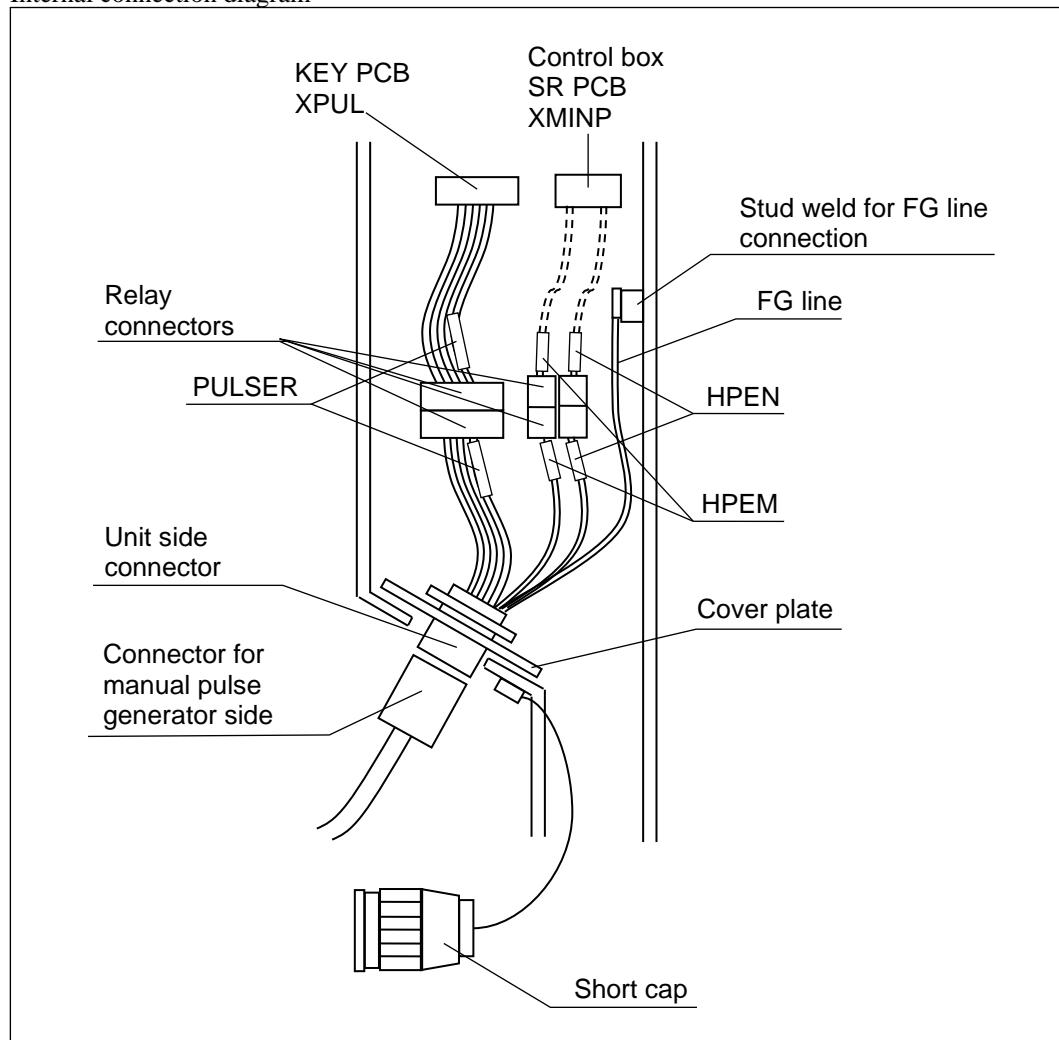
- (NOTICE 1) Do not put the manual pulse generator into liquid because it can cause a failure.
- (NOTICE 2) Do not damage the rubber part of the [ENABLE] switch by using a sharp object, or by pulling and twisting it, because the seal for the manual pulse generator will not hold.
- (NOTICE 3) Do not open and then close the back cover, because the seal for the manual pulse generator will not hold thereafter.
- (NOTICE 4) The rubber part for the [ENABLE] switch should be replaced by Brother maintenance staff, the service staff of an authorized dealer or the service staff that has received Brother maintenance training.
- (NOTICE 5) When removing the manual pulse generator from the machine, attach caps to the connector terminals, and store it in an environment where it will not get contaminated.

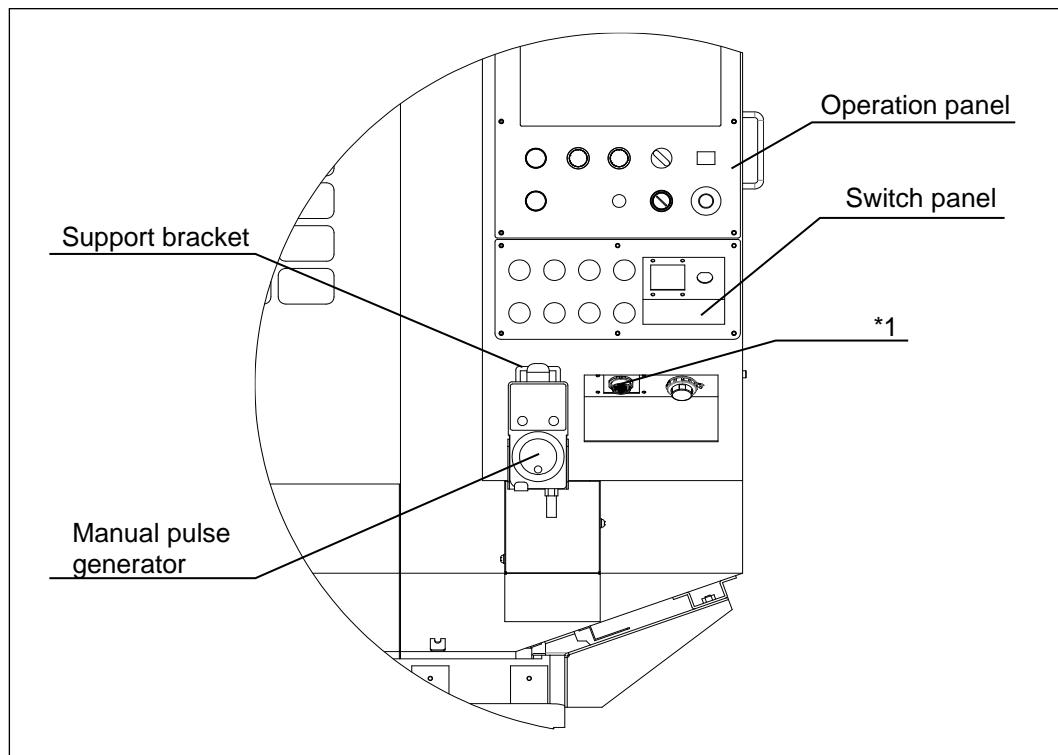
## 4 Installation Procedure

Follow the procedure below to install the manual pulse generator onto the machine.

1. Turn OFF the power switch on the operation panel.
2. Turn OFF the main power breaker on the control box.
3. Remove the 12 screws on the operation panel, and then open the operation panel.  
Remove the 6 screws on the switch panel, and then remove the switch panel.
4. Remove the cover plate that is provided in the standard accessories.
5. Use the 4 screws to attach the connector on the unit side to the cover plate provided with the manual pulse generator.
6. Use the 4 screws to attach the cover plate from step 5 to the machine cover.  
At this time, attach the short cap using the screw on the bottom-right of the cover plate.
7. Connect the FG line to the stud weld.
8. Connect the relay connector on the unit side to the connector on the relay cord, which is connected to the XPUL connector on the KEY PCB.
9. Connect the relay connector on the unit side to the connector on the relay cord, which is connected to the XMAINP connector on the SR PCB in the control box.
10. Attach the cap, which was on the connector for the manual pulse generator, to the short cap.  
When removing the manual pulse generator, attach the cap to the connector for the manual pulse generator, and attach the short cap to the unit side connector.
11. Use the screws to secure the operation panel and switch panel.
12. Connect the connector on the manual pulse generator side to the unit side connector.
13. Install the manual pulse generator onto the support brackets.

Internal connection diagram





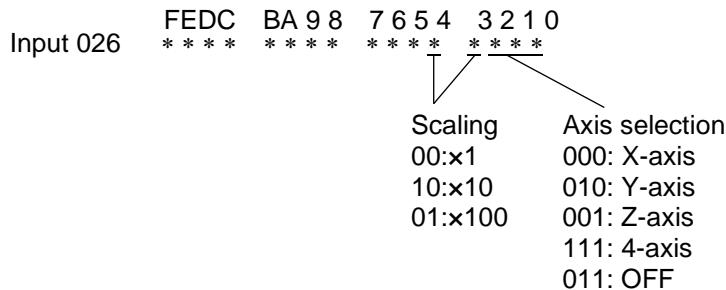
\*1 When attaching the connector for the manual pulse generator to the switch panel 8 hole assembly D00 (Part code: 6D0968001), the standard cover plate covers the mounting holes on the machine cover side.

- (NOTICE 1) When changing from the short cap to connecting to the manual pulse generator, turn OFF the power switch on the operation panel.
- (NOTICE 2) Do not move the machine with the manual pulse generator attached to the support bracket. Otherwise, the manual pulse generator may fall off and break.
- (NOTE 1) When using the machine with the manual pulse generator removed, the emergency stop alarm is triggered and the machine will not operate unless the short cap is attached to the connector.  
The short cap is attached with a string. Make sure that it stays attached and does not get lost.
- (NOTE 2) When removing the manual pulse generator, attach the cap to the connector on the manual pulse generator side so that it fits all the way inside.

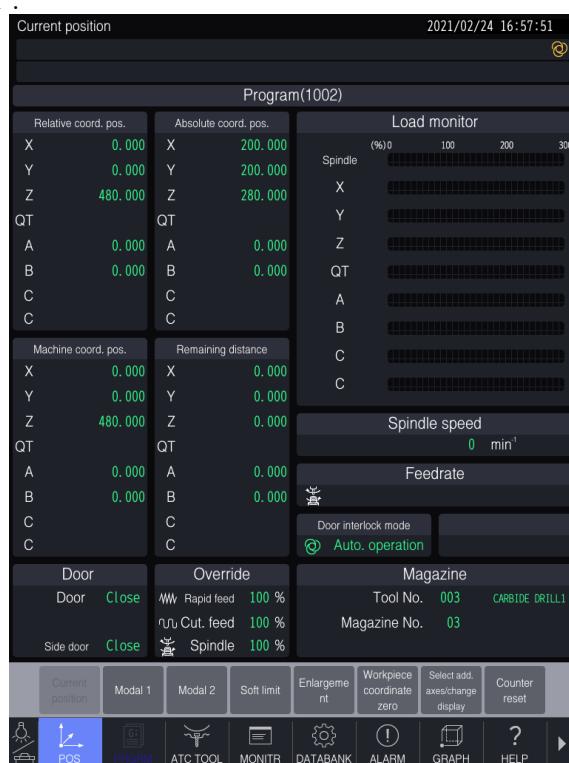
# 5 Operation Check

Use the following procedure to check operation when moving each axis with the manual pulse generator.

1. Turn OFF the power to the machine.
2. Press the [MANU] key to switch to machine setup mode.
3. Press the [I/O] key.
4. Use the number keys to enter [1] and press the [ENT] key.
5. Turn the handle scaling switch and the axis switch so that they match the settings in the table below.



6. Set the door interlock mode to machine setup, and press the [ENABLE] switch to position 1 (pressed state) while the door is open. Then, check the travel direction and the axis that travels when turning the handle.
    - (1) Match the handle to the 0 setting.
    - (2) Turn OFF the axis switch.
    - (3) Perform a machine zero return in manual operation mode to display the current position.
    - (4) Turn the axis switch to X and the scaling switch to  $\times 100$ .
    - (5) When the [ENABLE] switch is in position 1 (pressed state), turn the handle one rotation in the negative direction (counterclockwise direction).  
Make sure that the X-axis value for the machine position coordinate on the screen changes to -0.100 from 0.000.  
When the option function <Minimum unit setting> is set to <Type 2 (submicron)>, and the user parameter (switch) <Change handle magnification> is set to <0: x1>, make sure that the value changes from 0.0000 to 0.0100.
- \* When operation does not follow the intended steps in (1) to (5), refer to “6 Signal input check”.



## 6 Signal Input Check

Press the [I/O], [1] and [ENT] keys to display the I/O (main) screen and to check the signal input status.

Input 98 FEDC BA 9 8 7 6 5 4 3 2 1 0  
\*  
[EMERGENCY] switch  
00.... ON (Press)  
11.... OFF

Input 102 FEDC BA 9 8 7 6 5 4 3 2 1 0  
\*  
[ENABLE] switch  
Input 103 \*  
00.... Switch is released  
11.... Switch is pressed and is at position 1  
00.... Switch is pressed and is at position 2

- \* The [ENABLE] switch has 3 position settings. The 3 position settings change according to how hard the switch is pressed. Only position 1 turns the switch ON.

Switch released (OFF): Handle operation not available when switch is released

Position 1 (ON): Handle operation is available when switch is pressed gently

Position 2 (OFF): Handle operation is not available when switch is pressed down

# CHAPTER 11 (8)

## AUTOMATIC DOOR

- 1 Handling Precautions
- 2 Functions
- 3 External View
- 4 Parameters
- 5 Automatic Door Adjustment
- 6 Signal Input Check
- 7 Operation Check
- 8 Inspection
- 9 Area Sensor

# 1 Handling Precautions

## **⚠ WARNING**

High-voltage components are present inside the control box.  
There is risk of electric shock if you touch these components by mistake.

### [SAFETY INSTRUCTIONS]

Maintenance and inspection of electrical components must only be carried out by a qualified electrician who is trained in electrical safety and who has thorough knowledge of the electronic circuits in this machine.

Turn OFF the main power breaker, and then wait at least 20 minutes before carrying out work.

Attach a padlock to the main power breaker so that the power cannot be turned ON.

A sign or notice should be placed near the operation panel to warn others that work is in progress.

If leaving the machine unattended, close the control box and secure it with screws.

## **⚠ WARNING**

If the control box or operation panel is touched accidentally with wet hands while performing installation or maintenance, an electric shock or short-circuit may cause a fire.

### [SAFETY INSTRUCTIONS]

Do not touch the control box and the operation panel with wet hands.

The cover to the control box must be closed while the machine is operating.

The control box and the operation panel must be kept free of coolant, water, chips and shavings.

## **⚠ WARNING**

If terminal connections on the PCBs or terminal block screws become loose, poor contacts may cause overheating or a fire.

### [SAFETY INSTRUCTIONS]

There should be no loose screws when connecting the wiring.

Do not replace fuses and electrical parts that have been soldered to the inside of the unit.

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This function uses standard control program 10 for the built-in PLC function.  
This function assumes that the executing task assigns the control program that is included as part of the factory-default settings.

Therefore, when using this system, do not change execution settings for standard control program 10 and standard task 3.

In addition, do not change the corresponding contact.

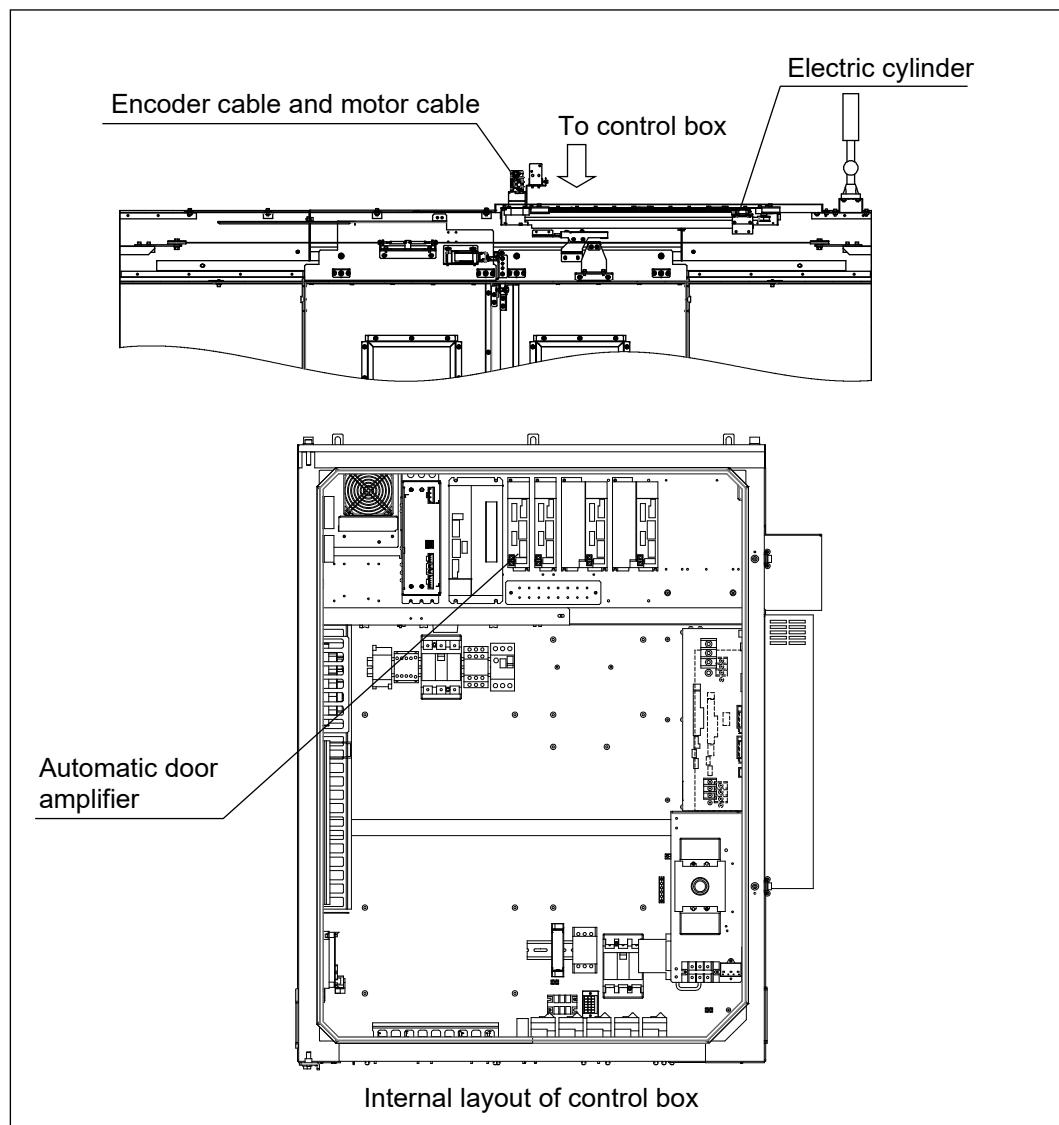
If a control program and/or a task execution setting is changed, operation will no longer be covered under the warranty.

In addition, do not perform the debug function (stop, ON/OFF for related contacts, etc.) for the standard control program 10 while this function is operating.

## 2 Functions

1. Open and close automatic door  
The front door is automatically opened and closed.
2. Area sensor  
When the area sensor is obstructed or blocked during automatic door operation, the door operation immediately stops.

## 3 External View



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Speeding up the opening and closing operation on the automatic door can cause damage to the automatic door.

Do not change the open and close operation speed.

# 4 Parameters

User parameter 1 (Switch 1: door)

Item name	Factory-set value	Description
Area sensor pattern (0: Pattern 1 1: Pattern 2)	1	<p>Set the area sensor pattern to stop the automatic door immediately when the beam of area sensor is obstructed during automatic door operation.</p> <p>Pattern 1: Enables area sensor during the door close operation. Pattern 2: Enables area sensor during the door open/close operation.</p>
Automatic door error level (0: Level 5, 1: Level 4, 2: Level 3, 3: Level 2)	1	<p>Sets alarm stop level when the following errors are detected on the automatic door.</p> <ul style="list-style-type: none"> <li>When it takes more than the time set (parameter value) for the automatic door open and close operations.</li> </ul> <p>Level 5: Servo is turned OFF Level 4: Operation stops temporarily Level 3: Operation stops at the block Level 2: Operation stops after 1 cycle</p> <p>The settings &lt;2: Level 3&gt; and &lt;3: Level 2&gt; are only available on machine models equipped with a QT. If these settings are used on any other machine model, the error &lt;&lt;User param. setting error (switch 1)&gt;&gt; is triggered.</p>

Machine parameter (System 1: automatic door)

Item name	Factory-set value	Description
Option	1	<p>&lt;0:No 1:Yes&gt;</p> <p>Set whether or not the machine is equipped with the automatic door option.</p> <p>(NOTE) When set to &lt;1:Yes&gt;, a control command from the built-in PLC for the P4-axis will not be accepted.</p>
Operation time		<p>Set the open and close operation time on the door.</p> <p>When the door open and close operation does not complete within the set time, the error &lt;&lt;Door operation timeout&gt;&gt; is triggered.</p> <p>When the time is set to 0, the next operation will not be performed until the door open and close operation is complete.</p>
Door open operation check time		<p>Set the check time to start from when the door is unlocked and to end when the open operation starts on the automatic door.</p>
Pulley belt		<p>Set the pulley belt for the automatic door.</p>
Absolute encoder rotation direction	1	<p>&lt;0:Normal by + comd. 1:Normal by – comd.&gt;</p> <p>Set the rotational direction of the absolute encoder for the automatic door.</p>
Door open reference position		<p>Set the reference machine coordinate when the door open operation is completed.</p>
Offset for door open position		<p>Set the offset from the reference machine coordinate when the door open operation is completed.</p>
Offset for door close position		<p>Set the offset when the door close position is adjusted.</p>
Door open maximum speed		<p>Set the maximum travel speed for the door open operation.</p>
Door close maximum speed		<p>Set the maximum travel speed for the door close operation.</p>
Manual speed		<p>Set the maximum feedrate during manual operations (JOG, STEP and HANDLE).</p>
Door open time constant 1		<p>Set the time constant for the door open operation.</p>
Door open time constant 2		<p>&lt;Door open time constant 1&gt; is the time it takes to reach the command speed.</p>
Door open time constant 3		<p>&lt;Door open time constant 2&gt; and &lt;Door open time constant 3&gt; are the times for ideal acceleration and deceleration.</p>

Item name	Factory-set value	Description
Door close time constant 1		Set the time constant for the door close operation. <Door close time constant 1> is the time it takes to reach the command speed.
Door close time constant 2		<Door close time constant 2> and <Door close time constant 3> are the times for ideal acceleration and deceleration.
Door close time constant 3		
Manual time constant 1		Set the acceleration and deceleration time constant during manual operations (JOG, STEP and HANDLE).
Manual time constant 2		
Manual time constant 3		When the manual time constants 1/2/3 settings are all “0” or are all not set, then the door motion accelerates and decelerates using the door open time constants 1/2/3 and door close time constants 1/2/3.
NC stop level for servo error		<1: Stop level 1 2: Stop level 2 3: Stop level 3 4: Stop level 4 5: Stop level 5> Set the stop level on the machine side (excluding the automatic door, PLC-axis, other axes) when a servo error is triggered on the automatic door. When not set, the default level is <5: Stop level 5>. A servo communication error and servo status error are a stop level 5 regardless of this parameter setting. A servo warning is a stop level 1 regardless of this parameter setting. (NOTE) The operation on the machine side does not immediately stop when an automatic door servo error is triggered if this parameter is set to <3: Stop level 3>, <2: Stop level 2> or <1: Stop level 1>.
In-position timeout period		Set the time allowed for the in-position check. The check operation does not execute when the time is 0.
In-position width		Set the allowable range for the final position relative to the command position.
Positioning end check distance		Set the allowable range for the final position when the door open/close operation is complete.
Return distance with servo controller ON		When the servo is turned ON, the machine automatically returns to the position where the servo was turned OFF the last time. This setting is for the maximum distance or range for that return operation.
Time period when door open position check is disabled		This time period refers to the duration (after the door open operation is completed) when the door open position check is not performed.
Door open position detection range		Set the external output signal <Door open> to turn OFF if the stop position falls outside of the range: “Door open position ± this value”.
Overrun distance when stopped		Stop control. Set the overrun distance for stopping.
Low-speed travel distance when stopped		Stop control. Set the command value for the low speed travel distance for stopping. Set a value that does not include the overrun distance.
Low-speed travel speed when stopped		Stop control. Set the speed during low speed travel for stopping.
Low-speed time constant 1 when stopped		Stop control. Set the time constant during low speed travel for stopping. <Low-speed time constant 1 when stopped> is the time it takes to reach the command speed.
Low-speed time constant 2 when stopped		<Low-speed time constant 2 when stopped> and <Low-speed time constant 3 when stopped> are the times it takes for ideal acceleration and deceleration.
Low-speed time constant 3 when stopped		

## Chapter 11 Options

Item name	Factory-set value	Description
Position check pulse		Set the tolerance for misalignment when the automatic door servo is ON. The alarm <<*Automatic door position shifted>> is triggered when the total value for the “Current machine coordinate ± position check pulse” is exceeded.
Stop check time when stopped		Stop control. Set the check time for determining whether it is stopped.
Wait time when stopped		Stop control. The alarm <<*Door open timeout>> is triggered when low speed travel for stopping does not stop even after this time has elapsed.
Stop time when stopped		Stop control. Set the time for determining whether it is stopped.
Stop position deviation when stopped		Stop control. Set the position deviation error for determining whether it is stopped. A stop is determined when a change in the stop deviation continues during the stop time.
Stop current reference value when stopped		Stop control. Set the standard value for the current command that determines whether it is stopped. A stop is determined when the current command value is more than the <Stop current reference value when stopped> and the <Stop check time when stopped> continues.

## 5 Automatic Door Adjustment

To perform the automatic door adjustment, follow the instructions in the recovery support application.

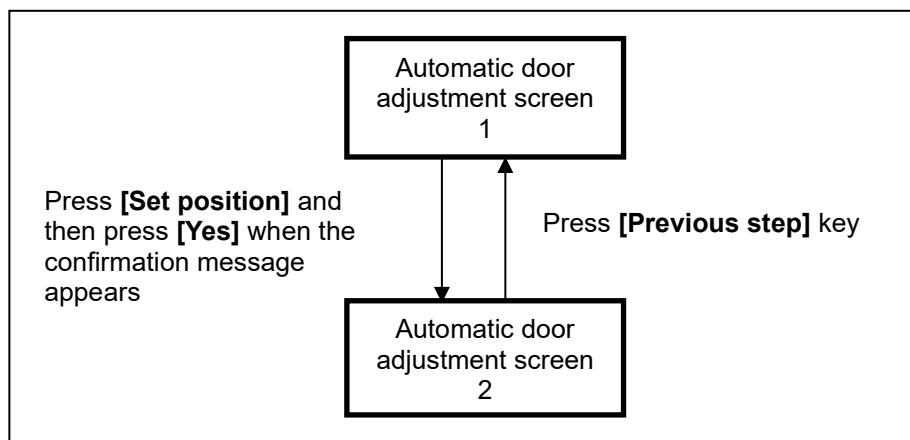
(NOTICE) Be careful while the automatic door moves automatically during the recovery operation.

Make sure that the door drive and door are connected properly.

Please manually close the door to make the door and the disconnection mechanism fit together.

1. Press <Automatic door adjustment> from the menu in the recovery support application to change to automatic door adjustment screen 1.
2. Follow the screen operation instructions to adjust the close position of the automatic door. After completing the adjustment, the screen changes to automatic door adjustment screen 2.
3. Follow the screen operation instructions to adjust the open position of the automatic door. After completing this adjustment, the message <<Automatic setting for automatic door parameter is complete>> appears and the adjustment is complete.
4. End and exit the recovery support application.

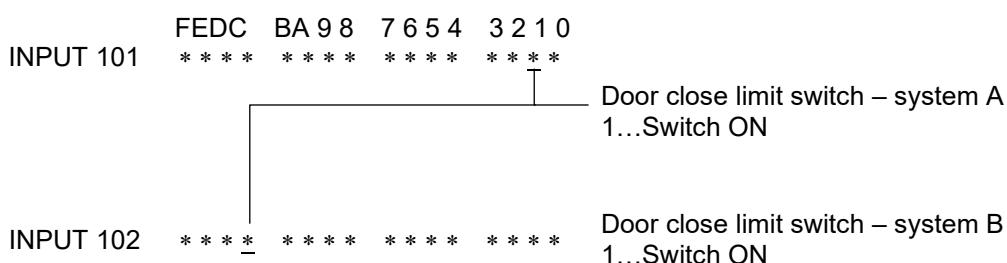
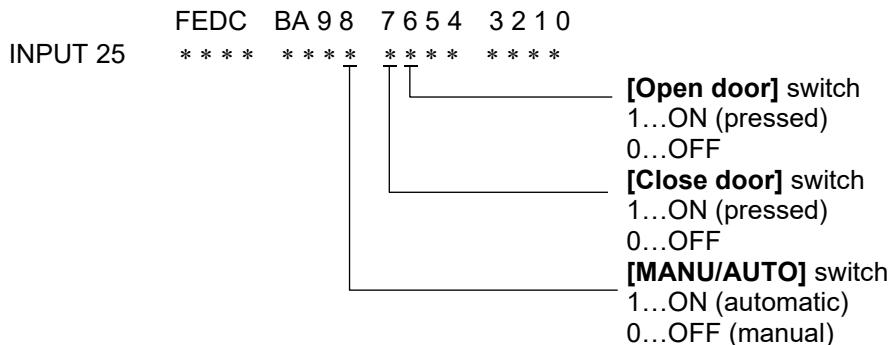
Note, the user can use the operations below to change back and forth between automatic door adjustment screen 1 and 2.



## 6 Signal Input Check

Press the [I/O], [1] and [ENT] keys to display the I/O (main) screen and to check the signal input status.

Main



## 7 Operation Check

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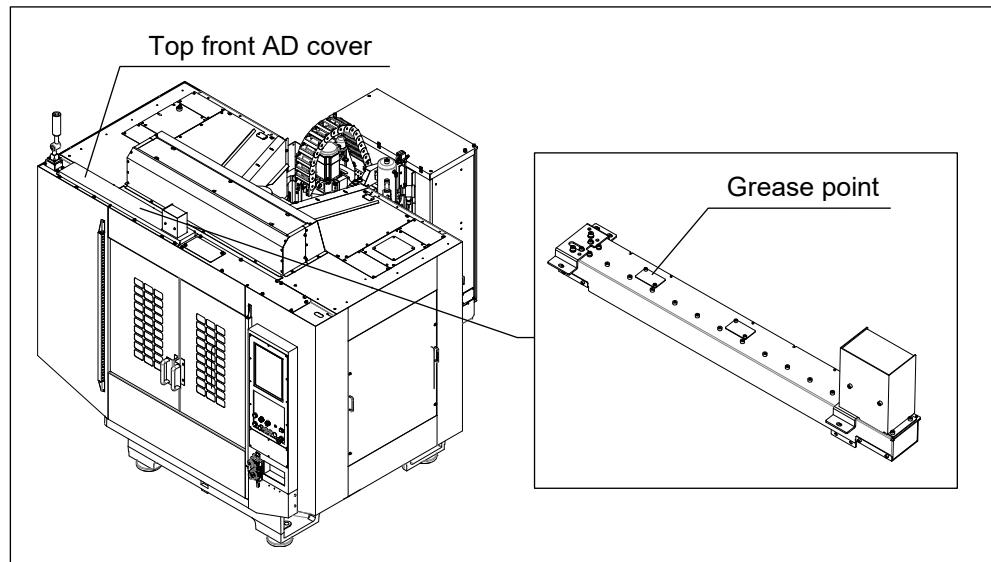
1. Set the [MANU/AUTO] switch to [MANU].
2. Turn the [AUTOMATIC DOOR OPEN/CLOSE] switch to the close setting, and press the button.  
The automatic door will close.
3. Turn the [AUTOMATIC DOOR OPEN/CLOSE] switch to the open setting, and press the button.  
The automatic door will open.

## 8 Inspection

Lubricate the linear guide block for the automatic door once a year.  
Open the door all the way and then lubricate.

Recommended grease:

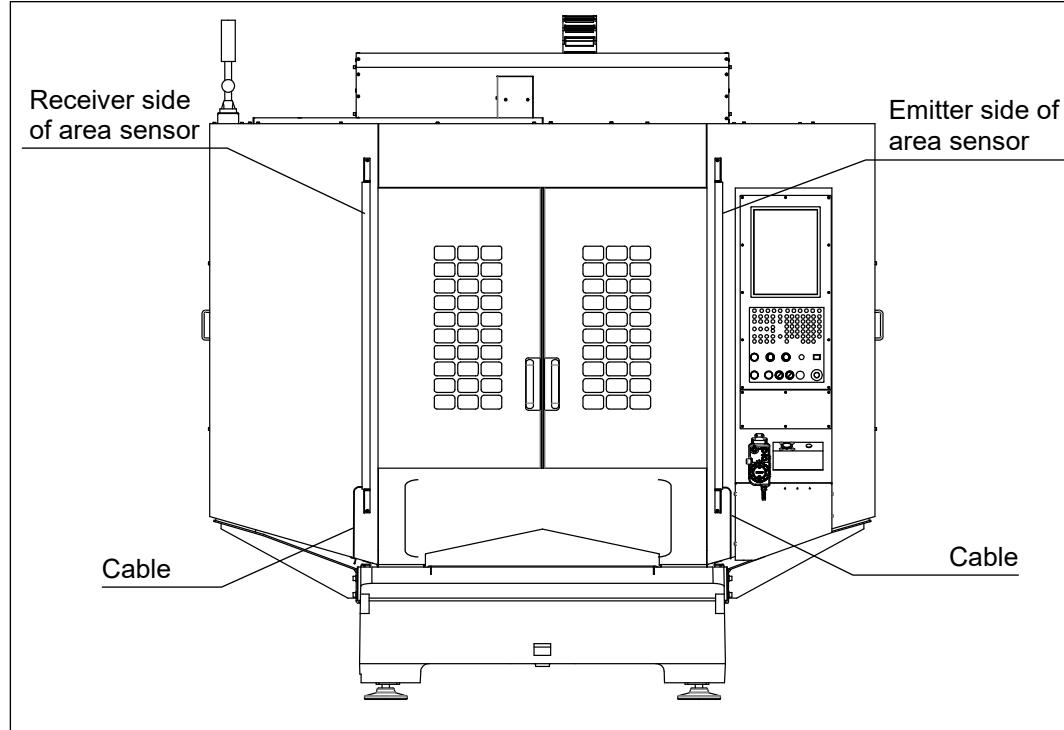
Manufacturer	Model
JXTG Nippon Oil & Energy Corporation	Multinoc grease No.2
Exxon Mobil	Unirex N2
Showa Shell Sekiyu	Alvania grease S No.2
Kyodo Yushi	Multemp LRL3



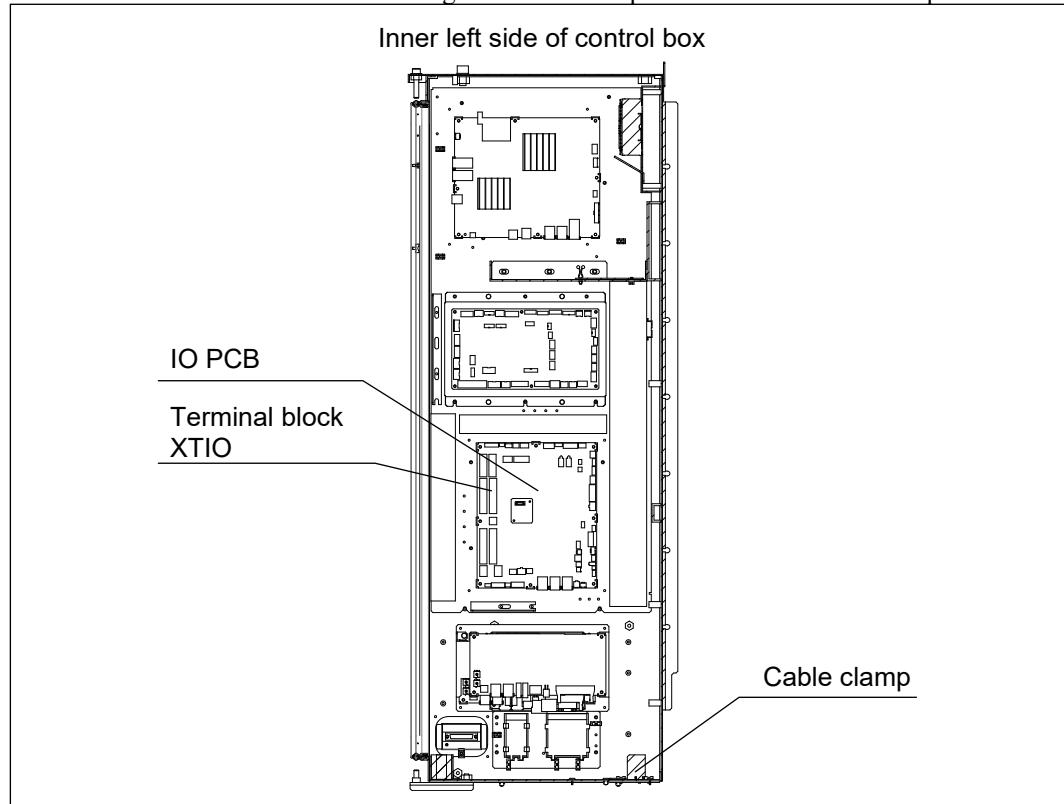
## 9 Area Sensor

The area sensor is used together with the automatic door as a set. The area sensor cannot be used just by itself. When the automatic door closes and there is something that is obstructing or blocking the area sensor, then the door immediately stops closing.

### 1. External view



Pull the cable from the area sensor through the cable clamp on the base of the control panel.



Connect the cable to the terminal XTIO on the IO PCB.

Emitter side...XTIO Nos. 17 and 18.

Receiver side...XTIO Nos. 13, 14 and 15.

(Remove the short cord for Nos. 13 and 14)

Return the cable clamp back to its original position.

## 2. Operation check

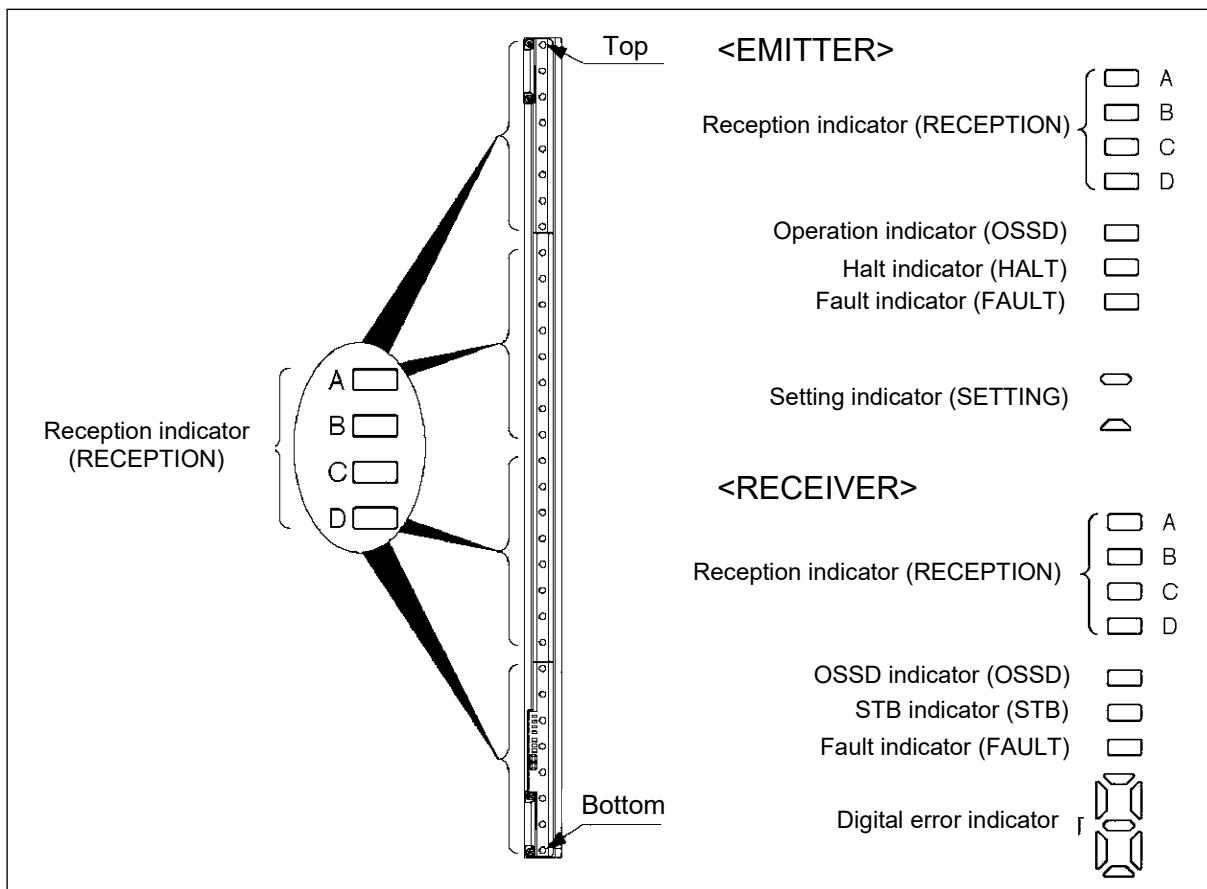
### (1) Checking operation status

i) Turn ON the main power breaker, and then turn ON the power switch for the operation panel.

ii) Check the area sensor operation status using the indicators for the receiver and emitter.

	Detection output operation	Indicator operations		
		Reception indicator	OSSD indicator	STB indicator
Receiver side	Light received	Green light	Green light	Green light
	Light blocked	Red light	Red light	Light is off

	Detection output operation	Indicator operations		
		Reception indicator	Operation indicator	Halt indicator
Emitter side	Light received	Light is off	Green light	Light is off
	Light blocked	Light is off	Green light	Light is off



### (2) Checking on the screen

i) Press the [I/O], [1], [ENT] and [↓] keys to display the I/O (main) screen.

Make sure that bit 5 for input 47 is 1 when all light beams are received and 0 when the light is blocked.

Main

FEDC BA 9 8 7 6 5 4 3 2 1 0  
INPUT 47 \* \* \* \* \* \* \* \* \* \* \* \*

1...When all lights beams are received  
0...When the light is blocked

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# CHAPTER 11 (9)

## INDICATORS

- 1 Handling Precautions
- 2 Functions
- 3 External View
- 4 Installation Procedure

# 1 Handling Precautions

## **WARNING**

High-voltage components are present inside the control box. There is risk of electric shock if you touch these components by mistake.

### [SAFETY INSTRUCTIONS]

Maintenance and inspection of electrical components must only be carried out by a qualified electrician who is trained in electrical safety and who has thorough knowledge of the electronic circuits in this machine.

Turn OFF the main power breaker, and then wait at least 20 minutes before carrying out work.

Attach a padlock to the main power breaker so that the power cannot be turned ON.

A sign or notice should be placed near the operation panel to warn others that work is in progress.

If leaving the machine unattended, close the control box and secure it with screws.

## **WARNING**

If the control box or operation panel is touched accidentally with wet hands while performing installation or maintenance, an electric shock or short-circuit may cause a fire.

### [SAFETY INSTRUCTIONS]

Do not touch the control box and the operation panel with wet hands.

The cover to the control box must be closed while the machine is operating.

The control box and the operation panel must be kept free of coolant, water, chips and shavings.

## **WARNING**

If terminal connections on the PCBs or terminal block screws become loose, poor contacts may cause overheating or a fire.

### [SAFETY INSTRUCTIONS]

There should be no loose screws when connecting the wiring.

Do not replace fuses and electrical parts that have been soldered to the inside of the unit.

## **WARNING**

If you touch cables which have been crushed or damaged by heavy objects, there is risk of electric shock.

In addition, short-circuits may occur if cables are crushed or damaged by heavy objects.

### [SAFETY INSTRUCTIONS]

Cables should be gathered up or arranged to prevent them from being crushed. If a cable has become damaged, it must be replaced with a new one.

## **WARNING**

**Do not climb onto the machine or other nearby equipment when performing installation or maintenance, otherwise you may fall down and injure yourself.**

**[SAFETY INSTRUCTIONS]**

**Do not climb onto the machine or nearby equipment.**

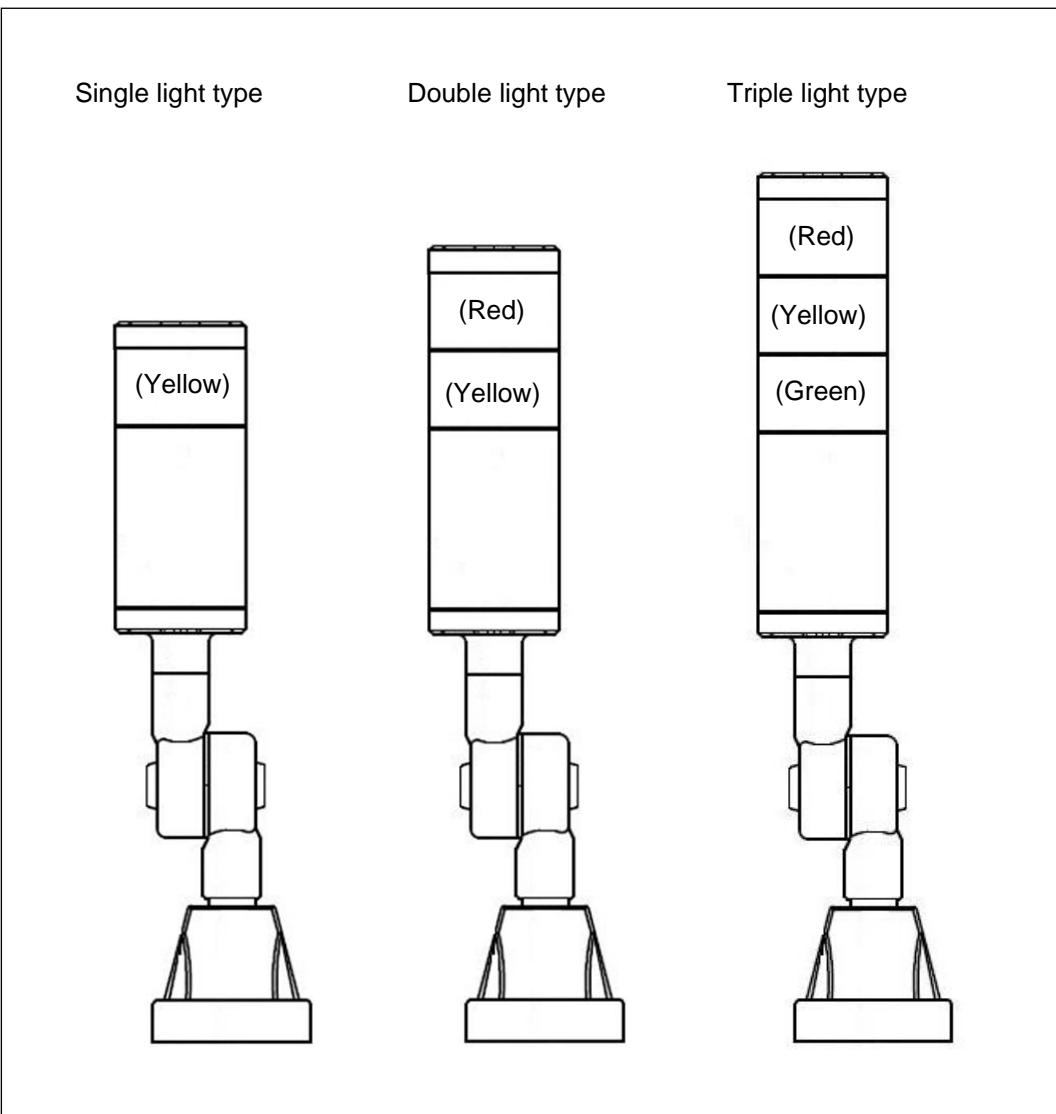
**Use a step or step-ladder to provide a secure foot hold when the working position or conditions are awkward or out of reach.**

## 2 Functions

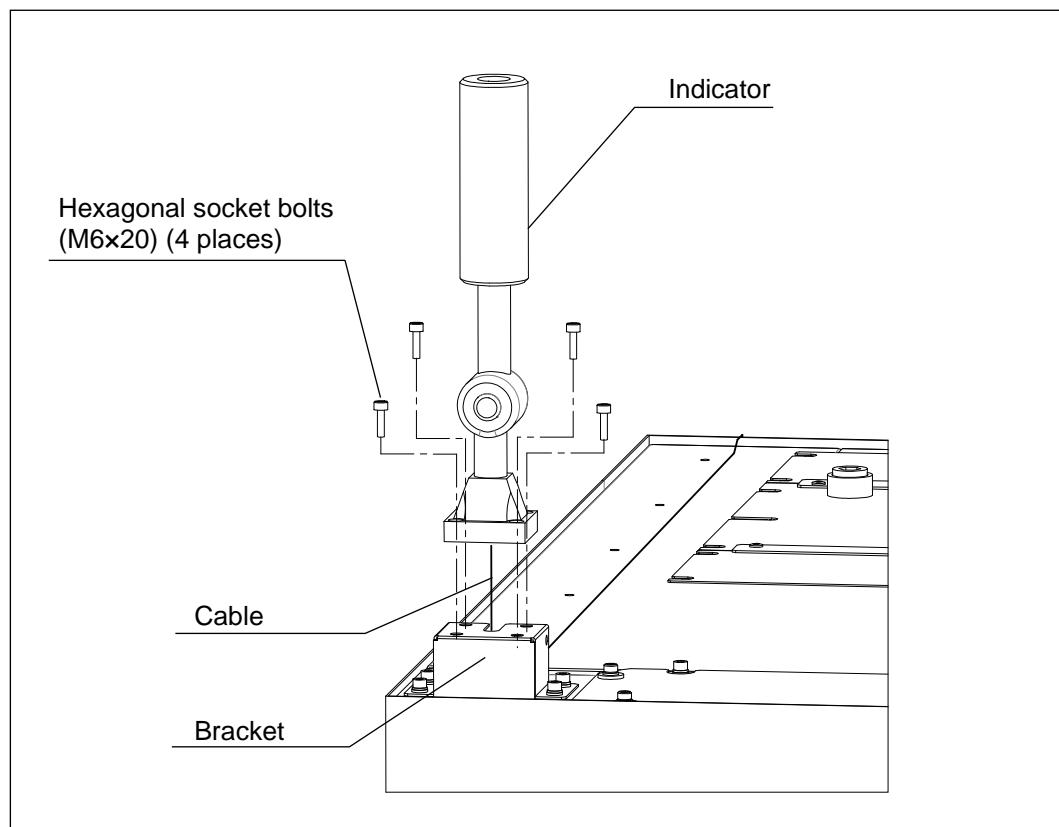
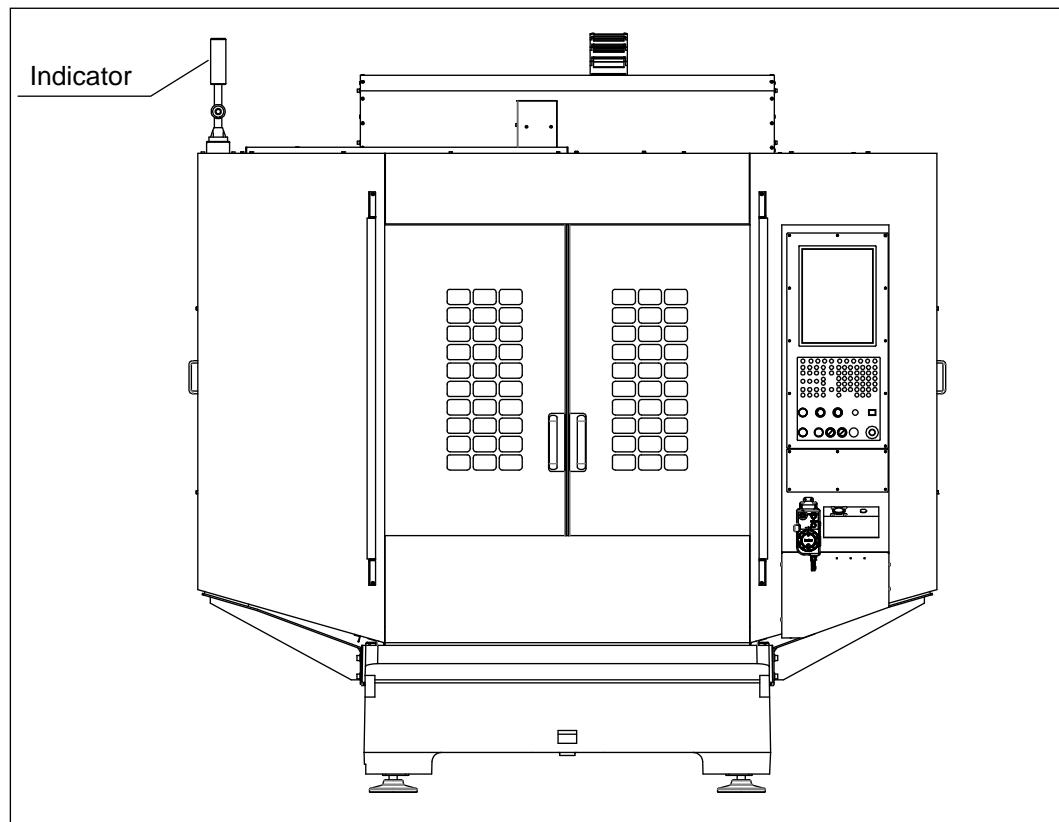
The indicators can be used to inform an operator about the status of the machine (operation in progress, machining complete, error) at a remote location. In addition, the indicators light up in the following situations.

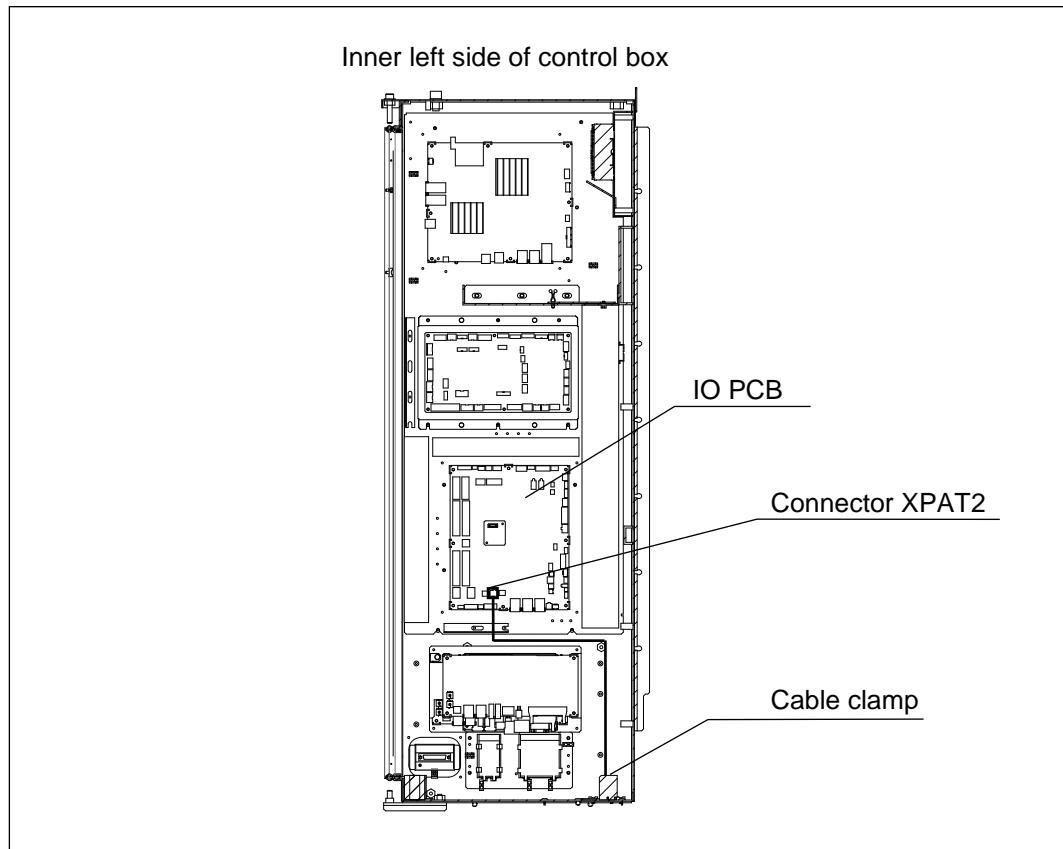
1. Red light (RED)
    - When the emergency stop switch is pressed.
    - When a servo OFF level alarm is triggered.
    - When the workpiece counter is finished (Note when the user parameter <Count end lamp status> is set to <2: Red>).
  2. Yellow light (YEL)
    - When memory operation is finished (M30 output).
    - When the workpiece counter is finished (Note when the user parameter <Count end lamp status> is set to <1: Yellow>).
  3. Green light (GRN)
    - When the memory operation and MDI operation are in progress (External output signal: Output of automatic operation starting up (STL)).
- \* The red, yellow and green lamps light up when configured to the factory default settings. The red, yellow and green indicators are the same as the external I/O output signals RED, YEL and GRN.  
If the ladder is changed, the above does not necessarily apply.

### 3 External View



## 4 Installation Procedure





After setting up the cable clamp, return it to its original position to prevent problems caused by oil. First, turn the main power breaker OFF, and then open the control box door.

1. Use the four hexagonal socket bolts (M6×20) to install the indicator bracket.
2. Run the cable along the top-left of the machine cover and bring it down on the left side of the control box. Insert the cable through the base of the control box.
3. Connect it to the XPAT2 connector on the IO PCB.

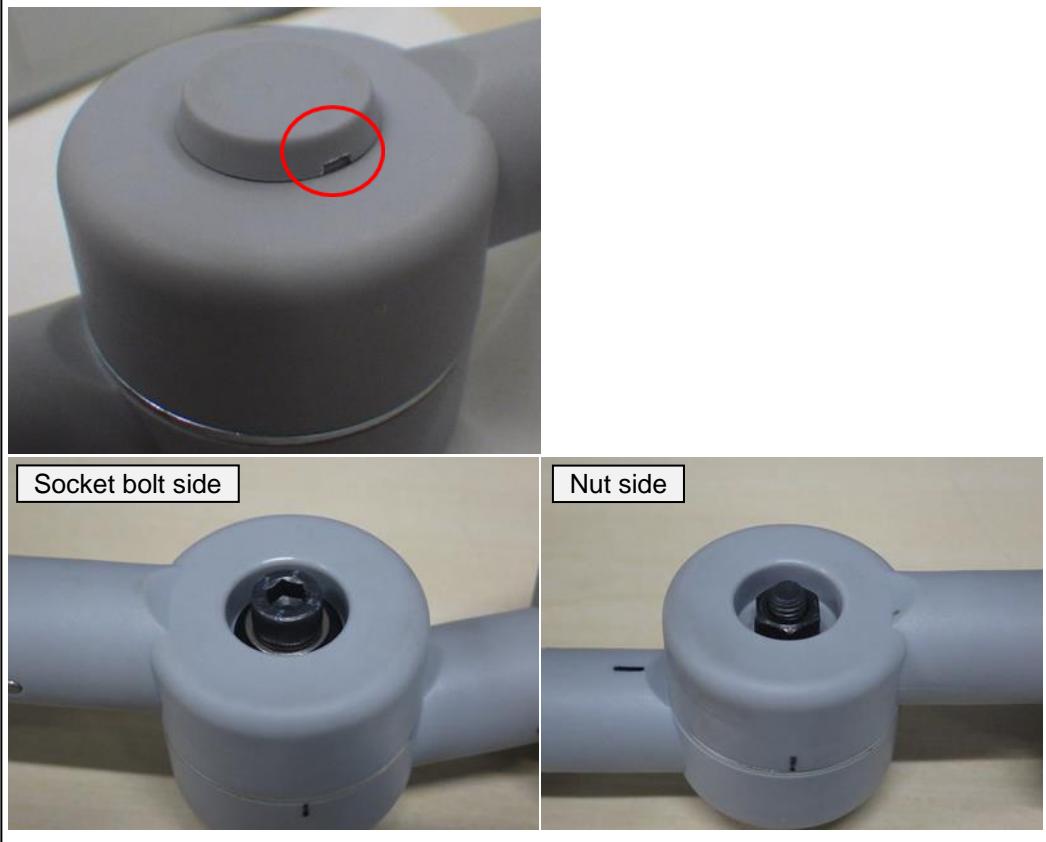
(NOTICE) This function's operation is performed in standard control program 10 for the built-in PLC function. If a ladder program is changed, an unexpected operation or malfunction can occur. Be sure to thoroughly check the ladder specification (setting) before making any changes.

(NOTE 1) The indicator can be tilted and the angle can be adjusted.

(NOTE 2) Due to machine vibration and deterioration over time, the frictional force on the sliding surface of the hinge may deteriorate and make it difficult to fix it at a given angle. If this occurs, use the following procedure to fix it at a given angle.

Adjust hinge bolt (to fix in place)

1. Insert a precision flat-head screwdriver into the groove on the cap, and remove the hinge cap on both sides.



2. Use a socket wrench to hold it so the nut side does not move, and use a hex wrench or Allen key to further tighten the socket bolt side.



3. Re-attach the caps (removed in step 1) to both sides (socket bold and nut sides).

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## CHAPTER 11 (10)

### TOOL BREAKAGE DETECTOR

- 1 Handling Precautions
- 2 Functions
- 3 External View
- 4 Installation Procedure
- 5 Connection Check

# 1 Handling Precautions

## **⚠ WARNING**

If you put any parts of your body inside the machine while the maintenance cover has been removed for setup or maintenance work, you may get caught or drawn into the machine if the machine is operated by mistake.

### [SAFETY INSTRUCTIONS]

Do not put any part of your body inside the machine while it is operating.

Turn OFF the main power breaker before removing the maintenance cover.

Attach a padlock to the main power breaker so that the power cannot be turned ON.

A sign or notice should be placed near the operation panel of the machine to warn others that work is in progress.

## **⚠ WARNING**

High-voltage components are present inside the control box. There is risk of electric shock if you touch these components by mistake.

### [SAFETY INSTRUCTIONS]

Maintenance and inspection of electrical components must only be carried out by a qualified electrician who is trained in electrical safety and who has thorough knowledge of the electronic circuits in this machine.

Turn OFF the main power breaker, and then wait at least 20 minutes before carrying out work.

Attach a padlock to the main power breaker so that the power cannot be turned ON.

A sign or notice should be placed near the operation panel to warn others that work is in progress.

If leaving the machine unattended, close the control box and secure it with screws.

## **⚠ WARNING**

If the control box or operation panel is touched accidentally with wet hands while performing installation or maintenance, an electric shock or short-circuit may cause a fire.

### [SAFETY INSTRUCTIONS]

Do not touch the control box and the operation panel with wet hands.

The cover to the control box must be closed while the machine is operating.

The control box and the operation panel must be kept free of coolant, water, chips and shavings.

**⚠ WARNING**

If terminal connections on the PCBs or terminal block screws become loose, poor contacts may cause overheating or a fire.

[SAFETY INSTRUCTIONS]

There should be no loose screws when connecting the wiring.  
Do not replace fuses and electrical parts that have been soldered to the inside of the unit.

**⚠ WARNING**

If you touch cables which have been crushed or damaged by heavy objects, there is risk of electric shock.

In addition, short-circuits may occur if cables are crushed or damaged by heavy objects.

[SAFETY INSTRUCTIONS]

Cables should be gathered up or arranged to prevent them from being crushed. If a cable has become damaged, it must be replaced with a new one.

**⚠ WARNING**

Do not climb onto the machine or other nearby equipment when performing installation or maintenance, otherwise you may fall down and injure yourself.

[SAFETY INSTRUCTIONS]

Do not climb onto the machine or nearby equipment.

Use a step or step-ladder to provide a secure foot hold when the working position or conditions are awkward or out of reach.

**⚠ WARNING**

If the maintenance cover is removed, coolant coming from inside the machine when it is operating may get into your eyes, or the tools or workpieces may shoot out causing injury.

[SAFETY INSTRUCTIONS]

All operators should check to make sure that the maintenance cover is properly attached before turning ON the power.

Attach the maintenance cover after the installation or maintenance work is complete.

The supervisor must attach the maintenance cover.

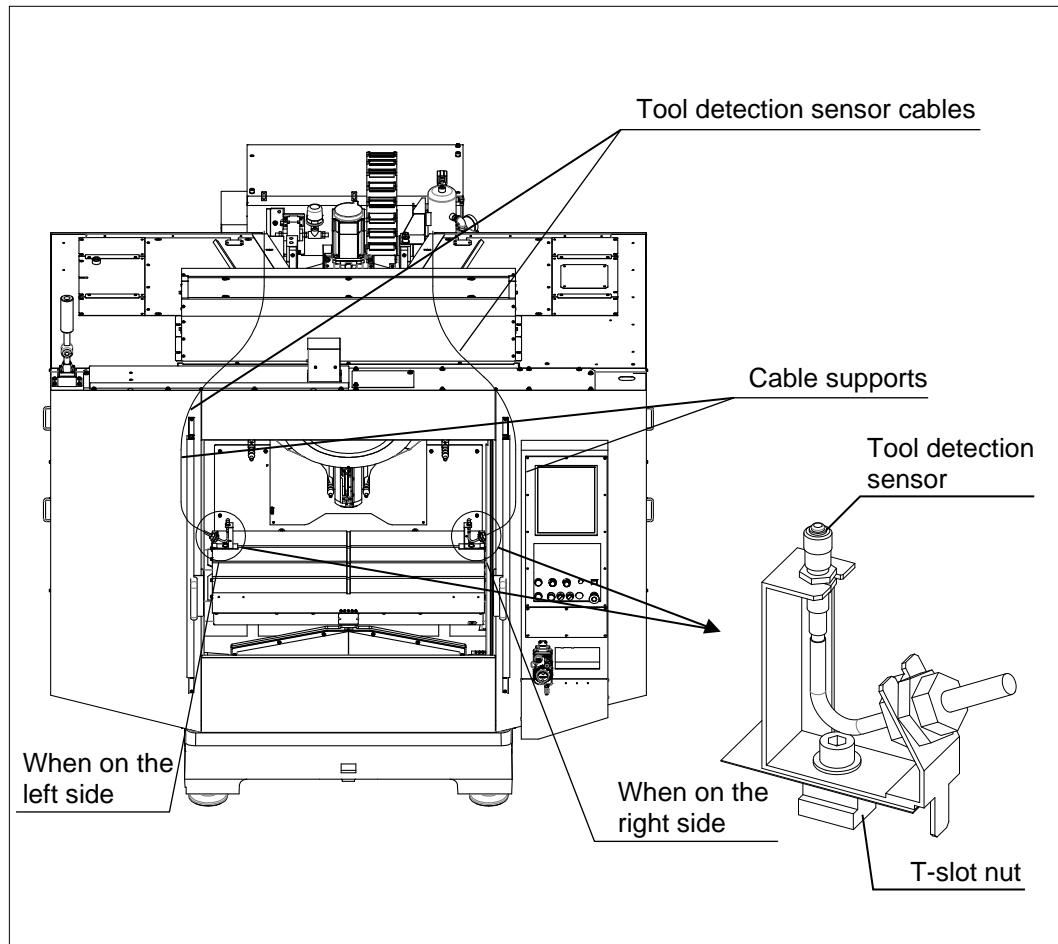
## 2 Function

The tool breakage detector is a device which detects a tool breakage when the tool touches a sensor.

The tool detection sensors are attached to the top of the table within the range of the XY strokes. When a breakage is detected, the device moves the table or the spindle after cutting.

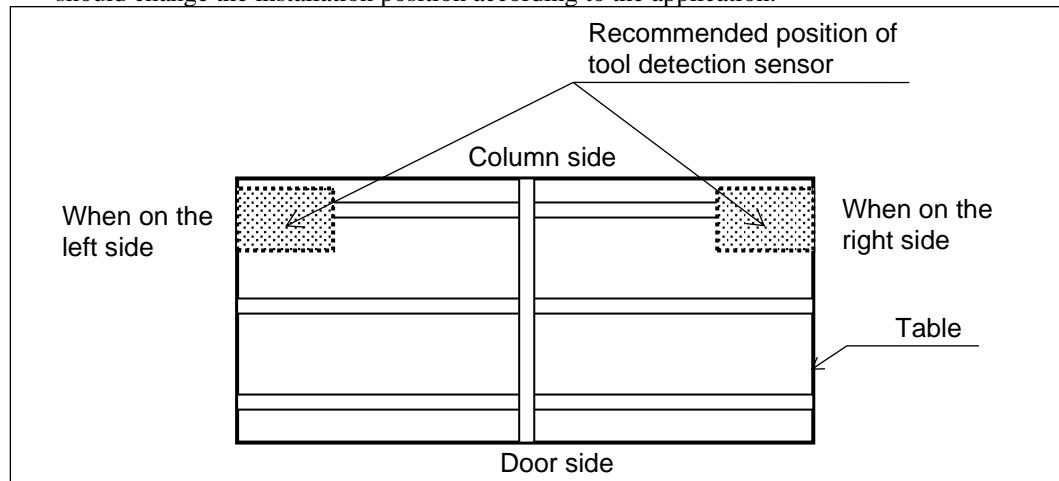
A mounting plate for securing the sensor is provided with this product. However, the customer must supply a mounting plate that complies with the usage conditions if there is interference with the workpiece or jig, or if chips and shavings shoot out, prohibiting machine use.

## 3 External View

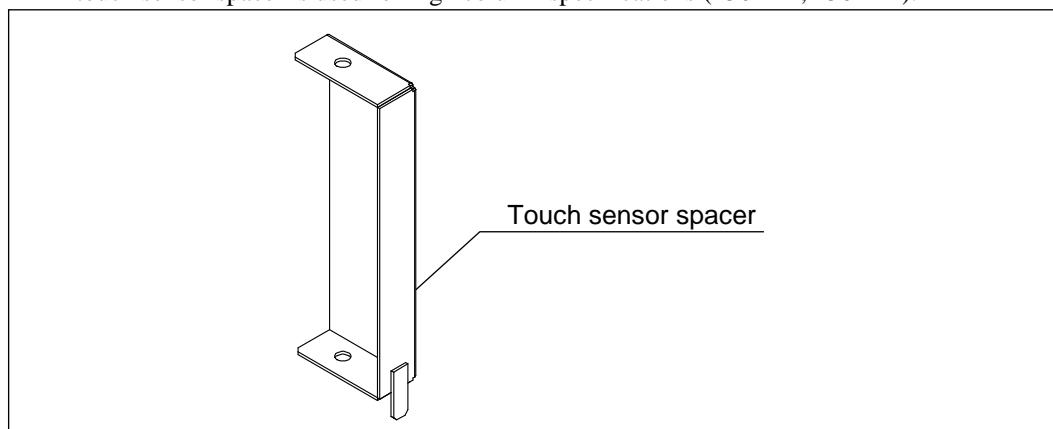


## 4 Installation Procedure

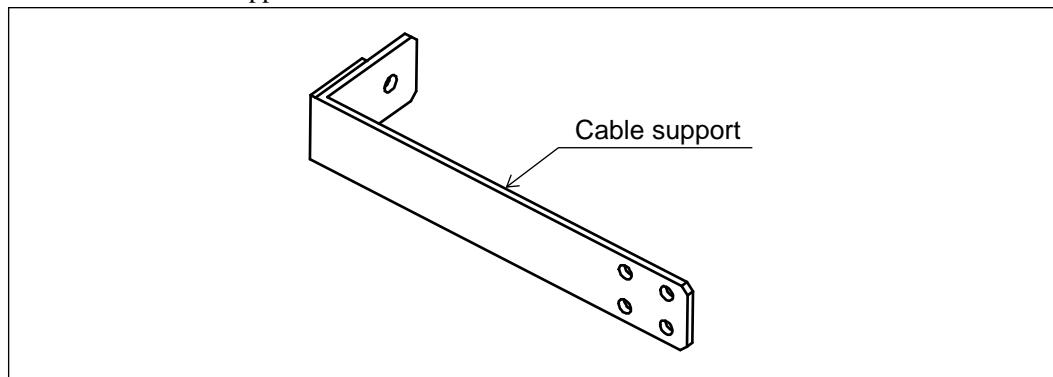
1. Turn OFF the power to the machine.
2. Install the tool detection sensor onto the top of the table within the range of the X and Y strokes. Refer to the recommended position noted below.  
The factory installed position is located near the end of the stroke. However, the customer should change the installation position according to the application.



A touch sensor spacer is used for high column specifications (150 mm, 250 mm).

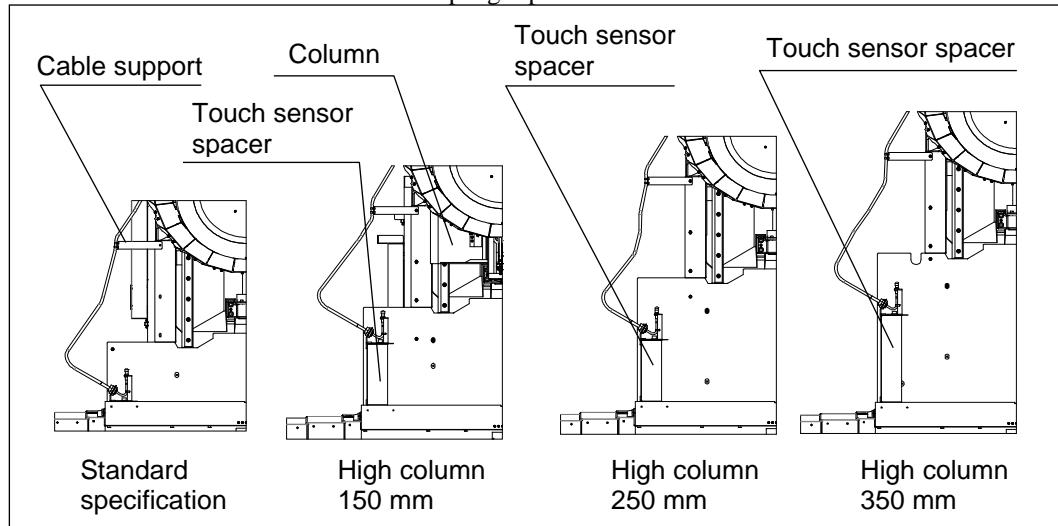


3. Install the cable support.



The installation position is different with the standard and high column specifications (150 mm, 250 mm).

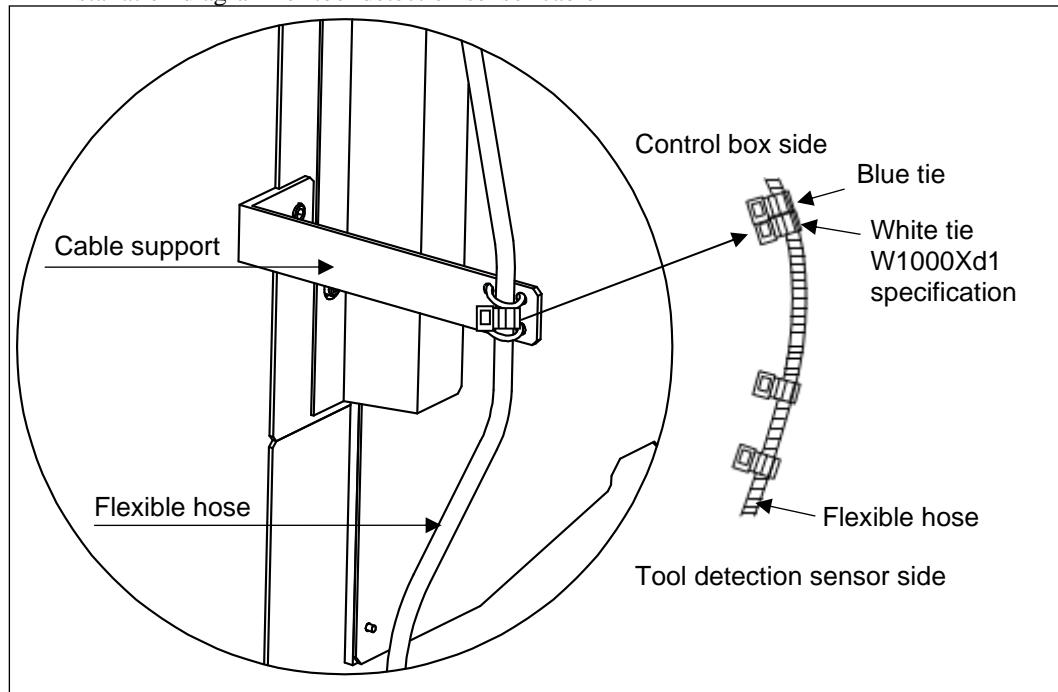
The diagram below is an example of a cable support when the tool detection sensor is installed on the top-left part of the table. Install it onto the right side of the column when the tool detection sensor is installed on the top-right part of the table.



- \* When securing the cable support, first, remove the bolt at the installation position, and then tighten it and the cable support together to the chassis.

4. Secure the tool detection sensor cable (flexible hose) to the cable support.

Installation diagram for tool detection sensor cable

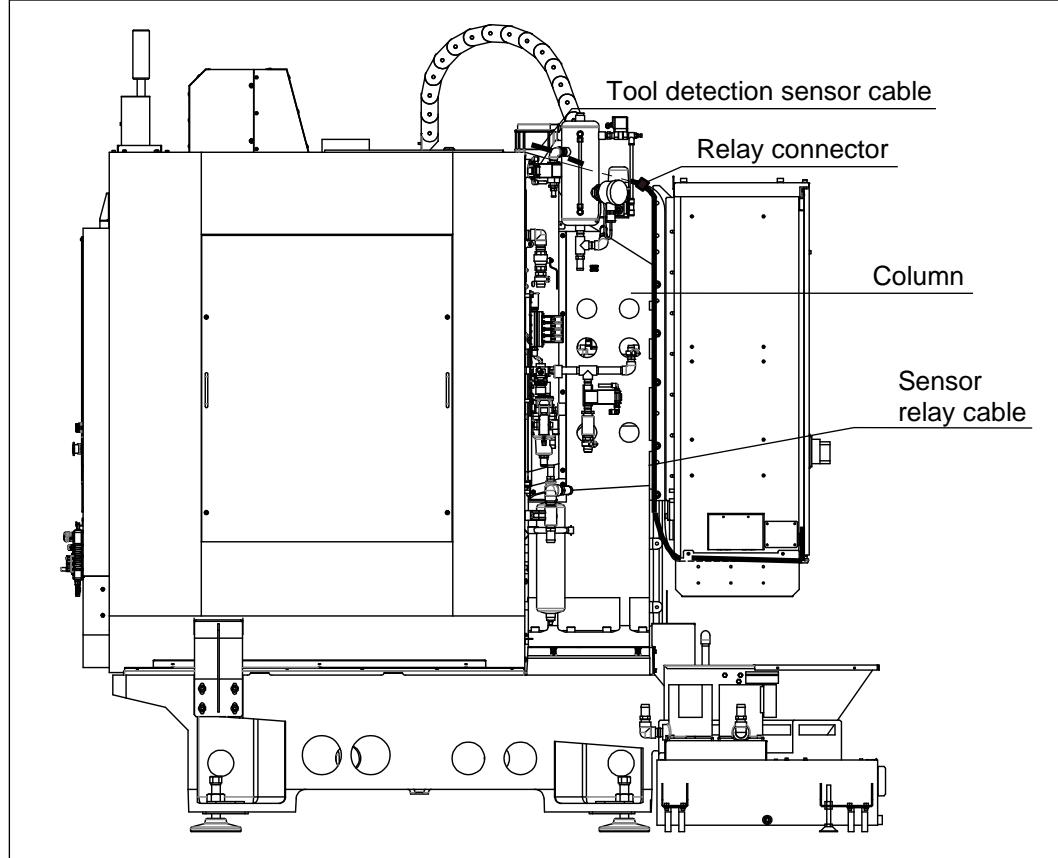


11

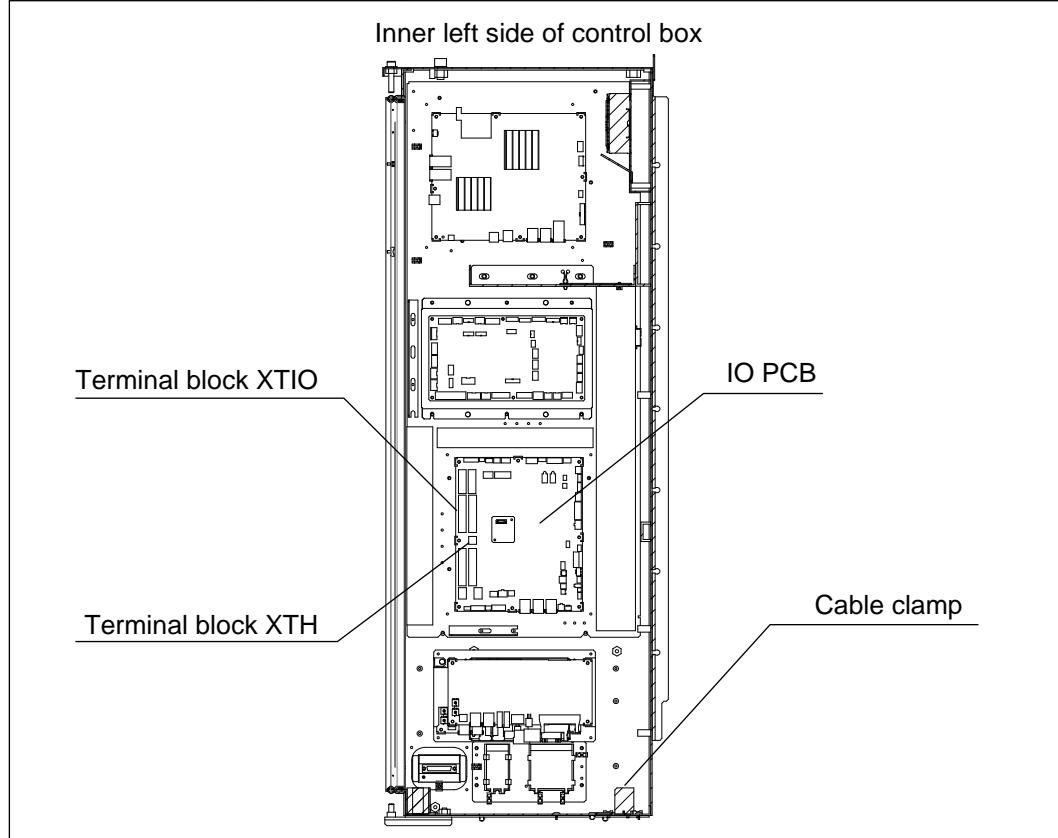
Use the two ties to secure the tool detection sensor cable (flexible hose) to the cable support. However, when using the tool detection sensor at a different position, follow the points below when installing and adjusting the flexible hose.

- (NOTICE 1) Move the X- and Y- axes through their full stroke and make sure that the flexible hose does not pull.
- (NOTICE 2) Make sure that the flexible hose does not interfere with the magazine and spindle tool.

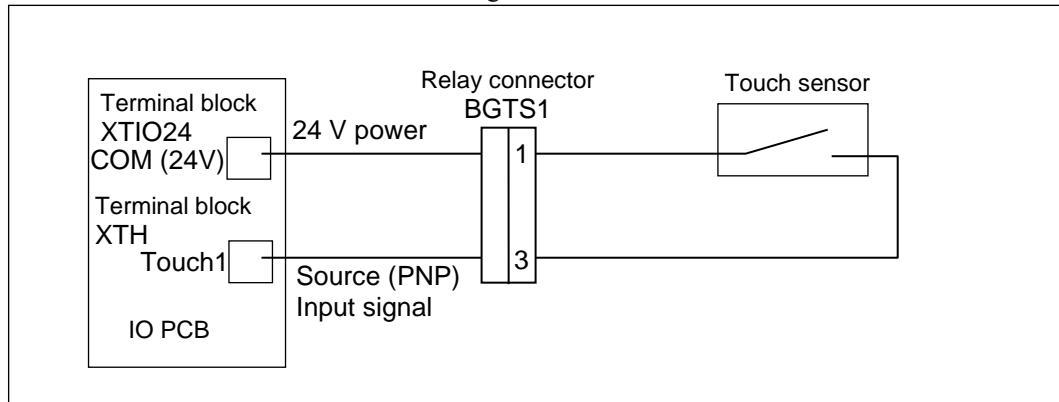
5. Use the relay connector to join the tool detection sensor cable and the sensor relay cable (control box side).



6. Pull the sensor relay cable through the cable inlet on the base of the control box.



7. Connect the sensor relay cable to Touch1 and COM (24) on the terminal blocks XTH and XTIO24 on the IO PCB. Turn ON No. 7 for SW1 on the IO PCB.
  - \* Refer to “5.2.2 General purpose external I/O terminal blocks on IO PCB” and “5.3 Precautions for use of external I/O signals” for further details.



## 5 Connection Check

1. Parameter setting  
Set the <Tool breakage detection OP> user parameter (switch 1) to <3: Type 3> in order to enable the tool breakage detection option.
2. Cable connection check  
Use the [I/O], [1], [ENT] and [PAGE DOWN] keys to display the screen below. Press the top of the tool detection sensor to check if the numbers on the screen change.

Main

Input 56	F E D C   B A 9 8   7 6 5 4   3 2 1 0
	* * * *   * * * *   * * * *   * * * *
	<hr/>
	0: Not pressed
	1: Pressed

## CHAPTER 11 (11)

**CHIP CONVEYOR  
(HINGE + SCRAPER TYPE)**

The description in this chapter is omitted because this product is not equipped with this function.

## CHAPTER 11 (12)

**COOLANT TANK WITH CHUTE**

The description in this chapter is omitted because this product is not equipped with this function.

## CHAPTER 11 (13)

**CHIP AUGER (COIL CONVEYOR)**

The description in this chapter is omitted because this product is not equipped with this function.

## CHAPTER 11 (14)

**A-AXIS CLAMP**

The description in this chapter is omitted because this product is not equipped with this function.

# CHAPTER 11 (15)

## FIELDBUS NETWORK

- 1      Handling Precautions
- 2      FC Unit
- 3      CM Unit
- 4      FE Unit

# 1 Handling Precautions

## **⚠ WARNING**

High-voltage components are present inside the control box. There is risk of electric shock if you touch these components by mistake.

### [SAFETY INSTRUCTIONS]

Maintenance and inspection of electrical components must only be carried out by a qualified electrician who is trained in electrical safety and who has thorough knowledge of the electronic circuits in this machine.

Turn OFF the main power breaker, and then wait at least 20 minutes before carrying out work.

Attach a padlock to the main power breaker so that the power cannot be turned ON.

A sign or notice should be placed near the operation panel to warn others that work is in progress.

If leaving the machine unattended, close the control box and secure it with screws.

## **⚠ WARNING**

If the control box or operation panel is touched accidentally with wet hands while performing installation or maintenance, an electric shock or short-circuit may cause a fire.

### [SAFETY INSTRUCTIONS]

Do not touch the control box and the operation panel with wet hands.

The cover to the control box must be closed while the machine is operating.

The control box and the operation panel must be kept free of coolant, water, chips and shavings.

## **⚠ WARNING**

If terminal connections on the PCBs or terminal block screws become loose, poor contacts may cause overheating or a fire.

### [SAFETY INSTRUCTIONS]

There should be no loose screws when connecting the wiring.

Do not replace fuses and electrical parts that have been soldered to the inside of the unit.

## **⚠ WARNING**

If you touch cables which have been crushed or damaged by heavy objects, there is risk of electric shock.

In addition, short-circuits may occur if cables are crushed or damaged by heavy objects.

### [SAFETY INSTRUCTIONS]

Cables should be gathered up or arranged to prevent them from being crushed. If a cable has become damaged, it must be replaced with a new one.

## 2 FC Unit

### 2.1 Functions

The following field buses can be used with the FC PCB.

