

Product manual FlexPLP IRPLP220

Product Manual
FlexPLP IRPLP220

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Overview

About this manual

This manual contains instructions and information for:

- the characteristics of the FlexPLP IRPLP220
- mechanical and electrical installation instructions for the FlexPLP IRPLP220
- maintenance instructions for the FlexPLP IRPLP220
- spare parts

Usage

This manual should be used when working during:

- installation, from lifting the FlexPLP IRPLP220 to its work site and securing it to the foundation, to making it ready for operation
- maintenance work
- repair work.

Who should read this manual?

This manual is intended for:

- installation personnel
- maintenance personnel
- repair personnel.

Prerequisites

A maintenance /repair/ installation craftsman working with an ABB FlexPLP IRPLP220 must:

- be trained by ABB and have the required knowledge of mechanical and electrical installation/repair/maintenance work.

Organization of chapters

The manual is organized in the following chapters:

Chapter	Content
Safety	Safety information that must be read through before performing any installation or service work on the FlexPLP IRPLP220. Contains general safety aspects as well as more specific information about how to avoid personal injuries and damage to the product.
Product description	Specifications and characteristics of the FlexPLP IRPLP220.
Unpacking and handling	Information relative to the steps following the reception of the FlexPLP IRPLP220, until its installation.
Installation and commissioning	Required information about lifting and installation of the FlexPLP IRPLP220 and installation of cabling.
Calibration	Information about calibration of the system.

Chapter	Content
Maintenance	Step-by-step procedures that describe how to perform maintenance of the FlexPLP IRPLP220. Based on a maintenance schedule that may be used in the work of planning periodical maintenance.
Decommissioning	Environmental information about the FlexPLP IRPLP220.
Reference information	Reference information may be useful for the understanding of this manual.
Spare parts	List of the spare parts available for the FlexPLP IRPLP220.

References

Reference (ABB manuals)	Document ID
Product manual - IRC5 Robot Controller	3HAC021313-001
Service Information System - IRC5	3HAC025709-001
Application manual - Additional axes and stand alone controller	3HAC021395-001
Operating manual - IRC5 with FlexPendant	3HAC16590
System Parameters	3HAC17076
Technical reference manual - RAPID Instructions, Functions, Data types	3HAC16581

Revisions

Revision	Description
–	First edition

Product documentation, IRC5

Categories for user documentation from ABB Robotics

The user documentation from ABB Robotics is divided into a number of categories.

This listing is based on the type of information in the documents, regardless of whether the products are standard or optional.

All documents listed can be ordered from ABB on a DVD. The documents listed are valid for IRC5 robot systems.

Product manuals

All hardware, manipulators and controllers will be delivered with a Product manual that contains:

- Safety information
- Installation and commissioning (description of mechanical installation, electrical connections)
- Maintenance (description of all required preventive maintenance procedures including intervals)
- Repair (description of all recommended repair procedures including spare parts)
- Additional procedures, if any (calibration, decommissioning)
- Reference information (article numbers for documentation referred to in Product manual, procedures, lists of tools, safety standards)
- Parts list.
- Foldouts or exploded views.
- Circuit diagrams (or references to circuit diagrams).

Technical reference manuals

The technical reference manuals describe the manipulator software in general and contain relevant reference information.

- **RAPID Overview:** An overview of the RAPID programming language.
- **RAPID Instructions, Functions and Data types:** Description of all RAPID instructions, functions and data types.
- **RAPID Kernel:** A formal description of the RAPID programming language.
- **System parameters:** Description of system parameters and configuration workflow.

Application manuals

Specific applications (for example, software or hardware options) are described in **Application manuals**. An application manual can describe one or several applications.

An application manual generally contains information about:

- The purpose of the application (what it does and when it is useful)
- What is included (for example, cables, I/O boards, RAPID instructions, system parameters)
- How to install included or required hardware.
- How to use the application
- Examples of how to use the application

Operating manuals

The operating manuals describe hands-on handling of the products. The manuals are aimed at those having first-hand operational contact with the product, that is production cell operators, programmers, and trouble shooters.

The group of manuals includes:

- **Emergency safety information**
- **General safety information**
- **Getting started, IRC5 and RobotStudio**
- **IRC5 with FlexPendant**
- **RobotStudio**
- **Introduction to RAPID**
- **Trouble shooting**, for the controller and manipulator.

How to read the product manual

Reading the procedures

The procedures contain references to figures, tools, material and so on. The references are read as described below.

References to figures

The procedures often include references to components or attachment points located on the device/controller. The components or attachment points are marked with *italic text* in the procedures and completed with a reference to the figure where the current component or attachment point is shown.

The denomination in the procedure for the component or attachment point corresponds to the denomination in the referenced figure.

The table below shows an example of a reference to a figure from a step in a procedure.

	Action	Note/Illustration
8.	Remove the rear attachment screws, gearbox.	Shown in the figure <i>Location of gearbox on page xx</i> .

Reference to required equipment

The procedures often include references to equipment (spare parts, tools, and so on.) required for the different actions in the procedure. The equipment is marked with *italic text* in the procedures and completed with a reference to the section where the equipment is listed with further information, i.e. article number, dimension.

The denomination in the procedure for the component or attachment point corresponds to the denomination in the referenced list.

The table below shows an example of a reference to a list of required equipment, from a step in a procedure.

	Action	Note/Illustration
3.	Fit a new sealing, 2 to the gearbox.	Art. no. is specified in <i>Required equipment on page xx</i> .

Safety information

The manual includes a separate safety chapter that must be read through before proceeding with any service or installation procedures. All procedures also include specific safety information when dangerous steps are to be performed.

For more information, see [Safety on page 11](#)

1 Safety

1.1. Introduction

Overview

The safety information in this manual is divided in two categories:

- general safety aspects, important to attend to before performing any service work on the device. These are applicable for all service work and are found in *General safety information on page 12*.
- specific safety information, pointed out in the procedure at the moment of the danger. How to avoid and eliminate the danger is either detailed directly in the procedure, or further detailed in separate instructions, found in *Safety related instructions on page 27*.

1.2 General safety information

1.2.1. Safety in the machine controller system

Validity and responsibility

The information does not cover how to design, install and operate a complete system, nor does it cover all peripheral equipment, which can influence the safety of the total system. To protect personnel, the complete system must be designed and installed in accordance with the safety requirements set forth in the standards and regulations of the country where the machine controller is installed.

The users of ABB industrial machine controllers are responsible for ensuring that the applicable safety laws and regulations in the country concerned are observed and that the safety devices necessary to protect people working with the machine controller system are designed and installed correctly. Personnel working with machine controllers must be familiar with the operation and handling of the industrial machine controller, described in the applicable documents, e.g. User's Guide and Product Manual

Connection of external safety devices

Apart from the built-in safety functions, the machine controller is also supplied with an interface for the connection of external safety devices. Via this interface, an external safety function can interact with other machines and peripheral equipment. This means that control signals can act on safety signals received from the peripheral equipment as well as from the machine controller.

Limitation of liability

Any information given in this manual regarding safety, must not be construed as a warranty by ABB that the industrial machine controller will not cause injury or damage even if all safety instructions are complied with.

Related information

Type of information	Detailed in document	Section
Installation of safety devices	Product manual for the machine controller	Installation and commissioning
Change operating modes	Operating manual - IRC5 with FlexPendant	Operating modes
Restricting the working space	Product manual for the machine controller	Installation and commissioning
Safety information about the machine controller	Product manual for the machine controller	Safety

1.3 Safety risks

1.3.1. Safety risks during installation and service work

Overview

This section includes information of general safety risks to be considered when performing installation and service work on FlexPLP IRPLP220 device.

General risks during installation and service

- The instructions in the Product Manual - Installation and Commissioning must always be followed.
- Emergency stop buttons must be positioned in easily accessible places so that the FlexPLP IRPLP220 device can be stopped quickly.
- Those in charge of operations must make sure that safety instructions are available for the installation in question.
- Those who install the FlexPLP IRPLP220 device must have the appropriate training for the FlexPLP IRPLP220 device system in question and in any safety matters associated with it.

Nation/region specific regulations

To prevent injuries and damage during the installation of the FlexPLP IRPLP220 device, the regulations applicable in the country concerned and the instructions of ABB Robotics must be complied with.



Non-voltage related risks

- Safety zones, which have to be crossed before admittance, must be set up in front of the FlexPLP IRPLP220's working space. Light beams or sensitive mats are suitable devices.
- Turntables or the like should be used to keep the operator out of the FlexPLP IRPLP220's working space.
- The axes are affected by the force of gravity when the brakes are released. In addition to the risk of being hit by moving FlexPLP IRPLP220 parts, you run the risk of being crushed by the FlexPLP IRPLP220 axes.
- When dismantling/assembling mechanical units, watch out for falling objects.
- Be aware of stored heat energy in the controller.
- Never use the FlexPLP IRPLP220 device as a ladder, i.e. do not climb on the device or other part during service work. There is a serious risk of slipping because of the high temperature of the motors or oil spills that can occur on the device.


To be observed by the supplier of the complete system

- The supplier of the complete system must ensure that all circuits used in the safety function are interlocked in accordance with the applicable standards for that function.
- The supplier of the complete system must ensure that all circuits used in the emergency stop function are interlocked in a safe manner, in accordance with the applicable standards for the emergency stop function.


Complete FlexPLP IRPLP220 device

Safety risk	Description
Hot components! Removed parts may result in collapse of the device!	 Caution signal Caution! Motors and gears are HOT after running the device! Touching the motors and gears may result in burns!  Warning! Take any necessary measures to ensure that the device does not collapse as parts are removed, e.g. secure the vertical axis with fixtures if removing driving belt of horizontal axes.

Cabling

Safety risk	Description
Cable packs are sensitive to mechanical damage!	 Caution signal Caution! The cable packs are sensitive to mechanical damage! They must be handled with care, especially the connectors, in order to avoid damaging them!

Gearboxes and motors

Safety risk	Description
Gears may be damaged if excessive force is used!	 Caution signal Caution! Whenever parting/mating motor and gearbox, the gears may be damaged if excessive force is used!

1.3.2. Safety risks related to tools/workpieces

Safe handling

It must be possible to safely turn off tools. Make sure that guards remain closed until the tools turn off.

It should be possible to release parts by manual operation (valves).

Safe design

End effectors must be designed so that they retain workpieces in the event of a power failure or a disturbance of the controller.



CAUTION!

Ensure that an end effector is prevented from dropping a workpiece, if such is used.

1.3.3. Safety risks related to pneumatic/hydraulic systems

General

Special safety regulations apply to pneumatic and hydraulic systems.

Residual energy

- Residual energy may be present in these systems. After shutdown, particular care must be taken.
 - The pressure in pneumatic and hydraulic systems must be released before starting to repair them.
-

Safe design

- Gravity may cause any parts or objects held by these systems to drop.
- Dump valves should be used in case of emergency.
- Shot bolts should be used to prevent tools, and so on, from falling due to gravity.

1.3.4. Safety risks during operational disturbances

General

- The FlexPLP IRPLP220 device is a flexible tool which can be used in many different industrial applications.
- All work must be carried out professionally and in accordance with the applicable safety regulations.
- Care must be taken at all times.

Qualified personnel

- Corrective maintenance must only be carried out by qualified personnel who are familiar with the entire installation as well as the special risks associated with its different parts.

Extraordinary risks

If the working process is interrupted, extra care must be taken due to risks other than those associated with regular operation. Such an interruption may have to be rectified manually.

1.3.5. Risks associated with live electric parts

Voltage related risks, general

- Although troubleshooting may, on occasion, have to be carried out while the power supply is turned on, the FlexPLP IRPLP220 device must be turned off (by setting the mains switch to OFF) when repairing faults, disconnecting electric leads and disconnecting or connecting units.
- The mains supply to the FlexPLP IRPLP220 device must be connected in such a way that it can be turned off outside the device's working space.

Voltage related risks, controller IRC5

A danger of high voltage is associated with the following parts:

- Be aware of stored electrical energy (DC link, Ultra Cap unit) in the controller.
- Units inside the controller, e.g. I/O modules, can be supplied with power from an external source.
- The mains supply/mains switch
- The transformers
- The power unit
- The control power supply (230 VAC)
- The rectifier unit (400-480 VAC and 700 VDC. Note: Capacitors!)
- The drive unit (700 VDC)
- The drive system power supply (230 VAC)
- The service outlets (115/230 VAC)
- The customer power supply (230 VAC)
- The power supply unit for tools, or special power supply units for the machining process.
- The external voltage connected to the control cabinet remains live even when the device is disconnected from the mains.
- Additional connections.

Voltage related risks, FlexPLP IRPLP220

A danger of high voltage is associated with the FlexPLP IRPLP220 device in:

- The power supply for the motors (up to 800 VDC).
- The user connections for tools or other parts of the installation (max. 230 VAC, see chapter Installation and commissioning in the Product manual).

Voltage related risks, tools, material handling devices, and so on.

Tools, material handling devices, and so on may be live even if the FlexPLP IRPLP220 control system is in the OFF position. Power supply cables which are in motion during the working process may be damaged.

1.4 Safety actions related to the FlexPLP IRPLP220

1.4.1. Safety fence dimensions

General

Install a safety cell around the FlexPLP IRPLP220 device to ensure safe installation and operation.

Dimensioning

Dimension the fence or enclosure to enable it to withstand the force created if the load being handled by the FlexPLP IRPLP220 device is dropped or released at maximum speed. Determine the maximum speed from the maximum velocities of the FlexPLP IRPLP220 device axes and from the position at which the FlexPLP IRPLP220 device is working in the work cell (see [Performances on page 35](#) and [Dimensions on page 37](#)).

Also consider the maximum possible impact caused by a breaking or malfunctioning rotating tool or other device fitted to the FlexPLP IRPLP220.

1.4.2. Fire extinguishing



NOTE!

Use a CARBON DIOXIDE (CO₂) extinguisher in the event of a fire in the FlexPLP IRPLP220 device (or controller)!

1.4.3. Emergency release of the FlexPLP IRPLP220 device axes

Description

In an emergency situation, any of the FlexPLP IRPLP220 device axes may be released manually by pushing the brake release buttons on the device.

How to release the brakes is detailed in the FlexPLP IRPLP220 product manual.

- The FlexPLP IRPLP220 axes may be moved by using a crane or similar.

Increased injury

Before releasing the brakes, make sure that the weight of the axes do not increase the pressure on the trapped person, further increasing any injury!

1.4.4. Brake testing

When to test

During operation the holding brakes of each axis motor wear normally. A test may be performed to determine whether the brake can still perform its function.

How to test

The function of each axis' motor holding brakes may be checked as detailed below:

1. Run each FlexPLP IRPLP220 axis to a position where the combined weight of the FlexPLP IRPLP220 axes and any load is maximized (max. static load).
2. Switch the motor to the MOTORS OFF position with the Operating mode selector on the controller.
3. Check that the axis maintains its position.

If the FlexPLP IRPLP220 device does not change position as the motors are switched off, then the brake function is adequate.

1.4.5. Safe use of the Teach Pendant Unit

**NOTE!**

The enabling device is a push button located on the side of the Teach Pendant Unit (TPU) which, when pressed halfway in, takes the system to MOTORS ON. When the enabling device is released or pushed all the way in, the device is taken to the MOTORS OFF state. To ensure safe use of the Teach Pendant Unit, the following must be implemented:

- The enabling device must never be rendered inoperative in any way.
- During programming and testing, the enabling device must be released as soon as there is no need for the FlexPLP IRPLP220 device to move.
- The programmer must always bring the Teach Pendant Unit with him/her, when entering the FlexPLP IRPLP220's working space. This is to prevent anyone else taking control of the FlexPLP IRPLP220 device without the programmer knowing.
- Do not change *Transm. gear ratio* or other kinematic parameters from the Teach Pendant Unit or a PC.

1.4.6. Work inside the FlexPLP IRPLP220's working range



WARNING!

If work must be carried out within the FlexPLP IRPLP220's work envelope, the following points must be observed:

- The operating mode selector on the controller must be in the manual mode position to render the enabling device operative and to block operation from a computer link or remote control panel.
- The FlexPLP IRPLP220's speed is limited to max. 200 mm/s when the operating mode selector is in position < 200 mm/s. This should be the normal position when entering the working space. The position 100% "full speed" may only be used by trained personnel who are aware of the risks that this entails.
- Pay attention to the moving axes of the device! Keep a distance to the axes. Also be aware of any danger that may be caused by tools or other devices mounted on the device or inside the cell.

1.4.7. Translate the information on safety and information labels

Labels on the product

Both the device and the controller are marked with several safety and information labels, containing important information about the product. The information is useful for all personnel handling the FlexPLP IRPLP220 system, e.g. during installation, service or operation.

Translation possibilities

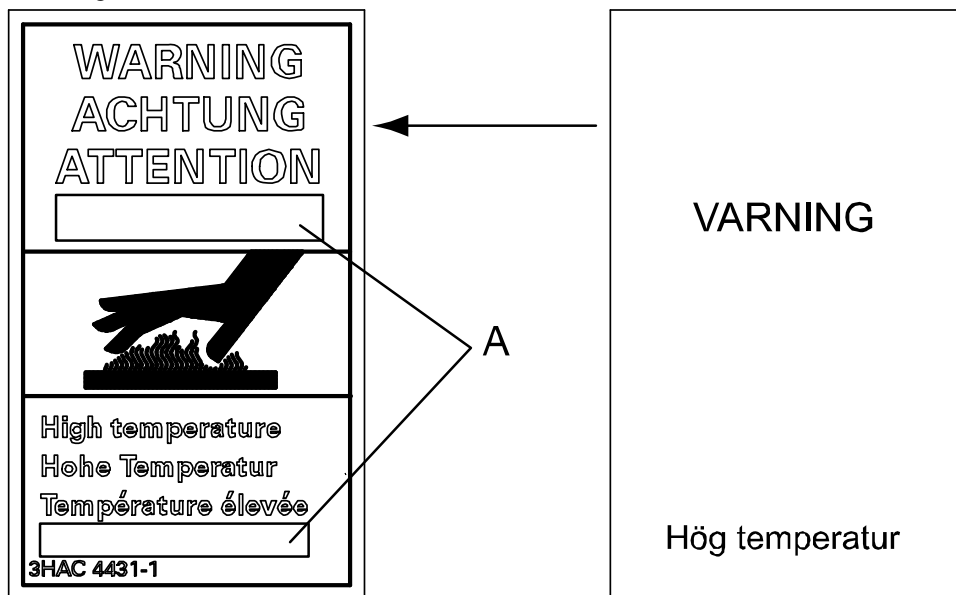
The labels fitted to the product contain space for adding a fourth language underneath the three standard languages (English, German and French).

Add a local language to the label by:

- Using a transparent sticker over the standard label with text added in a fourth language. Drawings detailing the design (text, figure, dimensions) of the standard labels can be ordered from ABB. Notice that each label is identified according to the article number located in the lower corner of the label.

Example of transparent sticker

The figure below shows the location of the free space on one of the labels on the device, where the fourth language can be added. The figure also shows a transparent sticker, containing the text in Swedish.



xx0500002517

A

Free space for adding a fourth language

1.5 Safety stops

1.5.1. What is an emergency stop?

Definition of emergency stop

An emergency stop is a state that overrides any other device control, disconnects drive power from the device motors, stops all moving parts, and disconnects power from any potentially dangerous functions controlled by the FlexPLP IRPLP220 system. An emergency stop state means that all power is disconnected from the device except for the manual brake release circuits. You must perform a recovery procedure, i.e, resetting the emergency stop button and pressing the Motors On button, in order to return to normal operation. The FlexPLP IRPLP220 system can be configured so that the emergency stop results in either:

- An uncontrolled stop, immediately stopping the device actions by disconnecting power from the motors.
- A controlled stop, stopping the device actions with power available to the motors so that the device path can be maintained. When completed, power is disconnected.

The default setting is uncontrolled stop. However, controlled stops are preferred since they minimize extra, unnecessary wear on the device and the actions needed to return the FlexPLP IRPLP220 system back to production. Please consult your plant or cell documentation to see how your FlexPLP IRPLP220 system is configured.

NOTE!

The emergency stop function may only be used for the purpose and under the conditions for which it is intended.

NOTE!

The emergency stop function is intended for immediately stopping equipment in the event of an emergency.

NOTE!

Emergency stop should not be used for normal program stops as this causes extra, unnecessary wear on the device.



