FANUC AC SERVO MOTOR @i series

DESCRIPTIONS

- No part of this manual may be reproduced in any form.
- All specifications and designs are subject to change without notice.

The products in this manual are controlled based on Japan's "Foreign Exchange and Foreign Trade Law". The export from Japan may be subject to an export license by the government of Japan.

Further, re-export to another country may be subject to the license of the government of the country from where the product is re-exported. Furthermore, the product may also be controlled by re-export regulations of the United States government.

Should you wish to export or re-export these products, please contact FANUC for advice.

The products are manufactured under strict quality control. However, when using any of the products in a facility in which a serious accident or loss is predicted due to a failure of the product, install a safety device.

In this manual we have tried as much as possible to describe all the various matters.

However, we cannot describe all the matters which must not be done, or which cannot be done, because there are so many possibilities.

Therefore, matters which are not especially described as possible in this manual should be regarded as "impossible".

SAFETY PRECAUTIONS

This "Safety Precautions" section describes the precautions which must be observed to ensure safety when using FANUC AC servo motors.

Users of any servo motor model are requested to read this "Safety Precautions" carefully before using the servo motor.

The users are also requested to read this manual carefully and understand each function of the motor for correct use.

The users are basically forbidden to do any behavior or action not mentioned in the "Safety Precautions." They are invited to ask FANUC previously about what behavior or action is prohibited.

Contents

DEFINITION OF WARNING, CAUTION, AND NOT	ΓEs-2
WARNING	s-3
CAUTION	s-6
NOTE	s-8
CAUTION LARFI	

DEFINITION OF WARNING, CAUTION, AND NOTE

This manual includes safety precautions for protecting the user and preventing damage to the machine. Precautions are classified into Warning and Caution according to their bearing on safety. Also, supplementary information is described as a Note. Read the Warning, Caution, and Note thoroughly before attempting to use the machine.

↑ WARNING

Applied when there is a danger of the user being injured or when there is a damage of both the user being injured and the equipment being damaged if the approved procedure is not observed.

↑ CAUTION

Applied when there is a danger of the equipment being damaged, if the approved procedure is not observed.

NOTE

The Note is used to indicate supplementary information other than Warning and Caution.

Those items described in CAUTION, if not observed, may lead to a serious result, depending on the situation. Each description of CAUTION provides important information. So, be sure to observe CAUTION.

- Read this manual carefully, and store it in a safe place.

WARNING

⚠ WARNING

- Be sure to ground a motor frame.

To avoid electric shocks, be sure to connect the grounding terminal in the terminal box to the grounding terminal of the machine.

- Before starting to connect a motor to electric wires, make sure they are isolated from an electric power source.

A failure to observe this caution is vary dangerous because you may get electric shocks.

- Do not ground a motor power wire terminal or short-circuit it to another power wire terminal.

A failure to observe this caution may cause electric shocks or a burned wiring.

- * Some motors require a special connection such as a winding changeover. Refer to Chapter 7, "OUTLINE DRAWINGS" for details.
- When connecting a cord such as a power line to the terminal block, use specified tightening torque to firmly connect the cord.

If operation is performed with a loose terminal, the terminal block can overheat, resulting in a fire. Moreover, a terminal can be detached, resulting in a ground fault, short circuit, or electric shock.

 Do not apply current when a terminal of the terminal block or the crimp terminal of a power line is exposed.

If the hand or a conductive object touches a terminal of the terminal block or the crimp terminal of a power line, you may get electric shocks. Attach an insulation cover (accessory) onto the terminal block. Moreover, cover the crimp terminal at the tip of a power line with an insulation tube.

- Assemble and install a power connector securely.

If a power line is detached due to a failure in crimping or soldering, or a conductive area is exposed due to a failure in shell assembly, you may get electric shocks.

- Do not touch a motor with a wet hand.

A failure to observe this caution is vary dangerous because you may get electric shocks.

- Before touching a motor, shut off the power to it.

Even if a motor is not rotating, there may be a voltage across the terminals of the motor.

Especially before touching a power supply connection, take sufficient precautions.

Otherwise you may get electric shocks.

⚠ WARNING

- Do not touch any terminal of a motor for a while (at least 5 minutes) after the power to the motor is shut off.

High voltage remains across power line terminals of a motor for a while after the power to the motor is shut off. So, do not touch any terminal or connect it to any other equipment. Otherwise, you may get electric shocks or the motor and/or equipment may get damaged.

- On the machine, install a stop device for securing safety.

The brake built into the servo motor is not a stop device for securing safety. The machine may not be held if a failure occurs.

- Do not enter the area under the vertical axis without securing safety.

If a vertical axis drop occurs unexpectedly, you may be injured.

- Fasten a motor firmly before driving the motor.

If a motor is driven when the motor is not fastened firmly or is fastened insufficiently, the motor can tumble or is removed, resulting in a danger. If the motor mounting section is not sufficiently strong, the machine may be damaged or the user may be injured.

- Do not get close to a rotary section of a motor when it is rotating.

When a motor is rotating, clothes or fingers can be caught, resulting in an injury.

- Do not drive a motor with an object such as a key exposed.

An object such as a key can be thrown away, resulting in an injury. Before rotating a motor, check that there is no object that is thrown away by motor rotation.

- Do not apply a radial load exceeding the "allowable radial load".

The shaft can break, and components can be thrown away. When the vertical axis is involved, a vertical axis drop can occur.

- To drive a motor, use a specified amplifier and parameters.

An incorrect combination of a motor, amplifier, and parameters may cause the motor to behave unexpectedly. This is dangerous, and the motor may get damaged.

- Do not bring any dangerous stuff near a motor.

Motors are connected to a power line, and may get hot. If a flammable is placed near a motor, it may be ignited, catch fire, or explode.

- Be safely dressed when handling a motor.

Wear safety shoes or gloves when handling a motor as you may get hurt on any edge or protrusion on it or electric shocks.

⚠ WARNING

- Use a crane or lift to move a motor from one place to another.

A motor is heavy, so that if you lift a motor by hand, you may be exposed to various risks. For example, the waist can be damaged, and the motor can drop to injure you. Use equipment such as a crane as needed. (For the weight of a motor, see Chapter 6, "SPECIFICATIONS".)

- Do not touch a motor when it is running or immediately after it stops.

A motor may get hot when it is running. Do not touch the motor before it gets cool enough. Otherwise, you may get burned.

- Be careful not get your hair or cloths caught in a fan.

Be careful especially for a fan used to generate an inward air flow. Be careful also for a fan even when the motor is stopped, because it continues to rotate while the amplifier is turned on.

- Install the components around a motor securely.

If a component is displaced or removed during motor rotation, a danger can result.

CAUTION

⚠ CAUTION

- Use the eyebolt of a motor to move the motor only.

When a motor is installed on a machine, do not move the machine by using the eyebolt of the motor. Otherwise, the eyebolt and motor can be damaged.

- Do not disassemble a motor.

Disassembling a motor may cause a failure or trouble in it.

If disassembly is in need because of maintenance or repair, please contact a service representative of FANUC.

For pulse coder replacement, refer to the maintenance manual (B-65285EN or B-65325EN).

- Do not machine and modify a motor.

Do not machine and modify a motor in any case except when motor machining or modification is specified by FANUC. Modifying a motor may cause a failure or trouble in it.

- Do not conduct dielectric strength or insulation test for a sensor.

Such a test can damage elements in the sensor.

- Be sure to connect motor cables correctly.

An incorrect connection of a cable cause abnormal heat generation, equipment malfunction, or failure. Always use a cable with an appropriate current carrying capacity (or thickness). For how to connect cables to motors, refer to Chapter 7, "OUTLINE DRAWINGS".

- Do not apply shocks to a motor or cause scratches to it.

If a motor is subjected to shocks or is scratched, its components may be adversely affected, resulting in normal operation being impaired. Plastic components and sensors can be damaged easily. So, handle those components very carefully. In particular, do not lift a motor by using a plastic component, connector, terminal block, and so forth.

- Do not step or sit on a motor, and do not put a heavy object on a motor.

If you step or sit on a motor, it may get deformed or broken. Do not put a motor on another unless they are in packages.

- When attaching a component having inertia, such as a pulley, to a motor, ensure that any imbalance between the motor and component is minimized.

If there is a large imbalance, the motor may vibrates abnormally, resulting in the motor being broken.

⚠ CAUTION

- Be sure to attach a key to a motor with a keyed shaft.

If a motor with a keyed shaft runs with no key attached, it may impair torque transmission or cause imbalance, resulting in the motor being broken.

- Use a motor under an appropriate environmental condition.

Using a motor in an adverse environment may cause a failure or trouble in it. Refer to Chapter 3, "USAGE" for details of the operating and environmental conditions for motors.

- Do not apply a commercial power source voltage directly to a motor.