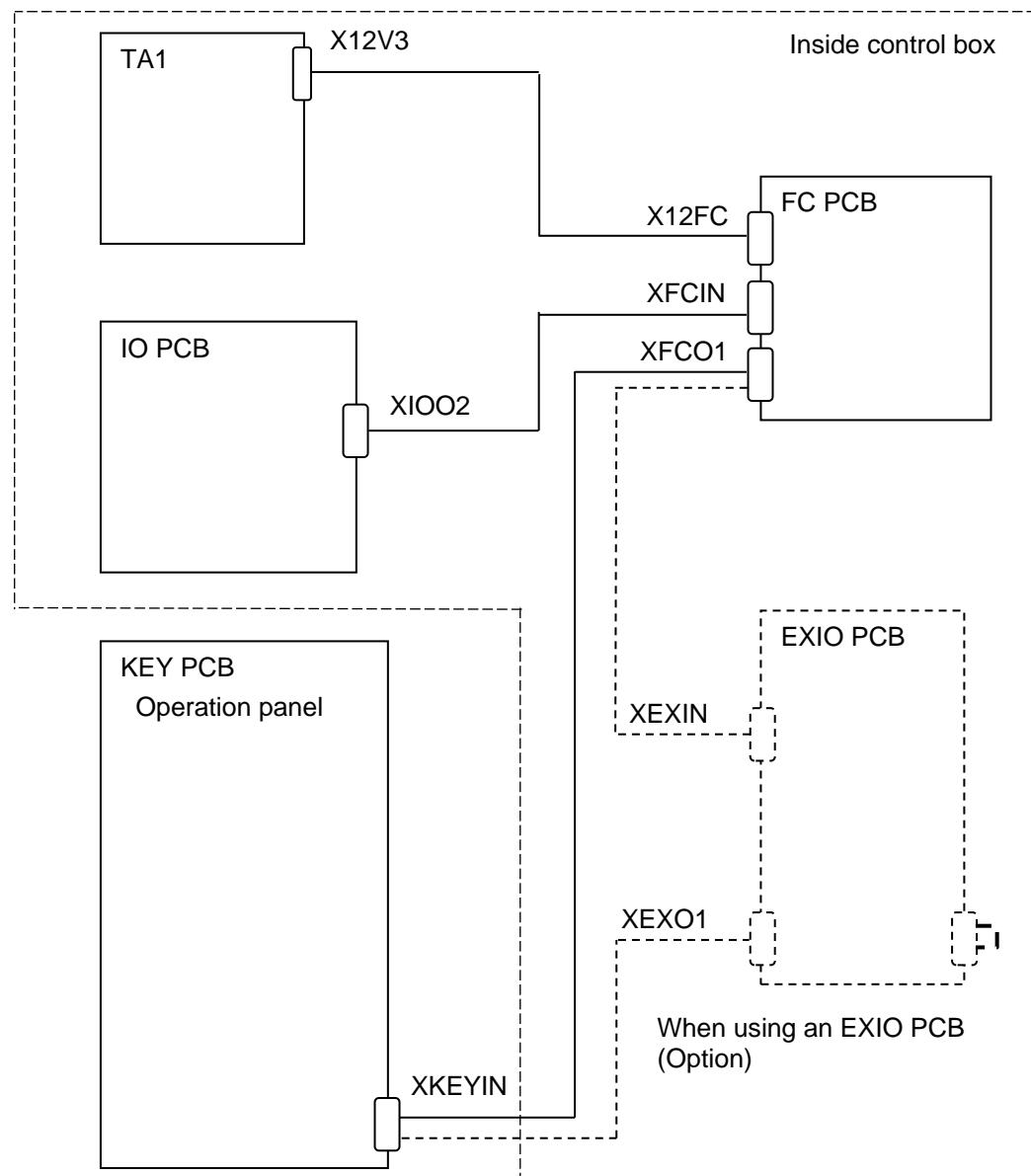
- FC-P PCB: For PROFIBUS DP
- FC-D PCB: For DeviceNet
- FC-C PCB: For CC-Link

(NOTE 1) The FC unit, CM unit and FE unit are exclusive units and only one type of unit can be installed.

(NOTE 2) An FC PCB that supports each field bus is required.

This manual only describes the wiring procedure. For further details on other information, refer to “Chapter 9 (15) Fieldbus network”, “1. PROFIBUS DP (Slave)”, “2. DeviceNet (Slave)”, “3. CC-Link (Remote device station)” in Operation Manual I.

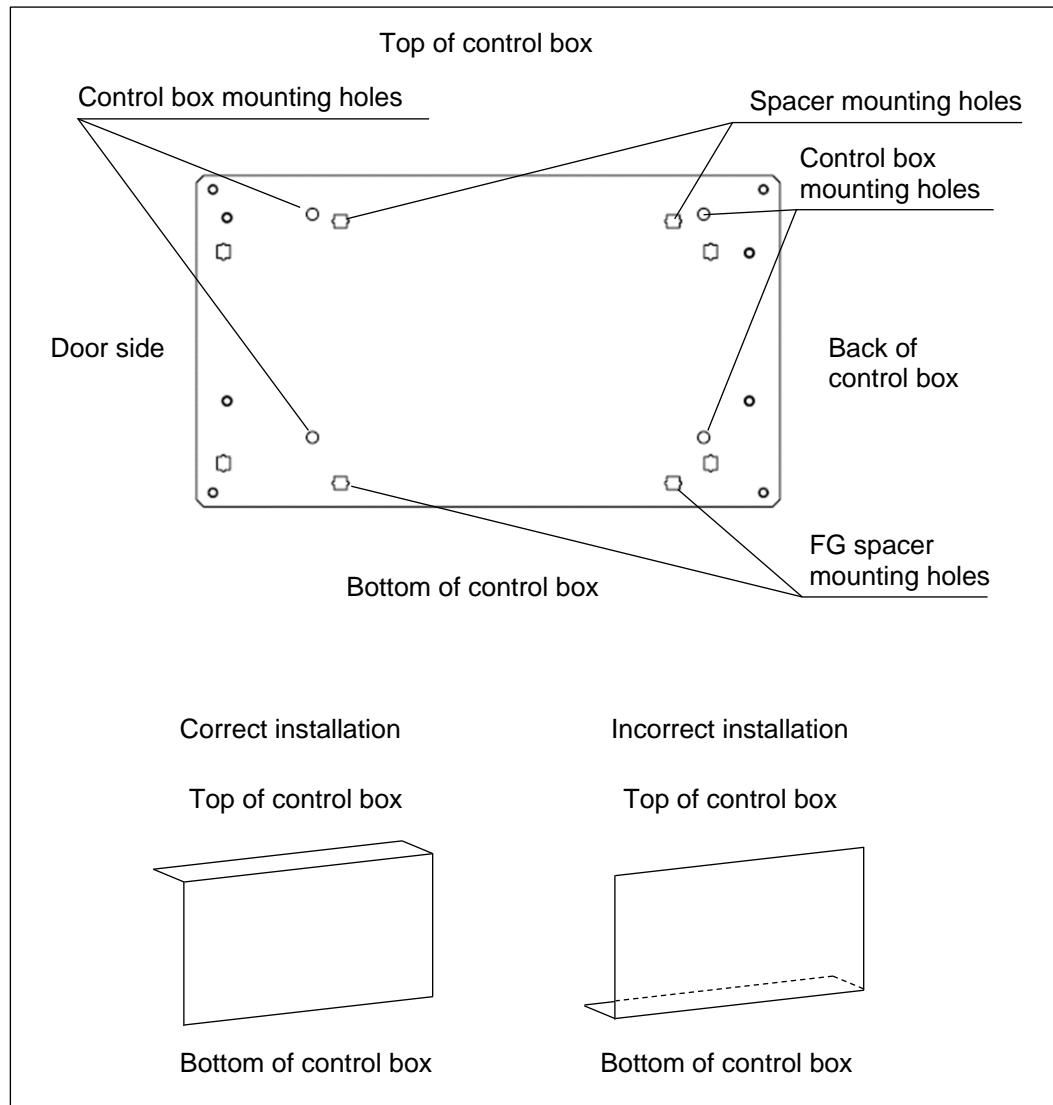
### 2.2 Block Diagram



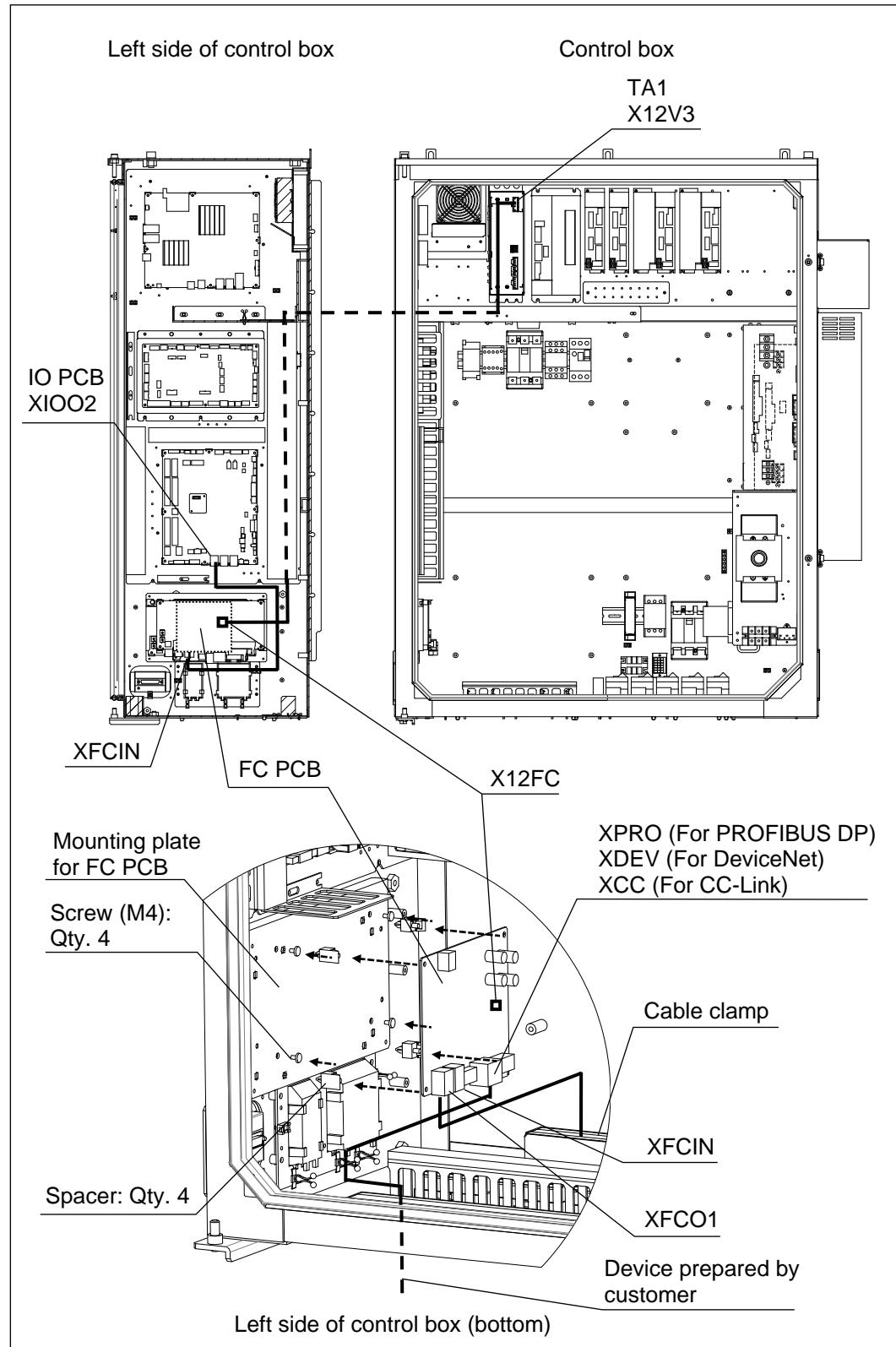
## 2.3 Installation & Wiring

Install the FC PCB to the control box following the orientation noted below.

(NOTE) Install the L-shaped piece so the bottom of the L is on top.

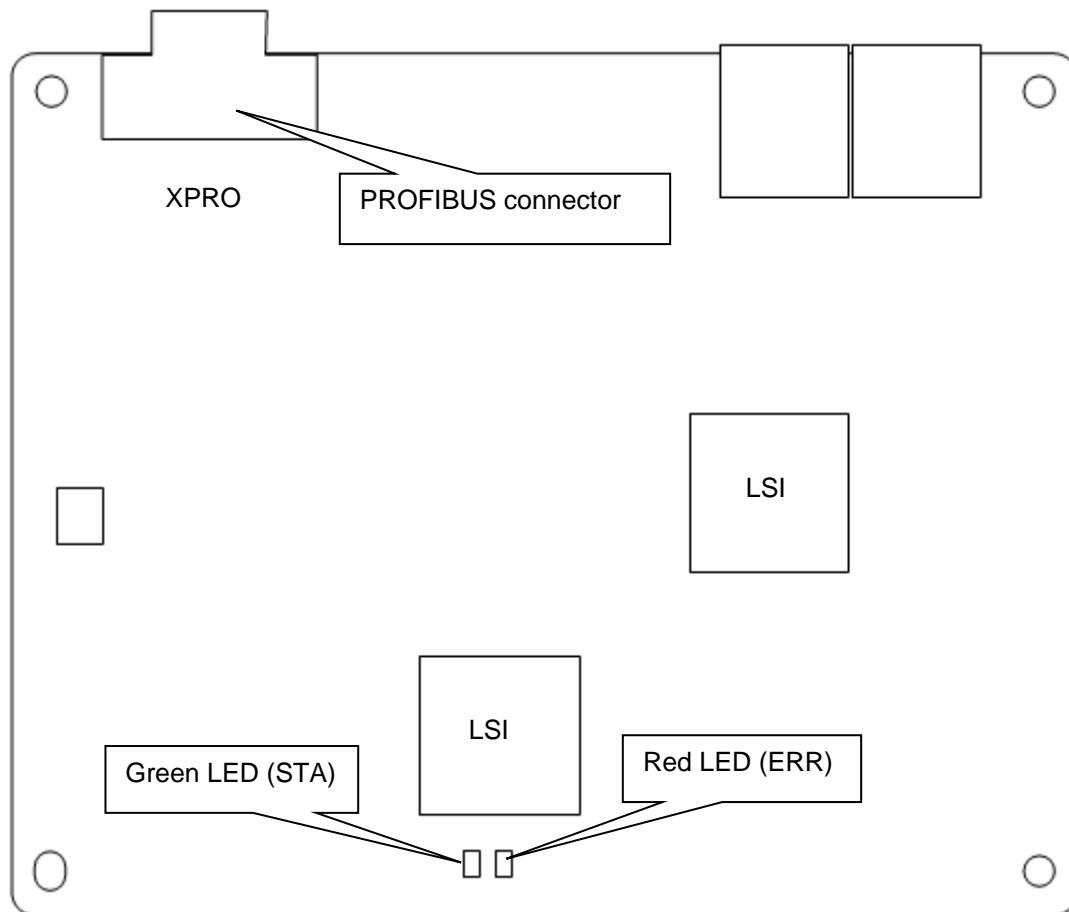


1. Use the four M4 screws (that were removed) to install the FC PCB onto the left side (bottom) of the control box.
2. Attach the two FG spacers (black) to the mounting plate as indicated in the figure.
3. Attach the two spacers (white) to the mounting plate as indicated in the figure, and install the FC PCB.
4. Connect the X12V3 connector for TA1 and the X12FC connector on FC PCB.
5. Connect the wiring for the XIOO2 connector on the IO PCB to the XFCO1 connector on FC PCB.
6. Connect the XIOO2 connector on the IO PCB and the XFCIN connector on FC PCB.



## 2.4 FC-P PCB (For PROFIBUS DP)

### 1. Layout of parts



### 2. LED display and description

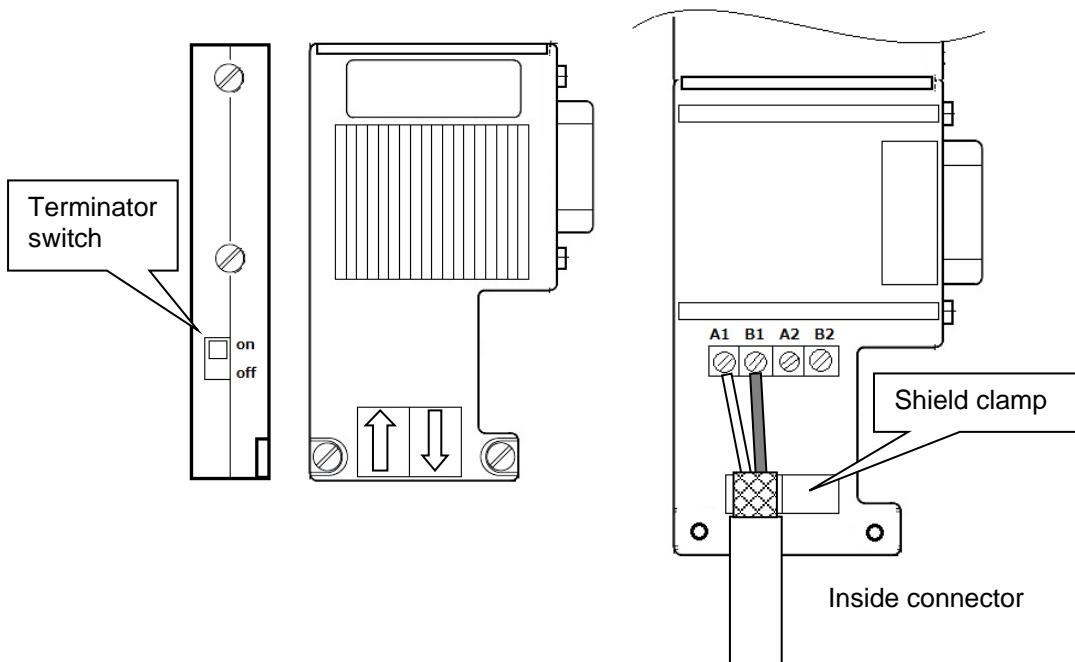
STA LED

LED display	Description
Green light	Operating and communicating regularly

ERR LED

LED display	Description
Red flash (1:3)	Stopped, communication stop and connection error
Red flash (1:1)	Not configured

3. Connector  
PROFIBUS interface connector



Terminal No.	Cable color	Signal type
A1	Green	RxD/TxD-N
B1	Red	RxD/TxD-P
A2	Green	RxD/TxD-N
B2	Red	RxD/TxD-P

Cable side connector: 6ES7972-OBA12-0XA0 (Manufactured by Siemens AG)  
(This item is a standard accessory.)

4. Communications cable connection

Follow the procedure below to connect the communications cable to the PROFIBUS interface connector.

- (1) Loosen the screws that secure the connector's cover, and open the cover.
- (2) Strip off the sheath on the PROFIBUS compliant cable. (See diagram below)



11

- (3) Connect the cables to the green and red terminals.

Make sure that the green cable is connected to terminal A and the red cable is connected to terminal B.

Use the printed labels to check the input wire cable (A1 and B1) and output wire cable (A2 and B2).

If there are nodes at both ends of the bus, connect to the input wire cable (A1 and B1) side, and turn ON the terminator switch.

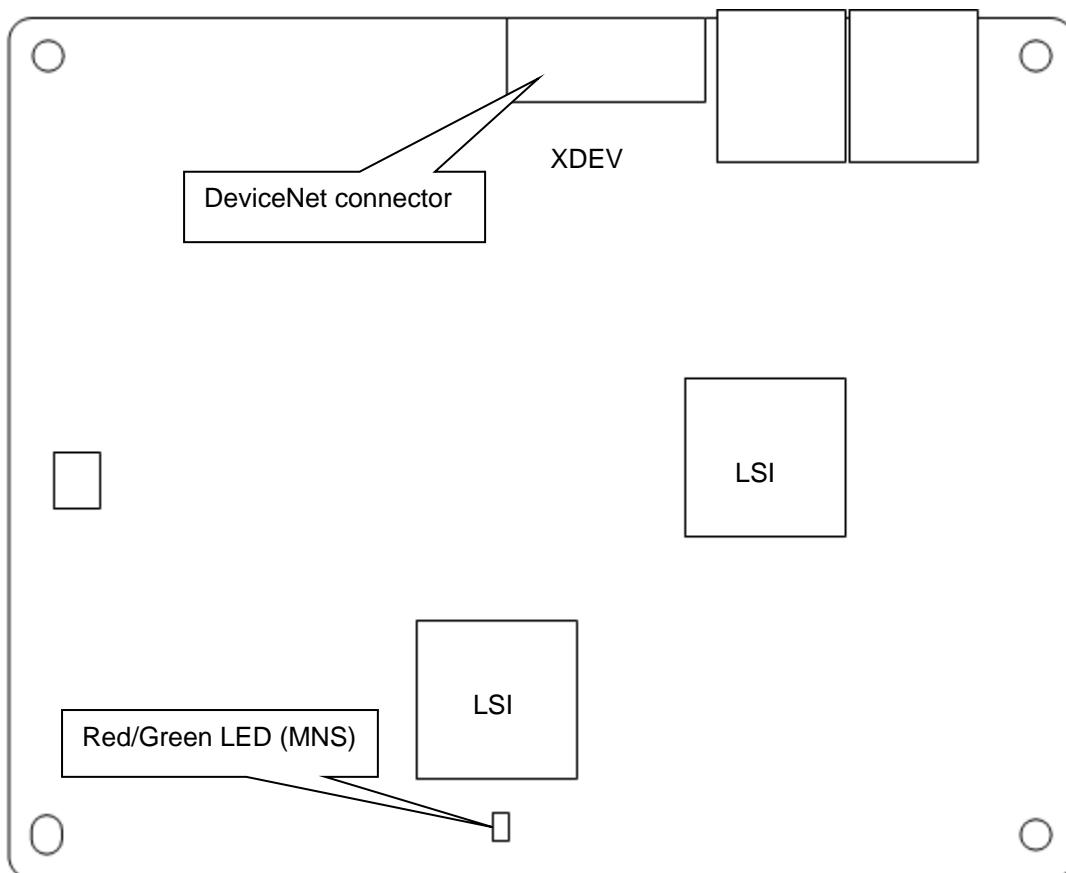
- (4) Insert the cable sheath into the sheath bracket in order to fix the position of the cable.
- (5) Tighten the terminal screw so that the terminal is securely connected.

- (6) Close the cover and tighten the screws.

Make sure that the shield for the cable that was exposed is securely connected to the shield clamp.

## 2.5 FC-D PCB (For DeviceNet)

### 1. Layout of parts

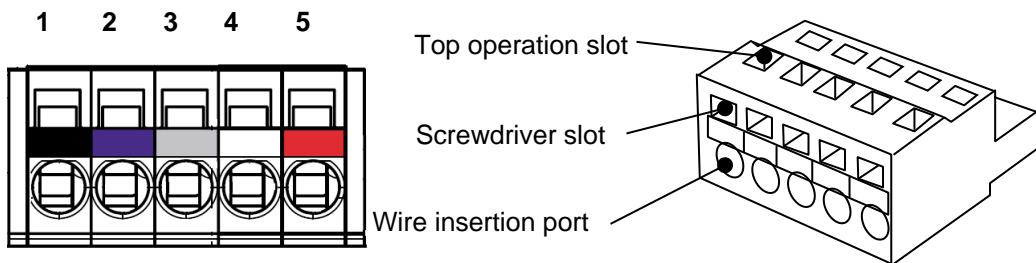


### 2. LED display and description

MNS LED: Module/Network station LED

LED display	Description
Light is off	Checking for duplicate MAC ID after device startup.
Green light	The device is online and has established more than one connection.
Green flash	The device is online but no connection is established.
Red flash	Connection timeout
Red light	Recovery not possible, error. A network error was detected by the device (duplicate MAC ID or Bus-off).
Red/Green flash	Connection fault (failure)

3. Connector  
DeviceNet interface connectors



Terminal No.	Cable color	Signal type		
1	Black	V-	Power cable	- side
2	Blue	CANL	Transmission data	Low side
3	Drain wire	DRAIN	Shield	
4	White	CANH	Transmission data	High side
5	Red	V+	Power cable	+ side

Cable side connector: 231-DN305 (Manufactured by WAGO) (product accessory)  
Compliant electrical wire: 0.08 to 2.5 mm<sup>2</sup>

4. Communications cable connection

Follow the procedure below to connect the communications cable to the DeviceNet interface connector.

- (1) Be careful not to damage the shield mesh on thick and thin cables when stripping off the sheath (30 to 80 mm).
- (2) Carefully unravel the shield mesh. There is one exposed drain wire bundled with the signal lines and power lines. (You will know which one because it is harder than the other mesh parts).
- (3) Cut off the extra shield mesh, and peel off the aluminum tape that binds the signal and power wires. Then, strip off the sheath on the signal and power wires (8 to 9 mm). Securely bundle the exposed signal and power wires respectively.
- (4) Insert each electrical wire all the way into the connector's wire port (circular hole), so that sheath colors of the shield wire, signal wire and power wire match the colors shown on the connectors.

The connector is a cage clamp type (spring connection) open connector.

We recommend using the following tools when inserting. (Manufactured by WAGO)  
Special screwdriver: 210-620 (Standard type), 210-350/01 (Short type), or  
Operation lever: 231-131 (for finger operation)

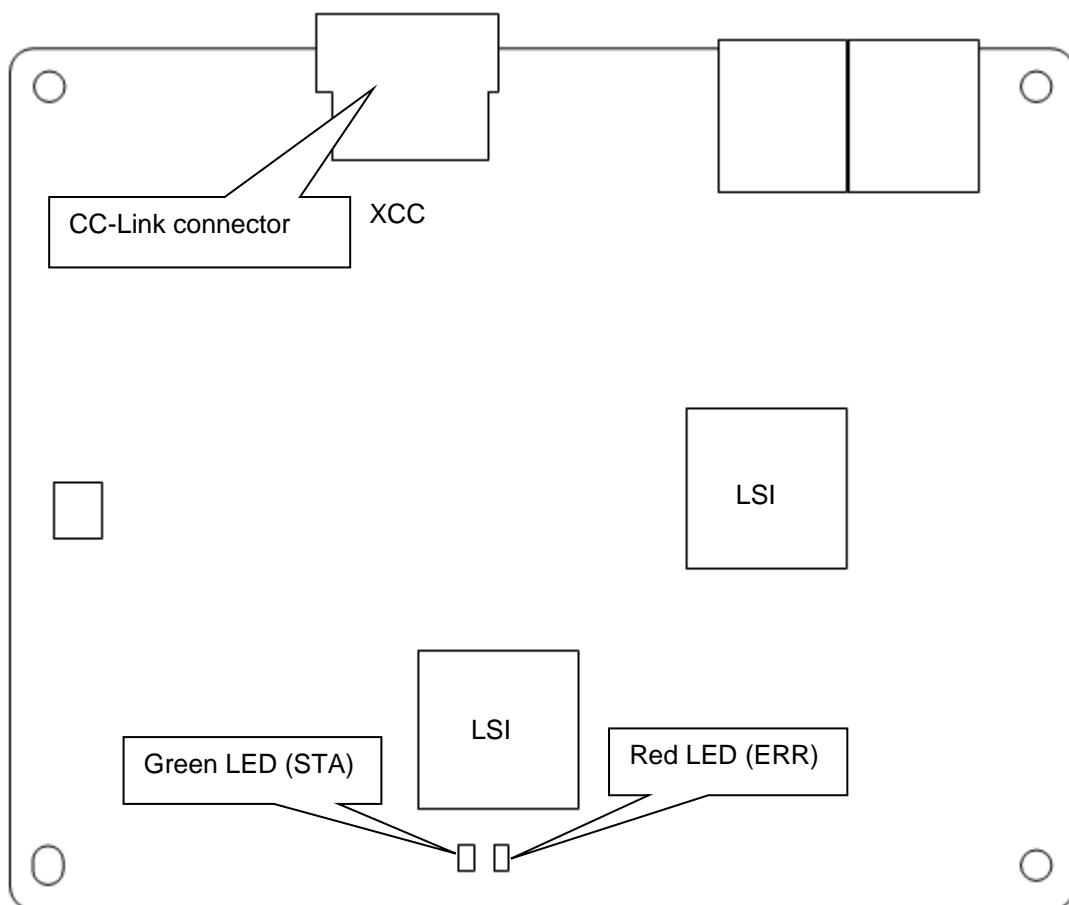
Use a rod terminal for a 2 wire connection when connecting a thin cable to one connection terminal in a multidrop system.

Use a T-junction type spring connector when not using a rod terminal for a 2 wire connection.

Always use a T-junction open connector when connecting a thick cable in a multidrop system.

## 2.6 FC-C PCB (For CC-Link)

### 1. Layout of parts



### 2. LED display and description

L RUN LED (STA)

LED display	Description
Light is off	1. Before entering a network 2. Carrier cannot be detected 3. Timeout 4. Hardware reset
Green light	Receiving both refresh and polling signals or just refresh signals after entering a network.
Green flash	-

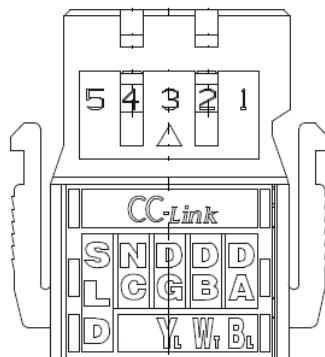
11

L ERR LED (ERR)

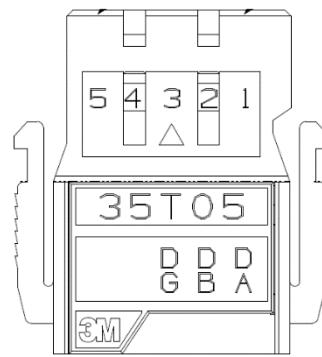
LED display	Description
Light is off	1. Normal connection 2. Hardware reset
Red light	1. CRC error 2. Address parameter error (0, 65 or higher is reset including the occupied number of stations) 3. Baud rate switch setting error during reset cancel (5 or more)
Red flash	The switch setting is changed from resetting with reset or cancel. (0.4 sec. blink)

### 3. Connector

CC-Link interface connector



CC-Link terminator connector



Terminal No.	Cable color	Signal type
1	Blue	DA BL
2	White	DB WT
3	Yellow	DG YL
4	-	Not connected
5	Drain wire	SLD (Shield)

Cable side connector: 35505-6000-BOM GF (Manufactured by 3M) (product accessory)

Compliant electrical wire: Conductor size 0.5 mm<sup>2</sup> and insulating sheath external dimension - φ2.2 mm to φ3.0 mm

Terminator connector: 35T05-6M00-BOM GF (Manufactured by 3M) (product accessory)

### 4. Communications cable connection

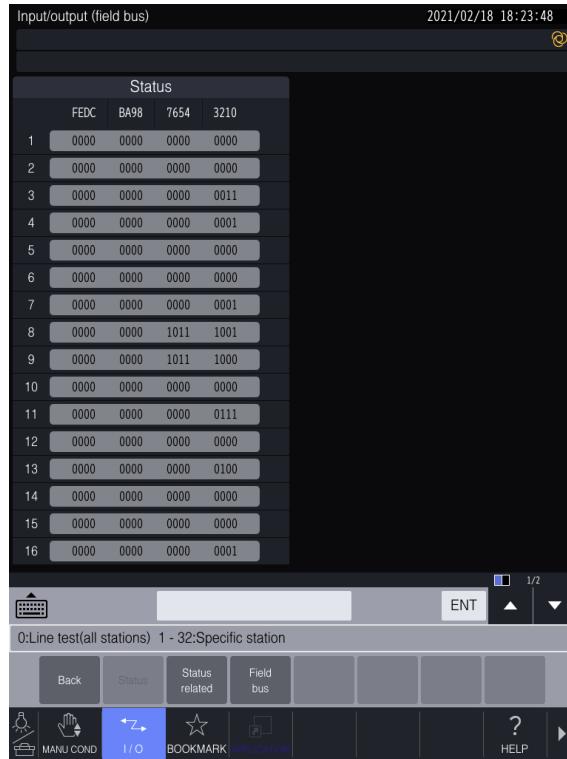
Follow the procedure below to connect the communications cable to the CC-Link interface connector.

- (1) Cut off 40 mm of the insulating sheath on the CC-Link compliant cable.
- (2) Separate the braided shield and drain wires, and then twist the drain wire with your fingers more than 10 times. (Be careful not to cut the drain wire)
- (3) Remove the braided shield, aluminum foil shield and filler.
- (4) Unravel the electrical wire so that the blue, white, yellow and drain wires are in order relative to the connector.
 

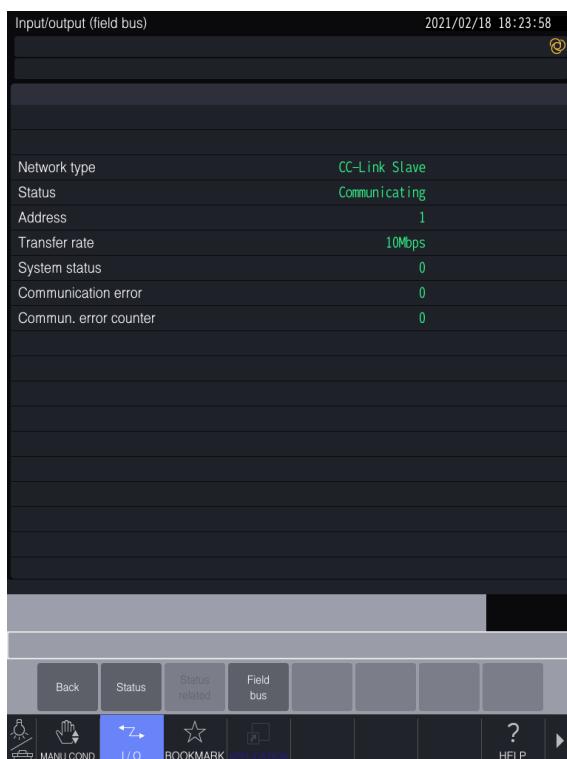
Blue sheath wire	No.1 Pin (Cover label: DA B)
White sheath wire	No.2 Pin (Cover label: DB W)
Yellow sheath wire	No.3 Pin (Cover label: DG Y)
Drain wire	No.5 Pin (Cover label: SLD)
- (5) Insert the cable all the way into the connector. Make sure that the electrical wire is inserted all the way looking from the top side of the top cover.
- (6) Press the cover into the body using pliers and crimp the cable.
- (7) Make sure that the cover is level relative to the body and that there is no space between the body and the cover.
- (8) Insert the terminator connector to the CC-Link connector (XCC) when using a node on both ends of the bus.

## 2.7 Operation Check

1. Use the [I/O], [1], [ENT] and [Fieldbus network] keys to display the <Input/output (fieldbus network) status> screen.



2. Use the [Status related] key to display the communication information. The fieldbus network type that is connected is displayed in the <Network type> field.



3. Use the [Fieldbus network] key to display the input/output status.

Input					Output				
FEDC	BA98	7654	3210		FEDC	BA98	7654	3210	
1	0000	0000	0000	0000	1	0000	0000	0000	0000
2	0000	0000	0000	0000	2	0000	0000	0000	0000
3	0000	0000	0000	0000	3	0000	0000	0000	0000
4	0000	0000	0000	0000	4	0000	0000	0000	0000
5	0000	0000	0000	0000	5	0000	0000	0000	0000
6	0000	0000	0000	0000	6	0000	0000	0000	0000
7	0000	0000	0000	0000	7	0000	0000	0000	0000
8	0000	0000	0000	0000	8	0000	0000	0000	0000
9	0000	0000	0000	0000	9	0000	0000	0000	0000
10	0000	0000	0000	0000	10	0000	0000	0000	0000
11	0000	0000	0000	0000	11	0000	0000	0000	0000
12	0000	0000	0000	0000	12	0000	0000	0000	0000
13	0000	0000	0000	0000	13	0000	0000	0000	0000
14	0000	0000	0000	0000	14	0000	0000	0000	0000
15	0000	0000	0000	0000	15	0000	0000	0000	0000
16	0000	0000	0000	0000	16	0000	0000	0000	0000

## 2.8 Usage

Refer to “Chapter 9 (15) Fieldbus network” in Operation Manual I.

# 3 CM Unit

## 3.1 Function

The CC-Link can be used with the CM PCB.

- CM PCB: CC-Link

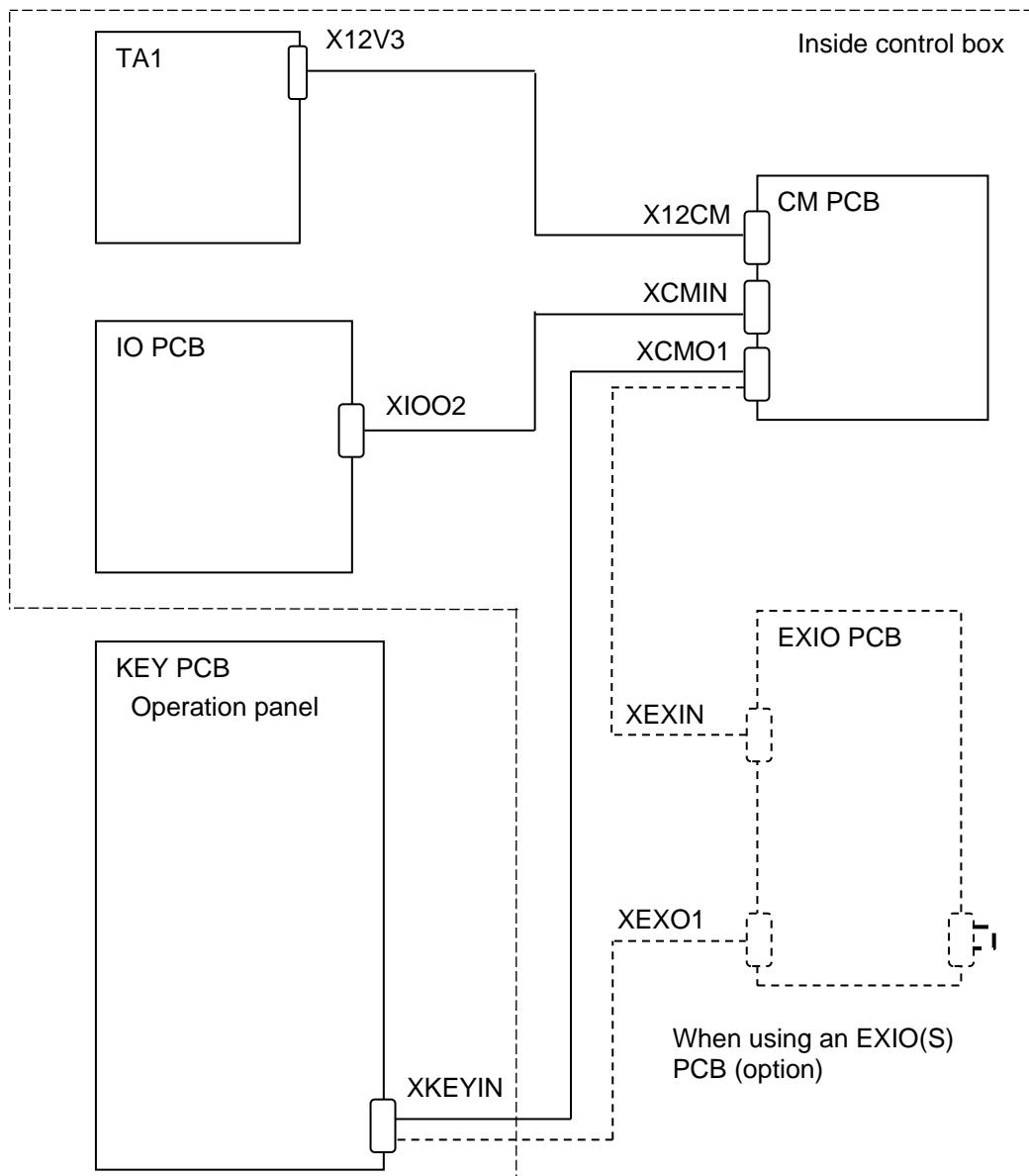
This manual only describes the wiring procedure. For further details on other information, refer to “Chapter 9 (15) Fieldbus network” and “4. CC-Link (Master station)” in Operation Manual I.

(NOTE 1) The CM unit, CM unit and FE unit are exclusive units and only one type of unit can be installed.

(NOTE 2) The terminator ( $110\Omega$ ,  $1/2W$ ) for the main line terminal on the CC-Link network must be connected between DA and DB.

In terms of terminators used for this product, one “Terminator: 35T05-6M00-B0M GF (made by 3M)” is provided, but the customer must make arrangements for terminators used on other products.

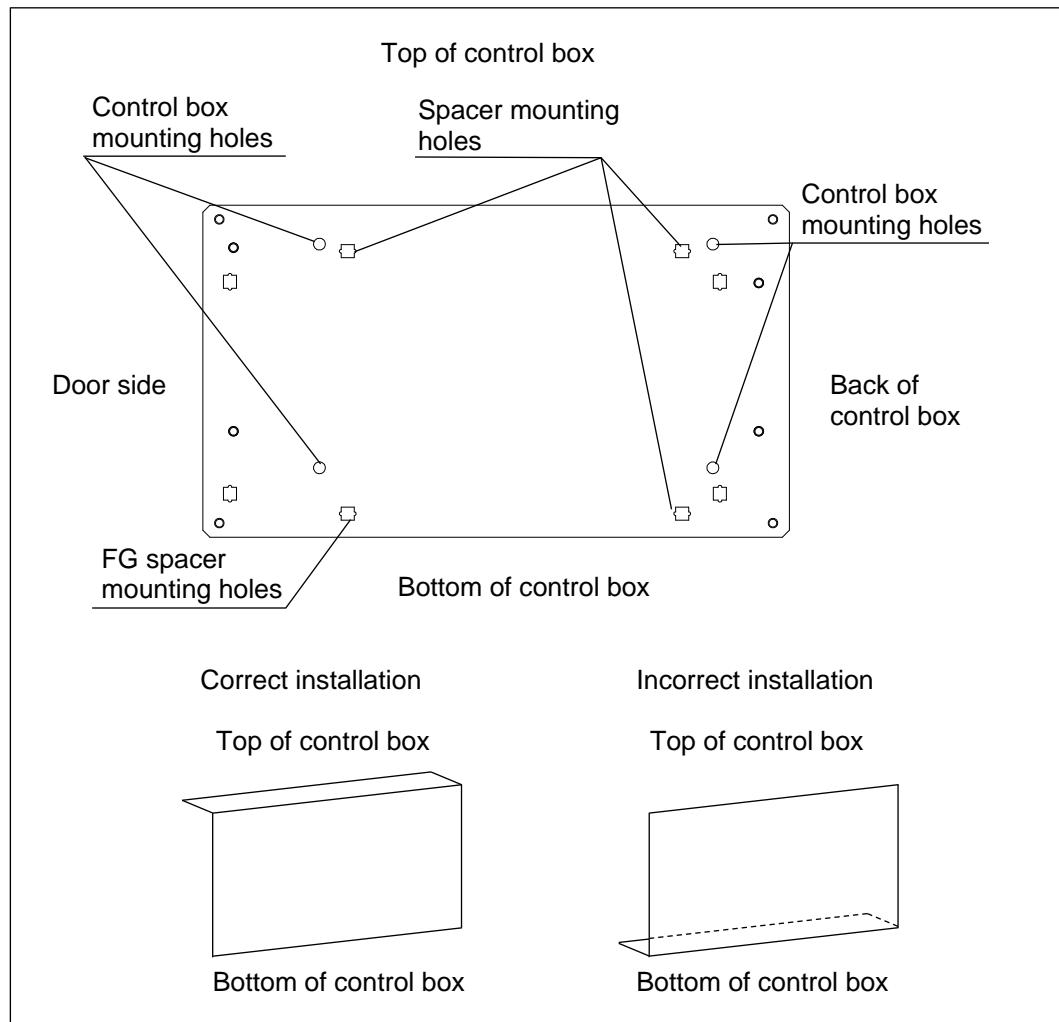
## 3.2 Block Diagram



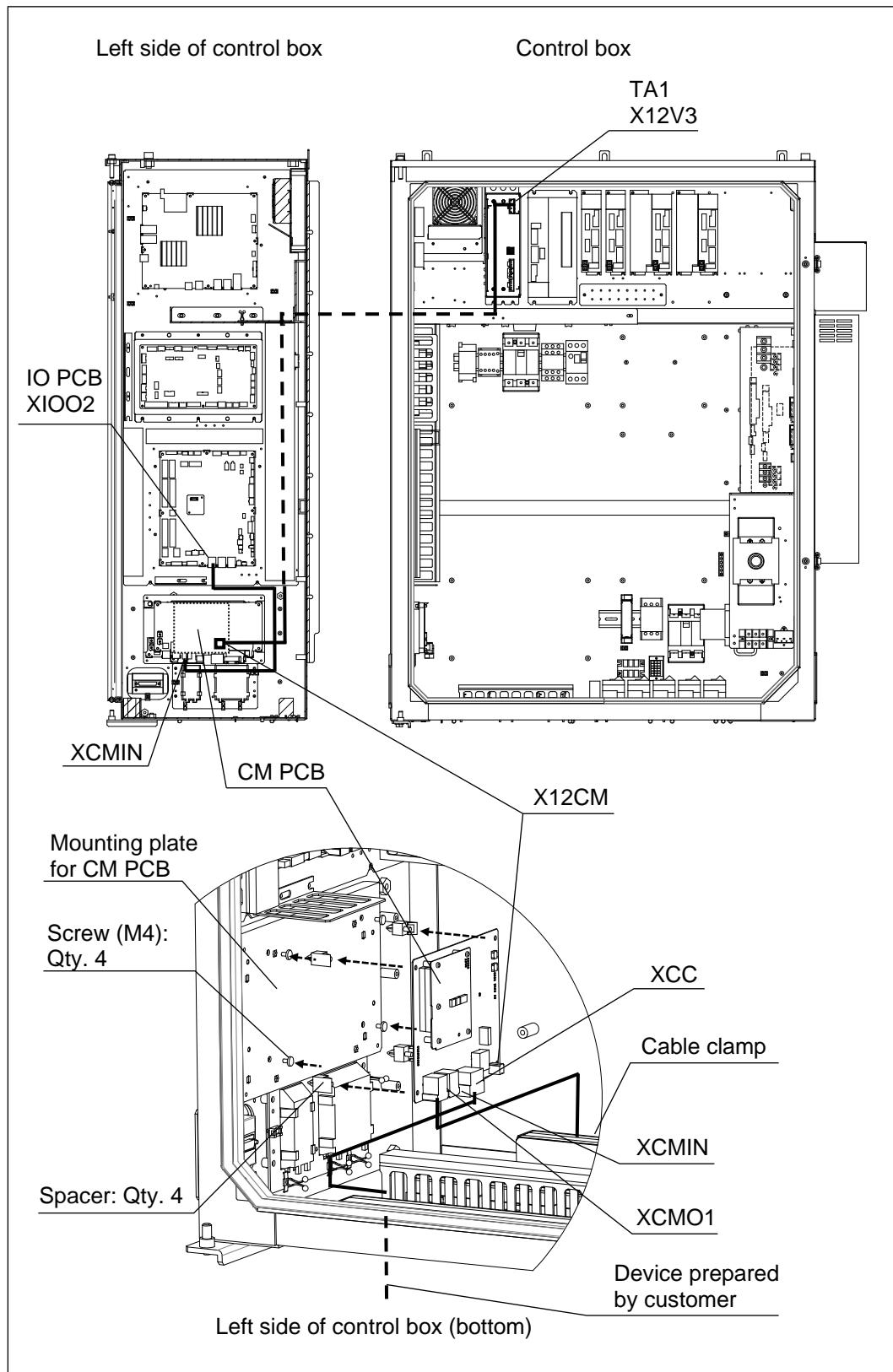
### 3.3 Installation & Wiring

Install the CM PCB to the control box following the orientation noted below.

(NOTE) Install the L-shaped piece so the bottom of the L is on top.

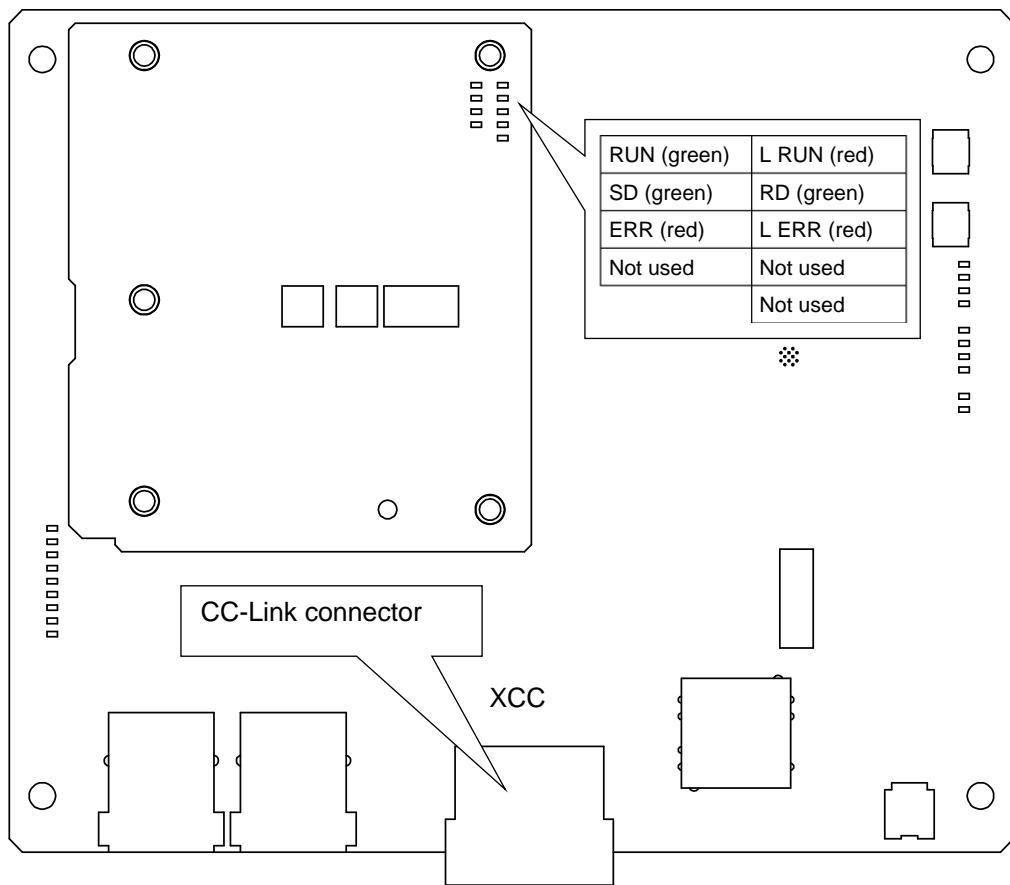


1. Use the four M4 screws (that were removed) to install the CM PCB onto the left side (bottom) of the control box.
2. Attach the one FG spacers (black) to the mounting plate as indicated in the figure.
3. Attach the three spacers (white) to the mounting plate as indicated in the figure, and install the CM PCB.
4. Connect the X12V3 connector for TA1 and the X12 CM connector on CM PCB.
5. Connect the wiring for the XIOO2 connector on the IO PCB to the XCMO1 connector on CM PCB.
6. Connect the XIOO2 connector on the IO PCB and the XCMIN connector on CM PCB.



## 3.4 CM PCB (For CC-Link)

### 1. Layout of parts



### 2. LED display and description

#### RUN

LED display	Description
Lights up	CC-Link is operating
Light is off	1. When CC-Link is not operating 2. When there is a watch dog timer error

#### L RUN

LED display	Description
Lights up	Data link is executing

#### L ERR

LED display	Description
Lights up	1. Data link communication error 2. Switch setting error
Flashes	Station number and/or mode change during operation

#### SD

LED display	Description
Lights up	Data sending

#### RD

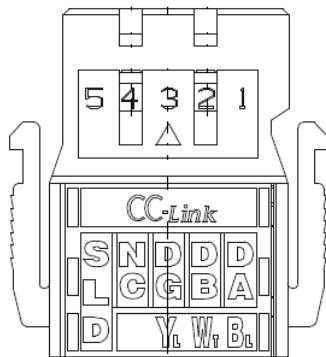
LED display	Description
Lights up	Data receiving

### ERR

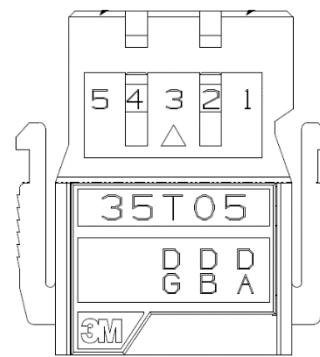
LED display	Description
Lights up	1. Switch setting error 2. Master duplication 3. Parameter error 4. Communication error
Flashes	Data link error on another station (when using master station)

### 3. Connector

CC-Link interface connector



CC-Link terminator connector



Terminal No.	Cable color	Signal type
1	Blue	DA BL
2	White	DB WT
3	Yellow	DG YL
4	-	Not connected
5	Drain wire	SLD (shield)

Cable side connector: 35505-6000-BOM GF (Manufactured by 3M) (product accessory)

Compliant electrical wire: Conductor size 0.5 mm<sup>2</sup> and insulating sheath external dimension - φ2.2 mm to φ3.0 mm

Terminator connector: 35T05-6M00-BOM GF (Manufactured by 3M) (product accessory)

### 4. Communications cable connection

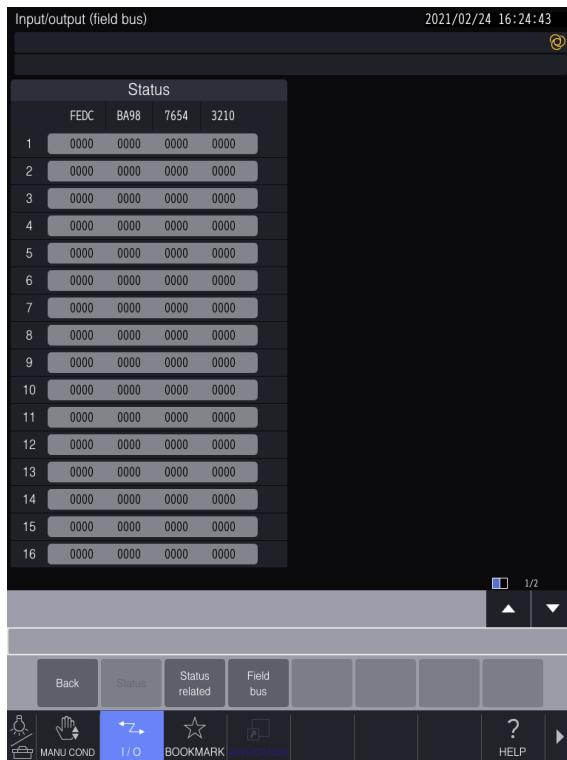
Follow the procedure below to connect the communications cable to the CC-Link interface connector.

- (1) Cut off 40 mm of the insulating sheath on the CC-Link compliant cable.
- (2) Separate the braided shield and drain wires, and then twist the drain wire with your fingers more than 10 times. (Be careful not to cut the drain wire)
- (3) Remove the braided shield, aluminum foil shield and filler.
- (4) Unravel the electrical wire so that the blue, white, yellow and drain wires are in order relative to the connector.
 

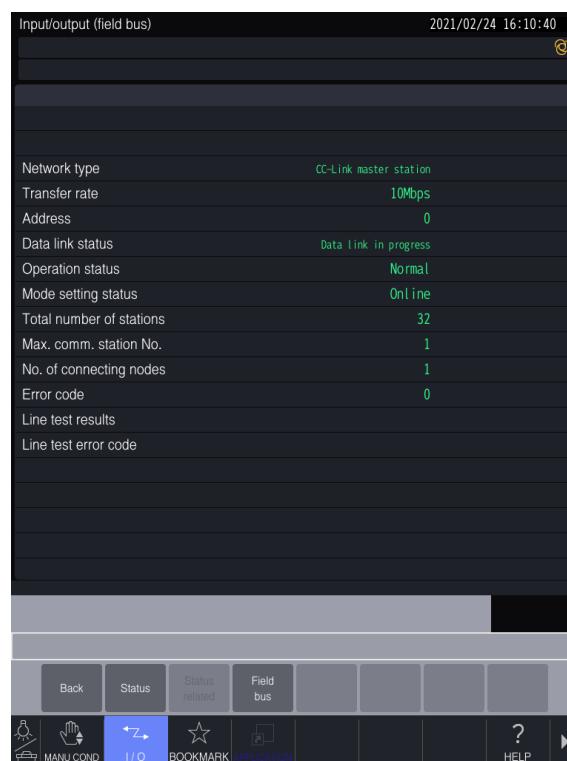
Blue sheath wire	No.1 Pin (Cover label: DA B)
White sheath wire	No.2 Pin (Cover label: DB W)
Yellow sheath wire	No.3 Pin (Cover label: DG Y)
Drain wire	No.5 Pin (Cover label: SLD)
- (5) Insert the cable all the way into the connector. Make sure that the electrical wire is inserted all the way looking from the top side of the top cover.
- (6) Press the cover into the body using pliers and crimp the cable.
- (7) Make sure that the cover is level relative to the body and that there is no space between the body and the cover.
- (8) Insert the terminator connector to the CC-Link connector (XCC) when using a node on both ends of the bus.

## 3.5 Operation Check

1. Use the [I/O], [1], [ENT] and [Fieldbus network] keys to display the <Input/output (fieldbus network) status> screen.



2. Use the [Status related] key to display the communication information. The fieldbus network type that is connected is displayed in the <Network type> field.



## Chapter 11 Options

3. Use the [Fieldbus network] key to display the input/output status.

Input					Output				
FEDC	BA98	7654	3210		FEDC	BA98	7654	3210	
1	0000	0000	0000	0000	1	0000	0000	0000	0000
2	0000	0000	0000	0000	2	0000	0000	0000	0000
3	0000	0000	0000	0000	3	0000	0000	0000	0000
4	0000	0000	0000	0000	4	0000	0000	0000	0000
5	0000	0000	0000	0000	5	0000	0000	0000	0000
6	0000	0000	0000	0000	6	0000	0000	0000	0000
7	0000	0000	0000	0000	7	0000	0000	0000	0000
8	0000	0000	0000	0000	8	0000	0000	0000	0000
9	0000	0000	0000	0000	9	0000	0000	0000	0000
10	0000	0000	0000	0000	10	0000	0000	0000	0000
11	0000	0000	0000	0000	11	0000	0000	0000	0000
12	0000	0000	0000	0000	12	0000	0000	0000	0000
13	0000	0000	0000	0000	13	0000	0000	0000	0000
14	0000	0000	0000	0000	14	0000	0000	0000	0000
15	0000	0000	0000	0000	15	0000	0000	0000	0000
16	0000	0000	0000	0000	16	0000	0000	0000	0000

## 3.6 Usage

Refer to “Chapter 9 (15) Fieldbus network” in Operation Manual I.

# 4 FE Unit

## 4.1 Functions

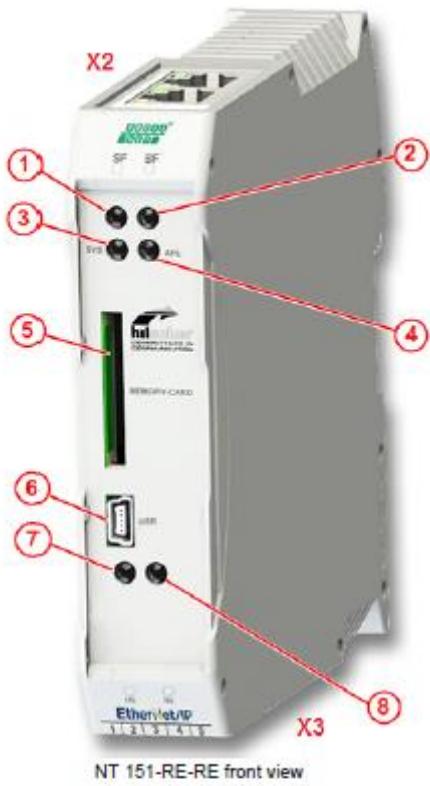
By using the FE unit, the user can connect the SPEEDIO to an industrial Ethernet network. Depending on the customer's purchase selection, one of the following two functions is pre-installed. Select one at the time of purchase.

- EtherNet/IP Slave function
- PROFINET Slave function

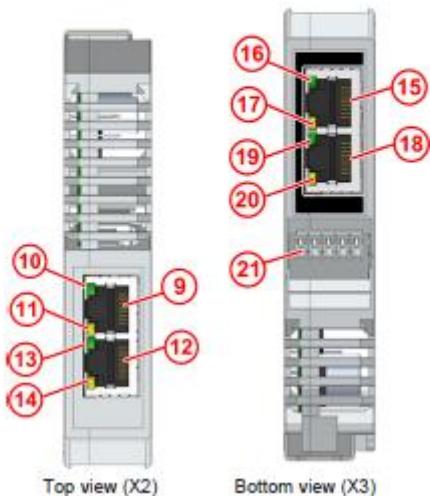
This manual only describes the wiring procedure. Refer to "Chapter 9 (15) Fieldbus network" in Operation Manual I for other details.

- (NOTICE) While it is rare, if the breaker is turned OFF or if there is a blackout (loss in power) while the power supply is activated, the FE unit data may become corrupt or lost. In this case, the unit will need to be replaced.
- (NOTE 1) The FC unit, CM unit and FE unit are exclusive units and only one type of unit can be installed.
- (NOTE 2) Use the CM PCB and FC PCB when connecting to a fieldbus.

## 4.2 External View



NT 151-RE-RE front view

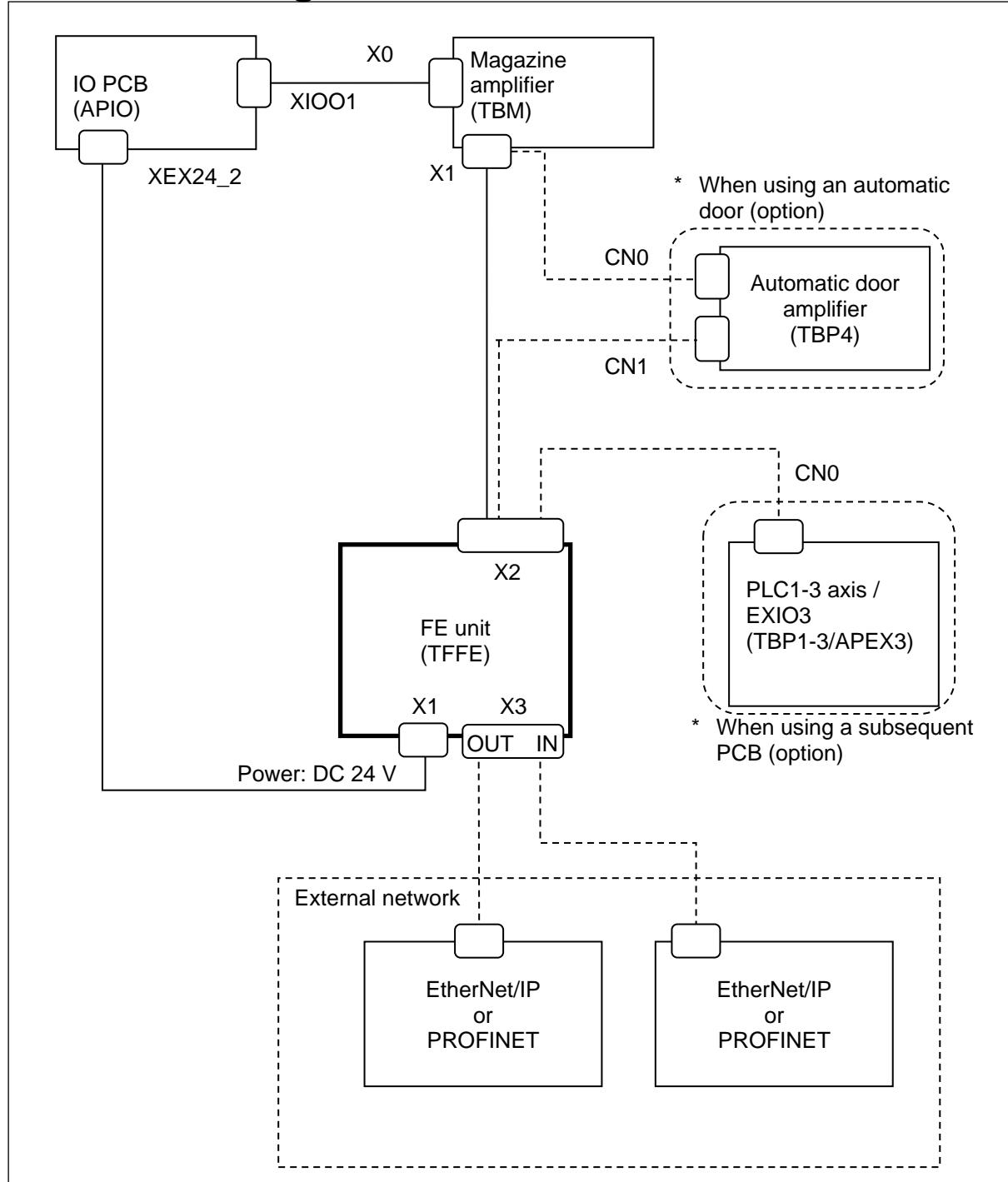


No.	
1	EtherCAT indicator LED (RUN) for X2 connector
2	EtherCAT indicator LED (ERR) for X2 connector
3	SYS LED (System status)
4	APL LED (Application status)
5	Not used
6	Mini-USB interface
7	Secondary protocol indicator LED (SF/MS) for X3 connector
8	Secondary protocol indicator LED (BF/NS) for X3 connector
9	Industrial Ethernet interface CH0 IN (X2, RJ45 socket)
10	LINK LED
11	ACT LED
12	Industrial Ethernet interface CH1 OUT (X2, RJ45 socket)
13	LINK LED
14	ACT LED
15	Industrial Ethernet interface CH0 IN/MAIN (X3, RJ45 socket)
16	LINK LED
17	ACT LED
18	Industrial Ethernet interface CH1 OUT/RED (X3, RJ45 socket)
19	LINK LED
20	ACT LED
21	Connector (X1) for supplying power

## System LEDs and application LEDs

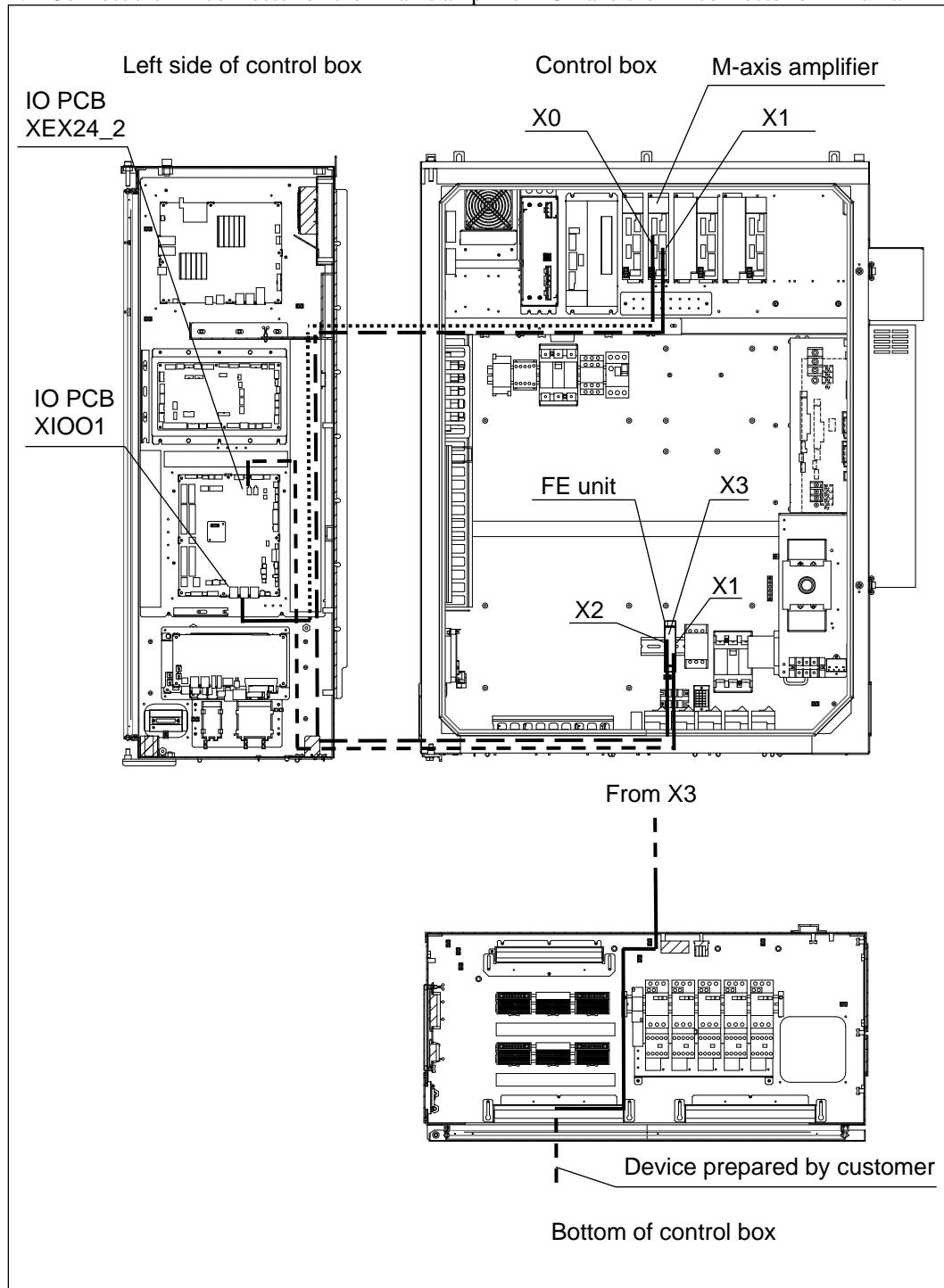
LED name	Color	LED ON/OFF	State	Description
<b>SYS</b> External view: 3	SYS LED is green	Light is on	Normal	The operating system is running properly, the gateway function is executed and data communication between X2 and X3 is being carried out periodically.
	APL LED is green	Light is on		
All LEDs	Light is off	Light is off	Error	The FE unit power supply is not connected. Check the FE unit power supply connector (X1) and wire. If the problem does not improve, replace the FE unit.
<b>SYS</b> External view: 3	Yellow / Green	Light flashes (Slowly)	Error	The FE unit does not start up properly. Replace the FE unit.
	Yellow	Light flashes	Error	The FE unit does not start up properly. Make sure that the FE unit and computer are connected. If the problem does not improve, replace the FE unit.
	Yellow	Light is on	Error	The FE unit is faulty. Replace the FE unit.
<b>SYS</b> External view: 3	SYS LED is green	Light is on	Error	There is a communication error between the FE unit and this device. Check the FE unit parameters.
	APL LED is red	Light flashes or Light is on		
<b>APL</b> External view: 4	Green	Light flashes	Error	There is a communication error between the FE unit and this device. Check the FE unit connectors X2 and X3.

## 4.3 Block Diagram



## 4.4 Installation & Wiring

1. Use three screws (M4) to install the DIN rail to the back of the control box.
2. Install the FE unit onto the DIN rails.
3. Connect the XEX24\_2 connector on the IO PCB and the X1 connector on FE unit.
4. Connect the X1 connector on the M-axis amplifier PCB and the X2 connector on FE unit.

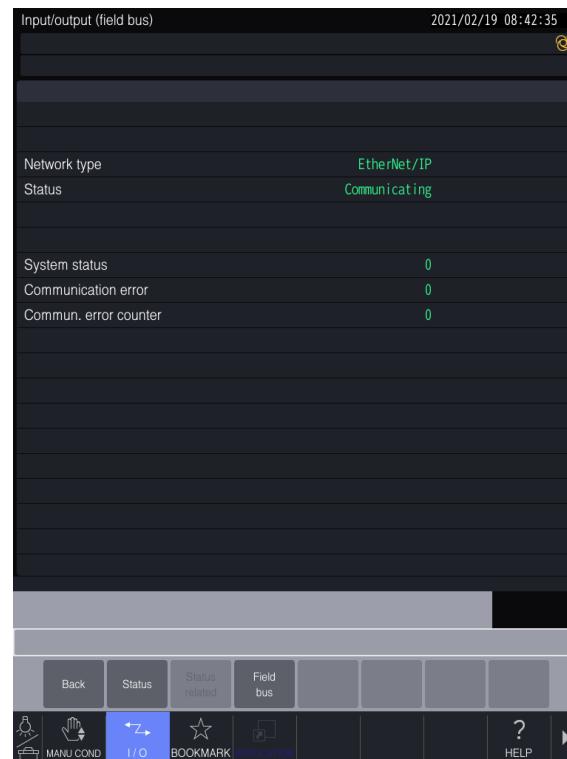


## 4.5 Operation Check

- The user can check the SPEEDIO side connection using the following operation. Use the [I/O], [1], [ENT] and [Fieldbus network] keys to display the <Input/output (fieldbus network) status> screen.



- Use the [Status related] key to display the communication information. The fieldbus network type that is connected is displayed in the <Network type> field.



3. Use the [Fieldbus network] key to display the input/output status.



## 4.6 Usage

Refer to “Chapter 9 (15) Fieldbus network” in Operation Manual I.

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# CHAPTER 11 (16)

## EXIO UNIT

- 1 Handling Precautions
- 2 Functions
- 3 Block Diagram
- 4 Switch Power Supplies
- 5 External Appearance
- 6 Installation Procedure
- 7 Wiring
- 8 Using EXIO PCB and Terminal Blocks

# 1 Handling Precautions

## **WARNING**

High-voltage components are present inside the control box. There is risk of electric shock if you touch these components by mistake.

### [SAFETY INSTRUCTIONS]

Maintenance and inspection of electrical components must only be carried out by a qualified electrician who is trained in electrical safety and who has thorough knowledge of the electronic circuits in this machine.

Turn OFF the main power breaker, and then wait at least 20 minutes before carrying out work.

Attach a padlock to the main power breaker so that the power cannot be turned ON.

A sign or notice should be placed near the operation panel to warn others that work is in progress.

If leaving the machine unattended, close the control box and secure it with screws.

## **WARNING**

If the control box or operation panel is touched accidentally with wet hands while performing installation or maintenance, an electric shock or short-circuit may cause a fire.

### [SAFETY INSTRUCTIONS]

Do not touch the control box and the operation panel with wet hands.

The cover to the control box must be closed while the machine is operating.

The control box and the operation panel must be kept free of coolant, water, chips and shavings.

## **WARNING**

If terminal connections on the PCBs or terminal block screws become loose, poor contacts may cause overheating or a fire.

### [SAFETY INSTRUCTIONS]

There should be no loose screws when connecting the wiring.

Do not replace fuses and electrical parts that have been soldered to the inside of the unit.

## **WARNING**

If you touch cables which have been crushed or damaged by heavy objects, there is risk of electric shock.

In addition, short-circuits may occur if cables are crushed or damaged by heavy objects.

### [SAFETY INSTRUCTIONS]

Cables should be gathered up or arranged to prevent them from being crushed. If a cable has become damaged, it must be replaced with a new one.

## 2 Functions

The user can add an EXIO PCB and increase the external input and external output by 32 points (on each) per PCB. A maximum of 32 EXIO PCBs can be added. If the maximum is added, the number of points for the output and the input would be 1024.

The standard setup has 16 points for the input and the output on the IO PCB.

- When connecting 6 or more EXIO PCBs, the customer needs to set up an external power supply on their side.  
Refer to “4 Switch power supplies” for details on how to switch to an external power supply.
- An extension PCB number can be assigned to the EXIO PCB.  
The sampling cycle for the external I/O signal varies depending on the extension PCB number. Set the extension PCB number using the RSW1 (ones’ place) and RSW2 (tens’ place) on the PCB.  
Refer to “8 Using EXIO PCB and terminal blocks” for further details.

Extension PCB No.	Sampling cycle
1 to 2	2 msec
3 to 63	10 msec

- The external input and external output used on the extension can be switched between sink (NPN) / source (PNP) by using the POL-SW setting on the EXIO PCB. Configure the settings to match the connecting device. When connecting to multiple EXIO PCBs, the settings must be configured for each.

Refer to “8 Using EXIO PCB and terminal blocks” for further details.

POL-SW No.	Description	ON setting	OFF setting
1	External input signal XTIE_0 to 15	Source (PNP)	Sink (NPN)
2	External input signal XTIE_16 to 31	Source (PNP)	Sink (NPN)
3	External input signal XTOE_100 to 115	Source (PNP)	Sink (NPN)
4	External input signal XTOE_116 to 131	Source (PNP)	Sink (NPN)

Refer to “1.6 External I/O signals” in the Data Bank & Alarm Manual for details about the signal assignment for the external input and external output.

Refer to “6.2.4 Extension I/O” for details about checking the status of the external input and external output.

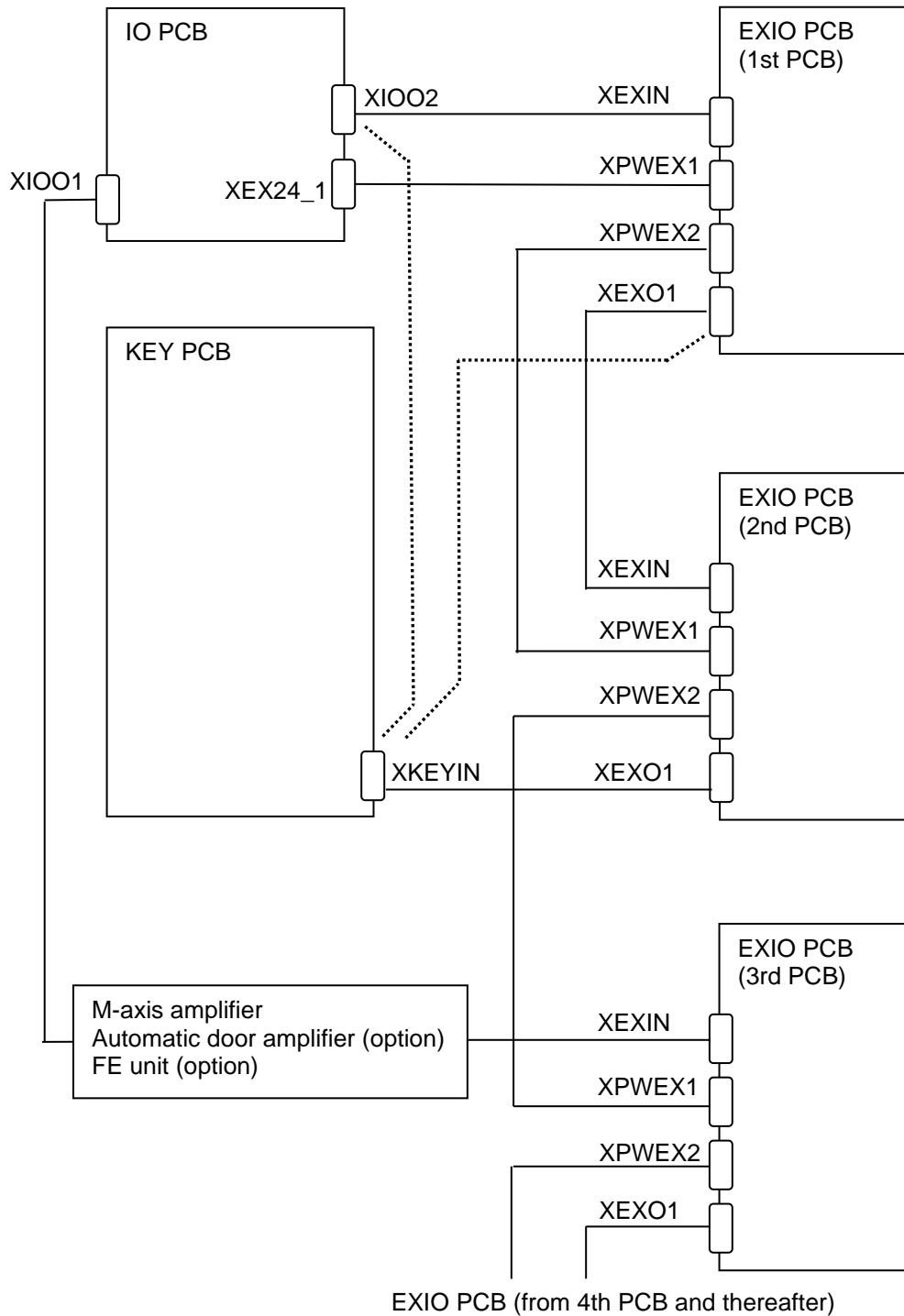
- A device is connected to a terminal block for the EXIO PCB. There is an external output terminal block, external internal terminal block and 24 V power COM terminal block.  
Refer to “8 Using EXIO PCB and terminal blocks” for further details.
- When using an internal power supply, use a current of 300 mA (maximum) per contact for the external output terminal block, external input terminal block and 24 V power COM terminal block on the EXIO PCB, and a total current of 500 mA (maximum). The total current does not change even if connecting to multiple EXIO PCBs.

When the customer has made arrangements to use an external power instead of an internal power supply, a maximum of 4 A can be used for the power capacity per EXIO PCB. There is no change in the requirements of 300 mA (maximum), but a total of 2 A (maximum) can be used on the terminal block for the external output and a total of 2 A (maximum) can be used on the terminal block for the 24 V power COM. Use a DC voltage of 24 V ±5% and a current of 5 A or greater for the external power supply.

Refer to “4 Switch power supplies” for details on how to switch from an internal to an external power supply.

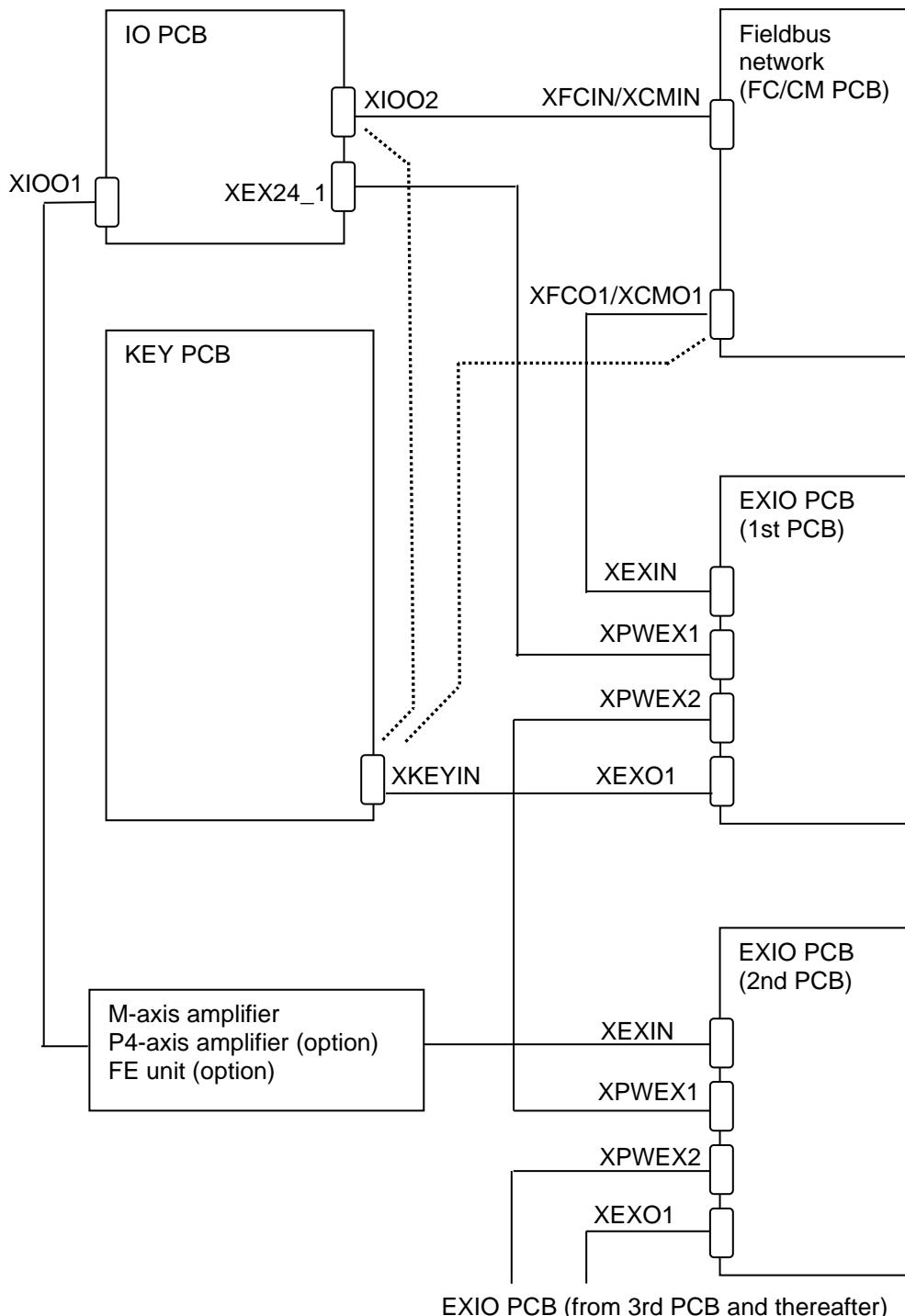
### 3 Block Diagram

1. Connection between PCBs (when an FC/CM PCB is not installed)



- This wiring setup is for using 24 V internally.
- When the EXIO PCB is not used, connect the XIOO2 on the IO PCB to the XKEYIN on the KEY PCB.
- When only one EXIO PCB is used, connect the XEXO1 on the EXIO PCB (1st PCB) to the XKEYIN on the KEY PCB.
- When two or more EXIO PCBs are used, connect the XEXO1 on the EXIO PCB (2nd PCB) to the XKEYIN on the KEY PCB.

## 2. Connection between PCBs (when an FC/CM PCB is installed)



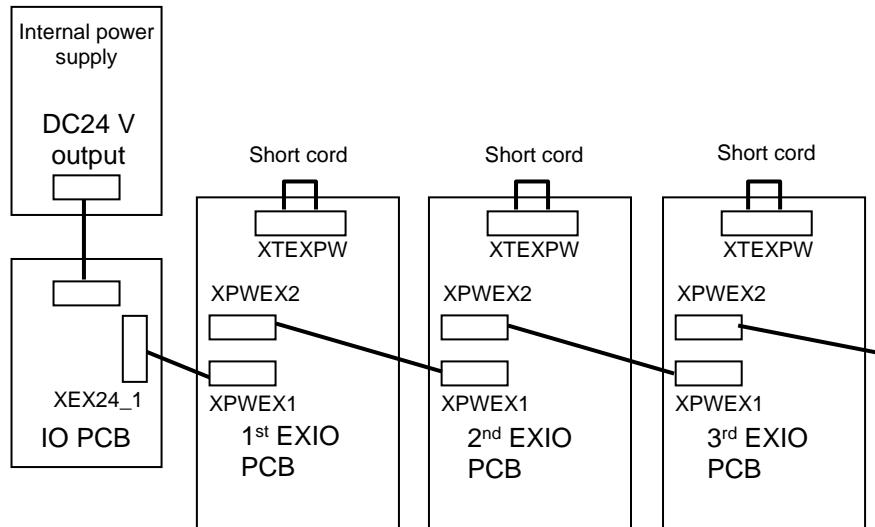
- This wiring setup is for using 24 V internally.
- When an EXIO PCB and FC/CM PCB are not used, connect the XIOO2 on the IO PCB to the XKEYIN on the KEY PCB.
- When an EXIO PCB is not used and only an FC/CM PCB is used, connect the XFCO1/XCMO1 on the FC/CM PCB to the XKEYIN on the KEY PCB.
- When one or more EXIO PCBs is used, connect the XEXO1 on the EXIO PCB (1st PCB) to the XKEYIN on the KEY PCB.
- When an FC/CM PCB is installed, the station number for the EXIO PCB (1st PCB) is set to “2” as the factory-default setting.