Classification of stops

The safety standards that regulates automation and equipment defines categories in which each type of stop applies:

If the stop is...	then it is classified as...
uncontrolled	category 0 (zero)
controlled	category 1

Emergency stop devices

In a FlexPLP IRPLP220 system there are several emergency stop devices that can be operated in order to achieve an emergency stop. There are emergency stop buttons available on the Flex-Pendant and on the controller cabinet (on the Control Module on a Dual Cabinet Controller). There can also be other types of emergency stops on your device, consult your plant or cell documentation to see how your FlexPLP IRPLP220 system is configured.

1.6 Safety related instructions

1.6.1. Safety signals in the manual





Introduction to safety signals

This section specifies all dangers that may arise from performing the work detailed in the manual. Each danger is detailed in its own section consisting of:





- A caption specifying the danger level (DANGER, WARNING or CAUTION) and the type of danger.
- A brief description of what will happen if the operator/service personnel do not eliminate the danger.
- An instruction of how to eliminate the danger to facilitate performing the activity at hand.

Danger levels

The table below defines the captions specifying the danger levels used throughout this manual.

Symbol	Designation	Signification
 danger	DANGER	Warns that an accident will occur if the instructions are not followed, resulting in a serious or fatal injury and/or severe damage to the product. It applies to warnings that apply to danger with, for example, contact with high voltage electrical units, explosion or fire risk, risk of poisonous gases, risk of crushing, impact, fall from height, and so on.
 warning	WARNING	Warns that an accident may occur if the instructions are not followed, that can lead to serious injury, possibly fatal, and/or great damage to the product. It applies to warnings that apply to danger with, for example, contact with high voltage electrical units, explosion or fire risk, risk of poisonous gases, risk of crushing, impact, fall from height, and so on.
 Electrical shock	ELECTRICAL SHOCK	The electrocution or electrical shock symbol indicates electrical hazards which could result in severe personal injury or death.
 caution	CAUTION	Warns that an accident may occur if the instructions are not followed, that can result in injury and/or damage to the product. It also applies to warnings of risks that include burns, eye injury, skin injury, hearing damage, crushing or slipping, tripping, impact, fall from height, and so on. Furthermore, it applies to warnings that include function requirements when fitting and removing equipment, where there is a risk of damaging the product or causing a breakdown.

1.6.1. Safety signals in the manual

Symbol	Designation	Signification
 Electrostatic discharge (ESD)	ELECTROSTATIC DISCHARGE (ESD)	The electrostatic discharge (ESD) symbol indicates electrostatic hazards which could result in severe damage to the product.
 Magnetic fields	MAGNETIC FIELDS	An intense and/or variable magnetic field can affect or damage certain electrical devices like cardiac pacemakers.
 Note	NOTE	Note symbols alert you to important facts and conditions.
 Tip	TIP	Tip symbols direct you to specific instructions, where to find additional information or how to perform a certain operation in an easier way.

2 Product description

2.1. Product overview

General

FlexPLP IRPLP220 is a programmable linear positioner. It is a versatile tool designed for a wide range of industrial applications. In particular, it can be used as a programmable locator for a vehicle reference, to position a locating pin or a clamping unit.

Modularity

FlexPLP IRPLP220 is based on a modular concept and can be constituted of one to three or more linear axes: one or two horizontal axes, with or without a vertical axis, the vertical axis alone or combined horizontal axis one. The stroke of horizontal axes is up to 670 mm and the vertical axes is up to 510 mm.

FlexPLP IRPLP220 must be installed on a device or tooling base.

Operating system

FlexPLP IRPLP220 functions with the IRC5 controller and FlexPLP IRPLP220 control software RobotWare, which supports every aspect of the FlexPLP IRPLP220 system, such as motion control, development and execution of application programs, communication, and so on.

See Product specification - Controller IRC5 with FlexPendant.

FlexPLP IRPLP220 can be controlled by an IRC5.

External wiring

FlexPLP IRPLP220 uses cable chains to integrate an external electrical wiring and pneumatic tubes. It is easy for maintenance. The cable chains have an available space 15 mm x 25 mm for additional cables.

Complete protection

FlexPLP IRPLP220 is rated International Protection IP54.

Continues on next page

2.2. Terminology

Terminology

You'll find in the table hereunder some explanations regarding the terms used in this manual:

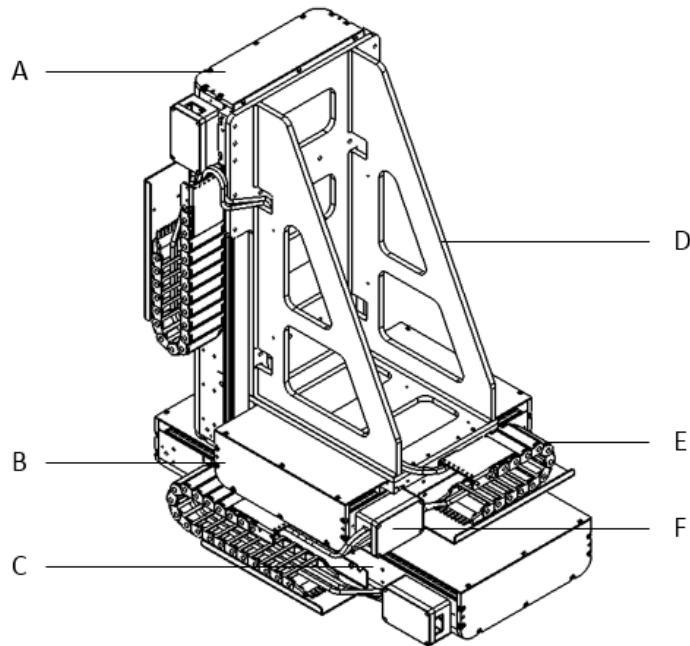
Designation	Definition
Axis (or linear axis)	In this document, the term axis is often used to designate a linear axis, i.e., a mechanical unit that possesses a carriage describing movement along a straight line.
Ballscrew	The ballscrew is the mechanical component that transforms rotational movement from the motor into linear movement with little friction. The ballscrew mounted on FlexPLP IRPLP220 are characterized by their stroke and their dimension $D0 \times P$: 32×5 . (D0: nominal diameter; P: Lead)
Gearbox	The gearbox is the mechanical component that change the rotation speed of the motor to the needed rotation speed with little friction.
Carriage	The carriage is the mechanical component that travels along the axis. The carriage table can be used to support a linear axis or the customer equipment.
Control system	Controller such as IRC5.
Horizontal	Parallel to the horizon plane.
Mounting surface	Upper surface of one axis carriage, onto which another axis or a tooling can be mounted. Flange frame on both sides of single PLP unit can be used as mounting surface for clamping
SMB	The serial measurement board (SMB) primarily gathers resolver data from the motors. This data is used to measure the speed and position of each axis. It also stores a number of data pertaining to each unit. This data is used by the controller and can be transferred between the SMB and the controller. The serial measurement board is a necessary link between the controller and the PLP motors.
Travel length or Stroke	Maximum displacement of one carriage.
Servo Motor	A motor used for motion control in FlexPLP IRPLP220. A servo motor is paired with an encoder to provide position/speed feedback.
Floor plate	A solid, flat plate used as the main horizontal reference plane and to which the unit must be fastened.
Vertical	Positioned at a right angle to the horizon.
Workpiece	A part that is being worked on. It may be subject to handling, welding, or other operations.

2.3 Principle structure

2.3.1. Modularity

Modularity

FlexPLP IRPLP220 is designed with high modularity what are constituted of the strokes, driving types, axes combination, vertical axis mounting methods and cable chains directions.



FlexPLP IRPLP220 overview

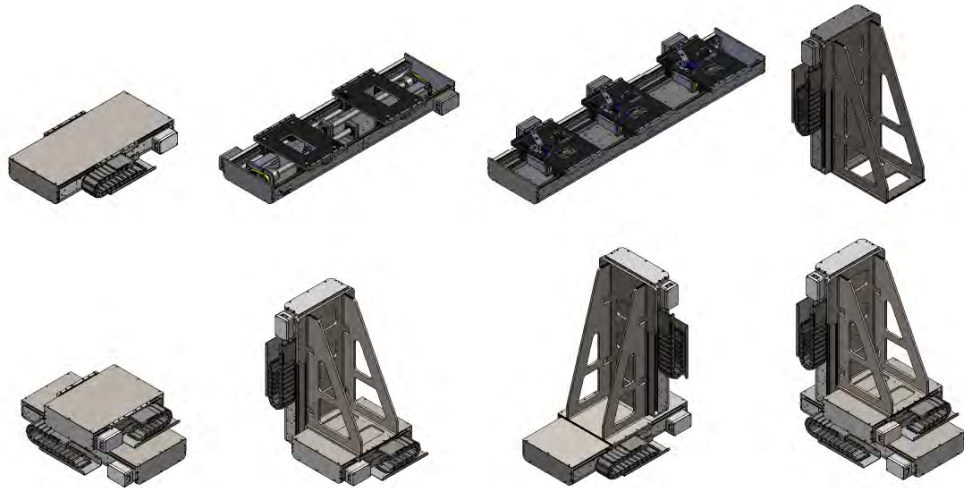
Item	Description	Note
A	Vertical axis	NOTE: When carriage is fixed on the triangle bracket, motor is moving with the movement of vertical axis. If basement body is fixed on the interface bracket, motor is not moving.
B	Second horizontal axis	
C	First horizontal axis	The Rack and Pinion version could extend stroke to 990 mm for first horizontal axis by additional module.
D	Interface bracket	Used to assemble axis 3 and guide cables.
E	Cable chain	External cable chains are used for axes of FlexPLP IRPLP220.
F	Cable box	Power and resolver cable connectors are inside. Each axis has a cable box installed.

2.3.2. Axes combinations

Axes combinations

FlexPLP IRPLP220 can be constituted of one to three axes: one or two horizontal axes, with or without a vertical axis, or the vertical axis alone.

For first horizontal axis, there can be one or more carriages or extended stroke by combined with additional module. Contact ABB if combined version is needed.



FlexPLP IRPLP220_Axes modularity

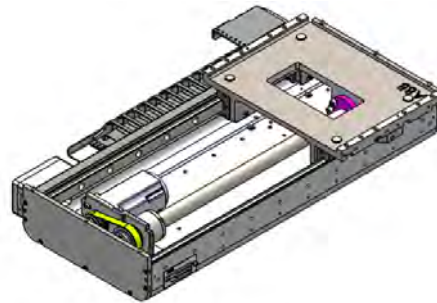
2.3.3. Driving types

Driving types

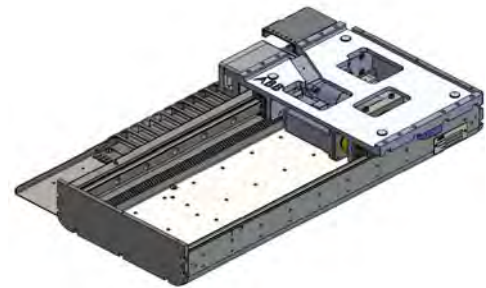
FlexPLP IRPLP220 axes have two types of drive method: Ballscrew type and Rack and Pinion type that have same parts except the driving system. The horizontal axes can use either type of drive method. The vertical axis use ballscrew type. Both of the two kinds of axes are available with stroke of 190, 270, 350, 430, 510, 590 and 670.

Below table show the strokes for each axis.

First Horizontal axis	Second Horizontal axis	Vertical axis
190 mm	190 mm	190 mm
270 mm	270 mm	270 mm
350 mm	350 mm	350 mm
430 mm	430 mm	430 mm
510 mm	510 mm	510 mm
590 mm	590 mm	
670 mm		



FlexPLP IRPLP220_Ballscrew driving type

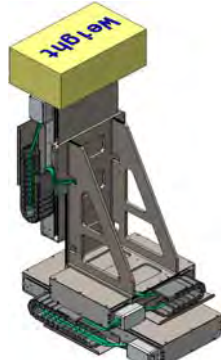


FlexPLP IRPLP220_Rack and Pinion driving type

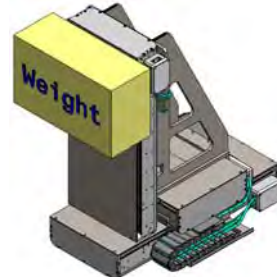
2.3.4. Vertical axis mounting and cable chain

Vertical axis mounting and cable chain

The vertical axis of FlexPLP IRPLP220 axes has two mounting method: Body moving or carriage moving. Both the carriage and base body of the axis can be mounted on the triangle bracket. The dimension for two mounting method are the same at lowest position. For body moving, there is an option of tooling flange plate for the top flange.

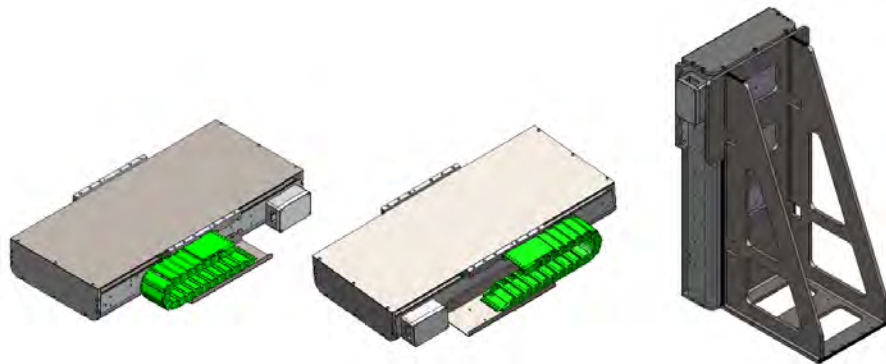


FlexPLP IRPLP220_Body moving



FlexPLP IRPLP220_Carriage moving

The cable chain of FlexPLP IRPLP220 axes can be mounted both on left and right side. If the connector is not moving, there is no need to assemble the cable chain. However, for second horizontal axis and vertical axis, the mounting method of cable chain should consider the first horizontal axis cable chain mounting method for cables routing.



FlexPLP IRPLP220_cable chain mounting

2.4 Performances

2.4.1. FlexPLP IRPLP220 overall specifications

General

Below are the overall specification of FlexPLP IRPLP220.

Specification	First Horizontal axis	Second Horizontal axis	Vertical axis
Stroke	190, 270, 350, 430, 510, 590, or 670 mm	190, 270, 350, 430, 510, or 590 mm	190, 270, 350, 430, or 510 mm
Repeatability ¹⁾	±0.025 mm ¹⁾	±0.025 mm ¹⁾	±0.025 mm ¹⁾
Maximum speed	200 mm/s	200 mm/s	200 mm/s
Acceleration time	< 0.2 s	< 0.2 s	< 0.2 s
Static load	220 kg	220 kg	220 kg
Dynamic load	220 kg	220 kg	220 kg
Protection index	IP 54	IP 54	IP 54

¹⁾Per ISO9283

2.4.2. FlexPLP IRPLP220 motor specifications

General

The ballscrew version and Rack and Pinion version of FlexPLP IRPLP220 are using the same servo motor.

Below are the specifications of the motor used on FlexPLP IRPLP220:

Specification	Performance
Power	750 W
Nominal speed	3000 rpm
Voltage	400 V AC
Torque	2.39 Nm
Brake voltage	24 V
Brake torque	2.39 Nm

2.5 Dimensions

2.5.1. Dimensions one-axis FlexPLP IRPLP220

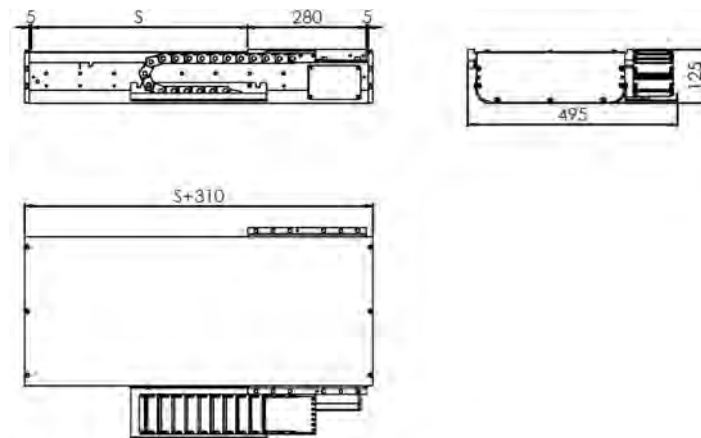
FlexPLP IRPLP220 - one horizontal axis

The dimensions of FlexPLP IRPLP220 - one horizontal axis depend on its stroke.

The figure below shows the dimensions.

S = Stroke.

S = 190, 270, 350, 430, 510, 590 or 670 mm.



Dimensions_one horizontal axis

2.5.1. Dimensions one-axis FlexPLP IRPLP220

FlexPLP IRPLP220 - one vertical axis

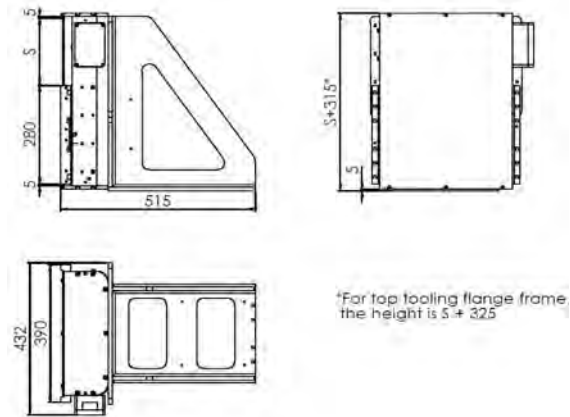
The dimensions of FlexPLP IRPLP220 - one vertical axis depend on its stroke.

The dimension of the vertical axis - body moving is same with vertical axis - carriage moving when they are at low position.

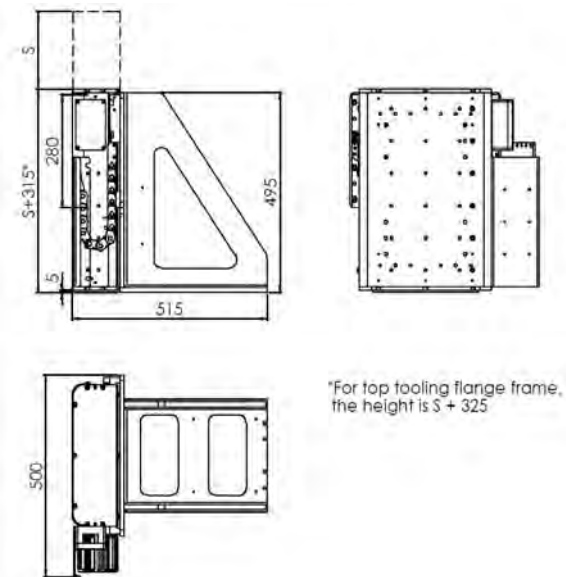
The figure below shows the dimensions of one vertical axis at low position.

S = Stroke.

S = 190, 270, 350, 430 or 510 mm.



Dimensions_one vertical axis-carriage moving



Dimensions_one vertical axis-body moving

2.5.2. Dimensions two-axes FlexPLP IRPLP220

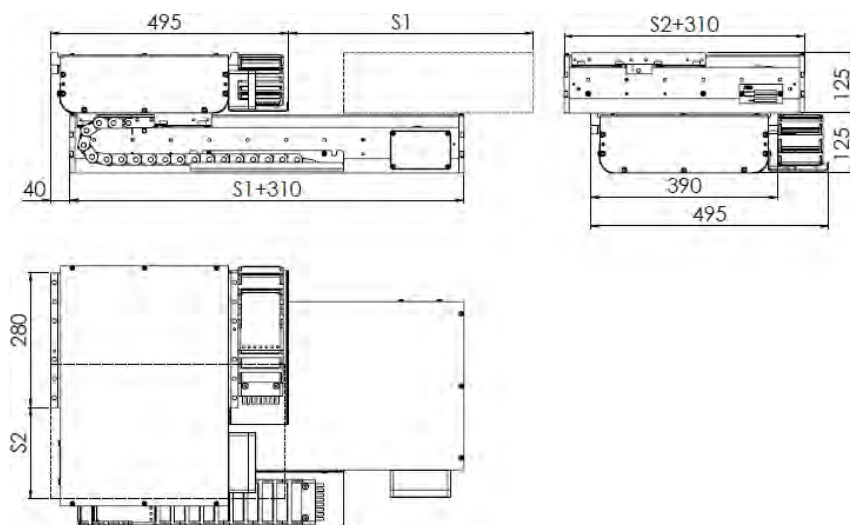
FlexPLP IRPLP220 - two horizontal axes

The dimensions of FlexPLP IRPLP220 unit depend on its axes strokes.