Applying a commercial power source voltage directly to a motor may result in its windings being burned. Be sure to use a specified amplifier for supplying voltage to the motor.

- Do not use the brake built into a motor for braking.

The brake built into a servo motor is designed for holding. If the brake is used for braking, a failure can occur.

Ensure that motors are cooled if they are those that require forcible cooling.

If a motor that requires forcible cooling is not cooled normally, it may cause a failure or trouble. For a fan-cooled motor, ensure that it is not clogged or blocked with dust and dirt. For a liquid-cooled motor, ensure that the amount of the liquid is appropriate and that the liquid piping is not clogged. For both types, perform regular cleaning and inspection.

- When storing a motor, put it in a dry (non-condensing) place at room temperature (0 to 40 $^{\circ}$ C).

If a motor is stored in a humid or hot place, its components may get damaged or deteriorated. In addition, keep a motor in such a position that its shaft is held horizontal and its terminal box is at the top.

- FANUC motors are designed for use with machines. Do not use them for any other purpose.

If a FANUC motor is used for an unintended purpose, it may cause an unexpected symptom or trouble. If you want to use a motor for an unintended purpose, previously consult with FANUC.

NOTE

NOTE

- Ensure that a base or frame on which a motor is mounted is strong enough.

Motors are heavy. If a base or frame on which a motor is mounted is not strong enough, it is impossible to achieve the required precision.

- Do not remove a nameplate from a motor.

If a nameplate comes off, be careful not to lose it. If the nameplate is lost, the motor becomes unidentifiable, resulting in maintenance becoming impossible.

- When testing the winding or insulation resistance of a motor, satisfy the conditions stipulated in IEC60034.

Testing a motor under a condition severer than those specified in IEC60034 may damage the motor.

 For a motor with a terminal box, make a conduit hole for the terminal box in a specified position.

When making a conduit hole, be careful not to break or damage unspecified portions. Refer to an applicable specification manual.

- Before using a motor, measure its winding and insulation resistances, and make sure they are normal.

Especially for a motor that has been stored for a prolonged period of time, conduct these checks. A motor may deteriorate depending on the condition under which it is stored or the time during which it is stored. For the winding resistances of motors, refer to their respective specification manuals, or ask FANUC. For insulation resistances, see the following table.

NOTE

- To use a motor as long as possible, perform periodic maintenance and inspection for it, and check its winding and insulation resistances.

Note that extremely severe inspections (such as dielectric strength tests) of a motor may damage its windings. For the winding resistances of motors, refer to Chapter 6, "SPECIFICATIONS", or ask FANUC. For insulation resistances, see the following table.

MOTOR INSULATION RESISTANCE MEASUREMENT

Measure an insulation resistance between each winding and motor frame using an insulation resistance meter (500 VDC). Judge the measurements according to the following table. Make an insulation resistance measurement on a single motor unit after detaching cords such as a power line.

Insulation resistance	Judgment
100 Ω or higher	Acceptable
10 to 100 Ω	The winding has begun deteriorating. There is no problem with the performance at present. Be sure to perform periodic inspection.
1 to 10 Ω	The winding has considerably deteriorated. Special care is in need. Be sure to perform periodic inspection.
Lower than 1 Ω	Unacceptable. Replace the motor.

CAUTION LABEL

The following label is attached to the motor.

Attach this label to a prominent place on the motor to call attention to the user.



Heat caution label (compliance with the IEC standard)

Heat caution label

Since the motor is heated to a high temperature during operation or immediately after a stop, touching the motor may cause a burn. So, attach this label to a prominent place to call attention when the surface is exposed and may be touched.

Remark:

The mark of this label conforms to the IEC standard, which is a global standard.

The mark has the meaning of heat caution, so the description is omitted.

B-65262EN/05 PREFACE

PREFACE

This manual describes the specifications, outline drawings, detectors and other options, usage, and selection method of the FANUC AC Servo Motor αi series ($\alpha i S/\alpha i F$ series).

This manual describes the layout of power pins and the output of detector signals but does not provide information about connection to a servo amplifier and an CNC. For the connection, refer to "FANUC SERVO AMPLIFIER αi series Descriptions (B-65282EN)", "FANUC SERVO AMPLIFIER βi series Descriptions (B-65322EN)", and "Maintenance Manual (B-65285EN)".

In this manual, servo motor names are sometimes abbreviated as follows:

Example) αi S 30/4000 $\rightarrow \alpha i$ S 30

Related manuals

The following five kinds of manuals are available for FANUC SERVO MOTOR αi series. In the table, this manual is marked with an asterisk (*).

Document name	Document number	Major contents	Major usage	
FANUC AC SERVO MOTOR $lpha i$ series DESCRIPTIONS	B-65262EN	SpecificationCharacteristicsExternal dimensions	Selection of motor Connection of motor	*
FANUC SERVO AMPLIFIER $lpha i$ series DESCRIPTIONS	B-65282EN	Specifications and functionsInstallation	Selection of amplifier	
FANUC SERVO AMPLIFIER $eta i$ series DESCRIPTIONS	B-65322EN	External dimensions and maintenance areaConnections	Connection of amplifier	
FANUC AC SERVO MOTOR αi series FANUC AC SPINDLE MOTOR αi series FANUC SERVO AMPLIFIER αi series MAINTENANCE MANUAL	B-65285EN	Start up procedureTroubleshootingMaintenance of motor	Start up the system (Hardware)TroubleshootingMaintenance of motor	
FANUC AC SERVO MOTOR αi series FANUC AC SERVO MOTOR βi series FANUC LINEAR MOTOR LiS series FANUC SYNCHRONOUS BUILT-IN SERVO MOTOR DiS series PARAMETER MANUAL	B-65270EN	Initial settingSetting parametersDescription of parameters	Start up the system (Software)Tuning the system (Parameters)	

TABLE OF CONTENTS

SA	FETY	PRECA	NUTIONS	s-1
	DEFI	NITION (OF WARNING, CAUTION, AND NOTE	s-2
	CAUT	ΓΙΟΝ		s-6
	NOTE	Ξ		s-8
	CAUT	TION LAE	BEL	s-10
PR	EFAC	E		p-1
1	GEN	ERAL.		1
	1.1	LINEU	IP OF THE SERIES	2
	1.2	FEAT	JRE	3
2	ORD	ERING	SPECIFICATION NUMBER	5
	2.1		RING SPECIFICATION NUMBER	
	2.2	APPLI	CABLE AMPLIFIERS	10
3	USA	GE		13
	3.1		ENVIRONMENT FOR SERVO MOTORS	
		3.1.1	Ambient Temperature, Humidity, Installation Height, and Vibration	14
		3.1.2	Usage Considering Environmental Resistance	
		3.1.3 3.1.4	Checking a Delivered Servo Motor and Storing a Servo Motor Separating and Disposing of a Servo Motor	24
	3.2	CONN	IECTING A SERVO MOTOR	
		3.2.1	Connections Related to a Servo Motor	26
	3.3		ITING A SERVO MOTOR	
		3.3.1	Methods for coupling the shaft	
		3.3.2 3.3.3	Fastening the Shaft	
		3.3.4	Shaft Run-out Precision of a Servo Motor	
		3.3.5	Other Notes on Axis Design.	
		3.3.6	Cautions in Mounting a Servo Motor	
4	SEL	ECTING	S A MOTOR	40
	4.1	COND	ITIONS FOR SELECTING A SERVO MOTOR	41
	4.2	SELEC	CTING A MOTOR	
		4.2.1	Calculating the Load Torque	
		4.2.2	Calculating the Motor Speed	
		4.2.3 4.2.4	Calculating the Load Inertia	
		4.2.4	4.2.4.1 Calculating acceleration torque	
			4.2.4.2 Calculating the torque required by the motor shaft in acceleration	
		4.2.5	Calculating the Root-mean-square Value of the Torques	56
		4.2.6	Calculating the Percentage Duty Cycle and ON Time with the Maximum	•
			Torque	58