## 4 Switch Power Supplies

Instructions and corresponding conditions for switching power supplies is noted below.

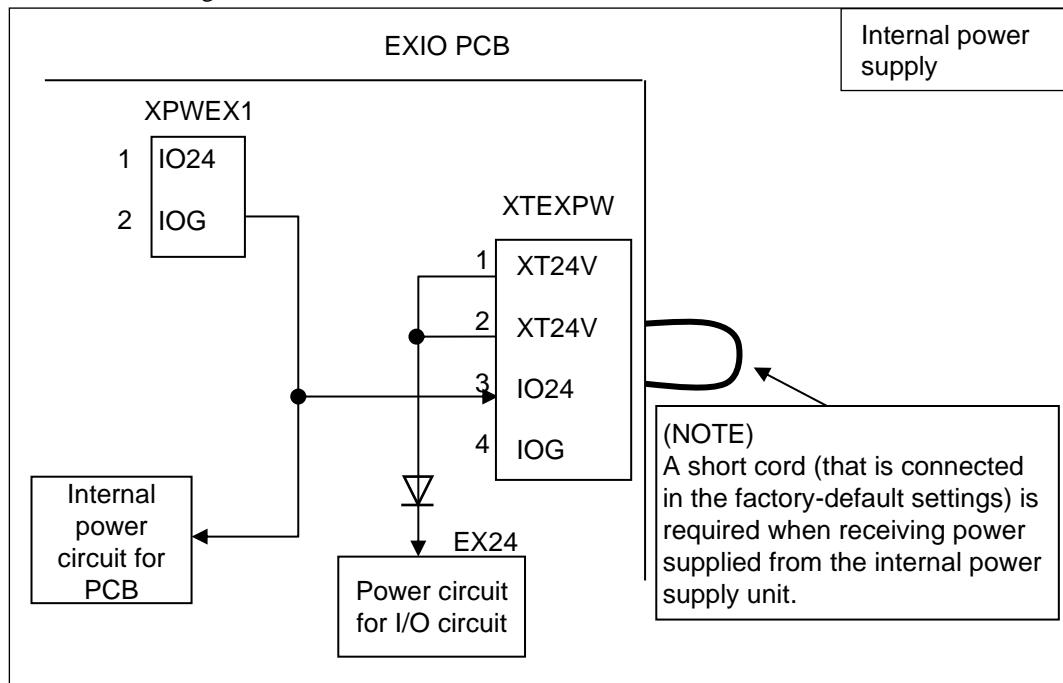
1. When setting up wiring for supplying the power from the internal power supply (factory-default setting):
  - The EXIO PCB control power supply and the motion power supply must both be internal power supplies.
2. When setting up wiring for supplying the power from an external power supply:
  - The EXIO PCB control power supply must be an internal power supply, and the motion power supply must be an external power supply.
  - To increase the input/output power capacity, it must be done through the wiring.
  - The customer must make arrangements for an external power supply.
3. When connecting six or more EXIO PCBs:
  - When connecting six or more EXIO PCBs, change the wiring setup from the default settings even if there is no need to increase the input/output power capacity.
  - The EXIO PCB control power supply and the motion power supply must both be external power supplies.
  - The customer must make arrangements for an external power supply and relay.

- When setting up the wiring for supplying the power from the internal power supply unit:

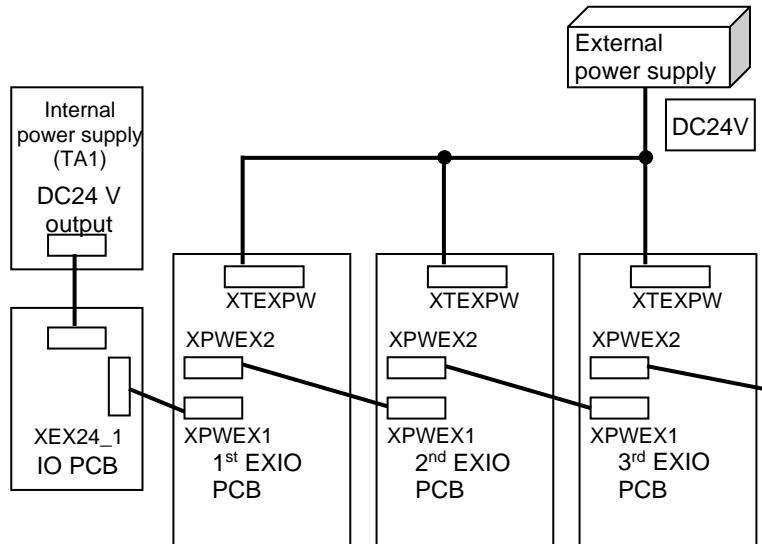


(NOTE) A short cord (that is connected in the factory-default settings) is required when receiving power supplied from the internal power supply unit.

EXIO PCB wiring

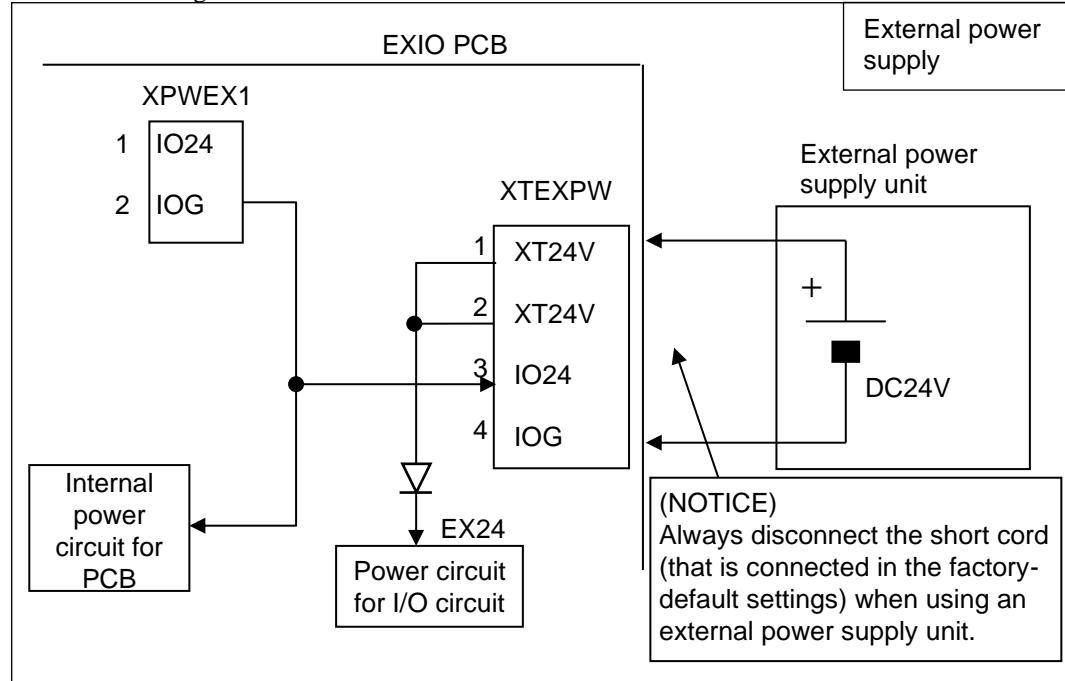


2. When setting up wiring for supplying the power from the external power supply unit:

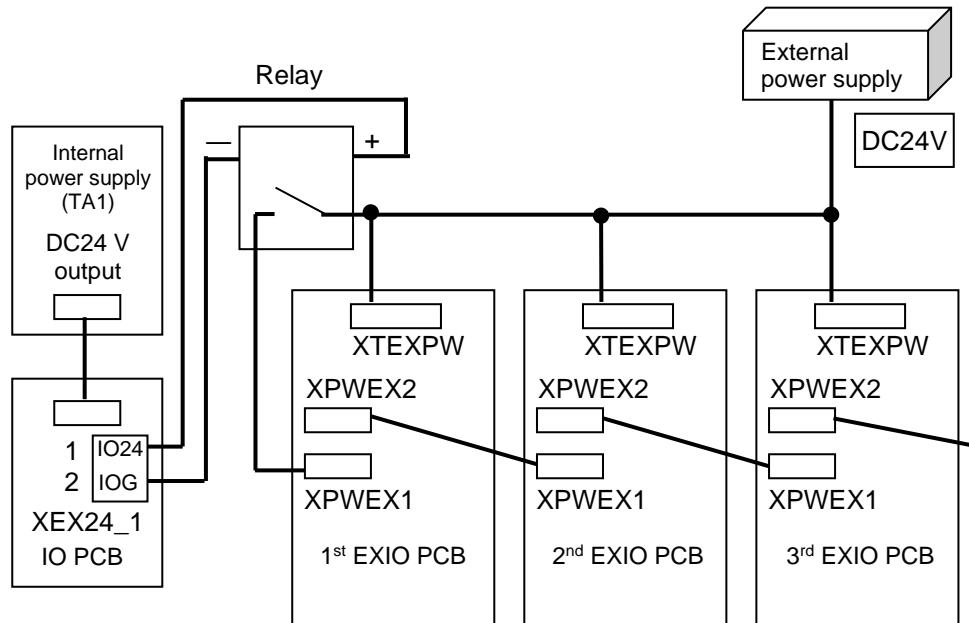


(NOTICE) Always disconnect the short cord when using an external power supply unit.

EXIO PCB wiring

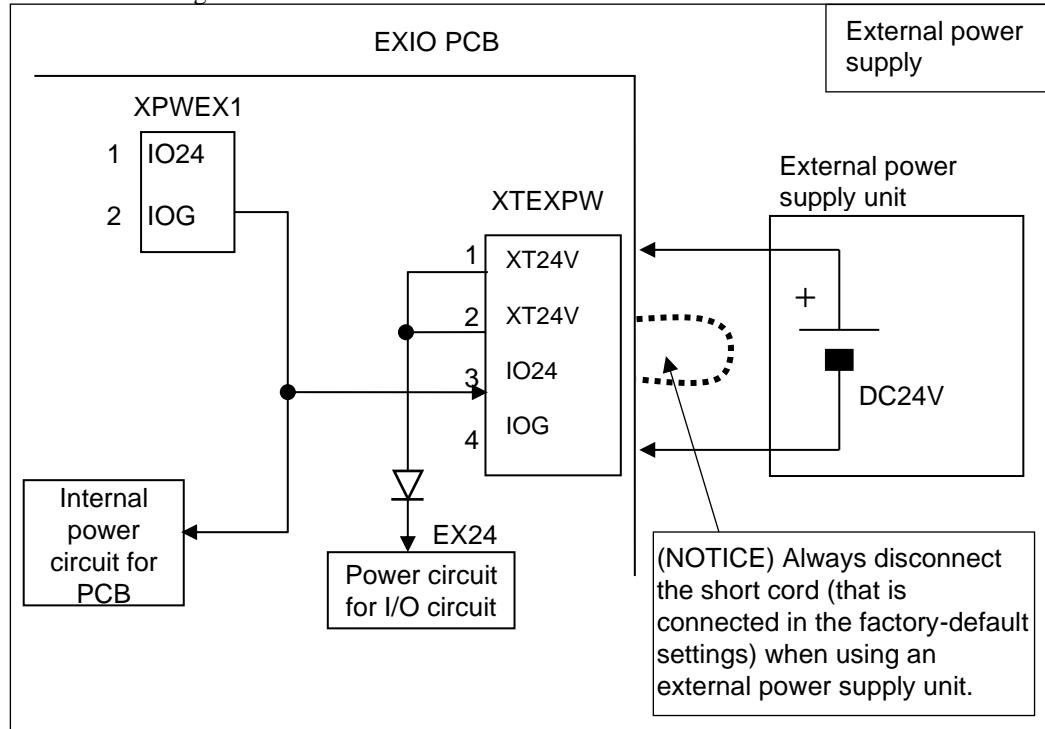


3. When connecting six or more EXIO PCBs:



(NOTICE) Always disconnect the short cord when using an external power supply unit.

EXIO PCB wiring



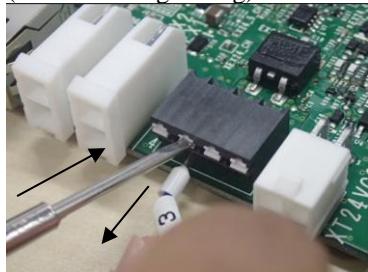
- (NOTICE 1) When using an internal motion power supply, use a current of 300 mA (maximum) per contact for the external output terminal block, external input terminal block and 24 V power COM terminal block on the EXIO PCB, and a total current of 500 mA (maximum). The total current does not change even if connecting to multiple EXIO PCBs.
- (NOTICE 2) When the customer has made arrangements to use an external power supply and follows the aforementioned wiring procedure (2. and 3.), a maximum of 4 A can be used for the power capacity per EXIO PCB. There is no change in the requirements of 300 mA (maximum) per contact, but a total of 2 A (maximum) can be used on the terminal block for the external output and a total of 2 A can be used on the terminal block for the 24 V power COM.

- (NOTICE 3) Always disconnect the short cord for XTEXPW (that is connected in the factory-default settings) when using an external power supply unit. Using an external power supply unit without disconnecting the short cord may cause damage to the PCB or external power supply.
- (NOTICE 4) Use a DC voltage of  $24\text{ V} \pm 5\%$  and a current of 5 A or greater for the external power supply specification. Use a relay that can handle a DC voltage of  $24\text{ V} \pm 5\%$  and a current of 1 A or less.
- (NOTICE 5) Be absolutely sure that the inrush current that occurs simultaneously for the connected equipment is  $10\text{A } 20\mu\text{s}$  or less.
- (NOTICE 6) Do not connect a device to a terminal if the device's application is different than the specified use of that terminal.
- (NOTICE 7) Do not connect to a device that does not meet the required specifications.
- (NOTICE 8) When using an external power supply, use the specified wiring to switch from an internal power supply to an external power supply.
- (NOTICE 9) Do not connect an external power supply directly to a terminal block on the EXIO PCB.
- (NOTE 1) When using the wiring procedure to connect 6 or more EXIO PCBs, before turning the machine's power supply switch ON, make sure that the power supply switch and the external power supply turn ON at the same time. If the external power supply is turned ON after the system starts up, the EXIO PCB cannot be used.
- (NOTE 2) Be sure not lose the short cord that is connected in the factory-default settings.

### Using the XTEXPW terminal block

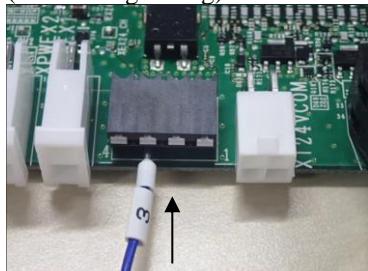
- \* Use the crimp terminal NF0.5-8 (Nichifu), or FE-0.5-8N-WH (Wago), to connect to the terminal block. The electrical wire specifications that are compatible with crimp terminals are  $0.5\text{ mm}^2$  (20AWG) with an outer diameter sheath size of  $\varphi 2.4\text{ mm}$  (maximum).

(Disconnecting wiring)

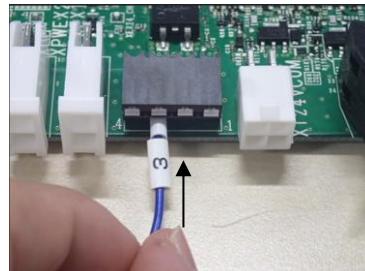


1. Press down the operation button with a screwdriver, and remove the electrical wire.

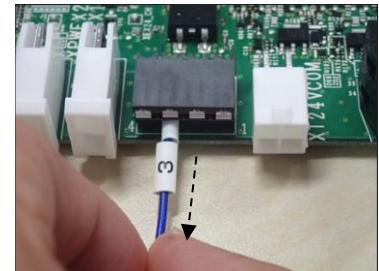
(Connecting wiring)



1. Insert the electrical wire into the wire port.

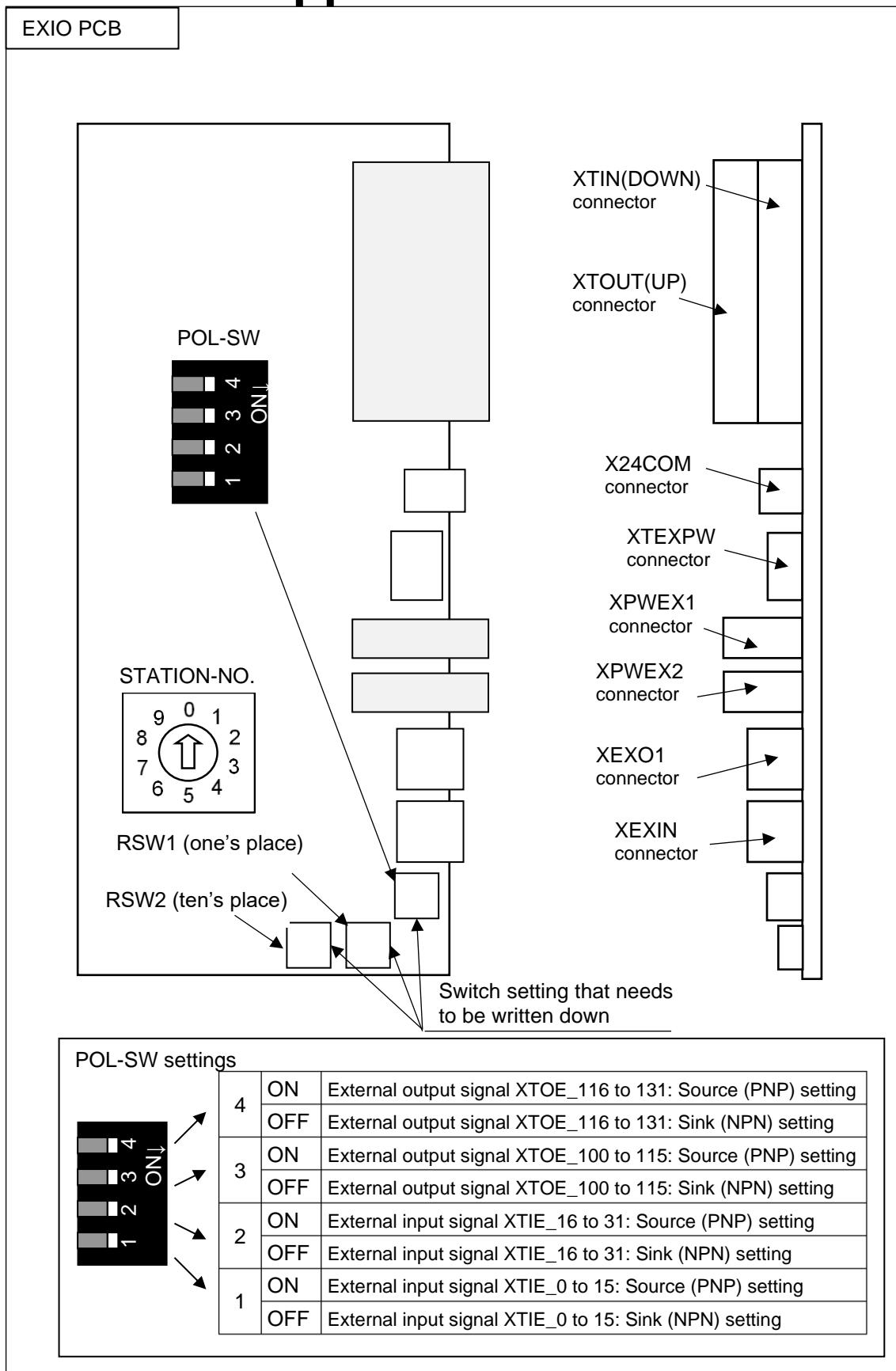


2. Insert the wire all the way so that it touches the end.

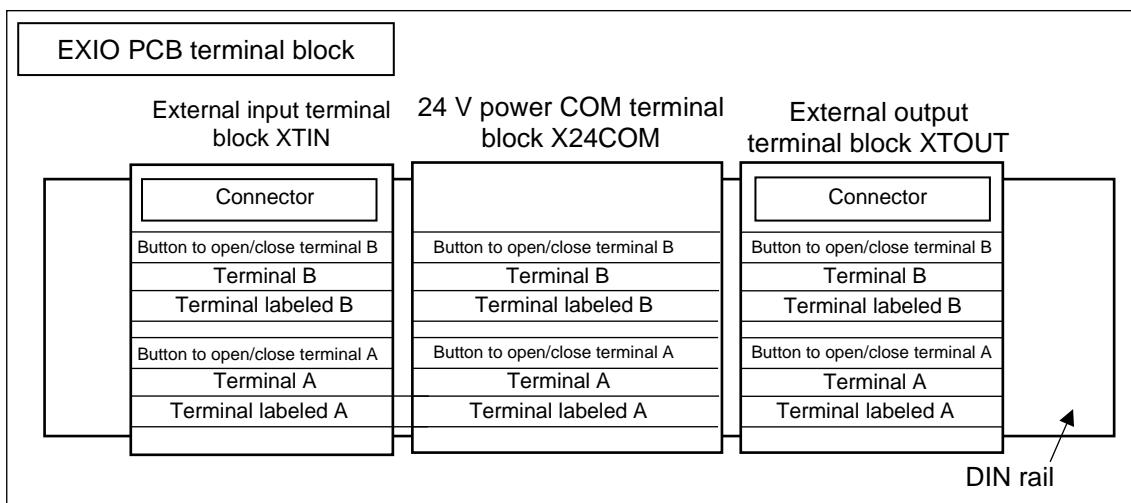


3. Lightly pull on the wire to ensure the connection is secure.

## 5 External Appearance



## Chapter 11 Options



External input terminal block XTIN on EXIO PCB

Terminal labeled B	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	24V
Signal name		XTIIE_16	XTIIE_17	XTIIE_18	XTIIE_19	XTIIE_20	XTIIE_21	XTIIE_22	XTIIE_23	XTIIE_24	XTIIE_25	XTIIE_26	XTIIE_27	XTIIE_28	XTIIE_29	XTIIE_30	XTIIE_31
Terminal labeled A	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	IOG
Terminal signal name	XTIIE_0	XTIIE_1	XTIIE_2	XTIIE_3	XTIIE_4	XTIIE_5	XTIIE_6	XTIIE_7	XTIIE_8	XTIIE_9	XTIIE_10	XTIIE_11	XTIIE_12	XTIIE_13	XTIIE_14	XTIIE_15	EX24

24 V power COM terminal block X24COM on EXIO PCB

Terminal	*1	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Signal name	EX24 (17 points excluding *1)																
Terminal	*1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Signal name	IOG (17 points excluding *1)																

\*1 Use in the power supply from the EXIO PCB to the 24 V power COM terminal block.

External output terminal block XTOUT on EXIO PCB

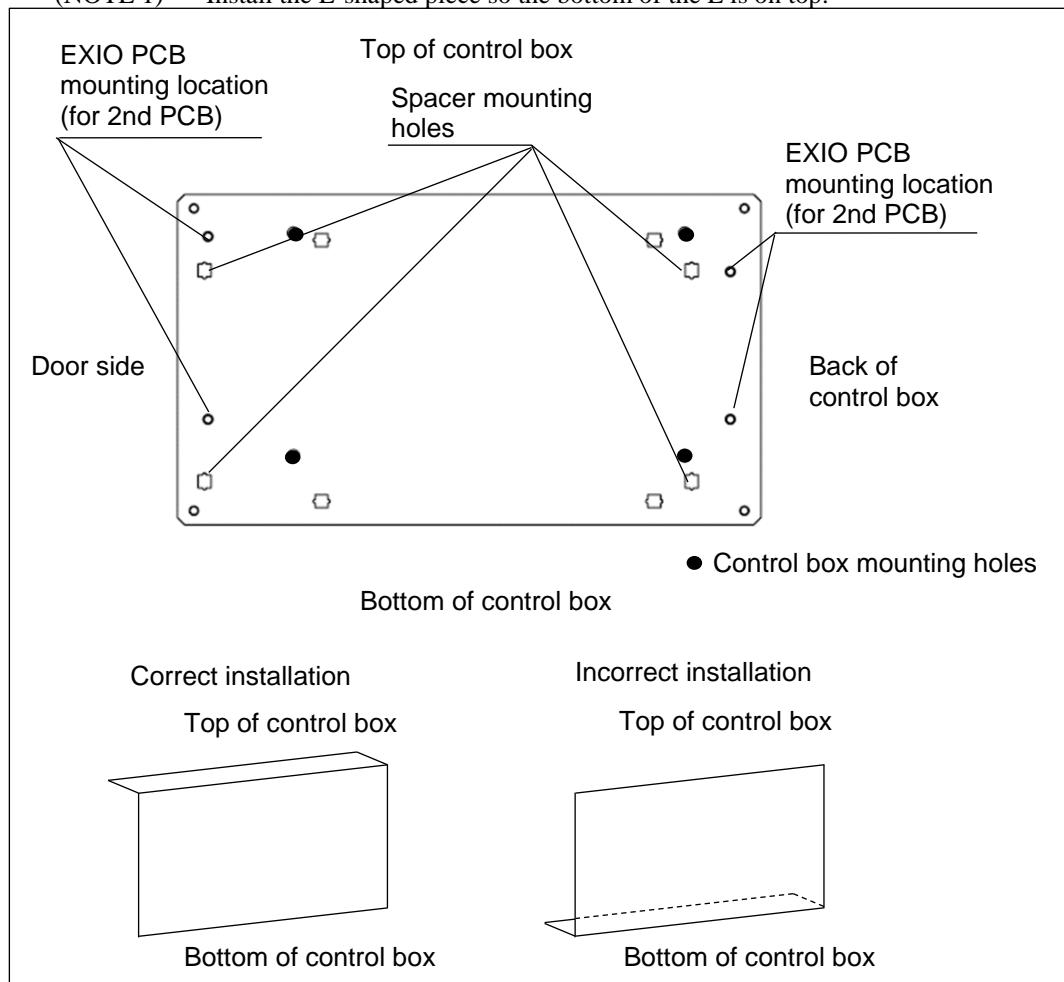
Terminal labeled B	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	24V
Signal name	XTOE_116	XTOE_117	XTOE_118	XTOE_119	XTOE_120	XTOE_121	XTOE_122	XTOE_123	XTOE_124	XTOE_125	XTOE_126	XTOE_127	XTOE_128	XTOE_129	XTOE_130	XTOE_131	EX24
Terminal labeled A	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	IOG
Signal name	XTOE_100	XTOE_101	XTOE_102	XTOE_103	XTOE_104	XTOE_105	XTOE_106	XTOE_107	XTOE_108	XTOE_109	XTOE_110	XTOE_111	XTOE_112	XTOE_113	XTOE_114	XTOE_115	EX24

# 6 Installation Procedure

## 1. Install EXIO unit

Install the EXIO PCB to the control box following the orientation noted below.

(NOTE 1) Install the L-shaped piece so the bottom of the L is on top.



(NOTE 2) When there are two EXIO PCBs installed at the same time, install them following said instructions using the order: 1-1, and then 1-2 (1), (2), (6), (3) and (8).

(NOTE 3) Refer to the following pages for the installation drawings of the EXIO PCB.

### 1-1 Install EXIO PCB (1st PCB)

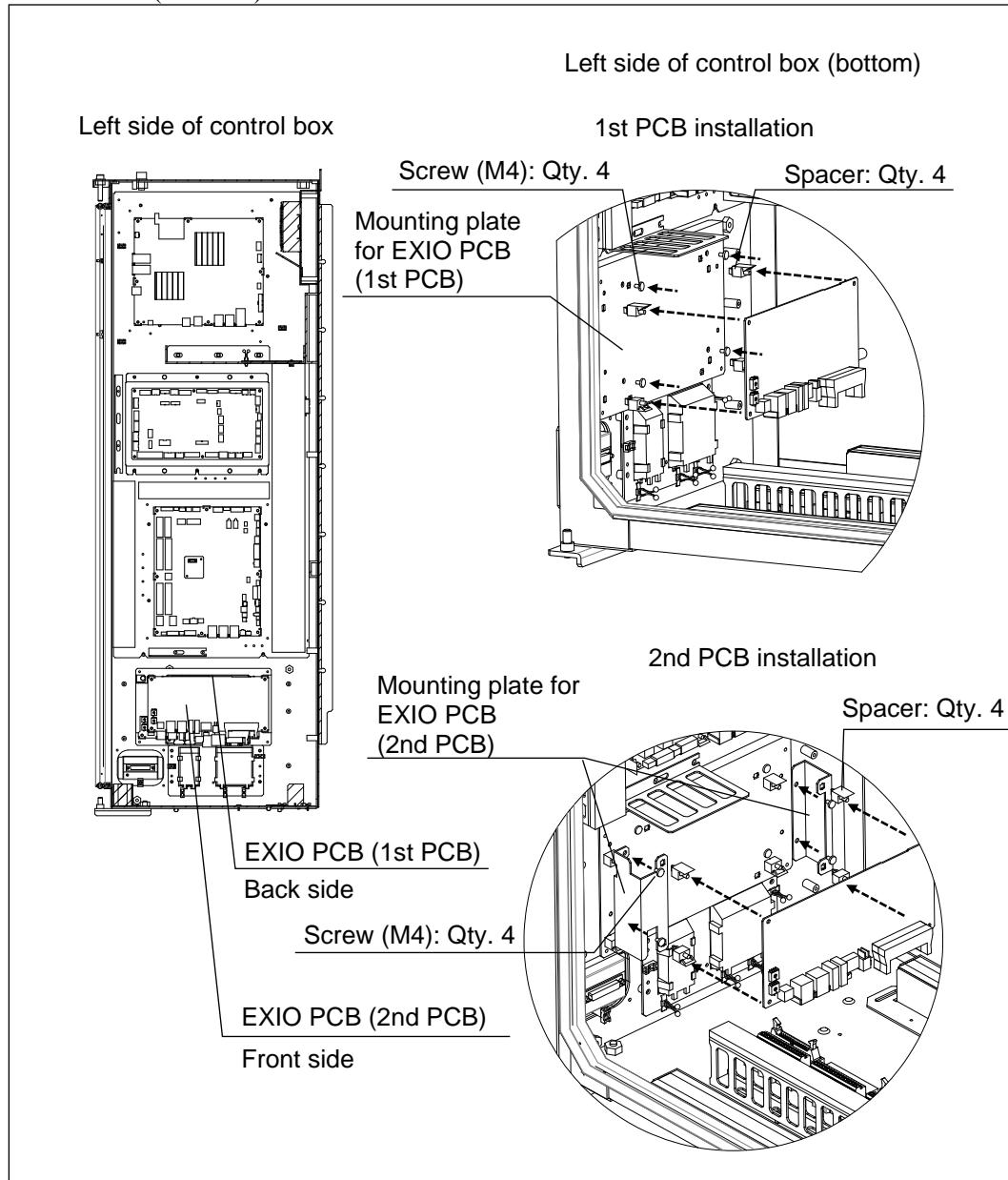
- (1) Turn OFF the power switch on the operation panel, and then turn OFF the main power breaker.
- (2) Use the four M4 screws (that were removed from the left side of the control box) to install the EXIO PCB (1st PCB) onto the left side (bottom) of the control box.
- (3) Attach four spacers to the plate as indicated in the figure, and install the EXIO PCB (1st PCB).

### 1-2 Install EXIO PCB(2nd PCB)

- (4) Turn OFF the power switch on the operation panel, and then turn OFF the main power breaker.
- (5) Remove all the EXIO PCB connectors that were attached in 1-1 (2), and remove the PCB from the spacers.
- (6) Use the four M4 screws (provided with the unit assembly) to install the plate for the EXIO PCB (1st PCB) onto the mounting plate (1st PCB).  
At this time, fix the EXIO PCB (2nd) temporarily in place and adjust the position of the mounting plate.
- (7) Follow step 1-1 (3) to install the EXIO PCB (1st PCB) that was removed in 1-2 (5), attach all the connectors and then return all the wiring to the initial setup.

## Chapter 11 Options

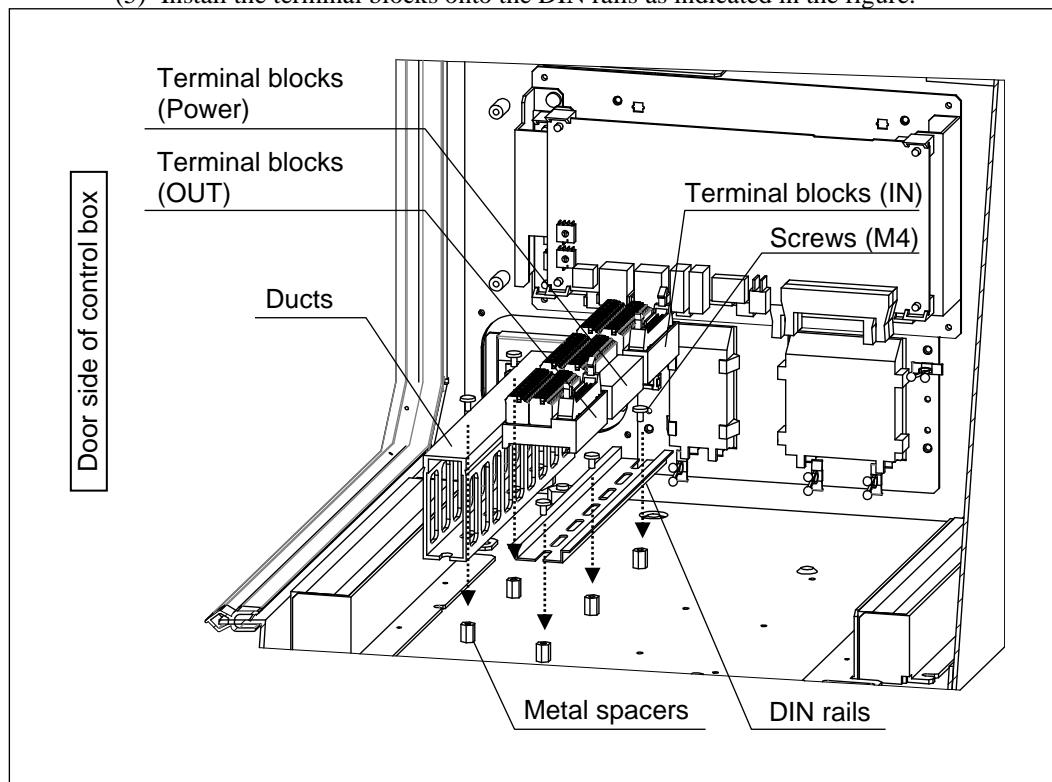
- (8) Attach four spacers to the plate as indicated in the figure, and install the EXIO PCB (2nd PCB).



## 1-3. Install terminal block (first) for EXIO PCB

(NOTE) When an FC PCB (option) or CM PCB (option) is installed, refer to “1-4. Install terminal block (second) for EXIO PCB”.

- (1) Turn OFF the power switch on the operation panel, and then turn OFF the main power breaker.
- (2) Remove the screws at the base of the control box, and attach metal spacers at 5 places.
- (3) Use the two M4 screws (that were removed) to install the duct to the metal spacers at the base of the control box.
- (4) Use the three M4 screws (that were removed) to install the DIN rail to the metal spacers at the base of the control box.
- (5) Install the terminal blocks onto the DIN rails as indicated in the figure.



## Chapter 11 Options

- 1-4. Install terminal block (second) for EXIO PCB
  - (1) Turn OFF the power switch on the operation panel, and then turn OFF the main power breaker.
  - (2) Remove the screws at the base of the control box, and attach metal spacers at 5 places.
  - (3) Use the two M4 screws (that were removed) to install the duct to the metal spacers at the base of the control box.
  - (4) Use the three M4 screws (that were removed) to install the DIN rail to the metal spacers at the base of the control box.
  - (5) Install the terminal blocks onto the DIN rails as indicated in the figure.

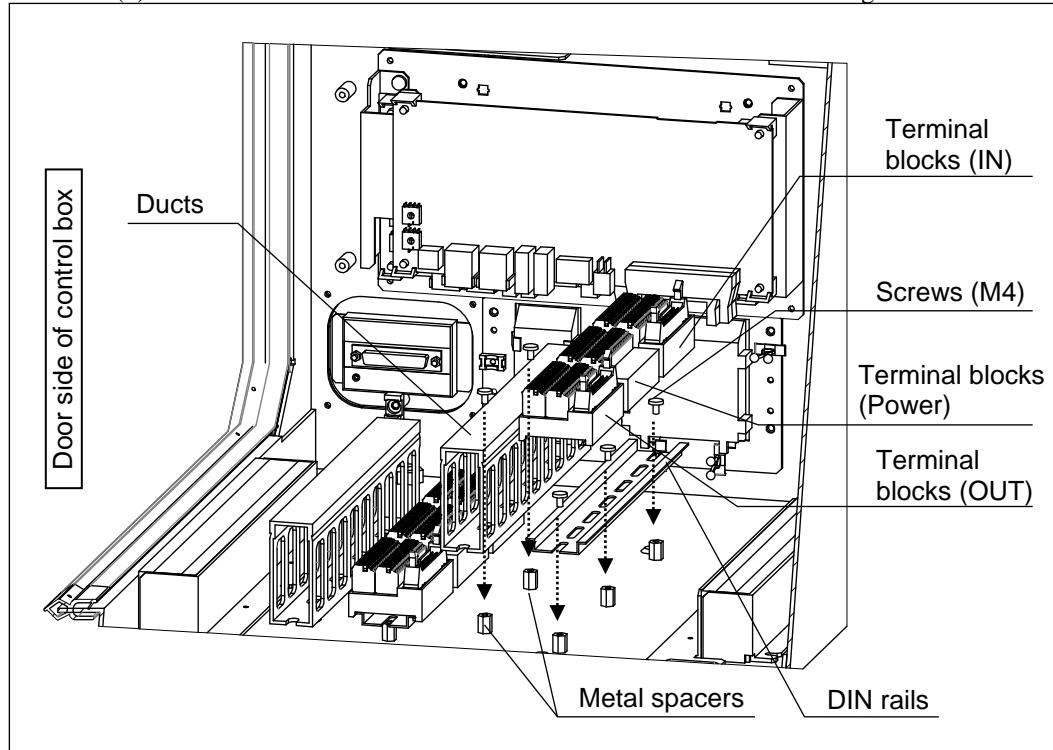


Diagram of complete assembly

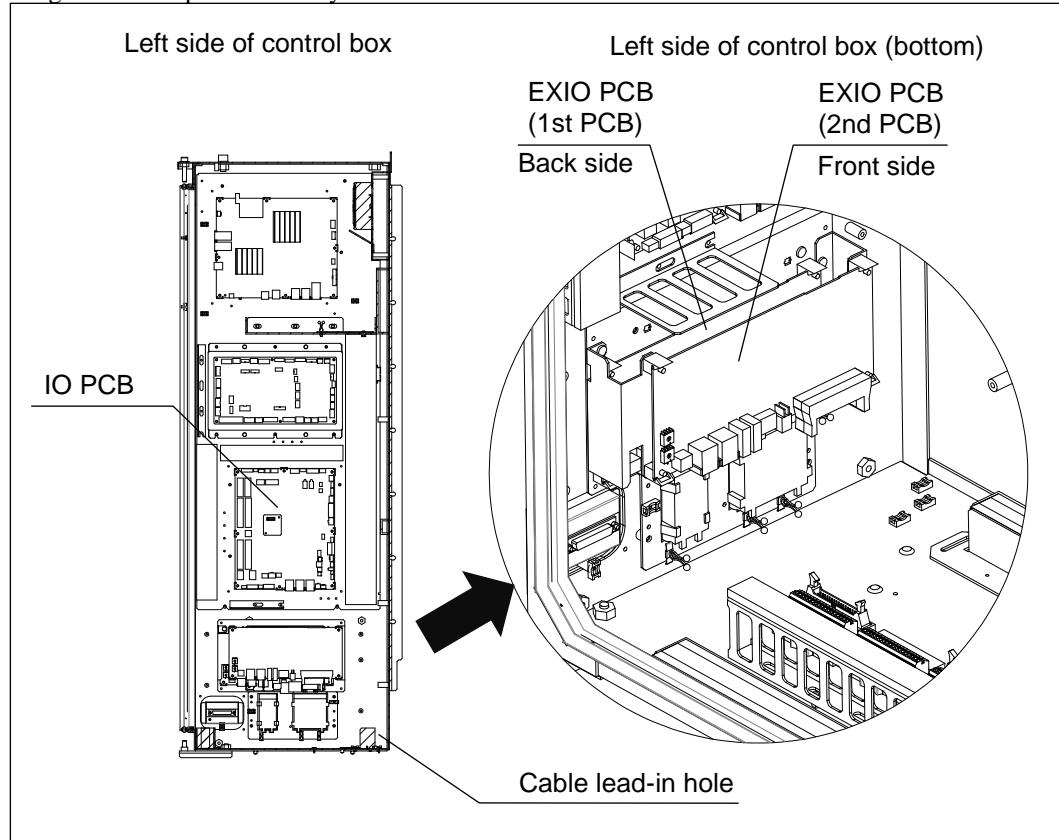
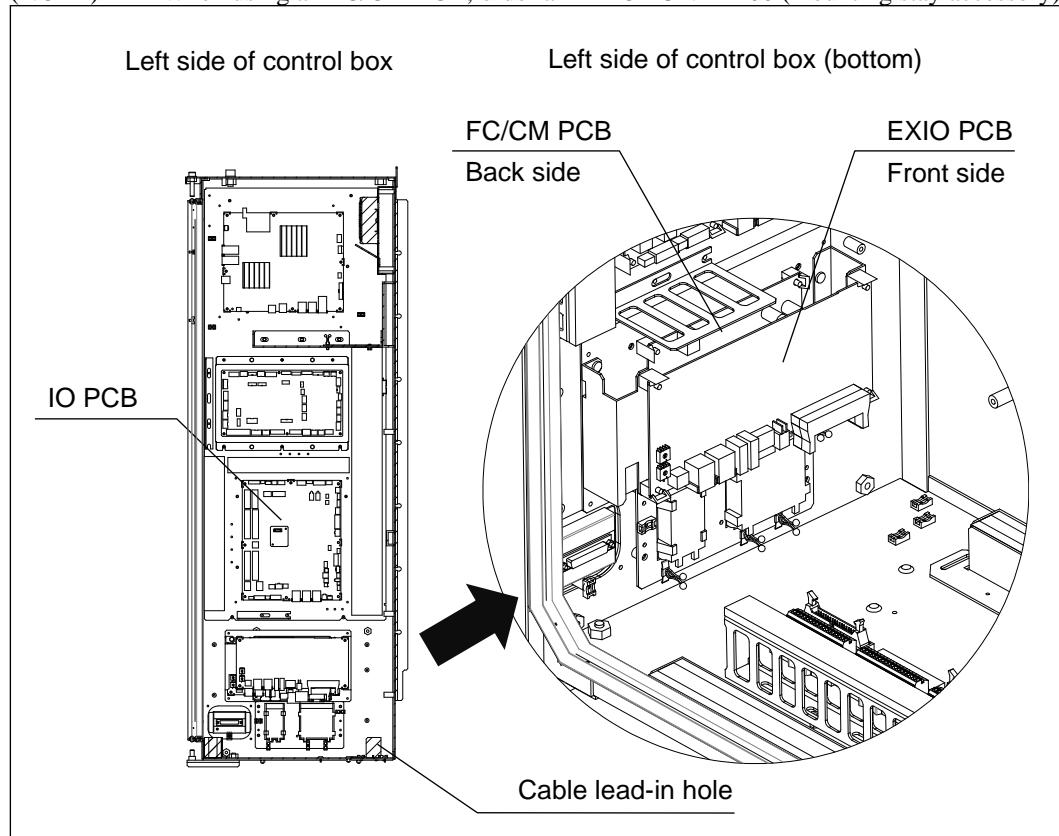


Diagram of complete assembly (When using an FC/CM PCB (Option))

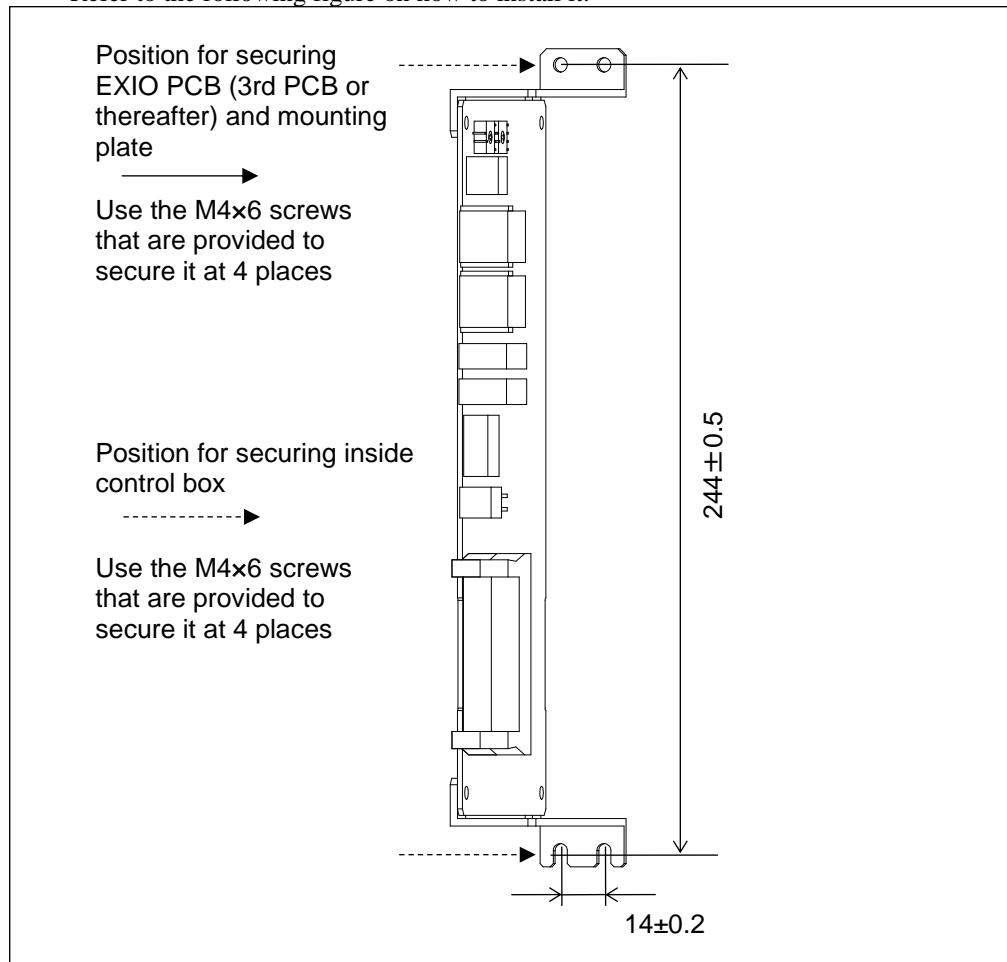
(NOTE) When using an FC/CM PCB, order an EXIO2 UNIT D00 (mounting stay accessory).



## Chapter 11 Options

- 1-5. Install and attach the EXIO PCB (from 3rd PCB and thereafter) at a given location in the control box to use it.

Refer to the following figure on how to install it.



There are 3 terminal block PCBs that are used for each EXIO PCB.

Install the DIN rail for attaching the terminal block PCB on the EXIO PCB (for 3rd PCB and thereafter) at a given location in the control box to use it.

Attach the harness that connects the EXIO PCB and terminal block PCB so that it has a little slack.

Use the M4×6 screws that are provided to secure the EXIO PCB (3rd PCB or thereafter) and mounting plate.

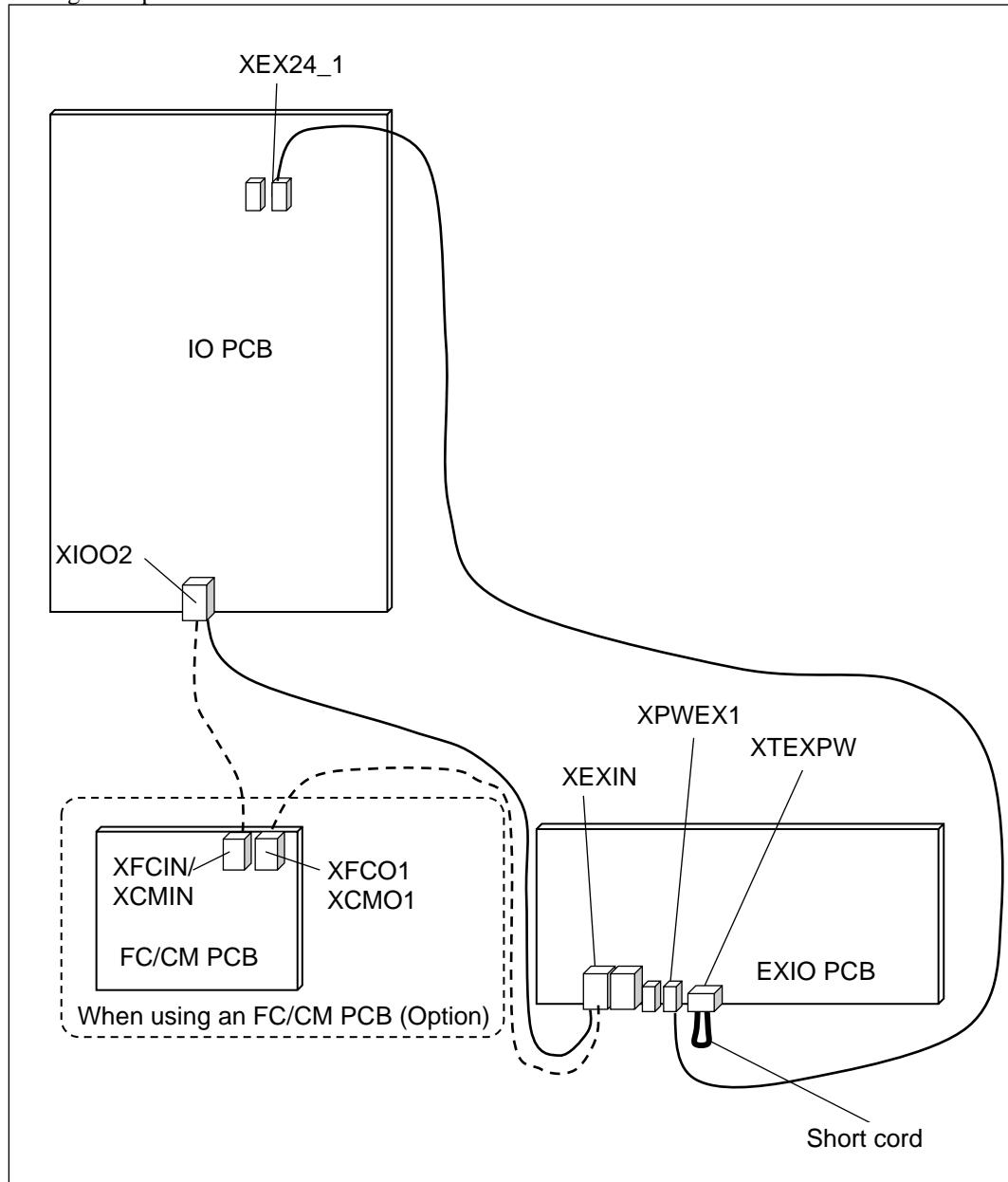
Use the M4×6 screws that are provided to install to the control box for the EXIO PCB (3rd PCB or thereafter).

## 7 Wiring

### Wiring procedure when attaching and using one EXIO PCB

- (1) Connect the XEX24\_1 connector on the IO PCB and the XPWEX1 connector on EXIO PCB with the cable provided in the accessories.
- (2) Connect the XIOO2 connector on the IL PCB and the XEXIN connector on EXIO PCB. Make sure that the short cord is attached to the XTEXPW connector on the EXIO PCB.

#### Wiring example



11

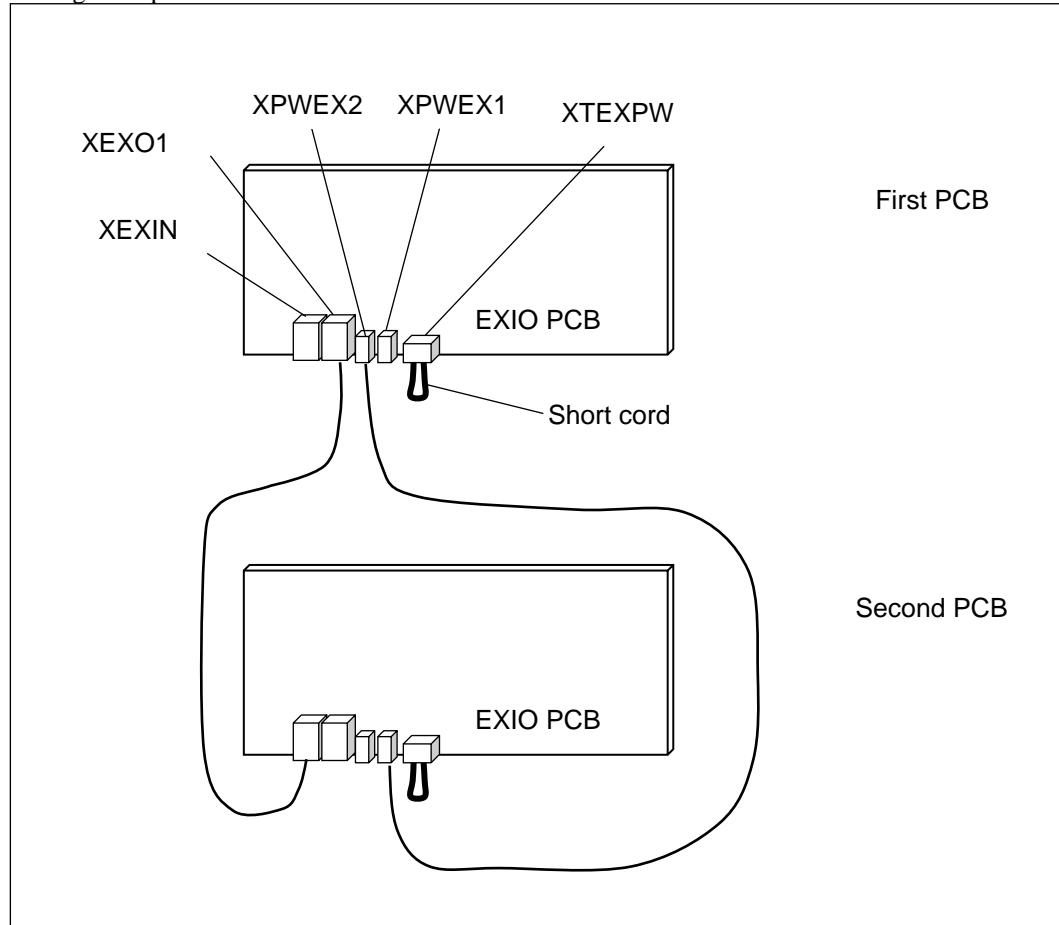
EXIO PCB connector	Connecting destination (connector)
XEXIN	XIOO2 on IO PCB XFCO1/XCMO1 on FC/CM PCB (When using an FC/CM PCB (Option))
XPWEX1	XEX24_1 on IO PCB

## Chapter 11 Options

### Wiring procedure when attaching and using multiple EXIO PCBs

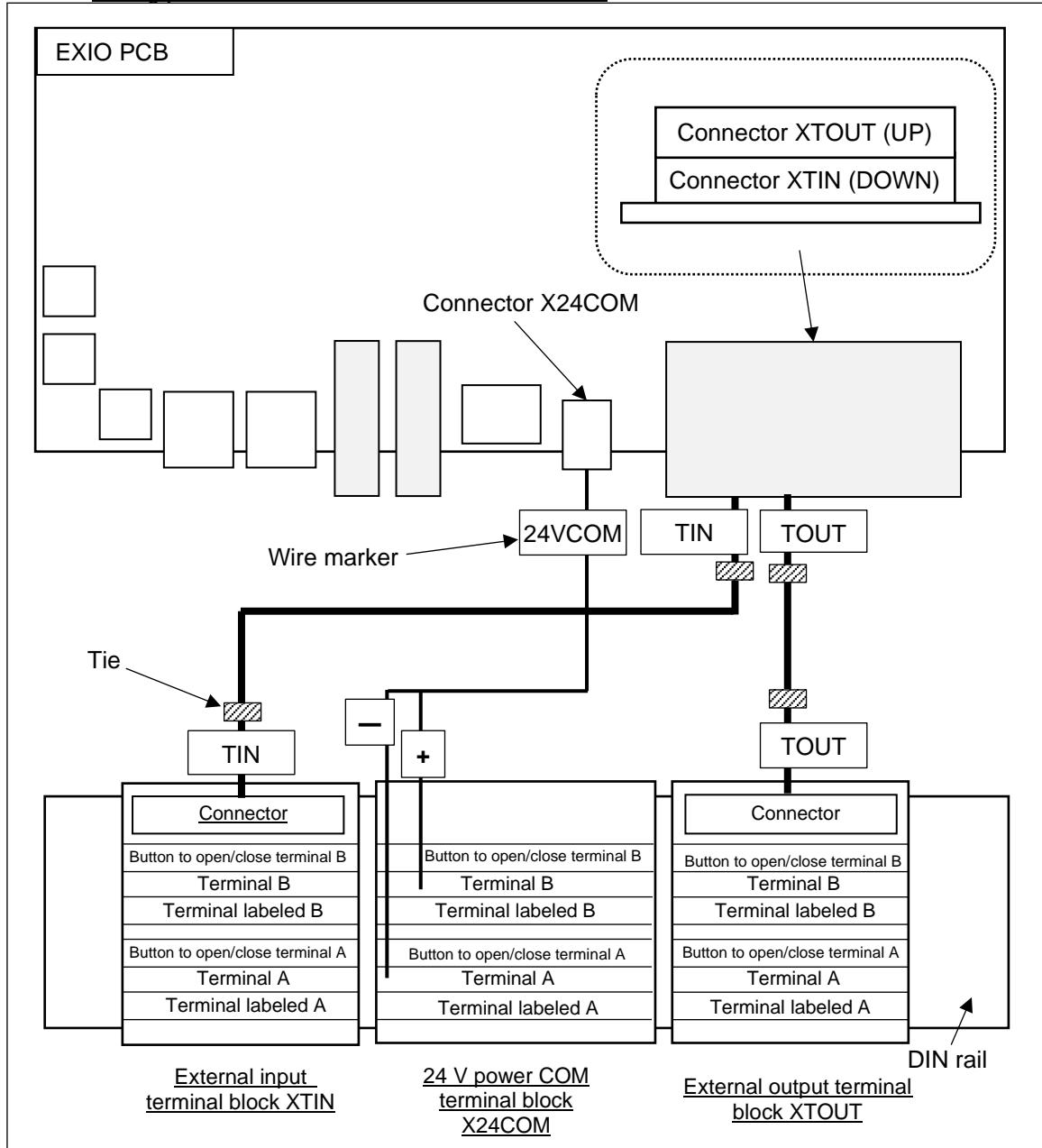
- (1) Connect the XPWEX2 connector on the first EXIO PCB and the XPWEX1 connector on the second EXIO PCB with the cable provided in the accessories.
- (2) Connect the XEXO1 connector on the first EXIO PCB and the XEXIN connector on the second EXIO PCB with the cable provided in the accessories.
- (3) Connect the third EXIO PCB or any EXIO PCBs thereafter in the same way.  
Make sure that the short cord is attached to the XTEXPW connector on each EXIO PCB.

#### Wiring example



EXIO PCB connector	Connecting destination (connector)
XPWEX2	Branches to: XPWEX1 on EXIO PCB
XTEXPW	Refer to "4. Switch power supplies".

## Wiring procedure for EXIO PCB and terminal blocks



- Connect the EXIO PCB connector XTOUT (UP) with the external output terminal block, connect the connector XTIN (DOWN) with the external input terminal block, and connect the connector X24COM with 24 V power COM terminal block.
- A rod terminal is used to connect to the terminal block X24COM. Check the wire marker on the cable, and connect the cable making sure that the plus and minus connections are not reversed.
- Use the silkscreen marks on the PCB, the wire markers on the cables and the labels on the terminal blocks when connecting. To prevent connection mistakes with XTIN (DOWN) and XTOUT (UP), match the colors on the marker for XTIN (DOWN) connector and the XTIN (DOWN) on the EXIO PCB, the cable tie color and the marker color on the terminal block connector. XTIN (DOWN) is blue, and XTOUT (UP) is green.

## 8 Using EXIO PCB and Terminal Blocks

The description below shows how to use the EXIO PCB and the terminal blocks XTIN, XTOUT and X24COM for the EXIO PCB.

- An extension PCB number can be assigned to the EXIO PCB.

The sampling cycle for the external I/O signal varies depending on the extension PCB number. Set the extension PCB number using the RSW1 (ones' place) and RSW2 (tens' place) on the PCB.

For example, when setting the station number to 21, set RSW1 to "1" and RSW2 to "2".

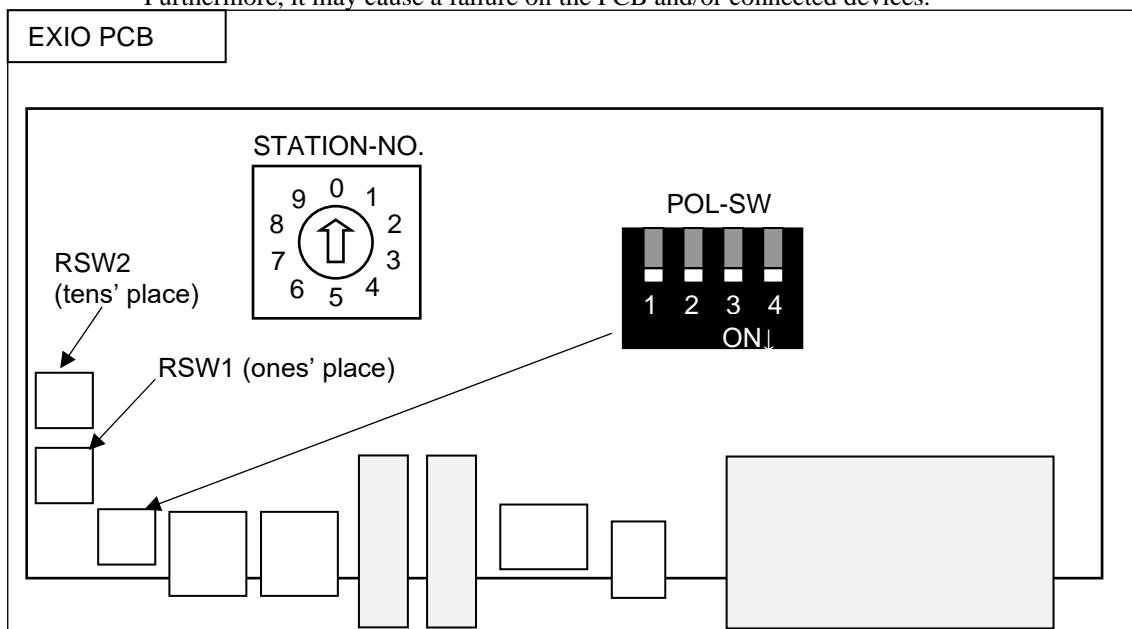
Extension PCB No.	Sampling cycle
1 to 2	2 msec
3 to 63	10 msec

- \*1 Always be sure to turn OFF the main power breaker when configuring the RSW1 and RSW2 settings. If the SW settings are changed while the power switch is ON, the setting change will not apply. Furthermore, it may cause a failure on the PCB and/or connected devices.
- \*2 When connecting to multiple EXIO PCBs, use different numbers to set each.

- The external input and external output used on the extension can be switched between sink (NPN) / source (PNP) by using the POL-SW setting on the EXIO PCB. Configure the settings to match the connecting device.

POL-SW No.	Description	ON setting	OFF setting
1	External input signal XTIE_0 to 15	Source (PNP)	Sink (NPN)
2	External input signal XTIE_16 to 31	Source (PNP)	Sink (NPN)
3	External input signal XTOE_100 to 115	Source (PNP)	Sink (NPN)
4	External input signal XTOE_116 to 131	Source (PNP)	Sink (NPN)

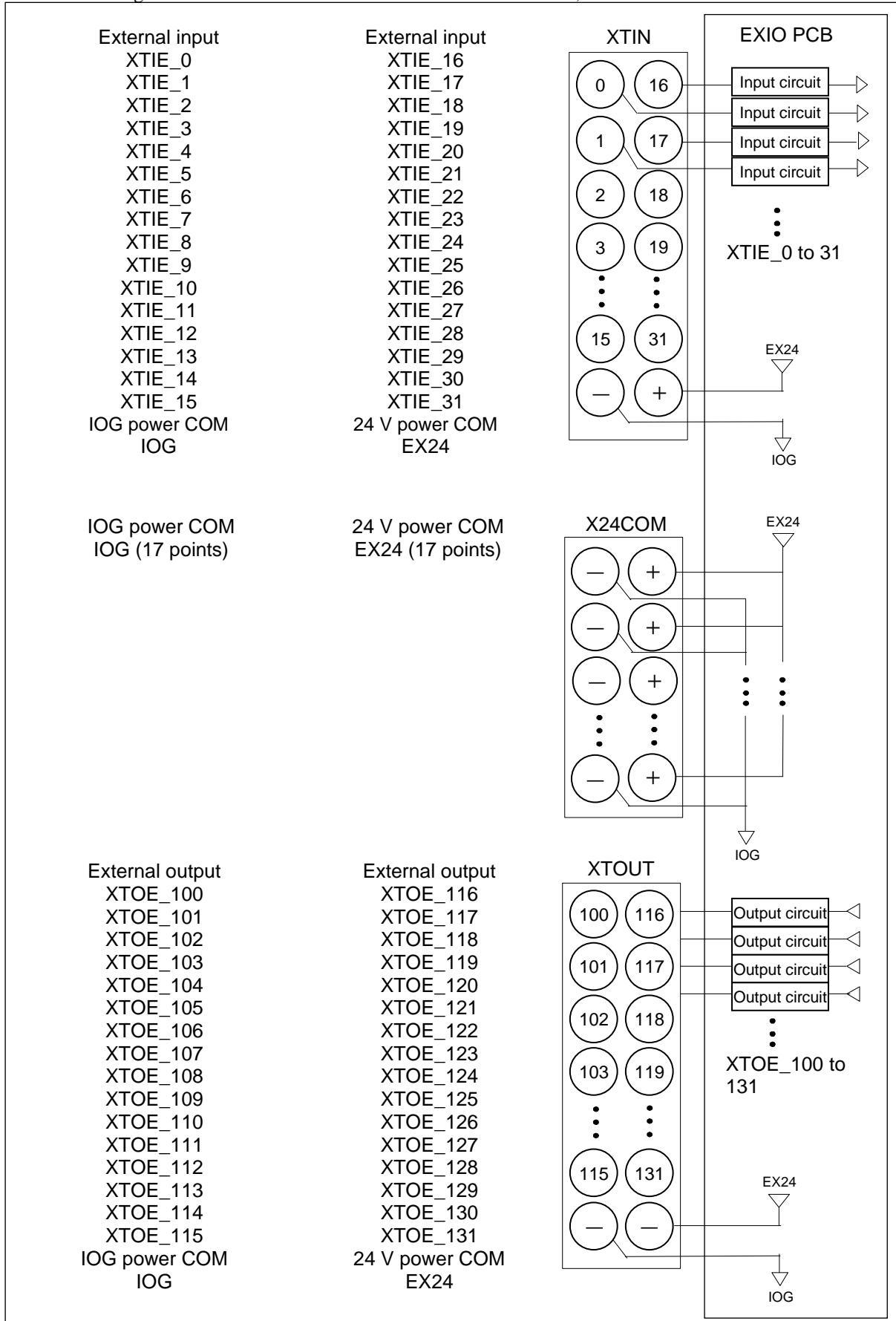
- \*1 All of the numbers are set to ON in the factory-default settings.
- \*2 Always be sure to turn OFF the main power breaker when configuring the POL-SW settings. If the SW settings are changed while the power is ON, the setting change will not apply. Furthermore, it may cause a failure on the PCB and/or connected devices.



Refer to "1.6 External I/O Signal" in the Data Bank & Alarm Manual for details about the signal assignment for the external input and external output on the extension.

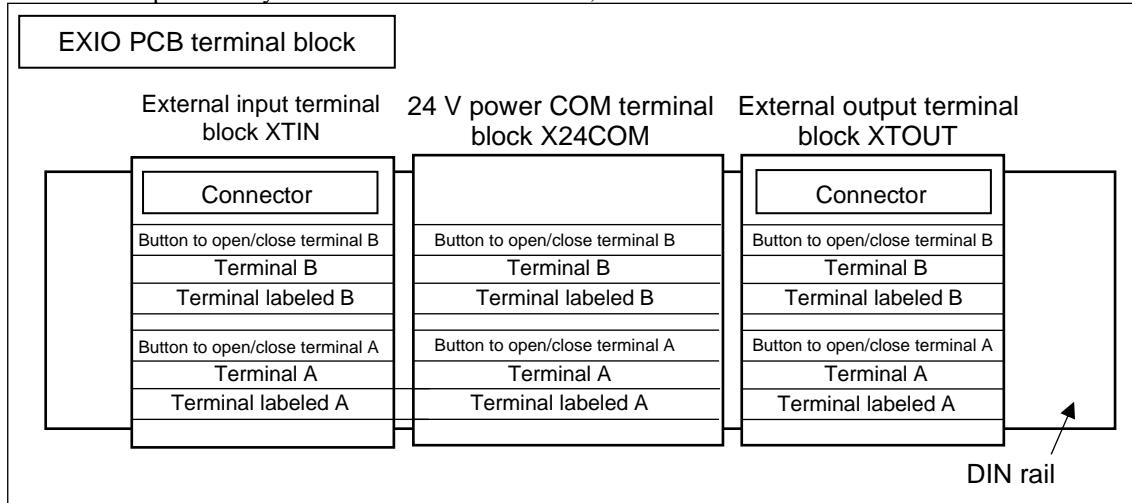
Refer to "6.2.4 Extension I/O" for details about checking the status of the extended external input and external output.

## Signal overview of EXIO PCB and terminal blocks XTIN, XTOUT and X24COM



## Chapter 11 Options

Description of layout for terminal blocks XTIN, XTOUT and X24COM



External input terminal block XTIN on EXIO PCB

Terminal labeled B	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	24V
Signal name	XTHE_16	XTHE_17	XTHE_18	XTHE_19	XTHE_20	XTHE_21	XTHE_22	XTHE_23	XTHE_24	XTHE_25	XTHE_26	XTHE_27	XTHE_28	XTHE_29	XTHE_30	XTHE_31	EX24
Terminal labeled A	XTIE_0	XTIE_1	XTIE_2	XTIE_3	XTIE_4	XTIE_5	XTIE_6	XTIE_7	XTIE_8	XTIE_9	XTIE_10	XTIE_11	XTIE_12	XTIE_13	XTIE_14	XTIE_15	IOG
Terminal signal name	XTIE_16	XTIE_17	XTIE_18	XTIE_19	XTIE_20	XTIE_21	XTIE_22	XTIE_23	XTIE_24	XTIE_25	XTIE_26	XTIE_27	XTIE_28	XTIE_29	XTIE_30	XTIE_31	EX24

24 V power COM terminal block X24COM on EXIO PCB

Terminal	*1	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Signal name	EX24 (17 points excluding *1)															
Terminal	*1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Signal name	IOG (17 points excluding *1)															

\*1 Use in the power supply from the EXIO PCB to the 24 V power COM terminal block.

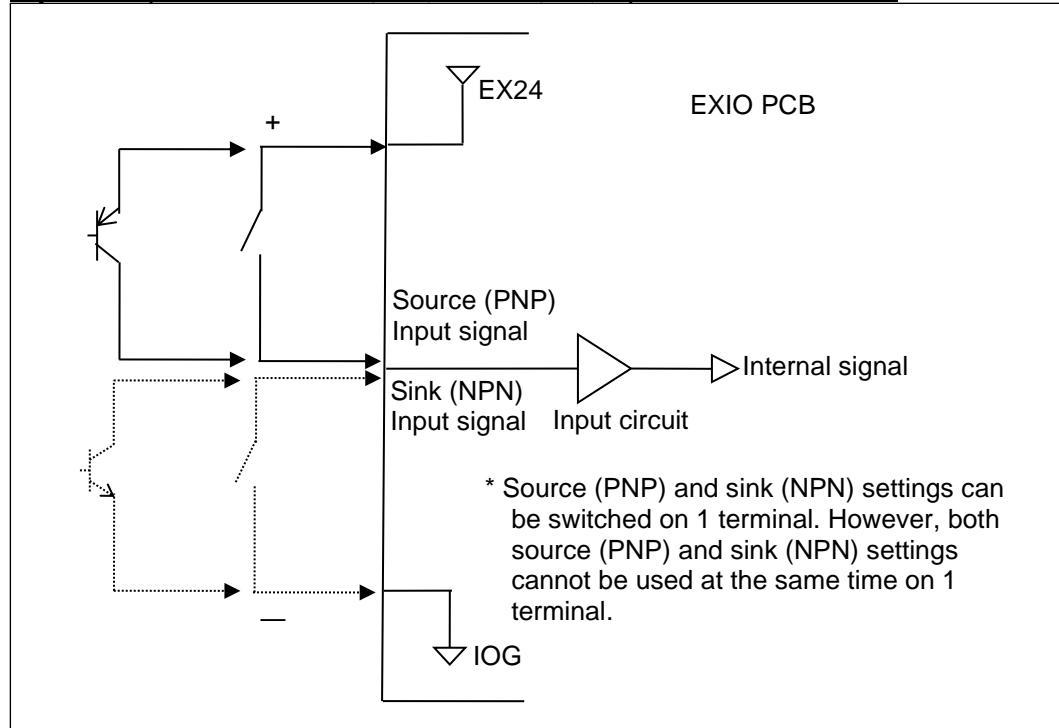
External output terminal block XTOUT on EXIO PCB

Terminal labeled B	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	24V
Signal name	XTOE_116	XTOE_117	XTOE_118	XTOE_119	XTOE_120	XTOE_121	XTOE_122	XTOE_123	XTOE_124	XTOE_125	XTOE_126	XTOE_127	XTOE_128	XTOE_129	XTOE_130	XTOE_131	EX24
Terminal labeled A	XTOE_100	XTOE_101	XTOE_102	XTOE_103	XTOE_104	XTOE_105	XTOE_106	XTOE_107	XTOE_108	XTOE_109	XTOE_110	XTOE_111	XTOE_112	XTOE_113	XTOE_114	XTOE_115	IOG
Signal name	XTOE_100	XTOE_101	XTOE_102	XTOE_103	XTOE_104	XTOE_105	XTOE_106	XTOE_107	XTOE_108	XTOE_109	XTOE_110	XTOE_111	XTOE_112	XTOE_113	XTOE_114	XTOE_115	IOG

## Signal description for terminal blocks XTIN, XTOUT and X24COM

Terminal block	Signal name	Symbol	EXIO PCB								Function	
			Contact a	Contact b	Enabling mode							
					Manual	MDI	Memory	Edit *1				
XTIN	External input	XTIE_0 to 31	○	-	○	○	○	○	Signal is used with the free mapping input signal terminal block. Free mapping refers to a terminal where the NC's internal function signals for the operation panel can be assigned freely. The default signals are each assigned at the factory. Refer to "1.6 External I/O signals" in the Data Bank & Alarm Manual for further details.			
	24 V power COM	EX24	-	-	○	○	○	○	This COM terminal is the + power(24 V) for the DC 24 V on the EXIO PCB. Use this signal for the 24 V power supply of a given I/O device. Strictly follow a 300 mA (maximum) output current.			
	IOG power COM	IOG	-	-	○	○	○	○	This COM terminal is the GND (0 V) for the DC 24 V on the EXIO PCB. Use this signal for the GND power supply of a given I/O device. Strictly follow a 300 mA (maximum) output current.			
XTOUT	External output	XTOE_100 to 131	○	-	○	○	○	○	Signal is used with the free mapping input signal terminal block. Free mapping refers to a terminal where the NC's internal function signals for the operation panel can be assigned freely. The default signals are each assigned at the factory. Refer to "1.6 External I/O signals" in the Data Bank & Alarm Manual for further details.			
	24 V power COM	EX24	-	-	○	○	○	○	This COM terminal is the + power (24 V) for the DC 24 V on the EXIO PCB. Use this signal for the 24 V power supply of a given I/O device. Strictly follow a 300 mA (maximum) output current.			
	IOG power COM	IOG	-	-	○	○	○	○	This COM terminal is the GND (0 V) for the DC 24 V on the EXIO PCB. Use this signal for the GND power supply of a given I/O device. Strictly follow a 300 mA (maximum) output current.			
X24COM	24 V power COM	EX24 (17 points)	-	-	○	○	○	○	This COM terminal is the + power (24 V) for the DC 24 V on the EXIO PCB. Use this signal for the 24 V power supply of a given I/O device.			
	IOG power COM	IOG (17 points)	-	-	○	○	○	○	This COM terminal is the GND (0 V) for the DC 24 V on the EXIO PCB. Use this signal for the GND power supply of a given I/O device.			

Layout and special notes on sink (NPN) / source (PNP) input circuit on EXIO PCB

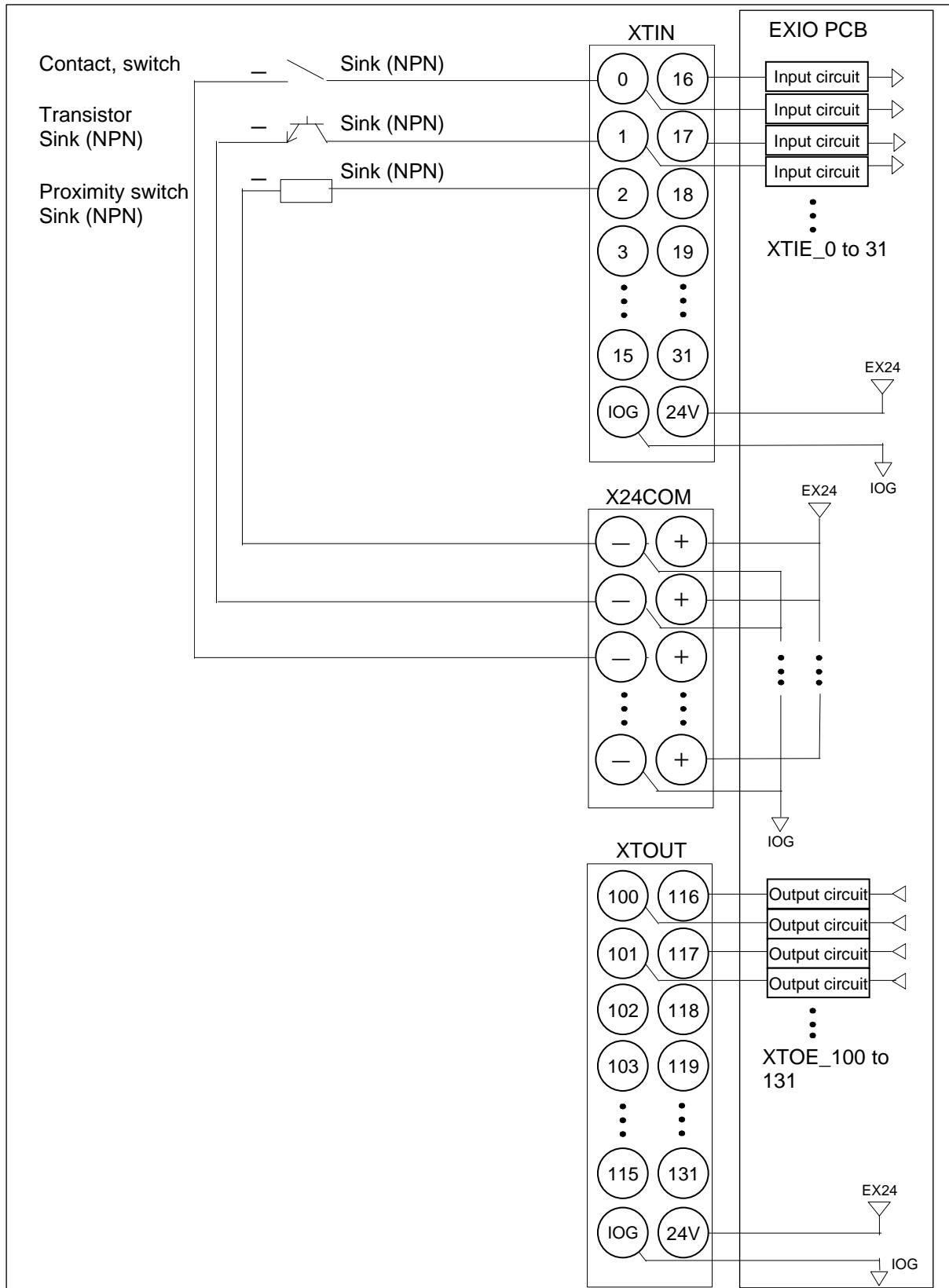


1. The input current is DC 24 V 5 mA. Use a connecting device that complies with this weak current value.  
The input filter time constant is 1 msec (standard). (CR filter only)
2. When using the sink (NPN) setting, connect the contact input and NPN open collector transistor to the input circuit. When using the source (PNP) setting, connect the contact input and PNP open collector transistor.
3. Make sure that the leakage current is 1.3 mA or less when the two wire type proximity switch is turned OFF.
4. Use “+” and “-” on X24COM for the power supply of the I/O device.
5. When pulling the power for an I/O device directly from an external power supply, use measures on the power line such as an overcurrent protection element. Refer to “4 Switch Power Supplies” to connect the external supply to EXIO PCB.
6. Do not connect an external power supply directly to the terminal blocks XTIN, XTOUT and X24COM. Otherwise, it may cause a failure on the PCB and/or connected devices.
7. A connection example is shown below.

Connection example of sink (NPN) input setting

- The following is a description on the connection example for the external input on the EXIO PCB.
- Turn the settings OFF for POL-SW No. 1 and 2 on the EXIO PCB to match a given terminal that is connected to a device.

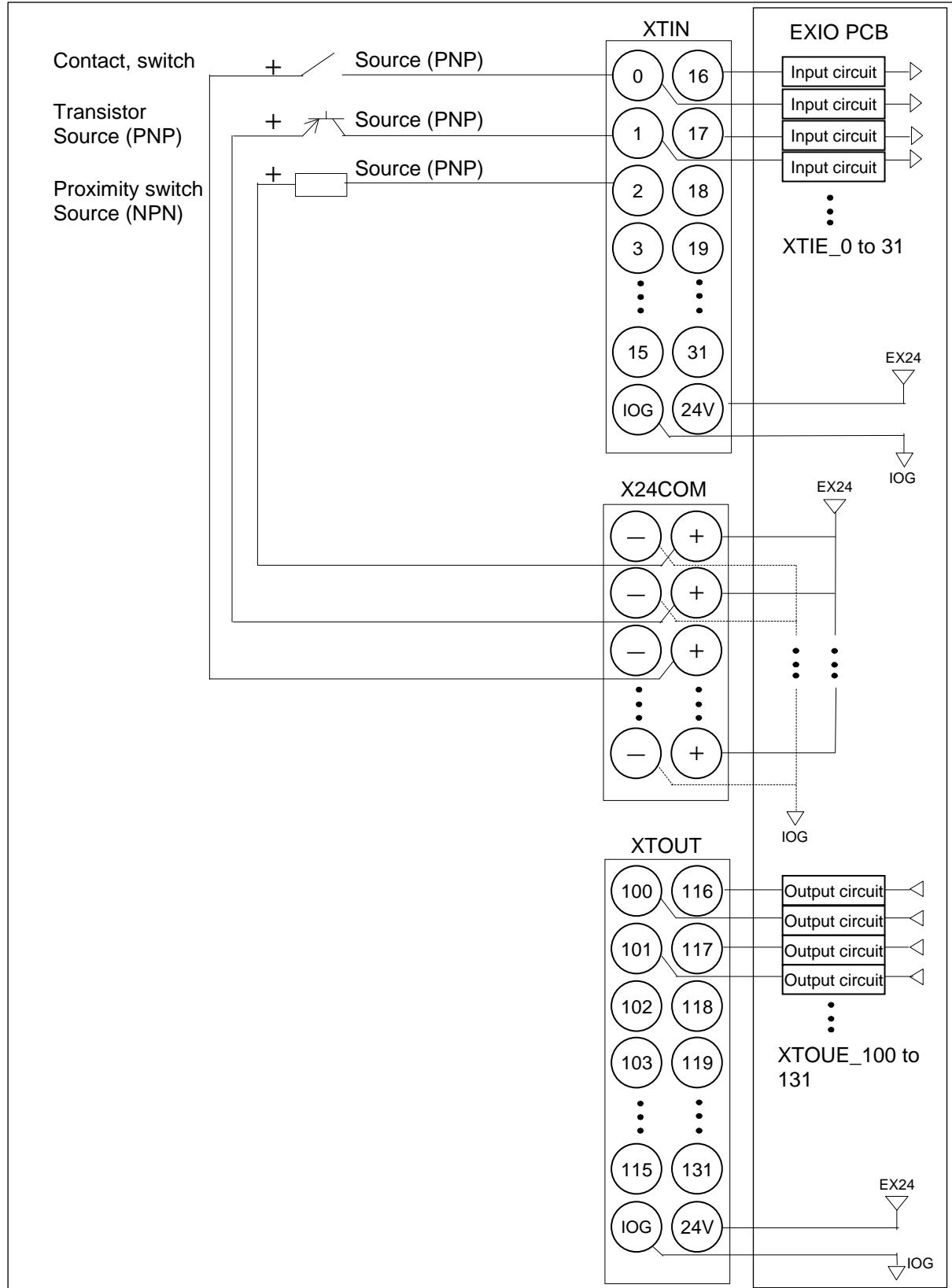
POL-SW No.	Description	ON setting	OFF setting
1	External input signal XTIE_0 to 15	Source (PNP)	Sink (NPN)
2	External input signal XTIE_16 to 31	Source (PNP)	Sink (NPN)



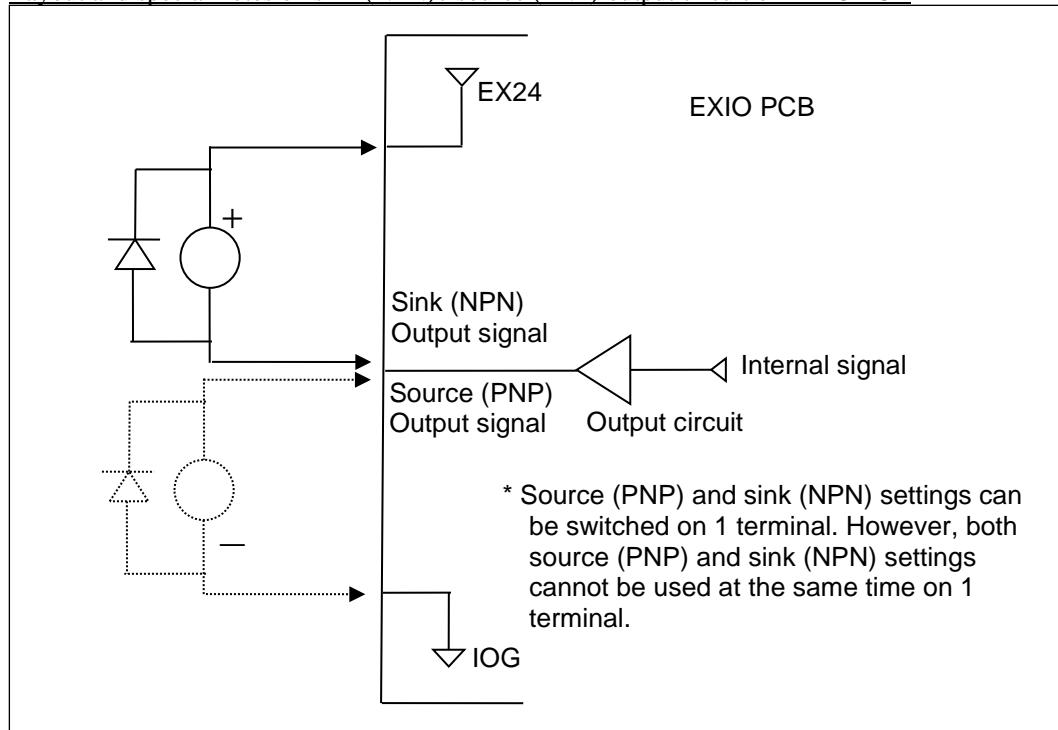
### Connection example of source (PNP) input setting

- The following is a description on the connection example for the external input on the EXIO PCB.
- Turn the settings ON for POL-SW No. 1 and 2 on the EXIO PCB to match a given terminal that is connected to a device.