The figure below shows the dimensions of the two horizontal axes.

S1 = Stroke of the first horizontal axis. S1 = 190, 270, 350, 430, 510, 590 or 670 mm.

S2 = Stroke of the second horizontal axis. S2 = 190, 270, 350, 430, 510 or 590 mm.



Dimensions_two horizontal axes

2.5.2. Dimensions two-axes FlexPLP IRPLP220

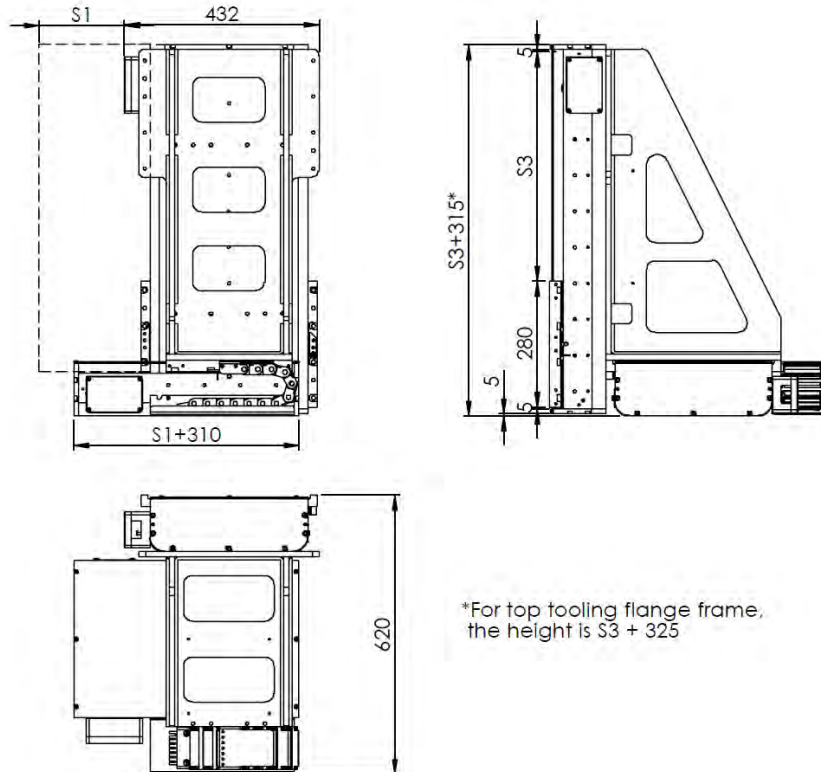
FlexPLP IRPLP220 - one horizontal and one vertical axis

The dimensions of FlexPLP IRPLP220 unit depend on its axes strokes. The dimensions of FlexPLP IRPLP220 unit with vertical axis - body moving is same with vertical axis - carriage moving when they are at low position.

The figure below shows the dimensions of a two axes FlexPLP IRPLP220 with vertical axis - carriage moving at low position with:

S1 = Stroke of the first horizontal axis. S1 = 190, 270, 350, 430, 510, 590 or 670 mm.

S3 = Stroke of the vertical axis. S3 = 190, 270, 350, 430 or 510 mm.



Dimensions_one horizontal axis and one vertical axis-carriage moving

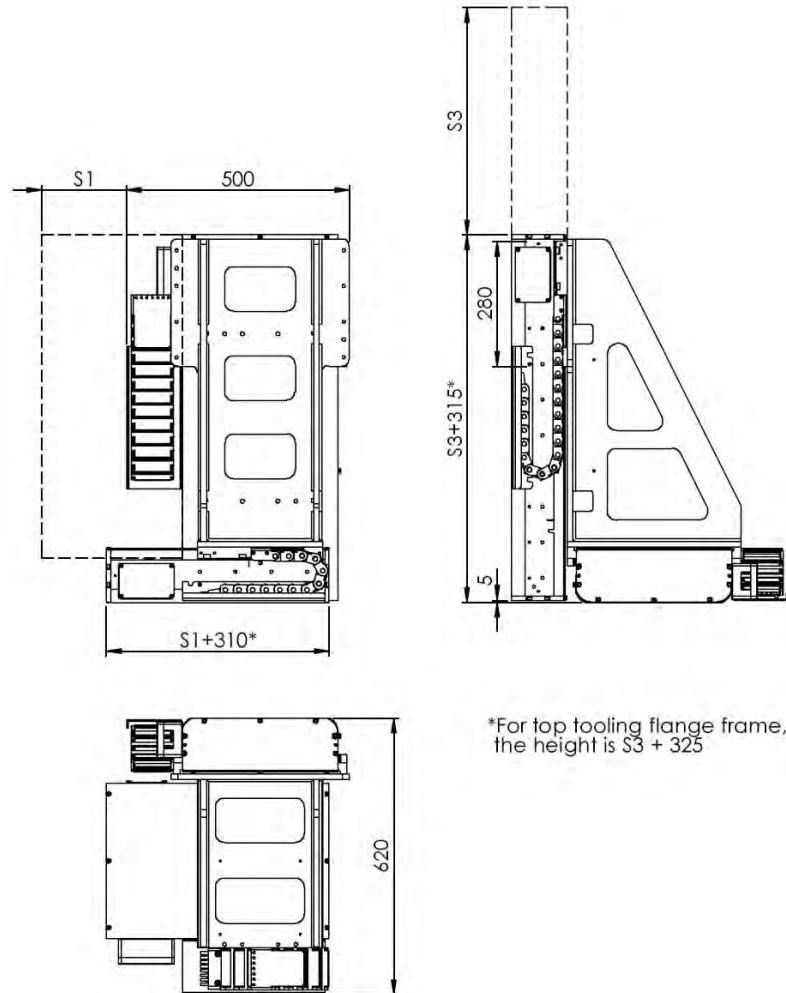
*For top tooling flange frame,
the height is S3 + 325

2.5.2. Dimensions two-axes FlexPLP IRPLP220

The figure below shows the dimensions of a two axes FlexPLP IRPLP220 with vertical axis - body moving at low position with:

S1 = Stroke of the first horizontal axis. S1 = 190, 270, 350, 430, 510, 590 or 670 mm.

S3 = Stroke of the vertical axis. S3 = 190, 270, 350, 430 or 510 mm.



*For top tooling flange frame, the height is S3 + 325

Dimensions_one horizontal axis and one vertical axis-body moving

2.5.3. Dimensions three-axes FlexPLP IRPLP220

FlexPLP IRPLP220 three axes

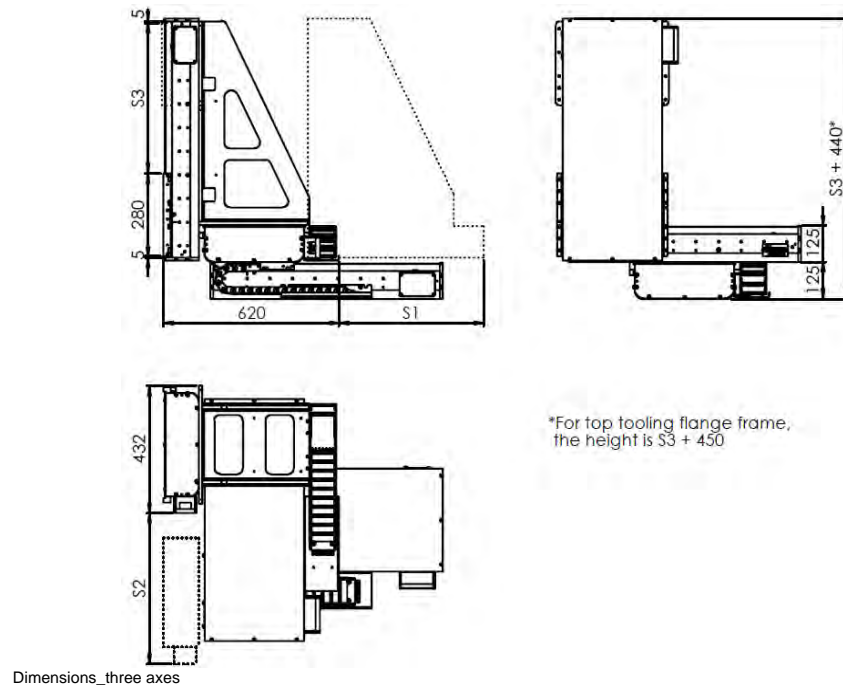
The dimensions of FlexPLP IRPLP220 unit depend on its axes strokes. The dimension of a FlexPLP IRPLP220 unit with vertical axis - body moving is same with vertical axis - carriage moving when they are at low position.

The figure below shows the dimensions a three axes FlexPLP IRPLP220 with vertical axis - carriage moving with:

S1 = Stroke of the first horizontal axis. S1 = 190, 270, 350, 430, 510, 590 or 670 mm.

S2 = Stroke of the second horizontal axis. S2 = 190, 270, 350, 430, 510 or 590 mm.

S3 = Stroke of the vertical axis. S3 = 190, 270, 350, 430 or 510 mm.



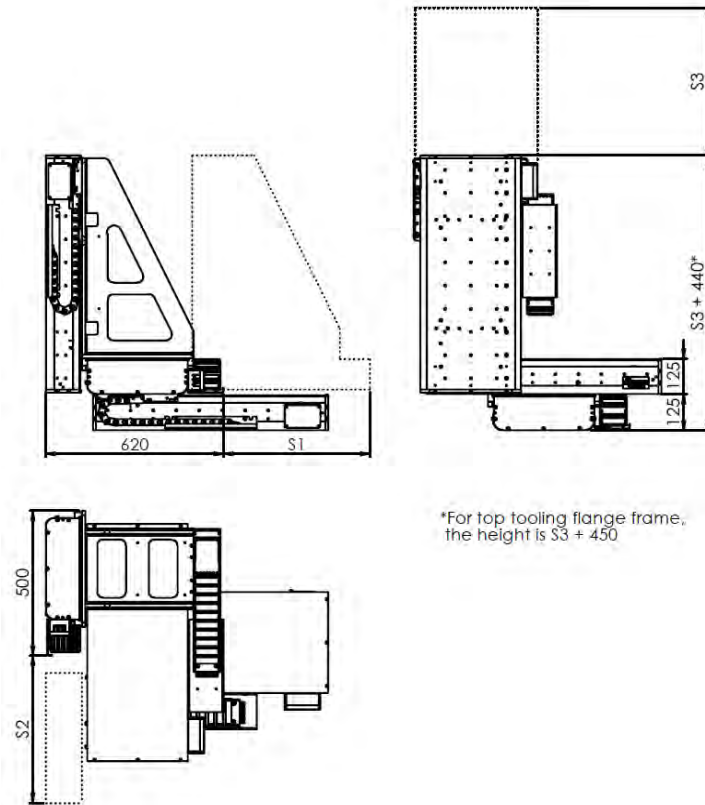
2.5.3. Dimensions three-axes FlexPLP IRPLP220

The figure below shows the dimensions a three axes FlexPLP IRPLP220 with vertical axis - body moving with:

S1 = Stroke of the first horizontal axis. S1 = 190, 270, 350, 430, 510, 590 or 670 mm.

S2 = Stroke of the second horizontal axis. S2 = 190, 270, 350, 430, 510 or 590 mm.

S3 = Stroke of the vertical axis. S3 = 190, 270, 350, 430 or 510 mm.



Dimensions_three axes

2.6 Weight

2.6.1. Weight

Overview

The weight of the complete mechanical unit depends on the configuration. Here under are the weight of each axis type and the total weight of each available combination of axis:

Axis type	Stroke (mm)	Weight (kg)
Ballscrew	190	67
Ballscrew	270	72
Ballscrew	350	78
Ballscrew	430	84
Ballscrew	510	89
Ballscrew	590	95
Ballscrew	670	99
Rack and Pinion	190	65
Rack and Pinion	270	70
Rack and Pinion	350	75
Rack and Pinion	430	81
Rack and Pinion	510	86
Rack and Pinion	590	91
Rack and Pinion	670	97
Interface bracket	190	33
Interface bracket	270	37
Interface bracket	350	39
Interface bracket	430	43
Interface bracket	510	46

3 Unpacking and handling

3.1. Pre-requisites for reception

Pre-requisites

The check-list below details what must be observed before proceeding with the unpacking and/or installation of the FlexPLP:

	Action	Note
1.	Make sure that only qualified installation personnel conforming to all national and local codes are allowed to perform the installation.	
2.	Make sure that FlexPLP has not been damaged, by visual inspection.	Specified in Unpacking and acceptance on page 46 .
3.	Make sure that the lifting device to be used is dimensioned to handle the weight of FlexPLP.	Specified in Weight on page 44
4.	When these prerequisites have been met, FlexPLP may be taken to its storage or installation site.	

3.2. Unpacking and acceptance



TIP!

Before unpacking the unit, quickly check that the package is not damaged, and that the goods are as ordered.

Contents

The content of the delivery package should be detailed on the delivery note.

A standard delivery package generally contains (not including options):

- FlexPLP
- The SMB box(es) and the cables

Inspection

FlexPLP is wrapped in a protective bag. Unpack it and check for any visible transport damage. If FlexPLP is damaged, stop unpacking and contact ABB.

Make sure that all parts of the packing list have been delivered.

Cleaning

If the unit seems to have been contaminated by impurities during the transport, clean them with a clean lint-free cloth.

Identification plate

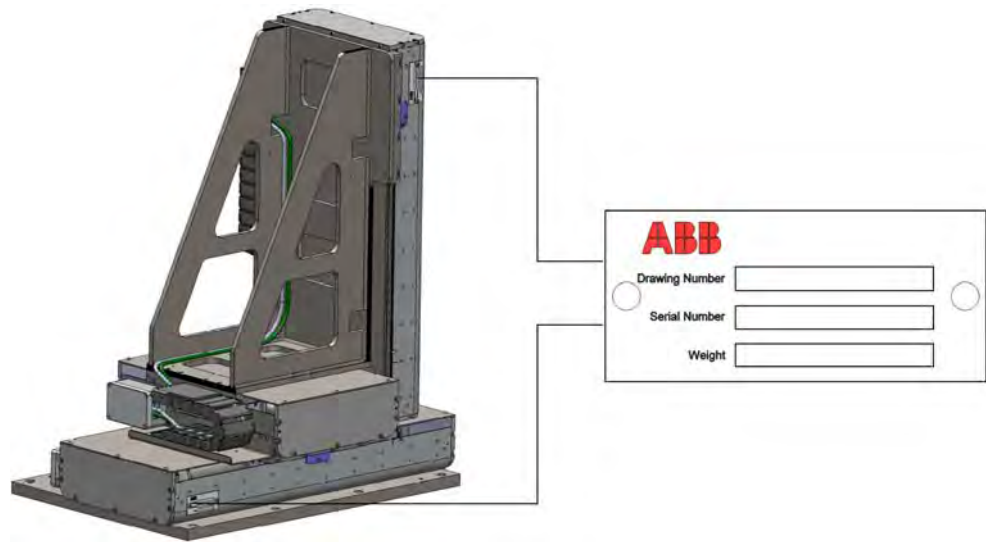
To identify the delivery, read the identification plates and compare them to the delivery note. There is one identification plate per axis, which displays the axis assembly drawing number, the serial number, and the weight.

The serial number is an alpha-numerical combination of the following types:

IRPLP220X0000 - 00 for the first horizontal axes, IRPLP220Y0000 - 00 for the second horizontal axes, and IRPLP220Z0000 - 00 for the vertical axis.

When FlexPLP IRPLP220 has more than one axis, the digits are identical on all plates.

The plates can be found on the sides of FlexPLP IRPLP220:



ID plate location

3.3. Handling/lifting



Safety



CAUTION!

Before lifting FlexPLP, read through the safety instructions carefully.

Handling equipment for FlexPLP

No.	Equipment for horizontal axis	Equipment for vertical axis
1	4 Eye-bolts with M8 thread hole 	2 Eye-bolts with M8 thread 
2	M8 x 25 screw	M8 nuts
3	Lifting straps rated for a minimum of 400kg	Lifting straps rated for a minimum of 400kg



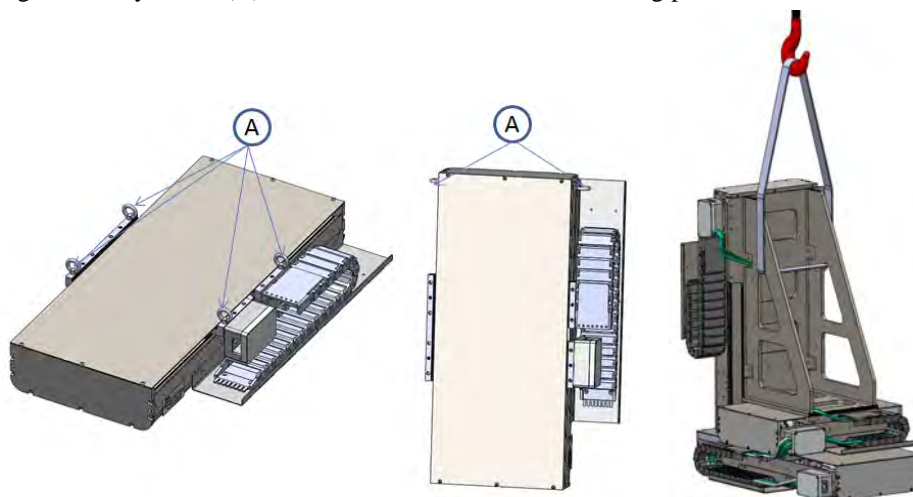
CAUTION!

Only use straps for lifting FlexPLP. Chains could damage FlexPLP.

Lifting the FlexPLP

Use lifting straps to lift FlexPLP with vertical axis by lifting the interface bracket.

Tighten the eye bolts (A) to the unit as shown on the following picture:



Lift of FlexPLP IRPLP220

For the dimensions and lifting weight, please refer to [Dimensions on page 37](#) and [Weight on page 44](#).

NOTE!

Before lifting FlexPLP IRPLP220, the carriages of the horizontal axis must be at mid-stroke and the vertical axis must be in low position.



Lifting the Interface bracket

Use lifting straps to lift the interface bracket.

4 Installation and commissioning

4.1. Introduction

Safety information

Before any service work is commenced, it is important that all safety information is observed!
Read [Safety on page 11](#) before performing any service work.

Required equipment

Equipment	Note
Handling equipment	Specified in Handling/lifting on page 48 .
Standard toolkit	Specified in Standard toolkit on page 98 .
Other tools and procedures may be required. See references to these procedures in the step-by-step instructions below.	Specified in Special tools on page 99 .

Bolts and screws and tightening torques

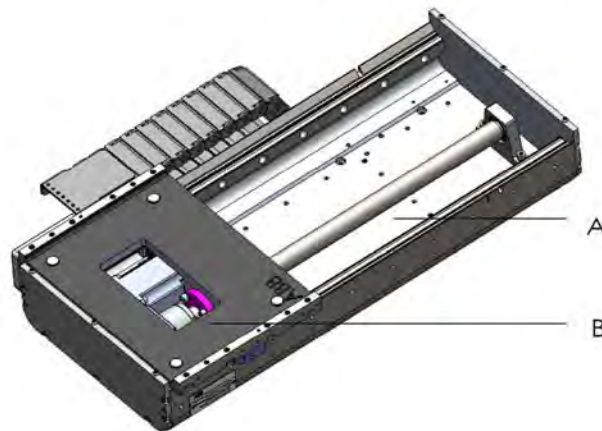
Specified in [Bolt, screws, tightening torques on page 97](#).

4.2 Mechanical installation

4.2.1. Introduction

Overview

The FlexPLP IRPLP220 is mounted on a floor plate, a tooling frame or another FlexPLP IRPLP220. The below picture shown the mounting surfaces.



Mounting surfaces

Item	Name	Description
A	Basement body	The basement body would be installed on a floor plate, a tooling frame or another FlexPLP IRPLP220.
B	Mounting surface of FlexPLP IRPLP220 carriage	Tools, fixtures or another FlexPLP IRPLP220 axis can be mounted on it.



NOTE!

FlexPLP IRPLP220 must be mounted on a machined leveling mounting surface.

Carefully check the work area of FlexPLP IRPLP220 before setting the system into service. Make sure that the area is free of all personnel when the unit moves. Also check that no object is located on the cover plates of FlexPLP IRPLP220.



WARNING!

Cables and pipes must not be contact with moving parts.