		4.2.7 Calculating the Dynamic Brake Stop Distance	60
	4.3	HOW TO FILL IN THE SERVO MOTOR SELECTION DATA TABLE	66
		4.3.1 Servo Motor Selection Data Table	
		4.3.2 Explanation of Items	
		4.3.2.1 Title	
		4.3.2.3 Mechanical specifications	
		4.3.2.4 Motor specifications and characteristics	
	4.4	CHARACTERISTIC CURVE AND DATA SHEET	
		4.4.1 Characteristic Curves	
		4.4.2 Data Sheet	80
5		DITIONS FOR APPROVAL RELATED TO THE IEC60034	
	STAI	NDARD	83
	5.1	TYPES OF MOTORS TO BE APPROVED	84
	5.2	APPROVED SPECIFICATIONS	86
		5.2.1 Motor Speed (IEC60034-1)	
		5.2.2 Output (IEC60034-1)	
		5.2.3 Protection Type (IEC60034-5)	
		5.2.4 Cooling Method (IEC60034-6)	
		5.2.6 Grounding (IEC60204-1)	
		5.2.7 Remarks	
	5.3	CONNECTORS REQUIRED FOR APPROVAL	89
6	SPE	CIFICATIONS	90
	6.1	α <i>i</i> S SERIES (200V)	
	6.2	α <i>i</i> S SERIES (400V)	
	6.3	α <i>i</i> F SERIES (200V)	
	6.4	αi F SERIES (400V)	
_		,	
7	OUT	LINE DRAWINGS	144
	7.1	MODELS αi S 2 TO αi S 4, αi S 2 HV TO αi S 4 HV, AND αi F 1 TO αi F 2	145
		7.1.1 Outline Drawing of the Motors	
		7.1.2 Shaft Shape	
		7.1.4 Shaft Run-out Precision	
		7.1.5 Power and Brake Connector	
	7.2	MODELS αi S 8 TO αi S 12, αi S 8 HV TO αi S 12 HV, αi F 4 TO αi F 8,	
		α <i>i</i> F 4 HV TO α <i>i</i> F 8 HV	151
		7.2.1 Outline Drawing of the Motors	
		7.2.2 Shaft Shape	
		7.2.3 Allowable Axis Load	
		7.2.4 Shaft Run-out Precision	

	7.3		ELS $lpha i$ S 22 TO $lpha i$ S 50, $lpha i$ S 22HV TO $lpha i$ S 50HV, $lpha i$ S 50 WIT 0HV WITH FAN, $lpha i$ F 12 TO $lpha i$ F 40, $lpha i$ F 12HV TO $lpha i$ F 22HV	
			O WITH FAN Outline Drawing of the Motors Shaft Shape Allowable Axis Load Shaft Run-out Precision Connector	
	7.4	MODE	ELS $lpha i$ S 100, $lpha i$ S 200, $lpha i$ S 100 WITH FAN, $lpha i$ S 200 WITH F	AN,
		αiS 10	00 HV, $lpha i$ S 200 HV, $lpha i$ S 100HV WITH FAN, AND	
		aiS 20	00HV WITH FAN	167
		7.4.1	Outline Drawing of the Motors	
		7.4.2	Allowable Axis Load	
		7.4.3	Shaft Run-out Precision	
		7.4.4 7.4.5	Power Terminal Layout	
	7.5		ELS $lpha$ iS 300, $lpha$ iS 500, $lpha$ iS 300 HV, AND $lpha$ iS 500 HV	
	7.5	7.5.1	Outline Drawing of the Motors	
		7.5.2	Allowable Axis Load	
		7.5.3	Shaft Run-out Precision	175
		7.5.4	Power Terminal Layout (for αiS 300 and αiS 500)	175
		7.5.5	Power Terminal Layout (for αiS 300HV and αiS 500HV)	
		7.5.6	Cabling (for αiS 300, αiS 500, αiS 300HV, and αiS 500HV)	177
	7.6	MODE	EL $lpha i$ S 1000 HV	178
		7.6.1	Outline Drawing of the Motors	
		7.6.2	Allowable Axis Load	
		7.6.3 7.6.4	Shaft Run-out Precision	
		7.6.4 7.6.5	Power Terminal Layout	
	7.7		ELS αi S 2000 HV AND αi S 3000 HV	
	7.7	7.7.1	Outline Drawing of the Motors	_
		7.7.1	Allowable Axis Load	
		7.7.3	Shaft Run-out Precision	
		7.7.4	Power Terminal Layout	184
		7.7.5	Cabling	185
8	FEE	DBACK	(SENSOR	186
	8.1	PULS	ECODER	187
		8.1.1	Types of Pulsecoders and Designation	
		8.1.2	Connecting Pulsecoder	
		8.1.3	Absolute-type Pulsecoder	189
	8.2	SEPA	RATE PULSECODER	190
		8.2.1	Separate Pulsecoder Type and Designation	
		8.2.2	Separate Pulsecoder Specifications	
		8.2.3 8.2.4	Connecting a Separate Type Pulsecoder Outline Drawings of Separate Pulsecoder	
		8.2.5	Cautions when Using a Separate Type Pulsecoder	
		- · - · · ·		

9	BUIL	T-IN BRAKE	194
	9.1	BRAKE SPECIFICATIONS	195
	9.2	9.2.1 Brake Connectors	196
		9.2.3 Recommended Parts in Brake Circuits	
	9.3	CAUTIONS	200
	9.4	REDUCING THE BRAKE SHAFT FALL AMOUNT	201
10	COO	LING FAN	202
	10.1	COOLING FAN SPECIFICATIONS	203
	10.2	CONNECTING A COOLING FAN	205
	10.3	COOLING FAN PROTECTION CIRCUIT	208
11	CON	NECTORS ON THE CABLE SIDE	209
	11.1	CONNECTORS FOR SIGNALS (FOR ALL αi SERIES MODELS)	210
	11.2	CONNECTORS FOR POWER	214
		11.2.1 Connectors for Power (for Group A)11.2.2 Connectors for Power (for Groups B to D)	
	11.3	CONNECTORS FOR THE BRAKE	
	11.4	CONNECTORS FOR THE FAN	
	11.5	CONNECTION TO A CONDUIT HOSE	223

B-65262EN/05 1.GENERAL

1

GENERAL

Cha	pter 1, "GENERAL", consists of the following sections:	
1.1	LINEUP OF THE SERIES	2
	FEATURE	

1.GENERAL B-65262EN/05

1.1 LINEUP OF THE SERIES

The FANUC AC Servo Motor αi series consist of the following series, each of which has the listed characteristics.

Series	Voltage	Stall torque	Applications	
ais	200V	2 to 500 N·m	High acceleration models for high-acceleration machine	
uis	400V	2 to 3000 N·m	lpha iS models applicable to 400VAC input	Lathe Machining Center
αi F	200V	1 to 53 N·m	Medium Inertia models for Axis feed of machine tools	Grinding Machine
Wir	400V	4 to 22 N·m	αiF models applicable to 400VAC input	

Lineup

	٠- ۲-																	
Stall torque Nm			2	4	8	12	22	30	40	50	100	200	300	500	1000	2000	3000	
Flange size mm			9	0	13	30	174 2		265			380	50	00				
	000)/	2001	/500	ais 2 /5000	αis 4	αis 8 /4000	α <i>i</i> s 12	ais 22 /4000	ais 30	α <i>i</i> s 40	/3000	α <i>i</i> s 100 /2500	ais 200 /2500	_	α <i>i</i> s 500			
		200V	ais 2 /6000	/5000	αis 8 /6000	/4000	α <i>i</i> S 22 /6000	/4000	/4000		α <i>i</i> S 100 /2500 FAN	α <i>i</i> S 200 /2500 FAN	/2000	/2000				
ais		400)/	αis 2 /5000 HV	ais 4	αis 8 /4000 HV	α <i>i</i> s 12	αis 22 /4000 HV	αis 30	α <i>i</i> s 40	αis 50 /3000 HV	α <i>i</i> s 100 /2500 HV	α <i>i</i> s 200 /2500 HV	ais 300 /2000 HV		α <i>i</i> s 1000 /2000 HV		ais 3000	
	,	400V	αis 2 /6000 HV	/5000 HV	αis 8 /6000 HV	/4000 HV	αis 22 /6000 HV	/4000 HV		αis 50 /3000 HV FAN	α <i>i</i> S 100 /2500 HV FAN	αis 200 /2500					/2000 HV	

Stall to Nr	•	1	1 2 4 8 12 22		30	40				
Flange mr		9	0	13	30	174				
	200V	200\/	α <i>i</i> F 1	αiF 2	αiF 4	α <i>i</i> F 8	α <i>i</i> F 12	α <i>i</i> F 22	α <i>i</i> F 30	α <i>i</i> F 40 /3000
αiF	2000	/5000	/5000	/4000	/3000	/3000	/3000	/3000	α <i>i</i> F 40 /3000 FAN	
	400V			0.1F 4 /4000 HV	α <i>i</i> F 8 /3000 HV	α <i>i</i> F 12 /3000 HV	α <i>i</i> F 22 /3000 HV			

B-65262EN/05 1.GENERAL

1.2 FEATURE

The FANUC AC Servo Motor αi series has been designed for machine tool feed axis applications. This servo motor αi series has the following features:

Compact

The use of a latest magnet and the optimized mechanical design reduce the total length and weight, therefore realizing light, compact motors.

Smooth rotation

The special magnetic pole shape which minimizes torque ripples which, when combined with precise current control and accurate Pulsecoder feedback, enables extremely smooth motor rotation.