POL-SW No.	Description	ON setting	OFF setting
1	External input signal XTIN_0 to 15	Source (PNP)	Sink (NPN)
2	External input signal XTIN_16 to 31	Source (PNP)	Sink (NPN)



## Layout and special notes on sink (NPN) / source (PNP) output circuit on EXIO PCB

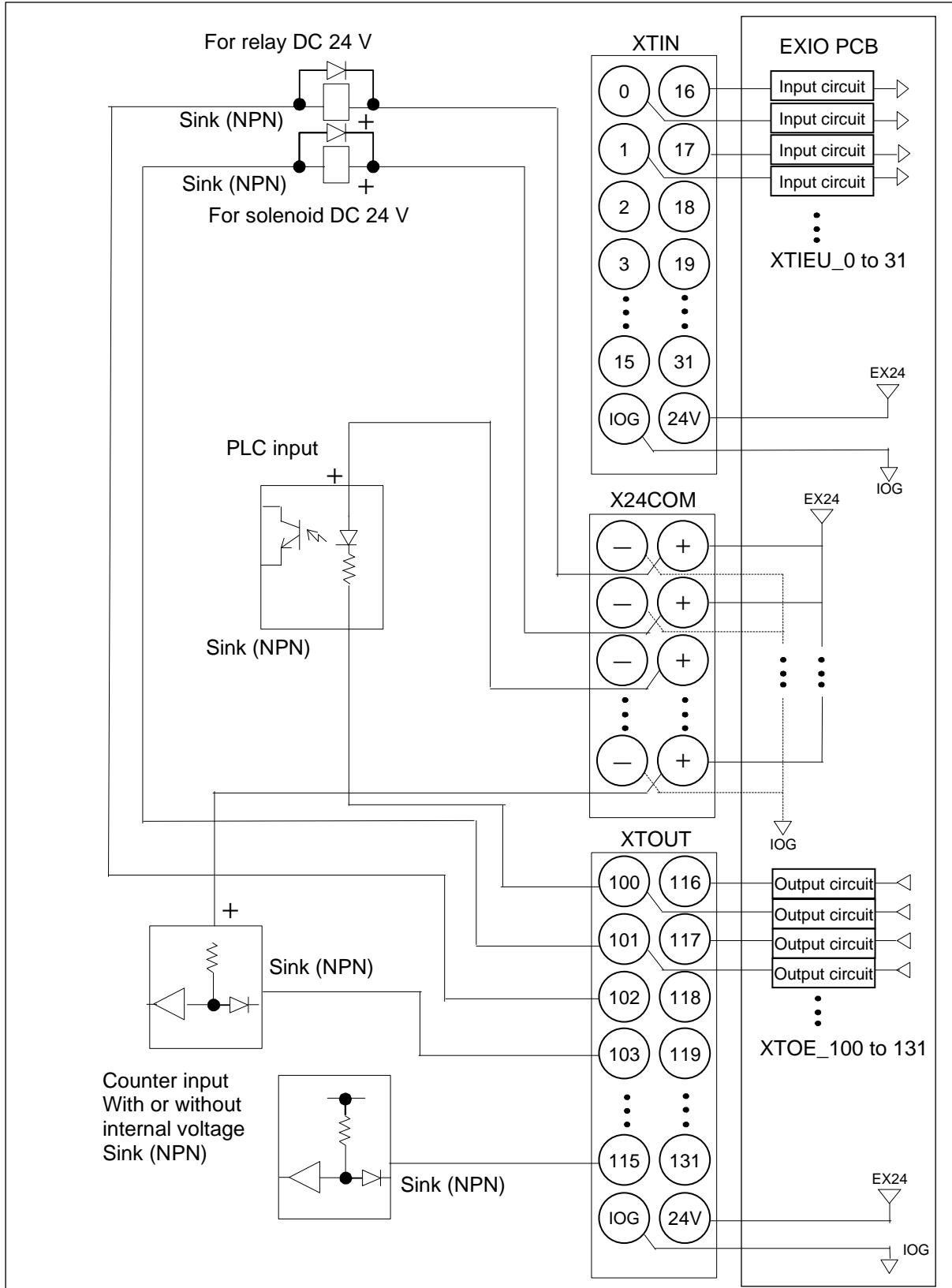


1. The output terminal voltage is DC 24 V. When using the internal power supply, be absolutely sure to use an output current of 300 mA (maximum) per contact for the external output, 24 V power COM and the IOG power COM and a total output current of 500 mA for all ports.
2. If connecting an inductive load to the output circuit, connect a flyback diode nearest to the load.
3. When using the sink (NPN) setting, do not connect a +24 V directly to the terminal for the external output. When using the source (PNP) setting, do not connect a 0 V directly to the terminal for the external output. Otherwise, it can short-circuit and damage the PCB.
4. Use “+” and “-” on X24COM for the power supply of the connecting device.
5. When pulling the power for a connecting device directly from an external power supply, use measures on the power line such as an overcurrent protection element. Refer to “4 Switch Power Supplies” to connect the external supply to EXIO PCB.
6. Do not connect an external power supply directly to the terminal blocks XTIN, XTOUT and X24COM. Otherwise, it may cause a failure on the PCB and/or connected devices.
7. Connect the FG line for the connecting device, to the tap for the FG connection close to the EXIO PCB.
8. Be absolutely sure that the inrush current that occurs simultaneously for the connected equipment is 10 A 20 µs or less.
9. A connection example is shown below.

### Connection example of sink (NPN) output setting

- The following is a description on the connection example for the external output on the EXIO PCB.
- Turn the settings OFF for POL-SW No. 3 and 4 on the EXIO PCB to match a given terminal that is connected to a device.

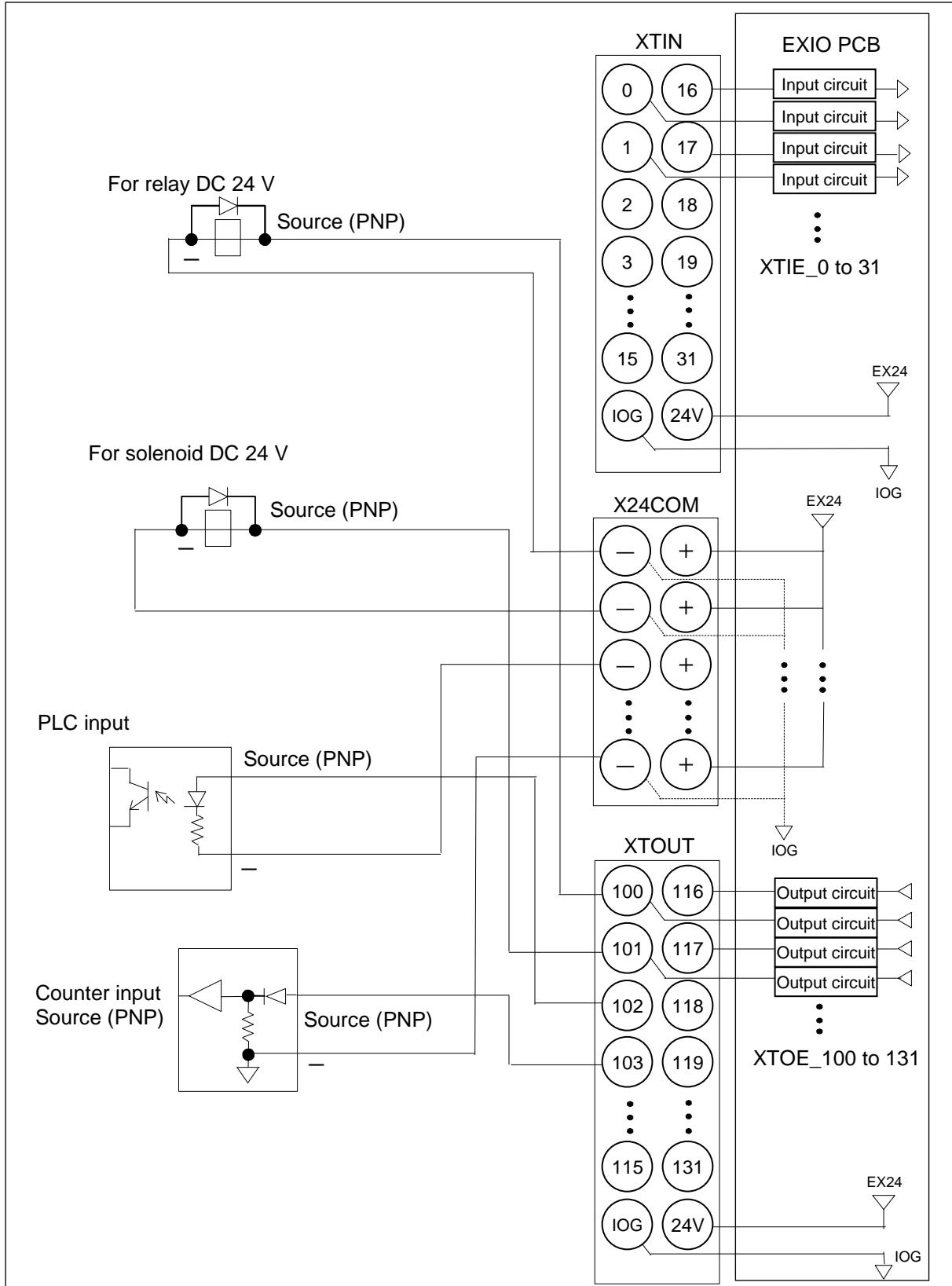
POL-SW No.	Description	ON setting	OFF setting
3	External input signal XTOE_100 to 115	Source (PNP)	Sink (NPN)
4	External input signal XTOE_116 to 131	Source (PNP)	Sink (NPN)



Connection example of source (PNP) output setting

- The following is a description on the connection example for the external output on the EXIO PCB.
- Turn the settings ON for POL-SW No. 3 and 4 on the EXIO PCB to match a given terminal that is connected to a device.

POL-SW No.	Description	ON setting	OFF setting
3	External input signal XTOE_100 to 115	Source (PNP)	Sink (NPN)
4	External input signal XTOE_116 to 131	Source (PNP)	Sink (NPN)



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# CHAPTER 11 (17)

## RS-232C CABLE

- 1 Handling Precautions
- 2 Functions
- 3 External View
- 4 Specifications
- 5 Wiring

# 1 Handling Precautions

## WARNING

High-voltage components are present inside the control box. There is risk of electric shock if you touch these components by mistake.

### [SAFETY INSTRUCTIONS]

Maintenance and inspection of electrical components must only be carried out by a qualified electrician who is trained in electrical safety and who has thorough knowledge of the electronic circuits in this machine.

Turn OFF the main power breaker, and then wait at least 20 minutes before carrying out work.

Attach a padlock to the main power breaker so that the power cannot be turned ON.

A sign or notice should be placed near the operation panel to warn others that work is in progress.

If leaving the machine unattended, close the control box and secure it with screws.

## WARNING

If the control box or operation panel is touched accidentally with wet hands while performing installation or maintenance, an electric shock or short-circuit may cause a fire.

### [SAFETY INSTRUCTIONS]

Do not touch the control box and the operation panel with wet hands.

The cover to the control box must be closed while the machine is operating.

The control box and the operation panel must be kept free of coolant, water, chips and shavings.

## WARNING

If terminal connections on the PCBs or terminal block screws become loose, poor contacts may cause overheating or a fire.

### [SAFETY INSTRUCTIONS]

There should be no loose screws when connecting the wiring.

Do not replace fuses and electrical parts that have been soldered to the inside of the unit.

## WARNING

If you touch cables which have been crushed or damaged by heavy objects, there is risk of electric shock.

In addition, short-circuits may occur if cables are crushed or damaged by heavy objects.

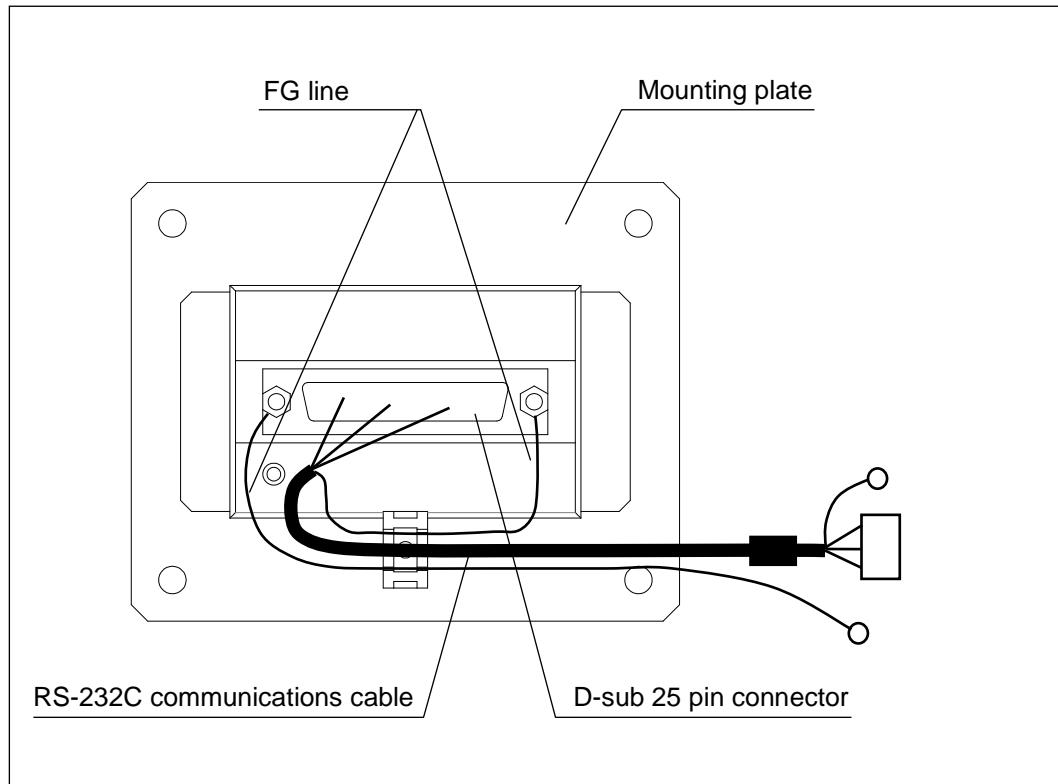
### [SAFETY INSTRUCTIONS]

Cables should be gathered up or arranged to prevent them from being crushed. If a cable has become damaged, it must be replaced with a new one.

## 2 Functions

The RS-232C can be connected to a D-sub 25 pin connection using a cable assembly.

## 3 External View

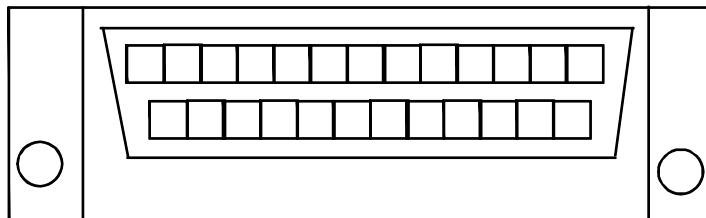


# 4 Specifications

Serial interface specification

1. Communication mode
  - RS-232C
  - Asynchronous system
  - Control line and control cord methods (changes depending on the parameter)
2. Connection procedure

Connector  
D-Sub 25 female



Cable side D-Sub 25 male

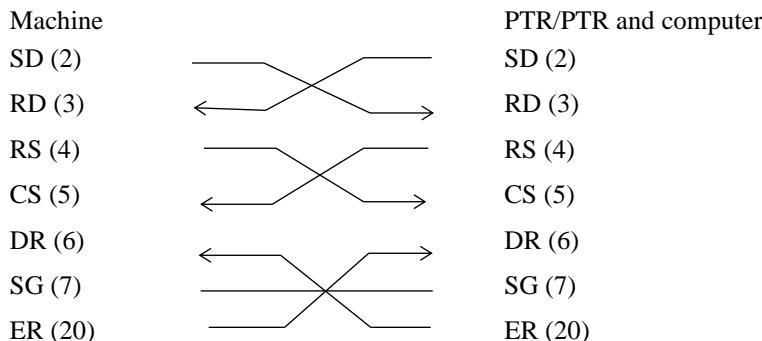
(Pin assignment)

Pin No.	Signal	Signal direction	Notes
2	SD	→	Send data
3	RD	←	Receive data
4	RS	→	Send request
5	CS	←	Send OK
6	DR	←	Data set ready
7	SG		Signal ground
20	ER	→	Data terminal ready
25	DC12V		DC12V 500mA max

→ refers to the output from the machine, and ← refers to the input to the machine.

- \* If the DC 12 V for the 25 pin is not used correctly, it can damage the connecting device.  
Do not use if it does not meet the specifications.

Signal cable connection example:

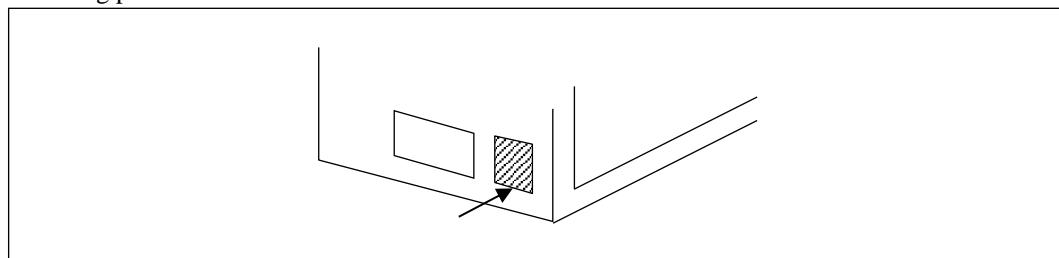


- \* Other signal connection combinations are also possible.  
Take into consideration the signal method being used and the connecting external device, etc., when connecting.
- \* Use a shielded cable.

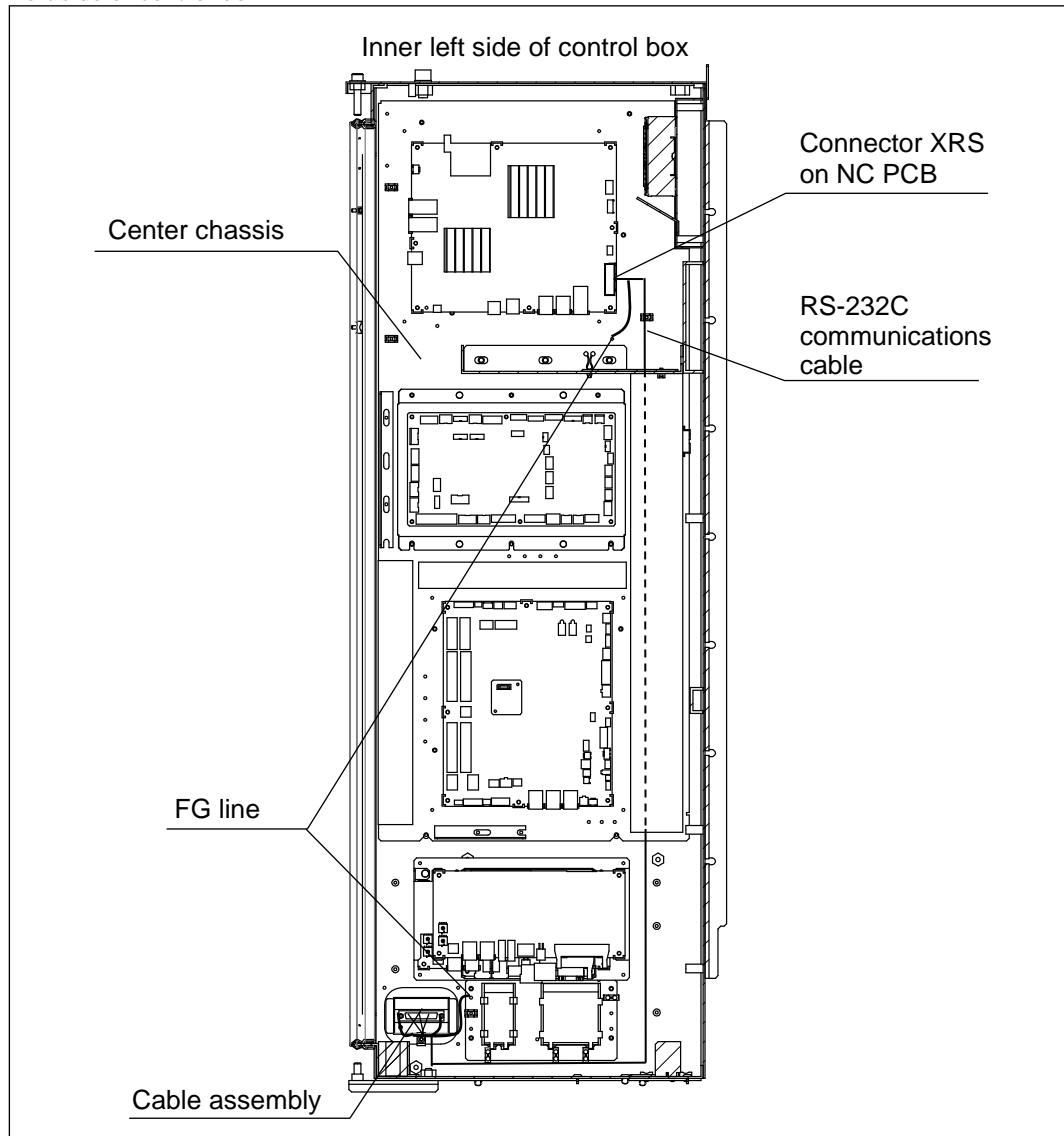
## 5 Wiring

1. Turn OFF the main power breaker.
2. Remove the cover from the left side of the control box when looking from the control box door.
3. Pull the cables for the cable assembly through the left side of the control box from the outside. Then, secure the mounting plate which is attached to the cable assembly to the outside of the control box with the screws. At this time, attach the mounting plate so that the stud weld faces down.
4. Connect the cable assembly FG line to the tap hole on the center chassis.
5. Connect the RS-232C communication cable for the cable assembly to the XRS connector on the NC PCB.

Mounting plate location



Left side of control box



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# CHAPTER 11 (18)

## SPINDLE OVERRIDE

- 1 Handling Precautions
- 2 Functions
- 3 External View
- 4 Installation Procedure
- 5 Connection Check

# 1 Handling Precautions

## WARNING

High-voltage components are present inside the control box. There is risk of electric shock if you touch these components by mistake.

### [SAFETY INSTRUCTIONS]

Maintenance and inspection of electrical components must only be carried out by a qualified electrician who is trained in electrical safety and who has thorough knowledge of the electronic circuits in this machine.

Turn OFF the main power breaker, and then wait at least 20 minutes before carrying out work.

Attach a padlock to the main power breaker so that the power cannot be turned ON.

A sign or notice should be placed near the operation panel to warn others that work is in progress.

If leaving the machine unattended, close the control box and secure it with screws.

## WARNING

If the control box or operation panel is touched accidentally with wet hands while performing installation or maintenance, an electric shock or short-circuit may cause a fire.

### [SAFETY INSTRUCTIONS]

Do not touch the control box and the operation panel with wet hands.

The cover to the control box must be closed while the machine is operating.

The control box and the operation panel must be kept free of coolant, water, chips and shavings.

## WARNING

If terminal connections on the PCBs or terminal block screws become loose, poor contacts may cause overheating or a fire.

### [SAFETY INSTRUCTIONS]

There should be no loose screws when connecting the wiring.

Do not replace fuses and electrical parts that have been soldered to the inside of the unit.

## WARNING

If you touch cables which have been crushed or damaged by heavy objects, there is risk of electric shock.

In addition, short-circuits may occur if cables are crushed or damaged by heavy objects.

### [SAFETY INSTRUCTIONS]

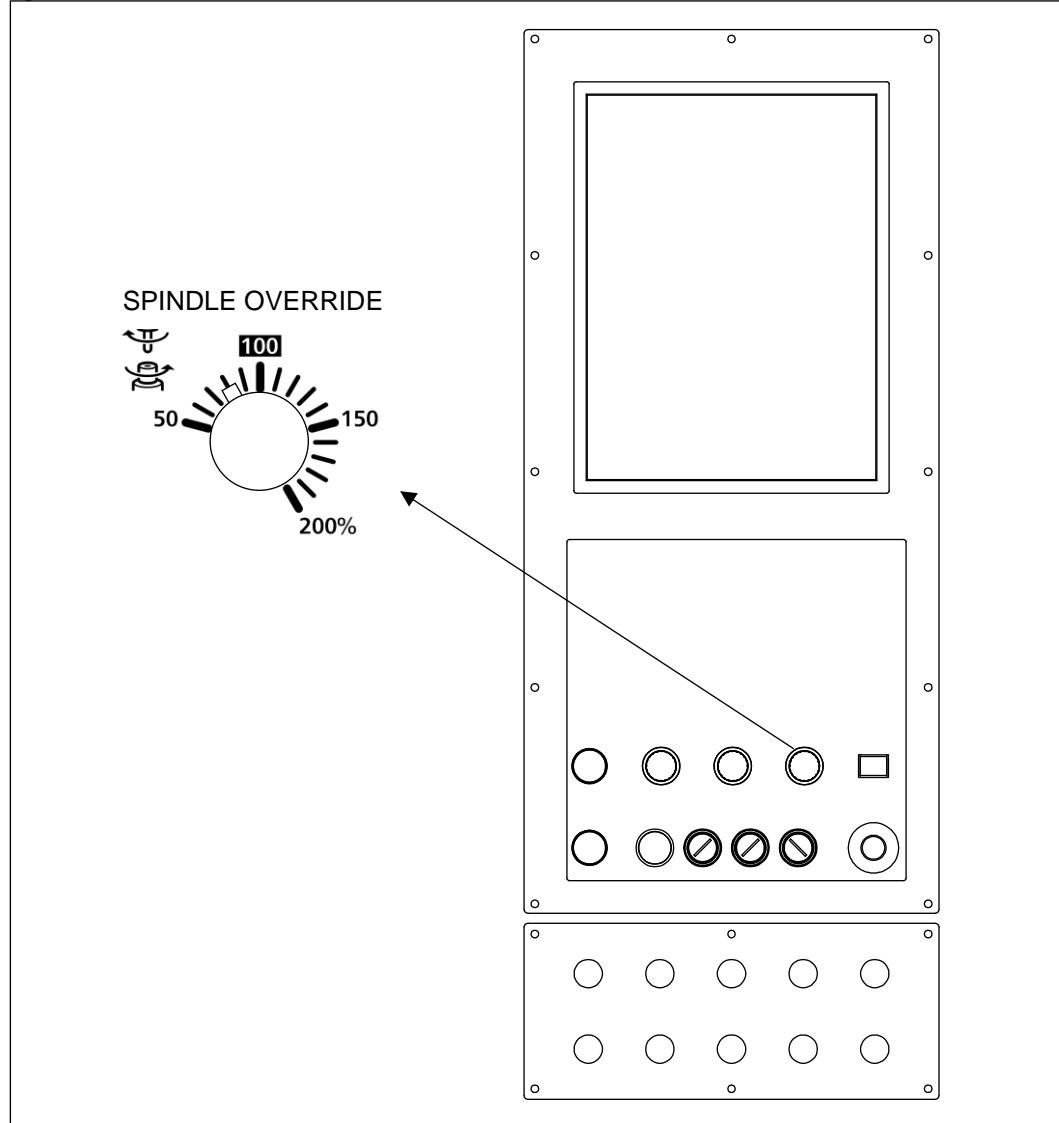
Cables should be gathered up or arranged to prevent them from being crushed. If a cable has become damaged, it must be replaced with a new one.

## 2 Functions

The spindle override allows the spindle speed to be changed without changing the program.

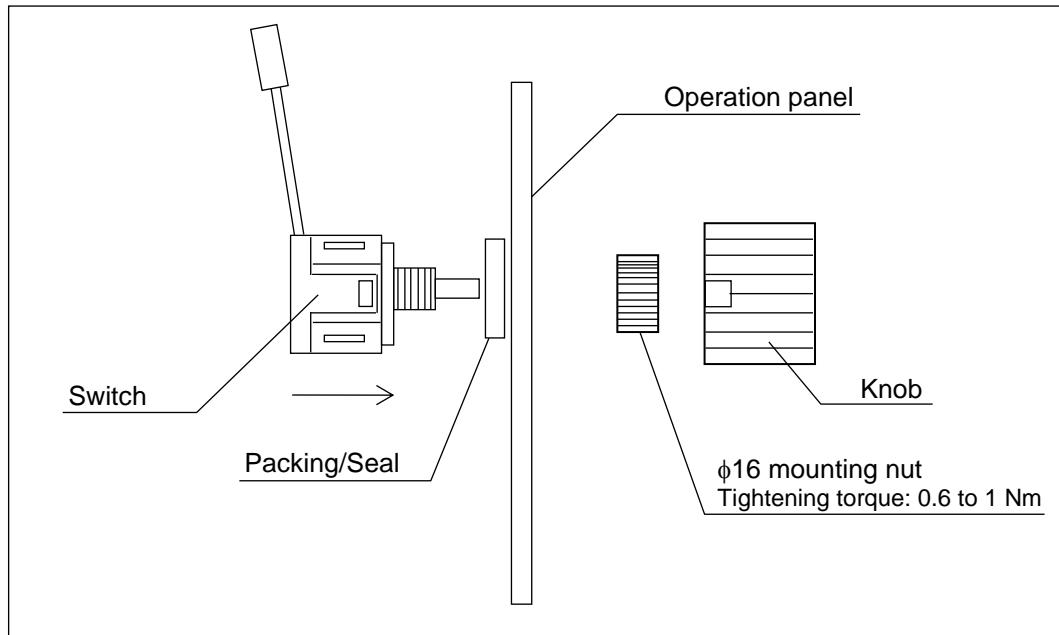
## 3 External View

Spindle override SW

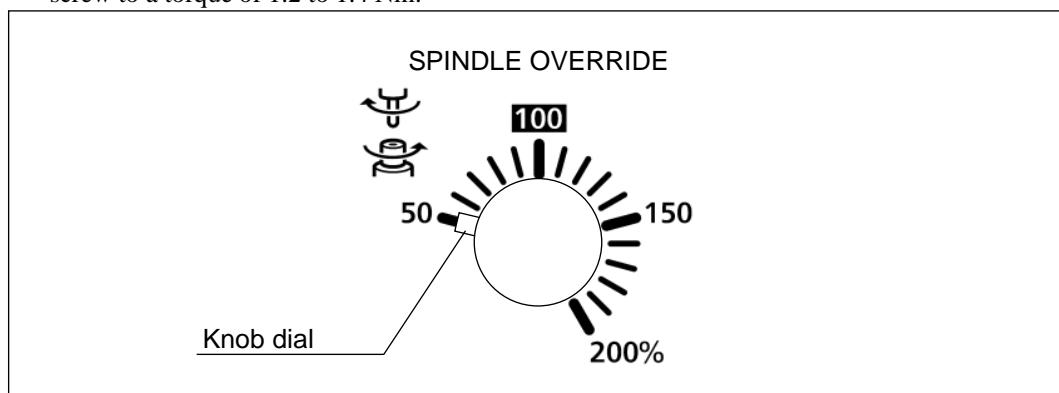


## 4 Installation Procedure

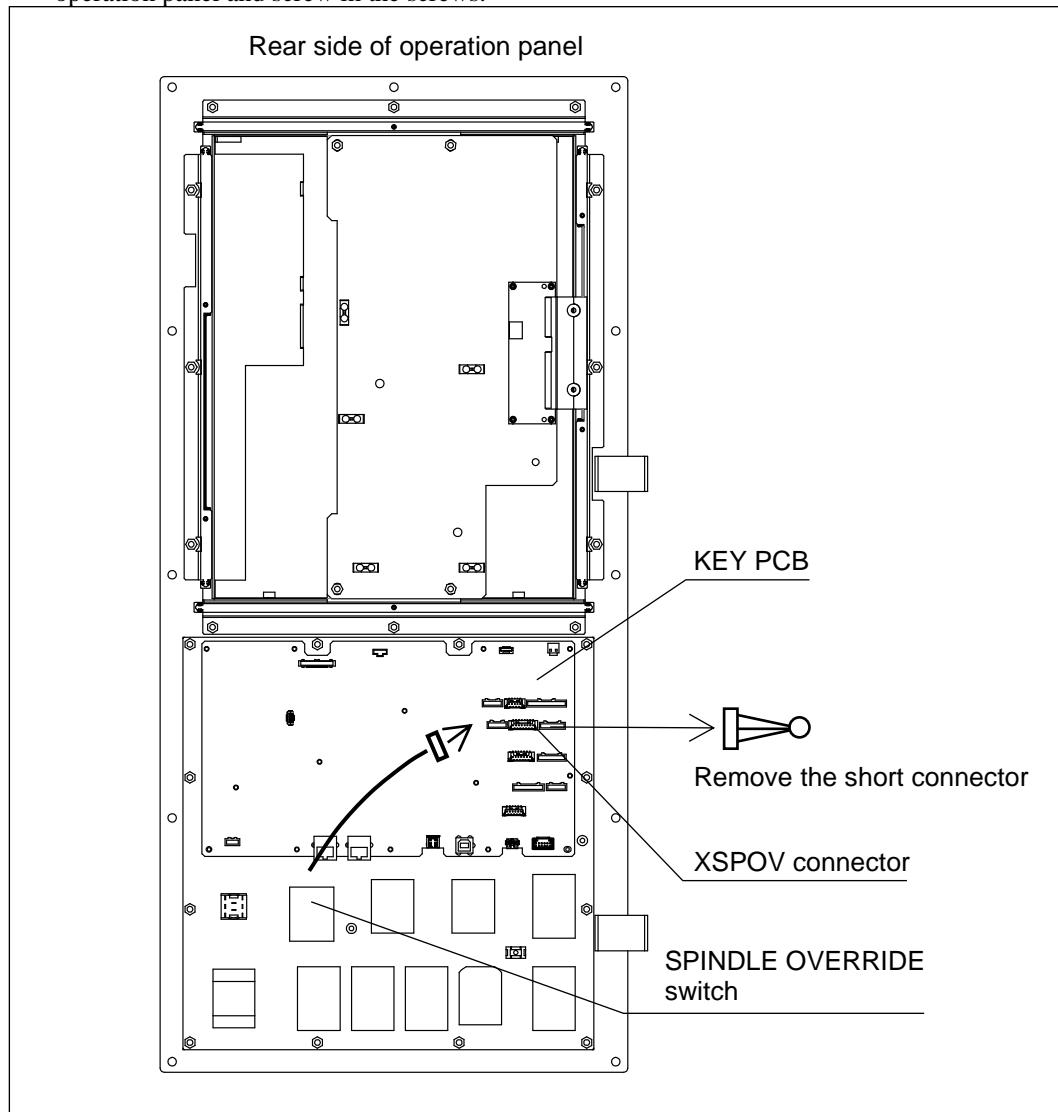
1. Turn OFF the power switch on the operation panel, and then turn OFF the main power breaker for the control box.
2. Remove the screws that secure the operation panel, and install the switch to the operation panel as shown in the diagram below. Tighten the mounting nuts to a torque of between 0.6 and 1 Nm.



3. Attach the knob to the switch with the setting screw, turning it counterclockwise all the way. Next, loosen the setting screw for the knob, and set the dial on the knob to the 50% mark. Then, fasten the setting screw for the knob while it is in that position. Tighten the setting screw to a torque of 1.2 to 1.4 Nm.

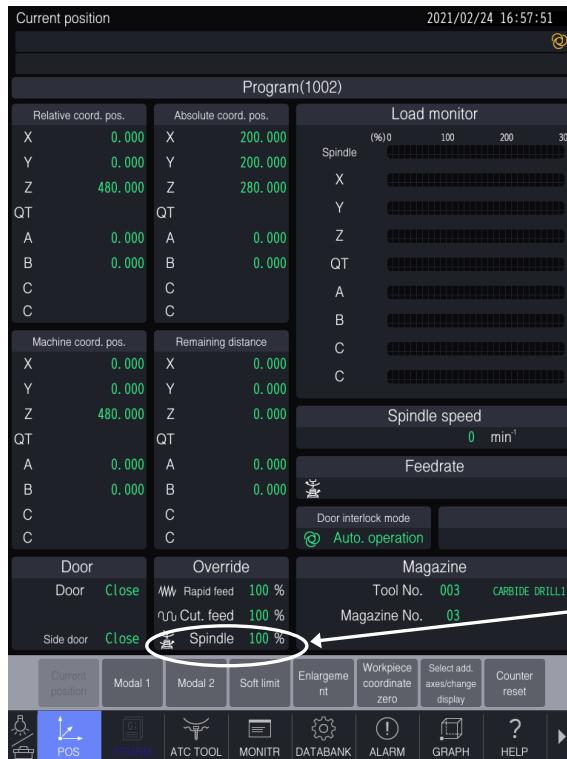


4. Remove the short connector that is attached to the XSPOV connector on the KEY PCB, and attach the connector for the SPINDLE OVERRIDE switch. After connecting it, close the operation panel and screw in the screws.



# 5 Connection Check

1. Turn OFF the power to the machine.
2. Press the [POS] key.
3. Change the SPINDLE OVERRIDE switch to a setting between 50% and 200%. Then, make sure that the display for the SPINDLE OVERRIDE on the current position screen is correct.



SPINDLE OVERRIDE  
display

## CHAPTER 11 (19)

### POWER SUPPLY EXPANSION ASSEMBLY

- 1 Handling Precautions
- 2 Function
- 3 External View
- 4 Block Diagram
- 5 Wiring

# 1 Handling Precautions

## **⚠ WARNING**

High-voltage components are present inside the control box. There is risk of electric shock if you touch these components by mistake.

### [SAFETY INSTRUCTIONS]

Maintenance and inspection of electrical components must only be carried out by a qualified electrician who is trained in electrical safety and who has thorough knowledge of the electronic circuits in this machine.

Turn OFF the main power breaker, and then wait at least 20 minutes before carrying out work.

Attach a padlock to the main power breaker so that the power cannot be turned ON.

A sign or notice should be placed near the operation panel to warn others that work is in progress.

If leaving the machine unattended, close the control box and secure it with screws.

## **⚠ WARNING**

If the power supply is not grounded, there is risk of electric shock because the leakage current breaker will not operate.

### [SAFETY INSTRUCTIONS]

Connect the ground according to the specified method.

The PE line for the power line is longer than the other lines (L1, L2 and L3), and therefore, all of the slack should be taken up when the line is connected.

## **⚠ WARNING**

If the control box or operation panel is touched accidentally with wet hands while performing installation or maintenance, an electric shock or short-circuit may cause a fire.

### [SAFETY INSTRUCTIONS]

Do not touch the control box and the operation panel with wet hands.

The cover to the control box must be closed while the machine is operating.

The control box and the operation panel must be kept free of coolant, water, chips and shavings.

## **⚠ WARNING**

If terminal connections on the PCBs or terminal block screws become loose, poor contacts may cause overheating or a fire.

### [SAFETY INSTRUCTIONS]

There should be no loose screws when connecting the wiring.

Do not replace fuses and electrical parts that have been soldered to the inside of the unit.

**⚠ WARNING**

If you touch cables which have been crushed or damaged by heavy objects, there is risk of electric shock.

In addition, short-circuits may occur if cables are crushed or damaged by heavy objects.

**[SAFETY INSTRUCTIONS]**

Cables should be gathered up or arranged to prevent them from being crushed. If a cable has become damaged, it must be replaced with a new one.

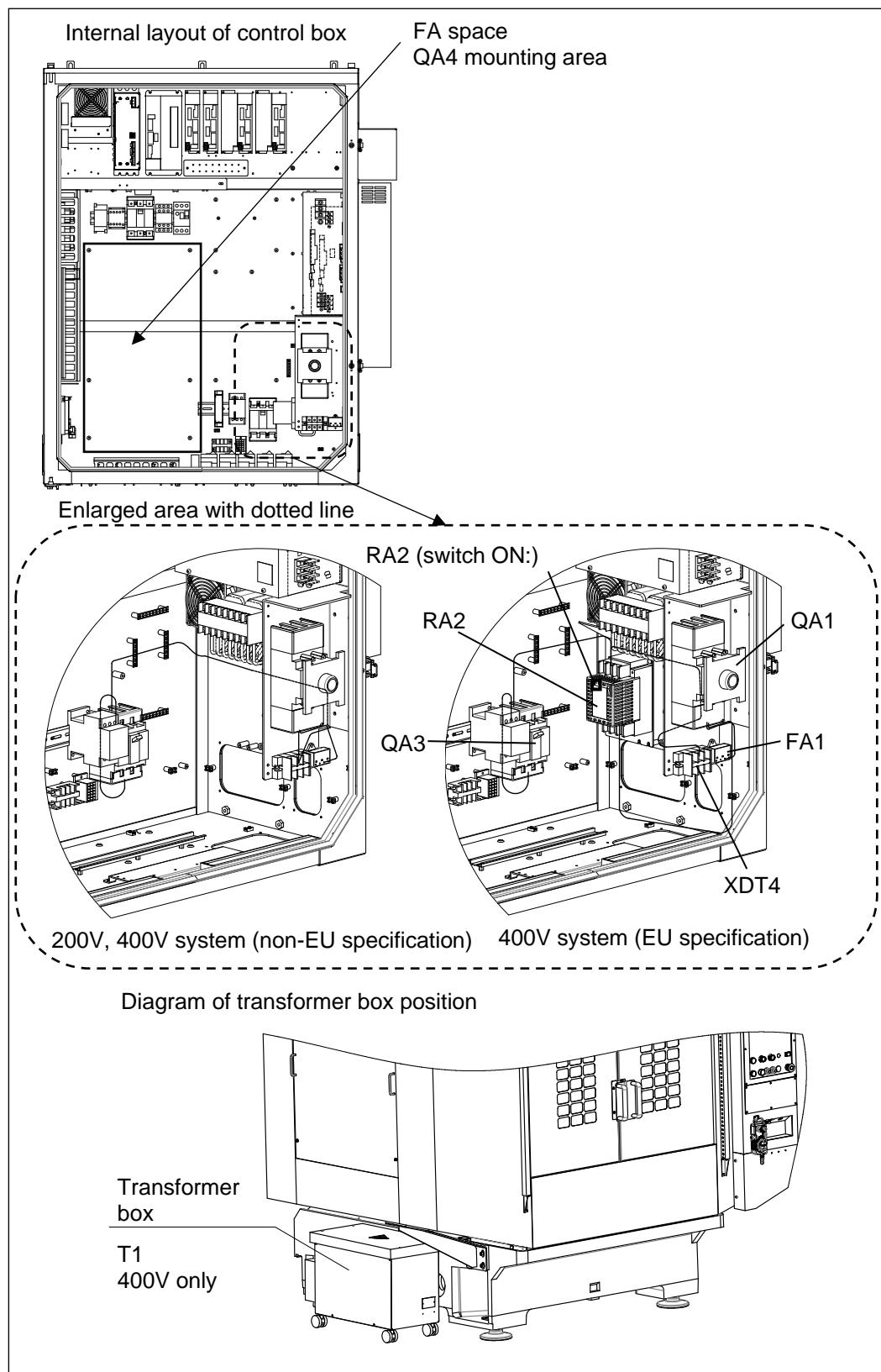
## 2 Function

When a customer adds hydraulic equipment or large coolant pumps, this assembly provides an open circuit for the additional power supply.

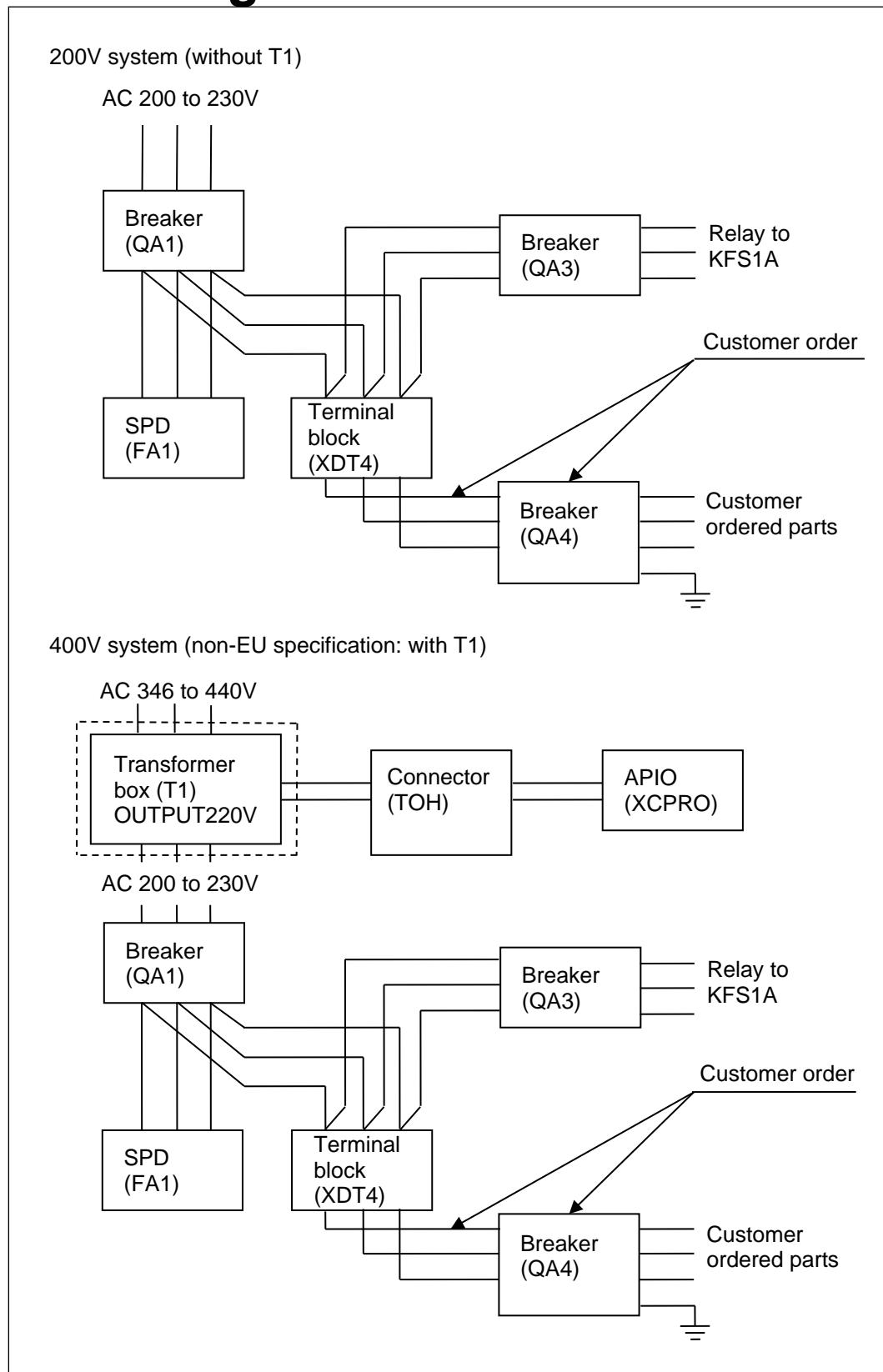
When expanding, a breaker for the power supply expansion (QA4) is needed for protection from an overload.

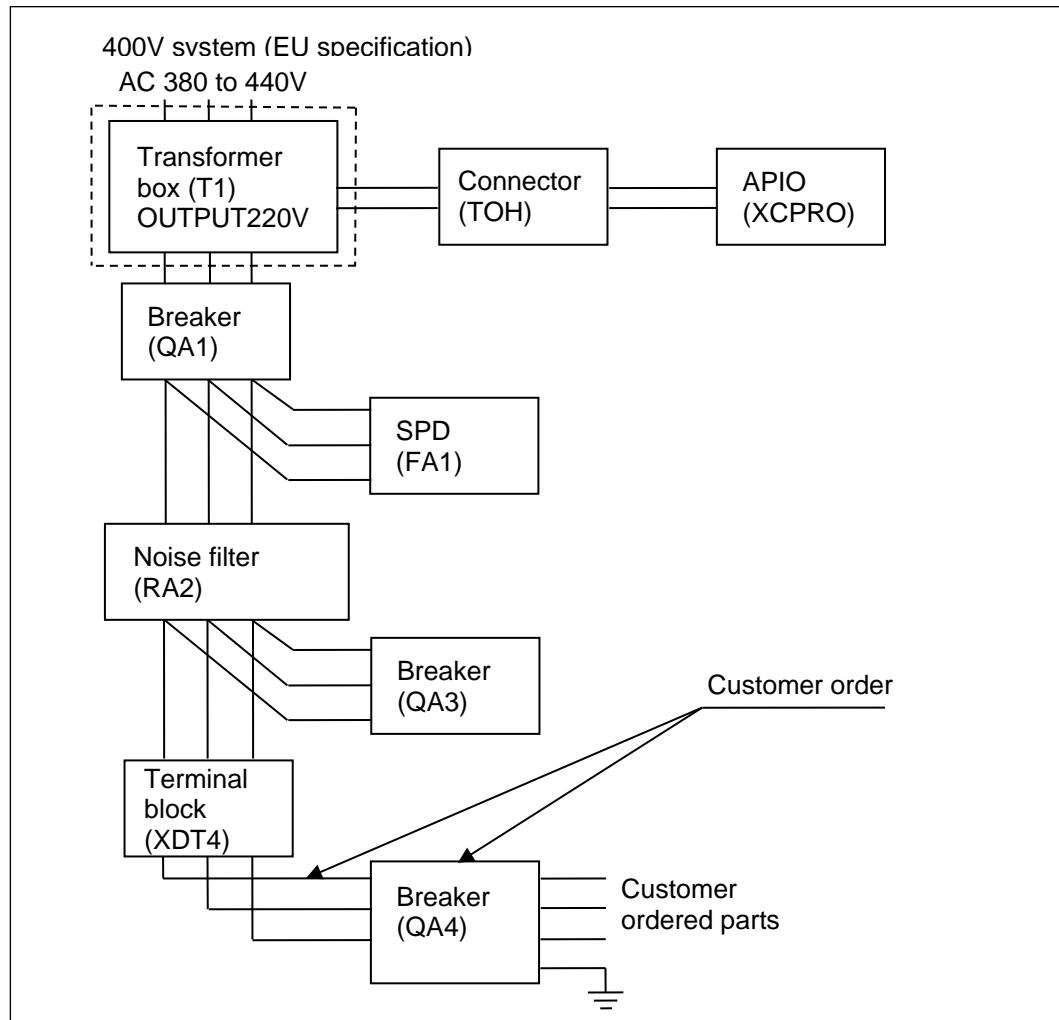
Refer to “4. Block diagram” for the details about the capacity of QA4. The breaker for power supply expansion (QA4) is wired to and uses the terminal block (XDT4).

### 3 External View



## 4 Block Diagram





When selecting a breaker for the power supply expansion (QA4), refer to the section below depending on the specification being used.

When using 200 V systems:

4.3.5.1 2. Power specifications table (200V system)

When using 400 V systems (non-EU specification):

4.3.5.2 2. Power specifications table (400V system, non-EU specification)

When using 400 V systems (EU specification):

4.3.5.3 2. Power specifications table (400V system, EU specification)

Prepare an AWG10 (UL1015) for the cable diameter that connects to the terminal block (XDT4) and breaker for the power supply expansion (QA4).

Size of the terminal that connects to the XDT4: M5, Width 12.5 mm or less

## 5 Wiring

This option is a factory-set option. The wiring has been set up except for the part between the terminal block (XDT4) and the breaker for the power supply expansion (QA4).

1. Turn OFF the main power breaker.
  2. Set up and connect the wiring between the terminal block (XDT4) and the breaker for the power supply expansion (QA4).
- \* Refer to the sections “3. External View” and “4. Block Diagram” for installation and wiring inside the control box.

# CHAPTER 11 (20)

## CEILING COVER

- 1 Handling Precautions
- 2 Functions
- 3 External View

# 1 Handling Precautions

## **WARNING**

**Do not climb onto the machine or other nearby equipment when performing installation or maintenance, otherwise you may fall down and injure yourself.**

### [SAFETY INSTRUCTIONS]

**Do not climb onto the machine or nearby equipment.**

**Use a step or step-ladder to provide a secure foot hold when the working position or conditions are awkward or out of reach.**

Always use a mist collector when attaching a ceiling cover.

When there is a ceiling cover attached, if a dust collector or mist collector is not used, the following problems can potentially occur.

- When it is full of cutting fluid mist, the cutting fluid may enter inside the mechanism, causing problems with the plastic components in a relatively short time period.
- When it is full of dust particles, coolant may enter inside the mechanical parts or inside the motor, causing damage to the cable sheath or the plastic parts.
- The temperature inside the machine may increase, causing a thermal error.
- The inside of the machine is sealed. The grease from the linear guide, ball screw and spindle flow out with the cutting fluid and can lead to damage.
- Water droplets can form inside the machine and may cause parts to rust.

There is a window for attaching the mist collector on the ceiling cover.

We recommend that the mist collector has a processing flow rate of 500 m<sup>3</sup>/h with an electric motor of 750 W or higher.

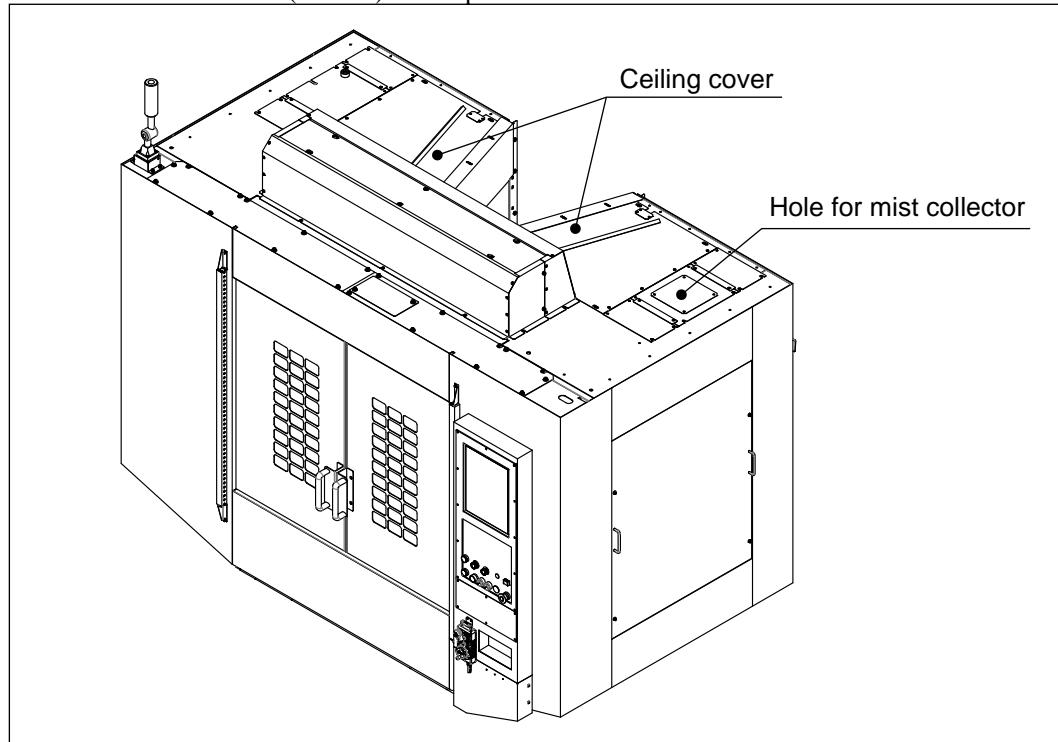
## 2 Functions

The machine is sealed by the ceiling cover to prevent coolant from shooting out from the top of the machine.

## 3 External View

Ceiling cover

Use the 17 bolts to install (M6×16) in two places.



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# CHAPTER 11 (21)

## INTERNAL LIGHT

- 1 Handling Precautions
- 2 Functions
- 3 External View
- 4 Installation Procedure
- 5 Operation Check

# 1 Handling Precautions

## **⚠ WARNING**

If you put any parts of your body inside the machine while the maintenance cover has been removed for setup or maintenance work, you may get caught or drawn into the machine if the machine is operated by mistake.

### [SAFETY INSTRUCTIONS]

Do not put any part of your body inside the machine while it is operating.

Turn OFF the main power breaker before removing the maintenance cover.

Attach a padlock to the main power breaker so that the power cannot be turned ON.

A sign or notice should be placed near the operation panel of the machine to warn others that work is in progress.

## **⚠ WARNING**

High-voltage components are present inside the control box. There is risk of electric shock if you touch these components by mistake.

### [SAFETY INSTRUCTIONS]

Maintenance and inspection of electrical components must only be carried out by a qualified electrician who is trained in electrical safety and who has thorough knowledge of the electronic circuits in this machine.

Turn OFF the main power breaker, and then wait at least 20 minutes before carrying out work.

Attach a padlock to the main power breaker so that the power cannot be turned ON.

A sign or notice should be placed near the operation panel to warn others that work is in progress.

If leaving the machine unattended, close the control box and secure it with screws.

## **⚠ WARNING**

If the control box or operation panel is touched accidentally with wet hands while performing installation or maintenance, an electric shock or short-circuit may cause a fire.

### [SAFETY INSTRUCTIONS]

Do not touch the control box and the operation panel with wet hands.

The cover to the control box must be closed while the machine is operating.

The control box and the operation panel must be kept free of coolant, water, chips and shavings.

**⚠ WARNING**

If terminal connections on the PCBs or terminal block screws become loose, poor contacts may cause overheating or a fire.

**[SAFETY INSTRUCTIONS]**

There should be no loose screws when connecting the wiring.  
Do not replace fuses and electrical parts that have been soldered to the inside of the unit.

**⚠ WARNING**

If you touch cables which have been crushed or damaged by heavy objects, there is risk of electric shock.

In addition, short-circuits may occur if cables are crushed or damaged by heavy objects.

**[SAFETY INSTRUCTIONS]**

Cables should be gathered up or arranged to prevent them from being crushed. If a cable has become damaged, it must be replaced with a new one.

**⚠ WARNING**

Do not climb onto the machine or other nearby equipment when performing installation or maintenance, otherwise you may fall down and injure yourself.

**[SAFETY INSTRUCTIONS]**

Do not climb onto the machine or nearby equipment.

Use a step or step-ladder to provide a secure foot hold when the working position or conditions are awkward or out of reach.

**⚠ WARNING**

If the maintenance cover is removed, coolant coming from inside the machine when it is operating may get into your eyes, or the tools or workpieces may shoot out causing injury.

**[SAFETY INSTRUCTIONS]**

All operators should check to make sure that the maintenance cover is properly attached before turning ON the power.

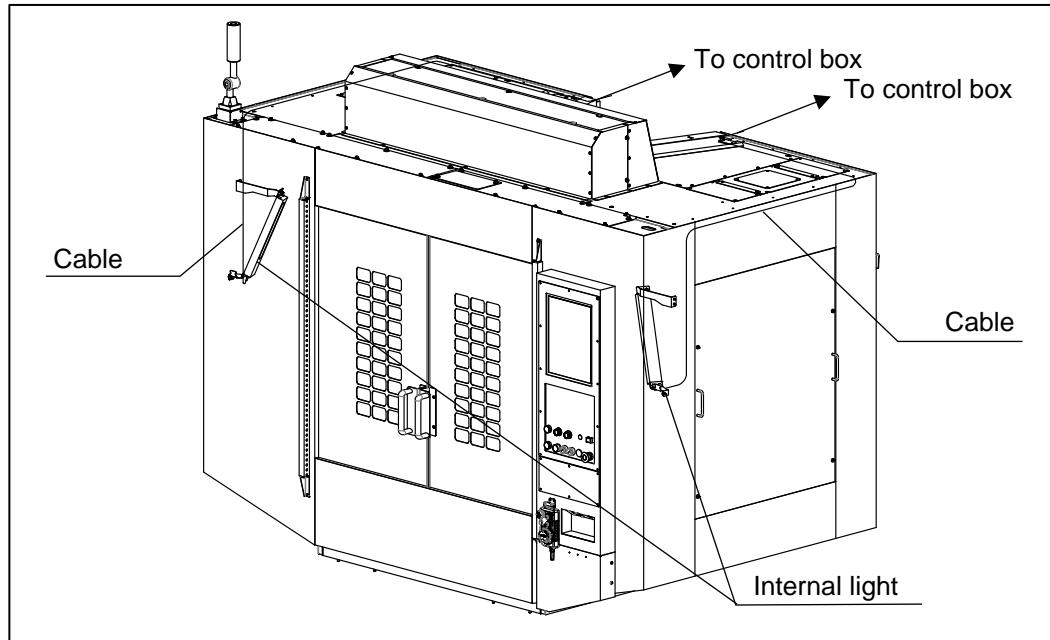
Attach the maintenance cover after the installation or maintenance work is complete.

The supervisor must attach the maintenance cover.

## 2 Functions

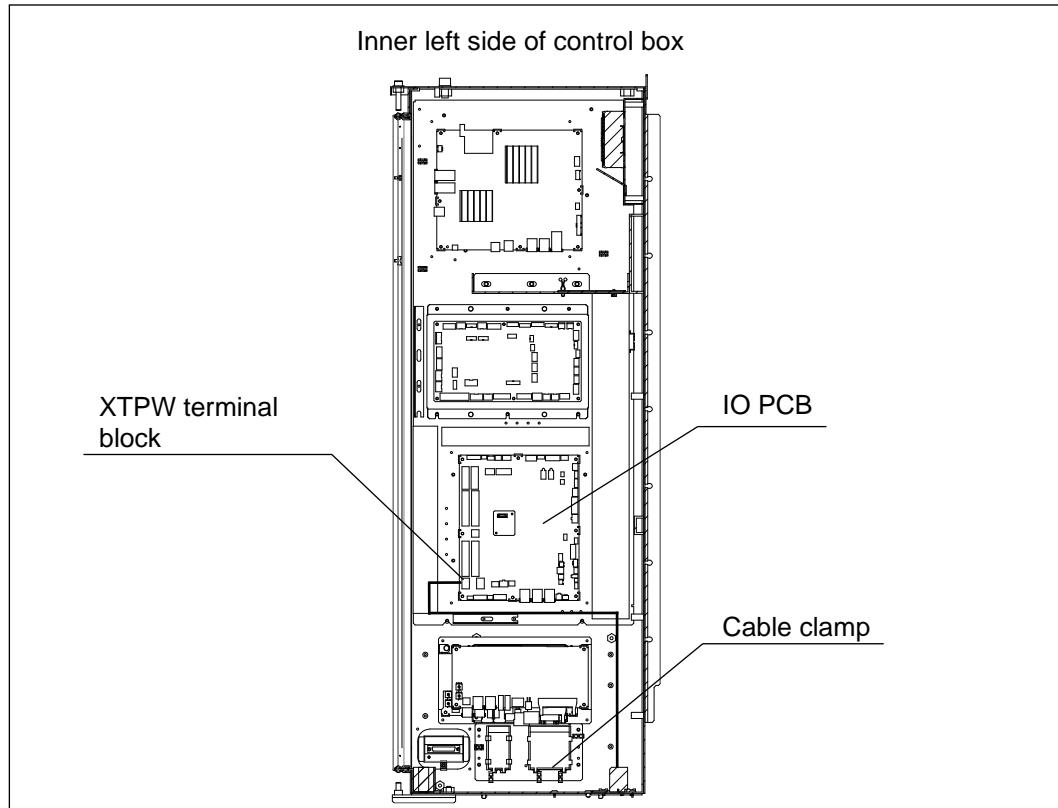
The internal light is a device which illuminates the table from the top of the machine in order to maintain an adequate field of vision.

## 3 External View



## 4 Installation Procedure

1. Turn OFF the main power breaker.
2. Use the tap hole on the side of the machine cover to install the internal light.
3. Insert the cord for the internal light via the base of the control box.
4. Connect to T24 and LT24 on the XTPW terminal block for the IO PCB.



## 5 Operation Check

1. Turn ON the main power breaker.
2. Turn ON the LIGHT switch on the operation panel. The switch lamp lights up and the internal light also lights up.
3. When the LIGHT switch is turned OFF, the internal light turns off.

(NOTE) This function's operation is performed in standard control program 1 for the built-in PLC function.

When the ladder program is changed, an unexpected operation or malfunction can occur. Therefore, if the ladder program needs to be changed, first be sure you thoroughly understand the specifications before proceeding.

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## CHAPTER 11 (22)

**SIDE DOOR**

The description in this chapter is omitted because this product is not equipped with this function.

## CHAPTER 11 (23)

**OUTSIDE INDEX ROTATION SWITCH**

The description in this chapter is omitted because this product is not equipped with this function.

## CHAPTER 11 (24)

**PNEUMATIC RELAY BOX**

The description in this chapter is omitted because this product is not equipped with this function.

## CHAPTER 11 (25)

**HYDRAULIC ROTARY JOINT**

The description in this chapter is omitted because this product is not equipped with this function.

## CHAPTER 11 (26)

**JIG TURNING DIAMETER ENLARGED**

The description in this chapter is omitted because this product is not equipped with this function.

## CHAPTER 11 (27)

**C-AXIS HYDRAULIC ROTARY JOINT**

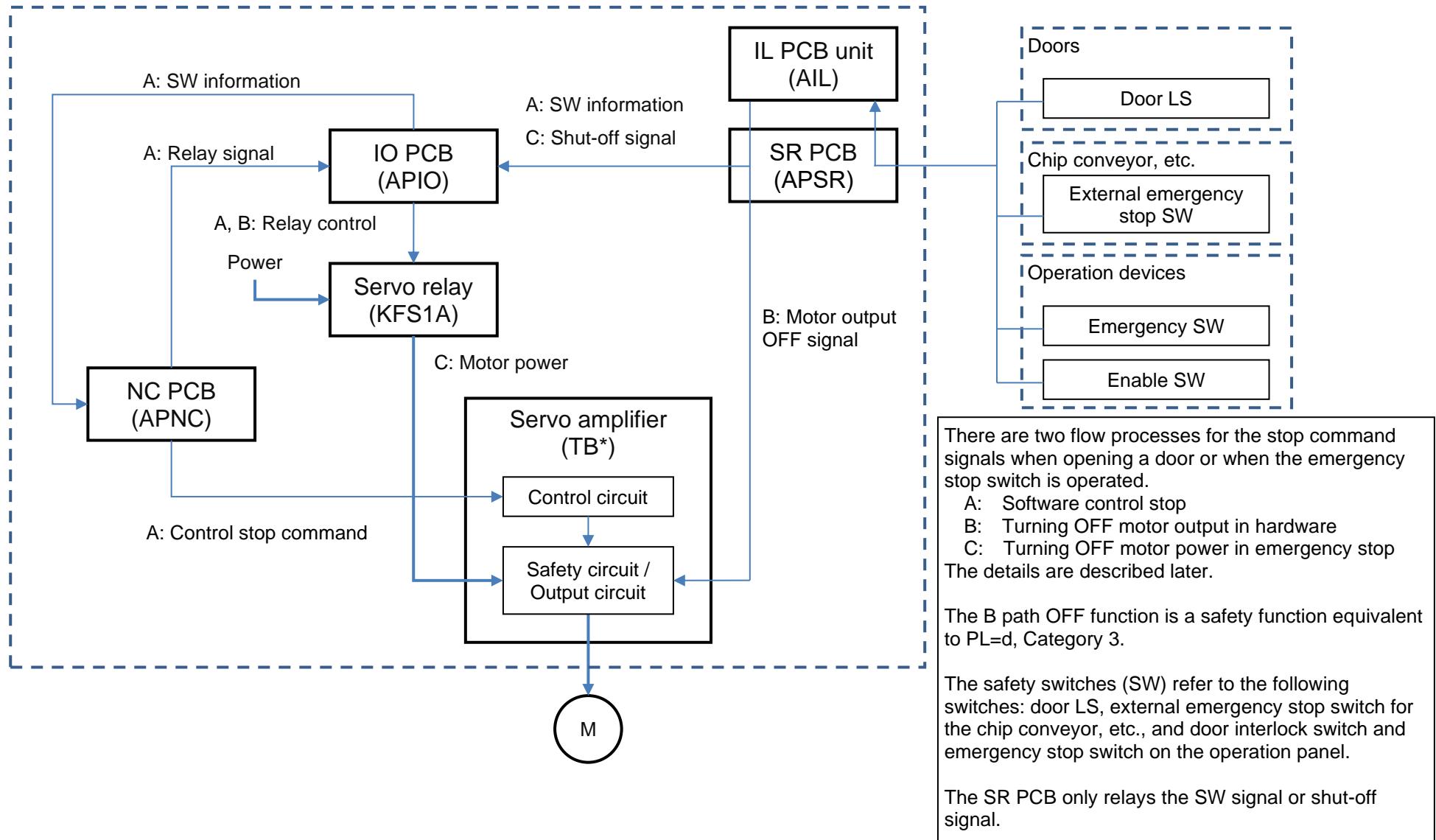
The description in this chapter is omitted because this product is not equipped with this function.

# CHAPTER 12

## SAFETY RELATED FUNCTIONS

- 12.1 Block Diagram of Signal System**
- 12.2 Software Control Stop**
- 12.3 Turning OFF Motor Output in Hardware**
- 12.4 KFS1A OFF (Only for Emergency Stop)**
- 12.5 Shut-Off Using Self-Diagnostics Function on IL PCB Unit (AIL)**

## 12.1 Block Diagram of Signal System



## 12.2 Software Control Stop

When a safety switch is turned OFF (emergency stop switch pressed or door opened), first, a software control stop is carried out. The processing for this control stop is as follows.

1. When a safety switch is operated, the OFF signal from the safety switch is detected via the SR PCB (APSR) in the safety control circuit on the IL PCB unit (AIL).
2. The switch signal is sent to the IO PCB (APIO) via the communication circuit from the IL PCB unit (AIL). Then, an OFF signal is transmitted from the IO PCB (APIO) to the NC PCB (APNC).
3. An operation stop command is issued from the NC PCB (APNC) to the servo amplifier control circuit.
4. A servo OFF command is issued to the servo amplifier control circuit after the NC PCB (APNC) operation stop has been confirmed.

## 12.3 Turning OFF Motor Output in Hardware

After a software control stop, the motor output OFF signal is output from the safety control circuit on the IL PCB unit (AIL) to the output circuit on the servo amplifier. Then, the motor output is turned OFF.

The processing for this control stop is as follows.

1. When a safety switch is operated, the OFF signal from the safety switch is detected via the SR PCB (APSR) in the safety control circuit on the IL PCB unit (AIL).
2. The safety control circuit on the IL PCB unit (AIL) goes into standby during the software control stop.  
This time period is different for an operation status or axis. Approximately 0.2 sec. and 1.2 sec. for the minimum and maximum.
3. After the standby time has elapsed, the safety control circuit on the IL PCB unit (AIL) issues a motor output OFF signal command to the output circuit on the servo amplifier via the SR PCB (APSR).
4. When the motor output OFF signal is received, the motor output is turned OFF on the output circuit for the servo amplifier.

The motor output is turned OFF on two types of hardware, on the safety control circuit for the IL PCB unit (AIL) and on the output circuit for the servo amplifier. The software does not intervene. Normally, the motor output is turned OFF in the hardware after a software control stop.

This stop status is still achieved when the output in the hardware is turned OFF, even when a software control stop cannot be carried out due to a disconnection or error.

## 12.4 KFS1A OFF (Only for Emergency Stop)

During an emergency stop, the motor power is also shut off along with the motor output via the hardware.

1. When a safety switch is operated, the OFF signal from the safety switch is detected via the SR PCB (APSR) in the safety control circuit on the IL PCB unit (AIL).
2. The safety control circuit on the IL PCB unit (AIL) goes into standby during the software control stop.  
This time period is approximately 1.2 sec. for an emergency stop.
3. After the standby time has elapsed, the motor output OFF signal on the safety control circuit on the IL PCB unit (AIL) is transmitted to the IO PCB (APIO) via the SR PCB (APSR).
4. When the motor output OFF signal is received and the IO PCB (APIO) also receives the signal, the control signal to the servo relay (KFS1A) is shut off.
5. When the servo relay (KFS1A) is shut off, the motor power is shut off for the emergency stop.

12

There is no software intervention in this processing either. But, even beyond the software capabilities, the motor power can be shut off. In addition, when the software is running normally, the KFS1A can be shut off with a software command before the hardware shuts off the KFS1A.

## 12.5 Shut-Off Using Self-Diagnostics Function on IL PCB Unit (AIL)

The IL PCB unit (AIL) is equipped with a self-diagnostics function, which does not require switch operation. If the self-diagnostics function determines that operation is not normal, it is designed to trigger an emergency stop.

The shut-off path is the same as the emergency stop in 12.4. However, if an error is detected in the self-diagnostics, the emergency stop that is triggered is different from a normal emergency stop. The power must be turned OFF to release the emergency stop.

### 12.5.1 Self-Diagnostics Function – Switch Diagnostics

There are two contacts for each safety circuit switch.

The IL PCB unit (AIL) monitors whether there is a mismatch between these two contacts.

In addition, the switch path itself monitors whether there is an error such as a ground fault or short-circuit. A monitoring signal is sent out periodically through the switch circuit and that response is monitored. (If there is an error detected by this monitoring, that contact is processed as closed contact.)

This monitoring is constantly running. The monitoring starts when the power is turned ON and it continues until the power is turned OFF. If the monitoring detects an error, the self-diagnostics function carries out a shut-off operation.

If a mismatch is detected, the alarm <<Input signal error (\*)>> is triggered (\* refers to the code that corresponds to the switch).

### 12.5.2 Self-Diagnostics Function – Motor Output OFF Signal Diagnostics

There are two signals per location for the motor output OFF signal that is sent from the IL PCB unit (AIL) to the servo amplifier. These two signals are also for IL PCB unit (AIL) monitoring.

In addition, the motor output OFF signal circuit itself monitors whether there is short-circuit, ground fault or sticking contact. A monitoring signal is sent out periodically through this circuit as well and that response is monitored.

This monitoring is executed during a reset after an emergency stop. In the factory-default settings, the monitoring is also executed automatically once right after the NC starts up.

If the monitoring detects an error, the self-diagnostics function carries out a shut-off operation.

If a mismatch is detected, the alarm <<IL output error \* (\*\*)>> is triggered (\* refers to the error number and \*\* refers to code that corresponds to the output port).

### 12.5.3 Self-Diagnostics Function – IL PCB Unit Internal Diagnostics

The IL PCB unit (AIL) internally is also a redundant system. There are two computation circuits that generate a motor output OFF signal from the switch input. The circuits monitor the computation of one another. If there is a difference in the computation between the two circuits, an error is triggered and a shut-off operation is carried out on both circuits.

This monitoring is constantly running. The monitoring starts when the power is turned ON and it continues until the power is turned OFF. If the monitoring detects an error, the self-diagnostics function carries out a shut-off operation.

If an error is detected in the internal diagnostics, one of the following alarms appears depending on the type of error.

```
<<IL_FPGA internal computation result error>>
<<IL_FPGA internal computation circuit error>>
<<IL_FPGA configuration error>>
<<IL_SW/HDL mismatch>>
<<IL_FPGA watchdog error>>
<<IL_FPGA internal state error>>
```

# CHAPTER 13

## SPECIAL SETTINGS

The description in this chapter is omitted because this product is not equipped with this function.

# CHAPTER 14

## RELOCATION DETECTION DEVICE

- 14.1 Handling Precautions
- 14.2 Functions

## 14.1 Handling Precautions

### **⚠ WARNING**

**High-voltage components are present inside the control box.  
There is risk of electric shock if you touch these components by mistake.**

#### [SAFETY INSTRUCTIONS]

**Maintenance and inspection of electrical components must only be carried out by a qualified electrician who is trained in electrical safety and who has thorough knowledge of the electronic circuits in this machine.**

**Turn OFF the main power breaker, and then wait at least 20 minutes before carrying out work.**

**Attach a padlock to the main power breaker so that the power cannot be turned ON.**

**A sign or notice should be placed near the operation panel to warn others that work is in progress.**

**If leaving the machine unattended, close the control box and secure it with screws.**

### **⚠ WARNING**

**If the control box or operation panel is touched accidentally with wet hands while performing installation or maintenance, an electric shock or short-circuit may cause a fire.**

#### [SAFETY INSTRUCTIONS]

**Do not touch the control box and the operation panel with wet hands.**

**The cover to the control box must be closed while the machine is operating.**

**The control box and the operation panel must be kept free of coolant, water, chips and shavings.**

### **⚠ WARNING**

**If terminal connections on the PCBs or terminal block screws become loose, poor contacts may cause overheating or a fire.**

#### [SAFETY INSTRUCTIONS]

**There should be no loose screws when connecting the wiring.**

**Do not replace fuses and electrical parts that have been soldered to the inside of the unit.**

- (NOTE 1) On machines equipped with a relocation detection device, the device is powered by batteries. If the voltage for the relocation detection device batteries drops, the alarm NC7002 <<Change batteries on relocat. detect. device with power ON>> is triggered. In addition, when the voltage drops, operation is disabled temporarily (the same as when the alarm NC7001 <<Relocation was detected>> triggers and relocation is detected). If the alarm NC7002 <<Change batteries on relocat. detect. device with power ON>> is triggered, refer to “9.7.5.2 Battery alarm for relocation detection device” and replace the batteries right away.
- (NOTE 2) Relocation may be detected accidentally during an earthquake or similar event. If relocation is detected accidentally, contact a Brother Industries dealer.

## 14.2 Functions

On machines equipped with a relocation detection device, if the machine is relocated, operation is disabled. When a machine is relocated, the machine user must submit a relocation application to a Brother Industries dealer in advance.

After submitting the application and the screening is complete, a serviceman authorized by Brother Industries will confirm the relocation and activate the machine for normal operation.

### 14.2.1 Relocation Detection

#### 14.2.1.1 Relocation Detection

When machine relocation is detected, the alarm <<Relocation was detected.>> triggers and relocation detection status is activated.

#### 14.2.1.2 Relocation Detection Status

While the machine relocation is detected, the alarm <<Relocation was detected.>> triggers and machine operation is restricted.

Mode	User Operation	Availability
Manual operation	Machine zero return (NOTE)	Available
	Jog and step feed	Available
	Spindle rotation	Spindle: Not available Lathe spindle: Not available
	Spindle stop	Available
	ATC	Available
	Magazine forward/reverse rotation	Available
	Pallet turn (NOTE)	Available
	Operation using the handle	Available
	Recovery and inspection operations (including spindle test run)	Available
	Spindle selection	Available
Memory operation	PLC program based PLC-axis operations	Available
	Start (NOTE)	Not available
MDI operation	Pallet start (NOTE)	Not available
	Start (NOTE)	Not available

(NOTE) Operations based on external input signals are also included.

### 14.2.2 Procedure for Resetting Relocation Detection Status

To reset the relocation detection status, fill out the required items on the prescribed form (electronic data) provided by a Brother Industries dealer. Then, the application must be submitted to a Brother Industries dealer. A request code is included in the required items. The request code is different for every machine. When relocating a machine, use the procedure below to get the request code from the machine, and then use the prescribed form to submit an application in advance to a Brother Industries dealer.

(NOTE 1) When performing the release procedure for the relocation detection status, if the alarm <<Time to change batteries>> or the <<Battery has expired. (Local)>> is triggered, first replace the batteries and then reset the alarm. If the battery expires while releasing the relocation detection status, redo the procedure from the first step.

(NOTE 2) When attempting to reset the relocation detection status, do not change the user parameters (switch 1: system) <Current date> and <Current time>. If the above parameters are changed before or during the reset procedure, the relocation detection status may not reset. When checking the request code for the reset procedure, always make sure that the above parameters are correctly set and then perform the reset.

### 14.2.2.1 Request Code

The request code is required to reset the relocation detection status.

The request code is a combination of 12 alphanumeric characters. (Excluding “-”)

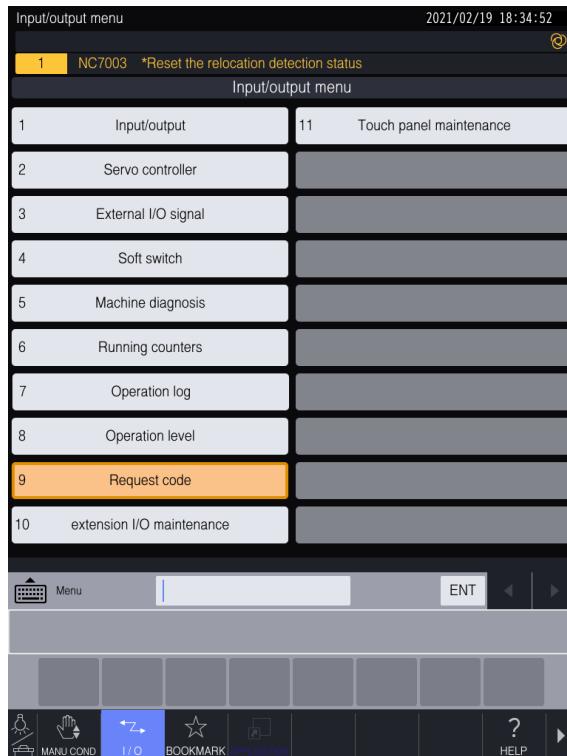
Request code example: 97T3-BX4A-Y5PQ

### 14.2.2.2 Checking Request Code

The request code is displayed on the <Request code> screen.

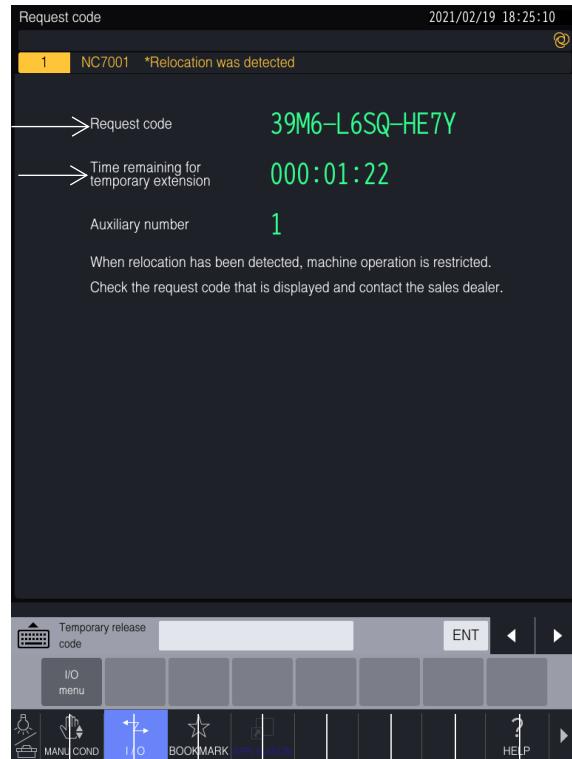
Use the operation below to display the <Request code> screen.

1. Press the [I/O] key to display the input/output menu screen.



2. Press the [>>] (Next function) key, and then press the [Request code] key.

3. Check the request code that is displayed on the <Request code> screen.



(1) (2) (3) (4) (5) (6) (7) (8)

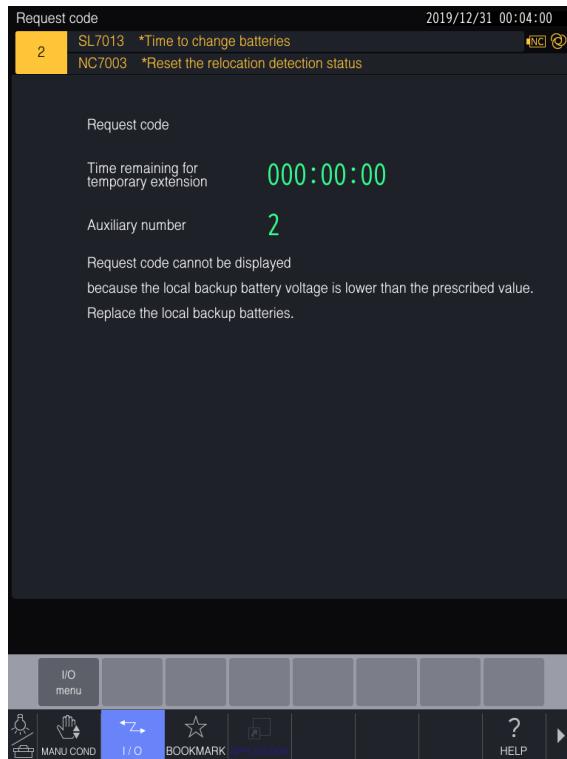
Main display area

Position	Name	Description
1	Request code	Displays the request code required for resetting the relocation detection status.
2	Time remaining for temporary extension	Displays the time remaining until the machine status is restricted.

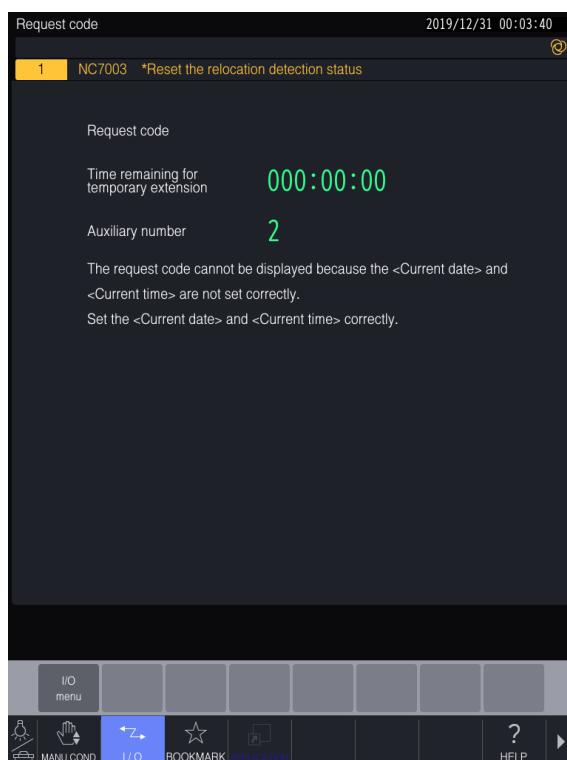
Function key display area

Column	Position	Label	Description
1	(1)	[I/O menu]	Changes to the <Input/output menu> screen.
	(2)		
	(3)		
	(4)		
	(5)		
	(6)		
	(7)		
	(8)		

(NOTE 1) The <<Request code>> does not display when the alarm <<Time to change batteries>> is triggered. Replace with new batteries.



- (NOTE 2) Check whether the current date and time (displayed on the top-right corner of the screen) is correct. The <Request code> does not display when the current date and time does not display properly. First set the user parameters (switch 1: system) <Current date> and <Current time>, and then check the <Request code>.