Inclination

The mounting surface must be horizontal. If FlexPLP IRPLP220 is mounted on a base plate, the base plate would be mounted horizontally on the ground.

4.2.2. Mounting surface (fastening of the FlexPLP IRPLP220 to the floor plate)

4.2.2. Mounting surface (fastening of the FlexPLP IRPLP220 to the floor plate)

Robustness

The FlexPLP IRPLP220 must be secured on a mounting surface that be sized to withstand the static loads resulting from the weight of the equipment and the dynamic loads generated by the movements of the carriages and the weight carried.

The table below gives the resulting static loads generated by a FlexPLP IRPLP220 at nominal payload:

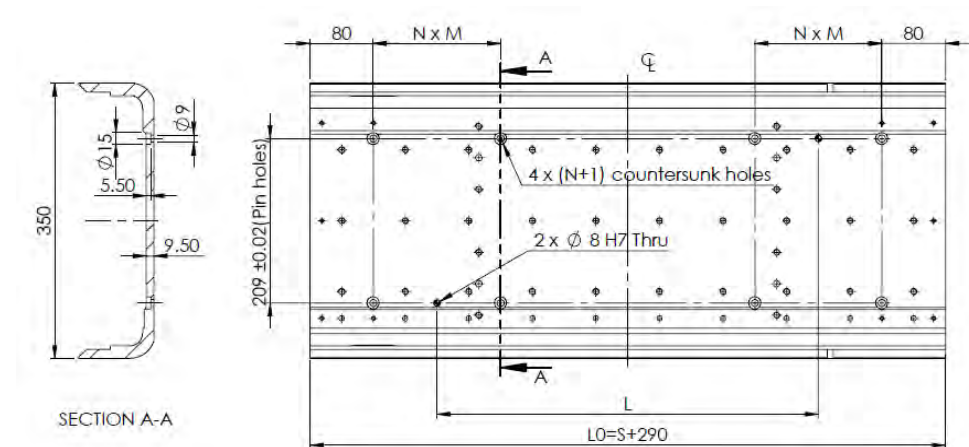
	X axis	Y axis	Z axis
Load	600 kg	500 kg	400 kg

Holes Configuration

The figures below show the countersunk and dowel holes prepared in the base body of the horizontal axis. The unit must be secured with socket head hex screws M8 and two 8 mm dowel pins.

The table below gives the detail numbers of holes and dimensions depending on the strokes.

Stroke (mm)	Body length L0 (mm)	Pin holes distance L (mm)	Number of countersunk holes	N x M (No.x mm)
190	480	240	8	1 x 80
270	560	320	8	1 x 80
350	640	320	8	1 x 160
430	720	400	8	1 x 160
510	800	480	8	1 x 160
590	880	560	8	1 x 160
670	960	640	12	2 x 160



Holes configuration_floor plate mounting

4.2.2. Mounting surface (fastening of the FlexPLP IRPLP220 to the floor plate)

Floor Plate

The FlexPLP IRPLP220 must be secured on a floor plate or a tooling frame. ABB provide the option of standard floor plate. With the standard floor plate, it is convenient for replacement of a whole FlexPLP IRPLP220 unit. Contact ABB if a floor plate is needed.

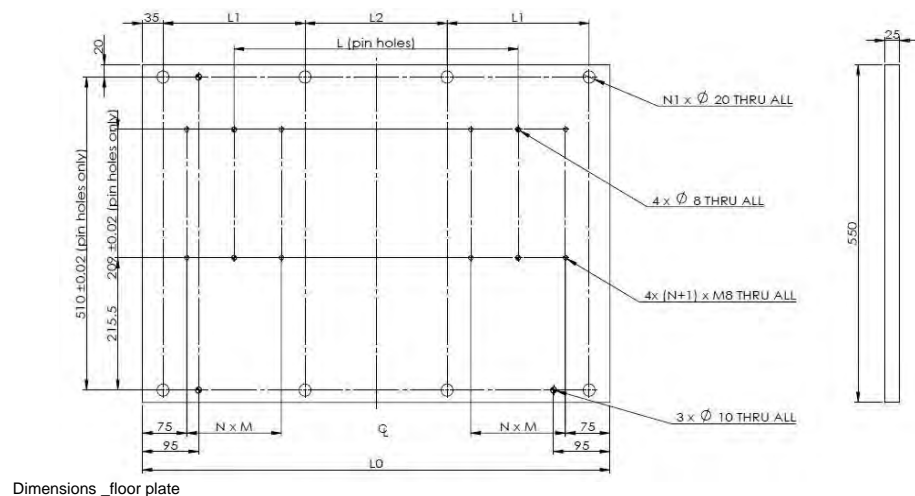


FlexPLP IRPLP220_floor plate option

The figures below show the dimensions of the floor plate.

The table below gives the detail numbers of holes and dimensions depending on the strokes

Stroke (mm)	Length L0 (mm)	Length L (mm)	Length L1 (mm)	Length L2 (mm)	No. of Ø20 holes	N x M (No. x mm)
190	470	240	200	0	6	1 x 80
270	550	320	240	0	6	1 x 80
350	630	320	280	0	6	1 x 160
430	710	400	200	240	8	1 x 160
510	790	480	240	240	8	1 x 160
590	870	560	280	240	8	1 x 160
670	950	640	280	320	8	2 x 160

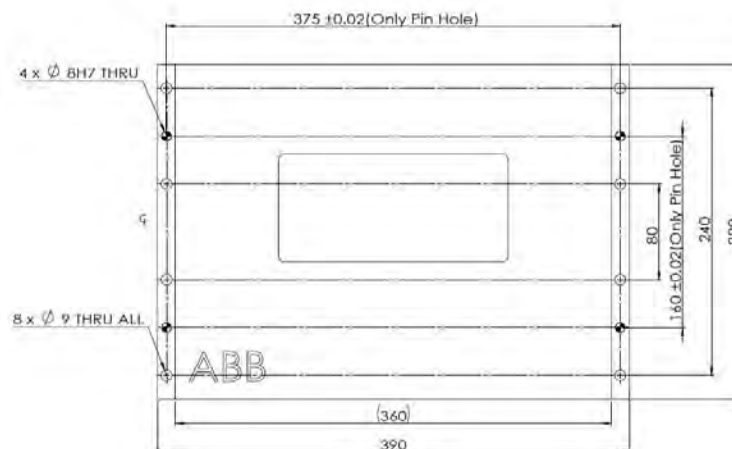


4.2.3. Mounting surfaces (fastening of an axis or customer equipment)

4.2.3. Mounting surfaces (fastening of an axis or customer equipment)

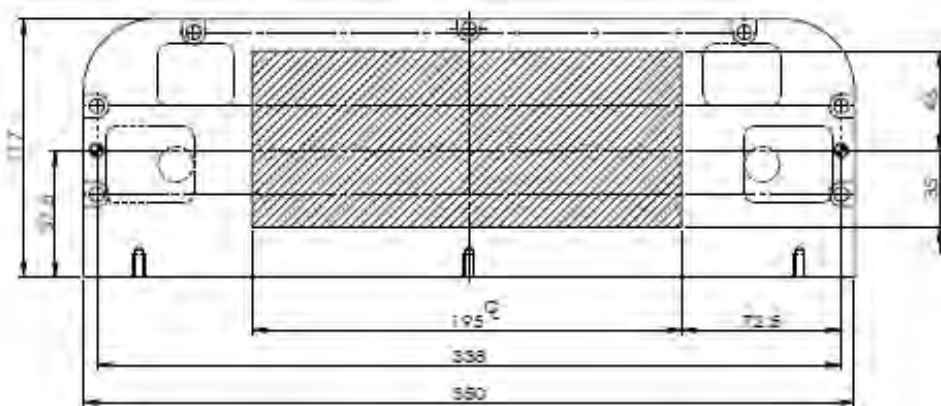
Mounting surfaces

For all axes have the same structure, the mounting surface of the horizontal and vertical axis carriages are the same. It includes eight $\varnothing 9$ through holes and four $\varnothing 8H7$ through holes for the fastening of another axis or the customer equipment.



Mounting surface of axis carriage

For vertical axis, the mounting surface for customer equipment has another option where the payload is mounted on the flange. The flange includes an area where the holes could be drilled according to the requirements.



Mounting surface of axis flange

4.2.4. Jogging axes of a unit with FlexPendant

Jogging properties

To jog is to manually position or move axes using the FlexPendant. It is possible to jog the axes under the following conditions:

- The system has been started.
- No programmed operation is running.
- The system is in Manual mode.
- The enabling device is pressed and the system is in Motors On state.

Any changes you make to jogging properties only affects the currently selected mechanical unit. All jogging properties are saved and restored when you return to jog that mechanical unit.

For details, please refer to Operating manual - IRC5 with FlexPendant.

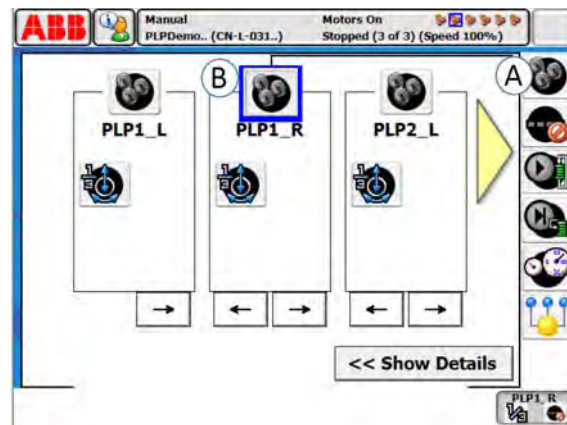
Select mechanical unit

If the system has more than one unit or additional axes, then it is needed to select which mechanical unit to jog when using the joystick. Each mechanical unit that can be jogged is represented in the mechanical units list. The name of the unit is defined in the system configuration. Each unit also has a symbol that is used in the Status bar.

There are three ways to select mechanical unit.

- Using the Quickset menu Mechanical unit.

On the Quickset menu, tap Mechanical unit, then tap to select a mechanical unit.



Select unit_Quickset menu

A	Mechanical unit menu button
B	Mechanical unit, a selected unit is highlighted

- Using the Select mechanical unit button.

Press the Select mechanical unit button to change unit. One press on the button changes to the next mechanical unit, as steps in a cycle.

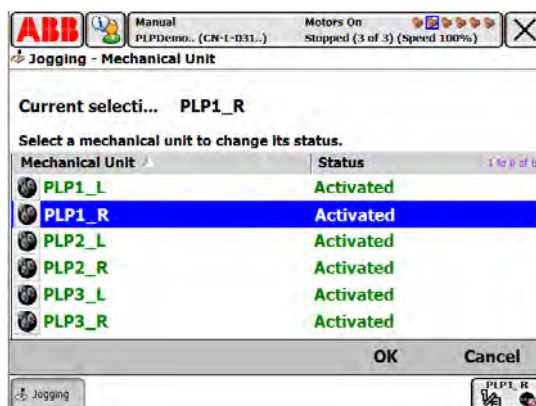


Select unit_hard button

- Using the Jogging window on the ABB menu.

On the ABB menu, tap Jogging. Then tap Mechanical unit. Tap the mechanical unit to be jogged, and then tap OK.

The selected mechanical unit is active until you select another unit, even if you close the Jogging window.

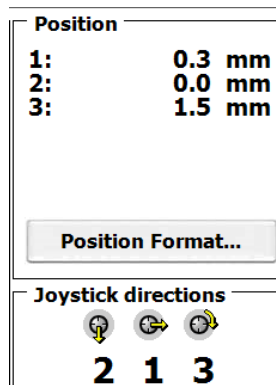


Select unit_Jogging window

Jog axis by axis

Jog the linear axis by Joystick, notice the Joystick Directions.

The Joystick Directions area shows how joystick axes correspond to the selected coordinate system's axes. The all axes of PLP can be jogged manually using the joystick. Please check your plant or product documentation to determine the movement patterns for each axis.



Joy axis_Joystick

Continues on next page

Incremental movement for precise positioning

Use incremental movement to jog the unit in small steps, which enables very precise positioning.

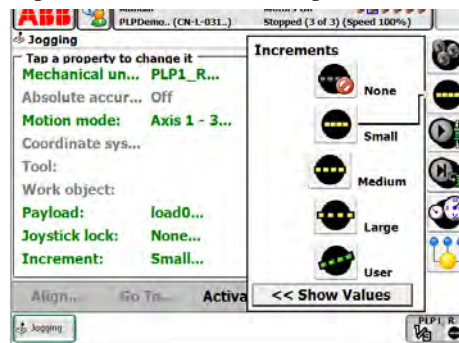
This means that each time the joystick is deflected, the device moves one step (increment). If the joystick is deflected for one or more seconds, a sequence of steps, (at a rate of 10 steps per second), will be performed as long as the joystick is deflected.

Default mode is no increment, then the robot moves continuously when the joystick is deflected.

There are three ways to select the increment size.

- Using the Quickset menu increments.

On the Quickset menu, tap Mechanical unit, then tap to select a mechanical unit.



Increments set_Quickset menu

- Using the Toggle increments button.

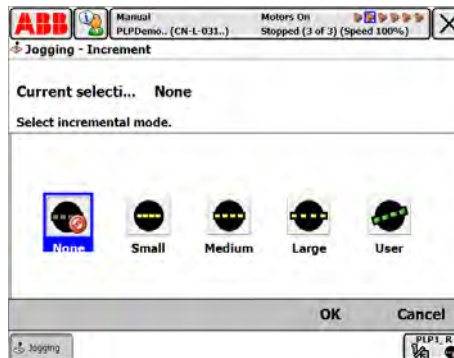
Press the Toggle increments button to switch increment size, toggle between no increments and the increment size you previously selected in the Jogging window.



Increments set_hard button

- Using the Jogging window on the ABB menu.

One the ABB menu, tap Jogging. Then tap increment. Tap the desired increment mode, and then tap OK.



Increments set_Jogging window

Choose between small, medium or large increments. You can also define your own increment movement sizes.

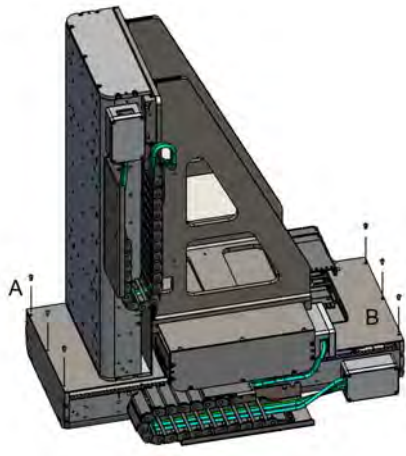
4.2.5. Fastening a unit to the floor plate

Equipment

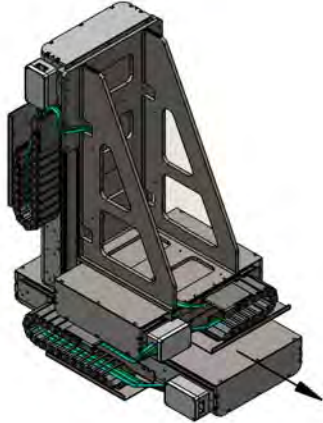
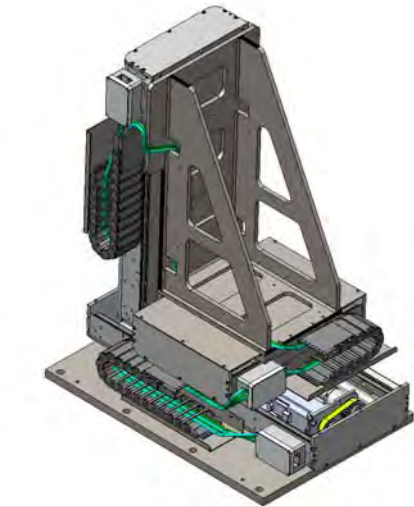
The required equipment is the standard toolkit, and in particular:

1.	Hex keys (Allen keys) 3 and 6 (socket wrenches recommended)
2.	Torque wrench used with socket head cap 6 mm. See Bolt, screws, tightening torques on page 97
3.	Two dowel pins Ø8 and eight M8 socket head screws for 190-590 stroke unit (twelve eight M8 socket head screws for 670 mm stroke unit).

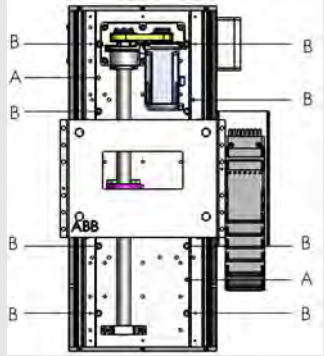
Procedure

Steps	Actions	Info/Illustration
1.	As it is necessary to jog the first horizontal axis carriage to tighten all the screws, you must prepare the equipment (controller, cables, SMB box) necessary to control the unit. See Jogging axes of a unit with FlexPendant on page 54 and Cabling on page 14 .	
2.	Dismantle the cover plate (B) of the first horizontal axis by dismantling its six M5x10 Class 8.8 fixing screws (A).	 <p>Dismantle axis one cover plate</p>

4.2.5. Fastening a unit to the floor plate

Steps	Actions	Info/Illustration
3.	Remove the cover plate by sliding it from one end of FlexPLP IRPLP220.	 Remove the cover plate
4.	Lift FlexPLP IRPLP220 and position it on the mounting surface.	 Position on the floor plate
5.	Connect the power and resolver cables to the unit. If needed, use the controller's FlexPendant to move the first horizontal axis carriage and clear the access to the countersunk holes and pin holes of the base body.	

4.2.5. Fastening a unit to the floor plate

Steps	Actions	Info/Illustration
6.	Fix the first horizontal axis of FlexPLP IRPLP220 by fixing the following fastening parts on the basement body: the two dowel pins Ø8 mm (A) and eight M8 screws with lock washer (B).	 <p>Body fixed on floor plate</p>
7.	Put the first horizontal axis cover back in position.	

4.3.1. Connectors and internal equipment wiring

4.3 Cabling and control

4.3.1. Connectors and internal equipment wiring

Connectors

Each axis of FlexPLP IRPLP220 has its own cable box which containing the power cable connector and the resolver cable connector.

External harness

FlexPLP IRPLP220 integrates an external harness of one power cable and one resolver cable for the control of customer equipment.

Quantity	Specification
1	Power cable, with M16 connector
1	resolver cable, With M16 connector

Read [Safety on page 11](#) before performing any service work.

4.3.2. Control architecture

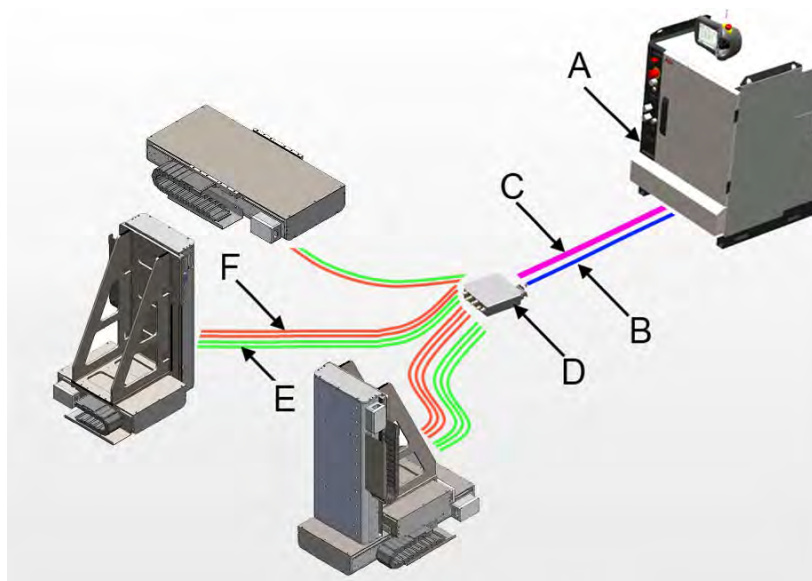
Overview

FlexPLP IRPLP220 is driven by the IRC5 through a set of cables and a SMB box.