Excellent acceleration

The use of a special rotor shape brings small and light motors, and a high level of torque. These motors, therefore, provide excellent acceleration characteristics.

Wide continuous-operating zone

High-density winding, low iron loss by the optimum core shape, and the use of the latest servo software reduce heat generation during high-speed rotation to a minimum and allow a wide continuous operating zone.

Controllability

The use of the latest servo software maintains controllability even when a disturbance occurs.

High reliability

A totally-enclosed, friction-free brushless design is used. This allows the servo motors to be used in demanding environments with no need for special checks or maintenance.

Excellent drip-proofing

The use of waterproof connectors and FANUC's unique stator seal provide excellent drip-proofing, which prevent ingress of liquid, such as coolant.

Built-in, high-precision encoder

A low-indexing-error optical encoder (Pulsecoder) is built into the motors. This Pulsecoder enables precise positioning.

Pulsecoders have the resolution of 1,000,000 or 16,000,000 per revolution. As such, the motors can be used for positioning applications ranging from simple positioning to those requiring a high degree of precision.

1.GENERAL B-65262EN/05

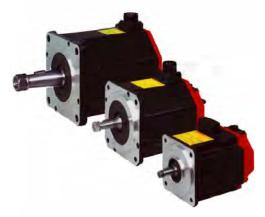
Powerful brake

A powerful brake with an increased holding torque is available as an option. The brake uses an asbestos-free design.

200-V and 400-V power supply specifications

A lineup of 400-V power supply specification motors is provided in addition to the 200-V power supply specification motors.

A suitable motor can be selected according to the local power supply specification.



<u>αi series</u>

2

ORDERING SPECIFICATION NUMBER

This chapter provides information about the ordering specification numbers and types of the FANUC AC Servo Motor αi series.

Chapter 2, "ORDERING SPECIFICATION NUMBER", consists of the following sections:

2.1	ORDERING SPECIFICATION NUMBER	6	-
2.2	APPLICABLE AMPLIFIERS	1(1

2.1 ORDERING SPECIFICATION NUMBER

The ordering specification numbers of the servo motors have the following format:

A06B-□□□-B△○▽#◎◎◎◎

An ordering specification number are described on the tables after next page.

 \triangle

0 : Taper shaft1 : Straight shaft

2: Straight shaft with a key groove
3: Taper shaft with a 24VDC brake
4: Straight shaft with a 24VDC brake

5 : Straight shaft with a key way and a 24VDC brake

* Do not select "Straight shaft with a key groove" when a large torque or abrupt acceleration rate is required.

 \bigcirc

0 : Standard1 : With a fan

2: With a high-torque brake

3 : With a high-torque brake and a fan

4 : With a strong fan

* When "With a high-torque brake" is selected ($\bigcirc = 2$ or 3), specify $\triangle = 3$ to 5.

 ∇

0 : Pulsecoder αiA 1000
1 : Pulsecoder αiI 1000
2 : Pulsecoder αiA 16000

$\bigcirc\bigcirc\bigcirc\bigcirc\bigcirc\bigcirc$

0000 : Standard

0100 : IP67 specification

* Omitted in case of #0000.

The following table lists the allowable combinations of numbers represented by symbols in ordering specification numbers.

αi S series (200V)

$\underline{A06B-\square\,\square\,\square-B\triangle\bigcirc\,\triangledown\#\bigcirc\bigcirc\bigcirc\bigcirc}$

Symbol in					7					0				∇		00	00
specification No. Servo motor name	0000	0	1	2	3	4	5	0	1	2	3	4	0	1	2	0000	0100
α <i>i</i> S 2/5000	0212	0	0	0	0	0	0	0	_	_	_	_	0	0	0	0	0
α <i>i</i> S 2/6000	0218	0	0	0	0	0	0	0	_	_	_	_	0	0	0	0	0
α <i>i</i> S 4/5000	0215	0	0	0	0	0	0	0	_	_	_	_	0	0	0	0	0
α <i>i</i> S 8/4000	0235	0	0	0	0	0	0	0	_	_	_	_	0	0	0	0	0
α <i>i</i> S 8/6000	0232	0	0	0	0	0	0	0	_	_	_	_	0	0	0	0	0
α <i>i</i> S 12/4000	0238	0	0	0	0	0	0	0	-	-	-	_	0	0	0	0	0
α <i>i</i> S 22/4000	0265	0	0	0	0	0	0	0	-	-	-	_	0	0	0	0	0
α <i>i</i> S 22/6000	0262	0	0	0	0	0	0	0	ı	ı	ı	-	0	0	0	0	0
α <i>i</i> S 30/4000	0268	0	0	0	0	0	0	0	ı	ı	ı	_	0	0	0	0	0
α <i>i</i> S 40/4000	0272	0	0	0	0	0	0	0	_	0	_	_	0	0	0	0	0
α <i>i</i> S 50/3000	0275	0	0	_	0	0	_	0	_	0	_	_	0	0	0	0	0
α <i>i</i> S 50/3000 with fan	0275	0	0	_	0	0	_	_	0	_	0	_	0	0	0	0	_
α <i>i</i> S 100/2500	0285	0	_	_	0	_	_	0	_	_	_	_	0	0	0	0	0
α <i>i</i> S 100/2500 with fan	0285	0	_	_	0	_	_	_	0	-	_	_	0	0	0	0	_
α <i>i</i> S 200/2500	0288	0	_	_	0		_	0	_	_	_	_	0	0	0	0	0
α <i>i</i> S 200/2500 with fan	0288	0	_	-	0		_	_	0	_	-	_	0	0	0	0	_
α <i>i</i> S 300/2000	0292	0	_	_	_		_	_	0	_	-	_	0	0	0	0	_
α <i>i</i> S 500/2000	0295	0	_	_	_	_	_	_	0	_	_	_	0	0	0	0	_

^{*} When $\bigcirc\bigcirc\bigcirc\bigcirc\bigcirc$ is #0000, omit the specification of $\bigcirc\bigcirc\bigcirc\bigcirc\bigcirc$.

^{*} Specify $\triangle = 3$ to 5 in the case of $\bigcirc = 2$ or 3.

αi S series (400V)

$\underline{A06B-\square\square\square\square-B\triangle\bigcirc\triangledown\#\bigcirc\bigcirc\bigcirc\bigcirc}$

Symbol in				Z	7					0				∇		00	00
specification No. Servo motor name	0000	0	1	2	3	4	5	0	1	2	3	4	0	1	2	0000	0100
aiS 2/5000 HV	0213	0	0	0	0	0	0	0			_	_	0	0	0	0	0
αiS 2/6000 HV		0	0	0	0) (0	0			_		0	0	0	0	0
• • • • • • • • • • • • • • • • • • • •	0219							_			_	_	_		_	_	
α <i>i</i> S 4/5000 HV	0216	0	0	0	0	0	0	0	_		_	_	0	0	0	0	0
α <i>i</i> S 8/4000 HV	0236	0	0	0	0	0	0	0	_	_		-	0	0	0	0	0
α <i>i</i> S 8/6000 HV	0233	0	0	0	0	0	0	0	_	_	_	_	0	0	0	0	0
α <i>i</i> S 12/4000 HV	0239	0	0	0	0	0	0	0	_	_	_	_	0	0	0	0	0
α <i>i</i> S 22/4000 HV	0266	0	0	0	0	0	0	0	_	_	_	_	0	0	0	0	0
α <i>i</i> S 22/4000 HV	0263	0	0	0	0	0	0	0	-	-	_	1	0	0	0	0	0
α <i>i</i> S 30/4000 HV	0269	0	0	0	0	0	0	0	-	1	_	1	0	0	0	0	0
α <i>i</i> S 40/4000 HV	0273	0	0	0	0	0	0	0	_	0	_	_	0	0	0	0	0
α <i>i</i> S 50/3000 HV	0276	0	0	-	0	0	1	0	-	0	_	1	0	0	0	0	0
lpha iS 50/3000 HV with fan	0276	0	0	-	0	0	1	-	0	-	0	1	0	0	0	0	_
α <i>i</i> S 100/2500 HV	0286	0	-	-	0	-	1	0	-	1	_	1	0	0	0	0	0
α <i>i</i> S 100/2500 HV with fan	0286	0	_	_	0	_	_	_	0	_	_	_	0	0	0	0	_
α <i>i</i> S 200/2500 HV	0289	0		-	0		1	0	-	1	_	1	0	0	0	0	0
α <i>i</i> S 200/2500 HV with fan	0289	0	_	_	0	_	_	_	0	_	_	_	0	0	0	0	_
α <i>i</i> S 300/2000 HV	0293	0	-	-	1	-	1	-	0	1	_	1	0	0	0	0	_
α <i>i</i> S 500/2000 HV	0296	0	_	_	_	_	_	_	0	_	_	_	0	0	0	0	_
α <i>i</i> S 1000/2000 HV	0298	0	_	_	_	1	_	1	0	1	-	_	0	١	-	0	_
α <i>i</i> S 2000/2000 HV	0091	0	_	_	_		_	1	-	1	-	0	0	١	-	0	_
α <i>i</i> S 3000/2000 HV	0092	0	_	_	_	_	_	_	_	_	_	0	0	_	_	0	_

^{*} When $\bigcirc\bigcirc\bigcirc\bigcirc\bigcirc$ is #0000, omit the specification of $\bigcirc\bigcirc\bigcirc\bigcirc$.