14

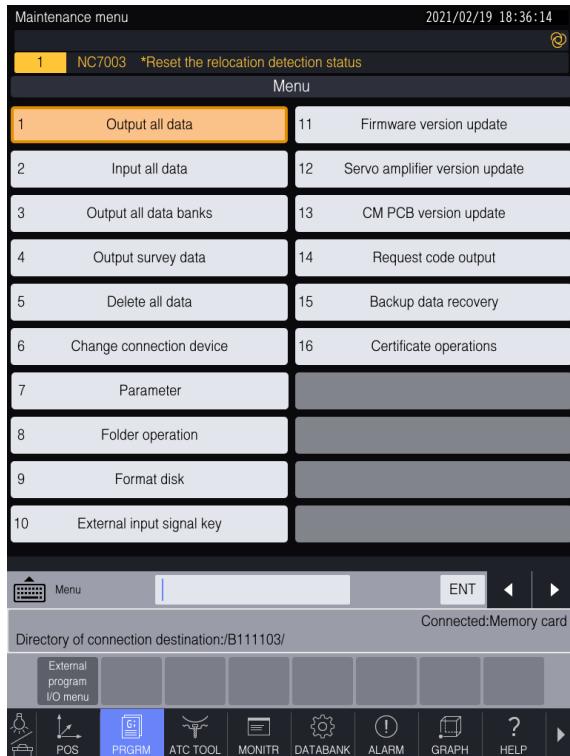
4. Enter the request code that is displayed into the prescribed form.

### 14.2.2.3 Request Code Output

The user can also get a request code file (not the request code procedure described above).  
The user can get the request code from <Request code output> under the maintenance menu.

Use the operations below to get the request code.

1. Press the [EDIT] key.
2. The <Maintenance menu> screen is displayed.



3. Connect the output device to the machine, and check <Connected:> on the bottom-right corner of the screen.

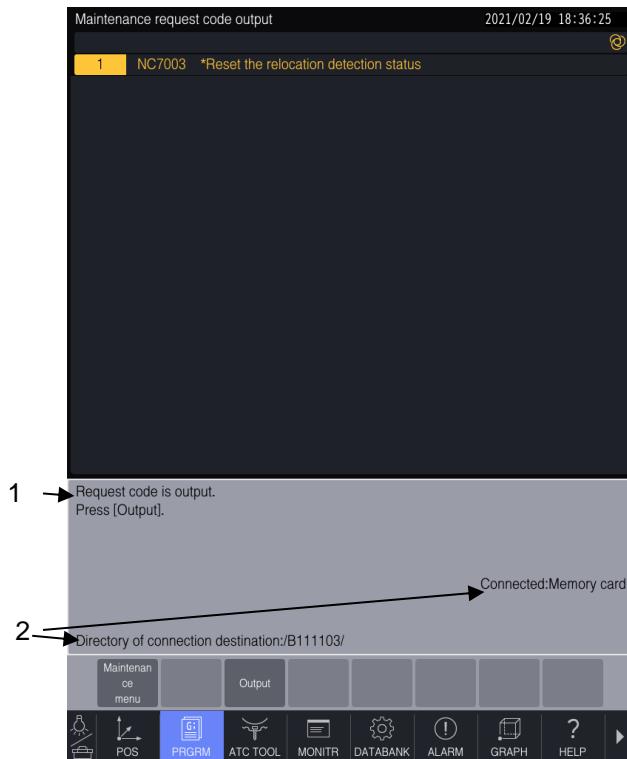
The connection device can be changed by accessing <6. Change connection device>.

## Chapter 14 Relocation Detection Device

4. Display the <Request code output> screen.

When a memory card is connected, press the [">>] (Next function) key, and then press the [Request code output] key.

When using an FTP(S) connection, press the [">>] (Next function) key, and then press the [Request code output] key.



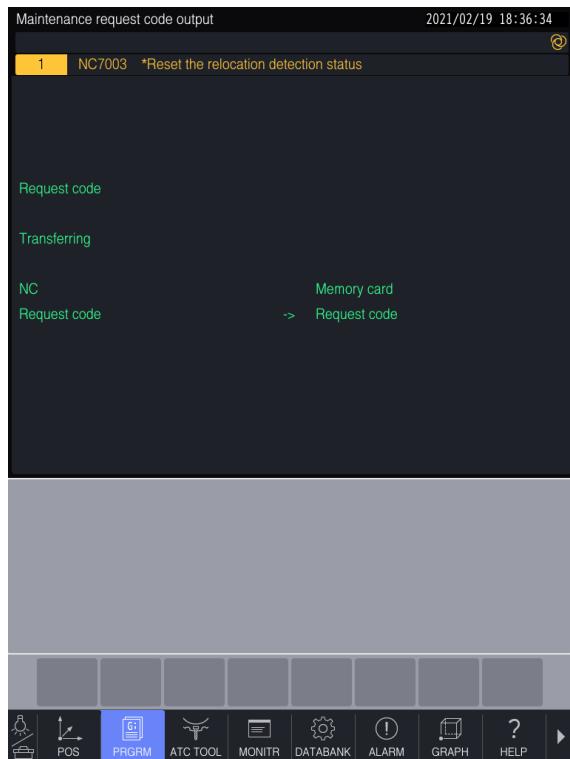
Instructions area

Position	Name	Description
1	Operation description	Displays the procedure for outputting the request code.
2	Connection	Displays the information for the connection that is currently selected.

Function key display area

Column	Position	Label	Description
1	(1)	[Maintenance menu]	Changes to the <Maintenance menu> screen.
	(2)		
	(3)	[Output]	Outputs the request code file to the connected device.
	(4)		
	(5)		
	(6)		
	(7)		
	(8)		

5. Start the data transfer. Press the [Output] key.



Main display area

Position	Name	Description
1	Data transfer status	Displays the data transfer status.
2	Transfer data	Displays the name of the source and destination of the data transfer.

Instructions area

Position	Name	Description
3	Connection	Displays the information for the connection that is currently selected.

6. After the data transfer is complete, it returns to the previous screen.

The request code is output externally under the following file name: RQC + Machine No. + Date (Output date).

File name: RQCnnnnnyymmdd  
nnnnnn: User parameter <Machine No.> (000000-999999)  
yy: Last two digits of year, mm: Month, dd: Day

7. Enter the request code in the output file into the prescribed form.

#### 14.2.2.4 Battery alarm for relocation detection device

**Always leave the machine's [POWER] switch ON when replacing the batteries for the relocation detection device. If the batteries are replaced for the relocation detection device while the machine's [POWER] switch is turned OFF, when the alarm <<Relocation was detected.>> triggers and relocation is detected, operation is disabled temporarily.**

On machines equipped with a relocation detection device, the device is powered by batteries when the machine's [POWER] switch is turned OFF. Replace the batteries once every 5 years. If the voltage for the relocation detection device batteries drops, the alarm <<Change batteries on relocat. detect. device with power ON>> is triggered when the machine's [POWER] switch is turned ON. When this alarm is triggered, replace the batteries right away.

Note, the OM (BX11F) for the PLC function can be used to monitor whether the alarm <<Change batteries on relocat. detect. device with power ON>> is triggered or not.

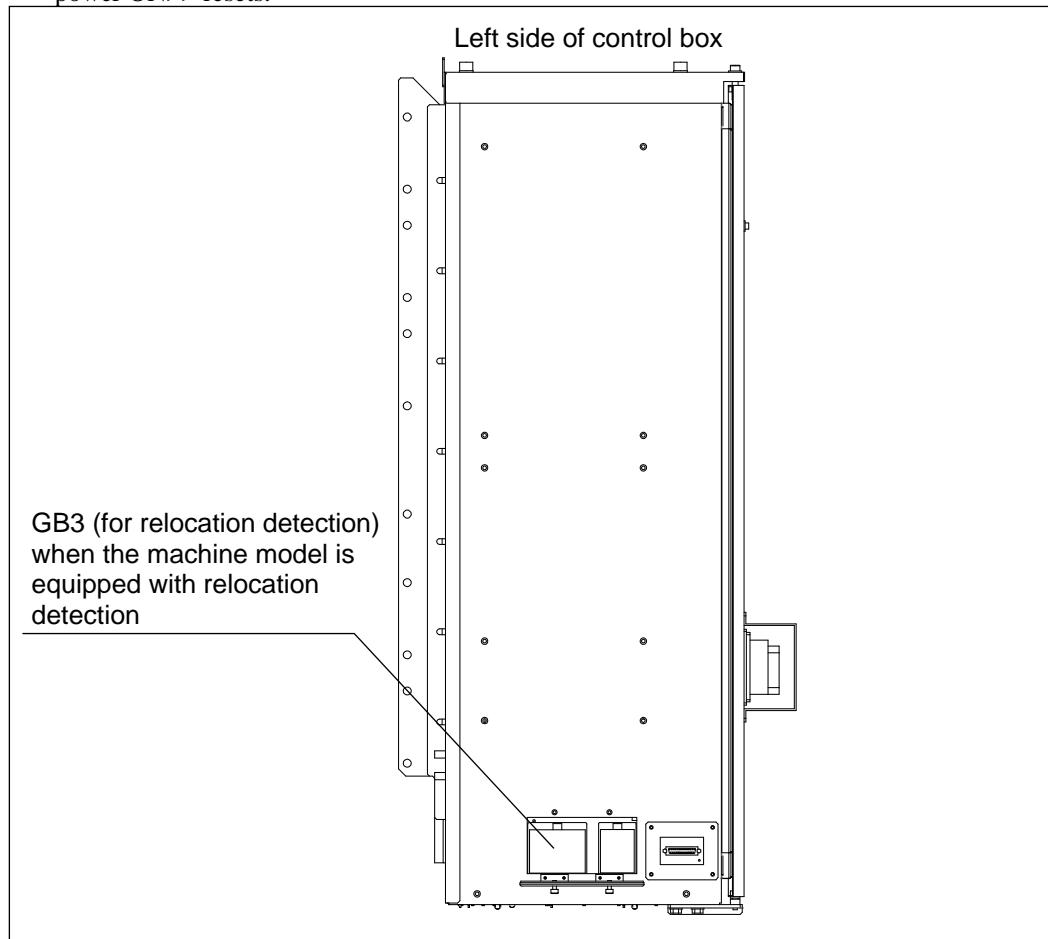
Use the following batteries.

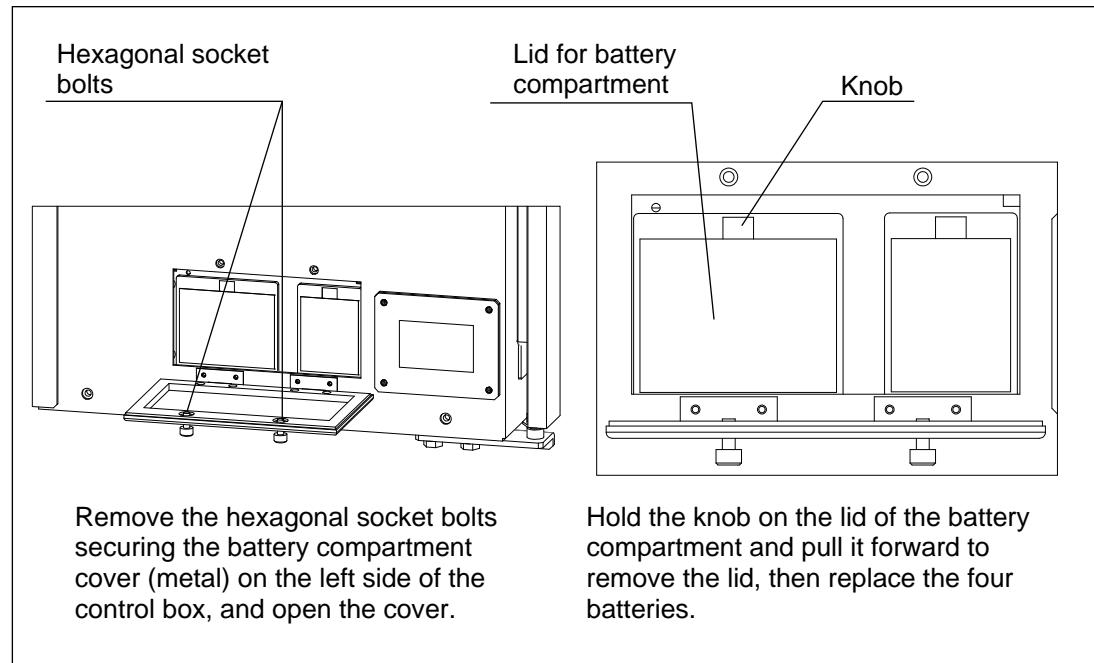
1.5 V AA-size alkaline batteries (Qty.4)

(NOTE) If the alarm <<Change batteries on relocat. detect. device with power ON>> is triggered, replace the batteries right away. In addition, if the voltage drops, when the alarm <<Relocation was detected.>> triggers and relocation is detected, operation is disabled temporarily.

For battery replacement, follow the procedure below to replace the batteries for the relocation detection device.

- (1) Check if the alarm <<Change batteries on relocat. detect. device with power ON>> triggered.
- (2) Leave the machine's power switch turned ON, and replace the batteries for the relocation detection device.
- (3) Press the [RST] key and check if the alarm <<Change batteries on relocat. detect. device with power ON>> resets.

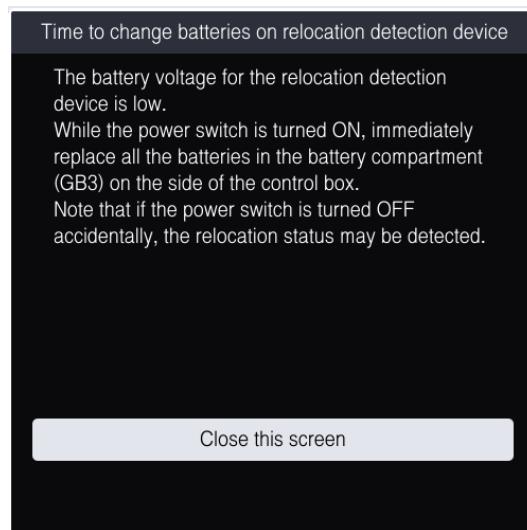




(NOTE) Always be sure to insert the batteries so that they face in the directions indicated on the lid of the battery compartment. After replacing the batteries, close the lid (plastic) of the battery compartment. Also, close the battery compartment cover (metal) and secure it with the hexagonal socket bolts in order to prevent oil mist from getting inside.

#### 14.2.2.5 Popup screen

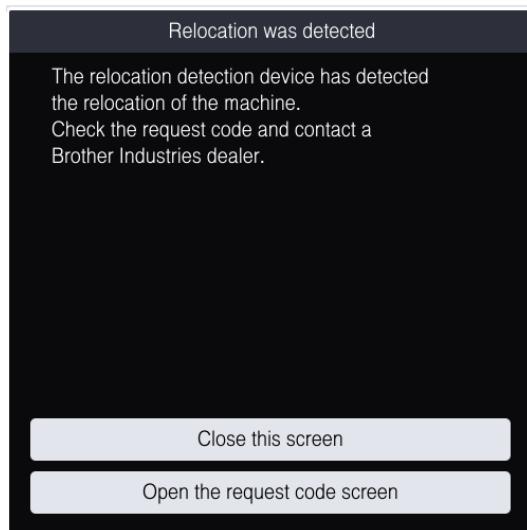
1. A popup screen displays depending on the status of the relocation detection device.
2. When the battery voltage drops for the relocation detection device, if there is no switch or key input operation for 5 minutes or longer, the display automatically switches to the following popup screen.



## Chapter 14 Relocation Detection Device

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3. When relocation is detected, if there is no switch or key input operation for 5 minutes or longer, the display automatically switches to the following popup screen.



4. To clear the popup screen display, select “1. Close this screen” and press the [ENT] key.

(NOTE) When the shortcut popup screen is displayed, the shortcut popup screen display closes.

**COMPACT MACHINING CENTER**

**SPEEDIO  
W1000Xd1 Series**

パーツリスト  
PARTS LIST

ブラザーアイダス株式会社

BROTHER INDUSTRIES, LTD.

**brother**

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### 機械(MECHANICAL)

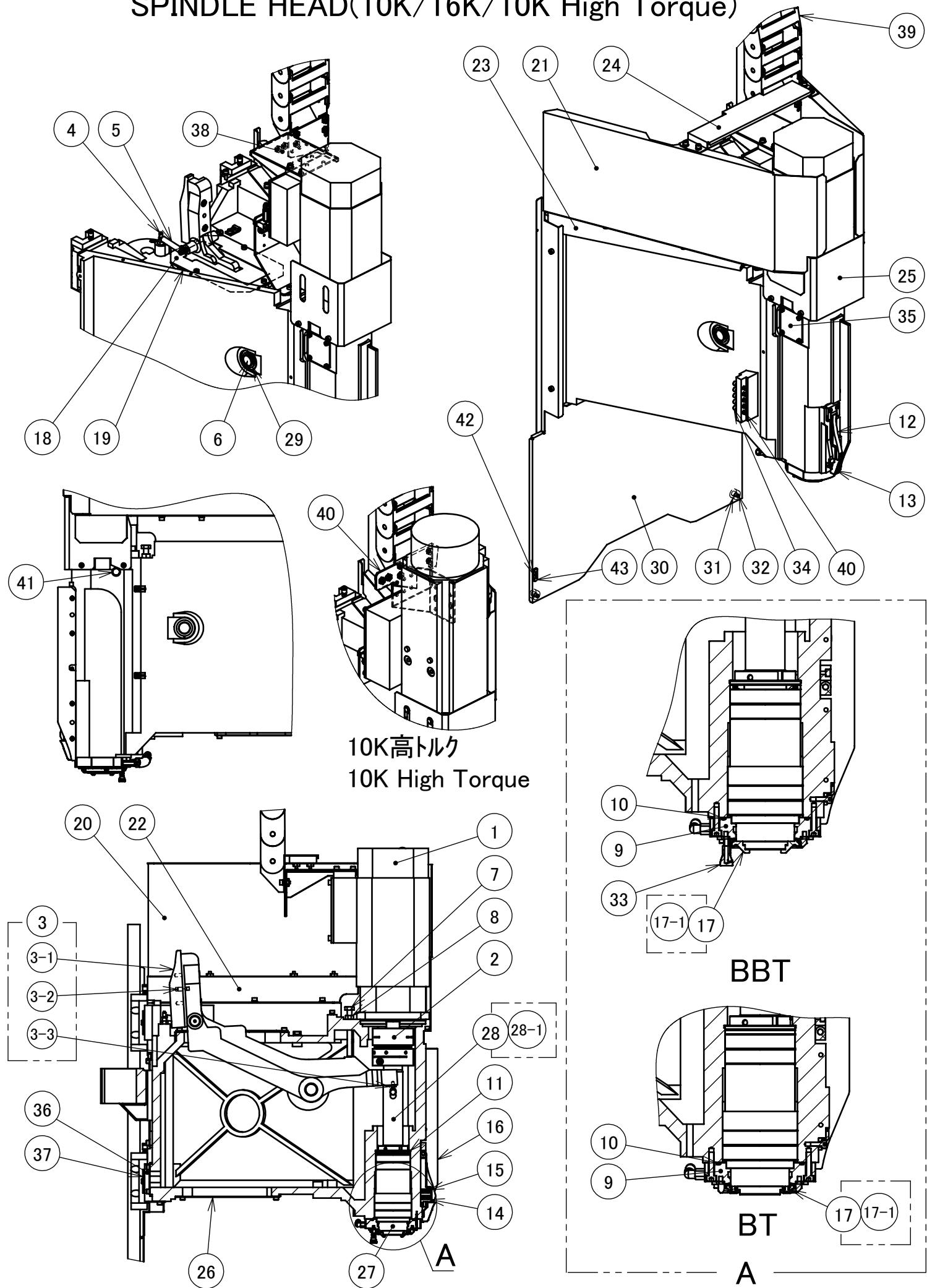
- 1 スピンドルヘッド(10K, 16K, 10K高トルク)  
SPINDLE HEAD(10K, 16K, 10K High Torque)
- 2-1 ATCサドル・マガジン14  
ATC SADDLE・MAGAZINE 14
- 2-2 ATCサドル・マガジン21  
ATC SADDLE・MAGAZINE 21
- 3-1 グリップ14  
GRIP 14
- 3-2 グリップ21  
GRIP 21
- 4 X軸  
X AXIS
- 5 Y軸  
Y AXIS
- 6 Z軸  
Z AXIS
- 7 Xテレスコカバー  
X TELESCOPIC COVER
- 8-1 Yテレスコカバー  
Y TELESCOPIC COVER
- 8-2 Y軸ウシロカバー  
Y AXIS REAR COVER
- 9 機械カバー  
MACHINE COVER
- 10 扉  
DOOR
- 11 扉運動  
DOOR WIRE
- 12 ドアインタロック  
DOOR INTERLOCK

- 13 エアユニット  
AIR UNIT
- 14 クーラント配管  
COOLANT PIPING
- 15 ツール洗浄  
TOOL CLEANING
- 16-1 クーラントタンク 200L  
COOLANT TANK 200L
- 16-2 クーラントタンク 200L サイクロン(ツール洗浄無し)  
COOLANT TANK 200L CYCLONE (WITHOUT TOOL CLEANING)
- 16-3 クーラントタンク 200L サイクロン(ツール洗浄有り)  
COOLANT TANK 200L CYCLONE (WITH TOOL CLEANING)
- 16-4 クーラントタンク 200L サイクロン CTS  
COOLANT TANK 200L CYCLONE CTS
- 16-5 CTS(逆洗有り)  
CTS(WITH BACK WASH)
- 17 高圧CTS  
HIGH PRESSURE CTS
- 18 工具折損検出装置  
TOOL BREAKAGE DETECTION UNIT
- 19 自動扉  
AUTOMATIC DOOR
- 20 機内灯、表示灯、手動パルス発生器  
MACHINE LIGHT, INDICATION LAMP, MANUAL PULSE GENERATOR
- 21 自動給油装置  
INTERMITTENT LUBRICATING UNIT
- 22 自動給脂装置  
AUTOMATIC GREASE SUPPLY UNIT
- 23 搬送固定具  
FIXING PARTS

## 電気 (ELECTRICAL)

- 100 制御箱  
CONTROL BOX
- 101 操作箱  
OPERATION BOX
- 102 ケーブル  
CABLE

# 1-1. スピンドルヘッド (10K/16K/10K高トルク) SPINDLE HEAD(10K/16K/10K High Torque)

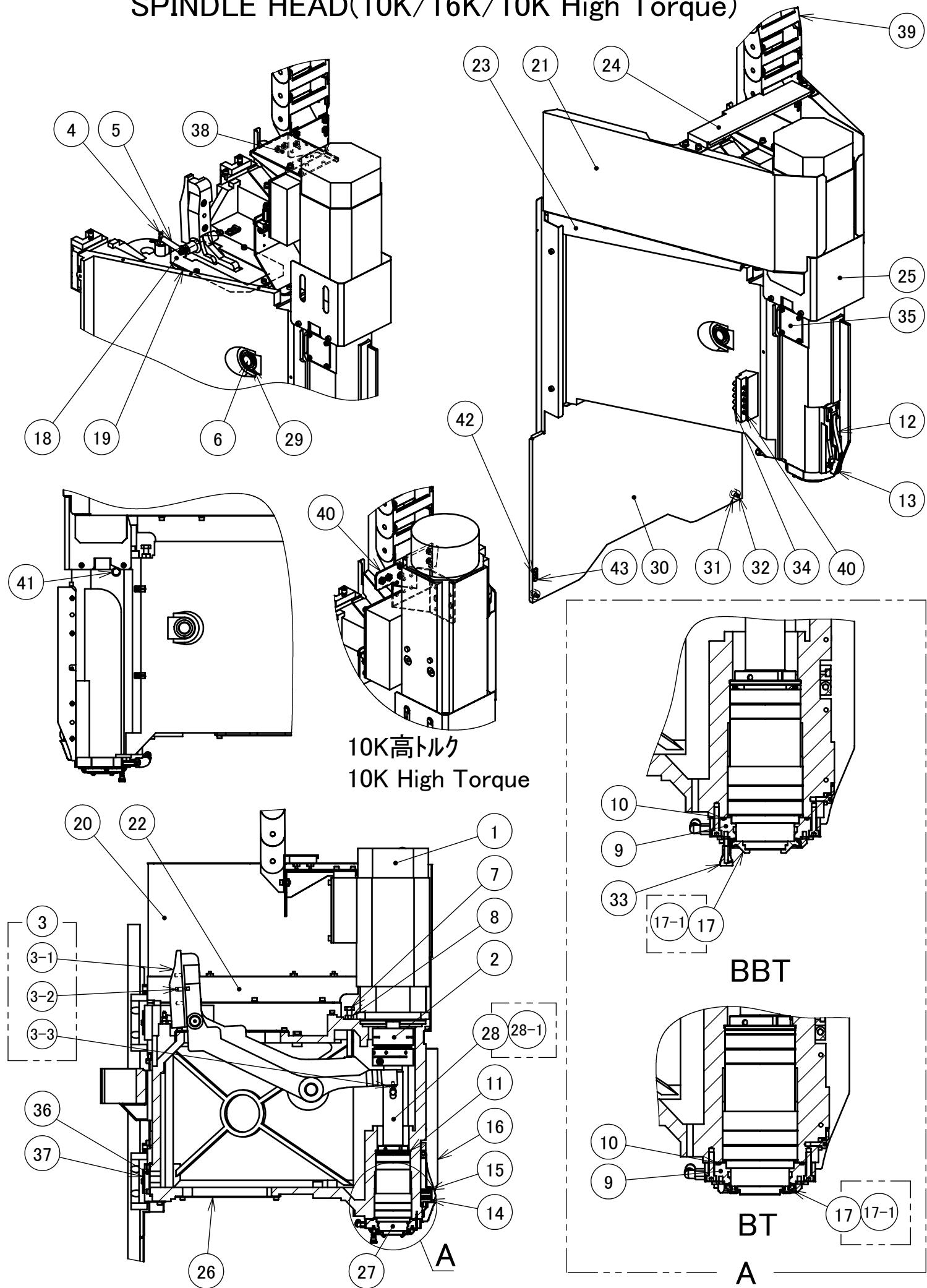


参照No. Ref. No.	部品コード Part Code	個数 Q'ty	品名 Part Name	備考 Remark	分類 Classification
1	6D0175001	1	SモータDOS 10K	MOTOR SPINDLE DOS 10K	10000min <sup>-1</sup>
	6D0176001	1	SモータDOS 10KC	MOTOR SPINDLE DOS 10KC	10000min <sup>-1</sup> , CTS
	6D0177001	1	SモータDOS 16K	MOTOR SPINDLE DOS 16K	16000min <sup>-1</sup>
	6D0178001	1	SモータDOS 16KC	MOTOR SPINDLE DOS 16KC	16000min <sup>-1</sup> , CTS
	6D0179001	1	SモータDOS 10KHT	MOTOR SPINDLE DOS 10KHT	10000min <sup>-1</sup> (High Torque)
	6D0180001	1	SモータDOS 10KHTC	MOTOR SPINDLE DOS 10KHT C	10000min <sup>-1</sup> CTS(High Torque)
2	6B1067001	1	カップリング28-40 S2D	COUPLING 28-40 S2D	10000min <sup>-1</sup> , 16000min <sup>-1</sup>
	6B5011001	1	カップリング28-40 HT	COUPLING 28-40 HT	10000min <sup>-1</sup> (High Torque)
3	6D0049001	1	アンクランプカム SK3	UNCLAMP ARM ASSY SK3	
3-1	6D0147001	1	アンクランプカム SK3	UNCLAMP CAM SK3	
3-2	620067002	1	ストレートピン8X26XM5	STRAIGHT PIN 8X26XM5	
3-3	645124001	2	アンクランプアームストッパー	STOPPER UNCLAMP ARM	
4	6A7740001	2	ピンM8X34	PIN M8X34	
5	622071001	2	アンクランプバネ228	SPRING EXTENSION UNCLAMP	
6	626175000	1	ジク 25X216	SHAFT 25X216	
7	626177001	1	ボルト 10X100 109T	BOLT 10X100 109T	
8	021100102	1	ナット10	NUT 1 M10	
9	6B6271001	1	BRGオサエクミ SX1	RETAINER ASSY BEARING SX1	BT
	6B6305001	1	BRGオサエクミSX1 BBT	RETAINER ASSY BEARING SX1 BBT	BBT
10	081085770	1	OリングG85	O RING G85	
11	652101001	1	カラ-D75	COLLAR D75	4.96
	652101002	1			4.97
	652101003	1			4.98
	652101004	1			4.99
	652101005	1			5.00
	652101006	1			5.01
	652101007	1			5.02
	652101008	1			5.03
	652101009	1			5.05
	12	6B1079001	1	シフトカム S2Dクミ	SHIFT CAM ASSY S2D
13	6B6273001	1	シフトサポートカム SX1	SHIFT SUPPORT CAM SX1	
14	640137000	1	コイルバネSWM10X25	COIL SPRING SWM10X25	RED
15	641405000	1	コイルバネSWH10-25	COIL SPRING SWH10-25	GREEN
16	6B9614001	1	DPカム MG14	DP CAM MG14	
17	6B9342001	1	タンメンカバー	SPINDLE EDGE COVER	BT
	6B9744101	1	SPカバーキーBBT V1	SPINDLE COVER KEY BBT V1	BBT
17-1	018400831	4	アナボルト4X8	BOLT SOCKET M4X8	
18	6B6032001	1	アンクランプカバー SX1	UCL COVER SX1	
19	6B6383001	1	UCLパッキンカバー SX1	UCL PACKING COVER SX1	
20	6D0014001	1	ヘッドカバー1R SK3	SP HEAD COVER 1R SK3	
21	6D0015001	1	ヘッドカバー1L SK3	SP HEAD COVER 1L SK3	
22	6C0049001	1	ヘッドエブリク R SX1SL	SP HEAD UPPER BRACKET R SX1-SL	
23	6C0050001	1	ヘッドエブリク L SX1SL	SP HEAD UPPER BRACKET L SX1-SL	
24	6B6055001	1	SPヘッドカバーBKT SX1	SP HEAD COVER BRACKET SX1	
25	6D0016001	1	SPヘッドMカバー SK3	SP HEAD MOTOR COVER SK3	
26	6C4022001	1	SPヘッドシタカバー SX2	SP HEAD UNDER COVER SX2	
27	6B6865301	1	SP5045A10FBT木	SPINDLE 5045-A 10KF BT SUPPLY	10000min <sup>-1</sup> , BT
	6B6866301	1	SP5045A16FBT木	SPINDLE 5045-A 16KF BT SUPPLY	16000min <sup>-1</sup> , BT
	6B6867301	1	SP5045A10FBMP木	SPINDLE 5045-A 10KF BMP SUPPLY	10000min <sup>-1</sup> , BT-CTS
	6B6868301	1	SP5045A16FBMP木	SPINDLE 5045-A 16KF BMP SUPPLY	16000min <sup>-1</sup> , BT-CTS
	6B6869301	1	SP5045A10FBBT木	SPINDLE 5045-A 10KF BBT SUPPLY	10000min <sup>-1</sup> , BBT
	6B6870301	1	SP5045A16FBBT木	SPINDLE 5045-A 16KF BBT SUPPLY	16000min <sup>-1</sup> , BBT
	6B6871301	1	SP5045A10FBBM木	SPINDLE 5045-A 10KF BBM SUPPLY	10000min <sup>-1</sup> , BBT, CTS
	6B6872301	1	SP5045A16FBMM木	SPINDLE 5045-A 16KF BBM SUPPLY	16000min <sup>-1</sup> , BBT, CTS
	6C7662001	1	SP5045A10FBHP木	SPINDLE 5045-A 10KF BHP SUPPLY	10000min <sup>-1</sup> , BT-HP
	6C7663001	1	SP5045A16FBHP木	SPINDLE 5045-A 16KF BHP SUPPLY	16000min <sup>-1</sup> , BT-HP
	6C7664001	1	SP5045A10FBBH木	SPINDLE 5045-A 10KF BBH SUPPLY	10000min <sup>-1</sup> , BBT-HP
	6C7665001	1	SP5045A16FBBH木	SPINDLE 5045-A 16KF BBH SUPPLY	16000min <sup>-1</sup> , BBT-HP

\* 分類の"C"は制御部品、無印は機械部品の扱いです。

\* "C" in the "Classification" indicates that the part is classified into control part, while no mark indicates machine part.

# 1-1. スピンドルヘッド (10K/16K/10K高トルク) SPINDLE HEAD(10K/16K/10K High Torque)

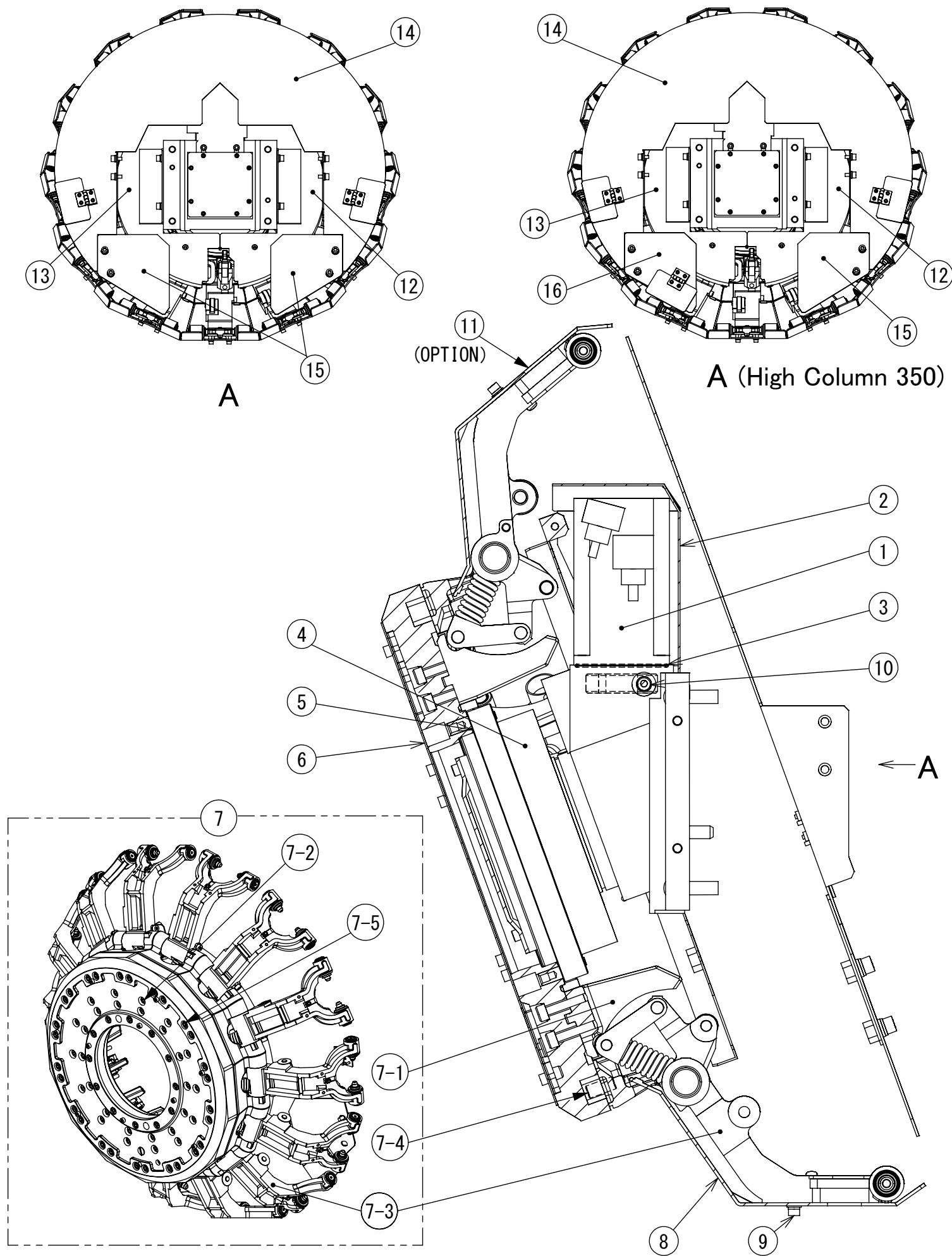


参照No. Ref. No.	部品コード Part Code	個数 Q'ty	品名 Part Name	備考 Remark	分類 Classification
28	6B9642001	1	クランプジククミBT	CLAMP SHAFT ASSY BT 10000min <sup>-1</sup> , BT 16000min <sup>-1</sup> , BT	
	6B9645001	1	クランプジククミBT-C	CLAMP SHAFT ASSY BT-C 10000min <sup>-1</sup> , BT, CTS 16000min <sup>-1</sup> , BT, CTS	
	6B1718001	1	クランプジククミBBT	CLAMP SHAFT ASSY BBT 10000min <sup>-1</sup> , BBT 16000min <sup>-1</sup> , BBT	
	6B1725001	1	クランプジククミBBT-C	CLAMP-SHAFT ASSY BBT-C 10000min <sup>-1</sup> , BBT, CTS 16000min <sup>-1</sup> , BBT, CTS	
	6C7067001	1	クランプジククミHP	CLAMP SHAFT ASSY HP 10000min <sup>-1</sup> , BT-HP 16000min <sup>-1</sup> , BT-HP 10000min <sup>-1</sup> , BBT-HP 16000min <sup>-1</sup> , BBT-HP	
28-1	602588001	5	コウキユウ5	STEEL BALL 5	
29	048250142	2	トメワジクヨウC25	RETAINING RING EXTERNAL C25	
30	6D0013001	1	Zカバー SK3	COVER Z SK3	
31	6B6276001	1	Zカバースライダ SX1	SLIDER Z COVER SX1	
32	533676001	2	ダンネジ	SHOULDER SCREW	
33	6B1732001	1	タンメンセンジョウノズル	NOZZLE EDGE CLEANING	BBT
34	641346000	5	ストレートBF4N	STRAIGHT BF4N 321	
35	6B4810001	1	SPカバーSX1	SP COVER SX1	
36	6C6110001	4	スペーサ 71X87	SPACER 71X87	t0.020
	6C6110002	4			t0.025
	6C6110003	4			t0.030
	6C6110004	4			t0.035
	6C6110005	4			t0.040
	6C6110006	4			t0.045
	6C6110007	4			t0.050
	6C6110008	4			t0.055
	6C6110009	4			t0.060
37	622036002	2	キ-16X10X50	KEY 16X10X50	15.960
	622036003	2			15.955
	622036004	2			15.950
	622036005	2			15.945
	622036006	2			15.940
	622036007	2			15.935
	622036008	2			15.930
	622036009	2			15.925
	622036010	2			15.920
	622036011	2			15.915
	6B6081101	1	CブラケットS SX1	C BRACKET S SX1 10000min <sup>-1</sup> , 16000min <sup>-1</sup>	
38	6B6082101	1	CブラケットK SX1	C BRACKET K SX1 10000min <sup>-1</sup> (High Torque)	
	6C0043001	1	ケーブルベア SX1-SL	CABLE BEAR SX1-SL	
39	6A6157001	5	グリースニップル6P0.75	GREESE NIPPLE 6P0.75	
40	646104000	1	ウスガタプラグPT3/8	PLUG PT3/8	
41	6C4032001	1	ゲンテニアイマーク	ORIGIN MARK	
42	000400608	2	+ハインド4X6	SCREW BIND M4X6	

\* 分類の“C”は制御部品、無印は機械部品の扱いです。

\* “C” in the “Classification” indicates that the part is classified into control part, while no mark indicates machine part.

## 2-1. ATCサドル・マガジン14 ATC SADDLE · MAGAZINE 14

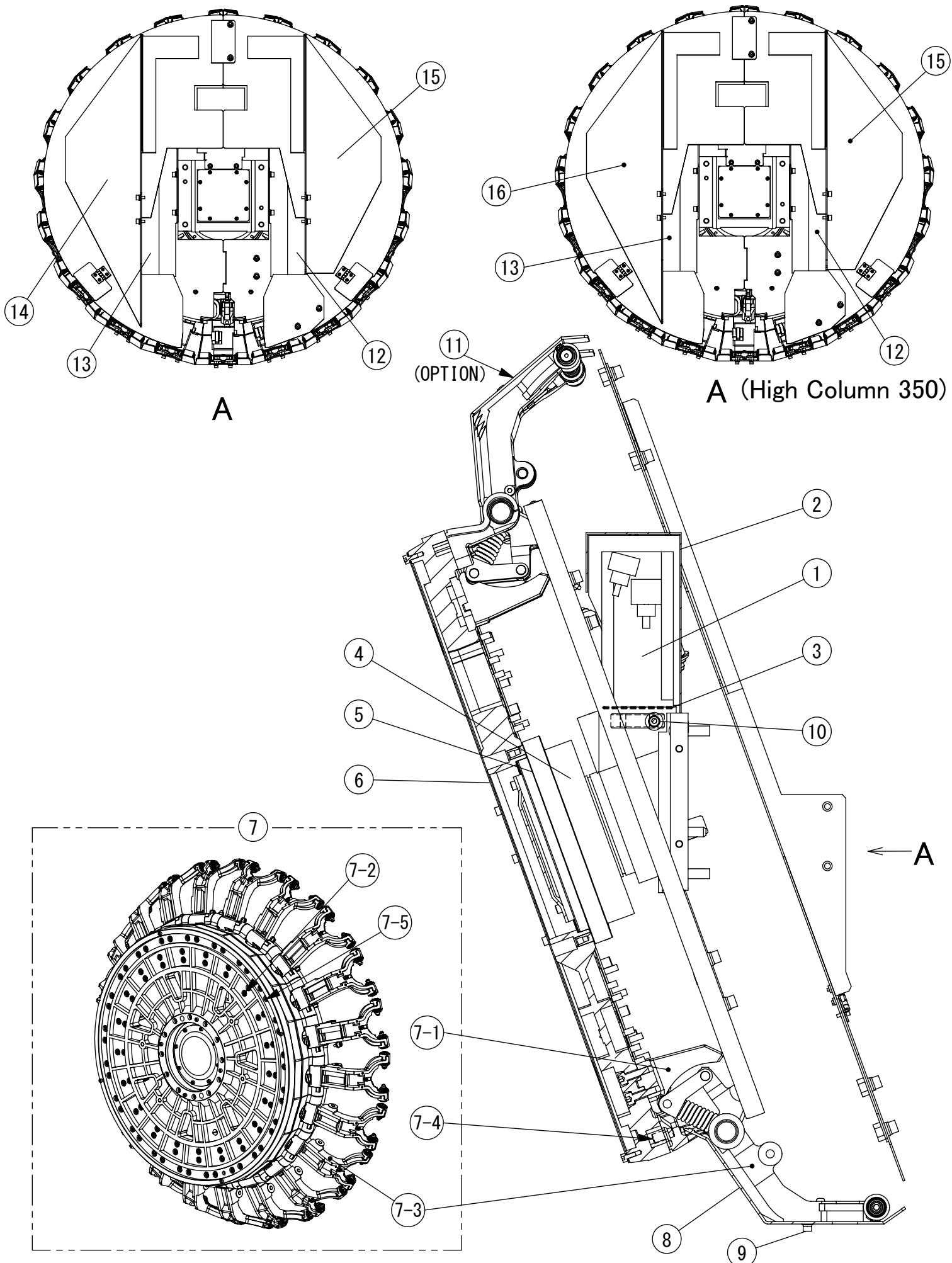


参照No. Ref. No.	部品コード Part Code	個数 Q'ty	品名 Part Name	備考 Remark	分類 Classification
1	6D0181001	1	MGモータ14 D0S	MOTOR MAGAZINE 14 D0S	
2	6D0158001	1	MGモータカバー14SK3	MAGAZINE MOTOR COVER 14 SK3	
3	6B1453001	1	OリングS55 4D	O RING S55 4D	
4	6C0321001	1	Cゲンソクキ ホキュウ SX1	TRANSMISSION C. SUPPLY SX1	
5	6B1108001 6B1108002 6B1108003 6B1108004 6B1108005 6B1108006 6B1108007 6B1108008	1 1 1 1 1 1 1 1	MGスペーサ S2D	MAGAZINE SPACER S2D         	t0.1 t0.2 t0.3 t0.4 t0.5 t0.8 t1.0 t1.2
6	6B9761001	1	アドレスメイバン14SX1V3	ADDRESS NAME PLATE 14 SX1 V3	
7	6C4959001	1	ツールMG14クミ SX V3	TOOL MAGAZINE 14 ASSY SX V3	
7-1	6C4961001	14	Gサポート SX V3	GRIP SUPPORT SX V3	
7-2	018062531	28	アナボルト6X25	BOLT SOCKET M6X25	
7-3	6C4977001	14	Gホキュウクミ14 SX V3	GRIP ASSY 14 SX V3 SUPPLY	
7-4	602574001	28	ストレートピン 8X18	STRAIGHT PIN	
7-5	018063531	28	アナボルト6X35	BOLT SOCKET M6X35	
8	6B6961001	14	グリップカバーM14SX1V2	GRIP COVER M14 SX1 V2	
9	6B4769001	28	ボルト NL 4X10	BOLT NL 4X10	
10	607327001	1	アナプラグPT1/8 GJ	PLUG SCREW PT1/8	
11	6B4998001	1	ダミーカバーSX1	DUMMY COVER SX1	Option
12	6B6278101	1	MGINカバー SX1 14L	MAGAZINE IN COVER SX1 14L	
13	6B6279001	1	MGINカバー SX1 14R	MAGAZINE IN COVER SX1 14R	
14	6B6280002	1	MGカバ-14-1クミSX1	MAGAZINE COVER 14-1 ASSY SX1	
15	6B6282002	2	MGカバ-14-2 SX1	MAGAZINE COVER 14-2 SX1	
16	6C0227002	1	MGカバ 14-2クミH350	MAGAZINE COVER 14-2 ASSY H350	High Column 350

\* 分類の"C"は制御部品、無印は機械部品の扱いです。

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## 2-2. ATCサドル・マガジン21 ATC SADDLE · MAGAZINE 21

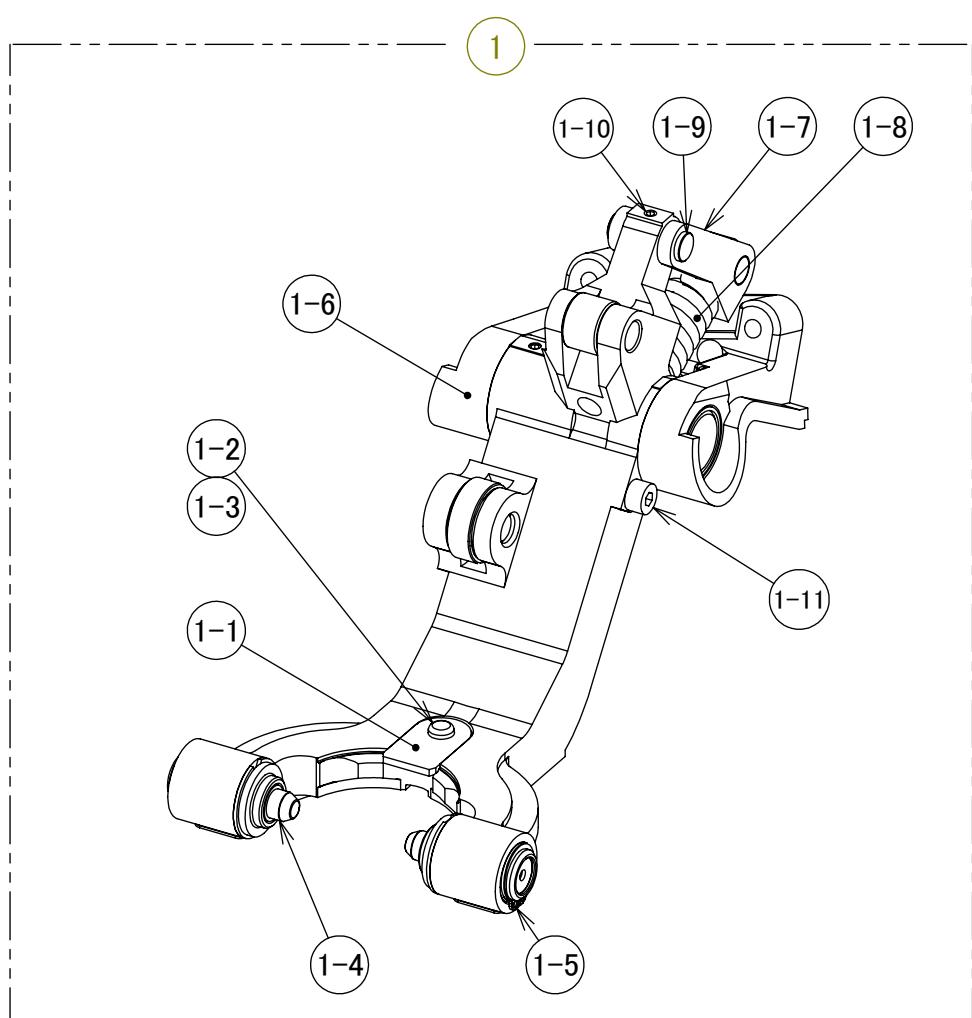


参照No. Ref. No.	部品コード Part Code	個数 Q'ty	品名 Part Name	備考 Remark	分類 Classification
1	6D0182001	1	MGモータ21 D0S	MOTOR MAGAZINE 21 D0S	
2	6D0159001	1	MGモータカバ-21SK3	MAGAZINE MOTOR COVER 21 SK3	
3	6B1453001	1	OリングS55 4D	O RING S55 4D	
4	6C0321001	1	Cゲンソクキ ホキュウSX1	TRANSMISSION C SUPPLY SX1	
5	6B1108001	1	MGスペーサ S2D	MAGAZINE SPACER S2D	t0.1
	6B1108002	1			t0.2
	6B1108003	1			t0.3
	6B1108004	1			t0.4
	6B1108005	1			t0.5
	6B1108006	1			t0.8
	6B1108007	1			t1.0
	6B1108008	1			t1.2
6	6B9760001	1	アドレスメイバン21SX1V2	ADDRESS NAME PLATE 21 SX1 V2	
7	6C4960001	1	ツールMG21クミ SX V3	TOOL MAGAZINE 21 ASSY SX V3	
7-1	6C4961001	21	Gサポート SX V3	GRIP SUPPORT SX V3	
7-2	018062031	42	アナボルト6X20	BOLT SOCKET M6X20	
7-3	6C4978001	21	Gホキュウクミ21 SX V3	GRIP ASSY 21 SX V3 SUPPLY	
7-4	602574001	42	ストレートピン 8X18	STRAIGHT PIN	
7-5	018063031	21	アナボルト6X30	BOLT SOCKET M6X30	
8	6B4768001	21	グリップカバーM21SX1V2	GRIP COVER M21 SX1 V2	
9	6B4769001	42	ボルトNL 4X10	BOLT NL 4X10	
10	607327001	1	アナプラグPT1/8 GJ	PLUG SCREW PT1/8	
11	6B4998001	1	ダミーカバーSX1	DUMMY COVER SX1	Option
12	6B6286101	1	MGINカバ- SX1 21L	MAGAZINE IN COVER SX1 21L	
13	6B6287001	1	MGINカバ- SX1 21R	MAGAZINE IN COVER SX1 21R	
14	6D0162001	1	MGカバ-21-1RクミSK3	MAGAZINE COVER 21-1R ASSY SK3	
15	6D0164001	1	MGカバ-21-1LクミSK3	MAGAZINE COVER 21-1L ASSY SK3	
16	6D0135001	1	MGカバ-21-1RクミH350	MG COVER 21-1R ASSY H350 SK3	High Column 350

\* 分類の"C"は制御部品、無印は機械部品の扱いです。

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### 3-1. グリップ14 GRIP 14

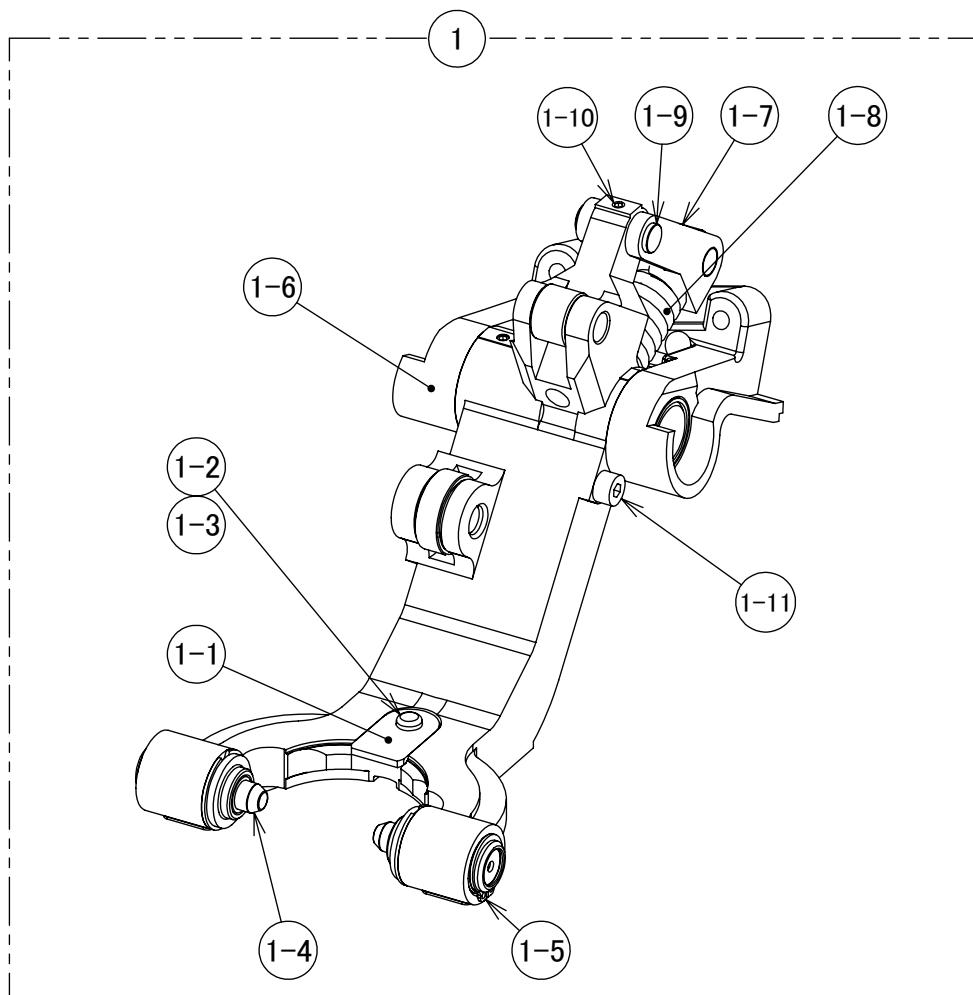


参照No. Ref. No.	部品コード Part Code	個数 Q'ty	品名 Part Name	備考 Remark	分類 Classification
1	6C4977001	1	G木キュウクミ14 SX V3	GRIP ASSY 14 SX V3 SUPPLY	
1-1	640150001	1	キ-DP2	KEY DP2	
1-2	002401605	1	+ナベコ4X16	SCREW PAN M4X16	
1-3	640115000	1	UナットM4X0.7	U NUT M4X0.7	
1-4	6C4985001	2	ピンホルダクミSX V3 SP	PIN HOLDER ASSY SX V3 SP	
1-5	048140142	2	トメワジクヨウC14	RETAINING RING EXTERNAL C14	
1-6	6C4979001	1	Gシテン14木キュウSX V3	G FULCRUM 14 SUPPLY SX V3	With bush
1-7	6C4973001	1	ローラレバークミ SX V3	LEVER ROLLER ASSY SX V3	
1-8	6C4972001	1	コイルバネ 18X40	COIL SPRING 18X40	
1-9	6C4975001	1	シャフト 8X22	SHAFT 8X22	
1-10	6D1118001	1	アヒラ4X4 M	SET SCREW SOCKET (FT) M4X4 M	
1-11	018500831	1	アナボルト5X8	BOLT SOCKET M5X8	

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### 3-2. グリップ21 GRIP 21

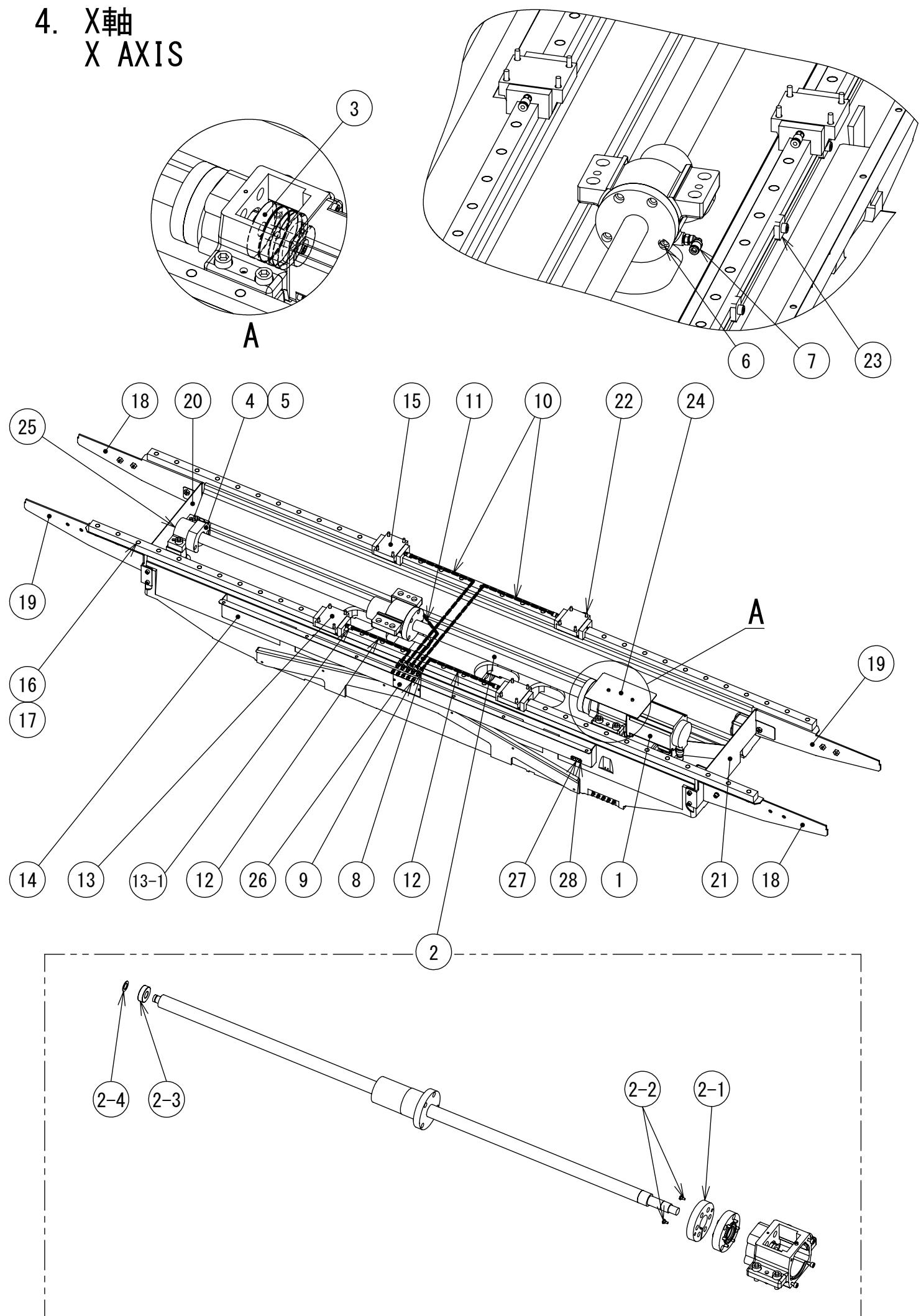


参照No. Ref. No.	部品コード Part Code	個数 Q'ty	品名 Part Name	備考 Remark	分類 Classification
1	6C4978001	1	G木キュウクミ21 SX V3	GRIP ASSY 21 SX V3 SUPPLY	
1-1	640150001	1	キ-DP2	KEY DP2	
1-2	002401605	1	+ナベコ4X16	SCREW PAN M4X16	
1-3	640115000	1	UナットM4X0.7	U NUT M4X0.7	
1-4	6C4985001	2	ピンホルダクミSX V3 SP	PIN HOLDER ASSY SX V3 SP	
1-5	048140142	2	トメワジクヨウC14	RETAINING RING EXTERNAL C14	
1-6	6C4980001	1	Gシテン21ホキュウSX V3	G FULCRUM 21 SUPPLY SX V3	With bush
1-7	6C4973001	1	ローラレバークミ SX V3	LEVER ROLLER ASSY SX V3	
1-8	6C4972001	1	コイルバネ 18X40	COIL SPRING 18X40	
1-9	6C4975001	1	シャフト 8X22	SHAFT 8X22	
1-10	6D1118001	1	アヒラ4X4 M	SET SCREW SOCKET (FT) M4X4 M	
1-11	018500831	1	アナボルト5X8	BOLT SOCKET M5X8	

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#### 4. X軸 X AXIS

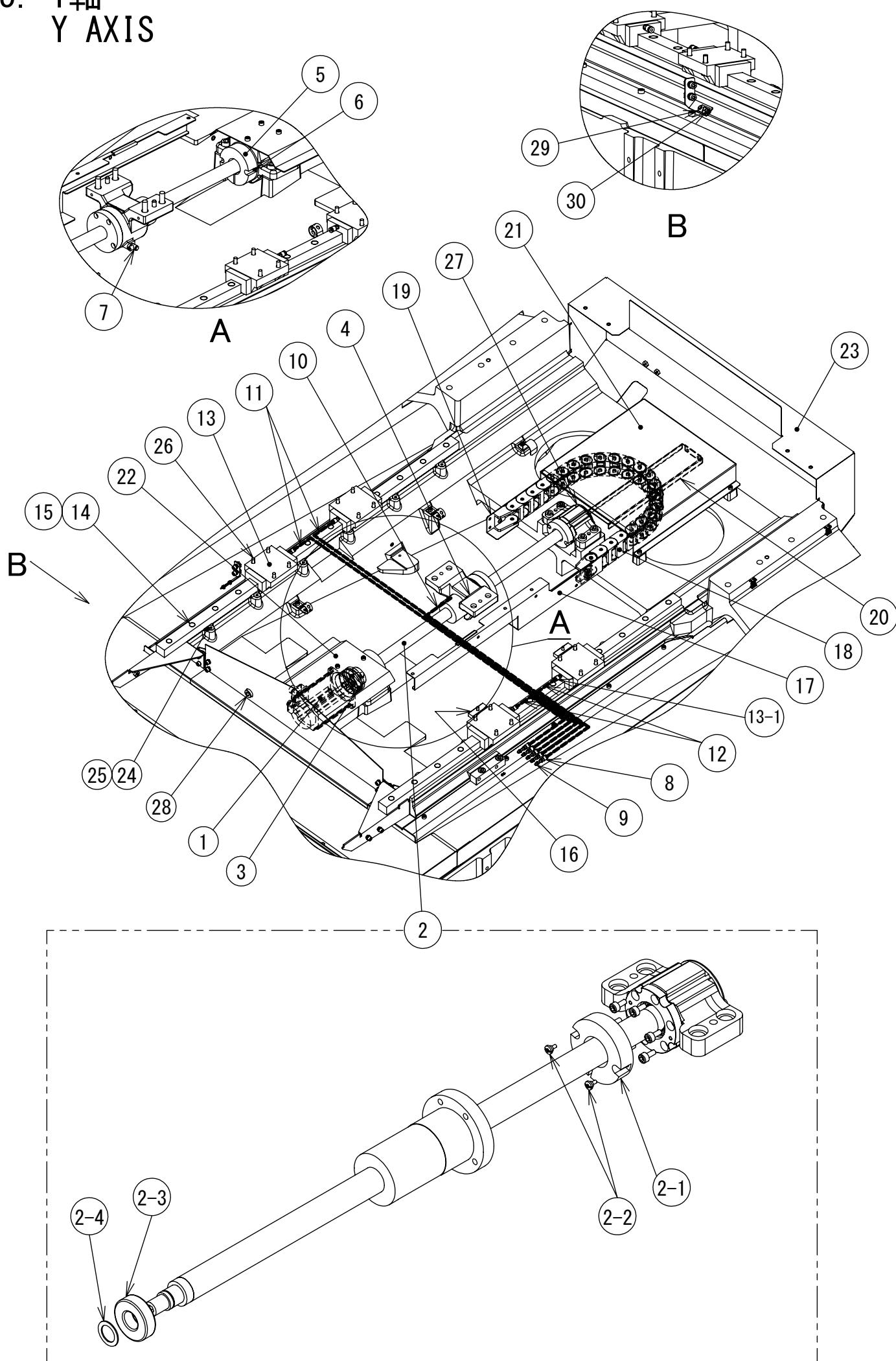


参照No. Ref. No.	部品コード Part Code	個数 Q'ty	品名 Part Name	備考 Remark	分類 Classification
1	6D0183001	1	XYジクモータ D0S	MOTOR XY AXIS D0S	
2	6X0263001	1	ボルネジXクミ SX1-SL	BALL SCREW ASSY X SX1-SL	
2-1	6C0027001	1	ストッパD88T16	STOPPER D88T16	
2-2	533676001	2	ダンネジ	SHOULDER SCREW	
2-3	076202602	1	Rタマジクウケ6202VV	BALL BEARING, RADIAL 6202VV	
2-4	048150142	1	トメワジクヨウC15	RETAINING RING EXTERNAL C15	
3	6B7022001	1	カツプリング16-16 MX1	COUPLING 16-16 MX1	
4	6B3422001	1	ストッパ D80T24	STOPPER D80T24	
5	533676001	2	ダンネジ	SHOULDER SCREW	
6	081006070	1	OリングP6	O RING P6	
7	6C0296001	1	エルボKL4-M5-1	ELBOW KL4-M5-1	
8	6B9132001	5	グリスツギテ KC4-BRT-1	GREASE TUBE JOINT KC4-BRT-1	
9	6A6157001	5	グリースニップル6P0.75	GREESE NIPPLE 6P0.75	
10	641342000	2	レイロンチューブ550	TUBE 550	For guide
11	641342000	1	レイロンチューブ550	TUBE 550	For ball screw
12	641336000	2	レイロンチューブ240	TUBE 240	For guide
13	6X0176001	1	ガイド+ツギテクミSX1SLX	GUIDE+TUBE JOINT ASSY SX1SL X	
13-1	6B9132001	4	グリスツギテ KC4-BRT-1	GREASE TUBE JOINT KC4-BRT-1	
14	6D0007001	2	テーブルカバー SK3	TABLE COVER SK3	
15	6B6260001 6B6260002 6B6260003 6B6260004 6B6260005 6B6260006 6B6260007 6B6260008 6B6260009	4 4 4 4 4 4 4 4 4	スペーサ 58X66	SPACER 58X66	t0.020 t0.025 t0.030 t0.035 t0.040 t0.045 t0.050 t0.055 t0.060
16	6A6903001	66	ガイドキャップ M6	GUIDE CAP M6	
17	018062031	54	アナボルト6X20	BOLT SOCKET M6X20	
18	6C0016001	2	Xテレサポ L SX1-SL	X TELESCOPIC SUPPORT L SX1-SL	
19	6C0017001	2	Xテレサポ R SX1-SL	X TELESCOPIC SUPPORT R SX1-SL	
20	6C0024001	1	Xテレシタカバ-L SX1SL	X TEL-P UNDER COVER L SX1-SL	
21	6C0025001	1	Xテレシタカバ-R SX1SL	X TEL-P UNDER COVER R SX1-SL	
22	018062031	16	アナボルト6X20	BOLT SOCKET M6X20	
23	6B8044001	10	ガイドオサエプレート T6	GUIDE FIXING PLATE T6	
24	6B4812001	1	モータベースカバ-X SX1	MOTOR BASE COVER X SX1	
25	6B4808001	1	BRGホルダカバ-X SX1	BEARING HOLDER COVER X SX1	
26	6A7576001	1	ホウコウメイバン XYZ	NAME PLATE XYZ	
27	6C4032001	2	ゲンテンアイマーク	ORIGIN MARK	
28	000400608	4	+バインド4X6	SCREW BIND M4X6	

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## 5. Y軸 Y AXIS

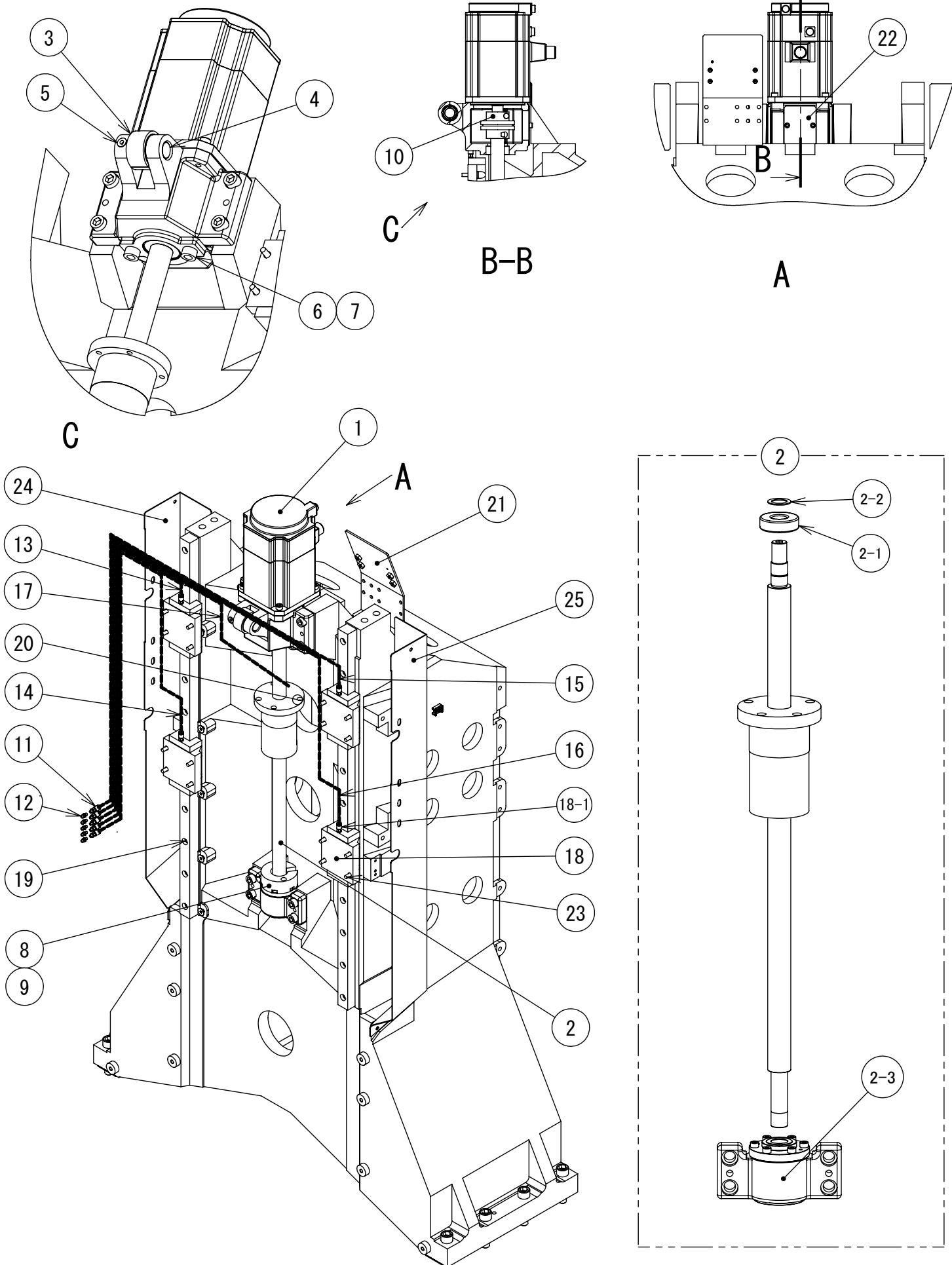


参照No. Ref. No.	部品コード Part Code	個数 Q'ty	品名 Part Name	備考 Remark	分類 Classification
1	6D0183001	1	XYジクモータ D0S	MOTOR XY AXIS D0S	
2	6X0264001	1	ボルネジYクミ SX1-SL	BALL SCREW ASSY Y SX1-SL	
2-1	6C0030001	1	ストッパーD72T18	STOPPER D72T18	
2-2	533676001	2	ダンネジ	SHOULDER SCREW	
2-3	076204602	1	Rタマジクワケ6204VV	BALL BEARING, RADIAL 6204VV	
2-4	048200142	1	トメワジクヨウC20	RETAINING RING EXTERNAL C20	
3	6B7022001	1	カップリング16-16 MX1	COUPLING 16-16 MX1	
4	081006070	1	OリングP6	O RING P6	
5	6C0031001	1	ストッパー D82T28	STOPPER D82T28	
6	533676001	2	ダンネジ	SHOULDER SCREW	
7	641347000	1	ユニバサルエルbowUEF4N	UNIVERSAL ELBOW UEF4N	
8	6B9132001	5	グリスツギテ KC4-BRT-1	GREASE TUBE JOINT KC4-BRT-1	
9	6A6157001	5	グリスニップル6P0.75	GREESE NIPPLE 6P0.75	
10	6A3423001	1	レイロンチューブ1300	TUBE 1300	For guide
11	6A7726001	2	レイロンチューブ1700	TUBE 1700	For ball screw
12	641338000	2	レイロンチューブ360	TUBE 360	For guide
13	6X0177001	1	ガイド+ツギテクミSX1SLY	GUIDE+TUBE JOINT ASSY SX1SL Y	
13-1	6B9132001	4	グリスツギテ KC4-BRT-1	GREASE TUBE JOINT KC4-BRT-1	
14	610576001	26	ガイドキャップ M8	GUIDE CAP M8	
15	018082531	24	アナボルト8X25	BOLT SOCKET M8X25	
16	622036002	2	キ-16X10X50	KEY 16X10X50	15.960
	622036003	2			15.955
	622036004	2			15.950
	622036005	2			15.945
	622036006	2			15.940
	622036007	2			15.935
	622036008	2			15.930
	622036009	2			15.925
	622036010	2			15.920
	622036011	2			15.915
17	6C0033001	1	XモーターコードBK SX1SL	X MOTOR CODE BK SX1-SL	
18	6C0034001	1	ケーブルベアY SX1-SL	CABLE BEAR Y SX1-SL	
19	6C0035001	1	YケーブルベアBK SX1SL	CABLE BEAR BK-Y SX1-SL	
20	6C0036001	1	YケーブルBサポ SX1SL	Y CABLE BEAR SUPPORT SX1-SL	
21	6C0037001	1	YケーブルBカバーSX1SL	Y CABLE BEAR COVER SX1-SL	
22	6B6259001	1	モータベースカバーY SX1	MOTOR BASE COVER Y SX1	
23	6D0140001	1	YベースウシロカバーSK3	Y BASE REAR COVER SK3	
24	637596001	12	ストレートピン5X25H7	STRAIGHTN PIN 5X25 H7	
25	637597001	12	サラボルト8X16トク	BOLT 8X16 SPECIAL	
26	018082531	16	アナボルト8X25	BOLT SOCKET M8X25	
27	6B4809001	1	BRGホルダカバ-YN SX1	BEARING HOLDER COVER YN SX1	
28	626373000	1	アナプラグ PT1/2	PLUG PT1/2	
29	6C4032001	1	ゲンテンアイマーク	ORIGIN MARK	
30	000400608	2	+バインド4X6	SCREW BIND M4X6	

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## 6. Z軸 Z AXIS

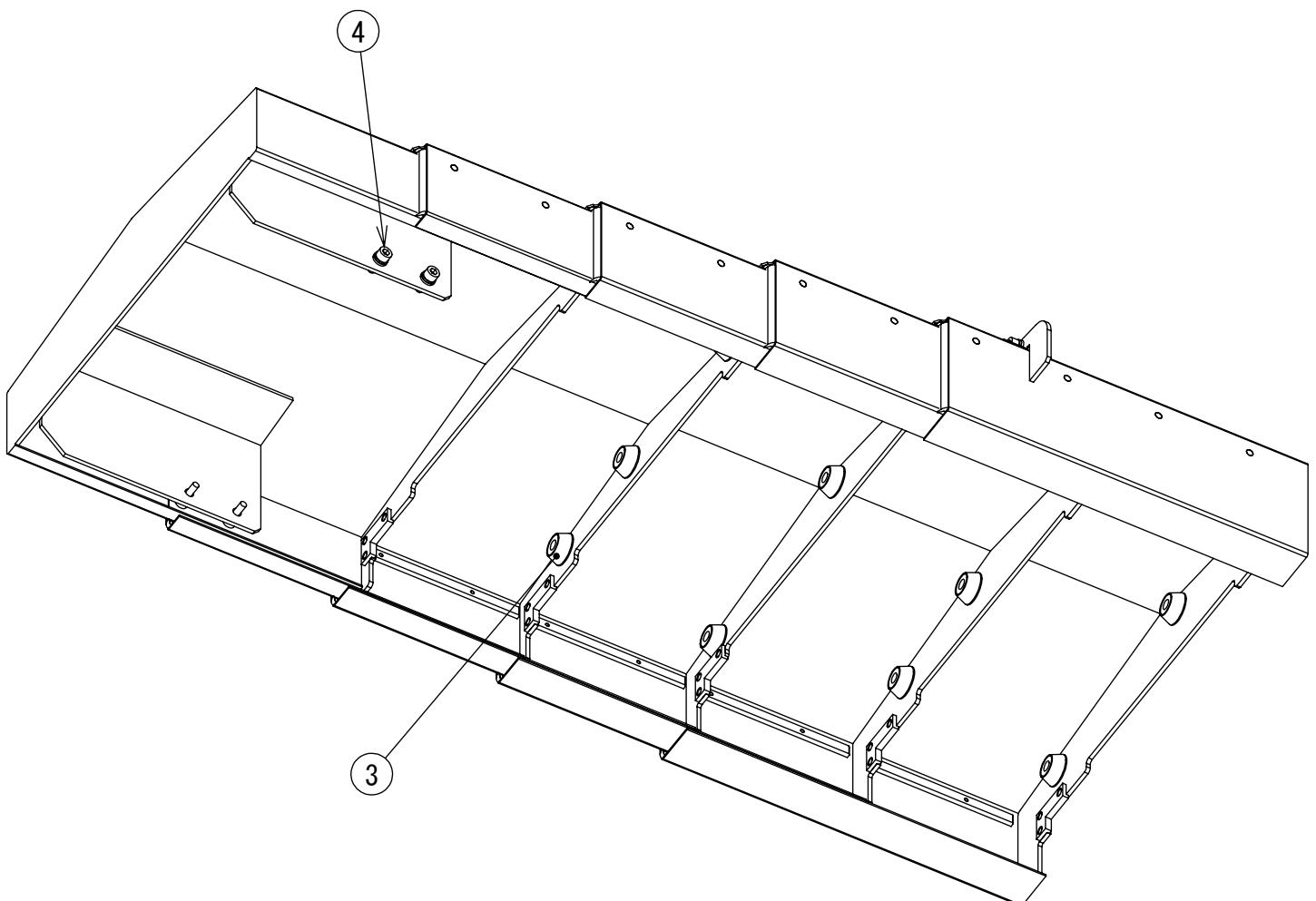
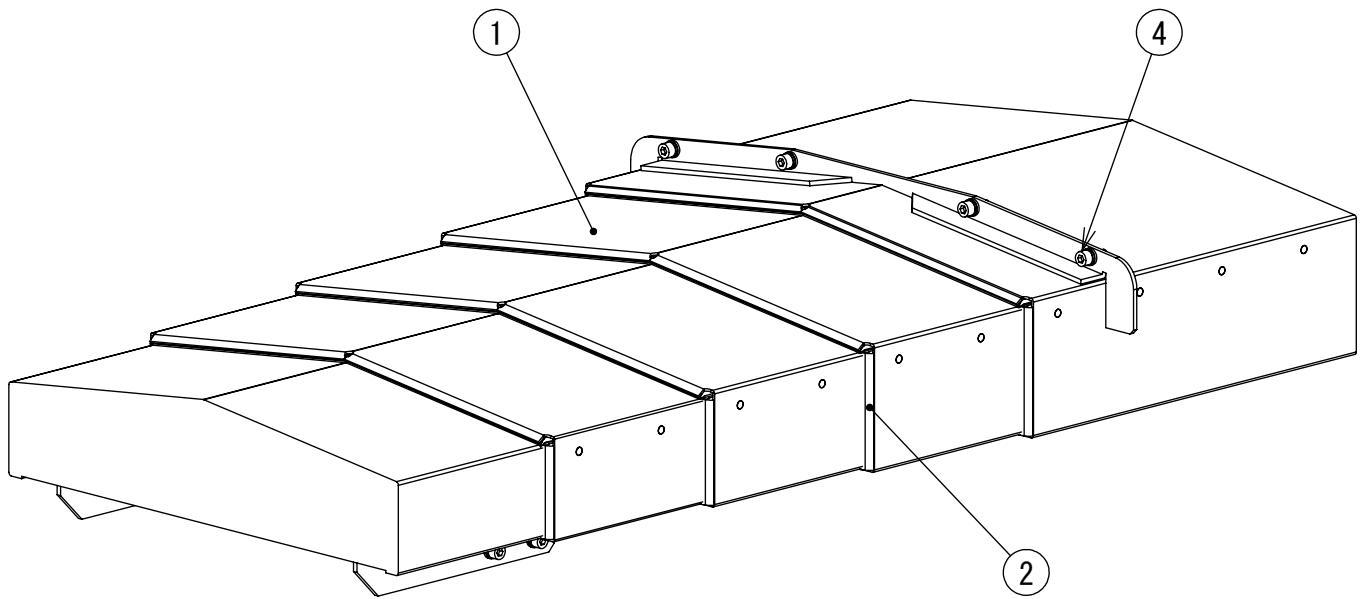


参照No. Ref. No.	部品コード Part Code	個数 Q'ty	品名 Part Name	備考 Remark	分類 Classification
1	6D0184001	1	Zジクモータ D0S	MOTOR Z AXIS D0S	
2	6X0257201	1	Z-BSホキュウクミ SX1	Z BALL SCREW SUPPLY ASSY SX1	
2-1	076204602	1	Rタマジクウケ6204VV	BALL BEARING, RADIAL 6204VV	
2-2	048200142	1	トメワジクヨウC20	RETAINING RING EXTERNAL C20	
2-3	6B8936201	1	シールドZ-BRGホキュウクミ	SHIELED Z-BRG SUPPLY ASSY	
3	6B6307001	1	ローラー NART20UUR	ROLLER NART20UUR	
4	6B6312001	1	ジク 20X57	SHAFT 20X57	
5	608782001	1	アナトメネジ6 クボミトク	SET SCREW, SOCKET 6 SPE.	
6	646237000	2	ストッパーZ 311	STOPPER Z 311	
7	533676001	2	ダンネジ	SHOULDER SCREW	
8	6B6277001	1	ストッパー D73T29	STOPPER D73T29	
9	533676001	2	ダンネジ	SHOULDER SCREW	
10	6B1066001	1	カップリング18-22 S2D	COUPLING 18-22 S2D	
11	641346000	5	ストレートBF4N	JOINT STRAIGHT BF4N 321	
12	6A6157001	5	グリースニップル6P0.75	GREESE NIPPLE 6P0.75	
13	637435001	1	レイロンチューブ1050	TUBE, LYYLON 1050	For guide
14	637435001	1	レイロンチューブ1050	TUBE, LYYLON 1050	For guide
15	6A3423001	1	レイロンチューブ1300	TUBE 1300	For guide
16	6A7726001	1	レイロンチューブ1700	TUBE 1700	For guide
17	637435001	1	レイロンチューブ1050	TUBE, LYYLON 1050	For ball screw
18	6X0178001	1	ガイド+ツギテクミSX1SLZ	GUIDE+TUBE JOINT ASSY SX1SL Z	
18-1	6B9132001	4	グリスソギテ KC4-BRT-1	GREASE TUBE JOINT KC4-BRT-1	
19	018082531	24	アナボルト8X25	BOLT SOCKET M8X25	
20	081006070	1	OリングP6	O RING P6	
21	6B6269101	1	CブレケットC SX1	C BRACKET C SX1	
22	6B4739001	1	Zモータベースカバ-SX1	Z MOTOR BASE COVER SX1	
23	018082531	16	アナボルト8X25	BOLT SOCKET M8X25	
24	6D0017001	1	Zサイドカバ-L SK3	COVER Z SIDE L SK3	
25	6D0018001	1	Zサイドカバ-R SK3	COVER Z SIDE R SK3	

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## 7. Xテレスコカバー X TELESCOPIC COVER



7. Xテレスコカバー  
X TELESCOPIC COVER

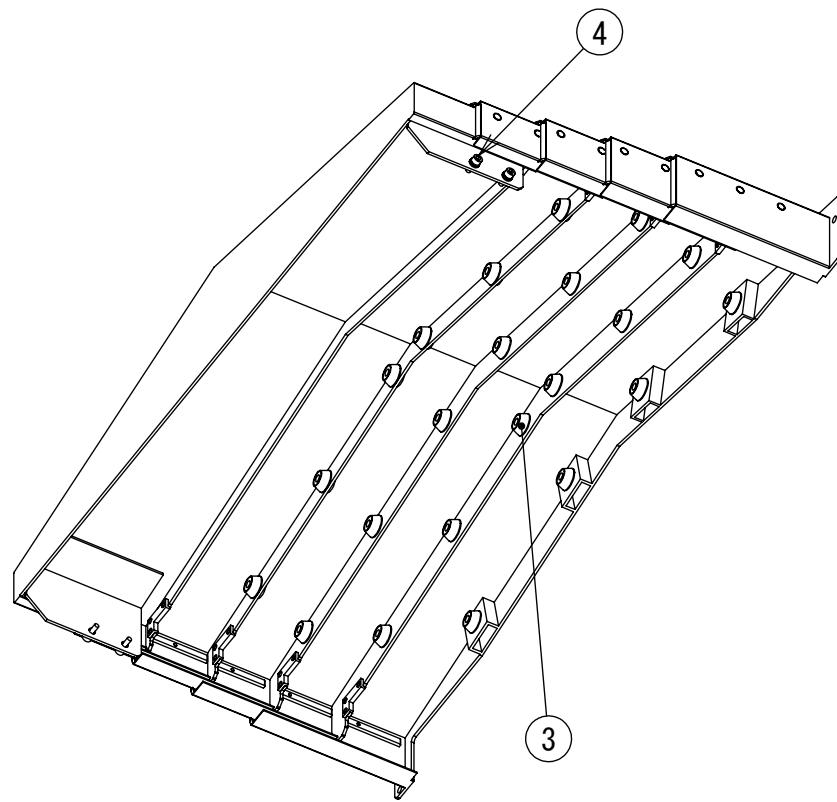
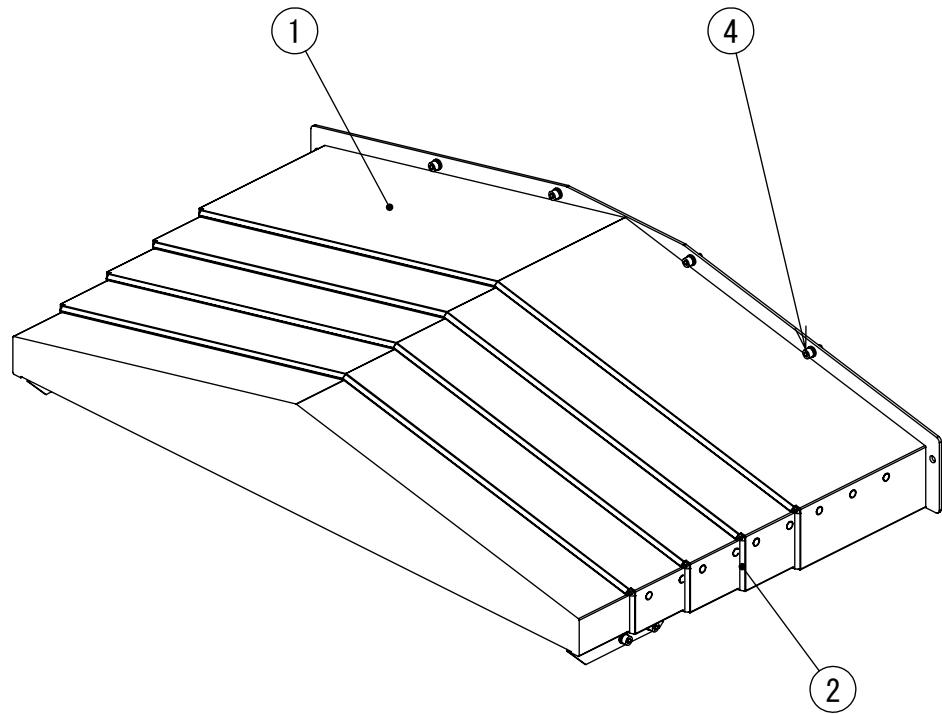
WXd1

参照No. Ref. No.	部品コード Part Code	個数 Q'ty	品名 Part Name	備考 Remark	分類 Classification
1	6D0362001	2	テレスコ X ホキュウ SK3	X TELESCOPIC SPARE SK3	same parts L/R
2	6C0259001	2	XTワイパー ホキュウ SX1SL	WIPER X TELESCOPIC SUPPLY SX1SL	
3	6A6810001	24	クッション	TELESCOPIC CUSHION 22B	
4	622959001	16	アナボルトバネヒラ6X16	SOCKET HEAD BOLT 6X16	

\* 分類の"C"は制御部品、無印は機械部品の扱いです。

\* "C" in the "Classification" indicates that the part is classified into control part, while no mark indicates machine part.