The standard control system includes:

- Controller: IRC5 (A). An IRC5 controller can control up to 36 axis, in up to 6 motion tasks. See [Controller capabilities on page 62](#).
- Floor resolver cable, IRC5 to SMB (B). For IRC5's XS.2 (single cabinet's SMB connection), A4.XS2 (drive module's SMB connection), XS.41 (single cabinet's external axis SMB connection), or A4.XS41 (drive module's external axis SMB connection).
- Floor power cable, IRC5 to SMB (C). Exists in 2 types:
 - 6 axis type for IRC5's XS.1 (single cabinet's robot power connection) or A4.X1 (drive module's robot power connection)
 - 3 axis type for XS.7 (single cabinet's external axis power connection) or A4.X7 (drive module's external axis power connection).
- SMB Box (D). Exists in 3 types: 1, 3, or 6 axes. Equipped with brake release trigger and back-up battery.
- FlexPLP IRPLP220 resolver cable, SMB to PLP (E) For 1 axis
- FlexPLP IRPLP220 power cable, SMB to PLP (F) For 1 axis

Each type of cable is available in a length of 2, 5, 10 or 15m.



FlexPLP IRPLP220 cables

Item	Description
A	IRC5
B	Floor resolver cable
C	Floor power cable
D	SMB Box
E	FlexPLP IRPLP220 resolver cable
F	FlexPLP IRPLP220 power cable

4.3.3. Controller capabilities

General

Depending on its configuration, an IRC5 controller with one drive module can control up to nine axes: six axis controlled by the Main Drive Unit (MDU) and up to three axis controlled by the Additional Drive Units (ADU). Up to three additional drive modules can be added to the controller. For a total of four drive modules, up to thirty-six axes can be driven by an IRC5 controller. Read 3HAC021313 - Product Manual, IRC5 Controller.

Furthermore, a controller with Multi-move system can manage up to six motions tasks, regardless of the number of drive modules. This means that if the system configuration has more than six FlexPLP IRPLP220, two or more units must be grouped in one motion task. Read 3HA021395 - Additional axes and stand alone controller.



NOTE!

On one drive module, the axes of one FlexPLP IRPLP220 unit shouldn't be controlled across the MDU (six first drive units) and the ADU (up to three drive units). For example, a 3 axis FlexPLP IRPLP220 should not have two axes controlled by the MDU and one axis controlled by one of the ADU.

Configurations: fully occupied drive module

Below are all the configurations in which all of the axes of one drive module are occupied:

#	Main Drive Unit						Additional Drive Units			PLP
	Drive 1	Drive 2	Drive 3	Drive 4	Drive 5	Drive 6	Drive 7	Drive 8	Drive 9	
1	PLP3 axis			PLP3 axis			PLP3 axis			3
2	PLP3 axis			PLP3 axis			PLP2 axis		PLP1 axis	4
3	PLP3 axis			PLP3 axis			PLP1 axis	PLP1 axis	PLP1 axis	5
4	PLP3 axis			PLP2 axis		PLP1 axis	PLP3 axis			4
5	PLP3 axis			PLP2 axis		PLP1 axis	PLP2 axis		PLP1 axis	5
6	PLP3 axis			PLP2 axis		PLP1 axis	PLP1 axis	PLP1 axis	PLP1 axis	6
7	PLP3 axis			PLP1 axis	PLP1 axis	PLP1 axis	PLP3 axis			5
8	PLP3 axis			PLP1 axis	PLP1 axis	PLP1 axis	PLP2 axis		PLP1 axis	6
9	PLP3 axis			PLP1 axis	PLP1 axis	PLP1 axis	PLP1 axis	PLP1 axis	PLP1 axis	7 ¹⁾
10	PLP2 axis		PLP2 axis		PLP2 axis		PLP3 axis			4
11	PLP2 axis		PLP2 axis		PLP2 axis		PLP2 axis		PLP1 axis	5
12	PLP2 axis		PLP2 axis		PLP2 axis		PLP1 axis	PLP1 axis	PLP1 axis	6
13	PLP2 axis		PLP2 axis		PLP1 axis	PLP1 axis	PLP3 axis			5

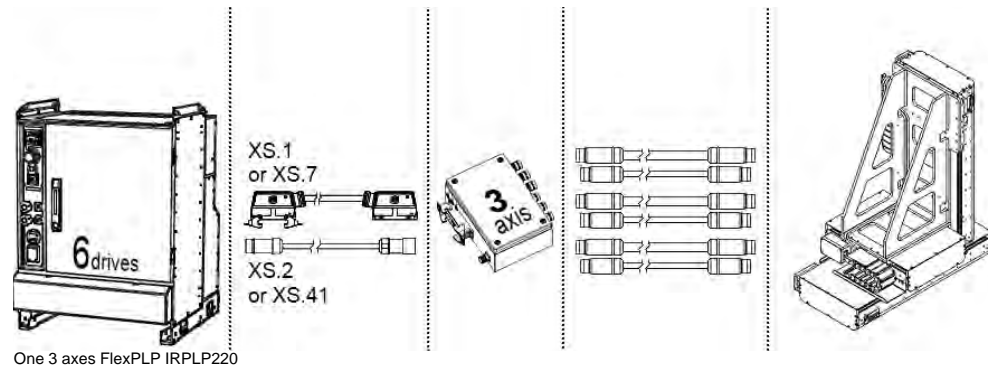
14	PLP2 axis		PLP2 axis		PLP1 axis	PLP1 axis	PLP2 axis		PLP1 axis	6
15	PLP2 axis		PLP2 axis		PLP1 axis	PLP1 axis	PLP1 axis	PLP1 axis	PLP1 axis	71)
16	PLP2 axis		PLP1 axis	PLP1 axis	PLP1 axis	PLP1 axis	PLP3 axis			6
17	PLP2 axis		PLP1 axis	PLP1 axis	PLP1 axis	PLP1 axis	PLP2 axis		PLP1 axis	71)
18	PLP2 axis		PLP1 axis	PLP1 axis	PLP1 axis	PLP1 axis	PLP1 axis	PLP1 axis	PLP1 axis	81)
19	PLP1 axis	PLP1 axis	PLP1 axis	PLP1 axis	PLP1 axis	PLP1 axis	PLP3 axis			71)
20	PLP1 axis	PLP1 axis	PLP1 axis	PLP1 axis	PLP1 axis	PLP1 axis	PLP2 axis		PLP1 axis	81)
21	PLP1 axis	PLP1 axis	PLP1 axis	PLP1 axis	PLP1 axis	PLP1 axis	PLP1 axis	PLP1 axis	PLP1 axis	91)

¹⁾Configuration in which two or more mechanical units must be grouped in one motion task.

4.3.4. Examples of configurations

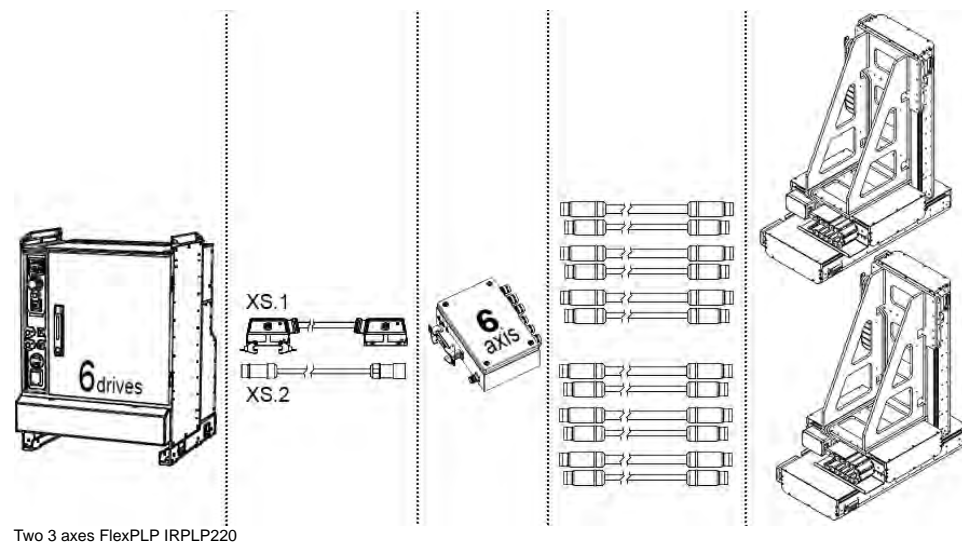
System example: One 3 axis FlexPLP IRPLP220

Below is an example of configuration with one single cabinet IRC5 which controls one 3 axis FlexPLP IRPLP220 through one 3 axis SMB box. Note that if the controller's XS.1 and XS.2 are already occupied, and if the number of drive units in the controller is enough for all the mechanical units, it is possible to use a power cable for IRC5's XS.7 (3 axis) and a resolver cable for XS.41.



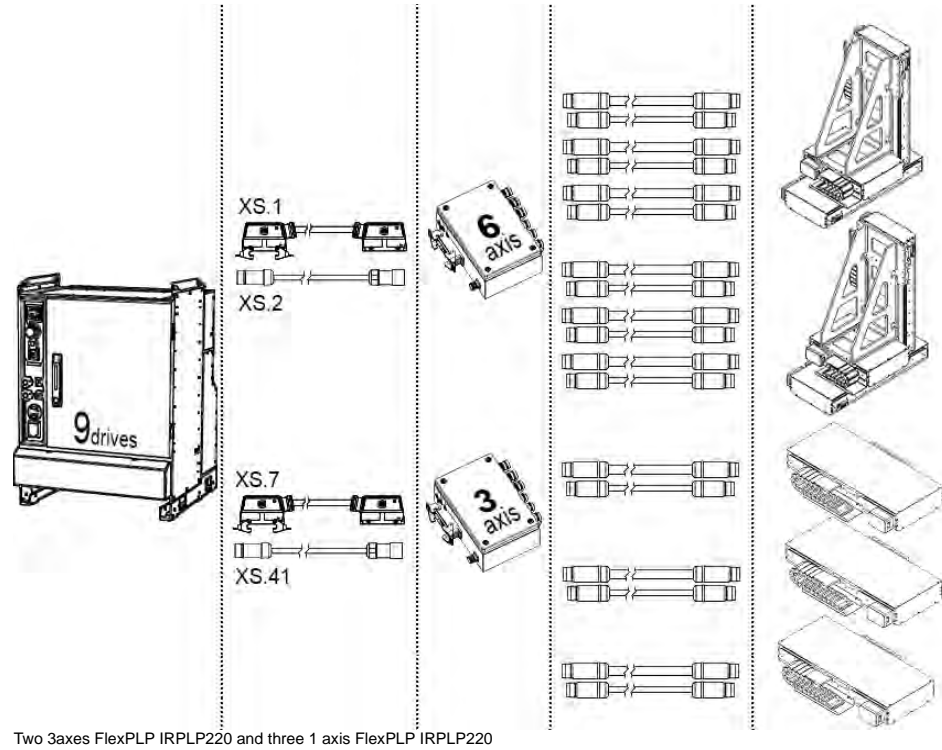
System example: Two 3 axis FlexPLP IRPLP220

Below is an example of configuration with one single cabinet IRC5 which controls two 3 axis FlexPLP IRPLP220 through one 6 axis SMB box.



System example: Two 3 axis FlexPLP IRPLP220 and three 1 axis FlexPLP IRPLP220

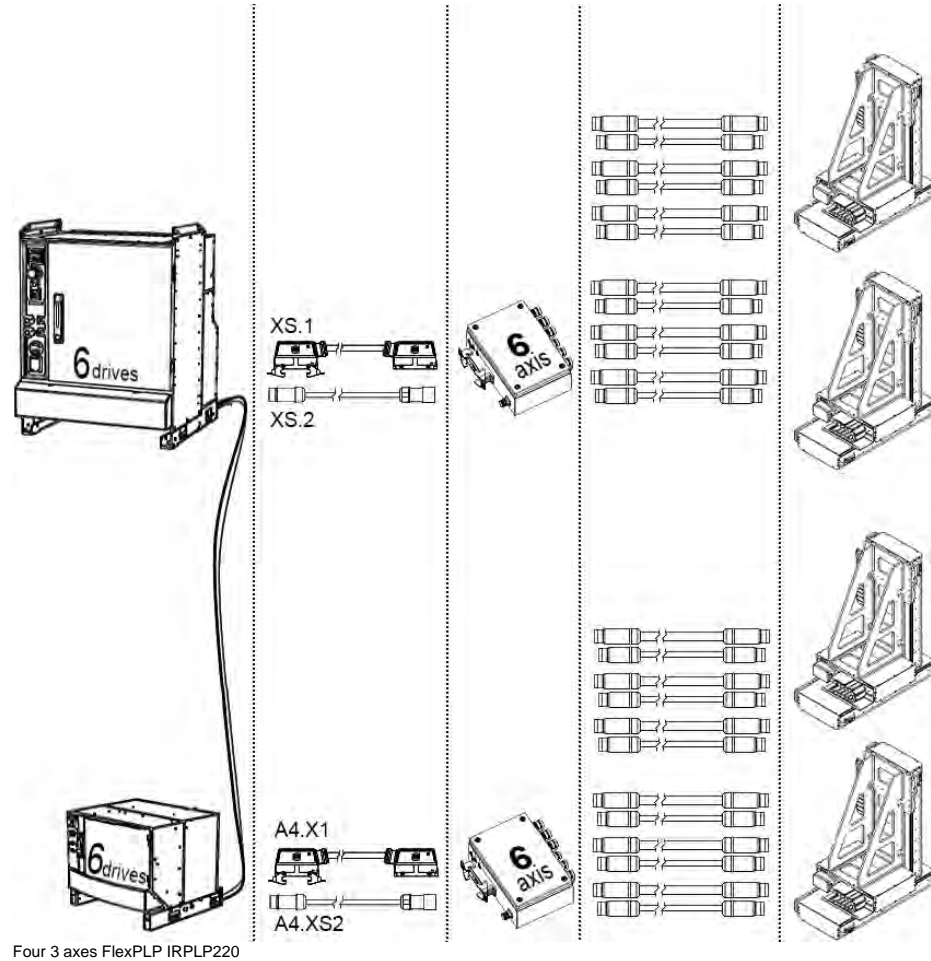
Below is an example of configuration with one single cabinet IRC5 (with nine drive units) which controls two 3 axis FlexPLP IRPLP220 and three 1 axis FlexPLP IRPLP220 through respectively one 6 axis SMB box and one 3 axis SMB box.



4.3.4. Examples of configurations

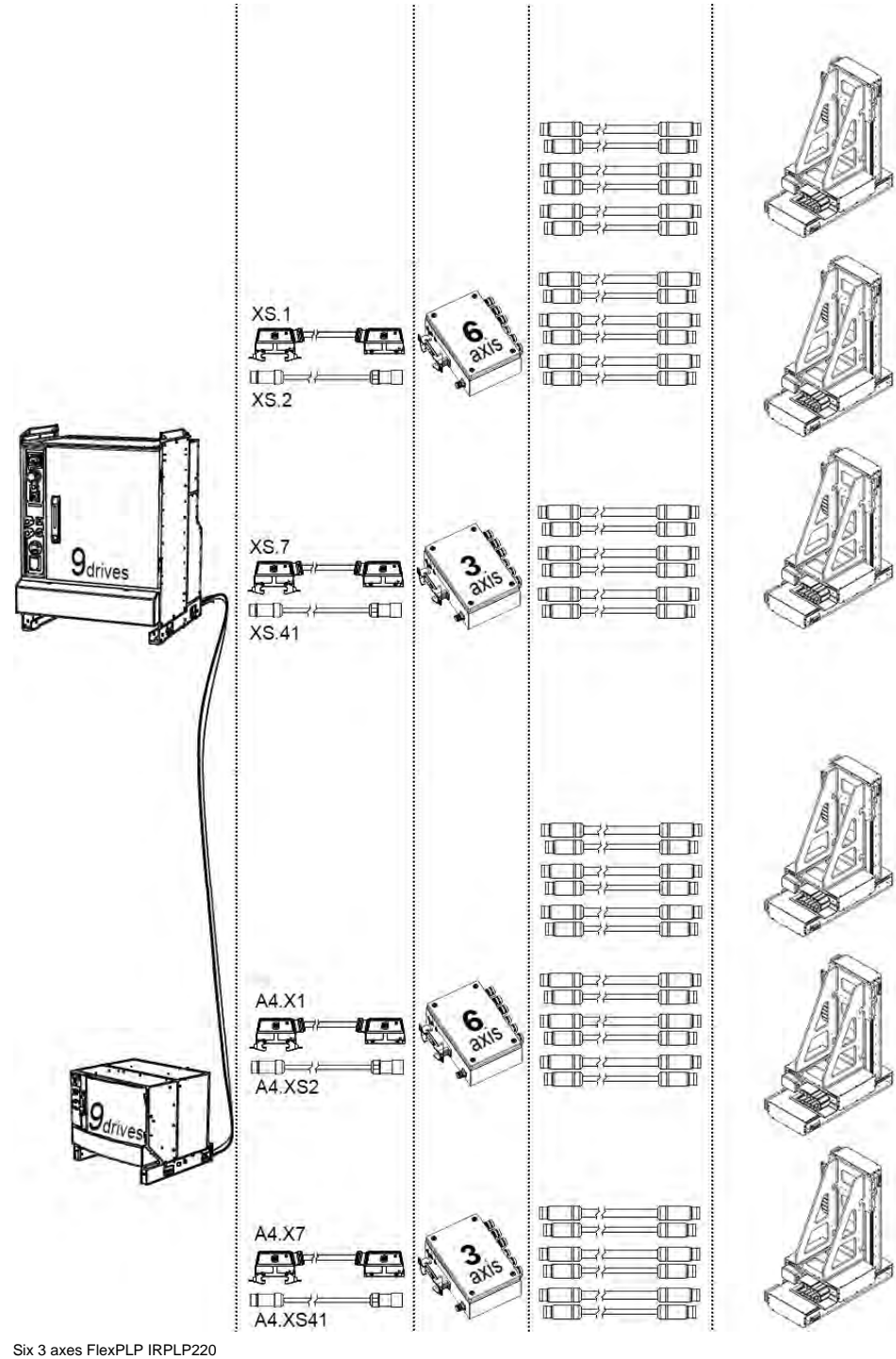
System example: Four 3 axis FlexPLP IRPLP220

Below is an example of configuration with one IRC5 (with six drive units) equipped with one additional drive module (also with six drive units), connected with one Ethernet cable and one safety cable. The IRC5 controls four 3 axis FlexPLP IRPLP220 through two 6 axis SMB box.



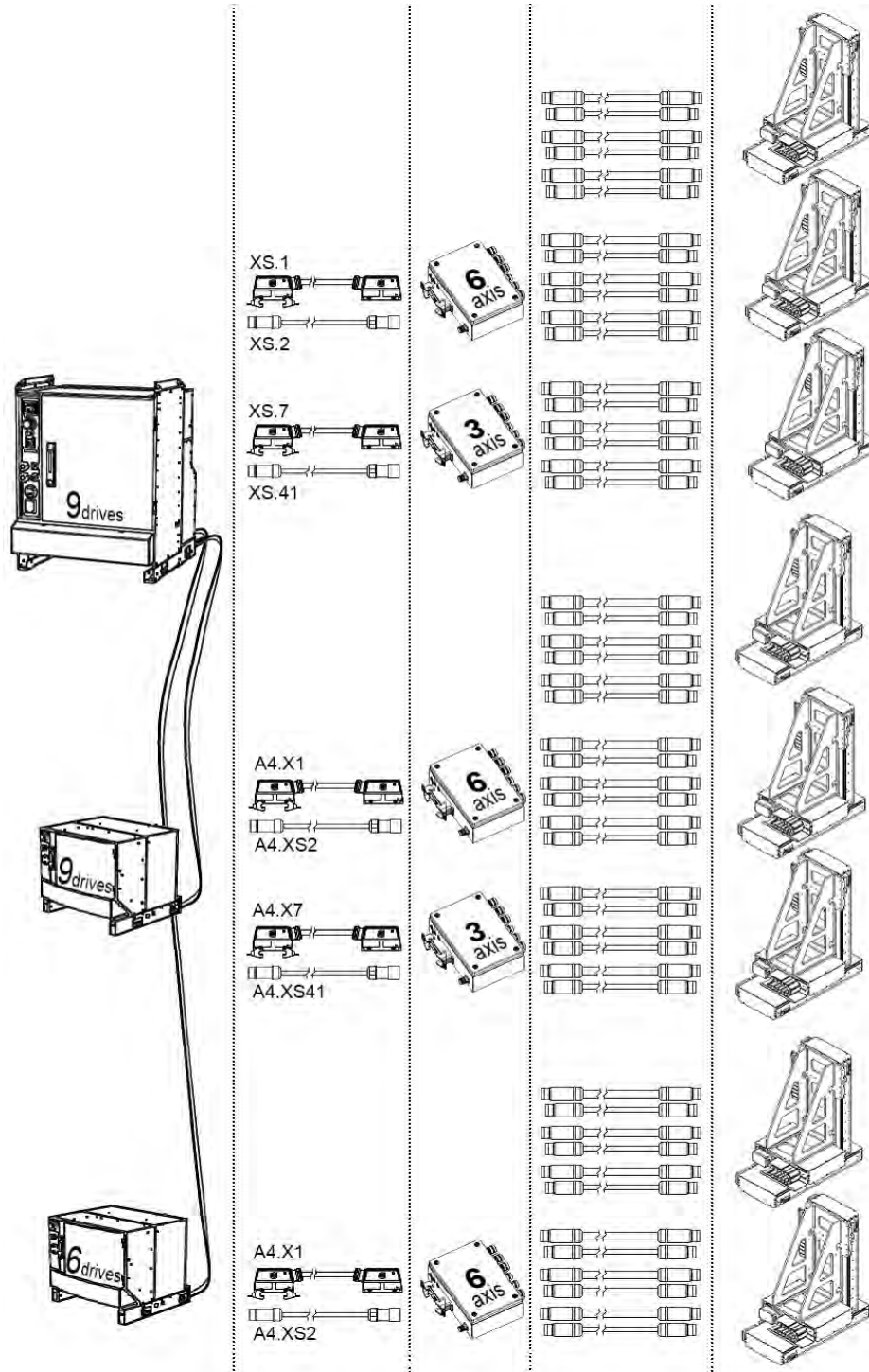
System example: Six 3 axis FlexPLP IRPLP220

Below is an example of configuration with one IRC5 (with nine drive units) equipped with one additional drive module (also with nine drive units). The IRC5 controls six 3 axis FlexPLP IRPLP220 through two 6 axis SMB box, and two 3 axis SMB box.