^{*} Specify $\triangle = 3$ to 5 in the case of $\bigcirc = 2$ or 3.

αi F series (200V)

$A06B-\square\square\square-B\triangle\bigcirc \nabla\#\bigcirc\bigcirc\bigcirc$

Symbol in				Z	7					0				∇		00	00
specification No. Servo motor name	0000	0	1	2	3	4	5	0	1	2	3	4	0	1	2	0000	0100
α <i>i</i> F 1/5000	0202	0	O	С	C	0	O	O		_	_		0	Ο	0	0	0
	0202		0		0	0		0									
α <i>i</i> F 2/5000	0205	0	0	0	0	0	0	0	_	-	1	_	0	0	0	0	0
α <i>i</i> F 4/4000	0223	0	0	0	0	0	0	0	1	ı	ı	_	0	0	0	0	0
α <i>i</i> F 8/3000	0227	0	0	0	0	0	0	0	-	ı	-	-	0	0	0	0	0
α <i>i</i> F 12/3000	0243	0	0	0	0	0	0	0	-	_	_	_	0	0	0	0	0
α <i>i</i> F 22/3000	0247	0	0	0	0	0	0	0	_	_	_	_	0	0	0	0	0
α <i>i</i> F 30/3000	0253	0	0	0	0	0	0	0	1	1	-	_	0	0	0	0	0
α <i>i</i> F 40/3000	0257	0	0	0	0	0	0	0	1	0	-	_	0	0	0	0	0
αiF 40/3000 with fan	0257	0	0	0	0	0	0	-	0	-	0	_	0	0	0	0	

^{*} When $\bigcirc\bigcirc\bigcirc\bigcirc\bigcirc$ is #0000, omit the specification of $\bigcirc\bigcirc\bigcirc\bigcirc$.

αi F series (400V)

$\underline{A06B-\square\square\square\neg B\triangle\bigcirc \triangledown\#\bigcirc\bigcirc\bigcirc\bigcirc}$

Symbol in					7					0				∇		00	00
specification No.	0000	0	1	2	3	4	5	0	1	2	3	4	0	1	2	0000	0100
Servo motor name																	
α <i>i</i> F 4/4000 HV	0225	0	0	0	0	0	0	0	_	_	_	_	0	0	0	0	0
α <i>i</i> F 8/3000 HV	0229	0	0	0	0	0	0	0	-	_	_	_	0	0	0	0	0
α <i>i</i> F 12/3000 HV	0245	0	0	0	0	0	0	0	_	_	_	_	0	0	0	0	0
α <i>i</i> F 22/3000 HV	0249	0	0	0	0	0	0	0	_	ı	_	_	0	0	0	0	0

^{*} When $\bigcirc\bigcirc\bigcirc\bigcirc\bigcirc$ is #0000, omit the specification of $\bigcirc\bigcirc\bigcirc\bigcirc\bigcirc$.

^{*} Specify $\triangle = 3$ to 5 in the case of $\bigcirc = 2$ or 3.

2.2 APPLICABLE AMPLIFIERS

The FANUC AC Servo Motor αi series can be driven using FANUC Servo Amplifier αi SV series or βi SV series.

For the ordering specification numbers of servo amplifiers, refer to "FANUC SERVO AMPLIFIER αi series Descriptions (B-65282EN)" or "FANUC SERVO AMPLIFIER βi series Descriptions (B-65322EN)".

Combinations of the αi S/ αi F servo motors and the αi SV/ βi SV servo amplifiers

(200 V, 160 A or less)

Stall torq		1		2	4	1		8		12		22		30	4	-0
Motor		•	-													Ĭ
	αis		α <i>i</i> s 2 /5000	αis 2 /6000	α <i>i</i> s 4 /5000			α <i>i</i> s 8 /4000	α <i>i</i> s 8 /6000	α <i>i</i> S12 /4000		αis22 /4000	αis22 /6000	αis30 /4000	α <i>i</i> \$40 /4000	
Amplifier	αi F	α <i>i</i> F 1 /5000	α <i>i</i> F 2 /5000			α <i>i</i> F 4 /4000	α <i>i</i> F 8 /3000			α <i>i</i> F12 /3000	α <i>i</i> F22 /3000			α <i>i</i> F30 /3000	α <i>i</i> F40 /3000	α <i>i</i> F40 /3000 FAN
αiSV 20 αiSV 20L	-	0	0	0	0											
αiSV 40 αiSV 40L	-					0	0									
αiSV 80 αiSV 80L	=							0	0	0	0					
αiSV 160 αiSV 160L	-											0	0	0	0	0
αiSV 4/20	L axis M axis	0	0	0	0											
αiSV 20/20 αiSV 20/20L	L axis M axis	0	0	0	0											
αiSV 20/40 αiSV 20/40L	L axis M axis	0	0	0	0	0	0									
αiSV 40/40 αiSV 40/40L	L axis M axis					0	0									
αiSV 40/80 αiSV 40/80L	L axis M axis					0	0	0	0	0	0					
αiSV 80/80 αiSV 80/80L	L axis M axis							0	0	0	0					
αiSV 80/160 αiSV 80/160L	L axis M axis							0	0	0	0	0	0	0	0	
αiSV 160/160L	L axis											0	0	0	0	
:677.00/00/00	M axis	0	0	0	0							0	0	0	0	
αiSV 20/20/20	M axis	0	0	0	0											
αiSV 20/20/40	L axis M axis	0	0	0	0 0	0	0									
β <i>i</i> SV 20	N axis	0	0	0	0											
β <i>i</i> SV 40	-					0	0									ļ
β <i>i</i> SV 80	L axis	0	0	0	0			0	0	0	0					
βiSV 20/20	M axis	0	0	0	0											

(200 V, 360 A or more)

Stall torque	5	0	10	00	20	00	300	500
Motor Amplifier	αiS 50 /3000	αiS 50 /3000 FAN	α <i>i</i> S 100 /2500	α <i>İ</i> S 100 /2500 FAN	α <i>i</i> S 200 /2500	α <i>İ</i> S 200 /2500 FAN	α <i>i</i> S 300 /2000	α <i>i</i> S 500 /2000
α <i>i</i> SV 360	0	0	0	0	0	0		
α <i>i</i> SV 360 x2							0	0

(*) For a motor driven by multiple servo amplifier, such as the αiS 300 motor, the torque tandem control option or the PWM distribution module is required.

(400V, 80A or less)

Stall torq	ue	2	2	4	1		8		12		22		30	40
Motor	αis	α <i>i</i> S 2 /5000 HV	α <i>i</i> S 2 /6000 HV	α <i>i</i> S 4 /5000 HV			α <i>i</i> s 8 /4000 HV	α <i>i</i> S 8 /6000 HV	α <i>i</i> S12 /4000 HV		α <i>i</i> S22 /4000 HV	ais22 /6000 HV	α <i>i</i> \$30 /4000 HV	α <i>i</i> \$40 /4000 HV
Amplifier	lpha iF				α <i>i</i> F 4 /4000 HV	α <i>i</i> F 8 /3000 HV			α <i>i</i> F12 /3000 HV	α <i>i</i> F22 /3000 HV				
αiSV 10HV αiSV 10HVL	-	0	0	0										
αiSV 20HV αiSV 20HVL	-				0	0								
αiSV 40HV αiSV 40HVL	-						0	0	0	0				
αiSV 80HV αiSV 80HV	-										0	0	0	0
α <i>i</i> SV 10/10HV	L axis	0	0	0										
αiSV 10/10HVL	M axis	0	0	0										
αiSV 20/20HV	L axis				0	0								
αiSV 20/20HVL	M axis				0	0								
αiSV 20/40HV	L axis				0	0								
αiSV 20/40HVL	M axis						0	0	0	0				
α <i>i</i> SV 40/40HV	L axis						0	0	0	0				
αiSV 40/40HVL	M axis						0	0	0	0				
αiSV 40/80HV	L axis						0	0	0	0				
	M axis										0	0	0	0
αiSV 80/80HV	L axis										0	0	0	0
0.00./ 4.01.11.	M axis										0	0	0	0
βiSV 10HV	-	0	0	0										
β <i>i</i> SV 20HV	-	-			0	0								
βiSV 40HV	-						0	0	0	0				

(400V, 180A or more)

Stall torque	5	0	1(00	20	00	300	500	1000	2000	3000
Motor Amplifier	α <i>i</i> S 50 /3000 HV	α <i>i</i> S 50 /3000 HV FAN	α <i>İ</i> S 100 /2500 HV	α <i>İ</i> S 100 /2500 HV FAN	α <i>i</i> S 200 /2500 HV	α <i>i</i> S 200 /2500 HV FAN	α <i>i</i> S 300 /2000 HV	α <i>i</i> S 500 /2000 HV	α <i>i</i> S 1000 /2000 HV	α <i>i</i> S 2000 /2000 HV	α <i>i</i> S 3000 /2000 HV
α <i>İ</i> SV 180HV	0	0	0	0	0	0					
α <i>İ</i> SV 360HV							0	0			
α <i>İ</i> SV 360HV x2									0		
α <i>İ</i> SV 360HV x4										0	0

(*) For a motor driven by multiple servo amplifier, such as the αiS 1000HV motor, the torque tandem control option or the PWM distribution module is required.