## 8-1. Yテレスコカバー Y TELESCOPIC COVER

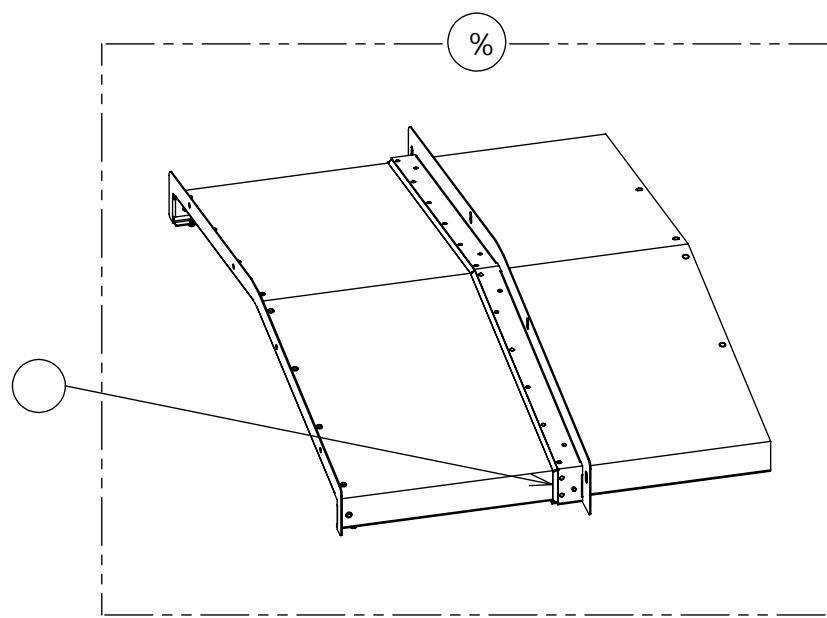
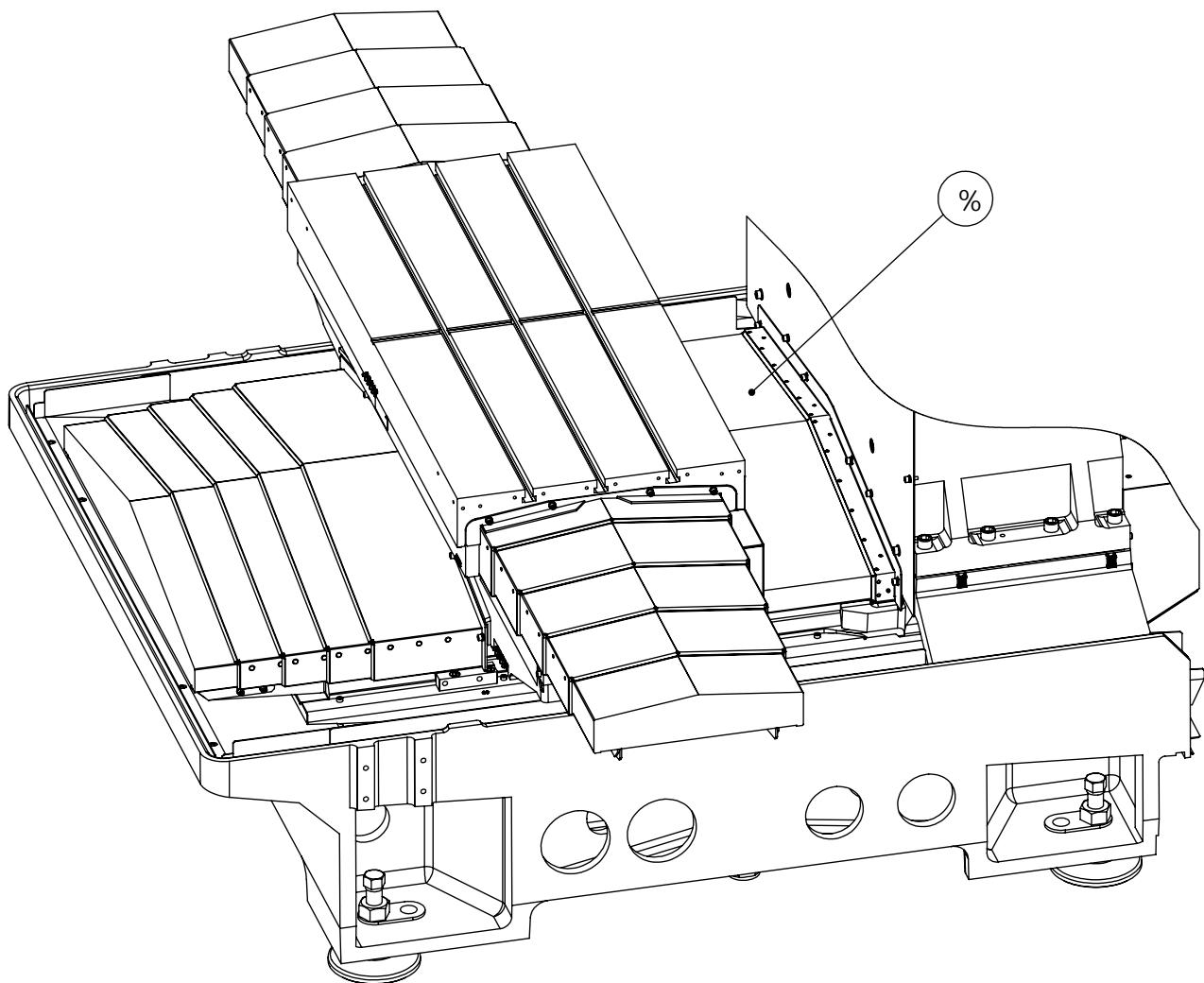


参照No. Ref. No.	部品コード Part Code	個数 Q'ty	品名 Part Name	備考 Remark	分類 Classification
1	6D0363001	1	テレスコ Y ホキュウ SK3	Y TELESCOPIC SPARE SK3	
2	6C0260001	1	YTワイパー ホキュウ SX1SL	WIPER Y TELESCOPIC SUPPLY SX1SL	
3	6A6810001	22	クッション	TELESCOPIC CUSHION 22B	
4	622959001	10	アナボルトバネヒラ 6X16	SOCKET HEAD BOLT 6X16	

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! & M  
M5L=G F95F 7CJ9F



8-2. Y軸ウシロカバー  
Y AXIS REAR COVER

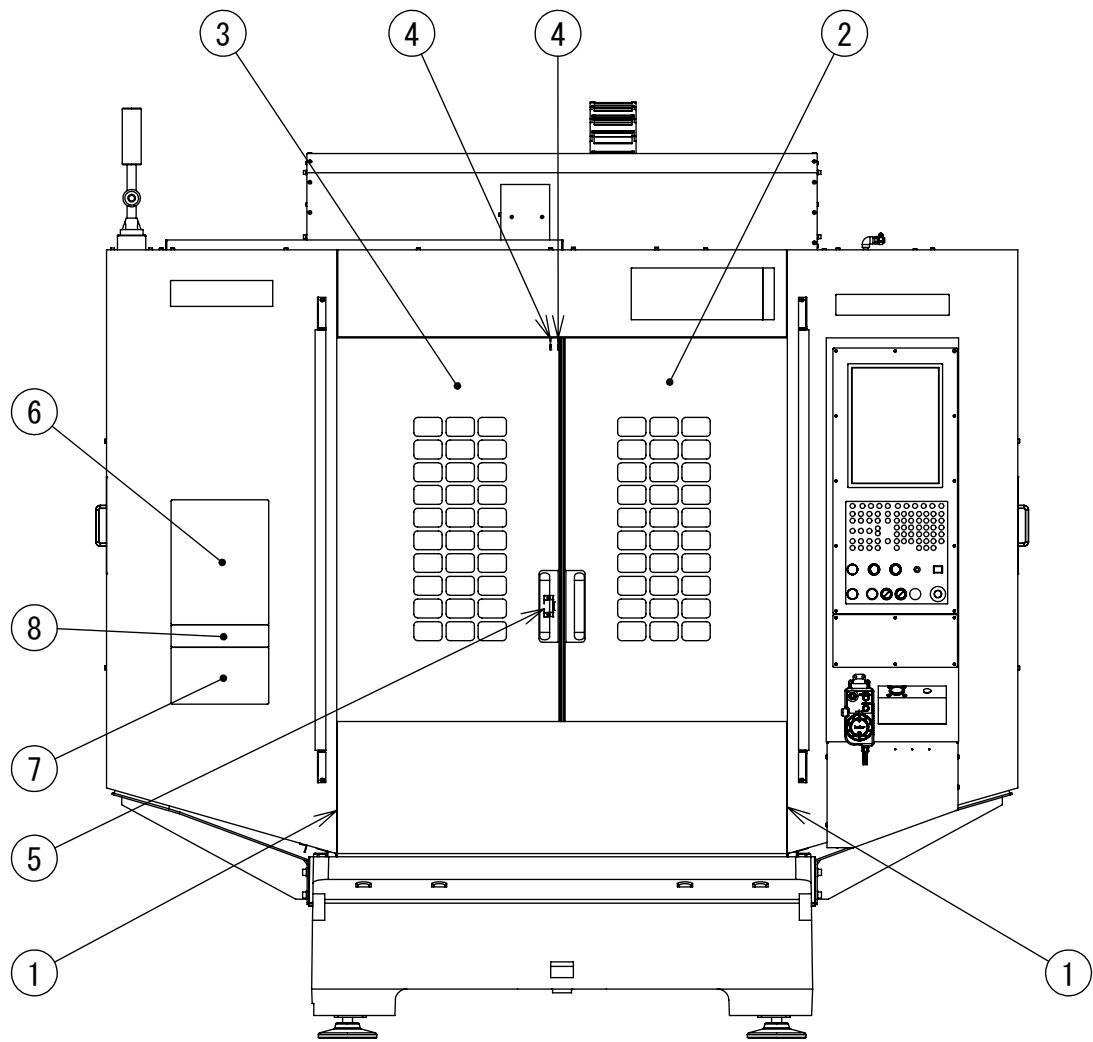
WXd1

参照No. Ref. No.	部品コード Part Code	個数 Q'ty	品名 Part Name	備考 Remark	分類 Classification
1	6D0364001	1	Yウシロカバー ホキュウ SK3 Y REAR COVER SPARE SK3		
2	6C0265001	1	Yウシロワイパクミ SX1SL Y REAR WIPER ASSY SX1SL		

\* 分類の"C"は制御部品、無印は機械部品の扱いです。

\* "C" in the "Classification" indicates that the part is classified into control part, while no mark indicates machine part.

## 9. 機械カバー MACHINE COVER 1/2

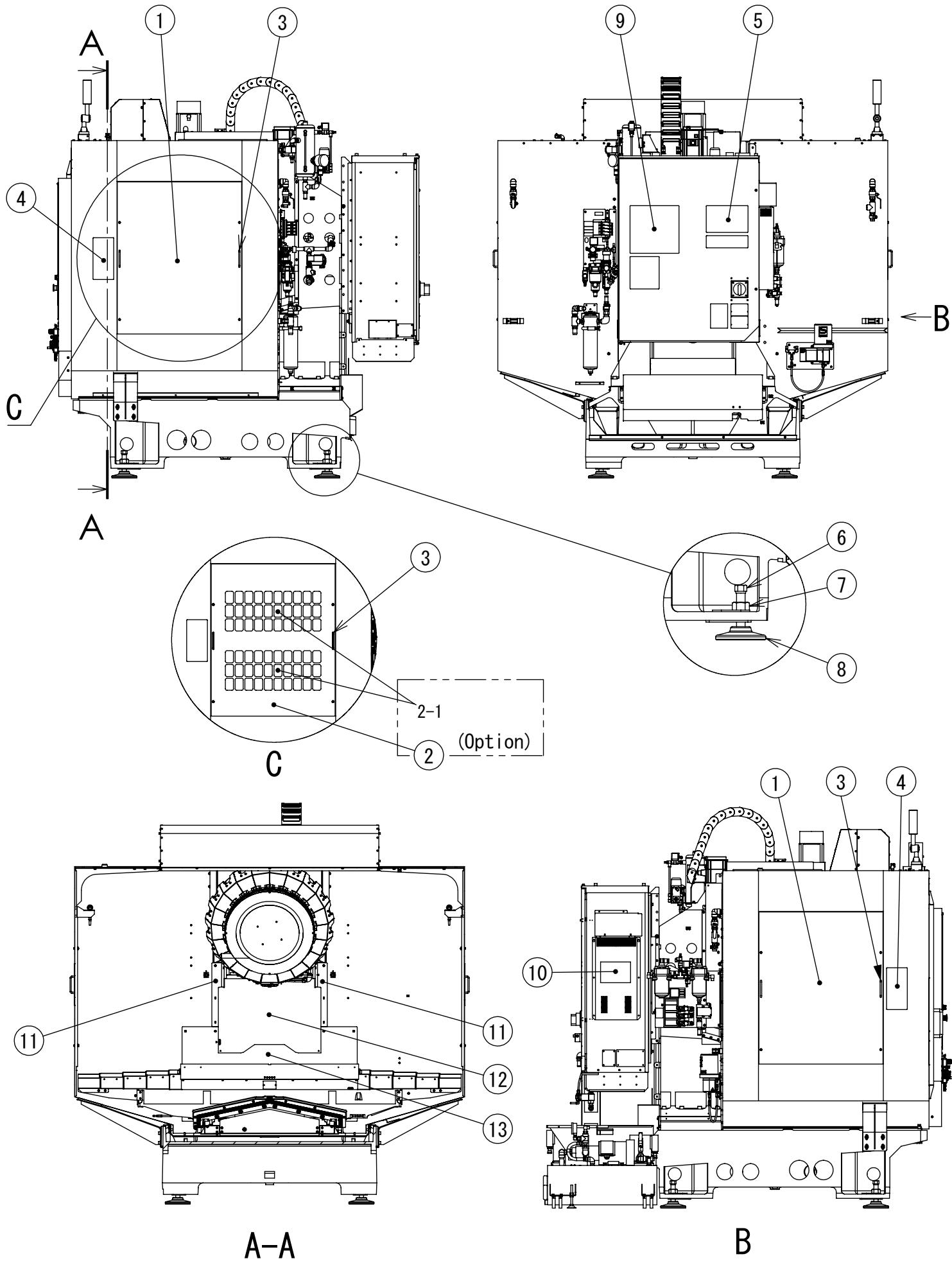


参照No. Ref. No.	部品コード Part Code	個数 Q'ty	品名 Part Name	備考 Remark	分類 Classification
1	6D0349001	1	フロントパッキンR SK3	FRONT PACKING R SK3	
	6D0350001	1	フロントパッキンL SK3	FRONT PACKING L SK3	
2	6D0024001	1	ドアRクミ SK3	DOOR R ASSY SK3	
3	6D0033001	1	ドアLクミ SK3	DOOR L ASSY SK3	
4	6A7006001	2	トビラワイパーS2C	DOOR WIPER S2C	
5	640313000	1	キヤツチ C-100-B-2	MAGNETIC CATCHES	
6	69A918001	1	マエPSラベルJCE IS	LABEL PS JCE IS	Japanese, English
	69A919001	1	マエPSラベルEGF IS	LABEL PS EGF IS	English, German, French
	69A921001	1	マエPSラベル C GB	LABEL PS C GB	Chinese
	69A962001	1	マエPSラベル KCE IS	LABEL PS KCE IS	Portuguese
7	69A906001	1	コウグラベルSXD1	LABEL TOOL SXD1	Japanese, English
	69A907001	1	コウグラベルSXD1 BBT	LABEL TOOL SXD1 BBT	BBT, Japanese, English
	69A908001	1	コウグラベルSXD1 C	LABEL TOOL SXD1 C	Chinese
	69A909001	1	コウグSXDI BBT C	LABEL TOOL SXD1 BBT C	BBT, Chinese
	69A926001	1	ツールソウチャクラベルJCE	LABEL TOOL ATTACHMENT JCE	Japanese, English

\* 分類の"C"は制御部品、無印は機械部品の扱いです。

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## 9. 機械力バー MACHINE COVER 2/2

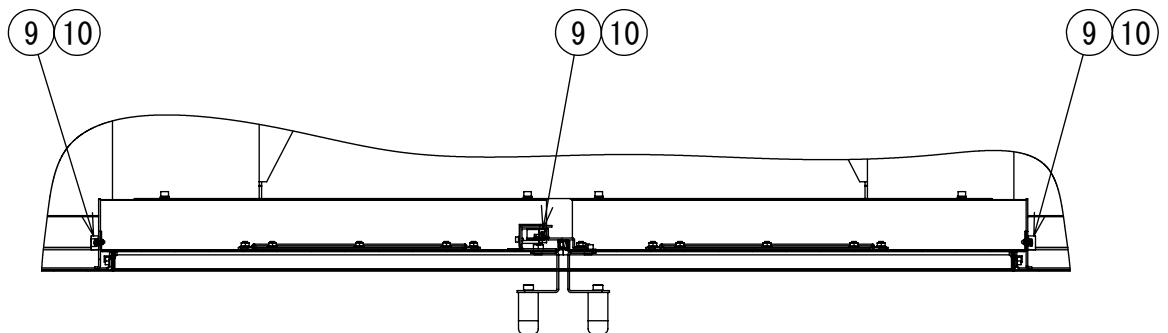


参照No. Ref. No.	部品コード Part Code	個数 Q'ty	品名 Part Name	備考 Remark	分類 Classification
1	6C4074002	2	サイドカバークミSX2	SIDE COVER ASSY SX2	
2	6C4103002	2	マドツキサイドカバクミSX2	WINDOW SIDE COVER ASSY T5 SX2	
2-1	6C4734001	2	ヨコマド628X268クミ	SIDE WINDOW 628X268 ASSY	
3	622627001	2	トツテ8X100	HANDLE 8X100	
4	69A957001	2	メンテマドラベルJCE IS	LABEL MAINTENANCE JCE IS	Japanese, English
	69A958001	2	メンテマドラベルEGF IS	LABEL MAINTENANCE EGF IS	English, German, French
	69A960001	2	メンテマドラベル C GB	LABEL MAINTENANCE C GB	Chinese
	69A964001	2	メンテマドラベルKCE IS	LABEL MAINTENANCE KCE IS	Korea
5	69A922001	1	ウシロPSラベルJCE IS	LABEL REAR PS JCE IS	Japanese, English
	69A923001	1	ウシロPSラベルEGF IS	LABEL REAR PS EGF IS	English, German, French
	69A925001	1	ウシロPSラベル C GB	LABEL REAR PS C GB	Chinese
	69A963001	1	ウシロPSラベルKCE IS	LABEL REAR PS KCE IS	Korea
6	635637001	4	ボルト M30P2 トク	BOLT M30P2 SPECIAL	
7	635638001	4	ナット1シユ M30P2	NUT 1 M30P2	
8	6B1224001	4	アンカ-P.D155H39クミ	UNCHOR P.D155H39 ASSY	
9	698846001	1	キュウユラベルSX2	LABEL LUBRICATION SX2	
10	698169001	1	ファンガードホシュラベルC	LABEL FAN GUARD C	Chinese
	698170001	1	ファンガードホシュラベルEJC	LABEL FAN GUARD EJC	English, Japanese, Chinese
11	6C0057001	1	CサイドカバーR SX1-SL	COLUMN SIDE COVER R SX1-SL	
	6C0056001	1	CサイドカバーL SX1-SL	COLUMN SIDE COVER L SX1-SL	
12	6D0013001	1	Zカバー SK3	COVER Z SK3	
13	6D0009001	1	コラムマエカバー SK3	COLUMN FRONT COVER SK3	
	6D0010001	1	コラムマエカバー150 SK3	COLUMN FRONT COVER H150 SK3	High Column 150
	6D0011001	1	コラムマエカバー250 SK3	COLUMN FRONT COVER H250 SK3	High Column 250
	6D0012001	1	コラムマエカバー350 SK3	COLUMN FRONT COVER H350 SK3	High Column 350

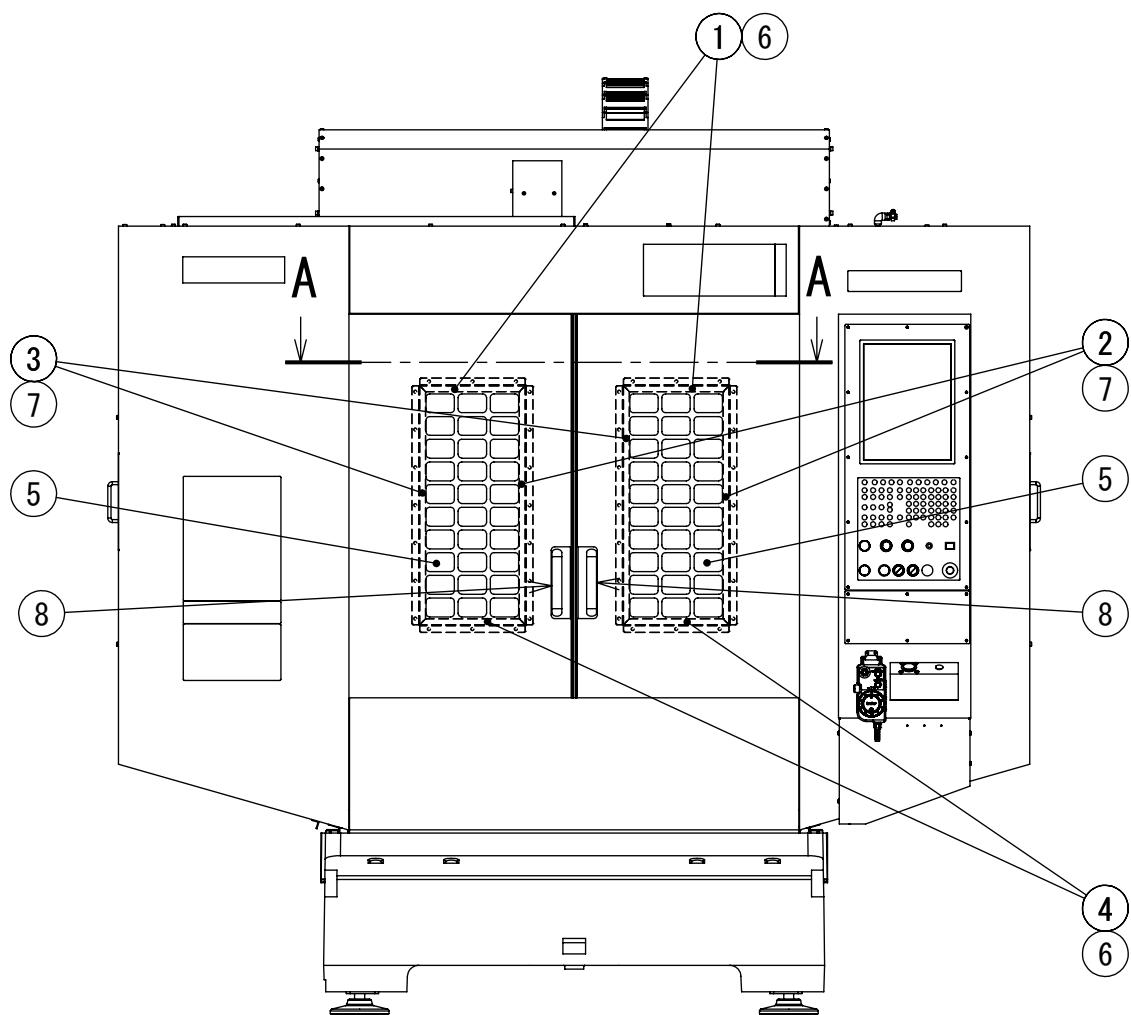
\* 分類の"C"は制御部品、無印は機械部品の扱いです。

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10. 扉 1/2  
DOOR 1/2



A-A

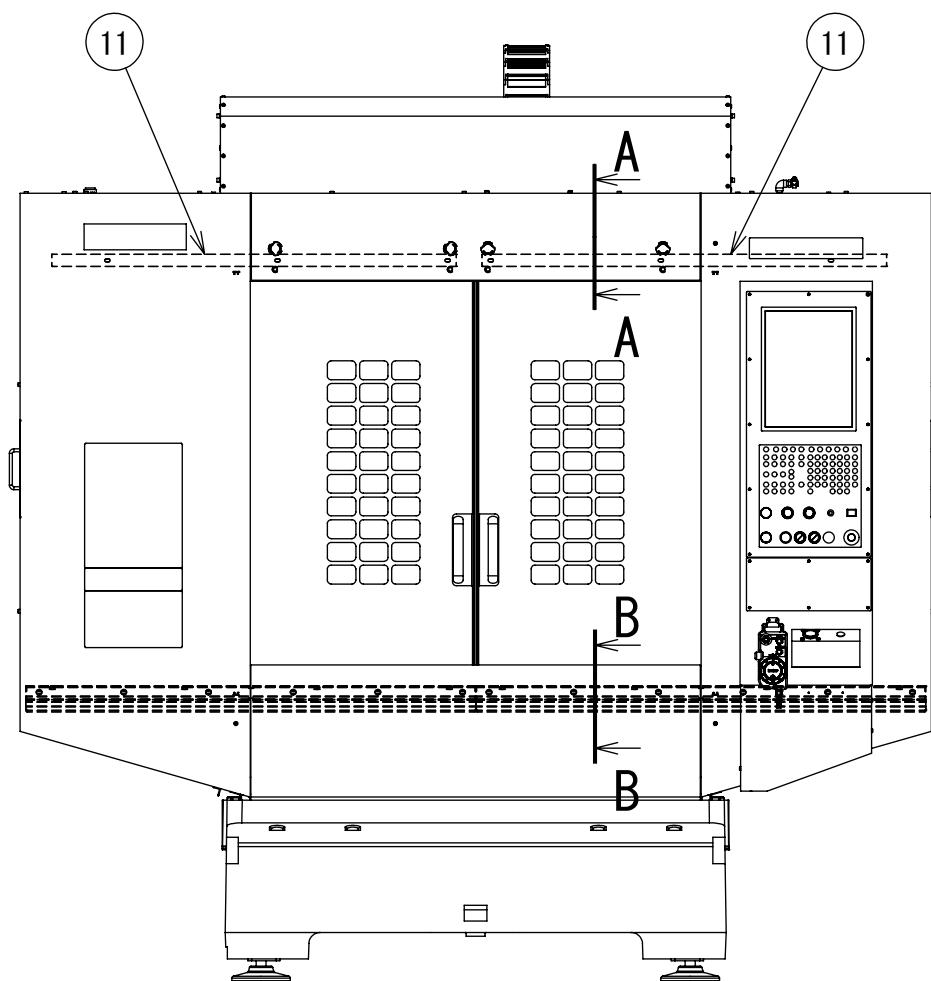
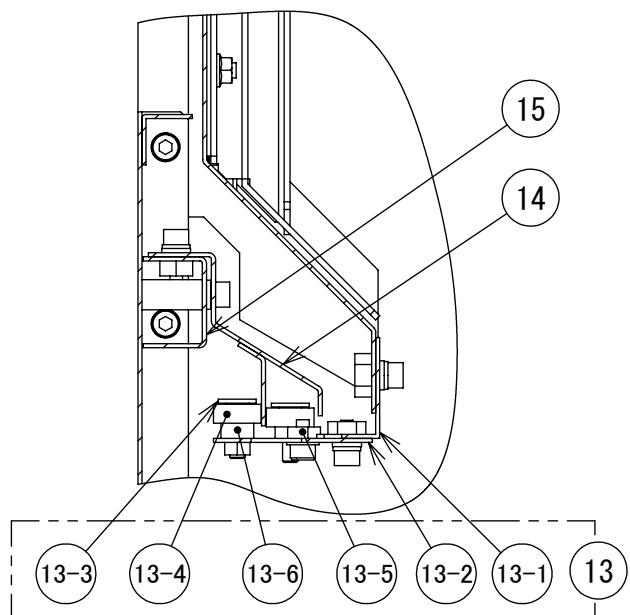
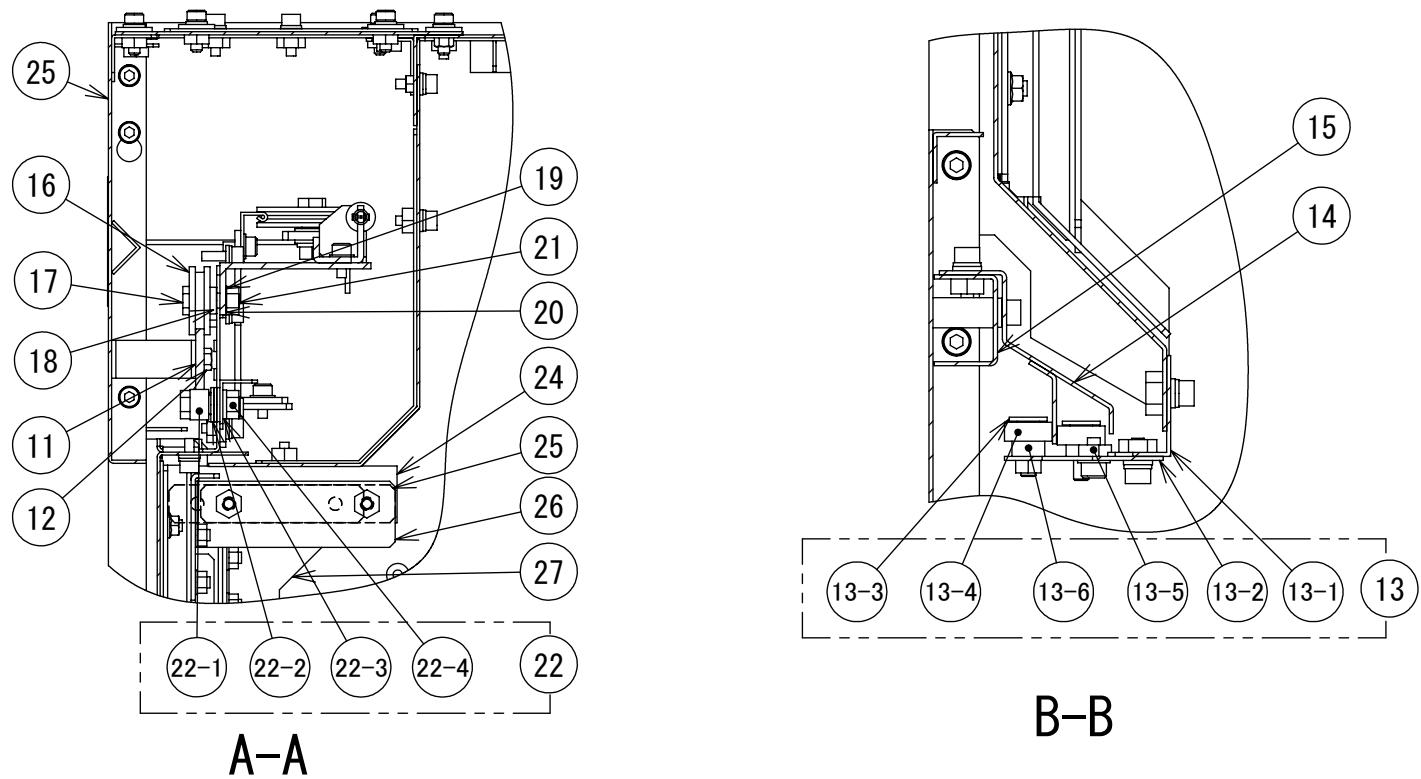


参照No. Ref. No.	部品コード Part Code	個数 Q'ty	品名 Part Name	備考 Remark	分類 Classification
1	653408001	4	マドパツキン1 PACKING WINDOW 1		
2	653409001	4	マドパツキン2 PACKING WINDOW 2		
3	653410001	4	マドパツキン3 PACKING WINDOW 3		
4	653411001	4	マドパツキン4 PACKING WINDOW 4		
5	6B4363001	2	トビラマド 628X268T5 DOOR WINDOW 628X268 T5		
6	6C4076001	4	HOLDER 1N T5 SX2 マドオサエ1N T5 SX2		
7	6C4077001	4	HOLDER 2N T5 SX2 マドオサエ2N T5 SX2		
8	6D0105001	2	HANDLE ETP-503-1 トツテ ETP-503-1		
9	646237000	6	ストッパーZ 311 STOPPER Z 311		
10	533676001	6	ダンネジ SHOULDER SCREW		

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10. 扇 2/2  
DOOR 2/2

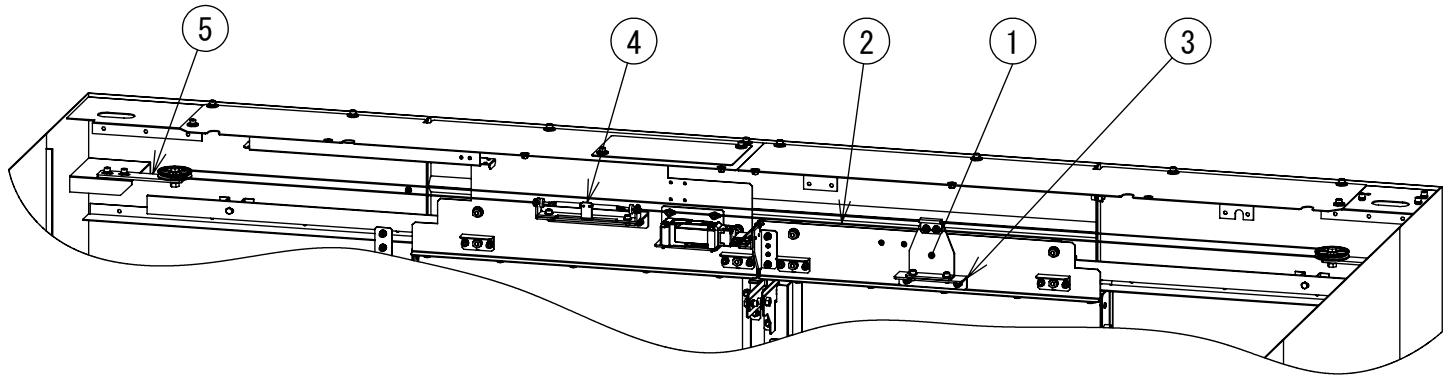


参照No. Ref. No.	部品コード Part Code	個数 Q'ty	品名 Part Name	備考 Remark	分類 Classification
11	6B4778001	2	ドアレールウエ2 SX1-2L DOOR UPPER RAIL 2 SX1-2L		
12	6B9613001	6	ボルト M6X12 H BOLT M6X12 H		
13	6D0030001	2	ROLLER BRACKET ASSY SK3 ローラBKTクミSK3		
13-1	6D0031001	2	ROLLER BRACKET 1 SK3 ローラBKT1 SK3		
13-2	6D0032001	2	ROLLER BRACKET 2 SK3 ローラBKT2 SK3		
13-3	6B9790001	8	LOW ROLLER SHAFT シタローラジク		
13-4	6B9791001	8	LOW ROLLER 19 シタローラ 19		
13-5	6B4747001	4	ROLLER BASE PLATE SX1 ローラーベースプレート SX1		
13-6	6B9792001	4	SPACER 13X6X6 スペーサ 13X6X6		
13-7	6B9901001	8	DOOR ROLLER SUPPLY ASSY ドア ローラ ホキュウクミ	LOW ROLLER 19(6B9791001)補給用 (中身は部品13-3、13-4、13-6、注意シート等)	
14	6D0038001	2	LOWER DOOR RAIL SK3 シタドアレール SK3		
15	6D0040001	2	LOWER DOOR RAIL BKT SK3 シタドアレールBK SK3		
16	6A7473001	4	ドアローラ S2Cクミ DOOR-ROLLER ASSY,S2C		
17	6B9793001	8	ローラジク 30 H ROLLER SHAFT 30 H		
18	6B1786001	4	スペーサ14X10X5 SPACER 14X10X5		
19	025080232	24	ヒラザガネチュウ8 WASHER PLAIN M 8		
20	028080242	8	バネザガネ2-8 WASHER SPRING 2-8		
21	021080102	8	NUT 1 M8 1シユナット8		
22	6C4742001	4	ROLLER SUPPORT ASSY SX2 ローラー サポートクミSX2		
22-1	6B1160001	4	ROLLER 16 ローラ 16		
22-2	025080232	12	WASHER PLAIN M 8 ヒラザガネチュウ8		
22-3	028080242	4	WASHER SPRING 2-8 バネザガネ2-8		
22-4	021080102	4	NUT 1 M8 1シユナット8		
23	6D0130001	1	F DOOR UPPER COVER SK3 Fドアウエカバー SK3		
24	6A7006001	2	DOOR WIPER S2C トピラワイパー-S2C		
25	6B4743001	2	DOOR WIPER PLATE SX1 トピラワイパオサエSX1		
26	6C5454001	1	DOOR WIPER STAY R FX1 ドアワイパーステイ R FX1		
27	6C5409001	1	DOOR WIPER STAY L FX1 ドアワイパーステイ L FX1		

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## 11. 扉運動 DOOR WIRE



11. 扉連動  
DOOR WIRE

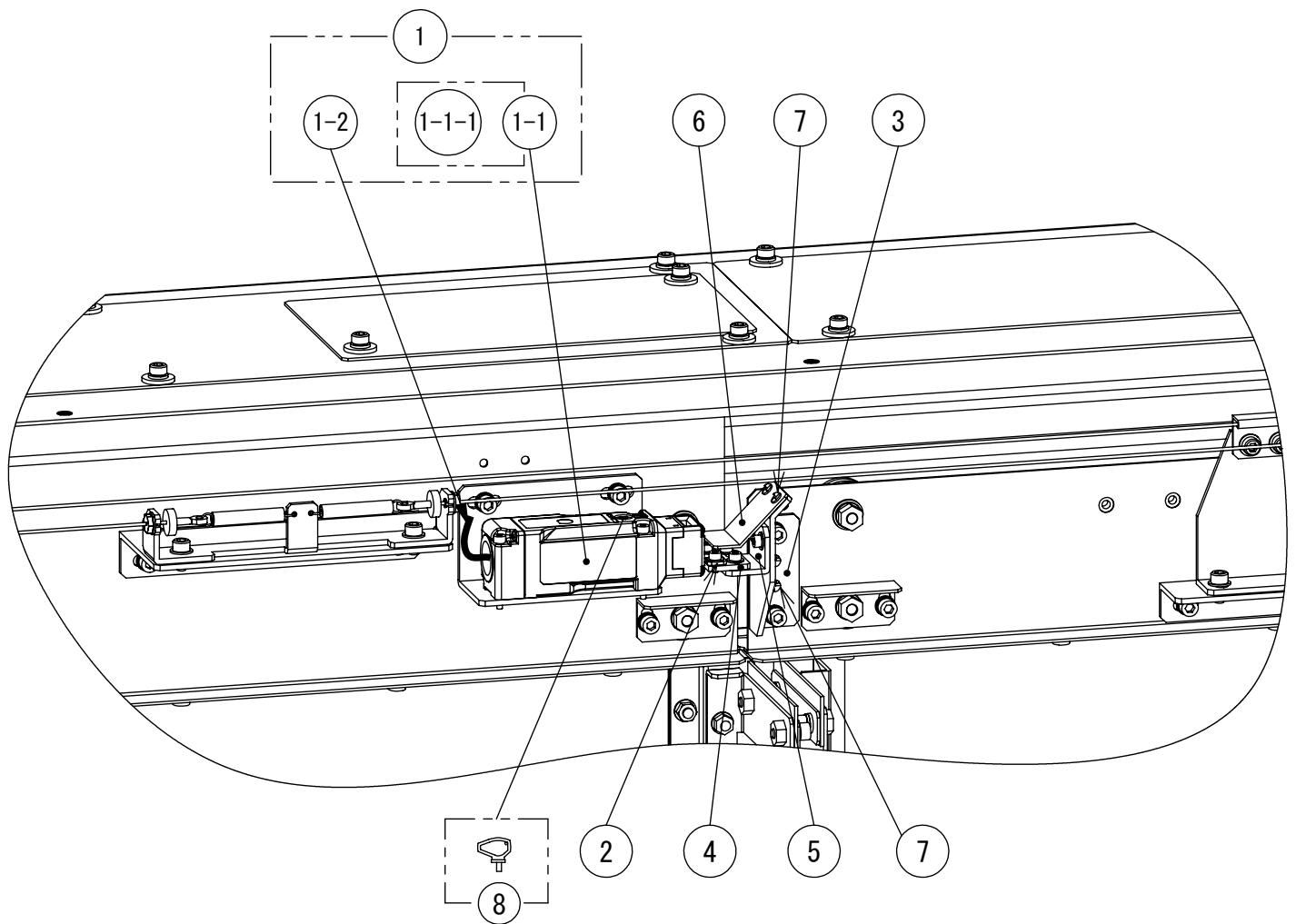
WXd1

参照No. Ref. No.	部品コード Part Code	個数 Q'ty	品名 Part Name	備考 Remark	分類 Classification
1	618411001	1	ワイヤコティフツクステイ251	WIRE HOOK STAY 251	
2	6C0091001	1	ドアワイヤクミ SX1-SL	DOOR WIRE ASSY SX1-SL	
3	618410001	1	フツクステイトリツケBKT	WIRE HOOK STAY BKT	
4	653713001	1	ワイヤコティブラケット	WIRE BRACKET	
5	6B6942001	2	シープBKTクミSX1	SHEAVE BRACKET ASSY SX1	

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## 12. ドアインタロック DOOR INTERLOCK



12. ドアインターロック  
DOOR INTERLOCK

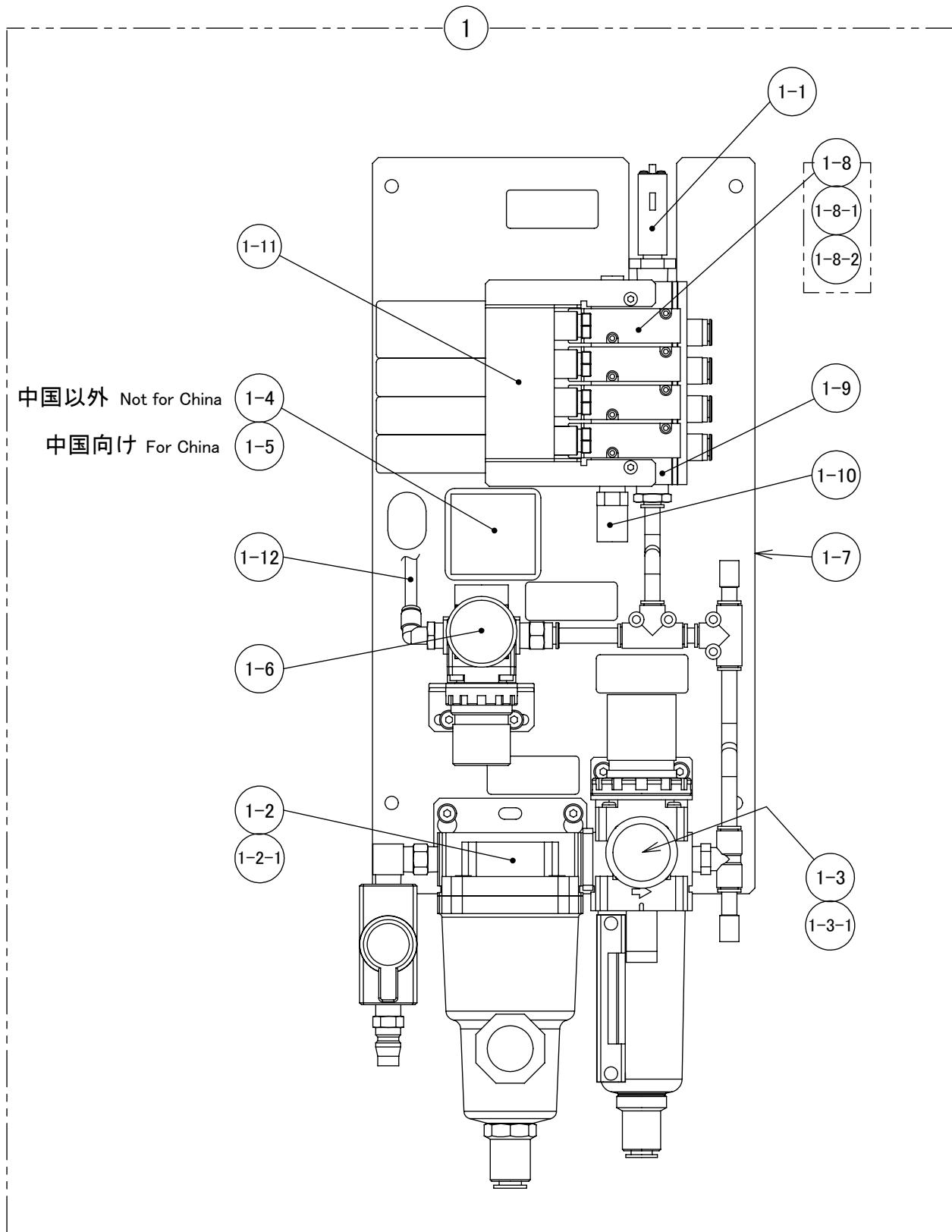
WXd1

参照No. Ref. No.	部品コード Part Code	個数 Q'ty	品名 Part Name	備考 Remark	分類 Classification
1	6D0116101	1	ドアロックLSクミSK3	SWITCH DOOR LOCK LS ASSY SK3	With Cable
1-1	6D0117001	1	ドアロツクLS HS5L	SWITCH DOOR LOCK LS HS5L	Without Cable
1-2	6D0874101	1	DR1コードDSL3	CORD DR1 DSL3	
2	6D0121001	1	ドアロツクキ-HS9Z-A51	KEY DOOR LOCK HS9Z-A51	
3	6D0120001	1	ロックキートリヅケBK SK3	DOOR LOCK KEY BRACKET SK3	
4	6D0122001	1	ロツクキー-チヨウセイタSK3	ADJUST PLATE ROCK KEY SK3	
5	6D0123001	1	ロツクキー-チヨウセイBKS SK3	ADJUST BRACKET ROCK KEY SK3	
6	6D0124001	1	ボルトカバー SK3	BOLT COVER SK3	
7	6C4490001	4	ワンサイドナベコネジ4X8	ONE-SIDE PAN HEAD SCREW 4X8	
8	6D0198001	1	ドアロックカイジョキー	DOOR UNLOCK KEY	

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# 13. エアユニット AIR UNIT



13. エアユニット  
AIR UNIT

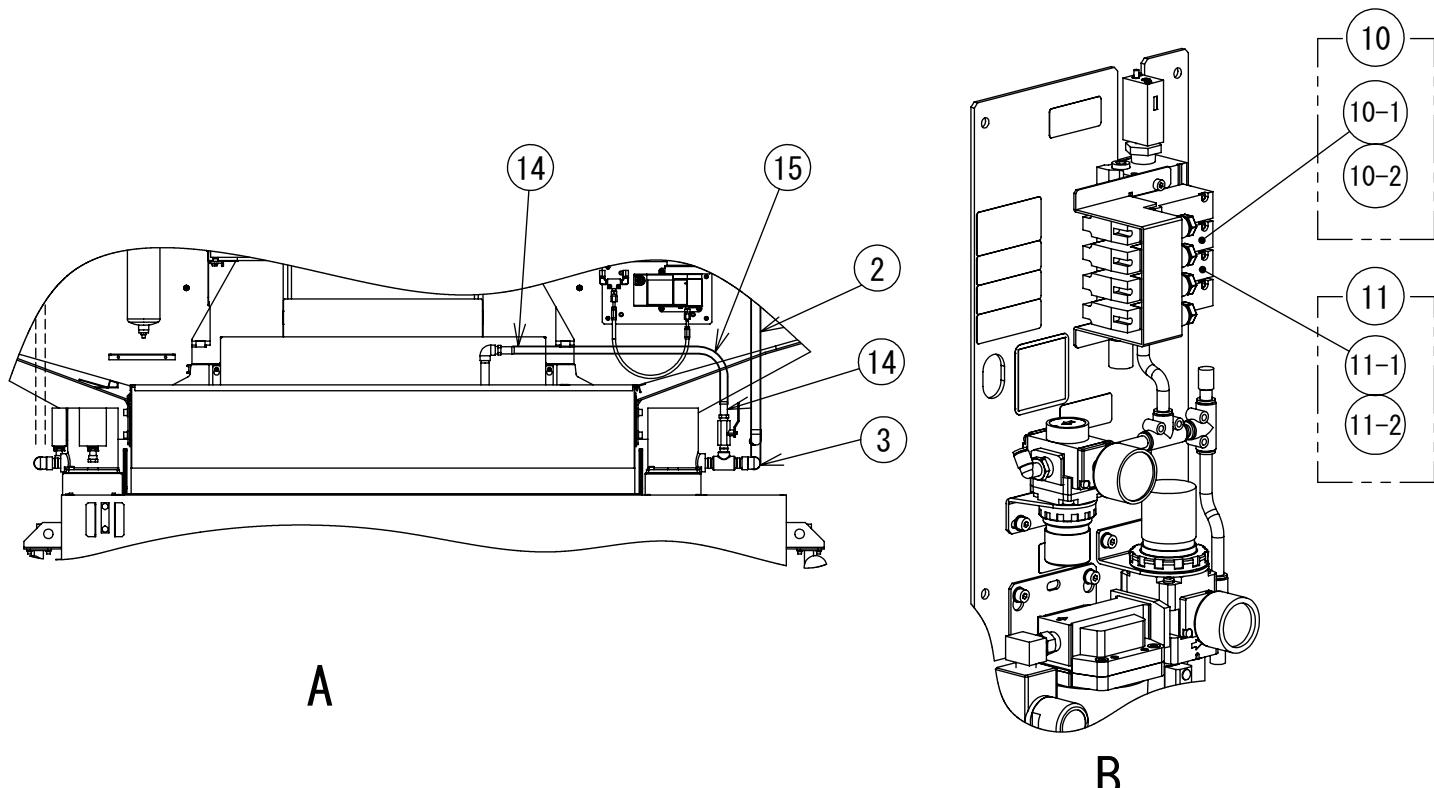
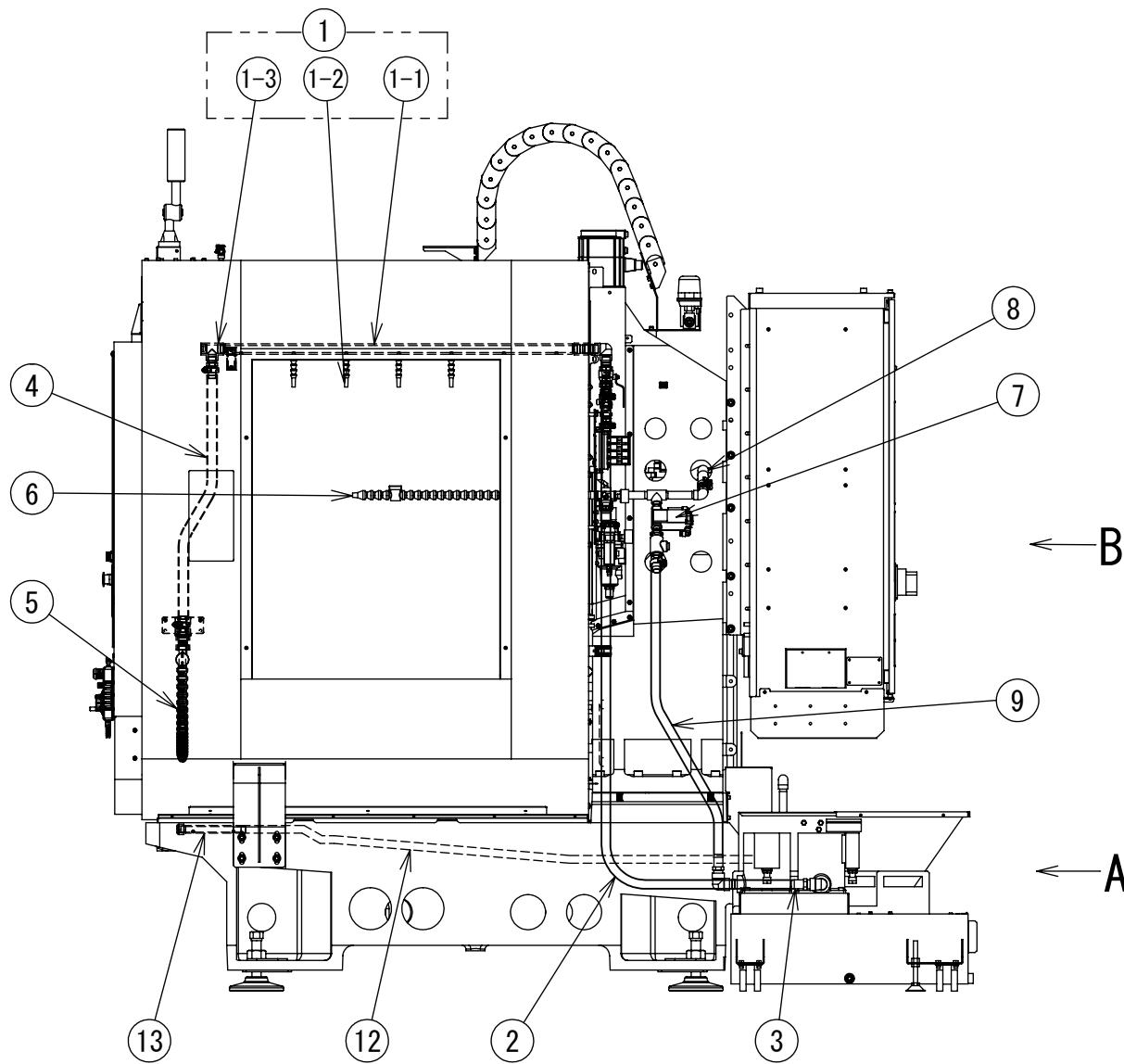
WXd1

参照No. Ref. No.	部品コード Part Code	個数 Q'ty	品名 Part Name	備考 Remark	分類 Classification
1	6D0189001	1	エアユニットクミ SX3	AIR UNIT ASSY SX3	
1-1	6D0972001	1	アツリヨクSWクミD00	PRESSURE SWITCH ASSY D00	
1-2	6B4750001	1	メインラインフィルタ AFF	MAIN LINE FILTER AFF	
1-2-1	6C4866001	1	エレメント AFF-EL4B	FILTER ELEMENT AFF-EL4B	
1-3	6B9171001	1	ミストセパレータレギュレータ	MR AWM30-02BDG-8	
1-3-1	6B9668001	1	エレメントクミホキュウ	FILTER ELEMENT AFM30P-060AS	
1-4	690687001	1	エアページラベル0.3	EAPA-ZIRABERU0.3	Not for China
1-5	693794001	1	エアページラベル0.03C	LABEL AIR PURGE 0.03 C	For China
1-6	6B3263001	1	レギュレータAR20-1R-B	REGULATOR AR20-1R-B	For Air Purge
1-7	6B4761002	1	エアプレートSX1-2	AIR PLATE SX1-2	
1-8	6D0190001	1	エアプローバルブクミD00	VALVE AIR BLOW ASSY D00	For Air Blow and Tool Cleaning
1-8-1	6B4760001	1	エアプローバルブVQZ335	VALVE AIR BLOW VQZ335	Without Cable
1-8-2	6D0873001	1	AブローコードD00	CORD AIR BLOW D00	Cable Only
1-9	6B4763001	1	マニホールドVV3QZ35	MANIFOLD VV3QZ35-04C8C	
1-10	610885001	1	サイレンサ AN15-02	SILENCER AN15-02	
1-11	6B6759001	1	バルブカバー	VALVE COVER	
1-12	6B6717001	1	エアチューブ 6X3500	AIR TUBE 6X3500	

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## 14. クーラント配管 COOLANT PIPING 1/2

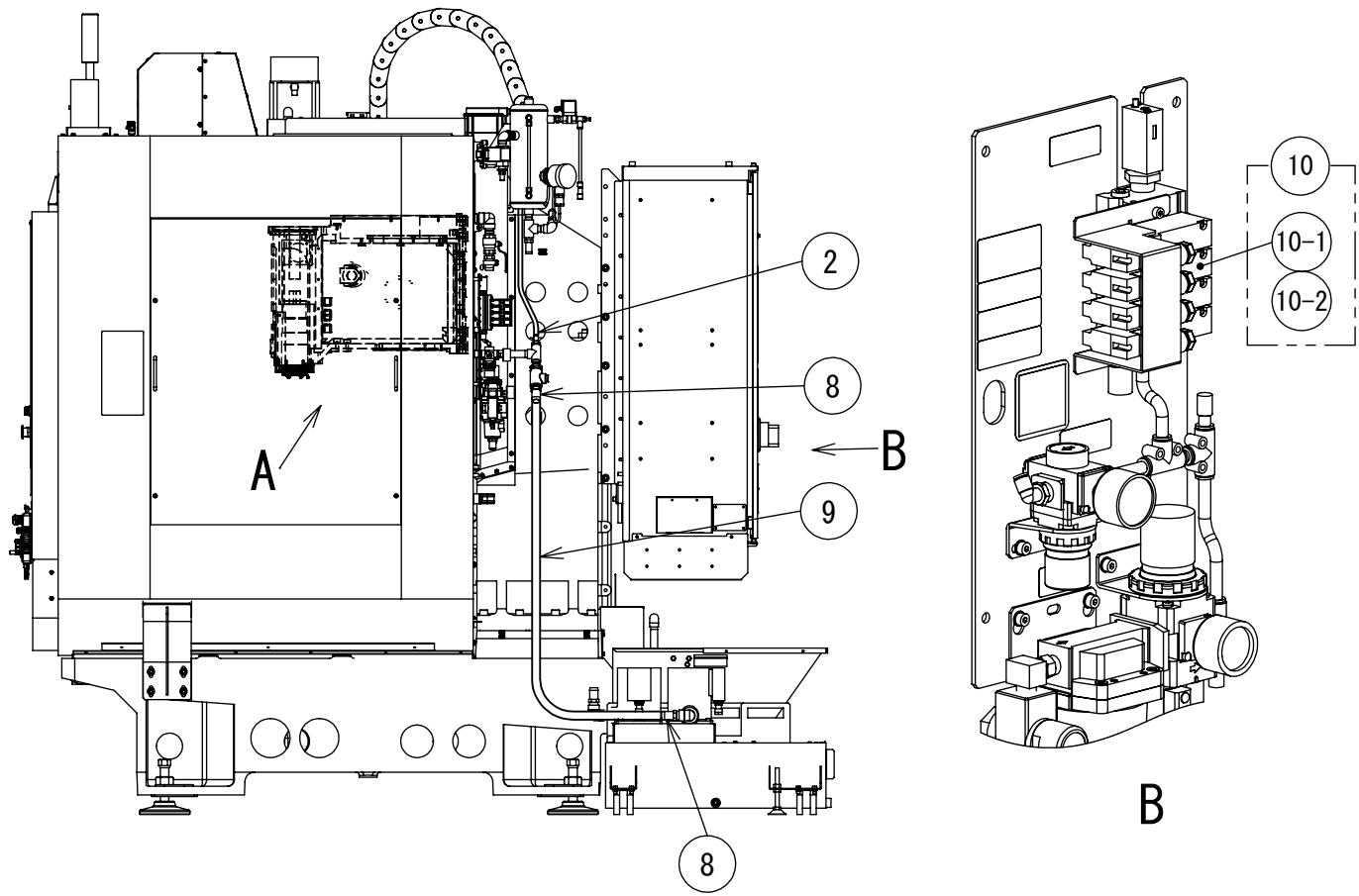
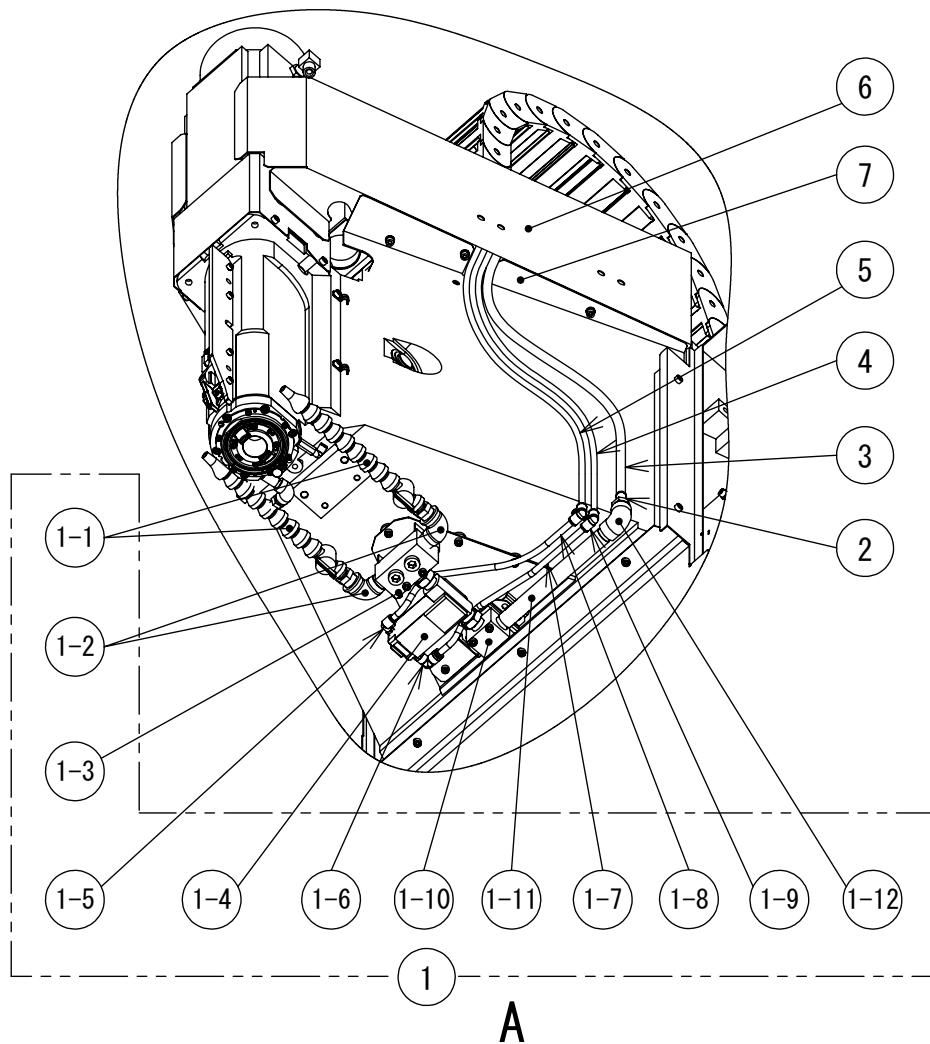


参照No. Ref. No.	部品コード Part Code	個数 Q'ty	品名 Part Name	備考 Remark	分類 Classification
1	6C0126001	2	CシャワーパイプクミSX1SL	CHIP SHOWER PIPE ASSY SX1-SL	
1-1	6C0127001	1	Cシャワーパイプ SX1-SL	CHIP SHOWER PIPE SX1-SL	
1-2	6B1493001	7	チップシャワーノズル S2D	CHIP SHOWER NOZZLE S2D	
1-3	6A8519001	1	ROHSネジコムティPT3/4	ROHS SCREW COMMITY PT3/4	
2	651334001	2	ゴムホース25X1800	RUBBER HOSE 25X1800	
3	618287001	8	ホースバンド35	HOSE BAND CLAMP 35	
4	6A0319001	2	ゴムホース25X750	RUBBER HOSE 25X750	
5	6B6931001	2	ノズル3/4X16 Vツキ	NOZZLE 3/4X16 WITH VALVE	
6	6A7619001	1	1/2ノズルS2C	1/2NOZZLE S2C	
7	6B1317001	1	バルブSGCA221B-15	VALVE SGCA221B-15	
8	610265001	1	ゴムホース19X1200	RUBBER-HOSE 19X1200	
9	6A5095001	1	ゴムホース25X1200	RUBBER HOSE 25X1200	
10	6D0629001	1	クーラントバルブクミD00	VALVE COOLANT ASSY D00	For Coolant ,With Cable
10-1	6B4760001	1	エアブローバルブVQZ335	VALVE AIR BLOW VQZ335	Without Cable
10-2	6D0941001	1	QVCコードD00	CORD QVC D00	Cable Only
11	6D0630001	1	ジグシャワーVクミD00	VALVE JIG SHOWER ASSY D00	For Jig Shower ,With Cable
11-1	6B4760001	1	エアブローバルブVQZ335	VALVE AIR BLOW VQZ335	Without Cable
11-2	6D0939001	1	ジグシャワーVコードD00	CORD JIG SHOWER VALVE D00	Cable Only
12	653502001	1	ゴムホース19X1500	RUBBER HOSE 19X1500	
13	6C0311001	1	キリコナガシクミY SX1SL	CHIP SHOWER PIPE ASSY Y SX1-SL	
14	620420000	2	ホースバンド30	HOSE BAND CLAMP 30	
15	6A8363001	1	ゴムホース19X750	RUBBER HOSE 19X750	

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## 14. クーラント配管 COOLANT PIPING 2/2

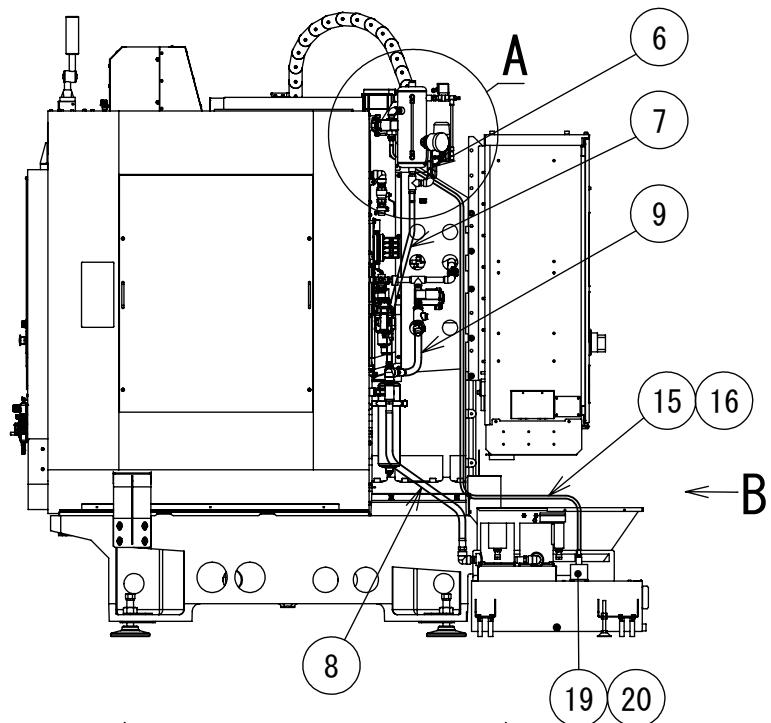
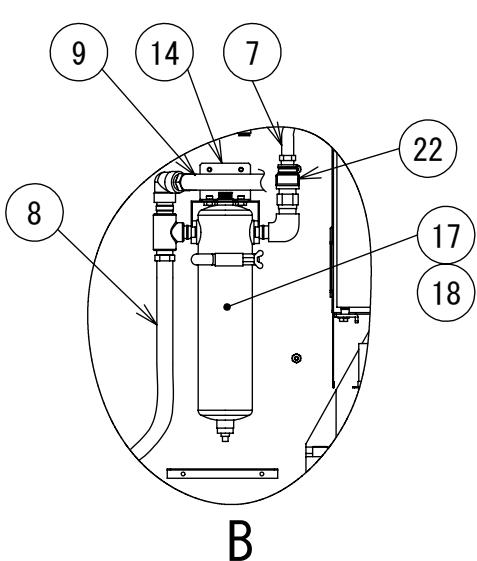


参照No. Ref. No.	部品コード Part Code	個数 Q'ty	品名 Part Name	備考 Remark	分類 Classification
1	6D0296001	1	CVノズルフロントクミSK3	CV NOZZLE FRONT FIX ASSY SK3	
1-1	6B9837001	2	ノズル 1/2-8	NOZZLE 1/2-8	
1-2	612820000	2	メスオスエルボ PT1/2	ELBOW PT1/2	
1-3	6G2232001	1	マニホールド1/2X5	MANIFOLD 1/2X5	
1-4	6B1317001	1	バルブSGCA221B-15	VALVE SGCA221B-15	For Head CV
1-5	6B4081001	1	エルボKQ2L08-01AS	ELBOW UNION KQ2L08-01AS	
1-6	610984001	1	スピコンJKL8-01A0.5	SPEED CONTROLLER JKL8-01A0.5	
1-7	6B9840002	1	チューブ 8X330	TUBE 8X330	Red
1-8	6B9840001	1	チューブ 8X330	TUBE 8X330	Green
1-9	6B9844001	2	エルボKQ2L08-00A	ELBOW KQ2L08-00A	
1-10	6A8742001	1	マニホールド1/2X3	MANIFOLD 1/2X3	
1-11	6B9833001	1	パイプ1/2 213L	PIPE 1/2 213L	
1-12	6A9013001	1	ROHSエルボ1/2	ROHS ELBOW 1/2	
2	607254001	2	ホースバンド20	HOSE BAND CLAMP 20	
3	6B9841001	1	ゴムホース12X2350	RUBBER HOSE 12X2350	
4	6D0305001	1	チューブ 8X3150	TUBE 8X3150	Red
5	6D0309001	1	チューブ 8X1200	TUBE 8X1200	Green
6	6D0293001	1	SPヘッドカバトク1R SK3	SP HEAD COVER OP 1R SK3	
7	6D0294001	1	SPヘッドウェブトクR SK	SP HEAD UPPER BRACKET OP R SK3	
8	618287001	2	ホースバンド35	HOSE BAND CLAMP 35	
9	6A5095001	1	ゴムホース25X1200	RUBBER HOSE 25X1200	
10	6D0629001	1	クーラントバルブD00	VALVE COOLANT ASSY D00	For Coolant ,With Cable
10-1	6B4760001	1	エアブローバルブVQZ335	VALVE AIR BLOW VQZ335	
10-2	6D0941001	1	QVCコードD00	CORD QVC D00	

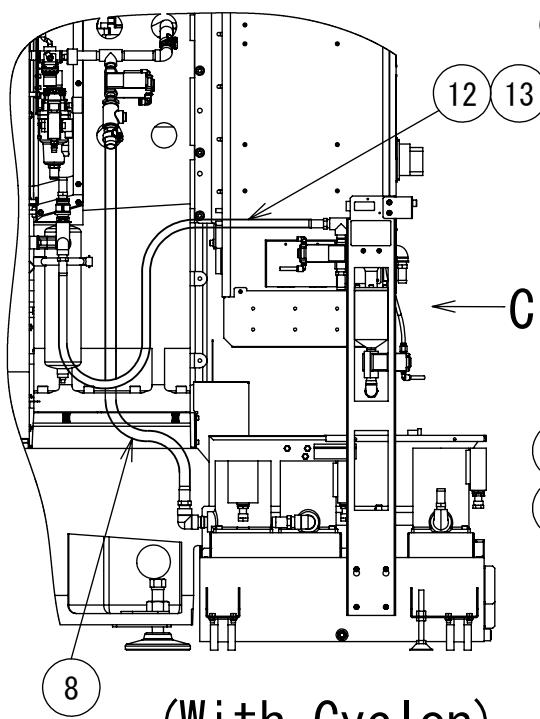
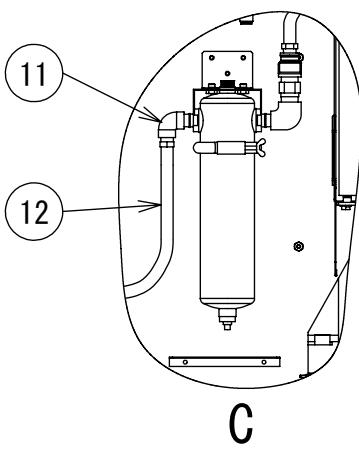
\* 分類の"C"は制御部品、無印は機械部品の扱いです。

\* "C" in the "Classification" indicates that the part is classified into control part, while no mark indicates machine part.

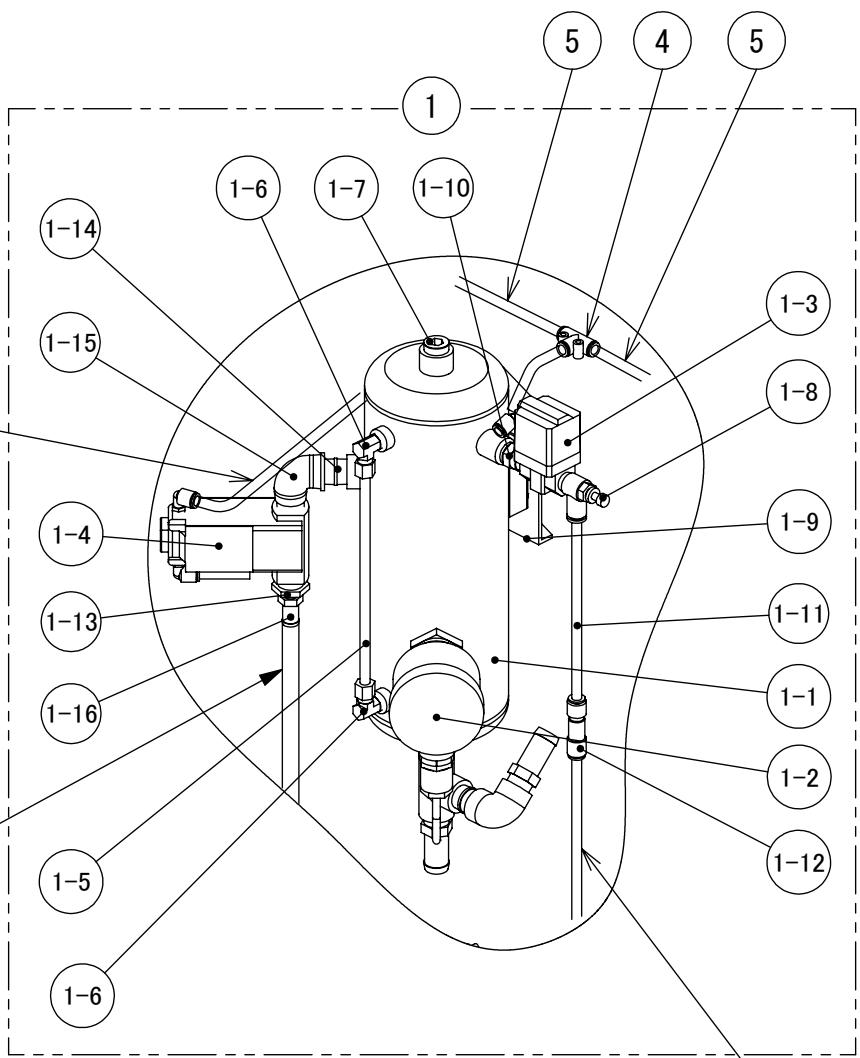
## 15. ツール洗浄 1/2 TOOL CLEANING 1/2



(Without Cyclon)



(With Cyclon)

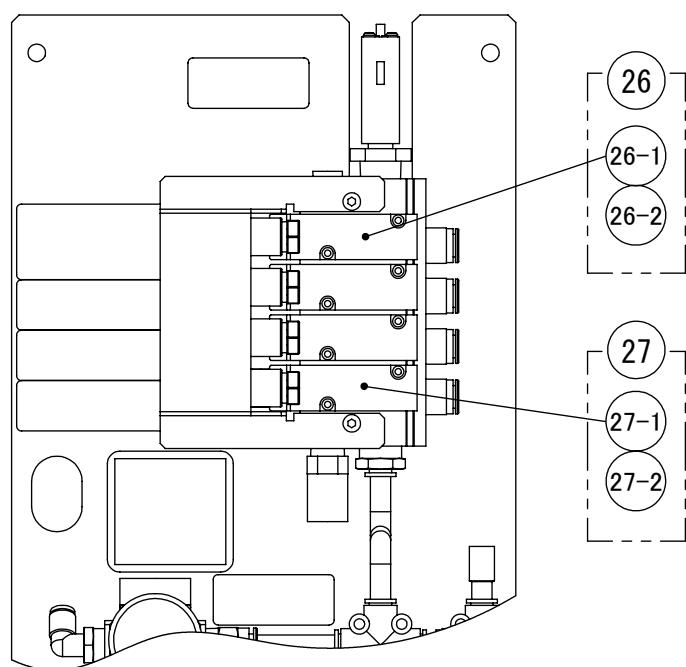
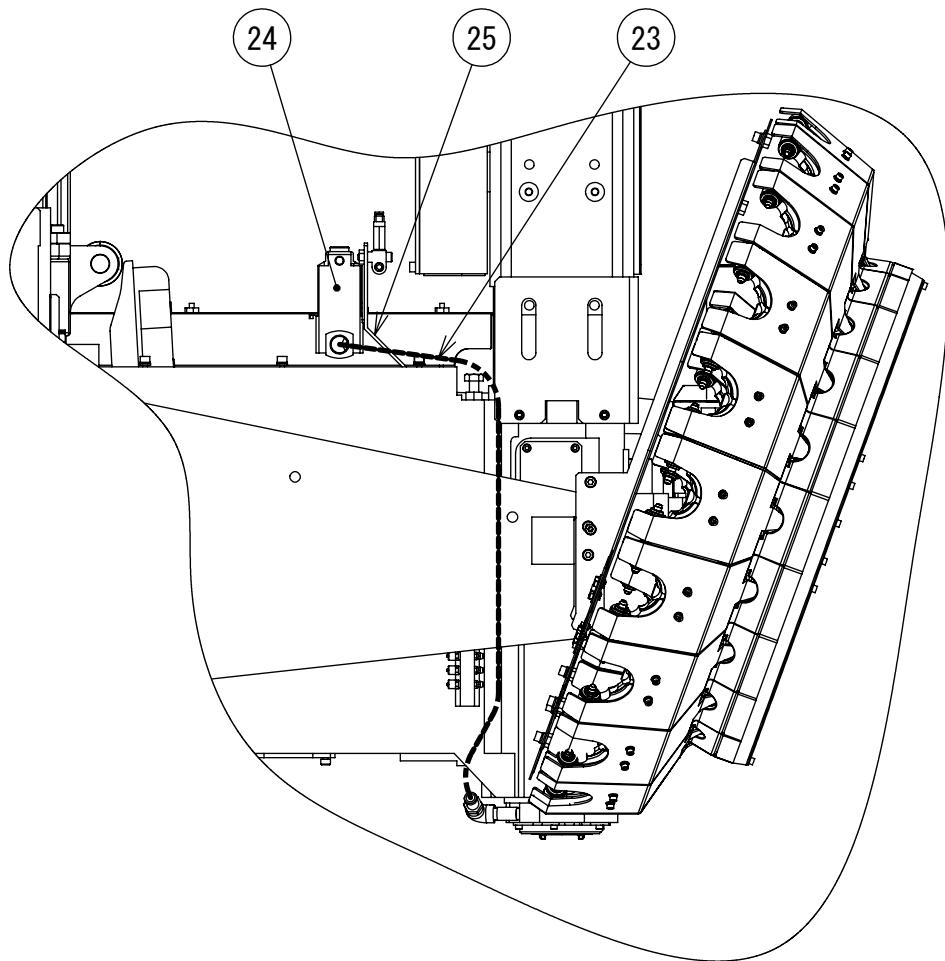


参照No. Ref. No.	部品コード Part Code	個数 Q'ty	品名 Part Name	備考 Remark	分類 Classification
1	6B6368001	1	クーラントチャンバーケミSX1 COOLANT CHAMBER ASSY SX1		
1-1	6B5387001	1	クーラントチャンバー <sup>+</sup> COOLANT CHAMBER		
1-2	6B6607101	1	エキメンセンサクミC00 SENSOR ASSY LIQUID LEVEL C00	With Cable	
1-3	618358001	1	エアバルブMP AIR VALVE MP	For Coolant Chamber	
1-4	6B1710001	1	バルブSGCA222B-15 VALVE SGCA222B-15	For Coolant Chamber Drain	
1-5	6B5388001	1	チューブTL0806 225 TUBE TL0806 225	Clear	
1-6	6B1708001	2	エルボ DL08-02 ELBOW DL08-02		
1-7	626373000	1	アナプラグ PT1/2 PLUG PT1/2		
1-8	618357001	1	スピコン8-3/8I SPEED CONTROL8-3/8I		
1-9	6B6526001	1	チャンバーブラケット SX1 CHAMBER BRACKET SX1		
1-10	6B9656001	1	チェックバルブ3/8CM CHECK VALVE 3/8 CM		
1-11	6B9090001	1	チューブ TH0806 200 TUBE TH0806 200	Clear	
1-12	6B9074001	1	チェックバルブAKH08-00 CHECK VALVE AKH08-00		
1-13	6A9181001	1	ROHSブッシング1/21/4 ROHS BUSH 1/2-1/4		
1-14	6A8146001	1	ROHSニップルPT1/2 ROHS NIPPLE PT1/2		
1-15	610849001	1	ROHSメスオスエルボ1/2 ROHS STREET ELBOW 1/2		
1-16	651338001	1	ホースニップル1/4トク HOSE NIPPLE 1/4		
2	645198000	1	チューブ8X1700 TUBE 8X1700	Black	
3	6B4219001	1	チューブ8X2000 TUBE 8X2000	Green	
4	610008001	1	チーズKQ2T08-00 JOINT TEE KQ2T08-00		
5	616065001	1	チューブ 8X3500 TIYU-BU 8X3500	White	
6	618446001	1	ゴムホース19X1800 RUBBER HOSE 19X1800		
7	6A8143001	1	ゴムホース19X1150 RUBBER HOSE 19X1150		
8	6A5095001	1	ゴムホース25X1200 RUBBER HOSE 25X1200		
9	651331001	1	ゴムホース25X360 RUBBER HOSE 25X360	Without Cyclone	
10	6A8577001	1	ROHSイケイT1/2-3/4 JOINT ROHS TEE 1/2-3/4	Without Cyclone	
11	6A9013001	1	ROHSエルボ1/2 ROHS ELBOW 1/2	With Cyclone	
12	6A9120001	1	ゴムホース19X1450 RUBBER HOSE 19X1450	With Cyclone	
13	620420000	1	ホースバンド30 HOSE BAND CLAMP 30	With Cyclone	
14	6D0137001	1	フィルタブラケットSK3 FILTER BRACKET SK3		
15	6B9787001	1	ゴムホース12X3400 RUBBER HOSE 12X3400		
16	607254001	2	ホースバンド20 HOSE BAND CLAMP 20		
17	618421001	1	フィルタFQ-NEWケミFILTER FQ-NEW ASSY		
18	652860001	1	センジョウフィルタホキュウ FILTER ELEMENT EHM15R10AX		
19	6C6114001	1	ドレインボックスクミホキュウ DRAIN BOX ASSY SUPPLY		
20	651338001	1	ホースニップル1/4トク HOSE NIPPLE 1/4		
21	6B1779001	1	ドレインボックスパッキン DRAIN BOX PACKING		
22	6B9657001	1	チェックバルブ3/4CM CHECK VALVE 3/4 CM		

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## 15. ツール洗浄 2/2 TOOL CLEANING 2/2