System example: Eight 3 axis FlexPLP IRPLP220

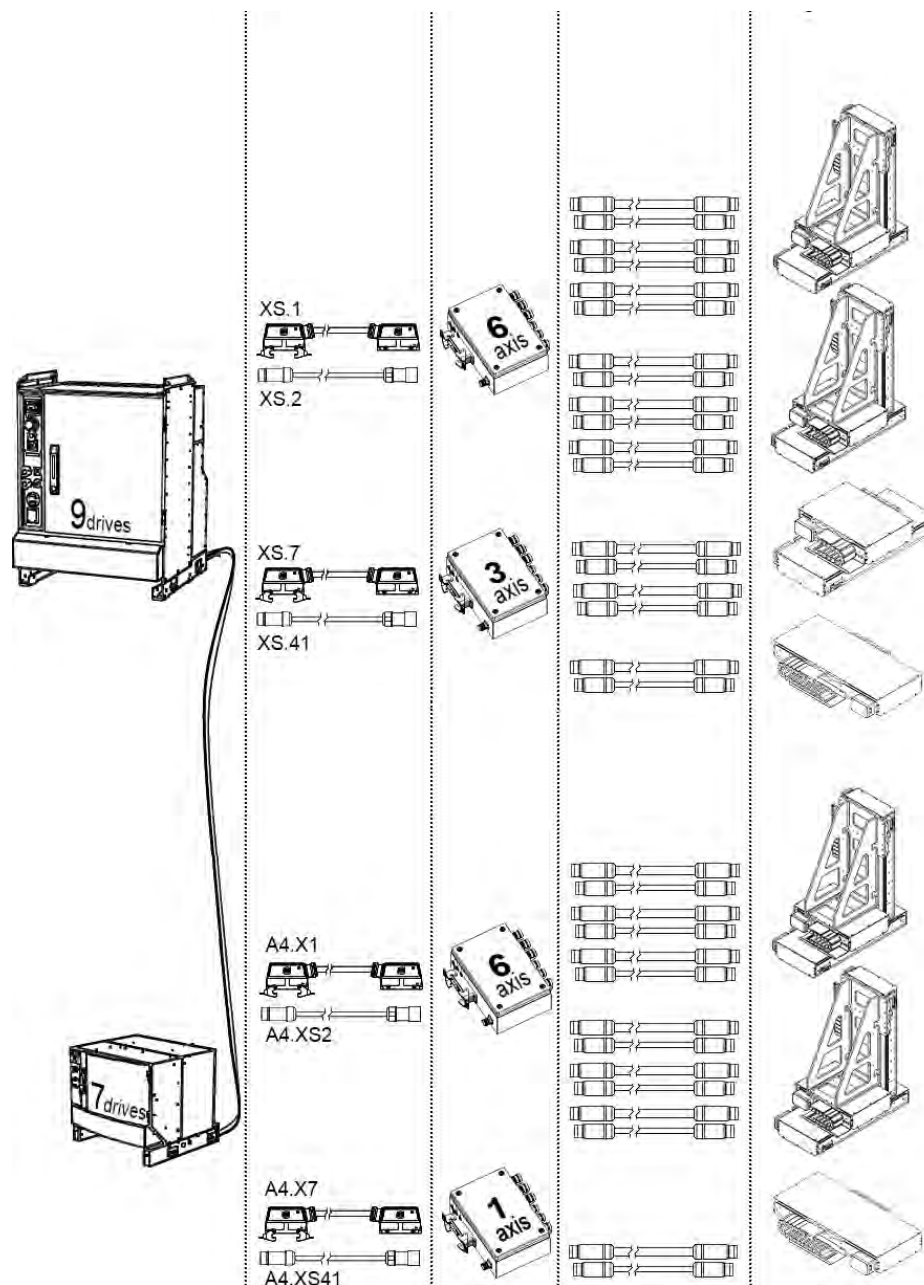
Below is an example of configuration with one IRC5 (with nine drive units) equipped with two additional drive module (one with nine drive units and the other one with six drive units), connected with two Ethernet cables and two safety cables. The IRC5 controls eight 3 axis FlexPLP IRPLP220 through three 6 axis SMB box, and two 3 axis SMB box. Since the system has eight FlexPLP IRPLP220, three mechanical units or more are grouped in two motion tasks or more.



Eight 3 axes FlexPLP IRPLP220

System example: Four 3 axis FlexPLP IRPLP220, one 2 axis FlexPLP IRPLP220, and two 1 axis FlexPLP IRPLP220

Below is an example of configuration with one IRC5 (with nine drive units) equipped with one additional drive module (with seven drive units). The IRC5 controls four 3 axis FlexPLP IRPLP220, one 2 axis FlexPLP IRPLP220, and two 1 axis FlexPLP IRPLP220 through two 6 axis SMB box, one 3 axis SMB box, and one 1 axis SMB box. Since the system has seven FlexPLP IRPLP220, two mechanical units or more are grouped in one motion task or more.



Four 3 axes FlexPLP IRPLP220 one 1 axes FlexPLP IRPLP220 one 2 axis FlexPLP IRPLP220

4.3.5. Configuration files

Overview

In order for the controller to identify that the FlexPLP exists and to control it, configuration files must be loaded into the IRC5 system.

Two files need to be set:

- The Motion Control file: MOC.cfg
- The System file: SYS.cfg

The Motion control file is provided with the product.

The system file should be set depending on your existing system and the layout.

Detailed instructions regarding the setting and loading of these files can be found in the following controller documentation:

- ***3HAC021313-001 - Product manual, IRC5 Robot Controller***
- ***3HAC035738-001 - Product Manual, IRC5 Compact***
- ***3HAC16590-1 - Operating manual, IRC5 with FlexPendant***

Once the parameters are properly set in the system, calibrate the unit(s) as described in [Calibration on page 71](#).

5 Calibration

5.1. Introduction / When to calibrate

General

This chapter includes general information and detailed procedures about the calibration methods: The fine calibration and the update of the revolution counters.

When to perform a fine calibration

The fine calibration of the FlexPLP must be done at the first commissioning or after the replacement of mechanical parts such as:

- Servomotor
- driving belt/pulley or gear/rack
- Ballscrew
- Replacement of a complete axis

For FlexPLP IRPLP220 without calibration index system, an Ø8 x 100 mm pin is required to perform the fine calibration.

For FlexPLP IRPLP220 with calibration index system, an Ø8 x 50 mm pin is required to perform the fine calibration.

When to update the revolution counters

The FlexPLP axis must be calibrated each time the contents of the revolution counter are changed or lost. This will occur when:

- The battery is discharged
- A resolver error occurs
- The signal between a resolver and measurement board is interrupted (for example: cable disconnected)
- A FlexPLP axis is moved with the control system disconnected

The revolution counters must also be updated after the device and controller are connected at the first installation.

Power failure

There's no need to calibrate the FlexPLP after a power failure, the backup battery included in the SMB box will store the resolver position until power is restored.

Precautions



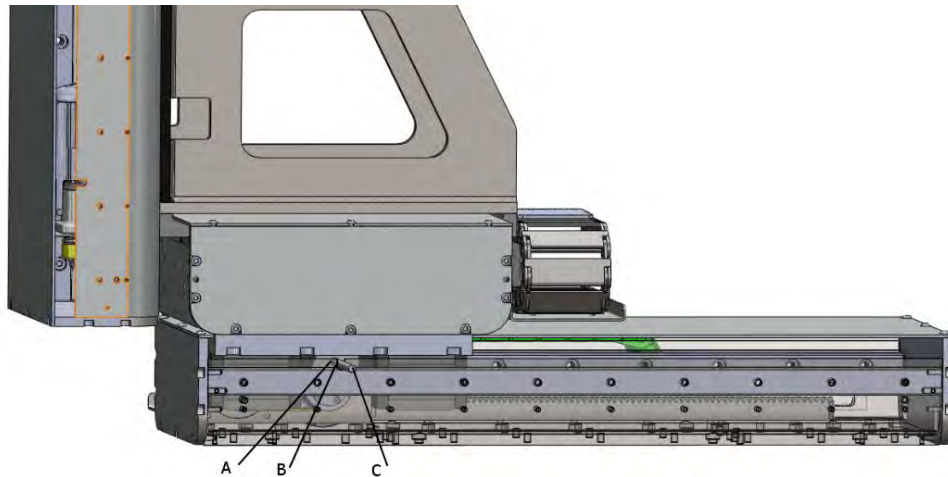
CAUTION!

- If an axis is incorrectly calibrated or if the revolution counter is incorrectly updated, it will cause incorrect positioning, which in turn may cause damage or injury! Check the calibration position very carefully after each update.
- Before any service work, make sure that nobody stands near the mechanical unit when the carriage moves, and make sure that no object which could get in the way of the carriage or jam between the carriage and the covers.

5.2. Calibration points

Calibration point, without calibration index system

For the FlexPLP IRPLP220 without calibration index system, there is only one calibration hole on the basement body. And the carriage has a corresponding calibration hole. The calibration point is reached when the two calibration holes align exactly with each other. An Ø8 x 100 pin should be used to do the fine calibration.



Calibration holes on basement and carriage

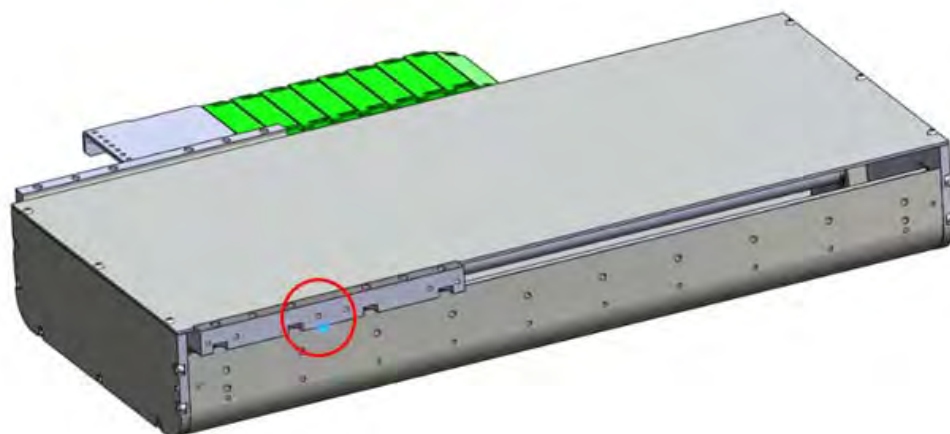
A	One calibration hole on the side plate of the basement. NOTE: To make the calibration hole on the carriage visible, here the side plate of the basement is made semi-transparent.
B	Calibration hole on the carriage
C	Calibration pin



NOTE!

As FlexPLP IRPLP220 without calibration index system has flexible installation methods for both parts and axes combination, there are only one calibration point for each axis.

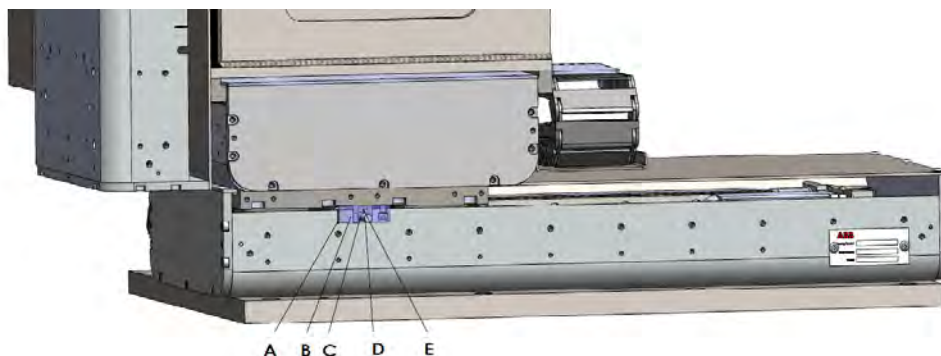
Here are the location of the calibration holes on the side plate of FlexPLP IRPLP220 basement.



Calibration holes per axis

Calibration point, with calibration index system

For the FlexPLP IRPLP220 with calibration index system, the calibration index system was installed on one side of the carriage. And there is a corresponding calibration hole on the basement body side. The calibration point is reached when the two calibration holes align exactly with each other. An Ø8 x 50 pin should be used to do the fine calibration.



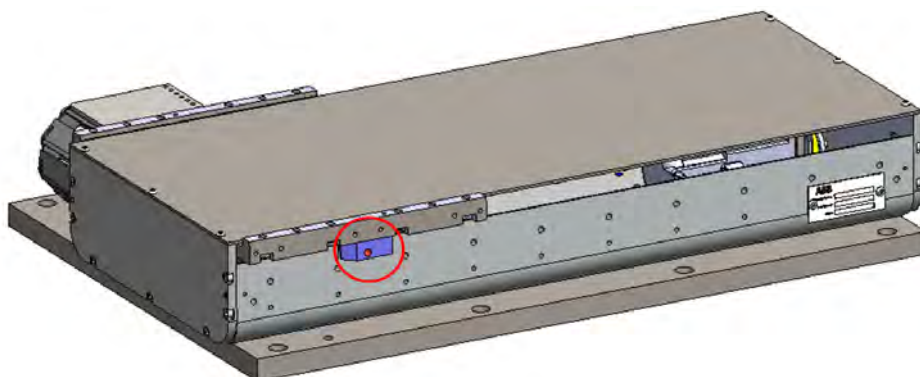
Calibration holes on basement and index system

A	Calibration mark on the side plate of the basement.
B	Calibration index system
C	Calibration hole on the index system. NOTE: To make the calibration hole on the basement body visible, here the calibration index system is made semi-transparent.
D	Calibration pin
E	Calibration hole on basement



NOTE!

As FlexPLP IRPLP220 with calibration index system has flexible installation methods for both parts and axes combination, there are only one calibration index system for each axis. Here are the location of the calibration holes on the index system of FlexPLP IRPLP220.



Calibration index system per axis

5.3. Fine calibration

Calibration Pin, without calibration index system

The fine calibration of the FlexPLP without calibration index system must be done with an Ø8 x 100 mm calibration pin.



TIP!

You can order a calibration pin from ABB under the reference number 3HAW050041927. See [Special tools on page 99](#)

Calibration Pin, with calibration system

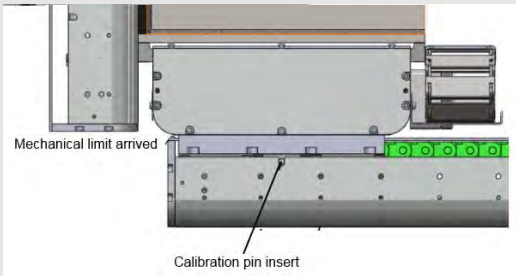
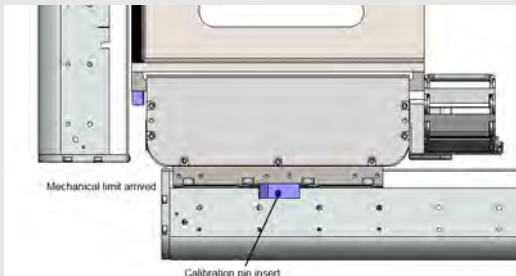
The fine calibration of the FlexPLP with calibration index system must be done with an Ø8 x 50 mm calibration pin.


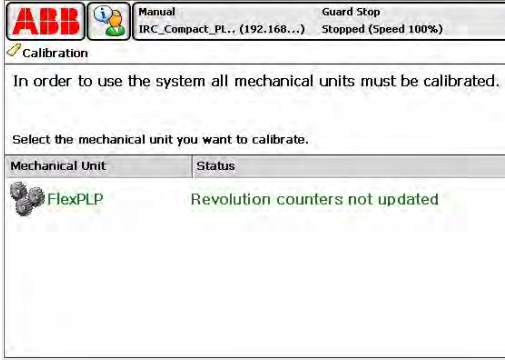
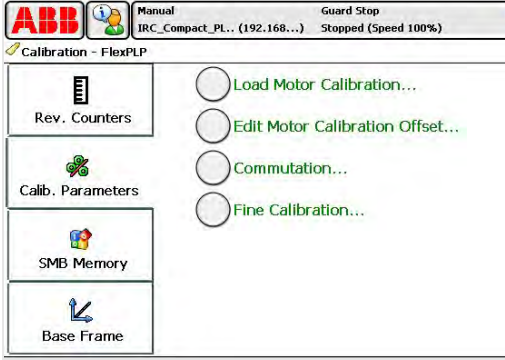


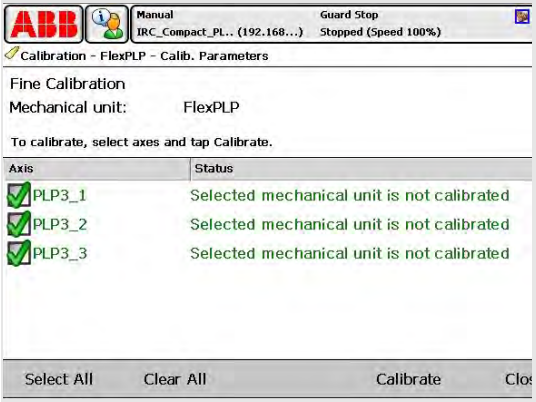
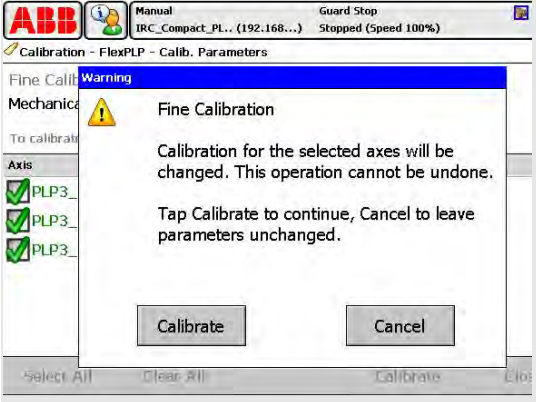
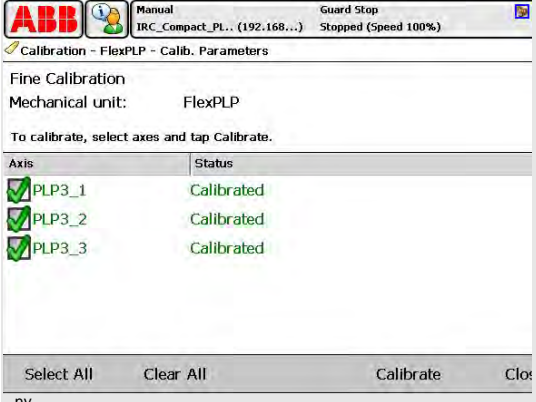
TIP!