⚠ CAUTION

- 1 If a motor is used in a combination other than those listed above, it may become broken.
- 2 For details on the servo amplifier, refer to "FANUC SERVO AMPLIFIER αi series DESCRIPTIONS (B-65282EN)" and "FANUC SERVO AMPLIFIER βi series DESCRIPTIONS (B-65322EN)".
- 3 If you want to use a motor in combination with the α/β series servo amplifier, consult with FANUC.

B-65262EN/05 3.USAGE

3 USAGE

This chapter explains how to connect the FANUC AC Servo Motor αi series to the CNC system and how to install it in the machine.

Chapter 3, "USAGE", consists of the following sections:

S14	USE ENVIRONMENT FOR SERVO MOTORS	3.1
26	CONNECTING A SERVO MOTOR	3.2
28	MOUNTING A SERVO MOTOR	3.3

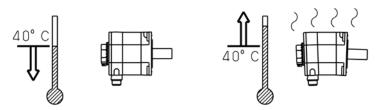
3.USAGE B-65262EN/05

3.1 USE ENVIRONMENT FOR SERVO MOTORS

3.1.1 Ambient Temperature, Humidity, Installation Height, and Vibration

Ambient temperature

The ambient temperature should be 0°C to 40°C. If the ambient temperature exceeds this range, the operating conditions must be eased to prevent the motor and detector from overheating. (The values in the data sheet are determined for an ambient temperature of 20°C.)



Ambient humidity

The ambient humidity should be 80%RH or less and no condensation should not be caused.

Installation height

<u>Up to 1,000 meters above the sea level requires</u>, no particular provision for attitude. When operating the machine at a higher level, special care is unnecessary if the ambient temperature is lowered 1°C at every 100m higher than 1,000m. For example, when the machine is installed at a place of 1,500 meters above sea level, there is no problem if the ambient temperature is 35°C or less.

Vibration

When installed in a machine, the vibration applied to the motor <u>must</u> <u>not exceed 5G</u>.

If any one of the four environmental conditions (ambient temperature, ambient humidity, installation height, and vibration) specified above is not satisfied, the output must be restricted.

B-65262EN/05 3.USAGE

3.1.2 Usage Considering Environmental Resistance

Overview

The motor is an electric part, and if the lubricant or cutting fluid falls on the motor, it will enter the inside of the motor, possibly adversely affecting the motor. In particular, if the cutting fluid adheres to the motor, it will deteriorate the resin or rubber sealing members, causing a large amount of cutting fluid to enter the inside of the motor and possibly damaging the motor. When using the motor, note the points described below.

Level of motor protection

For the standard type, the level of motor protection is such that a single motor unit can satisfy IP65 of the IEC 60034-5 standard. (Except the connectors of models with a fan. The connectors of Pulsecoders are water-proof when engaged.)

As options, IP67 type motors are also available. (Except models with a fan and the αiS 300/2000 and above. The connectors of Pulsecoders are water-proof when engaged.)

For a description of the drip-proof and water-proof properties of each connector, see the section on that connector.

<u>IP6</u> : Fully dust-proof machine

Structure completely free from the entry of dust.

<u>IP</u>□5 : Machine protected from injected water

Water injected from a nozzle to the machine in any direction does not have a harmful impact on the machine.

<u>IP</u>□7 : Machine protected from the effect of seeping water

If the machine is immersed in water at a prescribed pressure for a prescribed duration, there is no possibility that an amount of water that has a harmful impact on the machine enters the machine.

If sufficient water-proof performance is required, as in the case in which a motor is used in a cutting fluid mist atmosphere, specify an IP67 type motor.

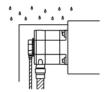
Note that both the standard and IP67 types satisfy the provisions for short-time water immersion, and do not guarantee their water-proof performance in an atmosphere in which the cutting fluid is applied directly to the motor. Before actual use, note the points described below.

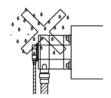
3.USAGE B-65262EN/05

Motor periphery

If the cutting fluid or lubricant falls on the motor, it will adversely affect the sealing properties of the motor surface, entering the inside of the motor and possibly damaging the motor. Note the following points on use.

Make sure that the motor surface is never wet with the cutting fluid or lubricant, and also make sure that no fluid builds up around the motor. If there is a possibility of the surface being wet, a cover is required. Be sure to mount a cover even when using an IP67 type motor.





If the cutting fluid is misted, the cutting fluid may be condensed on the inside of the cover and fall on the motor. Make sure that no condensed droplets fall on the motor.

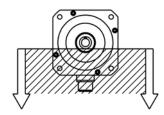
Completely separate the machining area from the motor area, using a telescopic cover, accordion curtain, and so on. Note that partitions such as accordion curtains are consumable and require periodic inspection for damage.

B-65262EN/05 3.USAGE

Output shaft seal (oil seal)

For all models, the shaft of the servo motor is provided with an oil seal to prevent entry of oil and other fluids into the motor. It does not, however, completely prevent the entry of lubricant and other fluids depending on the working conditions. Note the following points on use.

When the motor is rotating, the oil seal has an effect of discharging any oil that enters, but if it is pressurized for a long time when the motor is stopped, it may allow oil to enter through the lip. When lubrication with an oil bath is conducted for gear engagement, for example, the oil level must be below the lip of the oil seal of the shaft, and the oil level must be adjusted so that the oil does nothing but splash on the lip.

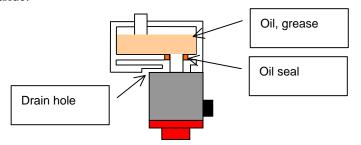


Diameters of the oil seal lips of motor shafts

Motor model	Oil seal diameter
α <i>i</i> S 2, α <i>i</i> S 4, α <i>i</i> S 2 HV, α <i>i</i> S 4 HV,	145 [name]
α <i>i</i> F 1, α <i>i</i> F 2	φ15 [mm]
αiS 8, αiS 12, αiS 8 HV, αiS 12 HV,	104 [maga]
α <i>i</i> F 4, α <i>i</i> F 8, α <i>i</i> F 4 HV, α <i>i</i> F 8 HV	φ24 [mm]
αiS 22, αiS 30, αiS 40,	
αi S 22 HV, αi S 30 HV, αi S 40 HV,	
αi F 12, αi F 22, αi F 30, αi F 12 HV, αi F 22 HV	
	φ35 [mm]
(Only the straight shaft type of the following)	
αi S 50, αi S 50 HV, αi F 40	
* Including those equipped with fans.	
(Only the taper shaft type of the following)	
αi S 50, αi S 50 HV, αi F 40	φ38 [mm]
* Including those equipped with fans.	
lpha iS 100, $lpha i$ S 200, $lpha i$ S 100 HV, $lpha i$ S 200 HV	φ55 [mm]
* Including those equipped with fans.	ψοο [ππη
αίS 300, αίS 500, αίS 300 HV, αίS 500 HV	φ65 [mm]
α <i>i</i> S 1000 HV	φ80 [mm]
lpha iS 2000 HV, $lpha i$ S 3000 HV	φ120 [mm]

3.USAGE B-65262EN/05

If the shaft is directed upward so that it is constantly immersed in oil, the oil seal of the motor alone does not provide sufficient sealing. If grease is used for lubrication, the properties of the oil seal are generally impaired. In these cases, a special design is required. For example, another oil seal is mounted on the machine side and a drain is provided so that any oil passing through that seal can is discharged outside.



In such an environment in which the lip of the oil seal switches between dry and wet states repeatedly, if the cutting fluid flies about after the lip has worn in a dry state, the cutting fluid may easily enter the inside of the motor. In this case, provide a cover, etc. so that no cutting fluid is applied to the oil seal of the motor.