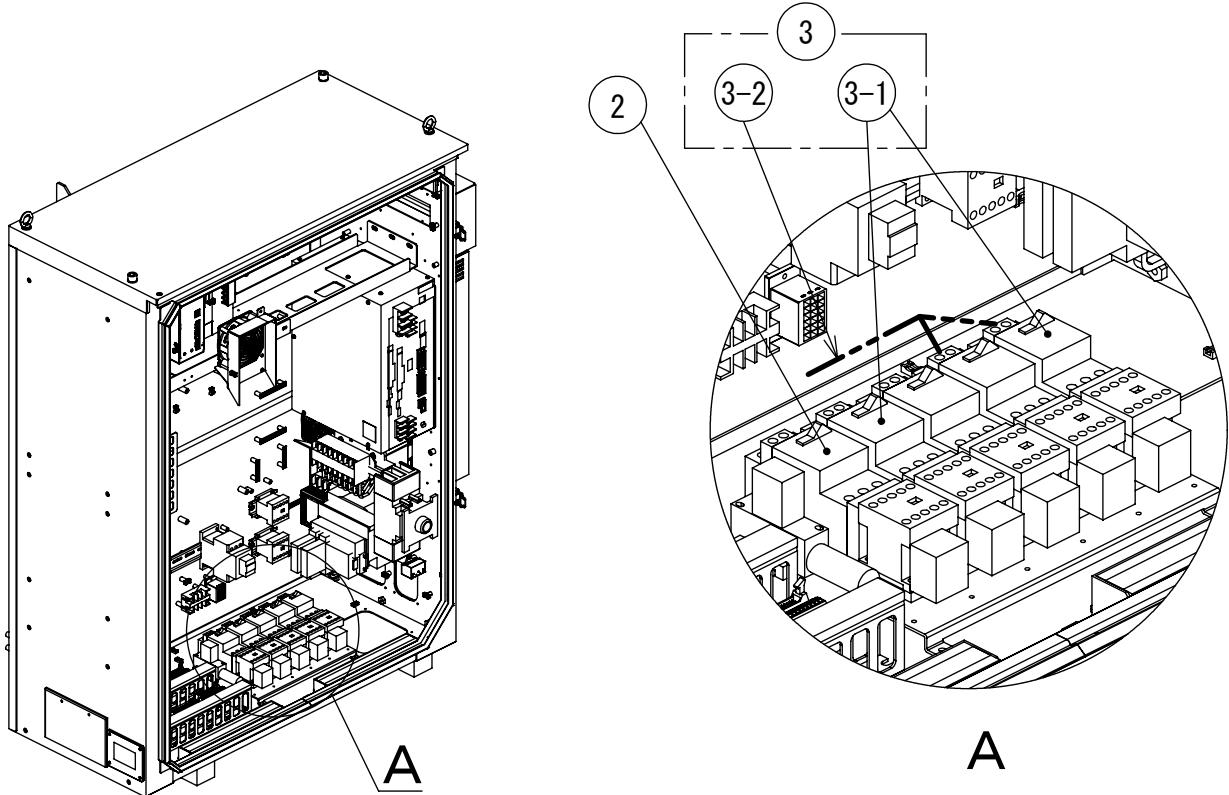
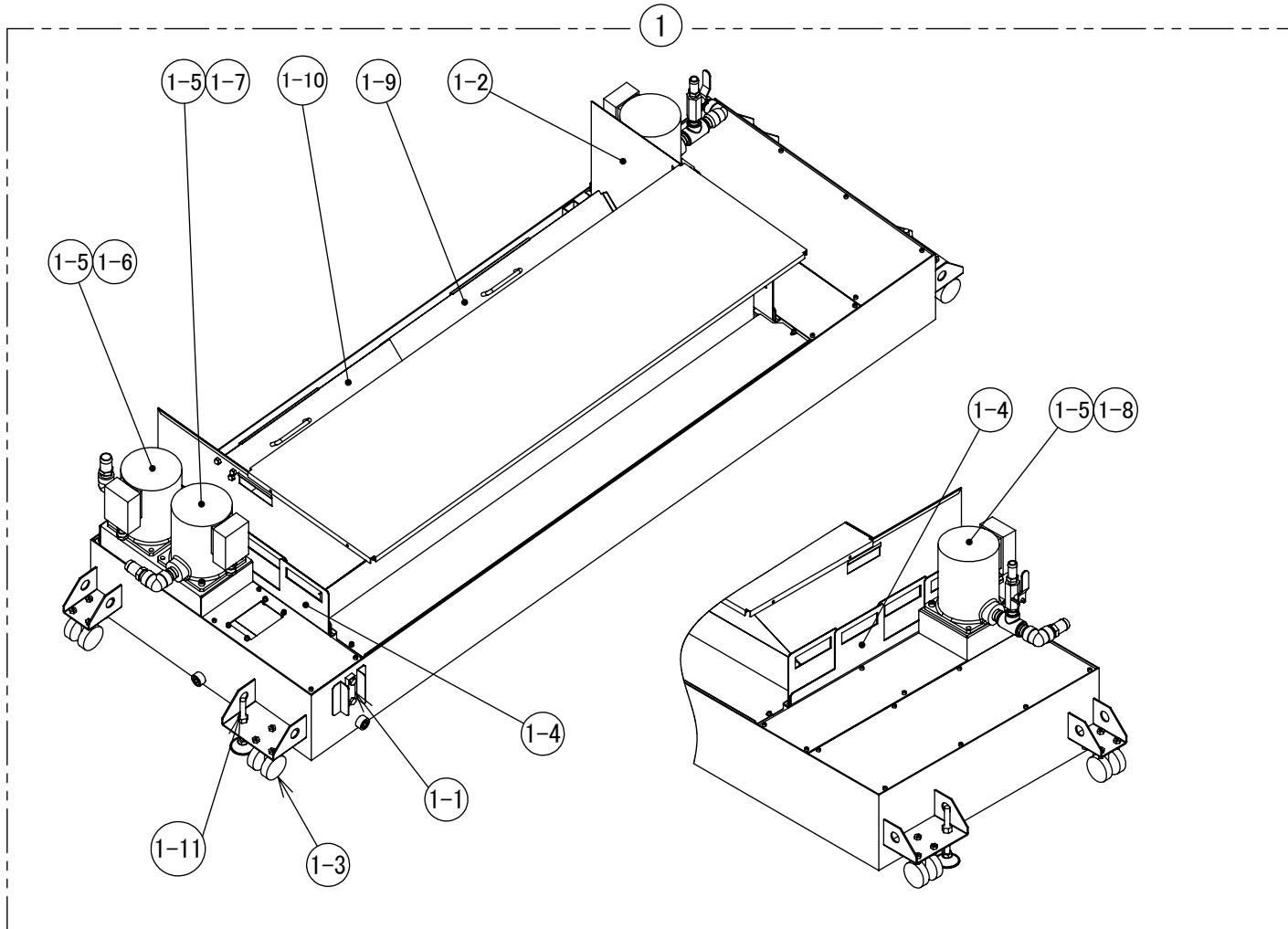


参照No. Ref. No.	部品コード Part Code	個数 Q'ty	品名 Part Name	備考 Remark	分類 Classification
23	6C0279001	1	ゴムホース12X640	RUBBER HOSE 12X640	
24	6B1713001	1	バルブSGCA221B-15B	VALVE SGCA221B-15B	For Tool Cleaning
25	6B6392001	1	Zキュウユプレート SX1	Z OIL SUPPLY PLATE SX1	
26	6D0190001	1	エアブローバルブクミD00	VALVE AIR BLOW ASSY D00	For Air Blow and Tool Cleaning
26-1	6B4760001	1	エアブローバルブVQZ335	VALVE AIR BLOW VQZ335	Without Cable
26-2	6D0873001	1	AブローコードD00	CORD AIR BLOW D00	Cable Only
27	6D0627001	1	ドレインバルブクミD00	VALVE DRAIN ASSY D00	For Tool Cleaning Drain With Cable
27-1	6B4760001	1	エアブローバルブVQZ335	VALVE AIR BLOW VQZ335	Without Cable
27-2	6D0943001	1	QVBコードD00	CORD QVB D00	Cable Only

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# 16-1. クーラントタンク 200L COOLANT TANK 200L

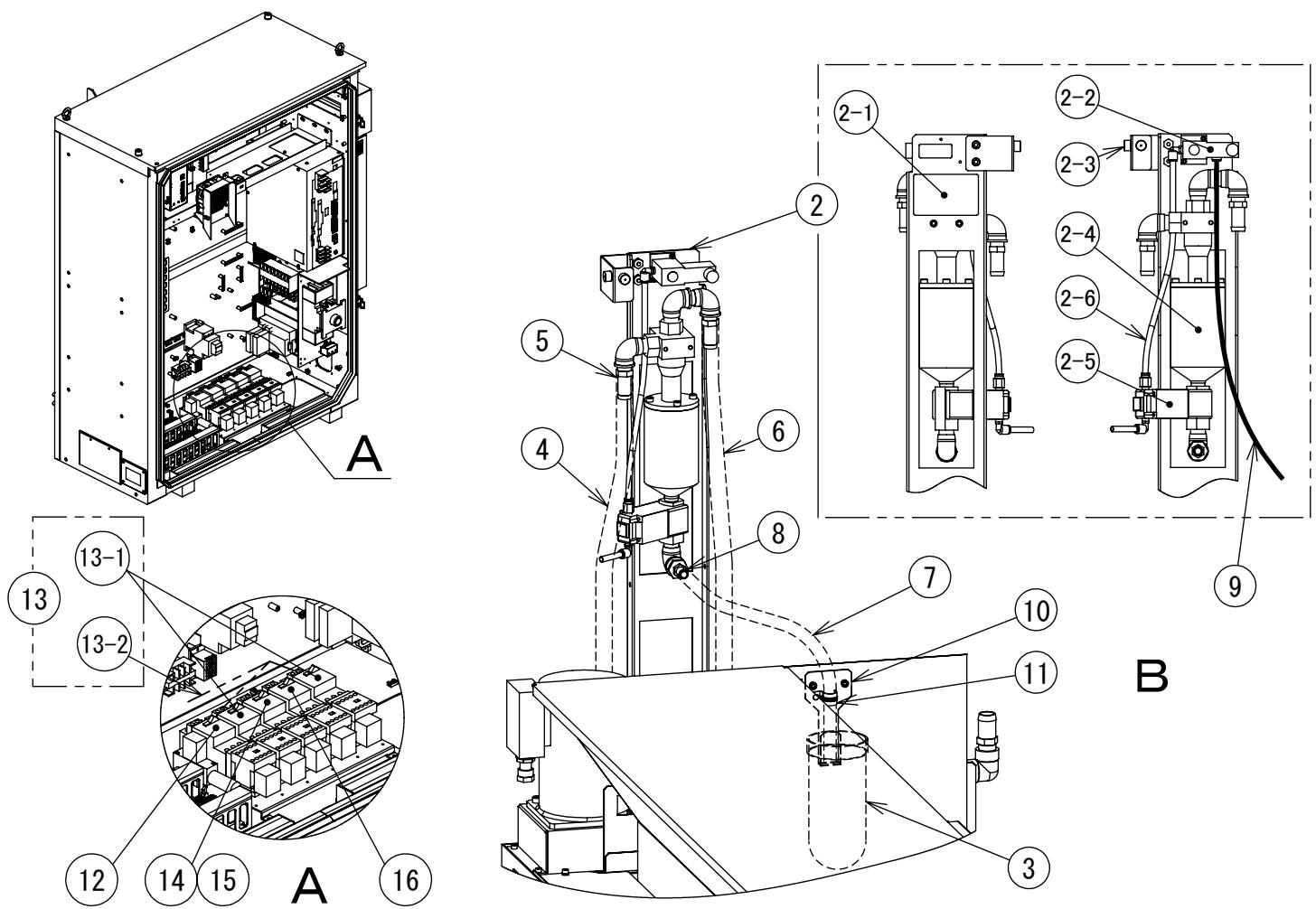
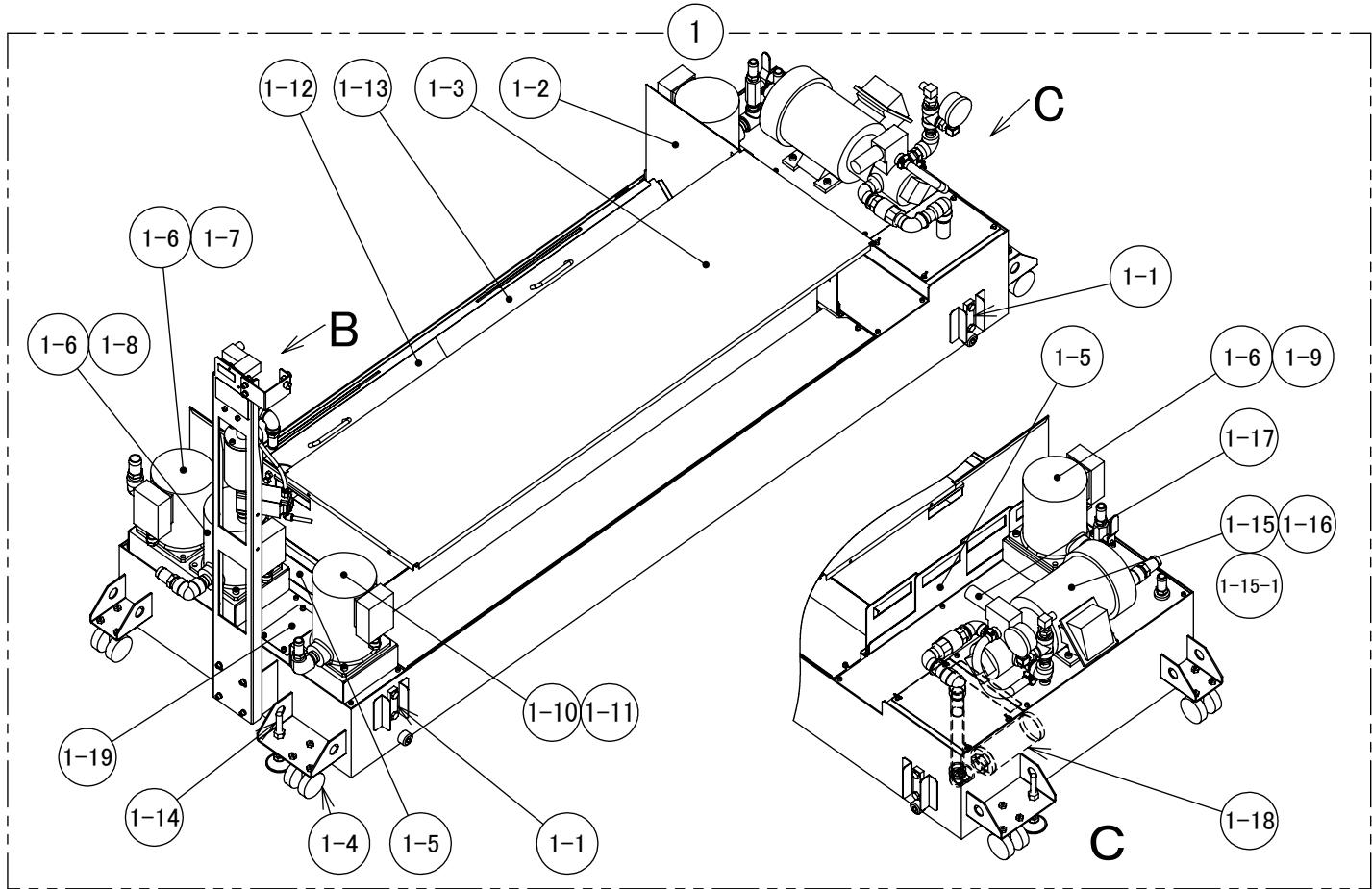


参照No. Ref. No.	部品コード Part Code	個数 Q'ty	品名 Part Name	備考 Remark	分類 Classification
1	6D0260001	1	Cタンク200Lクミ SK3	COOLANT TANK 200L ASSY SK3	
1-1	626422000	1	タンクオイルゲージ	OIL-GAUGE TANK	
1-2	6D0266001	1	キリコウケ SK3	CHIP BUCKET SK3	
1-3	6C0112001	4	キャスター-TY60	CASTER TY60	
1-4	6B1285001	4	タンクフィルター-S2D	TANK FILTER S2D	
1-5	6B3419001	3	クーラントポンプ250TAKU	PUMP COOLANT 250W TAKU	For CV ,Tool Cleaning and Chip Shower
1-6	6B6873001	1	クーラントMコードC00	CORD COOLANT M C00	
1-7	6B6874001	1	チップシャワーMコードC00	CORD CHIP SHOWER M C00	
1-8	6C0258001	1	CシャワーMコードSX1SL	CORD CHIP SHOWER M SX1-SL	
1-9	6C0182002	1	ベースエキキリL SX1-SL	BASE OIL DRAIN L SX1-SL	
1-10	6C0183002	1	ベースエキキリR SX1-SL	BASE OIL DRAIN R SX1-SL	
1-11	6C0065001	2	レベルボルトEA13-1212	LEVEL BOLT EA13-1212	
1-12	6B1761001	1	ドレンインプラグプレート	DRAIN PLUG PLATE	
2	6D0626001	1	Cホゴ250WクミD00	RELAY CLNT PRTCT 250W ASSY D00	For CV and Tool Cleaning
3	6D0996001	1	チップリレークミDSL	RELAY CHIP SHOWER ASSY DSL	For Chip Shower
3-1	6D0626001	2	Cホゴ250WクミD00	RELAY CLNT PRTCT 250W ASSY D00	
3-2	6C0219001	1	KP2チュウケイSX1SL	CORD KP2 RELAY SX1-SL	

\* 分類の"C"は制御部品、無印は機械部品の扱いです。

\* "C" in the "Classification" indicates that the part is classified into control part, while no mark indicates machine part.

## 16-2. クーラントタンク200L サイクロン(ツール洗浄無し) COOLANT TANK 200L CYCLONE (WITHOUT TOOL CLEANING)

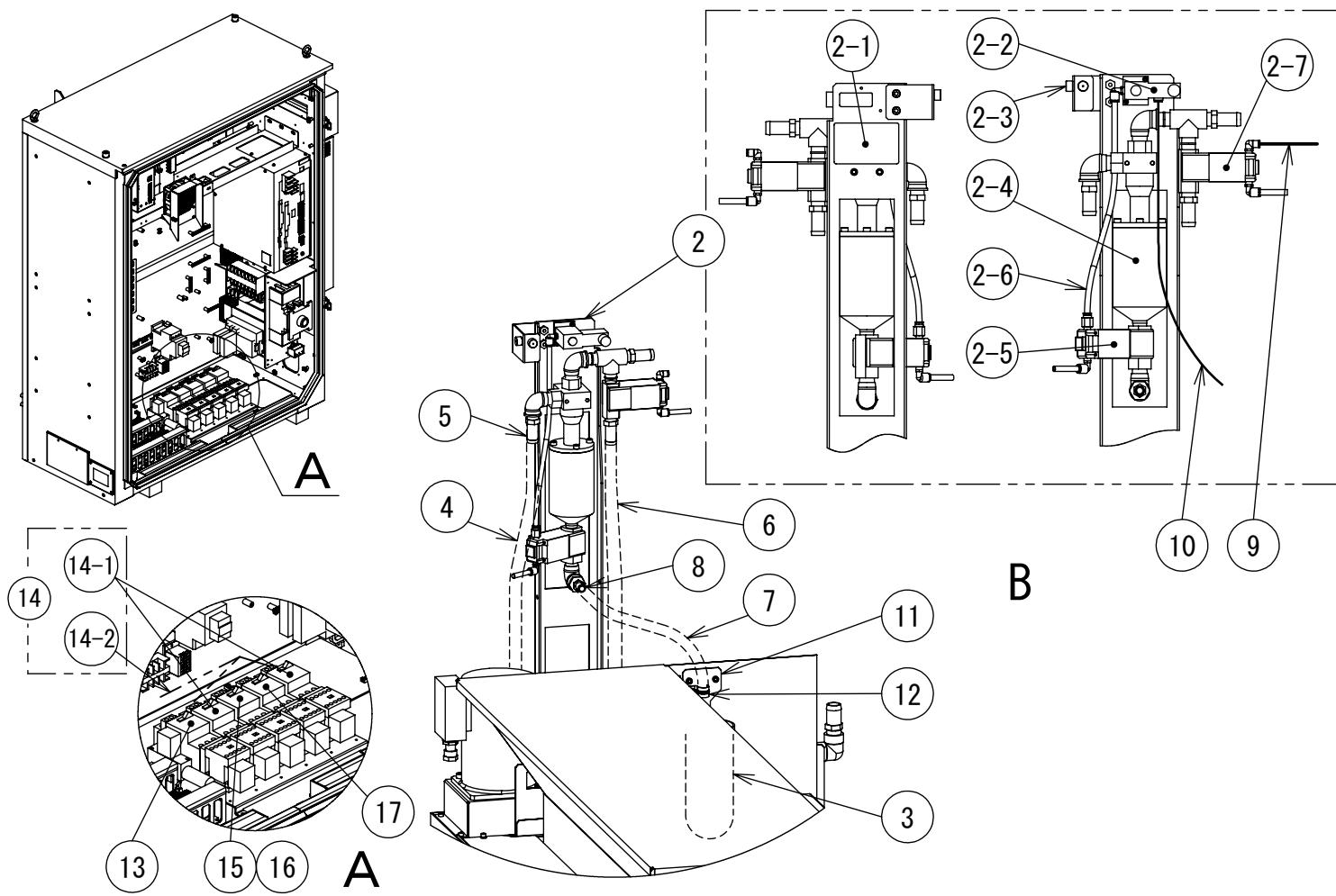
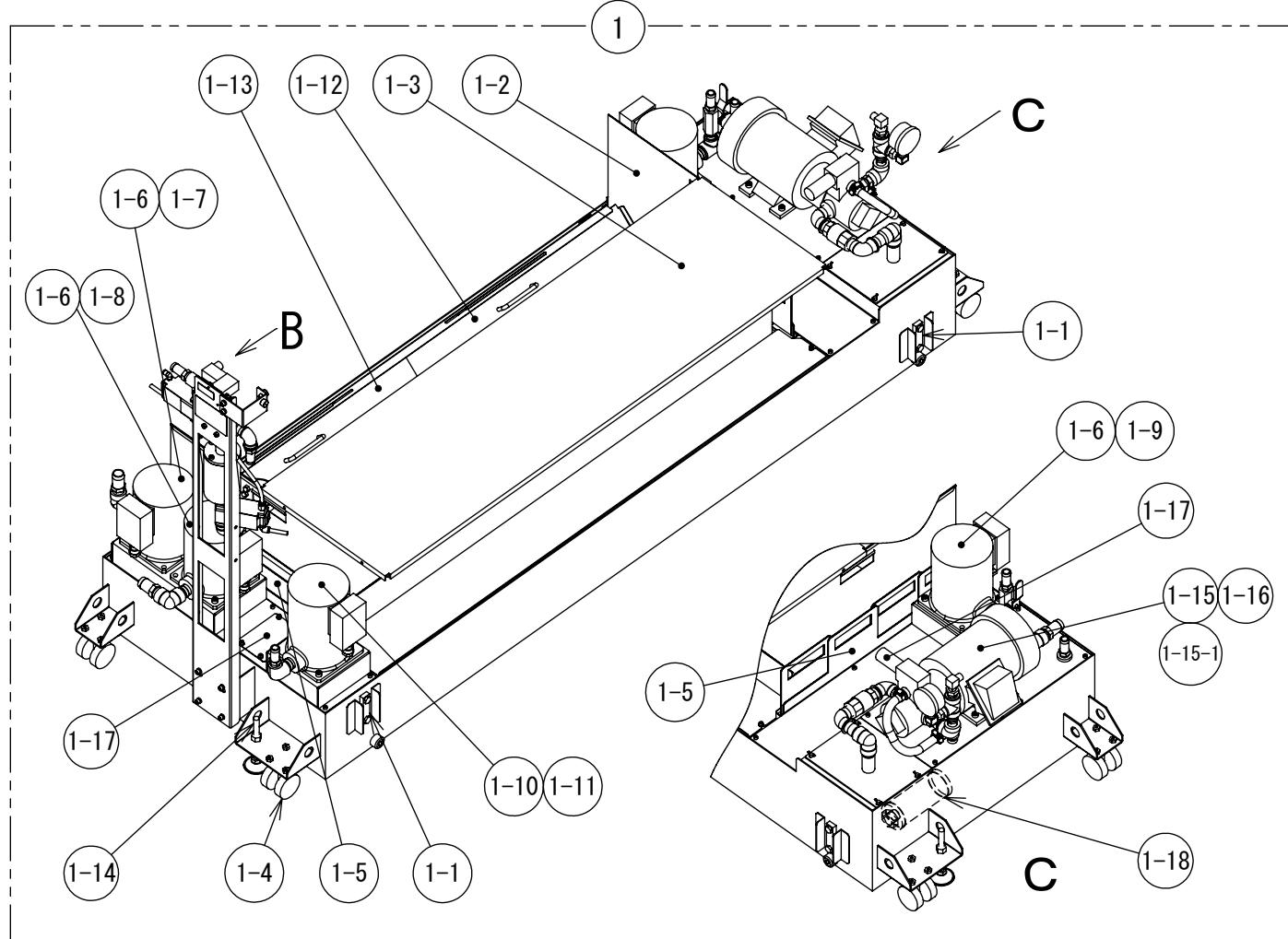


参照No. Ref. No.	部品コード Part Code	個数 Q'ty	品名 Part Name	備考 Remark	分類 Classification
1	6D0273001	1	CT200 CF クミ SK3	C-TANK200 CF ASSY SK3	
1-1	626422000	2	タンクオイルゲージ	OIL-GAUGE TANK	
1-2	6D0266001	1	キリコウケ SK3	CHIP BUCKET SK3	
1-3	6D0267001	1	キリコウケ C SK3	CHIP PAN COVER SK3	
1-4	6C0112001	4	キャスター-TY60	CASTER TY60	
1-5	6B1285001	4	タンクフィルタ-S2D	TANK FILTER S2D	
1-6	6B3419001	3	クーラントポンプ250TAKU	PUMP COOLANT 250W TAKU	
1-7	6B6873001	1	クーラントMコードC00	CORD COOLANT M C00	
1-8	6B6874001	1	チップシャワーMコードC00	CORD CHIP SHOWER M C00	
1-9	6C0258001	1	CシャワーMコードSX1SL	CORD CHIP SHOWER M SX1-SL	
1-10	6C5275001	1	CポンプCF250TAKU	COOLANT PUMP CF 250W TAKU	
1-11	6C7364001	1	サイクロンMコードCRW2	CORD CYCLONE M CRW2	
1-12	6C0183002	1	ベースエキキリR SX1-SL	BASE OIL DRAIN R SX1-SL	
1-13	6C0182002	1	ベースエキキリL SX1-SL	BASE OIL DRAIN L SX1-SL	
1-14	6C0065001	2	レベルボルトEA13-1212	LEVEL BOLT EA13-1212	
1-15	6B4406001	1	チュウアツポンプ 650W	PUMP MP 650W	
1-15-1	618492001	1	ポンプ TRP-MHG10	PUMP TRP-MHG10	
1-16	6B6875001	1	CTS MコードC00	CORD CTS M C00	
1-17	6B4084001	1	リリーフバルブTR-H-DB	RELIEF VALVE TR-H-DB	Included in No.1-14
1-18	622133001	1	サクションフィルタ-SFNO6	FILTER SUCTION SFN06	
1-19	6B1761001	1	ドレンインプラグプレート	DRAIN PLUG PLATE	
2	6D0333001	1	サイクロンフィルタークミD0	CYCLONE FILTER ASSY D00	
2-1	69A381001	1	CFラベル	CF LABEL	
2-2	6D0642001	1	スラッジバルブクミD00	SLUDGE VALVE ASSY D00	
2-3	636109001	1	クッションC-30-CS-2	CUSHION C-30-CS-2	
2-4	6C5273001	1	サイクロンF DC-1BF	CYCLONE FILTER DC-1BF	
2-5	6B1317001	1	バルブSGCA221B-15	VALVE SGCA221B-15	
2-6	6C4891001	1	チューブ 8X360	TUBE 8X360	
3	6C4865001	1	スラッジフィルター	SLUDGE FILTER	
4	6C4895001	1	ゴムホース19X570	RUBBER HOSE 19X570	
5	620420000	4	ホースバンド30	HOSE BAND CLAMP 30	
6	6C4892001	1	ゴムホース19X2600	RUBBER HOSE 19X2600	
7	6B1714001	1	ゴムホース12X550	RUBBER HOSE 12X550	
8	607254001	1	ホースバンド20	HOSE BAND CLAMP 20	
9	6C5470001	1	チューブ 8X1550	TUBE 8X1550	
10	6C4864002	1	スラッジカゴホルダー	SLUDGE CAGE HOLDER	
11	620605002	1	サドルCH1213-M6	SADDLE CH1213-M6	
12	6D0626001	1	Cホゴ250WクミD00	RELAY CLNT PRTCT 250W ASSY D00	
13	6D0996001	1	チップリレークミDSL	RELAY CHIP SHOWER ASSY DSL	
13-1	6D0626001	2	Cホゴ250WクミD00	RELAY CLNT PRTCT 250W ASSY D00	
13-2	6C0219001	1	KP2チュウケイSX1SL	CORD KP2 RELAY SX1-SL	
14	6D0648001	1	MPホゴ650WクミD00	RELAY MP PRTCT 650W ASSY D00	
15	6D0933001	1	CTS1-CFコードD00	CORD CTS1-CF D00	Cable Only
16	6D0645001	1	Cホゴ400WクミD00	RELAY CLNT PRTCT 400W ASSY D00	

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# 16-3. クーラントタンク200L サイクロン(ツール洗浄有り) COOLANT TANK 200L CYCLONE (WITH TOOL CLEANING)

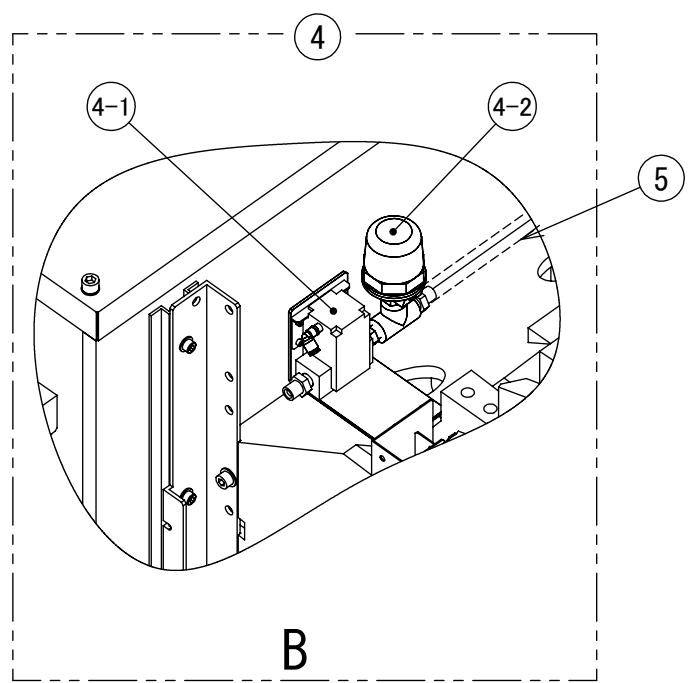
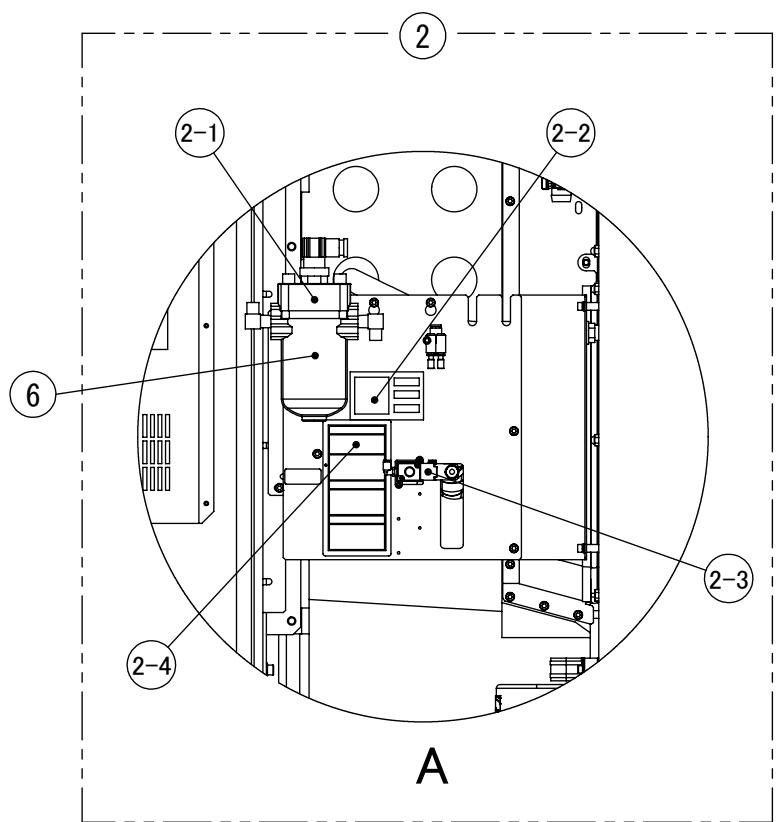
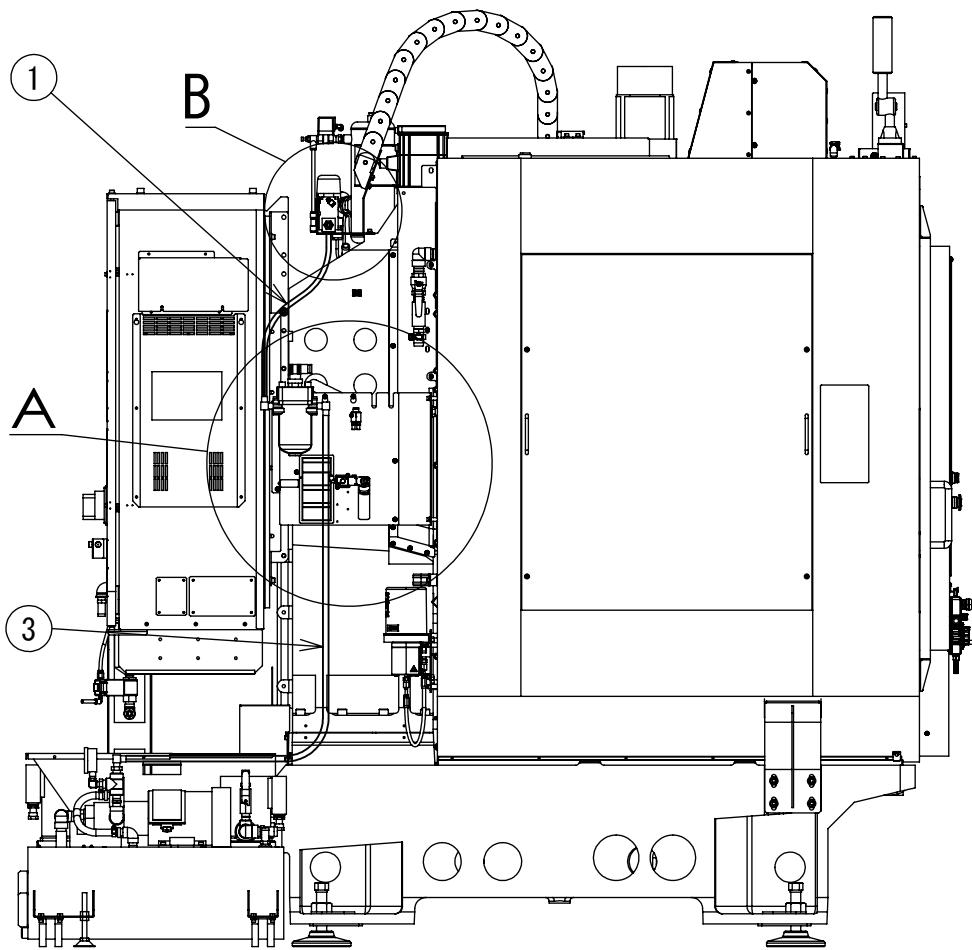


参照No. Ref. No.	部品コード Part Code	個数 Q'ty	品名 Part Name	備考 Remark	分類 Classification
1	6D0273001	1	CT200 CF クミ SK3	C-TANK200 CF ASSY SK3	
1-1	626422000	2	タンクオイルゲージ	OIL-GAUGE TANK	
1-2	6D0266001	1	キリコウケ SK3	CHIP BUCKET SK3	
1-3	6D0267001	1	キリコウケC SK3	CHIP PAN COVER SK3	
1-4	6C0112001	4	キャスター-TY60	CASTER TY60	
1-5	6B1285001	4	タンクフィルタ-S2D	TANK FILTER S2D	
1-6	6B3419001	3	クーラントポンプ250TAKU	PUMP COOLANT 250W TAKU	
1-7	6B6873001	1	クーラントMコードC00	CORD COOLANT M C00	
1-8	6B6874001	1	チップシャワーMコードC00	CORD CHIP SHOWER M C00	
1-9	6C0258001	1	CシャワーMコードSX1SL	CORD CHIP SHOWER M SX1-SL	
1-10	6C5275001	1	CポンプCF250TAKU	COOLANT PUMP CF 250W TAKU	
1-11	6C7364001	1	サイクロンMコードCRW2	CORD CYCLONE M CRW2	
1-12	6C0182002	1	ベースエキキリL SX1-SL	BASE OIL DRAIN L SX1-SL	
1-13	6C0183002	1	ベースエキキリR SX1-SL	BASE OIL DRAIN R SX1-SL	
1-14	6C0065001	2	レベルボルトEA13-1212	LEVEL BOLT EA13-1212	
1-15	6B4406001	1	チュウアツポンプ 650W	PUMP MP 650W	
1-15-1	618492001	1	ポンプ TRP-MHG10	PUMP TRP-MHG10	
1-16	6B6875001	1	CTS MコードC00	CORD CTS M C00	
1-17	6B4084001	1	リリーフバルブTR-H-DB	RELIEF VALVE TR-H-DB	Included in No.1-14
1-18	622133001	1	サクションフィルタ-SFN06	FILTER SUCTION SFN06	
1-19	6B1761001	1	ドレンインプラグプレート	DRAIN PLUG PLATE	
2	6D0332001	1	サイクロンフィルタTCクミD0	CYCLONE FILTER TC ASSY D00	
2-1	69A381001	1	CFラベル	CF LABEL	
2-2	6D0642001	1	スラッジバルブクミD00	SLUDGE VALVE ASSY D00	
2-3	636109001	1	クッションC-30-CS-2	CUSHION C-30-CS-2	
2-4	6C5273001	1	サイクロンF DC-1BF	CYCLONE FILTER DC-1BF	
2-5	6B1317001	1	バルブSGCA221B-15	VALVE SGCA221B-15	
2-6	6C4891001	1	チューブ 8X360	TUBE 8X360	
2-7	6B1317001	1	バルブSGCA221B-15	VALVE SGCA221B-15	
3	6C4865001	1	スラッジフィルター	SLUDGE FILTER	
4	6C4895001	1	ゴムホース19X570	RUBBER HOSE 19X570	
5	620420000	4	ホースバンド30	HOSE BAND CLAMP 30	
6	6C4892001	1	ゴムホース19X2600	RUBBER HOSE 19X2600	
7	6B1714001	1	ゴムホース12X550	RUBBER HOSE 12X550	
8	607254001	1	ホースバンド20	HOSE BAND CLAMP 20	
9	6C5470001	1	チューブ 8X1550	TUBE 8X1550	Red
10	6C5471001	1	チューブ 6X1550	TUBE 6X1550	Green
11	6C4864002	1	スラッジカゴホルダー	SLUDGE CAGE HOLDER	
12	620605002	1	サドルCH1213-M6	SADDLE CH1213-M6	
13	6D0626001	1	Cホゴ250WクミD00	RELAY CLNT PRTCT 250W ASSY D00	
14	6D0996001	1	チップリレーDSL	RELAY CHIP SHOWER ASSY DSL	
14-1	6D0626001	2	Cホゴ250WクミD00	RELAY CLNT PRTCT 250W ASSY D00	
14-2	6C0219001	1	KP2チュウケイSX1SL	CORD KP2 RELAY SX1-SL	
15	6D0648001	1	MPホゴ650WクミD00	RELAY MP PRTCT 650W ASSY D00	
16	6D0933001	1	CTS1-CFコードD00	CORD CTS1-CF D00	Cable Only
17	6D0645001	1	Cホゴ400WクミD00	RELAY CLNT PRTCT 400W ASSY D00	

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# 16-4. クーラントタンク200L サイクロン CTS COOLANT TANK 200L CYCLONE CTS

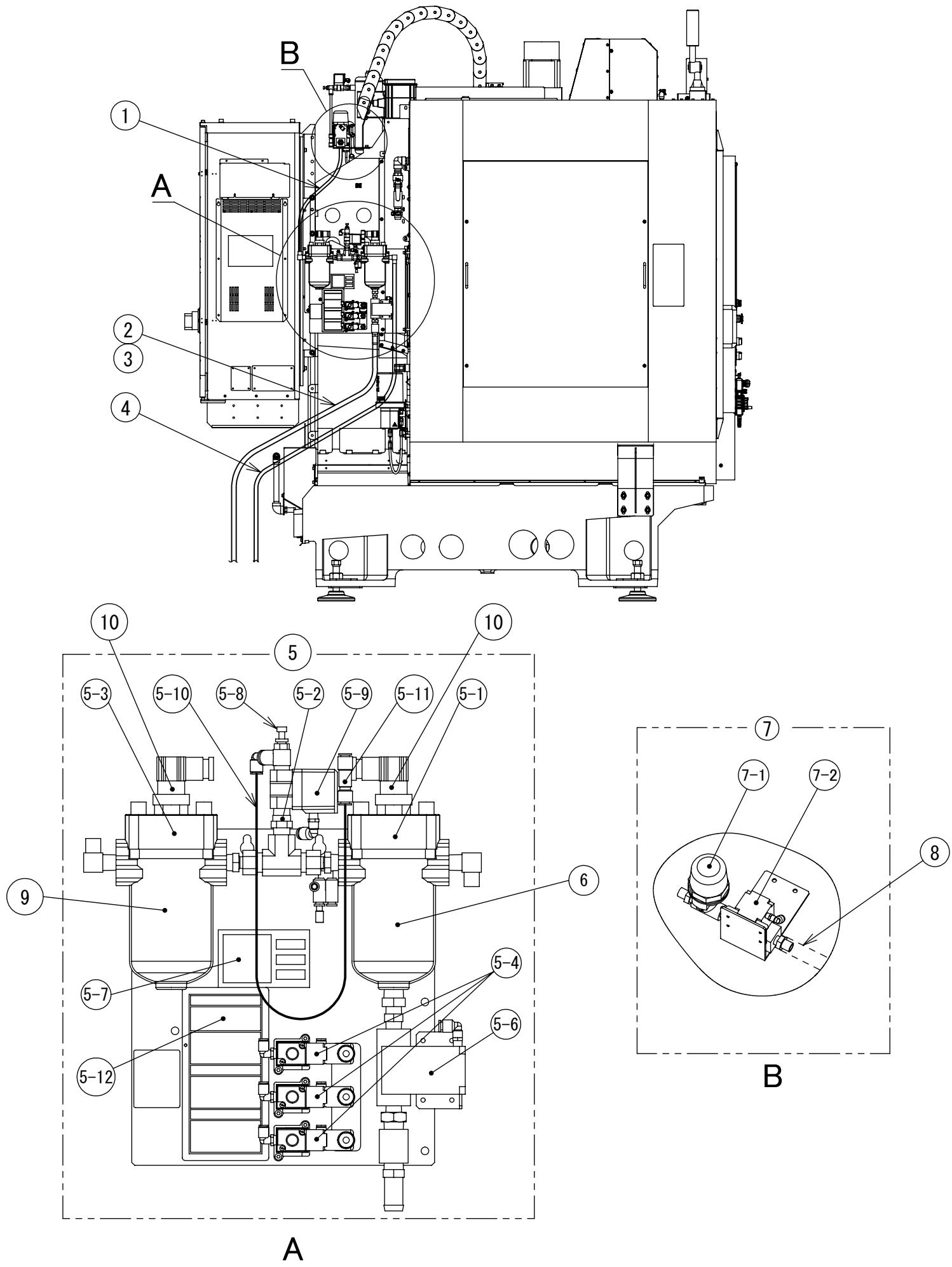


参照No. Ref. No.	部品コード Part Code	個数 Q'ty	品名 Part Name	備考 Remark	分類 Classification
1	6A7522001	1	MPホースL950	MP HOSE L950	
2	6D0125001	1	F/Vイタクミ BWナシDOS	F/V PLATE ASSY WITHOUT BW DOS	
2-1	618309001	1	ラインフィルタMP	LINE FILTER MP	Element included
2-2	693003001	1	CTSラベル 2	CTS LABEL 2	
2-3	6D0199001	1	MPバルブクミ	MP VALVE ASSY	
2-4	698936001	1	CTSラベル 1 JCE IS	LABEL CTS 1 JCE IS	Japanese, English
	698949001	1	CTSラベル 1 EGF IS	LABEL CTS 1 EGF IS	English, German, French
	698944001	1	CTSラベル 1 C GB	LABEL CTS 1 C GB	Chinese
3	618521001	1	MPホースL1700	MP HOSE L1700	
4	6D0128001	1	CTSVトリツケイタクミDOS	CTSV FIXING PLATE DOS	
4-1	618419001	1	アツリヨクスイツチMP	PRESSURE SWITCH MP	
4-2	618313001	1	クーラントバルブMP	COOLANT VALVE MP	
5	618311001	1	MPホースL2000	MP HOSE L2000	
6	618491001	1	ラインフィルタエレメントST	LINE FILTER ELEMENT ST	

\* 分類の"C"は制御部品、無印は機械部品の扱いです。

\* "C" in the "Classification" indicates that the part is classified into control part, while no mark indicates machine part.

# 16-5. CTS(逆洗有り) CTS(WITH BACK WASH)

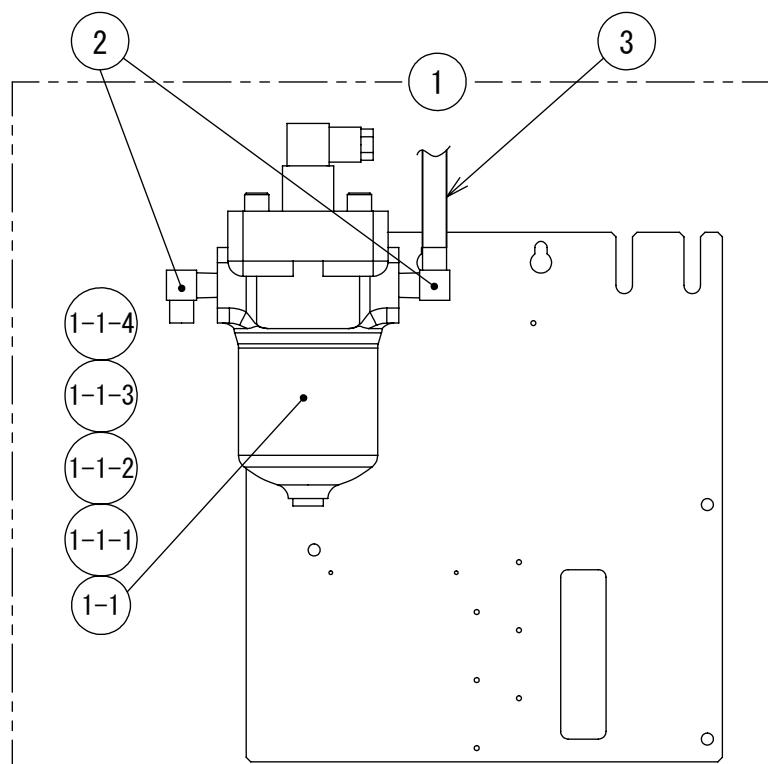
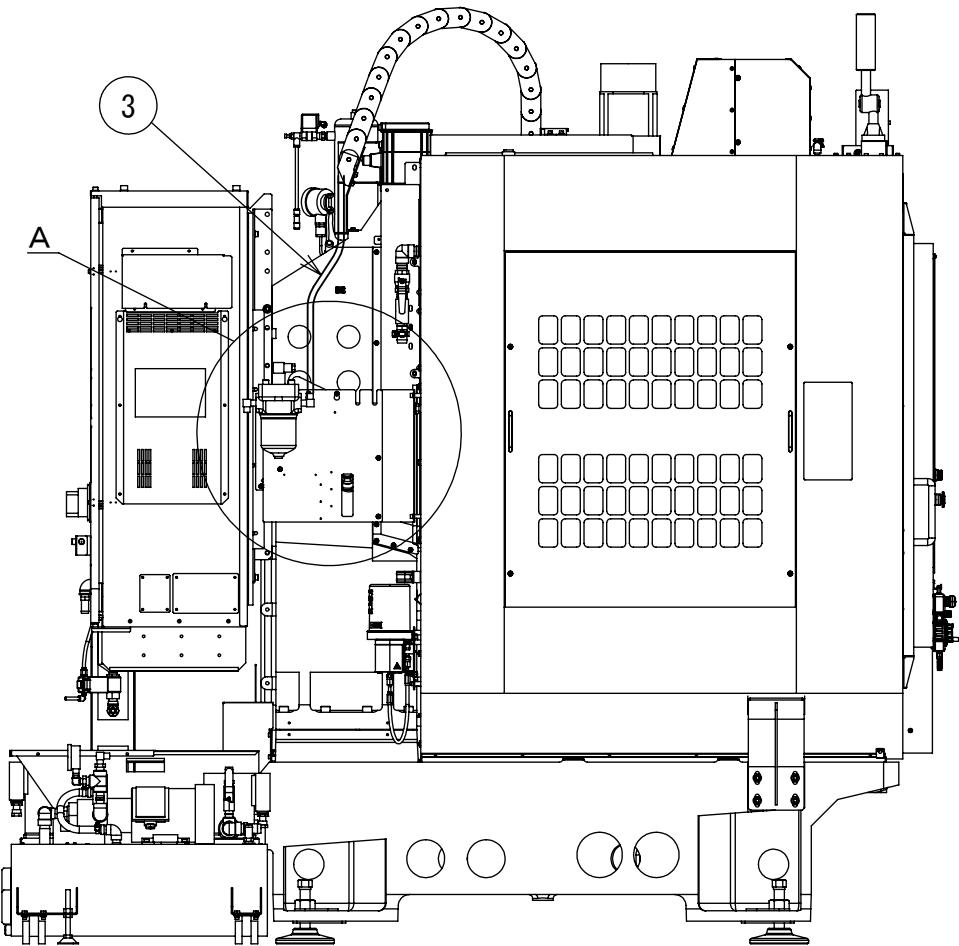


参照No. Ref. No.	部品コード Part Code	個数 Q'ty	品名 Part Name	備考 Remark	分類 Classification
1	6A7522001	1	MPホースL950	MP HOSE L950	
2	610265001	1	ゴムホース19X1200	RUBBER-HOSE 19X1200	
3	620420000	2	ホースバンド30	HOSE BAND CLAMP 30	
4	618521001	1	MPホースL1700	MP HOSE L1700	
5	6D0129001	1	F/Vイタクミ BW D0S	F/V PLATE ASSY BW D0S	
5-1	618295001	1	ギャクセンフィルタ	BACK WASH FILTER	Element included
5-2	6B9656001	1	チェックバルブ3/8CM	CHECK VALVE 3/8 CM	
5-3	618309001	1	ラインフィルタMP	LINE FILTER MP	Element included
5-4	6D0199001	3	MPバルブクミ	MP VALVE ASSY	
5-6	618313001	1	クーラントバルブMP	COOLANT VALVE MP	
5-7	693003001	1	CTS ラベル 2	CTS LABEL 2	
5-8	618357001	1	スピコン8-3/8I	SPEED CONTROL8-3/8I	
5-9	618358001	1	エアバルブMP	AIR VALVE MP	
5-10	6B9075001	1	チューブ TH0806 550	TUBE TH0806 550	
5-11	6B9074001	1	チェックバルブAKH08-00	CHECK VALVE AKH08-00	
5-12	698936001	1	CTSラベル 1 JCE IS	LABEL CTS 1 JCE IS	Japanese, English
	698949001	1	CTSラベル 1 EGF IS	LABEL CTS 1 EGF IS	English, German, French
	698944001	1	CTSラベル 1 C GB	LABEL CTS 1 C GB	Chinese
6	618497001	1	ギャクセンエレメント	BACK WASH ELEMENT	
7	6D0128001	1	CTSVトリツケイタクミD0S	CTSV FIXING PLATE D0S	
7-1	618419001	1	アツリヨクスイツチMP	PRESSURE SWITCH MP	
7-2	618313001	1	クーラントバルブMP	COOLANT VALVE MP	
8	618311001	1	MPホースL2000	MP HOSE L2000	
9	618491001	1	ラインフィルタエレメントST	LINE FILTER ELEMENT ST	
10	610684001	1	EA-3Dインジケータ	EA-3D INDICATOR	

\* 分類の"C"は制御部品、無印は機械部品の扱いです。

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## 17. 高压CTS HIGH PRESSURE CTS



A

17. 高圧CTS  
HIGH PRESSURE CTS

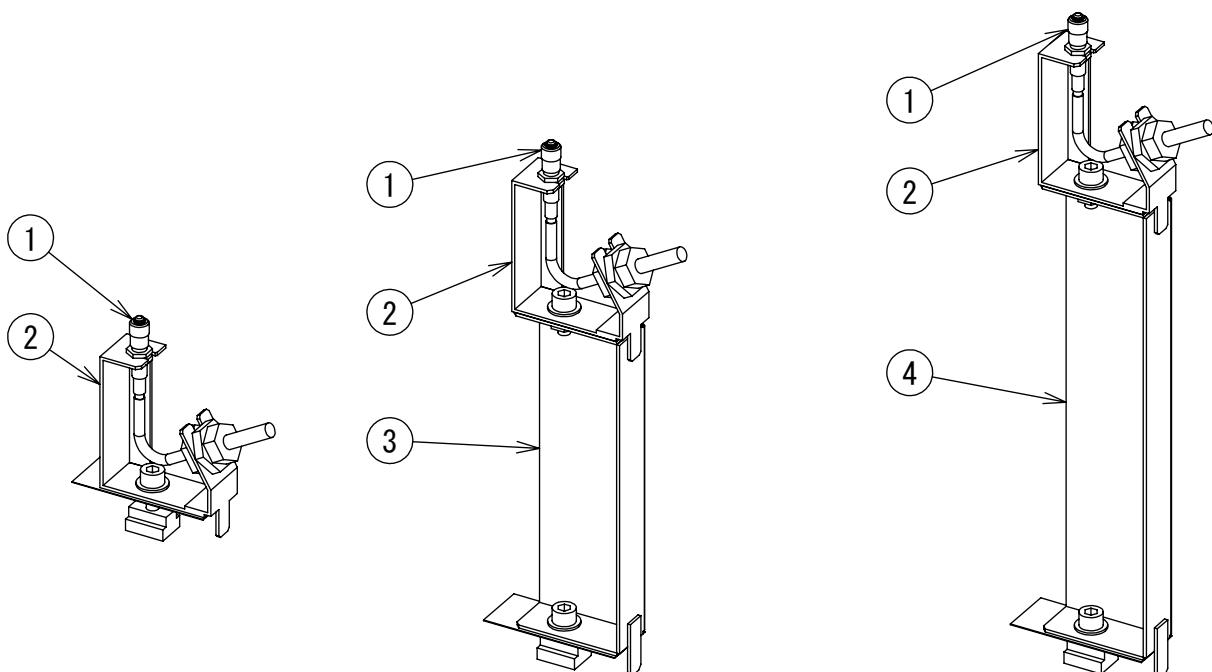
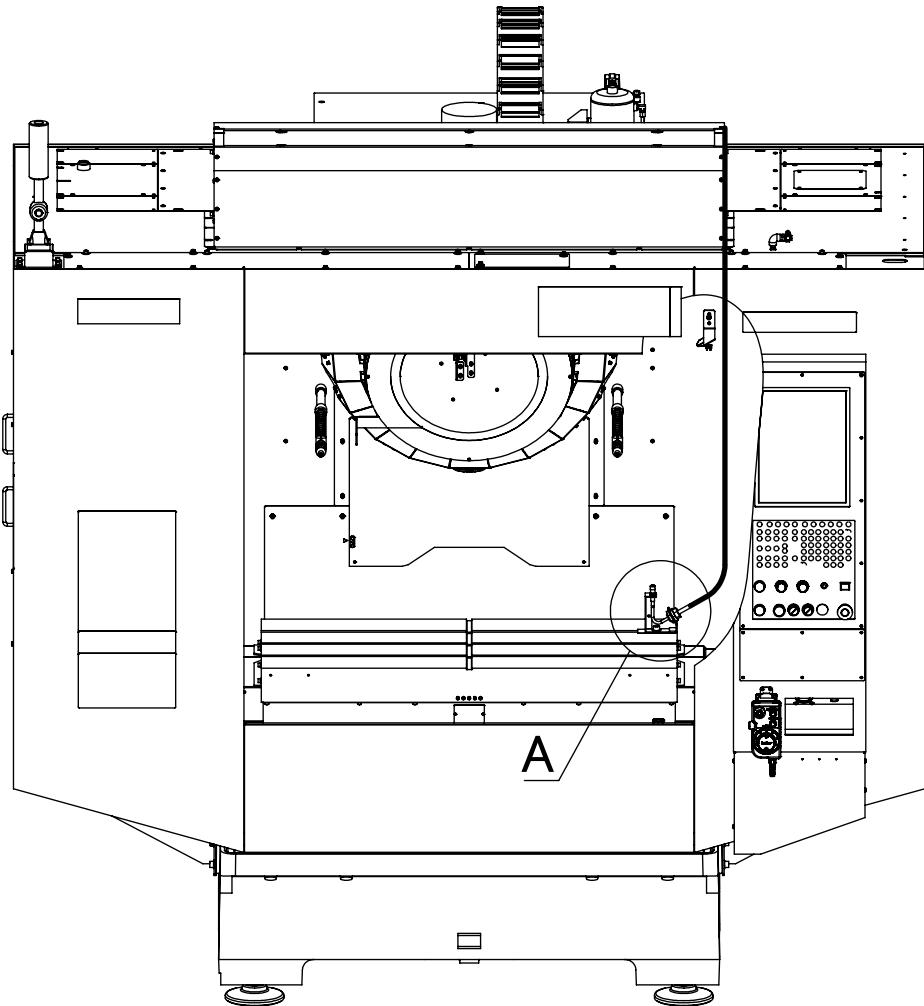
WXd1

参照No. Ref. No.	部品コード Part Code	個数 Q'ty	品名 Part Name	備考 Remark	分類 Classification
1	6D0346001	1	コウアツチュツクミ SK3 HIGH PRESSURE BLOW SK3		
1-1	6C7352001	1	ラインフィルタクミHPC0S LINE FILTER ASSY HP C0S		
1-1-1	652440001	1	ラインフィルタ70K LINE FILTER 70K		
1-1-2	6D0454001	1	HCTSコードクミD00 CORD HCTS ASSY D00		
1-1-3	610684001	1	EA-3Dインジケータ EA-3D INDICATOR		
1-1-4	655607001	1	ラインフィルタエレメントSUS LINE FILTER ELEMENT SUS		
2	652428001	2	HPホースエルボ3/8 HP HOSE ELBOW, 3/8		
3	610932001	1	コウアツホース3200L HIGH PRESSURE HOSE 3200L		

\* 分類の"C"は制御部品、無印は機械部品の扱いです。

\* "C" in the "Classification" indicates that the part is classified into control part, while no mark indicates machine part.

## 18. 工具折損検出装置 TOOL BREAKAGE DETECTION UNIT



標準コラム  
STANDARD COLUMN

ハイコラム 150, 250  
HIGH COLUMN 150, 250

ハイコラム 350  
HIGH COLUMN 350

A

18. 工具折損検出装置  
TOOL BREAKAGE DETECTION UNIT

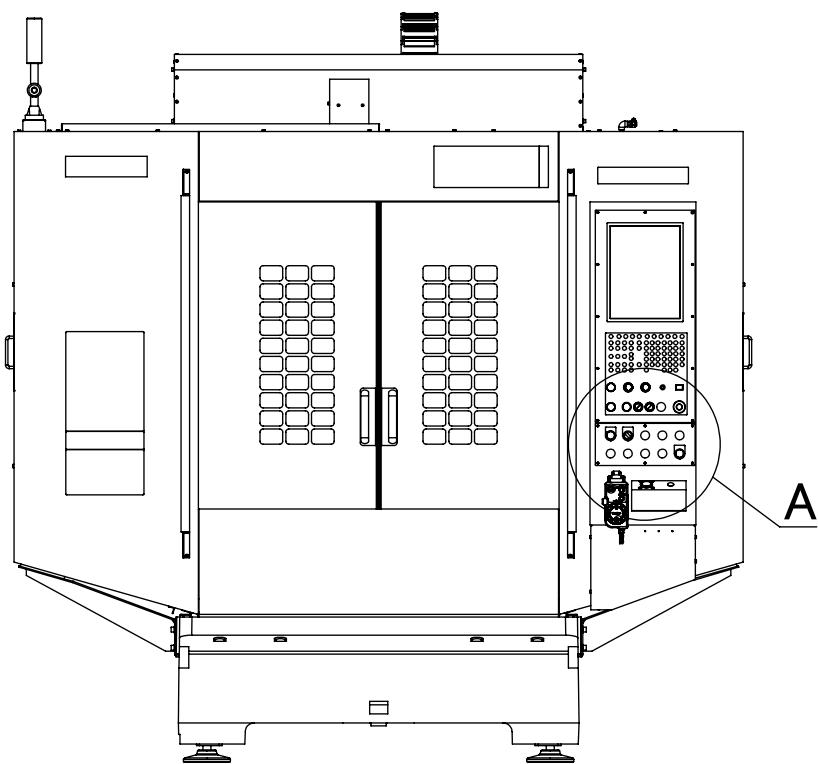
WXd1

参照No. Ref. No.	部品コード Part Code	個数 Q'ty	品名 Part Name	備考 Remark	分類 Classification
1	6D0918001	1	タッチセンサD0S	TOUCH SENSOR D0S	
2	6A7415001	1	タッチセンサ-ブラケットS2C	TOUCH SENSOR BRACKET S2C	
3	6A7850001	1	タッチセンサBKスペーサ	TOUCH SENSOR BK SPACER	High column 150,250
4	6C0270001	1	TセンサBKスペーサ350	TOUCH SENSOR BK SPACER H350	High column 350

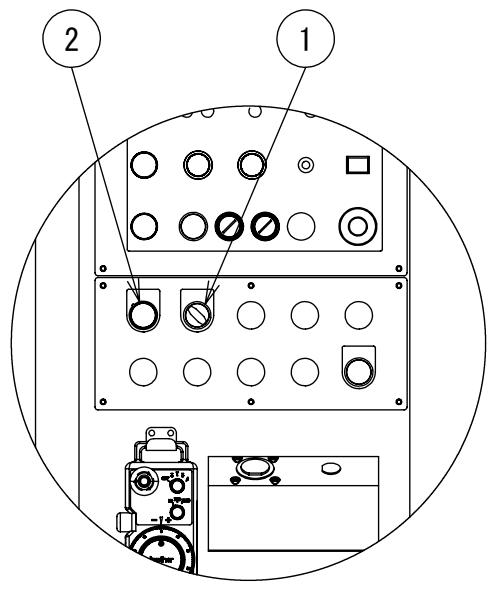
\* 分類の"C"は制御部品、無印は機械部品の扱いです。

\* "C" in the "Classification" indicates that the part is classified into control part, while no mark indicates machine part.

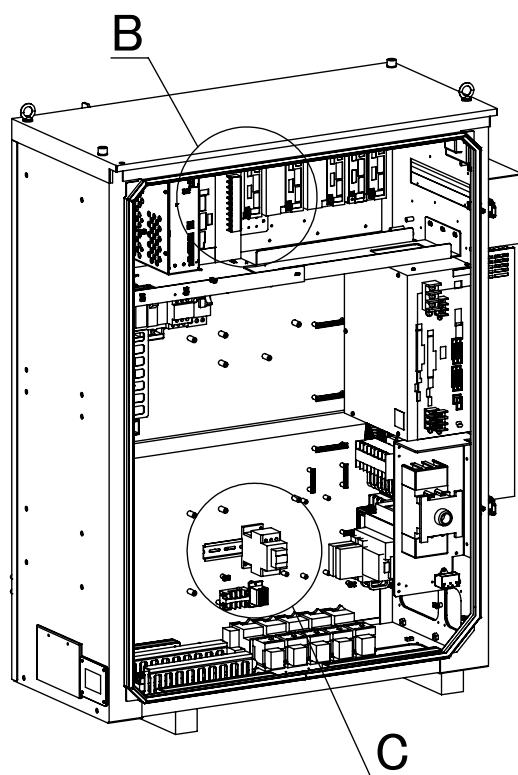
# 19. 自動扉 1/2 AUTOMATIC DOOR 1/2



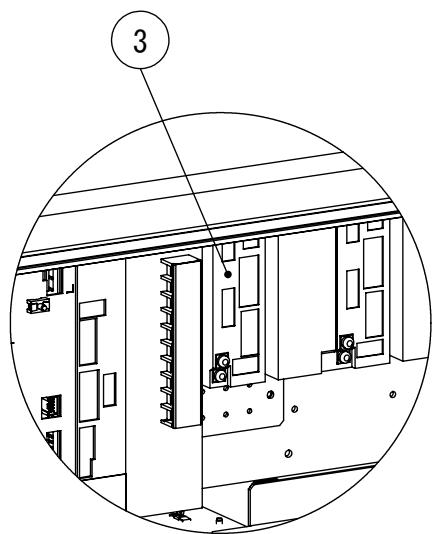
A



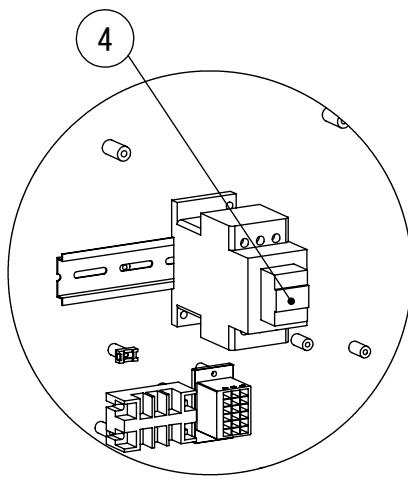
A



C



B



C

19. 自動扉 1/2  
AUTOMATIC DOOR 1/2

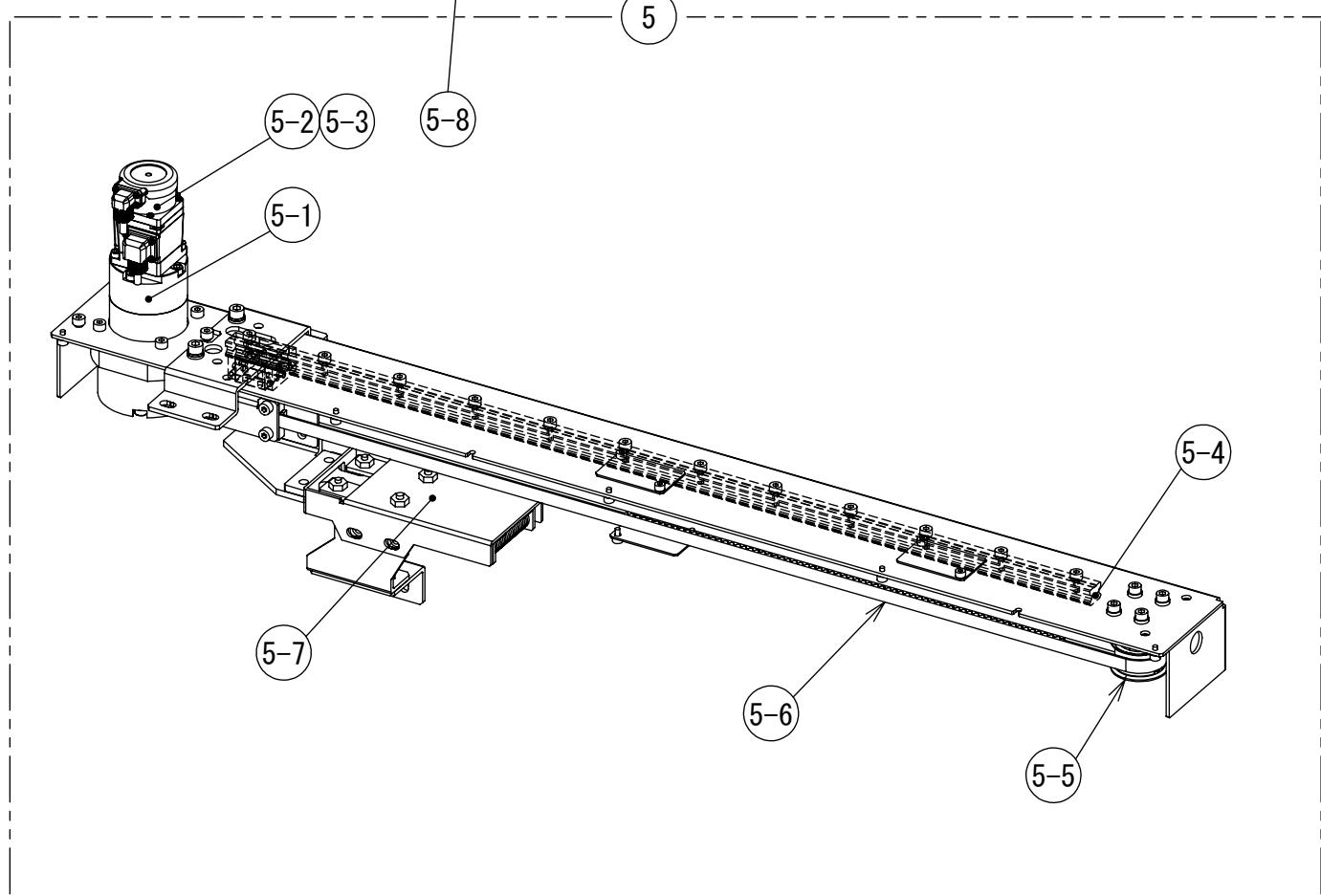
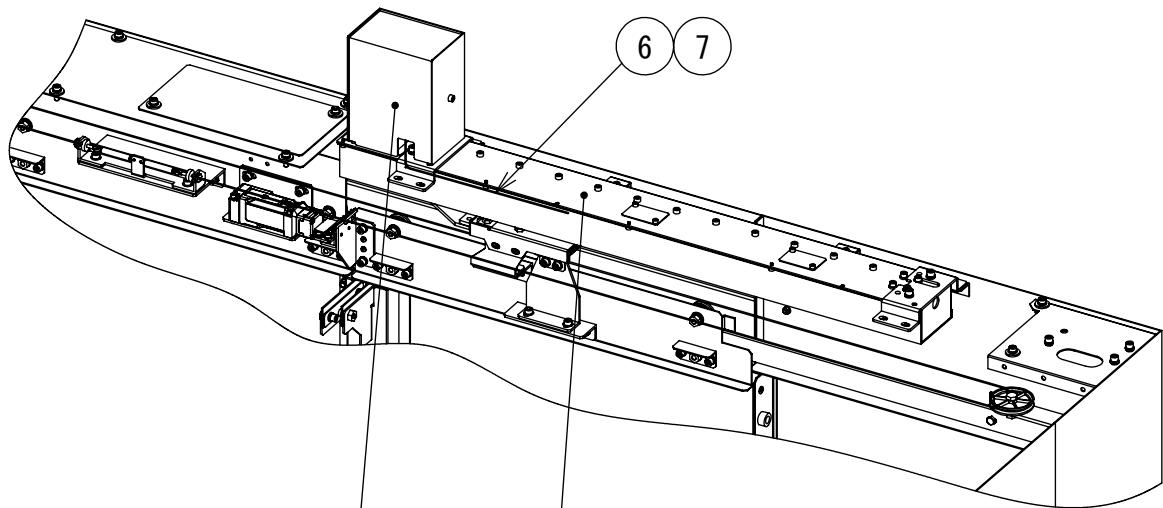
WXd1

参照No. Ref. No.	部品コード Part Code	個数 Q'ty	品名 Part Name	備考 Remark	分類 Classification
1	643738001	1	スイッチ モードセレクトクミ SWITCH MODE SELECT ASSY		
2	643636001	1	スイッチ オートドアクミ SWITCH AUTODOOR ASSY		
3	100.制御箱を参照してください Refer to 100.CONTROL BOX.				
4					

\* 分類の"C"は制御部品、無印は機械部品の扱いです。

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## 19. 自動扉 2/2 AUTOMATIC DOOR 2/2

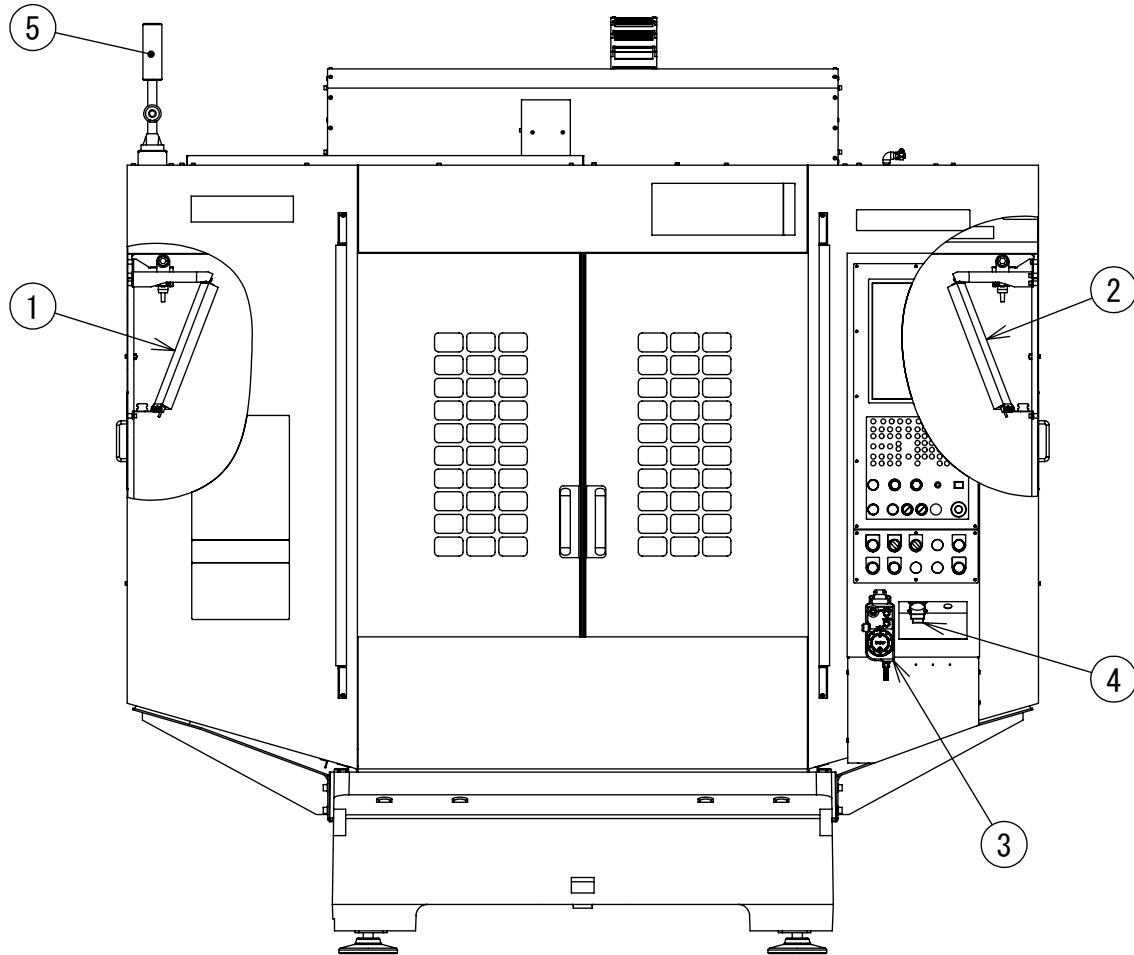


参照No. Ref. No.	部品コード Part Code	個数 Q'ty	品名 Part Name	備考 Remark	分類 Classification
5	6D0200001	1	ADアクチュエータクミSRT	AD ACTUATOR ASSY SRT	
5-1	6D0256001	1	ADクラブクミ	AD DRIVE PART ASSY	
5-2	6D0878001	1	P4ジクモータD00	MOTOR P4 AXIS D00	
5-3	6D0216001	1	Dカットアダプタ	D CUT ADAPTER	
5-4	6D0206001	1	ガイドMSB15TS SRT	GUIDE MSB15TS SRT	
5-5	6D0226001	1	アイドラブーリ S5M-22	IDLER PULLEY S5M-22	
5-6	6D0203001	1	タイミングベルトS5M SRT	TIMING BELT S5M SRT	
5-7	6D0243001	1	レンケツカイジョクミ	RELEASE MECHANICAL ASSY	
5-8	6D0236001	1	モータカバーアド	MOTOR COVER UPPER AD	
6	6D0877001	1	P4モータコードD00	CORD P4 MOTOR D00	
7	6D0875001	1	P4ENCコードD00	CORD P4 ENCODER D00	

\* 分類の"C"は制御部品、無印は機械部品の扱いです。

\* "C" in the "Classification" indicates that the part is classified into control part, while no mark indicates machine part.

20. 機内灯、表示灯、手動パルス発生器  
MACHINE LIGHT, INDICATION LAMP,  
MANUAL PULSE GENERATOR



20. 機内灯、表示灯、手動パルス発生器  
MACHINE LIGHT, INDICATION LAMP, MANUAL PULSE GENERATOR

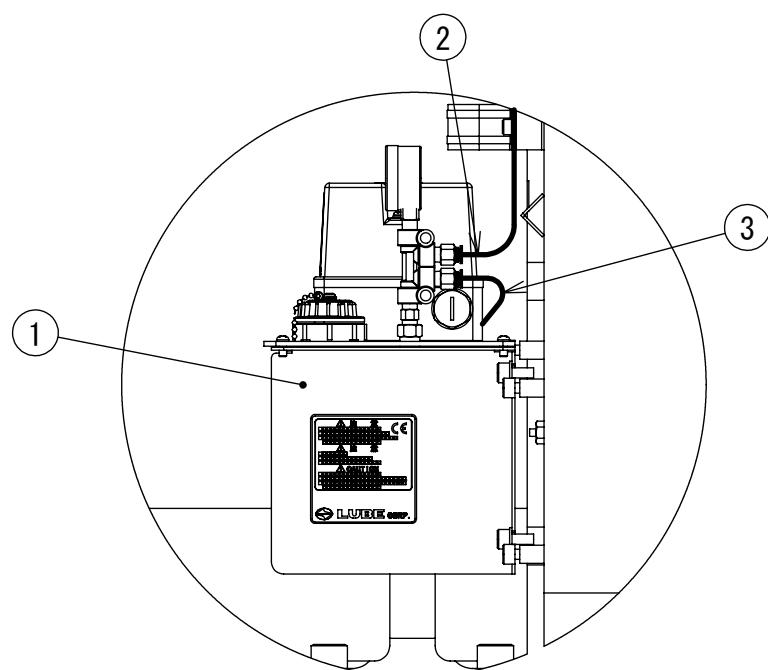
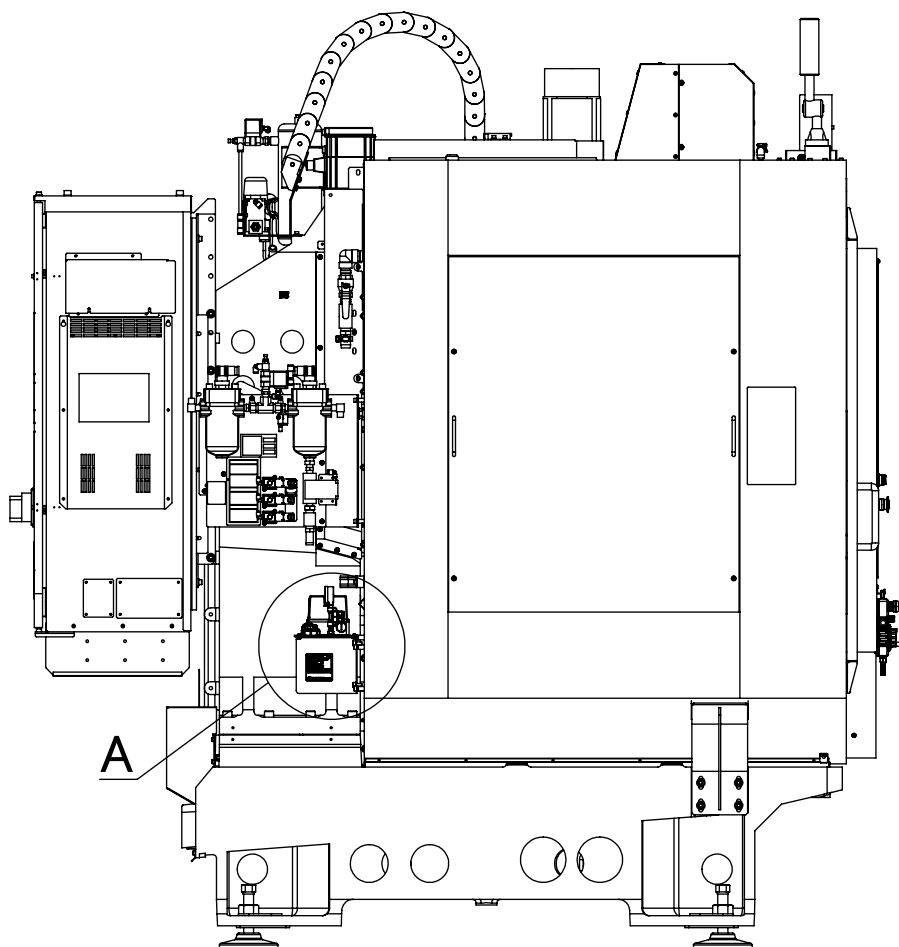
WXd1

参照No. Ref. No.	部品コード Part Code	個数 Q'ty	品名 Part Name	備考 Remark	分類 Classification
1	6D0152001	1	LEDキナイトLクミ SK3	LED LIGHT WORK L ASSY SK3	Left Side, With Cable
2	6D0148001	1	LEDキナイトRクミ SK3	LED LIGHT WORK R ASSY SK3	Right Side, With Cable
3	6C4301001	1	パルサクミ D00	PULSER ASSY D00	
4	6C4153001	1	ショートプラグCS2	SHORT PLUG CS2	When Manual pulse generator is not used
5	6D0678001	1	ヒヨウジトウ1トウクミD00	INDICATOR LIGHT 1 ASSY D00	Yellow, With Cable
	6D0679001	1	ヒヨウジトウ2トウクミD00	INDICATOR LIGHT 2 ASSY D00	Red, Yellow, With Cable
	6D0680001	1	ヒヨウジトウ3トウクミD00	INDICATOR LIGHT 3 ASSY D00	Red, Yellow, Green, With Cable

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21. 自動給油裝置 1/3  
INTERMITTENT LUBRICATING UNIT 1/3



A

21. 自動給油装置 1/3  
INTERMITTENT LUBRICATING UNIT 1/3

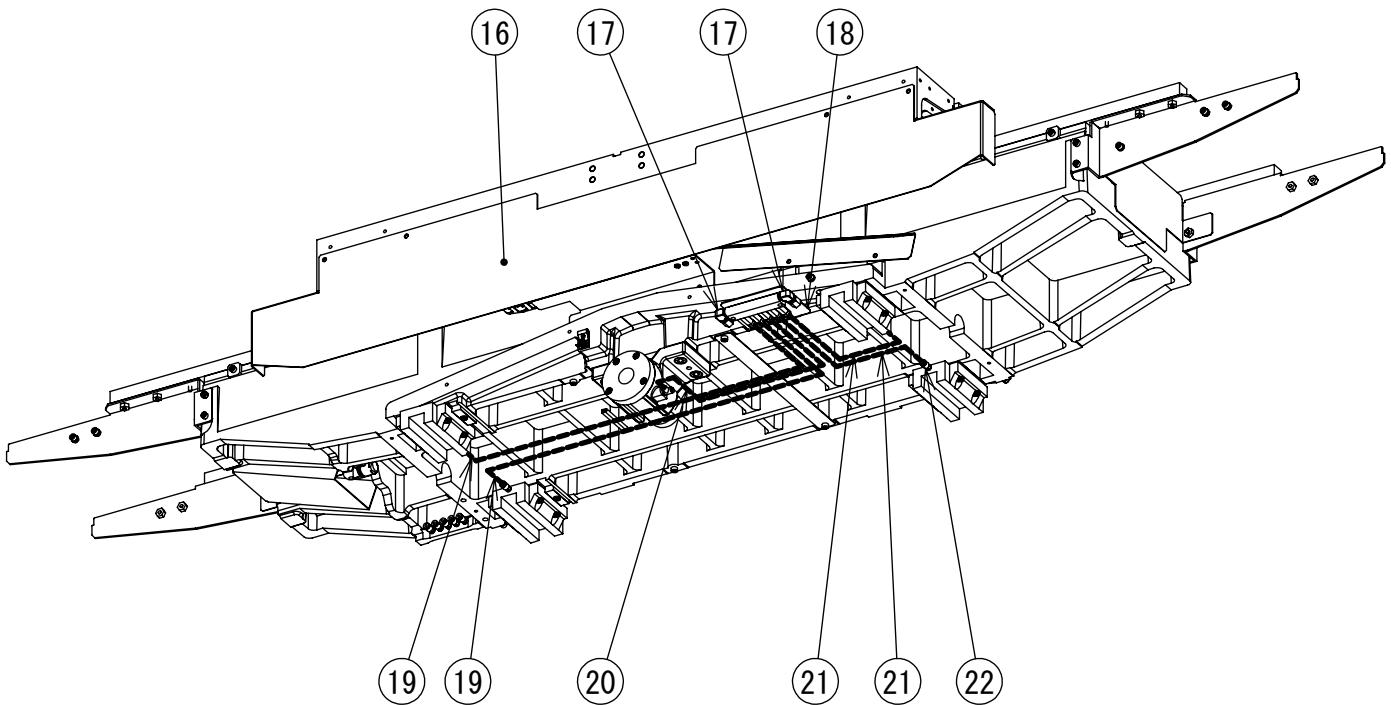
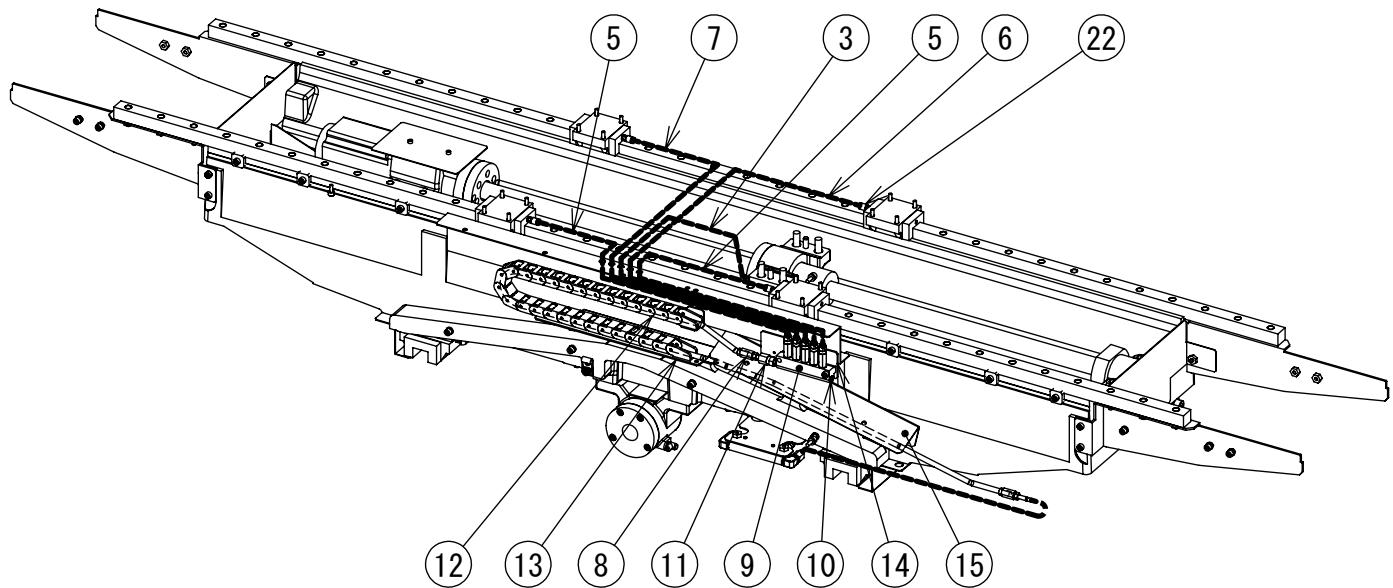
WXd1

参照No. Ref. No.	部品コード Part Code	個数 Q'ty	品名 Part Name	備考 Remark	分類 Classification
1	6B9881001	1	キュウユポンプ LUBE	LUBRICATION PUMP LUBE	
2	6B9898001	1	チューブ 6X4500	TUBE 6X4500	Z AXIS
3	6B9899001	1	チューブ 6X3900	TUBE 6X3900	X,Y AXIS

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## 21. 自動給油裝置 2/3 INTERMITTENT LUBRICATING UNIT 2/3