You can order a calibration pin from ABB under the reference number 3HAW050041930. See [Special tools on page 99](#)

Procedure

Steps	Action	Info/Illustration
1.	Using the FlexPendant, jog the carriage or calibration index system close to the calibration point. See Jogging axes of a unit with FlexPendant on page 54 .	
2.	Jog the axis slowly until the two calibration holes are aligned Insert the calibration pin.	 <p>Fine calibration_without index system</p>  <p>Fine calibration_with index system</p>

Steps	Action	Info/Illustration
3.	On the FlexPendant, tap on the ABB logo to access the ABB menu and tap on Calibration .	 
4.	Tap to select the mechanical unit and then tap to select Calib.Parameters . Tap Fine Calibration.... , a dialog box is displayed prompting to performing the actual calibration. A warning that updating the revolution counters can change. Programmed FlexPLP IRPLP220 positions are also displayed. Tap Yes to proceed.	

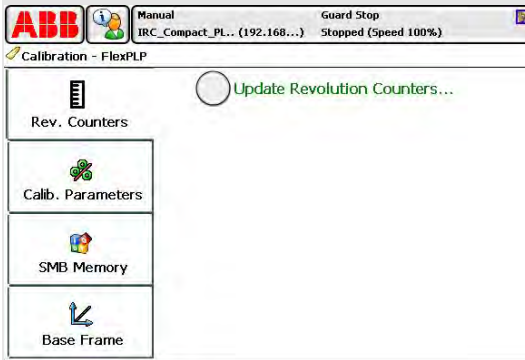
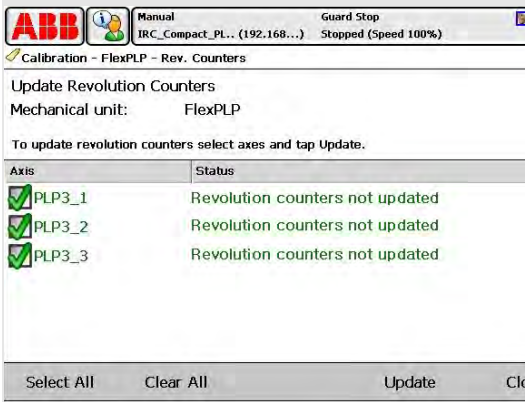
Steps	Action	Info/Illustration
5.	Select the check-box for the axis to calibrate.	
6.	<p>Tap Calibrate. A dialog box is displayed, warning that calibration of the selected axes will be changed, which cannot be undone:</p> <p>Tap Calibrate to proceed. Then a dialog box announcing that the calibration process has started would display.</p> <p>To cancel the calibration, tap Cancel</p>	
7.	The axis is calibrated and the system returns to the list of available mechanical units.	

Continues on next page

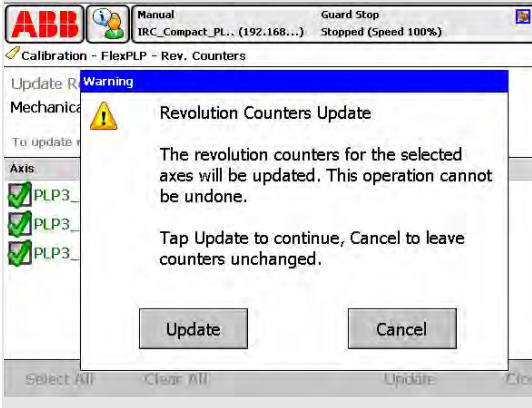
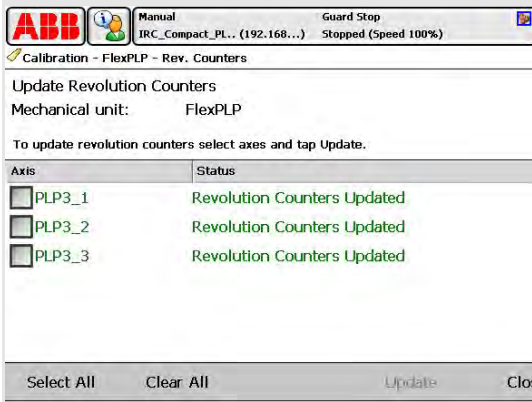
Procedure

y

5.4. Update of the revolution counters

Steps	Action	Info/Illustration								
3.	Tap to select the mechanical unit and then tap to select Rev.Counters . Tap Update Revolution counters... , a dialog box will display warning that updating the revolution counters may change programmed FlexPLP positions. Tap Yes to display the axis selection window.									
4.	Select the axis to have its revolution counter updated by ticking in the box to its left. Or tapping Select all to and then tapping Update to update revolution counters for all axes.	 <table><thead><tr><th>Axis</th><th>Status</th></tr></thead><tbody><tr><td><input checked="" type="checkbox"/> PLP3_1</td><td>Revolution counters not updated</td></tr><tr><td><input checked="" type="checkbox"/> PLP3_2</td><td>Revolution counters not updated</td></tr><tr><td><input checked="" type="checkbox"/> PLP3_3</td><td>Revolution counters not updated</td></tr></tbody></table>	Axis	Status	<input checked="" type="checkbox"/> PLP3_1	Revolution counters not updated	<input checked="" type="checkbox"/> PLP3_2	Revolution counters not updated	<input checked="" type="checkbox"/> PLP3_3	Revolution counters not updated
Axis	Status									
<input checked="" type="checkbox"/> PLP3_1	Revolution counters not updated									
<input checked="" type="checkbox"/> PLP3_2	Revolution counters not updated									
<input checked="" type="checkbox"/> PLP3_3	Revolution counters not updated									

5.4. Update of the revolution counters

Steps	Action	Info/Illustration
5.	<p>Tap Update. A dialog box is displayed, warning that calibration of the selected axes will be changed, which cannot be undone.</p> <p>Tap Calibrate to proceed.</p> <p>Tap Cancel to cancel.</p>	
6.	<p>Tap Update to update the selected revolution counters and removes the tick from the list of axes.</p>	

5.4. Update of the revolution counters

6 Maintenance

6.1. Introduction

General

This chapter details all maintenance activities recommended for the FlexPLP.

It is based on the maintenance schedule, located in the beginning of the chapter. The schedule contains information about required maintenance activities including intervals and refers to procedures for the activities. Each procedure contains all information required to perform the activity, for example: required tools and materials. The procedures are gathered in different sections, divided according to the maintenance activity.

Safety information

Observe all safety information before conducting any service work!

There are general safety aspects that must be read through, as well as more specific safety information that describe danger and safety risks when performing the procedures. Read [Safety on page 11](#) before performing any service work.

Precautions



The precautions below should be observed before proceeding with the maintenance of the FlexPLP.

CAUTION!

- Before any intervention on the mechanical and electrical components, all power supplies to the FlexPLP as well as to other machines within the danger zone must be turned off.
- If required, the main switch should be locked.
- Make sure that the pneumatic system is not pressurized.
- Use only original ABB spare parts. The use of unauthorized parts or others than original parts will void the warranty.

Required equipment

Equipment	Note
Handling equipment	Specified in Handling/lifting on page 48 .
Standard toolkit	Specified in Standard toolkit on page 98 .
Other tools and procedures may be required. See references to these procedures in the step-by-step instructions below.	Specified in Special tools on page 99 .

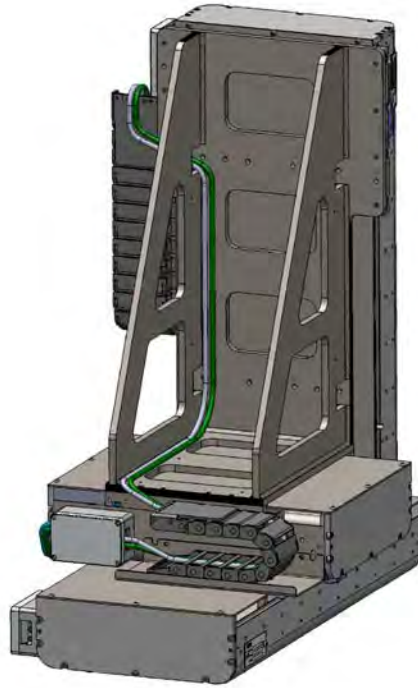
Bolts and screws and tightening torques

Specified in [Bolt, screws, tightening torques on page 97](#).

Maintenance position

Before proceeding any service work, FlexPLP IRPLP220 must be in its maintenance position: horizontal axes carriages on their mid-stroke and vertical axis carriage in low position.

The mounting method of the vertical axis showing below is carriage plate fixed with the triangle bracket.



Maintenance position

6.2. Maintenance planning

The FlexPLP IRPLP220 must be maintained regularly to ensure proper function. The maintenance activities and intervals are described in the table below.

Non-predictable situations also give rise to inspections of the product. Any damages must be attended to immediately!

The inspection intervals do not specify the life of each component.

Item	Maintenance	Interval	More info.
General condition	Covers removed, inspect the condition of the unit and clean it thoroughly.	1 month	Inspection on page 84.
Cables and connectors	Look for wearing or damages.	1 month	
cable chains	Look for wearing or damages.	1 month	
Linear guide ways and ball bearings blocks	Inspect, clean, and lubricate	3 month or every 100 km	Lubrication on page 85.
Ballscrew	Inspect, clean, and lubricate	3 month or every 100 km	
Driving belt	<ul style="list-style-type: none"> Look for premature wearing. Measure the belt tension and adjust it if necessary. Replace the belt in case of apparent damage. 	1 year	Driving belt (tension check, adjustment and replacement) on page 87.
Pinion and rack and gearbox	Inspect, clean, temperature and lubricate.	3 month or every 100 km	
SMB box back-up battery	Replace the battery	Battery low alert (1)	SMB Battery pack replacement on page 91.



NOTE!

Battery low alert (38213 Battery charge low) is displayed when remaining backup capacity (robot powered off) is less than two months. Typical lifetime of a new battery is 36 months if the robot is powered off 2 days/week or 18 months if the robot is powered off 16 h/day. The lifetime can be extended (approx. 3 times) for longer production breaks by a battery shutdown service routine. See *Operating manual - IRC5 with FlexPendant* for instructions.

6.3. Inspection

General

A thorough inspection of the FlexPLP IRPLP220 should be done at least once a year.

All covers removed, clean the unit with a lint free cloth.



CAUTION!

Before any intervention on the mechanical and electrical components, all power supplies to FlexPLP IRPLP220 as well as to other machines within the danger zone must be turned off. Remember to go first through the inspections that require the system to be live (for example: test of all electrical functions and search for abnormal noise).

Emergency stop

To check the emergency stop function, the unit must be stationary. Press the emergency stop button and perform the procedure for restart after an emergency stop as detailed in the controller documentation.

Electrical functions

Test all the electrical functions.

Make sure that each carriage can reach the limits of its stroke.

Abnormal noise

Look for any abnormal noise, for example: bearing noise.

Cables

Inspect all cables. If a cable is damaged due to wear or pinching, replace it. If a cable rubs against sharp edges, extend the cable so that it hangs freely.

Contacts

Make sure that all plugs are properly connected and that there is no clearance.

Cable chain

Check the condition of the cable chain and in particular the state of the mechanical links and the fastening points (carriage and base plate).

6.4. Lubrication

General

For ballscrew type of FlexPLP IRPLP220, each axis of FlexPLP IRPLP220 has 5 lubrication points: On the four ball bearings block, and on the ballscrew nut.

For gear and rack type of FlexPLP IRPLP220, each axis of FlexPLP IRPLP220 has 4 lubrication points on the four ball bearings block and rack need lubrication.



WARNING!

Use lithium soap grease, class NLGI 0, with a mineral oil base, doped with EP (extreme pressure) additives. The base oil viscosity must be ISO VG68 to ISO VG 100. Grease doped with EP additives is absolutely necessary, due to high loads on blocks.

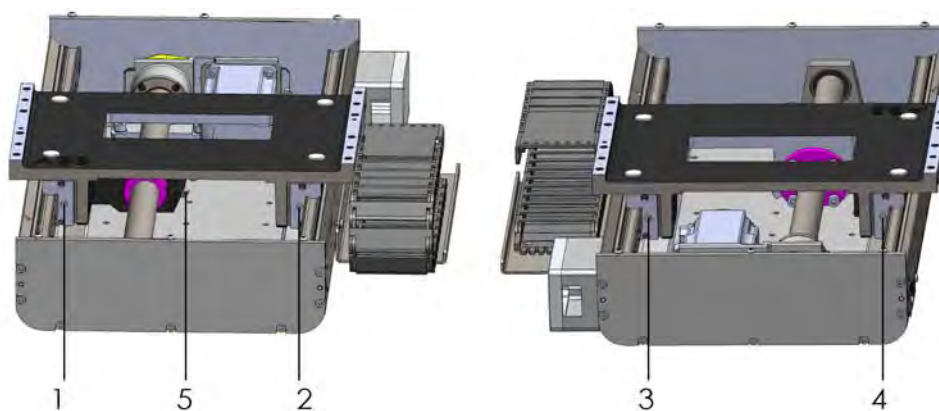
Equipment	Note
Lubricant	CASTROL Longtime PD0
Lubricant	KLÜBER Microlube GB0
Lubricant	TOTAL Multis EP 0

Lubrication ports of ballscrew type

To access the lubrication ports of the horizontal axis, make sure that the carriage is in maintenance position (mid-stroke) and remove the upper and side covers.

If necessary, clean the ballscrew and/or the linear guides with a lint-free cloth and slightly lubricate them with a brush.

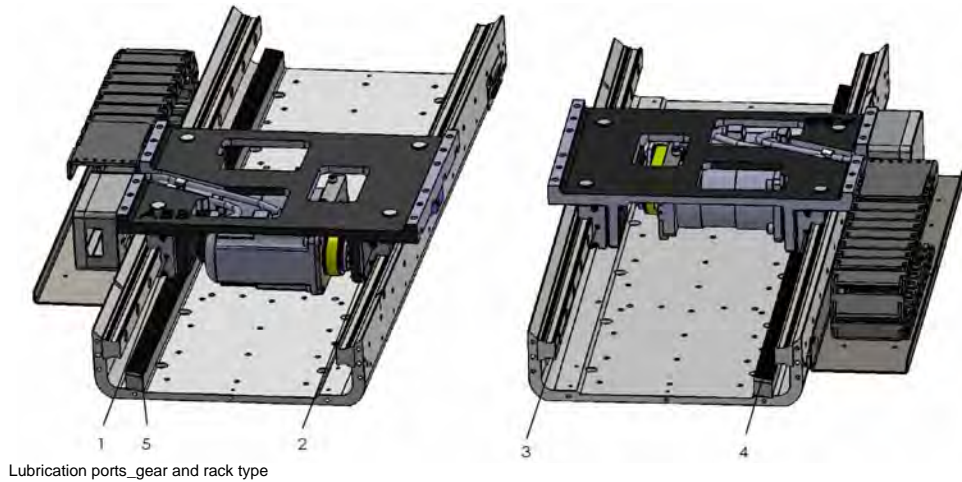
Use a manual pump to inject grease in the five nipples. If difficult to reach the nut grease nipple for small strokes, try to move the carriage to the end. If necessary, remove the flange frame.



Lubrication ports_ ballscrew type

Port 1,2,3,4	Ball bearing blocks
Ports 5	Nut of the ballscrew

Lubricate ports of gear and rack type



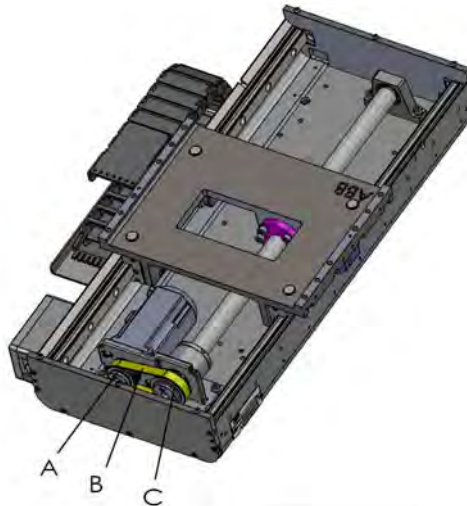
Port 1,2,3,4	Ball bearing blocks
Port 5	Racks

6.5. Driving belt (tension check, adjustment and replacement)

Inspection

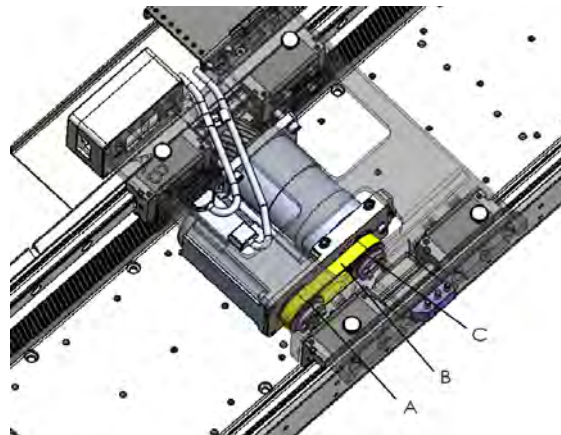
To inspect the driving belt of a horizontal axis, remove the upper cover.

To inspect the belt of a vertical axis, it is necessary to remove the axis from the horizontal axis or surface place to which it is attached.



Driving belt location_ballscrow

A	Motor shaft pulley
B	Driving belt
C	Ballscrew shaft pulley



Driving belt location_Rack and Pinion

A	Motor shaft pulley
B	Driving belt
C	Gearbox shaft pulley

Wearing of the belt is normal and the presence of a reasonable quantity of black dust should not be alarming. If however the belt shows signs of advanced wearing, it should be replaced ([Spare parts on page 101](#)). In any case, you should measure the tension of the belt and, if necessary, adjust it.

6.5. Driving belt (tension check, adjustment and replacement)

Tension of the belt

The easiest and most reliable method to measure the belt tension is to use a tension gauge with an optical resonance frequency meter, such as the Continental CONTITECH VSM-1.

Below is the correct value for the belt tension

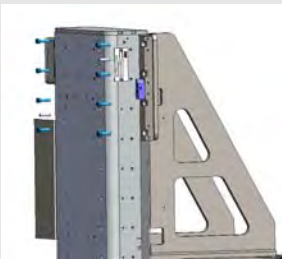
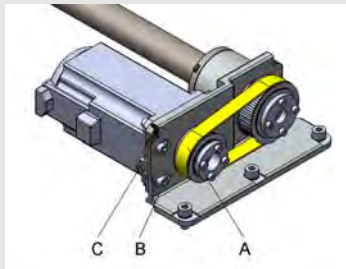
Item	Belt resonance frequency
Ballscrew	185 Hz \pm 5Hz
Rack & pinion	175 Hz \pm 5Hz



TIP!