Ensure that no pressure is applied to the lip of the oil seal.

The cutting fluid does not provide lubrication for the oil seal lip, so that the fluid may easily enter the seal. Provide a cover so that no cutting fluid is applied to the oil seal.

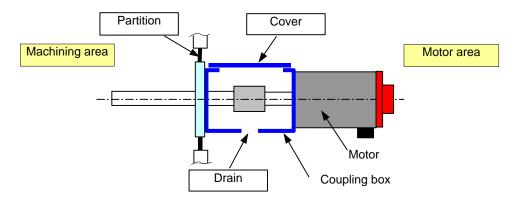
The oil seal lip is made of rubber, and if foreign matters such as cutting chips get in, it will be easily worn, losing its sealing properties. Provide a cover, etc. to prevent cutting chips from entering near the lip.

Motor coupling

If a coupling box exists between the motor and the machine, employ the structure described below so that no cutting fluid builds up in the box.

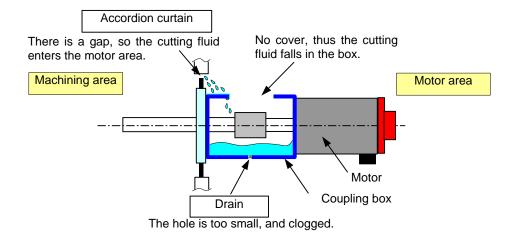
Provide a cover for the top and sides of the coupling box.

Provide a drain hole at the bottom of the coupling box. The hole must be large enough to avoid clogging. Make sure that any cutting fluid that bounces back is not applied from the drain hole to the motor.



<Fault example>

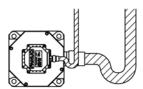
The cutting fluid leaks from a gap in the accordion curtain to the motor area, and builds up in the coupling box. While the motor is moving, the cutting fluid ripples, splashing on the oil seal of the motor. The cutting fluid enters the inside of the motor there in large quantities, deteriorating the insulation of the motor.

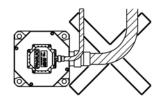


Connectors

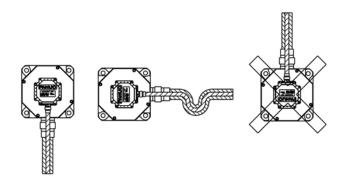
Note the following points on use:

Make sure that no cutting fluid is introduced to the motor via cables. If the motor connector is used horizontally, this can be accomplished by forming a slack in the cable.





If the motor connector is directed upward, the cutting fluid collects into the cable connector. Whenever possible, direct the motor connector sideways or downward.



If there is a possibility of the power cable and the power connector being wet, it is recommended to use the water-proof connector plug recommended in this DESCRIPTIONS for the connector and a oil-proof cable as the power cable. (Oil-proof cable example: PUR (polyurethane) series made by LAPP)

If using a conduit hose for cable protection purposes, use the seal adapter recommended in this DESCRIPTIONS.

The feedback cable connector provides IP67 water-proof performance when it is engaged with the pulse coder connector. If the feedback cable connector is not fully engaged, the cutting fluid will enter the inside of the pulse coder from the connector, possibly causing a failure. Install the connector properly in accordance with the feedback cable engagement procedure described in this DESCRIPTIONS and check that it is engaged securely.

If the feedback cable connector cannot provide sufficient water resistance due to an assembly failure, the cutting fluid will enter the inside of the pulse coder from the connector, possibly causing a failure. When manufacturing a feedback cable connector, assemble it properly in accordance with the operator's manual issued by the connector manufacturer.

Notes on cutting fluid

Cutting fluid containing highly active sulfur, oil-free cutting fluid called synthetic cutting fluid, and highly alkaline, water-soluble cutting fluid in particular significantly affect the CNC, motor, or amplifier. Even when these components are protected from direct spraying of cutting fluid, problems as described below may arise. So special care should be taken.

• Cutting fluid containing highly active sulfur

Some cutting fluids containing sulfur show extremely high activity of sulfur. Ingress of such cutting fluid into the CNC, motor, or amplifier can cause corrosion of copper, silver, and so on used as parts' materials, therefore resulting in parts' failures.

• Synthetic cutting fluid with high permeability

Some synthetic type cutting fluids that use polyalkylene glycol (PAG) as a lubricant have extremely high permeability. Such cutting fluid can easily penetrate into the motor even if the motor is sealed well. Ingress of such cutting fluid into the CNC, motor, or amplifier can degrade insulation or lead to parts' failures.

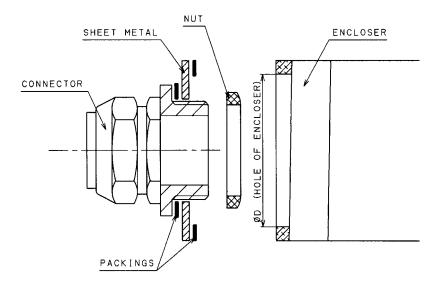
Highly alkaline, water-soluble cutting fluid

Some cutting fluids that strengthen pH by alkanolamine show strong alkalinity of pH10 or higher when diluted to the standard level. Ingress of such cutting fluid into the CNC, motor, or amplifier can cause chemical reaction with plastic and so on and deteriorate them.

Terminal box

For the αiS 100/2500 model or higher, the power line is connected at the terminal box.

To ensure the appropriate IP level, a conduit or something similar is required at the power line lead-in hole. When connecting the conduit to the terminal box, employ rubber packings, a water-proof connector, etc. to prevent the entry of the lubricant or cutting fluid from the wiring hole in the terminal box.



The terminal box is provided with rubber water-proof packings. Check that the packings are not damaged, and mount them with the prescribed tightening torque in such a way that no foreign matters get in.

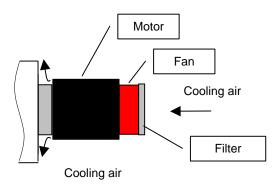
NOTE

For information on the wiring hole diameters, refer to the Chapter 7, "OUTLINE DRAWINGS."

Fan motor

The fan motor provides low water-proof performance, so make sure that a fan unit and a fan-equipped motor are not employed in an environment in which the cutting fluid is applied.

If lubricant or cutting fluid mist, particles, or cutting chips are drawn into the fan motor, the air holes in the motor and the blades of the fan motor will clog, causing the cooling capacity to reduce. Employ a machine structure that allows clean, cooling air to be fed into the motor.



3.1.3 Checking a Delivered Servo Motor and Storing a Servo Motor

When the servo motor is delivered, check the following items.

- The motor meets the specifications. (Specifications of the model/shaft/sensor)
- Damage caused by the transportation.
- The shaft is normal when rotated by hand.
- The brake works.
- Looseness or play in screws.

FANUC servo motors are completely checked before shipment, and the inspection at acceptance is normally unnecessary. When an inspection is required, check the specifications (wiring, current, voltage, etc.) of the motor and sensor. Store the motor indoors. The storage temperature is -20° C to $+60^{\circ}$ C. Avoid storing in the following places.

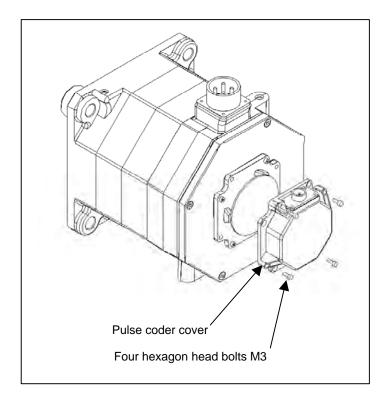
- Place with high humidity so condensation will form.
- Place with extreme temperature changes.
- Place always exposed to vibration. (The bearing may be damaged.)
- Place with much dust.

3.1.4 Separating and Disposing of a Servo Motor

For a servo motor, a plastic part is used.

Disassemble the motor as shown in the following figure, separate the plastic part (Pulsecoder cover), and dispose of the motor. The following plastic material is used:

Plastic material : > (PBT+PC)-GF(30)FR(17)<

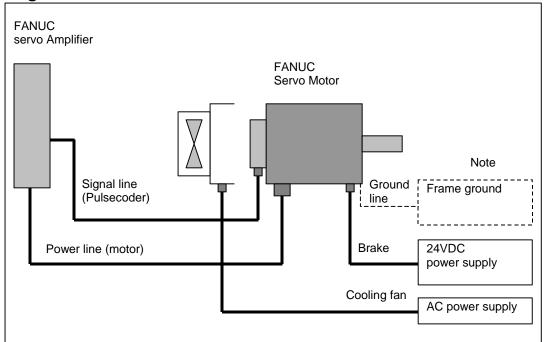


3.2 CONNECTING A SERVO MOTOR

3.2.1 Connections Related to a Servo Motor

For the FANUC AC Servo Motor αi series, connect the power line of the motor and the signal line of a Pulsecoder to an FANUC Servo Amplifier. When the motor has a built-in brake or cooling fan as an option, connect the built-in brake or cooling fan to the specified power supply.