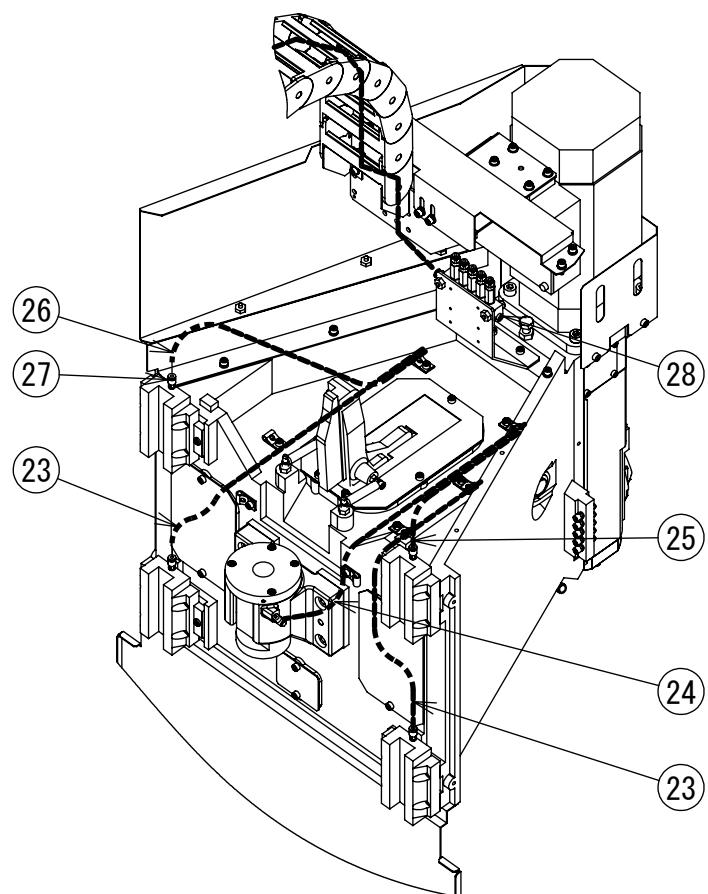
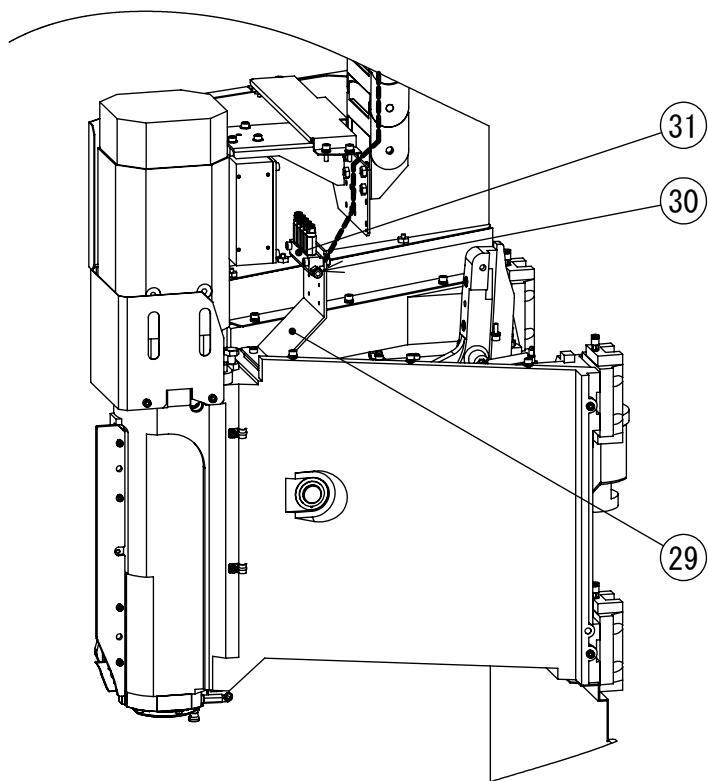


参照No. Ref. No.	部品コード Part Code	個数 Q'ty	品名 Part Name	備考 Remark	分類 Classification
4	6A4346001	1	レイロンチューブ970 TUBE 970		
5	6A4346001	2	レイロンチューブ970 TUBE 970		
6	6A4992001	1	レイロンチューブ1030 TUBE 1030		
7	6A4346001	1	レイロンチューブ970 TUBE 970		
8	6C6169001	1	チューブ 6X1850 TUBE 6X1850		
9	6C4095001	2	ブンパイキクミ MO2 DISTRIBUTOR ASSY MO2		
10	607327001	1	アナプラグPT1/8 GJ PLUG SCREW PT1/8		
11	6C4519001	1	ストレート KBC6-01-F STRAIGHT KBC6-01-F		
12	6C0142001	1	XキュウユCB SX1SL X OIL SUPPLY CABLE BEAR SX1-SL		
13	6C0141001	1	XキュウユCBサポ SX1SL X OIL SUPPLY CB SUPPORT SX1-SL		
14	6C0143001	1	XキュウユP SX1-SL X OIL SUPPLY PLATE SX1-SL		
15	6C0140001	1	XキュウユホースC SX1SL X OIL SUPPLY HOSE COVER SX1-SL		
16	6D0008001	1	XキュウユRC SK3 X OIL SUPPLY REAR COVER SK3		
17	6C4518001	2	エルボ KBL6-01-F ELBOW KBL6-01-F		
18	6C0316001	1	Yキュウユプレート SX1SL Y OIL SUPPLY PLATE SX1SL		
19	6A3423001	2	レイロンチューブ1300 TUBE 1300		
20	641343000	1	レイロンチューブ600 TUBE LYLYON 600		
21	641340000	2	レイロンチューブ470 TUBE 470		
22	6B9132001	8	グリスツギテKC4-BRT-1 GREASE TUBE JOINT KC4-BRT-1		

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## 21. 自動給油裝置 3/3 INTERMITTENT LUBRICATING UNIT 3/3

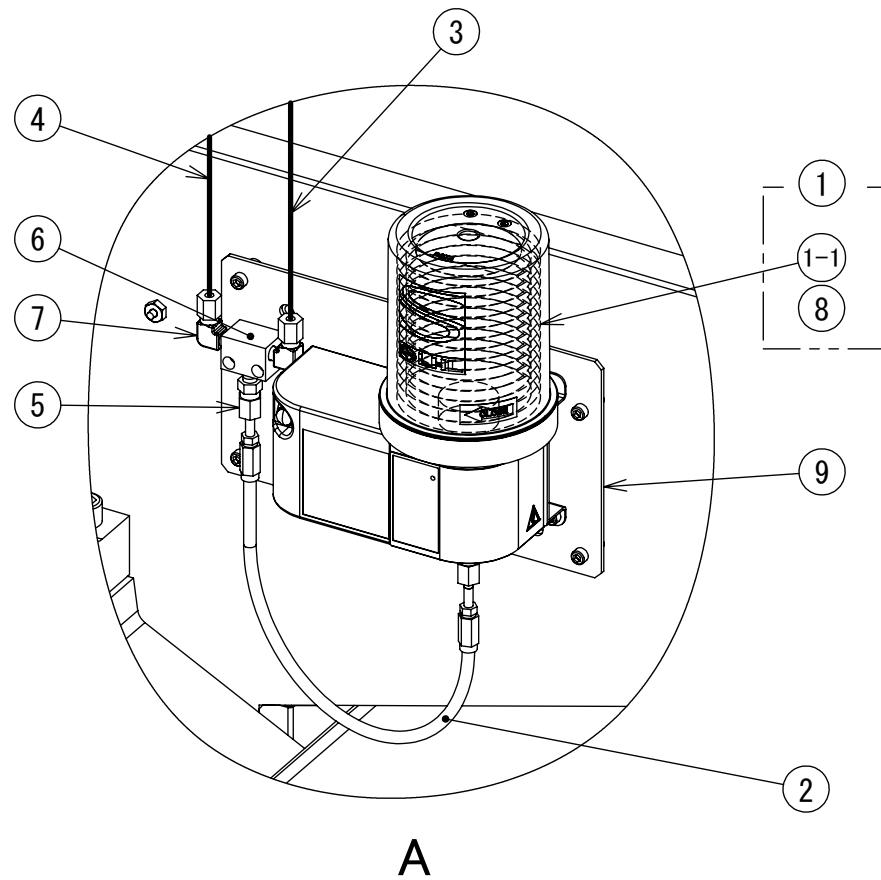
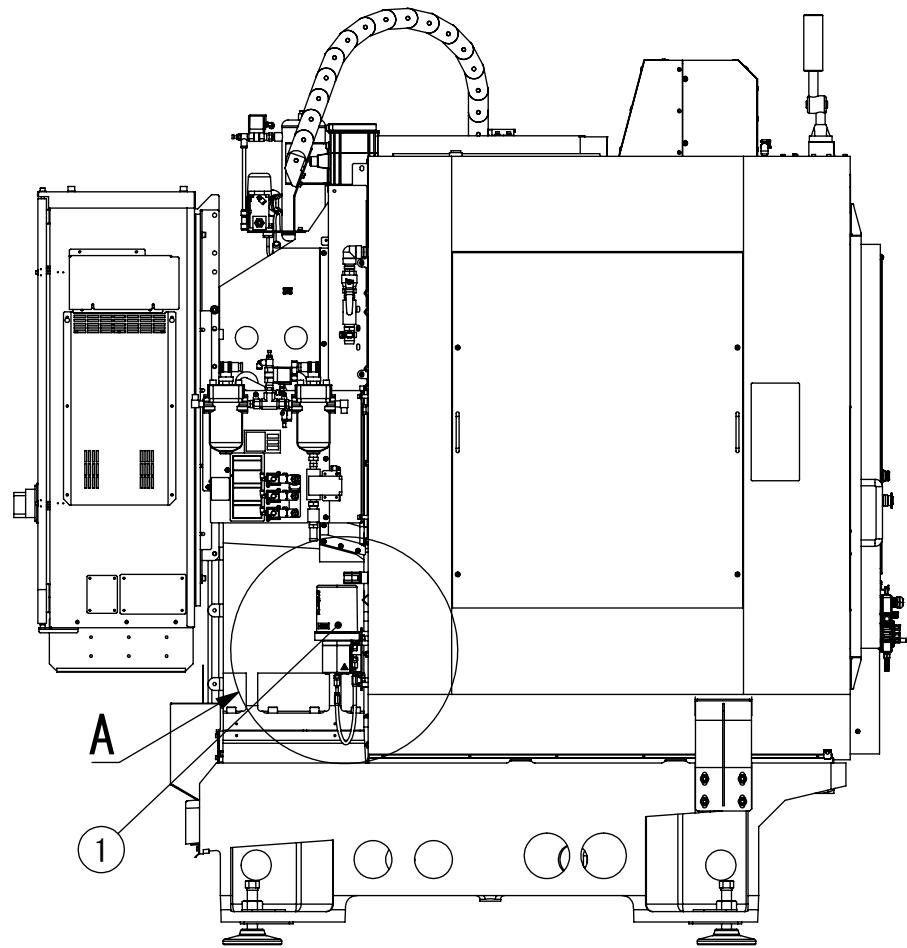


参照No. Ref. No.	部品コード Part Code	個数 Q'ty	品名 Part Name	備考 Remark	分類 Classification
23	6A3423001	2	レイロンチューブ1300 TUBE 1300		
24	6A4992001	1	レイロンチューブ1030 TUBE 1030		
25	6A4346001	1	レイロンチューブ970 TUBE 970		
26	650954001	1	レイロンチューブ850 TUBE,LYLON 850		
27	6B9132001	4	グリスツギテKC4-BRT-1 GREASE TUBE JOINT KC4-BRT-1		
28	607327001	1	アナプラグPT1/8 GJ PLUG SCREW PT1/8		
29	6B6392001	1	ZキュウユプレートSX1 Z_OIL_SUPPLY PLATE SX1		
30	6C4519001	1	ストレート KBC6-01-F STRAIGHT KBC6-01-F		
31	6C4095001	1	ブンパイキクミ MO2 DISTRIBUTOR ASSY MO2		

\* 分類の"C"は制御部品、無印は機械部品の扱いです。

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## 22. 自動給脂装置 1/3 AUTOMATIC GREASE SUPPLY UNIT 1/3



22. 自動給脂装置 1/3  
AUTOMATIC GREASE SUPPLY UNIT 1/3

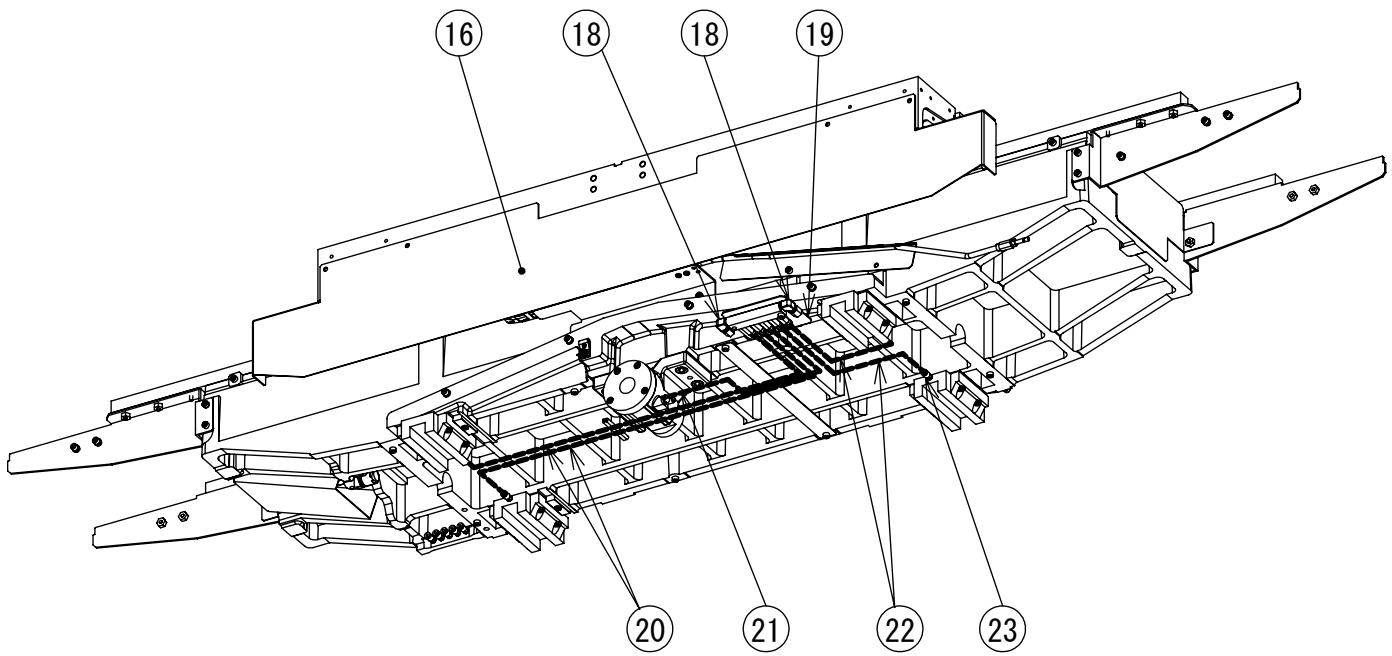
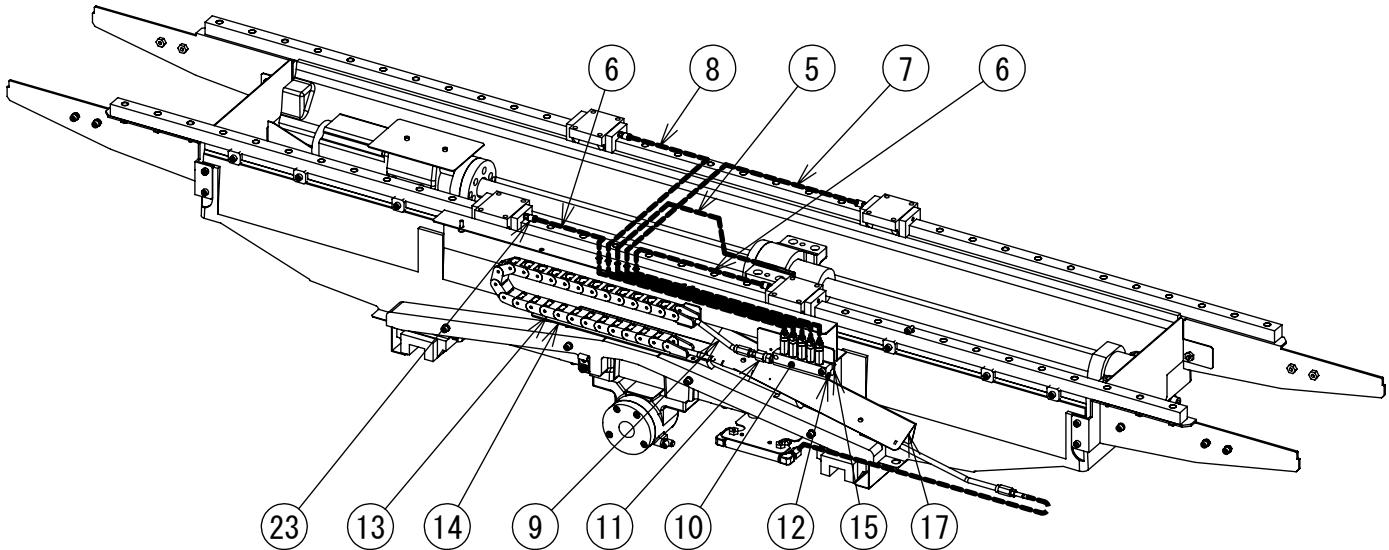
WXd1

参照No. Ref. No.	部品コード Part Code	個数 Q'ty	品名 Part Name	備考 Remark	分類 Classification
1	6B6543001	1	ジドウキュウシポンプP207F	PUMP AUTOMATIC GREASE P207F	
1-1	6B6536001	1	カートリッジグリース X100	CARTRIDGE-GREASE X100	
2	6D1383001	1	HPフレキホキュウL400	HP FLEX TUBE SUPPLY ASSY L400	
3	6D1393001	1	HPフレキホキュウL4100	HP FLEX TUBE SUPPLY ASSY L4100	
4	6D1393001	1	HPフレキホキュウL4100	HP FLEX TUBE SUPPLY ASSY L4100	
5	6A8370001	2	グリスヨウストレート	GREASE STRAIGHT	
6	6B6544001	1	キュウユマニホーランド1/8X3	MANIFOLD 1/8X3	
7	6A8371001	2	グリスヨウエルボ	GREASE ELBOW	
8	6B6605001	1	ジドウキュウシコード C00	CORD AUTO GREASE SUPPLY C00	
9	6C4279002	1	キュウユポンプPL SX2	LUBRICATOR PUMP PLATE SX2	

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## 22. 自動給脂装置 2/3 AUTOMATIC GREASE SUPPLY UNIT 2/3

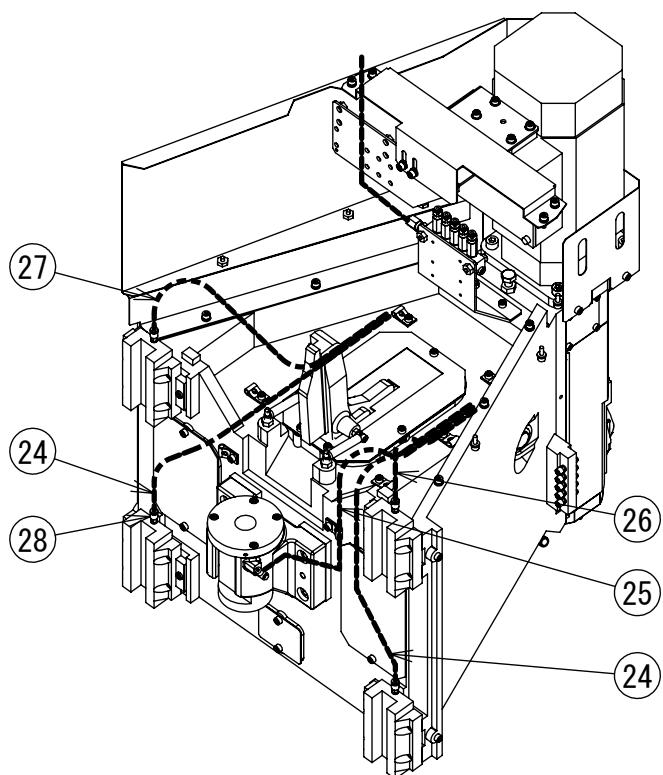
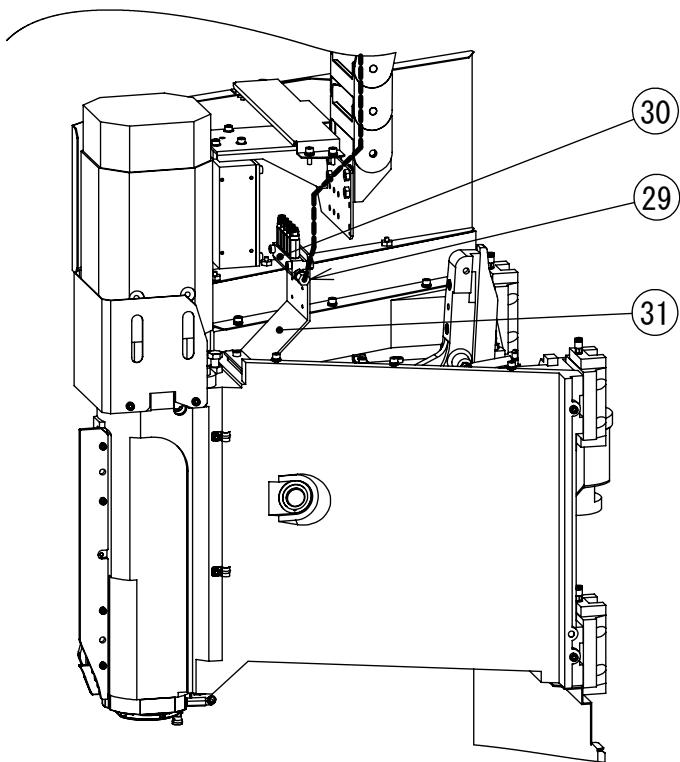


masu Ref. No.	部品コード Part Code	個数 Q'ty	品名 Part Name	備考 Remark	分類 Classification
5	6A4346001	1	レイロンチューブ970	TUBE 970	
6	6A4346001	2	レイロンチューブ970	TUBE 970	
7	6A4992001	1	レイロンチューブ1030	TUBE 1030	
8	6A4346001	1	レイロンチューブ970	TUBE 970	
9	6D1389001	1	HPフレキホキュウL1800	HP FLEX TUBE SUPPLY ASSY L1800	
10	6B6729001	2	グリスブンパイクMG2C	GREASE DISTRIBUTOR ASSY MG2C	
11	6A8370001	1	グリスヨウストレート	GREASE STRAIGHT	
12	607327001	1	アナプラグPT1/8 GJ	PLUG SCREW PT1/8	
13	6C0142001	1	XキュウユCB SX1SL	X OIL SUPPLY CABLE BEAR SX1-SL	
14	6C0141001	1	XキュウユCBサポ SX1SL	X OIL SUPPLY CB SUPPORT SX1-SL	
15	6C0143001	1	XキュウユP SX1-SL	X OIL SUPPLY PLATE SX1-SL	
16	6D0008001	1	XキュウユR C SK3	X OIL SUPPLY REAR COVER SK3	
17	6C0140001	1	XキュウユホースC SX1SL	X OIL SUPPLY HOSE COVER SX1-SL	
18	6A8371001	2	グリスヨウエルボ	GREASE ELBOW	
19	6C0316001	1	Yキュウユプレート SX1SL	Y OIL SUPPLY PLATE SX1SL	
20	6A3423001	2	レイロンチューブ1300	TUBE 1300	
21	641343000	1	レイロンチューブ600	TUBE LYLYON 600	
22	641340000	2	レイロンチューブ470	TUBE 470	
23	6B9132001	8	グリスツギテKC4-BRT-1	GREASE TUBE JOINT KC4-BRT-1	

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22. 自動給脂装置 3/3  
AUTOMATIC GREASE SUPPLY UNIT 3/3



22. 自動給脂装置 3/3  
AUTOMATIC GREASE SUPPLY UNIT 3/3

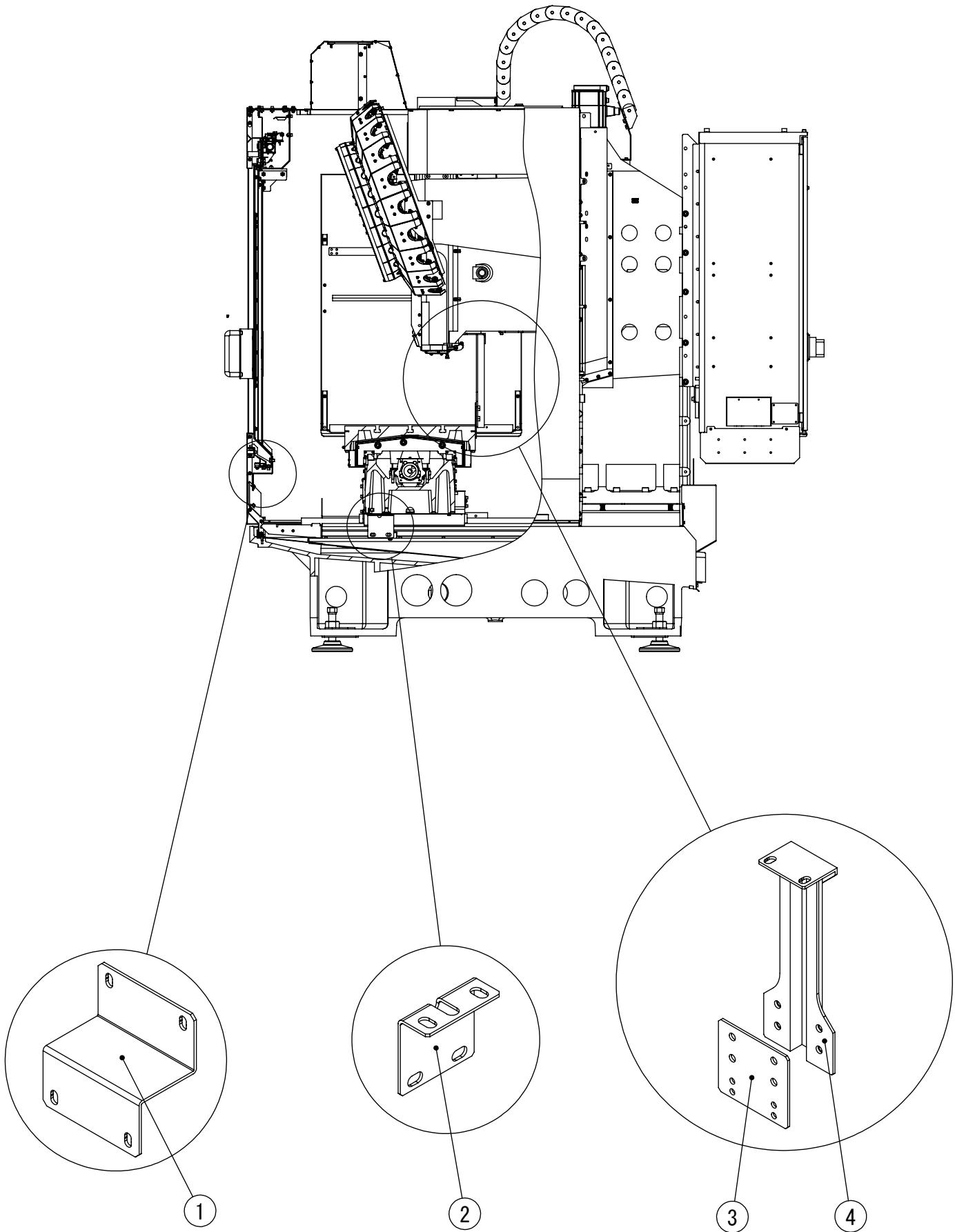
WXd1

参照No. Ref. No.	部品コード Part Code	個数 Q'ty	品名 Part Name	備考 Remark	分類 Classification
24	6A3423001	2	レイロンチューブ1300 TUBE 1300		
25	637435001	1	レイロンチューブ1030 TUBE 1030		
26	6A4346001	1	レイロンチューブ970 TUBE 970		
27	650954001	1	レイロンチューブ850 TUBE,LYLON 850		
28	6B9132001	4	グリスツギテKC4-BRT-1 GREASE TUBE JOINT KC4-BRT-1		
29	6A8370001	1	グリスヨウストレート GREASE STRAIGHT		
30	6B6729001	1	グリスブンパイキクMG2C GREASE DISTRIBUTOR ASSY MG2C	Z AXIS	
31	6B6392001	1	Zキュウユプレート SX1 Z OIL SUPPLY PLATE SX1		

\* 分類の"C"は制御部品、無印は機械部品の扱いです。

\* "C" in the "Classification" indicates that the part is classified into control part, while no mark indicates machine part.

## 23. 搬送固定具 FIXING PARTS



23. 搬送固定具  
FIXING PARTS

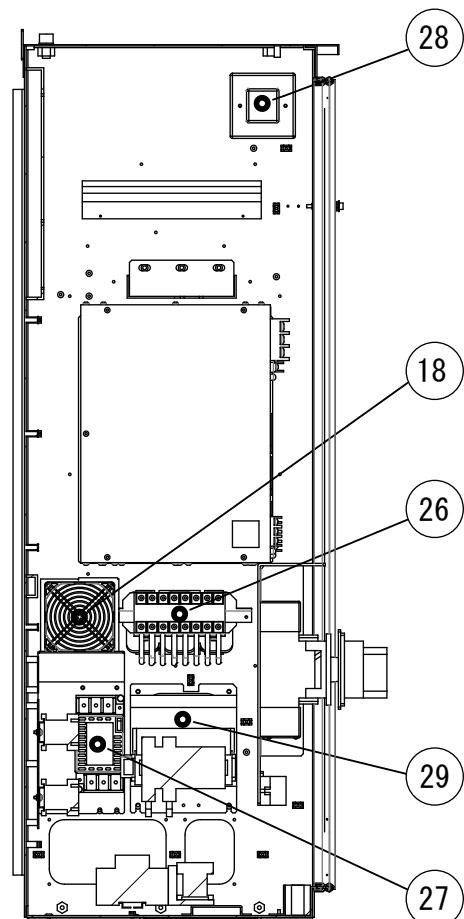
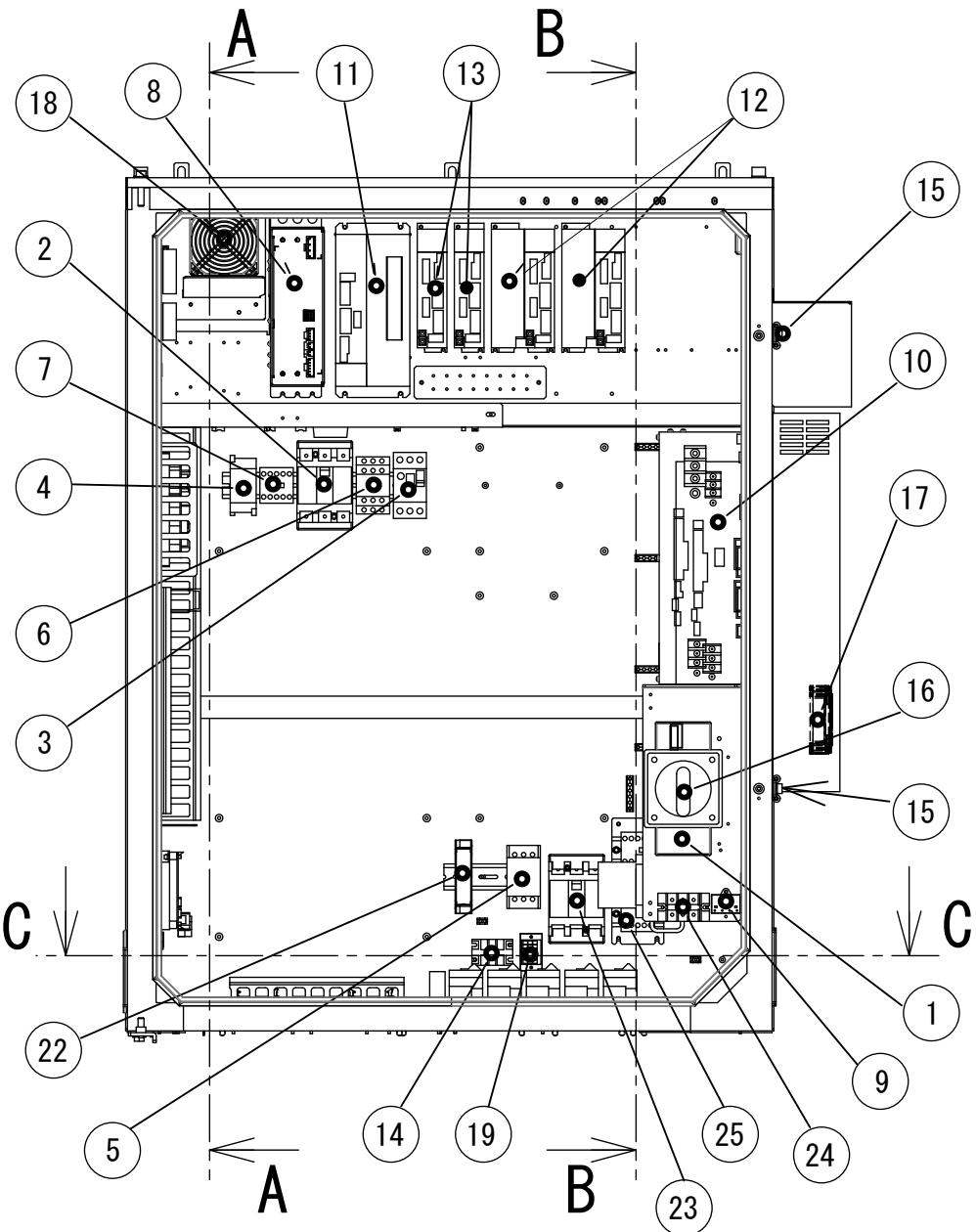
WXd1

参照No. Ref. No.	部品コード Part Code	個数 Q'ty	品名 Part Name	備考 Remark	分類 Classification
1	6D0050001	2	Fドアコティカナグ SK3	F DOOR FIXING FITTINGS SK3	
2	6D0067001	1	ハンソウコティイグY SK3	FIXING PARTS Y SK3	
3	6D0066001	1	ハンソウコティイグ2 Z SK3	FIXING PARTS2 Z SK3	
4	6D0062001	1	ハンソウコティイグ1 Z SK3	FIXING PARTS1 Z SK3	
	6D0063001	1	ハンソウコティイ1Z150SK3	FIXING PARTS Z150 SK3	High Column 150
	6D0064001	1	ハンソウコティイ1Z250SK3	FIXING PARTS Z250 SK3	High Column 250
	6D0065001	1	ハンソウコティイ1Z350SK3	FIXING PARTS Z350 SK3	High Column 350

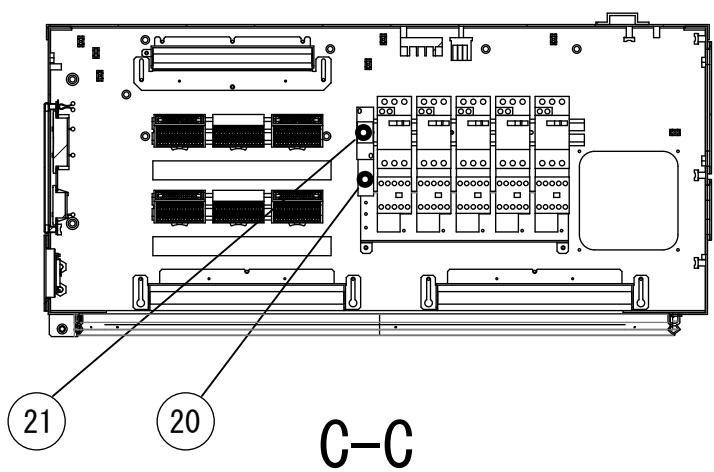
\* 分類の"C"は制御部品、無印は機械部品の扱いです。

\* "C" in the "Classification" indicates that the part is classified into control part, while no mark indicates machine part.

100. 制御箱 (1/2)  
CONTROL BOX (1/2)



B-B



C-C

参照No. Ref. No.	部品コード Part Code	個数 Q'ty	品名 Part Name	ハーツシンボル Part Symbol	備考 Remark	分類 *1 Classification
1	6A8847001	1	ブレーカEW32EAG30B4	BREAKER EW32EAG-3P030B 4B	QA1 EU (10kH) EU (10k/16k) Power extension(OPTION) EXCEPT EU *2 Power extension(OPTION) EU *2	C
	6A9320001	1	ブレーカEW32EAG030B	BREAKER EW32EAG-3P030B		C
	6A9319001	1	ブレーカEW32EAM024B	BREAKER EW32EAM-3P024B		C
	6A9321001	1	ブレーカEW50EAG50B4	BREAKER EW50EAG-3P050B 4B		C
	6C4580001	1	ブレーカEW50EAG050B	BREAKER EW50EAG-3P050B		C
	6B6813001	1	カバー-BW9BTAA-L3	COVER BW9BTAA-L3-00635		C
2	6D0710001	1	ブレーカBW32AAG005	BREAKER BW32AAG-3P005	FC1	C
	6A9326001	1	カバー-BW9BTAA-S3W	COVER BW9BTAA-S3W		for FC1
3	6B1551001	1	モータブレーカGV2-ME04	BREAKER GV2-ME04	FC2	C
4	6B9907001	1	ブレーカCP30FM2P0P5	BREAKER CP30FM-2P0P5	FC3	EXCEPT EU and U.S.A.(OPTION)
5	618630001	1	リレーLC1 32A 24V	RELAY LC1 32A 24V	KFS1A	C
	6D0468001	1	ヘッドオンクミD00	HEAD ON ASSY D00		AUTO DOOR(OPTION)
6	6B6803001	1	リレーLC1D09BD	RELAY LC1D09BD	KFC1	C
7	6B7484001	1	リレーSK09L-E01	RELAY SK09L-E01	KFF1	C
8	6D0712001	1	パワーユニットPS5161	POWER UNIT PS5161	TA1	C
9	6D0936001	1	SPD クミD00	SPD ASSY D00	FA1	C
10	6D0677001	1	アンプRT3X30	AMPLIFIER RT3X30	TBS 10kH 10k/16k	C
	6D0719001	1	アンプRT3X15	AMPLIFIER RT3X15		C
11	6D0720001	1	アンプRT3W10	AMPLIFIER RT3W10	TBZ	C
	649681001	1	ホキュウFAN RT3W10	FAN RT3W10 AMPLIFIER SUPPLY		AMP FAN
12	6D0721001	2	アンプRT3W05	AMPLIFIER RT3W05	TBX,TBY	C
	649680001	1	ホキュウFAN RT3W05	FAN RT3W05 AMPLIFIER SUPPLY		AMP FAN
13	6D0722001	2	アンプRT3W02	AMPLIFIER RT3W02	TBM TBP4(OPT ION)	C
	649678001	1	ホキュウFAN RT3W02	FAN RT3W02 AMPLIFIER SUPPLY		AMP FAN
14	6D0970001	1	タンシダイ600V30A 3P	TERMINAL 600V30A 3P	XDT1	C
15	6B6131001	2	クリップA20340A0000	CLIP A20340A0000		C
16	6A6382001	1	ハンドル BZ6V10C	HANDLE BZ6V10C		C
	626986000	1	ナンキンジョウ1000-30	PADLOCK 1000-30		C
17	649698001	1	FANクミP D00ホキュウ	FAN ASSY POTTING D00 SUPPLY	ECB2	C
	6B6375001	1	ファンガード92-SQ	FAN GUARD 92-SQ		
18	649700001	2	FANクミC D00ホキュウ	FAN ASSY COATING D00 SUPPLY	ECB1,3	C
	6B6375001	2	ファンガード92-SQ	FAN GUARD 92-SQ		
19	6D0971001	1	コネクタP18BF36TK	CONNECTOR P18B-F36TK-GFAR	CLM	C
20	655734001	1	SアブソーバCR50500	SURGE ABSORBER CR50500	FA2	OIL SUPPLY(OPTION)
21	6C6263001	1	リレーHH52PJFDC24	RELAY HH52P-JF DC24	KFL1	OIL SUPPLY(OPTION)
22	649709001	1	FEユニットPROFINETホキュウ	FE UNIT OF PROFINET SUPPLY	TFFE	PROFINET(OPTION)
	649710001	1	FEユニットETHERNETホキュウ	FE UNIT OF ETHERNET SUPPLY		EHTERNET IP(OPTION)
23	6C4581001	1	ブレーカBW32AAG30	BREAKER BW32AAG-3P030	QA3	Power extension(OPTION) *2
	6A9326001	1	カバー-BW9BTAA-S3W	COVER BW9BTAA-S3W		for QA3 Power extension(OPTION) *2
24	6C4355001	1	タンシダイ600V50A 3P	TERMINAL 600V50A 3P	XDT4	Power extension(OPTION) *2
25	6D0885001	1	KFG3ABリレークミD00	RELAY KFG3AB ASSY D00	KFG3A/B	CTS(OPTION)
26	6B6174201	1	ACL 300A	ACL 300A	RA1	10kH
	6B6341201	1	ACL 150A	ACL 150A		10k/16k
27	649711001	1	ホキュウNF3060CYXWA	FILTER NF3060C-YXWA SUPPLY	RA2	EU
28	6B6817001	1	コンセント2833 Oタイプ	OUTLET 2833 TYPE-O	XDS1	EXCEPT EU and U.S.A.(OPTION)
	6C4737001	1	100VコンセントLUBアリ	OUTLET 100V ASSY WITH LUB		EXCEPT EU and U.S.A.(OPTION)
29	6B9347001	1	トランス 0.6K200VJ	TRANSFORMER 0.6K 200V J	T2	EXCEPT EU OIL SUPPLY(OPTION) /100V OUTLET(OPTION)
	6A6368001	1	トランス2 432VA EU	TRANSFORMER2 432VA EU		EU OIL SUPPLY(OPTION)

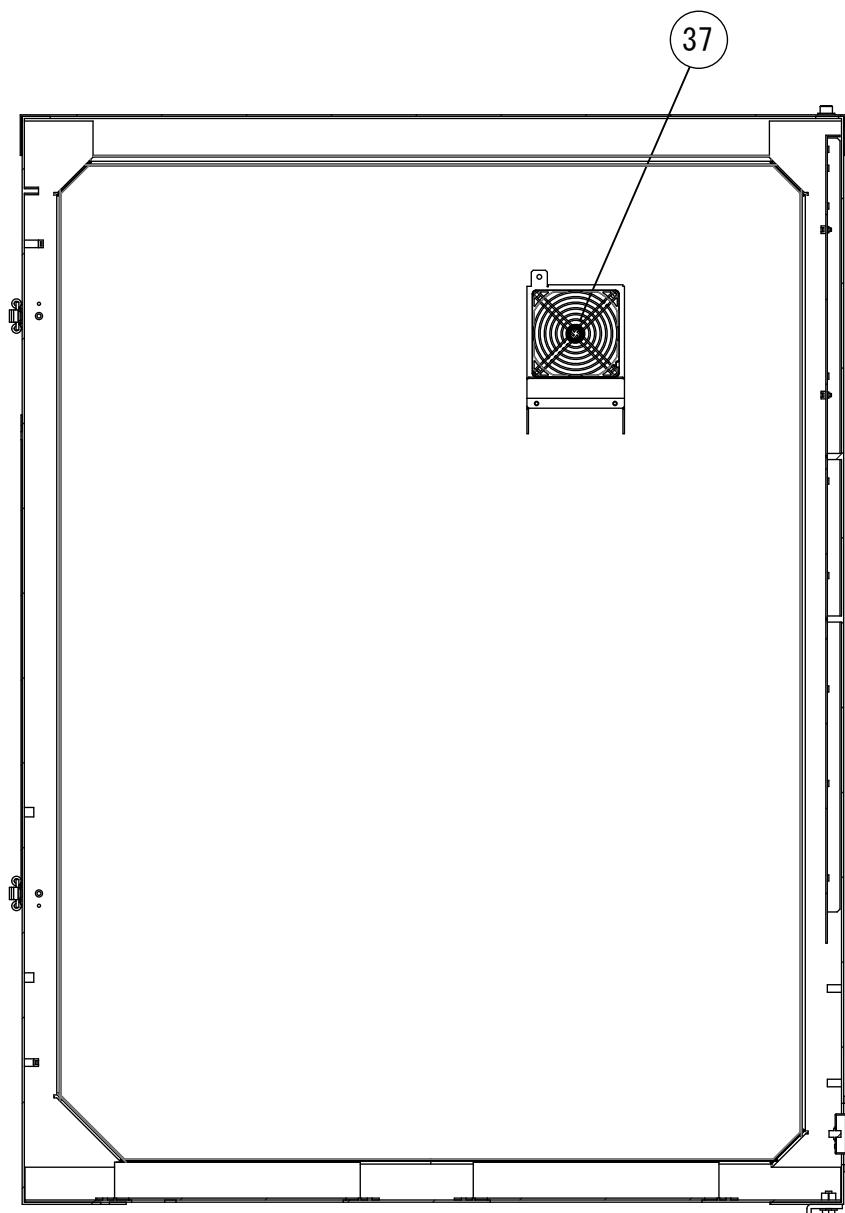
\*1 分類の"C"は制御部品、無印は機械部品の扱いです。

\*1 "C" in the "Classification" indicates that the part is classified into control part, while no mark indicates machine part.

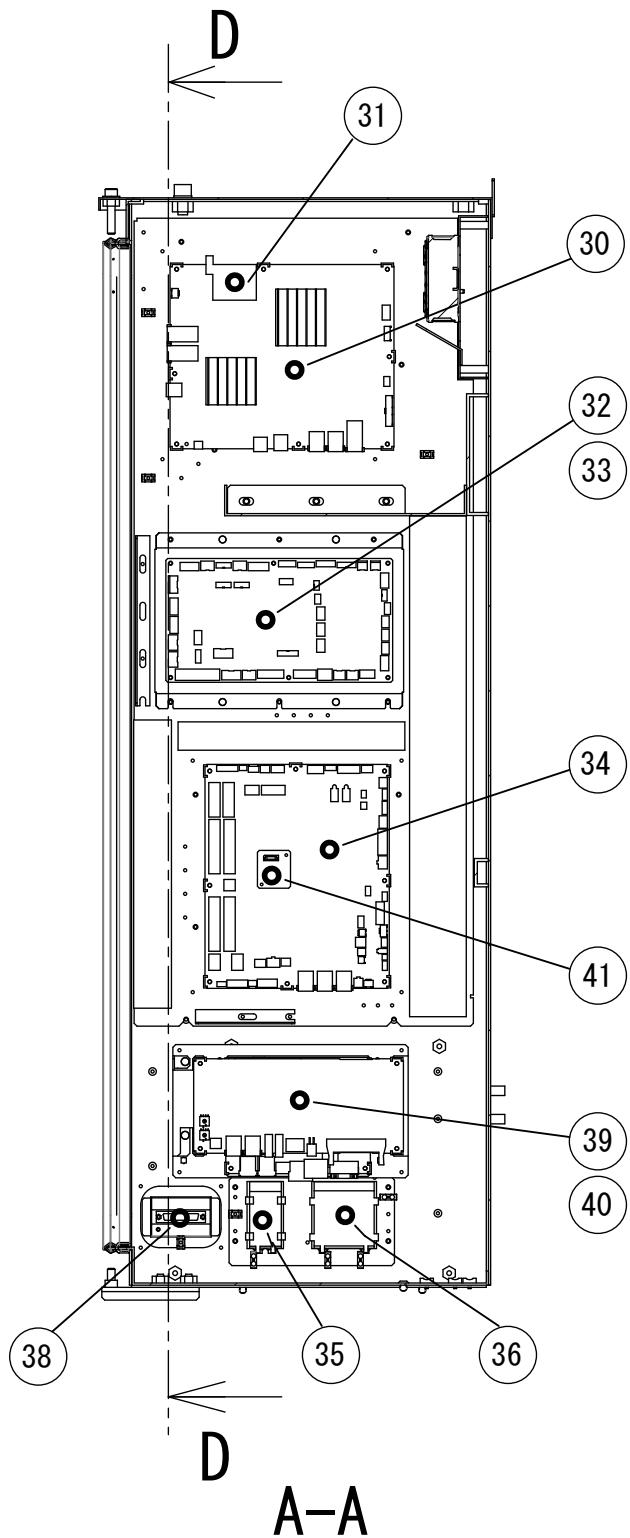
\*2 電源拡張(出荷時)オプションを選択していない場合は取付け禁止

\*2 This attachment is prohibited when the Power extension (factory-default) option is not selected.

# 100. 制御箱 (2/2) CONTROL BOX (2/2)



D-D



参照No. Ref. No.	部品コード Part Code	個数 Q'ty	品名 Part Name	バーツシンボル Part Symbol	備考 Remark	分類 Classification
30	649688001	1	NCキバンD00ホキュウ	NC PCB D00 SUPPLY	APNC	C
31	6D0723001	1	CFAST D00クミX	CFAST D00 ASSY X	CF1	For software version DX
	6D0697001	1	CFAST D00クミA	CFAST D00 ASSY A		For software version DA
32	649691101	1	SRキバンD00ホキュウ	SR PCB D00 SUPPLY	APSR	*2
33	649690001	1	ILユニットNQD00ホキュウ	IL UNIT NQ D00 SUPPLY	AIL	*2
34	649689001	1	IOキバンD00ホキュウ	IO PCB D00 SUPPLY	APIO	C
35	6D0864001	1	デンチホルダ2PクミD00	BATTERY HOLDER 2P ASSY D00	GB1	C
36	6C4564001	1	デンチホルダ4PクミCS2	BATTERY HOLDER 4P ASSY CS2	GB3	C
37	649700001	1	FANクミC D00ホキュウ	FAN ASSY COATING D00 SUPPLY	ECB4	C
	6B6375001	1	ファンガード92-SQ	FAN GUARD 92-SQ		
38	6D0545001	1	RS OPユニットD00	CONNECTOR RS OPTION ASSY D00	XRS	RS-232C(OPTION)
39	649697001	1	EXIOキバンD00ホキュウ	EXIO PCB D00 SUPPLY	APEX2	EXIO(OPTION)*3
40		1				C
	649657001	1	FC-CキバンC00ホキュウ	FC-C PCB C00 SUPPLY	APFC	CC-Link(OPTION)*3
	649658001	1	FC-DキバンC00ホキュウ	FC-D PCB C00 SUPPLY		DeviceNet(OPTION)*3
	649659001	1	FC-PキバンC00ホキュウ	FC-P PCB C00 SUPPLY		PROFIBUS DP(OPTION)*3
	649685001	1	CMPCBユニットC00ホキュ	CM PCB UNIT C00 SUPPLY	APCM	CC-Link(OPTION)*3
41	649660001	1	OPSELキバンC00ホキュウ	OPSEL PCB C00 SUPPLY	APOP	1POINT(OPTION)
	649660002	1				2POINT(OPTION)
	649660003	1				3POINT(OPTION)
	649660004	1				4POINT(OPTION)
	649660005	1				5POINT(OPTION)
	649660006	1				6POINT(OPTION)
	649660007	1				7POINT(OPTION)
	649660008	1				8POINT(OPTION)
	649660009	1				9POINT(OPTION)
	649660010	1				10POINT(OPTION)
	649660011	1				11POINT(OPTION)

\*1 分類の“C”は制御部品、無印は機械部品の扱いです。

\*1 “C” in the “Classification” indicates that the part is classified into control part, while no mark indicates machine part.

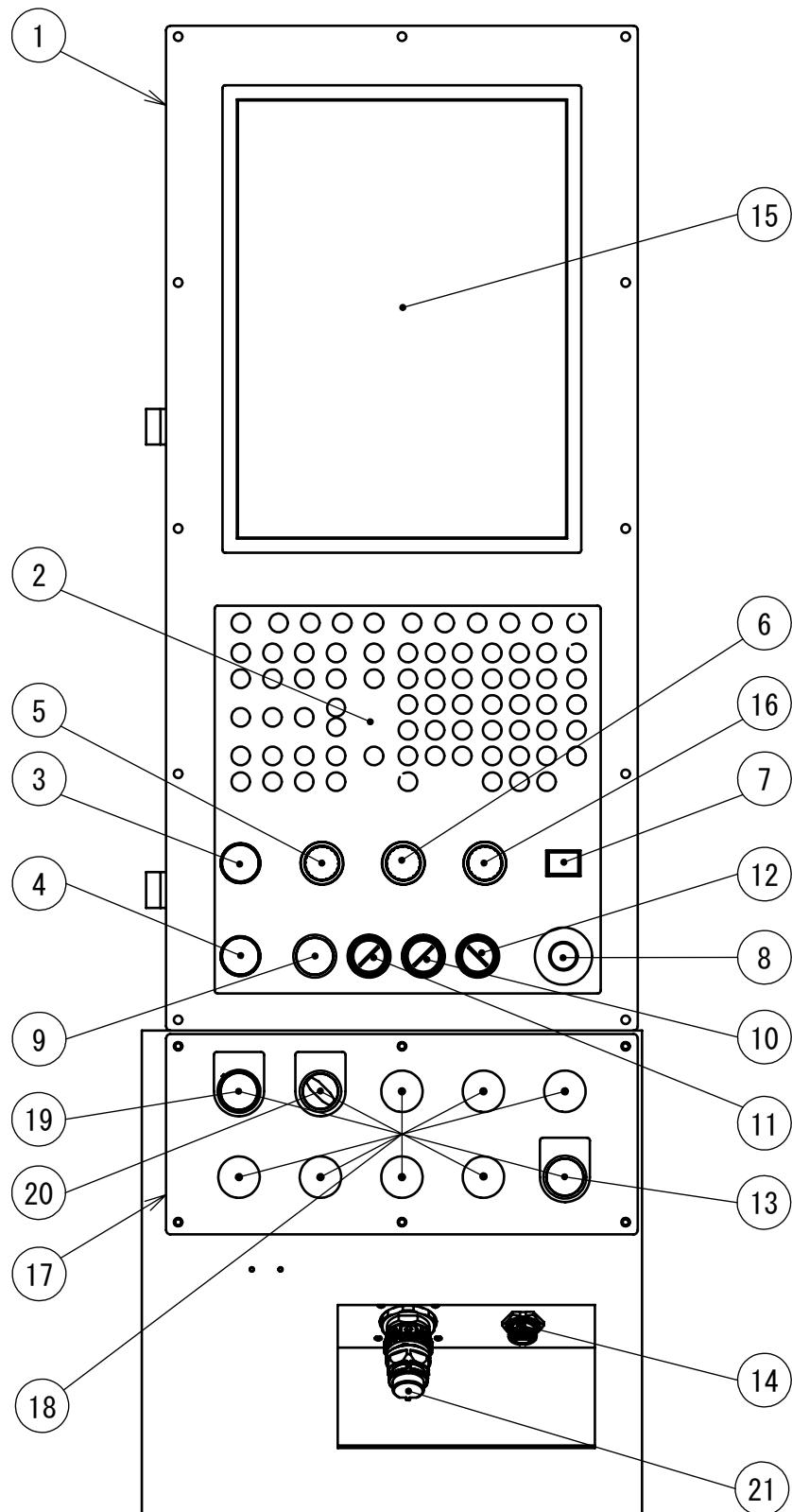
\*2 制御箱内の配置は③が前面、④が背面です。

\*2 The layout inside the control box is ③ on the front and ④ on the back.

\*3 制御箱内の配置は⑤が前面、⑥が背面です。

\*3 The layout inside the control box is ⑤ on the front and ⑥ on the back.

# 101. 操作箱 (1/2) OPERATION BOX (1/2)



参照No. Ref. No.	部品コード Part Code	個数 Q'ty	品名 Part Name	パーツシンボル Parts Symbol	備考 Remark	分類 Classification
1	649701001	1	ソウサソウチD00ホキュウ J	OPERATION BOX D00 SUPPLY J		Japanese C
	649702001	1	ソウサソウチD00ホキュウ E	OPERATION BOX D00 SUPPLY E		English C
	649703001	1	ソウサソウチD00ホキュウ C	OPERATION BOX D00 SUPPLY C		Chinese C
2	6D0825001	1	キーシートクミD00 J	KEY-SHEET ASSY D00 J		Japanese C
	6D0824001	1	キーシートクミD00 E	KEY-SHEET ASSY D00 E		English C
	6D0572001	1	キーシートクミD00 C	KEY-SHEET ASSY D00 C		Chinese C
3	6D0727001	1	SW AR22F0L10B3G	SWITCH AR22F0L-10B3GZ9(CCC)	SFST	C
4	6D0728001	1	SW AR22F0L10B3R	SWITCH AR22F0L-10B3RZ9(CCC)	SFFH	C
5	6D0841001	1	スイッチSFROクミD00	SWITCH SFRO ASSY D00	SFRO	C
	6B6205001	1	ツマミ BC60	NIPPLE BC60		C
6	6D0842001	1	スイッチSFFOクミD00	SWITCH SFFO ASSY D00	SFFO	C
	6B6205001	1	ツマミ BC60	NIPPLE BC60		C
7	6D0813001	1	スイッチSFPWクミD00	SWITCH SFPW ASSY D00	SFPW	C
8	6D0730001	1	SW AR22V0R-02R	SWITCH AR22V0R-02RZ098(CCC)	SFEM	C
9	6D0733001	1	SW AR22F0R-20B	SWITCH AR22F0R-20B(CCC)	SFENP	C
10	6D0731001	1	SW AR22JR-2D11B	SWITCH AR22JR-2D11B(CCC)	SFDM1	C
	616341001	1	キーAR9C022-B	KEY AR9C022-B		
11	6D0732001	1	SW AR22JR-2D11C	SWITCH AR22JR-2D11C(CCC)	SFDM2	C
	649704001	1	キーAR9C022-C	KEY AR9C022-C		
12	6B6726001	1	プラグAHX725-B	PLUG AHX725-B		
	640915001	1	リングAHX750	RING AHX750		
	6D0670001	1	データホゴSWクミD00	DATA PROTECT SW ASSY D00	SFDP	SWITCH & CABLE & KEY OPTION
	6B6839001	1	SW AR22JR2D01AC	SWITCH AR22JR-2D01A(CCC)		SWITCH & KEY OPTION
	616340001	1	キーAR9C022-A	KEY AR9C022-A		KEY OPTION
13	6D0952001	1	ウンテンジュンビSWクミD00	SWITCH MASTER ON ASSY D00	SFMO	SWITCH & CABLE OPTION
	6D0953001	1	SW AR22F0L20E3G	SWITCH AR22F0L-20E3GZ434 (CCC)		SWITCH OPTION
14	6B9806101	1	USBコネクタ AM AB	USB CONNECTOR AM AB	XUSB	C
	6B9807001	1	USBキャップ AM	USB CAP AM		C
15	649694001	1	LCDTPD00ホキュウ	LCD TOUCH PANEL ASSY D00 SUPPLY	APTC,PH1	C
16	6D0452001	1	プラグTM-96-13	PLUG TM-96-13		*2
	6D0449001	1	スイッチSFSOクミD00	SWITCH SFSO ASSY D00	SFSO	OPTION C
17	6D0847001	1	OPSWパネル10HクミD00	SWITCH PANEL 10 HOLE ASSY D00		PLATE+PLUG OPTION
	6D0968001	1	SWパネル8ケツクミD00	SWITCH PANEL 8 HOLE ASSY D00		PLATE+PLUG OPTION
18	6B6726001	10	プラグAHX725-B	PLUG AHX725-B		OPTION*2
	640915001	10	リングAHX750	RING AHX750		OPTION
19	643636001	1	スイッチオートドアクミ	SWITCH AUTODOOR ASSY		OPTION C
20	643738001	1	スイッチモードセレクトクミ	SWITCH MODE SELECT ASSY		OPTION C
21	20機内灯、表示灯、手動パルス発生器を参照してください Refer to 20.MACHINE LIGHT,INDICATION LAMP, MANUAL PULSE GENERATION (OPTION)					C

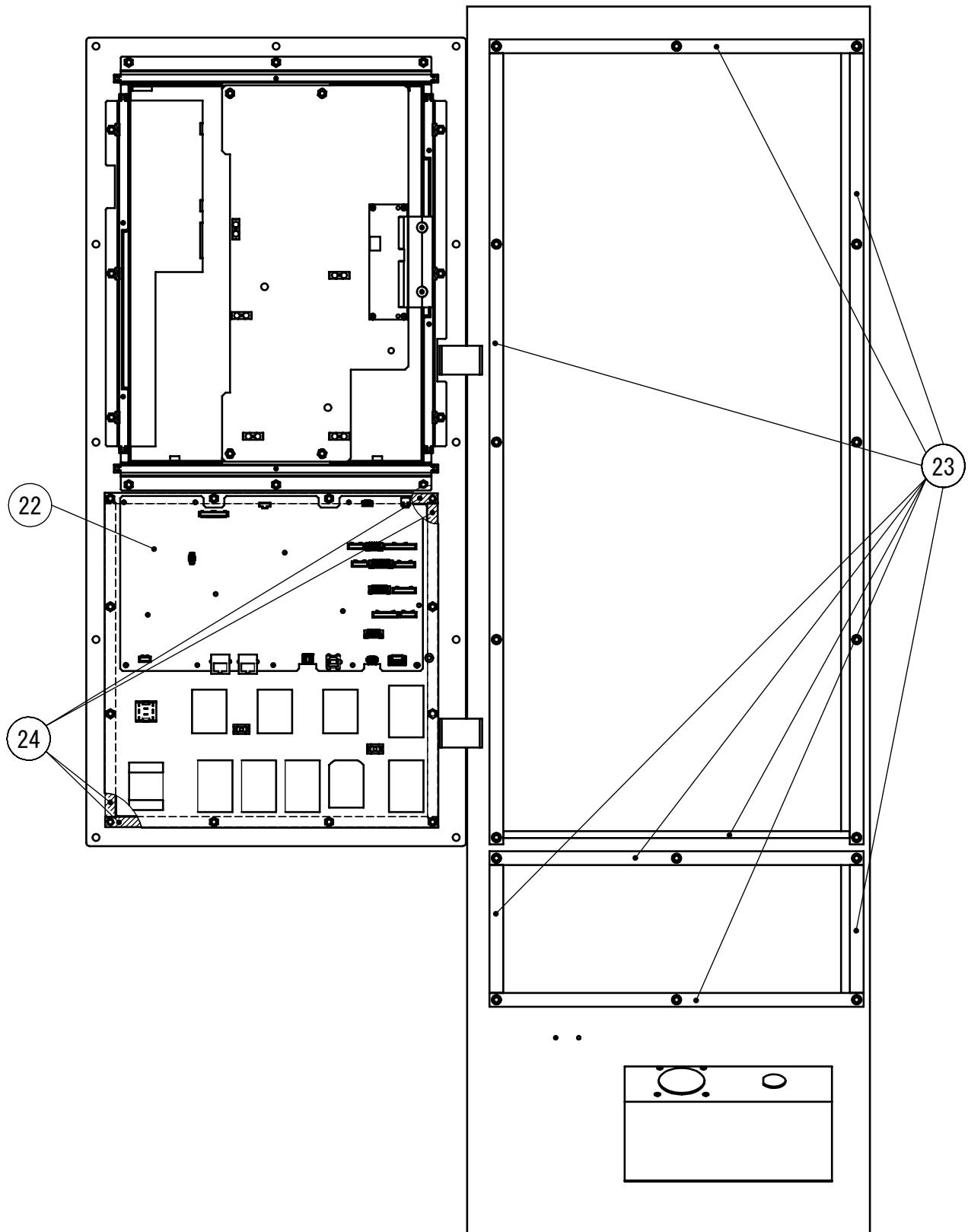
\*1 分類の"C"は制御部品、無印は機械部品の扱いです。

\*1 "C" in the "Classification" indicates that the part is classified into control part, while no mark indicates machine part.

\*2 スイッチオプションが付いていない時

\*2 When there is no switch option

101. 操作箱 (2/2)  
OPERATION BOX (2/2)



101. 操作箱 2/2  
OPERATION BOX 2/2

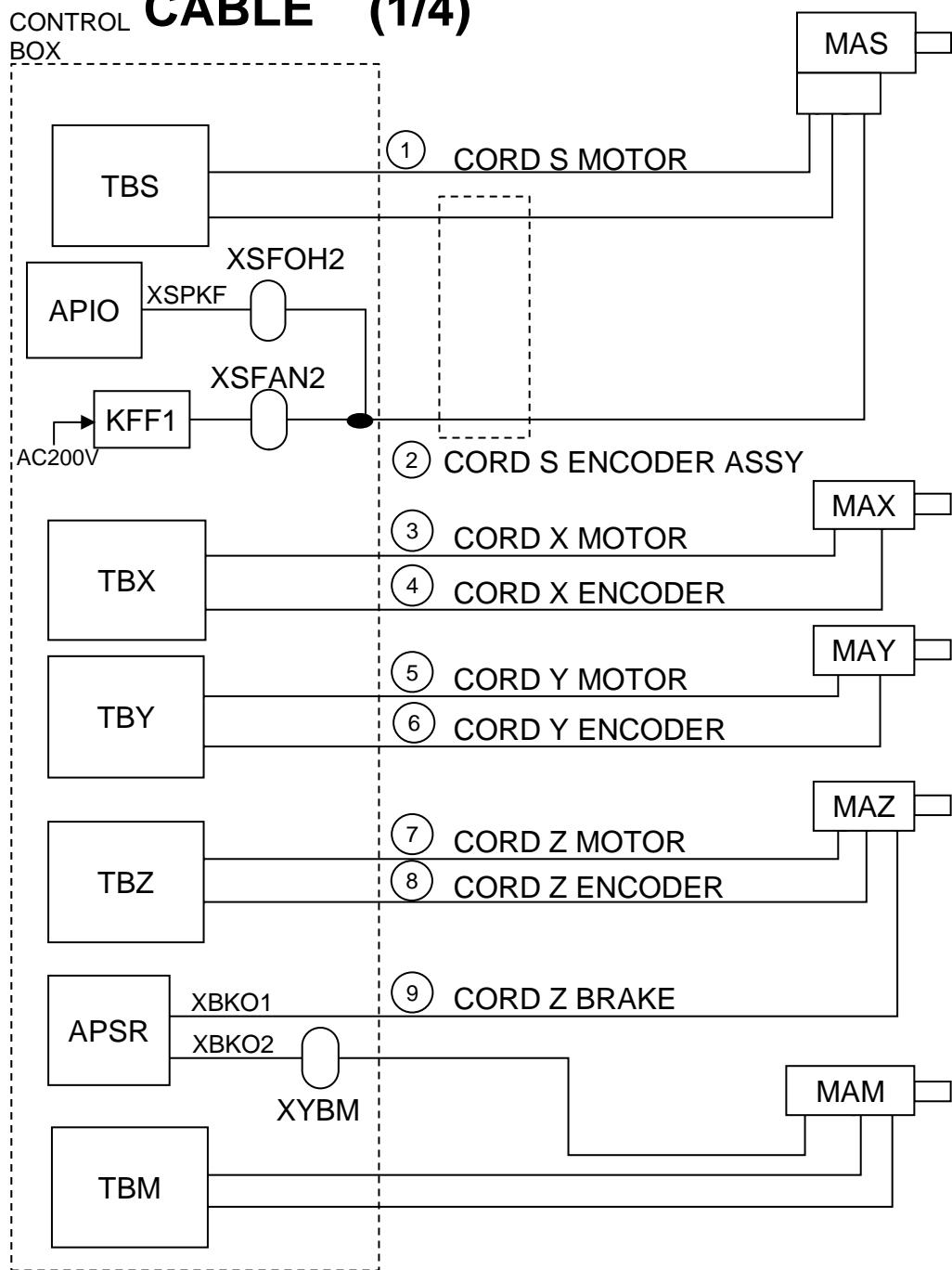
WXd1

参照No. Ref. No.	部品コード Part Code	個数 Q'ty	品名 Part Name	パーツシンボル Parts Symbol	備考 Remark	分類 Classification
22	649692001	1	KEYキバンD00ホキュウ KEY PCB D00 SUPPLY	APKY		C
23	649708001	1	ソウサバネルパッキンホキュウ PACKING OPERATION PANEL SUPPLY			
24	649707001	1	キーシートパッキンホキュウ PACKING KEY-SHEET SUPPLY			

\*1 分類の"C"は制御部品、無印は機械部品の扱いです。

\*1 "C" in the "Classification" indicates that the part is classified into control part, while no mark indicates machine part.

# 102. ケーブル (1/4) CABLE (1/4)

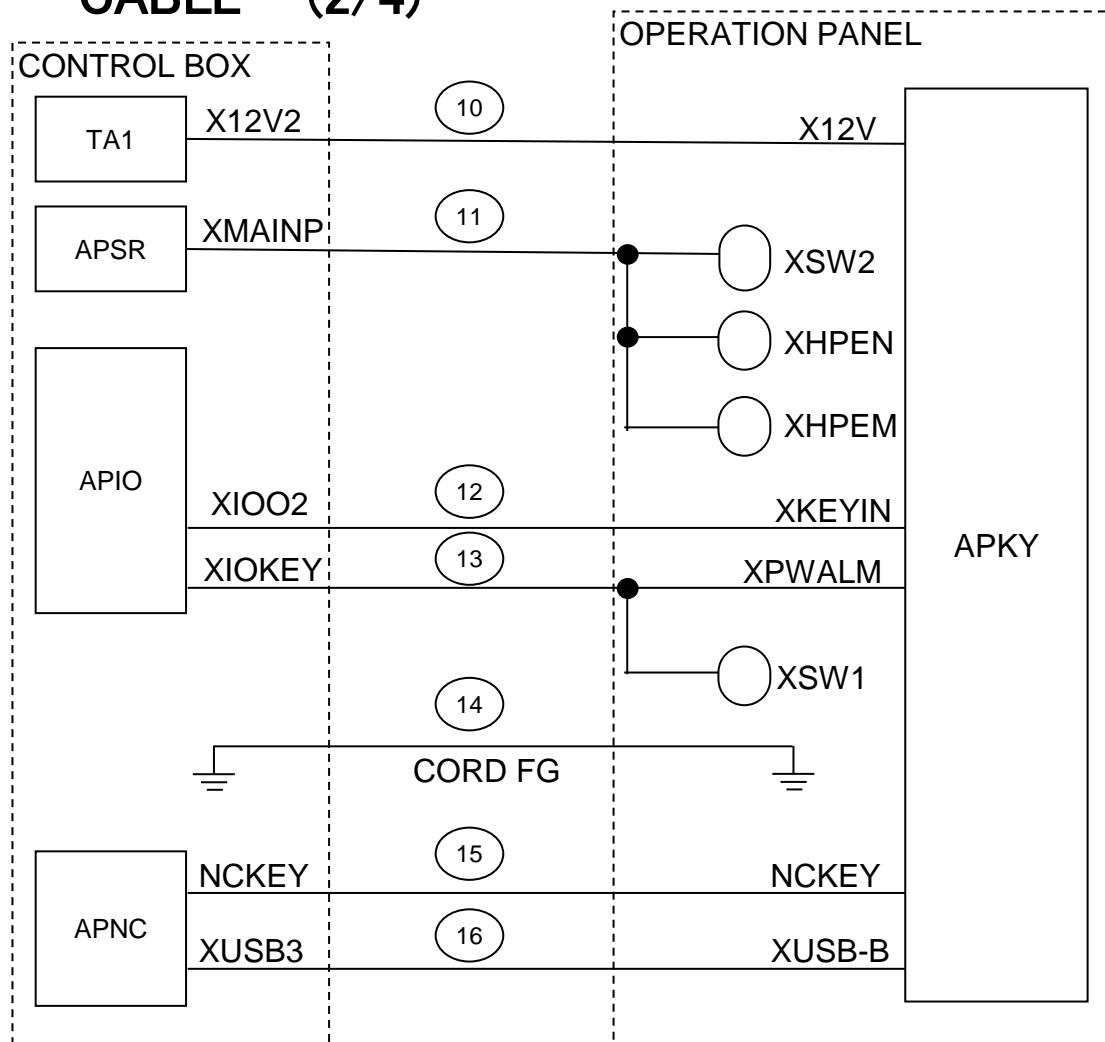


参照No. Ref. No.	部品コード Part Code	個数 Q'ty	品名 Part Name	備考 Remark	分類 Classification
1	6C6457001	1	Sモータコードホキュウクミ S MOTOR CORD DSL3 150 SUPPLY	10K/16K	C
	6C6459001	1	Sモータコードホキュウクミ S MOTOR CORD DSL3 300 SUPPLY	10KH	C
2	6C6458001	1	SENCコードホキュウクミ S ENCODER CORD DSL3 SUPPLY		C
3	6D0549001	1	XモータコードDSL3 CORD X MOTOR DSL3		C
4	6D0764001	1	XENCコードDSL3 CORD X ENCODER DSL3		C
5	6D0550001	1	YモータコードDSL3 CORD Y MOTOR DSL3		C
6	6D0765001	1	YENCコードDSL3 CORD Y ENCODER DSL3		C
7	6D0551001	1	ZモータコードDSL3 CORD Z MOTOR DSL3		C
8	6D0766001	1	ZENCコードDSL3 CORD Z ENCODER DSL3		C
9	6D0767001	1	ZブレーキコードDSL3 CORD Z BRAKE DSL3		C

\* 分類の"C"は制御部品、無印は機械部品の扱いです。

\* "C" in the "Classification" indicates that the part is classified into control part, while no mark indicates machine part.

## 102. ケーブル (2/4) CABLE (2/4)



102. ケーブル 2/4  
CABLE 2/4

WXd1

参照No. Ref. No.	部品コード Part Code	個数 Q'ty	品名 Part Name		備考 Remark	分類 Classification
10	6D0807001	1	12V2コードD0S	CORD 12V2 D0S		C
11	6D0808001	1	MAINPコードD0S	CORD MAINP D0S		C
12	6D0708001	1	ECATコード4370クミD0	CORD ECAT 4370 ASSY D0S		C
13	6D0809001	1	IO KEYコードD0S	CORD IO KEY D0S		C
14	6D0967001	1	FGコードD0S	CORD FG D0S		C
15	6D0810001	1	NC KEYコードD0S	CORD NC KEY D0S		C
16	6A7526001	1	USBコードS2C	CORD USB S2C		C

\* 分類の"C"は制御部品、無印は機械部品の扱いです。

\* "C" in the "Classification" indicates that the part is classified into control part, while no mark indicates machine part.

## 102. ケーブル (3/4)

### CABLE (3/4)

※パーツシンボルは100制御箱を参照してください。  
※Please refer "100 Control Box" for any parts symbol.

部品コード Part Code	個数 Q'ty	品名 Part Name	接続先1 Connection 1		接続先2 Connection 2		備考 Remark	分類 Classification
			パーツシンボル parts symbol	コネクタ connector	パーツシンボル parts symbol	コネクタ connector		
6D0774001	1	FC1 TA1コードD00	CORD FC1 TA1 D00	FC1	-	TA1	XACIN	C
6D0775001	1	AVRコードD00	CORD AVR D00	TA1	X24OUT	APIO	XAVR	C
6D0776001	1	PWコードD00	CORD PW D00	TA1	X12V1	APNC	XPW	C
6D0777001	1	ACCHコードD00	CORD ACCH D00	TA1	XACPWM	APIO	XACCH	C
6D0920001	1	ECS1コードD00	CORD ECS1 D00	KFF1	-	ECS1	XSFAN2	C
6D0778001	1	FANコードD00	CORD FAN D00	APIO	XFAN	ECS1 ECS2 ECS3 ECS4	XFAN1 XFAN2 XFAN3 XFAN4	C
6D0779001	1	ショートコードPEN D00	CORD SHORT PEN D00	APSR	XPEN	-	-	C
6D0780001	1	IOSRコードD00	CORD IOSR D00	APSR	XIOSR	APIO	XIOSR	C
6D0781001	1	CPROコードD00	CORD CPRO D00	APIO	XCPRO	T1 KFP1/FCP1 KFP2/FCP2	XTOH KP1 KP2	C
6B7355001	1	ショートコードTOH COM	CORD SHORT TOH COM	T1	XTOH	-	-	C
6D0704001	1	ECATコードNCO2クミD0	CORD ECAT NCO2 ASSY D0S	APNC	XNCO2	APIO	XIOIN	C
6D0705001	1	ECATコードNCO1クミD0	CORD ECAT NCO1 ASSY D0S	APNC	XNCO1	TBZ	X0	C
6D0706001	1	ECATコードIO01クミD0	CORD ECAT IO01 ASSY D0S	APIO	XIOO1	TBM	X0	C
6D0469001	1	TBS X15コードD00	CORD TBS X15 D00	KFC1	-	TBS	X15	C
6D0782001	1	BKIN1コードD0S	CORD BKIN1 D0S	TBZ	X5	APSR	XBKIN1	C
6D0783001	1	STO1コード D0S	CORD STO1 D0S	APSR	XSTO1	TBZ	X3	C
6D0784001	1	STO2コード D0S	CORD STO2 D0S	APSR	XSTO2	TBM	X3,X4	C
6D0785001	1	STO3コード D00	CORD STO3 D00	APSR	XSTO3	TBS	X3,X4	C
6D0786001	1	STO180+X4コードD00	CORD STO 180 + X4 D00	TBY	X4	TBX	X3,X4	C
6D0787001	1	FC2 FC1コードD00	CORD FC2 FC1 D00	FC2	-	FC1	-	C
6D0617001	1	FC2 KFF1コードD00	CORD FC2 KFF1 D00	FC2	-	KFF1	-	C
6D0788001	1	FC1 KFC1コードD00	CORD FC1 KFC1 D00	FC1	-	KFC1	-	C
6B7374001	1	AWG8アースコード200	CORD AWG8 EARTH 200 COM	TBS	-	BREAKER PLATE	-	C
6D0966001	1	XDT1 FC2コードD00	CORD XDT1 FC2 D00	XDT1	-	FC2	-	C
6D0923001	1	XDT1 CLMコードD00	CORD XDT1 CLM D00	XDT1	-	CLM	-	C
6D0789001	1	KFS1コードD00	CORD KFS1 D00	APIO	XKFS1	KFS1A	-	C
6D0790001	1	KFC1コードD00	CORD KFC1 D00	APIO	XKFC1	KFC1	-	C
6D0791001	1	SPKFコードD00	CORD SPKF D00	APIO	XSPKF	ECS1 KFF1 KFF1	XSFOH2 A1+ A2-	C
6D0919001	1	AWG8アースコード130	CORD AWG8 EARTH 130	RA1	-	BREAKER PLATE	-	C
6D0922001	1	KFC1 DJDSコードD00	CORD KFC1 DJDS D00	KFC1	-	-	XDJDS	C
6D0792001	1	ショートコードRST D00	CORD SHORT RST D00	APSR	XRST	-	-	C
6D0925001	1	KFS1 XDT1コードD00	CORD KFS1 XDT1 D00	KFS1A	-	XDT1	-	C
6D0890001	1	NCRDコードD00	CORD NC RD D00	APNC GB3	XNCRD XGJGB3	APRD	XRDNC	C

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\* "C" in the "Classification" indicates that the part is classified into control part, while no mark indicates machine part.

部品コード Part Code	個数 Q'ty	品名 Part Name	接続先1 Connection 1		接続先2 Connection 2		備考 Remark	分類*1 Classification
			パーツシンボル parts symbol	コネクタ connector	パーツシンボル parts symbol	コネクタ connector		
6D0794001	1	ショートコードDR3 D0S	CORD SHORT DR3 D0S	APSR	XDR3	-	-	C
6D0795001	1	ショートコードDR4 D0S	CORD SHORT DR4 D0S	APSR	XDR4	-	-	C
6D0796001	1	ショートコードDRMG D0S	CORD SHORT DRMG D0S	APSR	XDRMG	-	-	C
6D0797001	1	ショートコードMGP D0S	CORD SHORT MGP D0S	APSR	XMPG	-	-	C
6D0798001	1	ショートコードQTP D0S	CORD SHORT QTP D0S	APSR	XQTP	-	-	C
6B7409001	1	ECATコード200COM	CORD ECAT 200 COM	TBX	X0	TBY	X1	C
6D0477001	1	ECATコード810クミD0S	CORD ECAT 810 ASSY D0S	TBX	X1	TBS	X0	C
6D0709001	1	ECATコード610クミD0S	CORD ECAT 610 ASSY D0S	TBZ	X1	TBY	X0	C
6D0799001	1	X12コードD0S	CORD X12 D0S	TBS	X12	TBX/TBY/TBM	X/Y/M	C
				TBS	X16	TBX	X	
					XDJ1	TBZ	Z	
6D0800001	1	STOコード630 D0S	CORD STO 630 D0S	TBZ	X4	TBY	X3	C
6D0801001	1	BKIN2コードD0S	CORD BKIN2 D0S	TBM	X5	APSR	XBKIN2	C
6D0802001	1	BKOUT2コードD0S	CORD BKOUT2 D0S	APSR	XBKO2	YBM	-	C
6D0470001	1	X14コードD0S	CORD X14 D0S	TBS	X14	TBZ	X11	C
6B7372001	1	AWG8アースコード190	CORD AWG8 EARTH 190 COM	CONTROL BOX	-	CONTROL DOOR	-	C
6C4226001	1	AWG14アースコード550	CORD AWG14 EARTH 550 CS2	TBZ	-	FG PLATE	-	C
6B7375001	3	AWG14アースコード220	CORD AWG14 EARTH 220 COM	TBX	-	FG PLATE	-	C
				TBY	-	FG PLATE	-	
				TBM	-	FG PLATE	-	
6D0924001	1	QA1 KFS1コードD00	CORD QA1 KFS1 D00	QA1	-	KFS1A	-	EXCEPT EU(10K/16K)
6D0987001	1	QA1KFS1コードD00 H	CORD QA1 KFS1 D00 H	QA1	-	KFS1A	-	EXCEPT EU(10KH)
6D0926001	1	RA2KFS1コードD00	CORD RA2 KFS1 D00	RA2	-	KFS1A	-	EU (10K/16K)
6D0997001	1	RA2KFS1コードD00H	CORD RA2 KFS1 D00 H	RA2	-	KFS1A	-	EU (10KH)
6C4248001	1	KFS1RA1コードCS2	CORD KFS1 RA1 CS2	KFS1	-	RA1	-	10K/16K
6C4244001	1	KFS1RA1コードCS2 H	CORD KFS1 RA1 CS2 H	KFS1	-	RA1	-	10KH
6B7390001	1	RA1 TBSコードCOM	CORD RA1 TBS COM	RA1	-	TBS	-	10K/16K
6B6505001	1	RA1TBSコードC0S H	CORD RA1 TBS C0S H	RA1	-	TBS	-	10KH
6D0928001	1	DJDS FC3コードD00	CORD DJDS FC3 D00	DJDS	-	FC3	-	EXCEPT EU
6C4235001	1	OUTLETコードCS2	CORD OUTLET CS2	FC3	-	XDS1	-	EXCEPT EU
6C4251001	1	QA1RA2コードCS2 EU	CORD QA1 RA2 CS2 EU	QA1	-	RA2	-	EU (10K/16K)
6C7392001	1	QA1RA2コードCRW2HE	CORD QA1 RA2 CRW2 H EU	QA1	-	RA2	-	EU (10KH)
6D0927001	1	LUBPWコードD00	CORD LUBPW D00	FC3	-	LUBPW	-	EXCEPT EU
6D0652001	1	QA1 XDT4コードD00	CORD QA1 XDT4 D00	QA1	-	XDT4	-	EXCEPT EU Power extension (OPTION)*2
6D0653001	1	XDT4 QA3コードD00	CORD XDT4 QA3 D00	XDT4	-	QA3	-	EXCEPT EU Power extension (OPTION)*2
6D0665001	1	RA2XDT4コードD00EU	CORD RA2 XDT4 D00 EU	RA2	-	XDT4	-	Power extension (OPTION)*2
6D0666001	1	RA2 QA3コードD00EU	CORD RA2 QA3 D00 EU	RA2	-	QA3	-	Power extension (OPTION)*2
6D0654001	1	QA3 KFS1コードD00	CORD QA3 KFS1 D00 L450	QA3	-	KFS1A	-	Power extension (OPTION)*2

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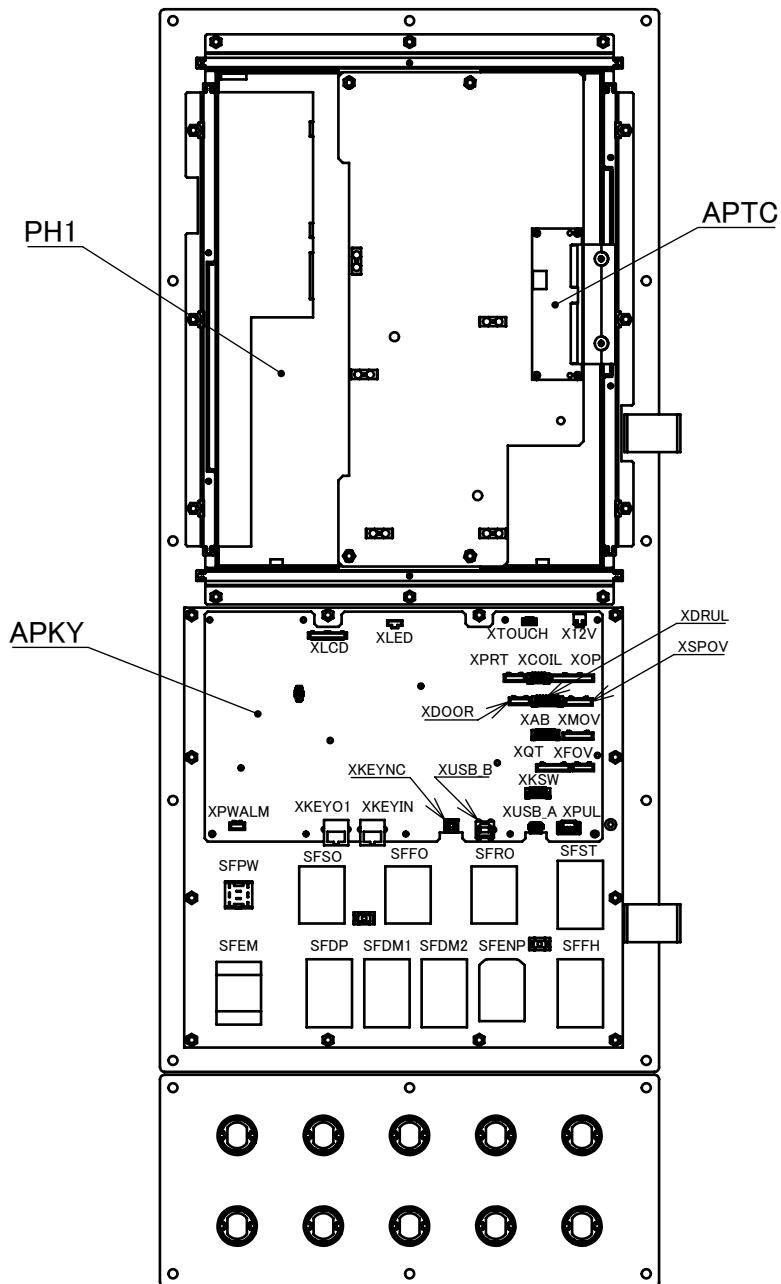
\*1 "C" in the "Classification" indicates that the part is classified into control part, while no mark indicates machine part.

\*2 電源拡張(出荷時)オプションを選択していない場合は取付け禁止

\*2 This attachment is prohibited when the Power extension (factory-default) option is not selected.

## 102. ケーブル (4/4)

## CABLE (4/4)



部品コード Part Code	個数 Q'ty	品名 Part Name	接続先1 Connection 1		接続先2 Connection 2		備考 Remark	分類 Classification
			パーツシンボル parts symbol	コネクタ connector	パーツシンボル parts symbol	コネクタ connector		
6D0814001	1	SW2コードD00	CORD OPERATION SW2 D00	-	XSW2	SFEM SFENP SFDM1 SFDM2	-	
6D0815001	1	KSWコードD00	CORD OPERATION KSW D00	APKY	XKSW	SFST SFFH	-	
6B7342001	1	SPOVショートコード	CORD OPERATION SPOV SHORT COM	APKY	XSPOV	-	-	
6D0625001	1	XPULコードD00	CORD OPERATION XPUL D00	APKY	XPUL	-	XPULSER	
6B7340001	1	ソウサソウチコードFG COM	CORD OPERATION BOX FG COM	-	OPERATION PANEL	-	Machine Cover	
6D0816001	1	ソウサPH1コードD00	CORD OPERATION PH1 D00	APKY	XLCD	PH1	CN1	
6D0817001	1	バックライトコードD00	CORD OPERATION BKLT D00	APKY	XLED	PH1	CN2	
6D0818001	1	タッチパネルコードD00	CORD OPERATION TOUCH D00	APKY	XTOUCH	APTC	JP1	
6D0447001	1	USBコード1000ケミD00	CORD USB 1000 ASSY D00	APKY	XUSB A	-	XUSB	

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