You can order a tension gauge (Continental CONTITECH VSM-1) from ABB under the reference number 3HAW050009048. See [Special tools on page 99](#)

Adjustment or replacement of the belt of Ballscrew unit

Steps	Actions	Info/Illustration
1.	FlexPLP IRPLP220 must be in maintenance position (horizontal carriage at mid stroke, vertical axis in low position)	
2.	For vertical axis, Remove the eight M8 screws and two dowel pins Ø8 mm from the vertical axis and take it off the interface bracket. Lay the axis horizontally on the worktable.	 Vertical axis maintenance
3.	Remove the upper cover to clear the access to the belt.	
4.	Measure the tension of the belt (A), preferably with a tension gauge. If the tension is out of range, slightly loosen the four M6 (B) screws on motor mounting bracket.	 Driving belt adjustment

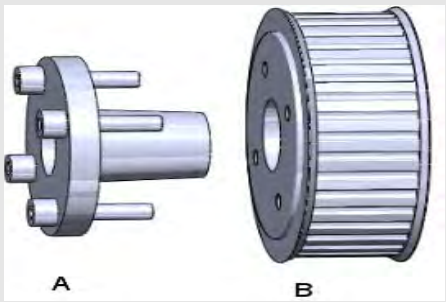

6.5. Driving belt (tension check, adjustment and replacement)

Steps	Actions	Info/Illustration
5.	<p>Assembly a the adjusting hex cap M5 screw (C) and slightly tighten or loosen the screw using a 8 mm wrench adjust the belt to desired tension.</p> <p>When the desired tension is achieved, tighten the four motor mounting bracket screw and check the tension again.</p> <p>Remove the adjusting M5 screw (C)</p> <p>Put the cover back.</p>	
6.	<p>If a replacement of the belt and/or the pulley is needed, remove the end flange to clear access to the locking device (A). Remove the locking screws and screw them in the adjacent holes to pull the device out.</p> <p>Remove the motor mounting bracket screws to loosen the belt and extract the belt and pulleys (B).</p> <p>To re-assemble, proceed in opposite order.</p> <p>The belt must be perfectly aligned on the two pulleys.</p> <p>The locking device screws must be tightened in a gradual uniform way, increasing the torque on each equally to 5Nm.</p>	<p>The illustration shows two components. Component A is a locking device with four screws. Component B is a belt and pulley assembly.</p>

Adjustment or replacement of the belt of Rack and Pinion unit

Steps	Actions	Info/Illustration
1.	FlexPLP IRPLP220 must be in maintenance position (horizontal carriage at mid stroke)	
2.	Remove the upper cover to clear the access to the belt.	
3.	<p>Measure the tension of the belt (A), preferably with a tension gauge.</p> <p>If the tension is out of range, slightly loosen the four M6 (B) screws on motor mounting bracket.</p>	<p>The illustration shows a close-up of the driving belt adjustment process. Label A points to the belt, label B points to the motor mounting bracket, and label C points to the adjusting screw.</p> <p>Driving belt adjustment</p>

6.5. Driving belt (tension check, adjustment and replacement)

Steps	Actions	Info/Illustration
4.	<p>Assembly a adjusting M5 screw (C) and slightly tighten the adjusting M5 screw (C) using a M4 hexagonal spanner to adjust the belt to desired tension.</p> <p>When the desired tension is achieved, tighten the four motor mounting bracket screw and check the tension again.</p> <p>Remove the adjusting M5 screw (C).</p> <p>Put the cover back.</p>	
5.	<p>If a replacement of the belt is needed, loosen and remove the belt. If replacement of a pulley need, loosen the belt and remove the end flange.</p> <p>Using plastic rail to protect rail blocks (C) and take out the carriage system. Clear access to the locking device (A). Remove the locking screws and screw them in the adjacent holes to pull the device out.</p> <p>Remove the motor mounting bracket screws to loosen the belt and extract the belt and pulleys (B).</p> <p>To re-assemble, proceed in opposite order.</p> <p>The belt must be perfectly aligned on the two pulleys.</p> <p>The locking device screws must be tightened in a gradual uniform way, increasing the torque on each equally to 5Nm.</p>	 

6.6. SMB Battery pack replacement

General

The SMB box uses a battery for the memory backup in order to maintain position data. The battery reference number is 3HAC16831-1.

The battery should be replaced:

- Every three years.
- When the battery is going flat. This is generally shown by an error code on the FlexPendant screen (38213). Information about error codes can be found in the FlexPendant documentation.




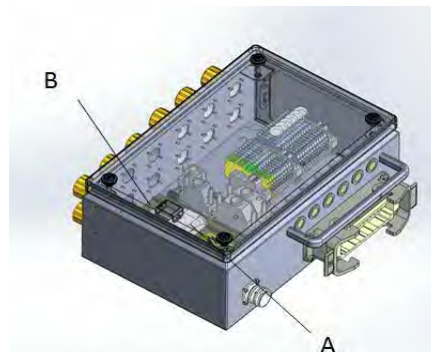
NOTE!

In a new system the batteries are charged to full capacity after a few hours in STANDBY mode.

Instructions

Replace the SMB battery as follows:

	Action
1.	Position all of the carriages at the calibration point. See Calibration points on page 72 .
2.	Switch off the power on the SMB box.  warning WARNING! Turn off all electric power and pneumatic pressure supplies to the unit!
3.	Open the SMB box and locate the battery.
4.	Cut the plastic straps.
5.	Unplug the 2 wires cable from the board and remove the battery pack.
6.	Place the new battery pack, plug the connector on the board, and secure the pack with straps.
7.	Close the SMB box, switch on the power.
8.	Update the revolution counters of each axis.



SMB Box

A	Battery
B	Board

6.7. Repair information

Replacement of critical parts

Some critical components require to be replaced by appropriately trained ABB personnel.

In the case of failure of the parts listed below, please contact ABB in order to arrange an on-site repair by an ABB technician, or send the unit (or axis) for “exchange repair”:

- The ballscrews
- The motor
- The gearbox
- The racks and pinion
- The rails

7 Decommissioning

7.1. Decommissioning

Safety information

Before any service work is commenced, it is extremely important that all safety information is observed! Read [Safety on page 11](#) before performing any service work.

Precautions

The precautions below should be observed before proceeding with the decommissioning of the FlexPLP:



CAUTION!

- All power supplies to the FlexPLP as well as to other machines within the danger zone must be turned off. Make sure that the pneumatic circuit is not pressurized.
- If required, the main switch should be locked.

Required equipment

Equipment	Note
Handling equipment	Specified in Handling/lifting on page 48 .
Standard toolkit	Specified in Standard toolkit on page 98 .

Hazardous material

The table specifies some of the materials in the product and their respective use throughout the product. Dispose of the components properly to prevent health or environmental hazards.

Material	Example application
Aluminum	Cable box, and so on.
Copper alloy	Cable, motor, and so on.
Steel	Gears, screws, nuts, and so on.
Plastic / Rubber (PVC)	Cables, connectors, belt, and so on.

Oil and grease

Where possible, arrange for the oil and grease to be recycled. Dispose of oil and grease via an authorized person/contractor in accordance with local regulations. Do not dispose of oil and grease near lakes, ponds, ditches, down drains or onto soil. Incineration must be carried out under controlled conditions in accordance with local regulations. Also note that:

- Spills may form a film on water surfaces causing damage to organisms. Oxygen transfer could also be impaired. Spillage may penetrate the soil causing ground water contamination.

7.1. Decommissioning

8 Reference information

8.1. Introduction

General

This chapter includes general information, complementing the more specific information in the different procedures in the manual.

8.2. Unit conversion

Converter table

Use the following table to convert units used in this manual.

Quantity	Unit		
Length	1 m	3.28 ft	39.37 in
Weight	1 kg	2.21 lb	
Pressure	1 bar	100 kpa	14.5 psi
Force	1 N	0.738 lbf	
Moment	1 N.m	0.738 lbf·tn	
Volume	1 L	0.264 US gal	

8.3. Bolt, screws, tightening torques

Bolt and screws

Before tightening any screw, observe the following:

- Determine whether a standard tightening torque or special torque is to be applied. The standard torques are specified in the following tables. Any special torques are specified in the repair, maintenance or installation procedure descriptions. Any special torque specified overrides the standard torque! Use the correct tightening torque for each type of screw joint.
- Only use correctly calibrated torque wrench.
- Always tighten the joint by hand, and never use pneumatic tools. Use the correct tightening technique, tighten the screw in a slow, flowing motion. Maximum allowed total deviation from the specified value is 10%!



NOTE!

Unless indicated otherwise, the bolts used on (or provided with) the FlexPLP are of class 8.8.



NOTE!

Unless indicated otherwise, all bolts must be clean of oil or grease and tightened with a mild thread-locker such as Loctite 243.

Standard tightening torques

The following table specifies the recommended standard tightening torques for hex screws and socket head hex screws:

Screw thread size	M5	M6	M8	M10	M12
Tightening torque CLASS 8.8	5.5 N.m	9.5 N.m	23 N.m	46 N.m	79 N.m
Tightening torque CLASS 10.9	8.1 N.m	14 N.m	34 N.m	67 N.m	116 N.m
Tightening torque CLASS 12.9	9.5 N.m	16.4 N.m	40 N.m	79 N.m	136 N.m

The following table specifies the recommended standard tightening torque for water and air connectors when one or both connectors are made of brass:

Dimension	Tightening torque Nm - Nominal	Tightening torque Nm - Minimal	Tightening torque Nm - Maximum
1/8	12 N.m	8 N.m	15 N.m
1/4	15 N.m	10 N.m	20 N.m
3/8	20 N.m	15 N.m	25 N.m
1/2	40 N.m	30 N.m	50 N.m
3/4	70 N.m	55 N.m	90 N.m

8.4. Standard toolkit

8.4. Standard toolkit

General

All service (repairs, maintenance and installation) procedures contain lists of tools required to perform the specified activity.

All special tools required are listed directly in the procedures while all the tools that are considered standard are gathered in the standard toolkit and defined in the table below.

This way, the tools required are the sum of the standard toolkit and any tools listed in the instruction.

Contents, standard toolkit

Qty	Tool
1	Set of spanners
1	Hex keys (Allen key) 3, 4, 5, and 6 mm, Wrench 8 mm
1	Torque wrench 5-40 Nm
1	Ratchet head for torque wrench 1/4"
1	Socket head cap 4 mm, 5 mm and 6 mm socket 1/4" bit L 20 MM (for socket head cap screws - ISO 4762)
1	Plastic mallet
1	Dowel Pin remover
1	Mild thread-locker (Recommended: Loctite 243)

8.5. Special tools

General

All service instructions contain lists of tools required to perform the specified activity. The required tools are a sum of standard tools, defined in the section [Standard toolkit on page 98](#), and of special tools, listed directly in the instructions and also gathered in this section.

Special tools

The following table specifies the special tools required during several of the service procedures. The tools are also specified directly in concerned instructions in the Product manual.

For operations on pneumatic connectors:		
Qty	Tool	Product
1	Thread sealant for conical fittings	Loctite 577
For operations on electrical parts:		
Qty	Tool	Product
1	Wire strippers	
1	Cable cutters	

Special tools available from ABB

The following table specifies the special tools required during several of the service procedures. The tools may be ordered separately and are also specified directly in concerned instructions in the Product manual.

Qty	Tool	ABB Article no.
1	Tension gauge	3HAW050009048
2	Calibration pin for FlexPLP IRPLP220 without index system	3HAW050041927
2	Calibration pin for FlexPLP IRPLP220 with index system	3HAW050041930

8.5. Special tools

9 Spare parts

9.1. Introduction

General

This chapter specifies all spare parts and replacement articles of the FlexPLP. It is divided in 4 sections:

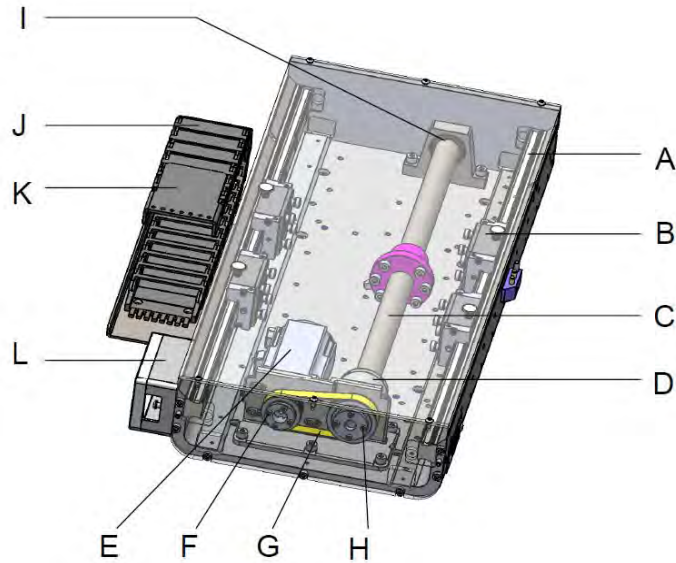
- Spare parts for ballscrew unit axes.
- Spare parts for Rack and Pinion axes, which share most of their components with ballscrew units.
- Spare parts for covers
- Electrical parts: SMB boxes, static cables.

Some spare parts must be chosen according to the strokes of your PLP: The horizontal axes exist in versions for 190 mm, 270 mm, 350 mm, 430 mm, 510 mm, 590 mm and 670 mm stroke.

In any case, contact ABB if you do not know what type of material is required for your PLP.

9.2. Spare parts ballscrew type

Ball screw type



Spare parts_ball screw type

Item	Quantity	ABB part reference no.	Note
A	2	3HAW050041851	Rail stroke 190 mm
		3HAW050041852	Rail stroke 270 mm
		3HAW050041853	Rail stroke 350 mm
		3HAW050041854	Rail stroke 430 mm
		3HAW050041855	Rail stroke 510 mm
		3HAW050041856	Rail stroke 590 mm
		3HAW050041857	Rail stroke 670 mm
B	4	3HAW050041850	Linear ball bearing block
C	1	3HAW050041871	Ballscrew stroke 190 mm type Dia. 32x5
		3HAW050041872	Ballscrew stroke 270 mm type Dia. 32x5
		3HAW050041873	Ballscrew stroke 350 mm type Dia. 32x5
		3HAW050041874	Ballscrew stroke 430 mm type Dia. 32x5
		3HAW050041875	Ballscrew stroke 510 mm type Dia. 32x5
		3HAW050041876	Ballscrew stroke 590 mm type Dia. 32x5
		3HAW050041877	Ballscrew stroke 670 mm type Dia. 32x5
D	2	3HAW050041890	Bearing
E	1	3HAW050041970	Motor
F	1	3HAW050041897	Pulley - motor shaft
G	1	3HAW050041899	driving belt
H	1	3HAW050041898	Pulley - ballscrew shaft
I	1	3HAW050041895	Bearing
J	12*	3HAW050041861	Cable chain link

Item	Quantity	ABB part reference no.	Note
K	1	3HAW050041864	Chain moving end
L	1	3HAW050041823	Cable box

*The number of chain links depend on strokes. 12 for stroke 190 mm, 14 for stroke 270 mm, 16 for stroke 350 mm, 17 for stroke 430mm, 19 for stroke 510 mm, 21 for stroke 590 mm, 23 for stroke 670 mm.

NOTE!

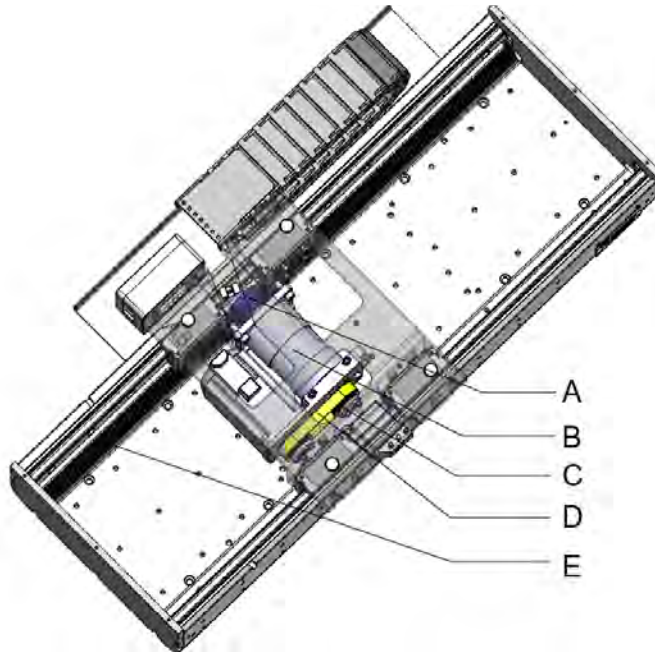
Contact ABB if you do not know whether your FlexPLP requires:

- Material for strokes
- Ballscrew type or Rack and Pinion type



9.3. Spare parts gear rack type

The outside components of the two types of FlexPLP IRPLP220 are same, as the outside cable chain, rails with linear ball bearing blocks. So here only the spare parts that are different with ballscrew type FlexPLP IRPLP220 would be described. For ABB reference No. of cable chain and other parts, please refer to [Spare parts ballscrew type on page 102](#)



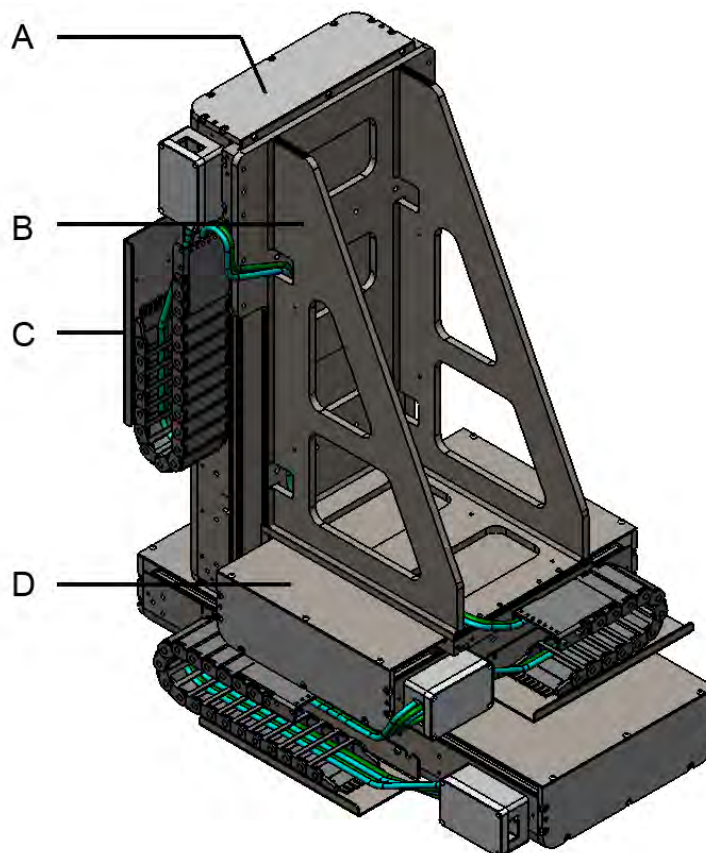
Spare part_Rack and Pinion type

A	1	3HAW050041924	Pinion
B	1	3HAW050041920	Gearbox
C	1	3HAW050041921	Pulley - gearbox shaft
D	1	3HAW050041922	driving belt
E	1	3HAW050041881*	Rack stroke 190 mm, 270 mm, 350 mm
		3HAW050041882*	Rack stroke 430 mm, 510 mm, 590 mm

*:For stroke 670 mm, the rack is combined by two 3HAW050041881.

9.4. Covers

Covers



Covers

Item	Quantity	ABB part reference no.	Note
A	1 per vertical axis	3HAW050041828	Flange frame tooling (For body moving axis)
B	1 per vertical axis	3HAW050041931	Interface Bracket stroke 190 mm
		3HAW050041932	Interface Bracket stroke 270 mm
		3HAW050041933	Interface Bracket stroke 350 mm
		3HAW050041934	Interface Bracket stroke 430 mm
		3HAW050041935	Interface Bracket stroke 510 mm
C	1 or 2	3HAW050041825	Cable tray
D	1 per axis	3HAW050041841	Cover stroke 190 mm
		3HAW050041842	Cover stroke 270 mm
		3HAW050041843	Cover stroke 350 mm
		3HAW050041844	Cover stroke 430 mm
		3HAW050041845	Cover stroke 510 mm
		3HAW050041846	Cover stroke 590 mm
		3HAW050041847	Cover stroke 670 mm

9.5. Cables**Cables: from controller to SMB box**

ABB part reference no.	Description
3HAW050008612-005	6 axis resolver static cable XS41-2 5m
3HAW050008612-010	6 axis resolver static cable XS41-2 5m
3HAW050008612-015	6 axis resolver static cable XS41-2 10m
3HAW050008614-005	3 axis motor static cable XP7 400-600V 5m
3HAW050008614-010	3 axis motor static cable XP7 400-600V 10m
3HAW050008614-015	3 axis motor static cable XP7 400-600V 15m
3HAW050008616-005	6 axis motor static cable XP1 400V 5m
3HAW050008616-010	6 axis motor static cable XP1 400V 10m
3HAW050008616-015	6 axis motor static cable XP1 400V 15m

SMB boxes

ABB part reference no.	Description
3HAW050008651	SMB box 6 axis M2011 (Does not include board & battery! Order in addition 3HAC044168-001 and 3HAC044075-001)
3HAW050008605	SMB box 3 axis M2008 (Does not include board & battery! Order in addition 3HAC044168-001 and 3HAC044075-001)
3HAC044168-001	Main board for SMB box
3HAC044075-001	Battery for SMB box
3HAW050008607	PTC Shunt M2008

Cables: from SMB box to mechanical unit

Quantity	ABB part reference no.	Description
1 per axis	3HAW050041981-002	1 Resolver Static M2008 2m
1 per axis	3HAW050041981-005	1 Resolver Static M2008 5m
1 per axis	3HAW050041981-010	1 Resolver Static M2008 10m
1 per axis	3HAW050041981-015	1 Resolver Static M2008 15m
1 per axis	3HAW050041980-002	1 Motor Static or Extension M2008 2m
1 per axis	3HAW050041980-005	1 Motor Static or Extension M2008 5m
1 per axis	3HAW050041980-010	1 Motor Static or Extension M2008 10m
1 per axis	3HAW050041980-015	1 Motor Static or Extension M2008 15m

Contact us

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