Connection diagram



! CAUTION

If a motor is not connected to ground through the machine (cabinet) in which the motor is installed, connect the motor grounding point and the amplifier grounding point to absorb noise. In this case, use a wire with a thickness of at least 1.25 mm², other than the GND conductor in the power line. Keep the wire as far from the power line as possible.

Connecting the power line

For the pin layout of the power connector on the servo motor side or the layout of the power terminals, see Chapter 7, "OUTLINE DRAWINGS".

For details of the connector of a cable connected to the servo motor, see Chapter 11, "CONNECTORS ON THE CABLE SIDE."

For the pin size and cabling of the models connected to the terminal block (αiS 100 to αiS 500, αiS 100HV to αiS 3000HV), see Chapter 7, "OUTLINE DRAWINGS".

For details of selection of a power line and the shapes of the connector and terminal connected to a servo amplifier, refer to "FANUC SERVO AMPLIFIER α*i* series Descriptions (B-65282EN)."

Connecting the signal line

For details of the signal connector on a Pulsecoder, see Chapter 8, "FEEDBACK SENSOR".

For details of the connector of a cable connected to a Pulsecoder, see Chapter 11, "CONNECTORS ON THE CABLE SIDE."

For details of selection of a signal line and the connector connected to a servo amplifier, refer to "FANUC SERVO AMPLIFIER αi series Descriptions (B-65282EN)."

Connecting a built-in brake

For details of how to connect the power connector on a built-in brake and the power supply, see Chapter 9, "BUILT-IN BRAKE."

For details of the connector of a cable connected to a built-in brake, see Chapter 11, "CONNECTORS ON THE CABLE SIDE."

Connecting a cooling fan

For the power connector on the cooling fan side, the type of power supply for driving the fan, and power cabling, see Chapter 10, "COOLING FAN".

For details of the connector of a cable connected to a cooling fan, see Chapter 11, "CONNECTORS ON THE CABLE SIDE."

3.3 MOUNTING A SERVO MOTOR

3.3.1 Methods for coupling the shaft

In many cases, the following four methods are used for coupling the motor shaft to the ball screw on a machine: Direct connection through a flexible coupling, direct connection through a rigid coupling, connection through gears, and connection through timing belts. It is important to understand the advantages and disadvantages of each method, and select one that is most suitable for the machine.

Direct connection using a flexible coupling

Direct connection by a flexible coupling has the following advantages over connection using gears:

- Even if the angle of the motor shaft to the ball screw changes, it can be compensated to a certain extent.
- Because a flexible coupling connects elements with less backlash, driving noise from joints can be significantly suppressed.

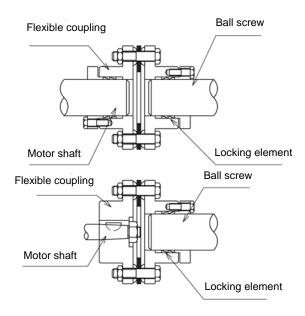
However, this method has the following disadvantages:

- The motor shaft and the ball screw must not slide from each other in the radial direction (for single coupling).
- Loose assembly may result in lower rigidity.

When the motor shaft needs to be connected directly to the ball screw, connecting them using a flexible coupling facilitates adjustment and installation of the motor.

To use a single coupling, the machine needs to be designed so that the centers of the motor shaft and the ball screw are aligned. (In the same way as with a rigid coupling, the use of a single coupling demands that there be almost no relative eccentricity between the axes.)

If it is difficult to align the centers, a double coupling needs to be employed.



Direct connection using a rigid coupling

Direct connection using a rigid coupling has the following advantages over direct connection using a flexible coupling:

- More economical
- The coupling rigidity can be increased.
- If the rigidity is the same as with a flexible coupling, the inertia can be reduced.

However, this method has the following disadvantages:

• The motor shaft and the ball screw must not slide from each other in the radial direction, and the angle of the motor shaft to the ball screw must be fixed.

For this reason, a rigid coupling needs to be mounted very carefully. It is desirable that the run-out of the ball screw is 0.01 mm or less. When a rigid coupling is used on the motor shaft, the run-out of the hole for the ball screw must be set to 0.01 mm or less by adjusting the tightness of the locking element.

The run-out of the motor shaft and the ball screw in the radial direction can be adjusted or compensated to a certain extent by deflection. Note, however, that it is difficult to adjust or measure changes in the angle. Therefore, the structure of the machine should be such that precision can be fully guaranteed.

Gears

This method is used when the motor cannot be put in line with the ball screw because of the mechanical interference problem or when the reduction gear is required in order to obtain large torque. The following attention should be paid to the gear coupling method:

- Grinding finish should be given to the gear, and eccentricity, pitch error, tooth-shape deviations etc. should be reduced as much as possible. Please use the JIS, First Class as a reference of precision.
- Adjustment of backlash should be carefully performed. Generally, if there is too little backlash, a high-pitched noise will occur during high-speed operation, and if the backlash is too big, a drumming sound of the tooth surfaces will occur during acceleration/deceleration. Since these noises are sensitive to the amount of backlash, the structure should be so that adjustment of backlash is possible at construction time.

Timing belt

A timing belt is used in the same cases as gear connection, but in comparison, it has advantages such as low cost and reduced noise during operation, etc. However, it is necessary to correctly understand the characteristics of timing belts and use them appropriately to maintain high precision.

Generally, the rigidity of timing belt is sufficiently higher than that of other mechanical parts such as ball screw or bearing, so there is no danger of inferiority of performance of control caused by reduction of rigidity by using timing belt. When using a timing belt with a position sensor on the motor shaft, there are cases where poor precision caused by backlash of the belt tooth and pulley tooth, or elongation of belt after a long time becomes problem, so consideration should be given to whether these errors significantly affect precision. In case the position sensor is mounted behind the timing belt (for example, on the ball screw axis), a problem of precision does not occur.

Life of the timing belt largely varies according to mounting precision and tension adjustment. Please refer to the manufacturer's Instruction Manual for correct use.

3.3.2 Fastening the Shaft

Taper shaft

In case of taper shafts, the load must be exerted on the tapered surface. For this reason, at least 70% of gage fitting is required on the tapered surface.

In addition, the screw at the end of the taper shaft must be tightened with a proper torque to achieve sufficient axial force.

Straight shaft

To use a straight shaft that has no key way, connect the shaft with a coupling using a locking element. Because the locking element connects elements by the friction generated when the screw is tightened, it is free from backlash and the concentration of stress. For this reason, the locking element is highly reliable for connecting elements.

To assure sufficient transmission with the locking element, factors such as the tightening torque of the screw, the size of the screw, the number of screws, the clamping flange, and the rigidity of connecting elements are important. Refer to the manufacturer's specifications before using the locking element. When a coupling or gear is mounted using the locking element, tighten the screws to remove a run-out of the coupling or gear including the shaft.

Straight shaft with a key way

In a straight shaft with a key way, torque is transmitted at the key. This means that if there is a looseness between the key and key way, the impact incurred at the time of inversion increases, which can result in shaft breakage, or a backlash occurs as a result of the looseness, which can lower positioning accuracy. Therefore, the key and key way should be designed so as to minimize the looseness between them. When performing acceleration abruptly or frequently, select a taper shaft or straight shaft with no key groove.

3.3.3 Allowable Axis Load for a Servo Motor

The allowable axis load for the shaft of each motor is indicated in Chapter 7, "OUTLINE DRAWINGS". Using a motor under a load higher than the allowable axial load may break the motor. When designing a machine and connecting a motor to the machine, fully consider the following points:

- The allowable radial load is determined, assuming that a radial load is applied to the end of the shaft.
- Applying a load higher than the allowable axis load may break the bearing. Applying a radial load higher than the allowable radial load may break the shaft due to a fatigue failure.
- A radial load indicates the constant force continuously applied to the shaft depending on the mounting method (such as belt tension) and the force by the load torque (such as dividing moment by pulley radius).
- When a timing belt is used, the belt tension is critical particularly. Too tight a belt causes a fault such as the broken shaft. Belt tension must be controlled so as not to exceed the limits calculated from the allowable radial load. Positioning the pulley as close to the bearing as possible in design can prevent possible faults such as the broken shaft.
- In some use conditions, the pulley diameter and gear size should be considered. For example, when the α*i* F4 model is used with a gear and pulley with a radius of 2.5 cm or less, the radial load with a torque of 17.6 Nm (180 kgfcm) exceeds the allowable axis load, 686 N (70 kgf). In this case, take measures such as supporting the end of the motor shaft mechanically.
- If a motor may be used under a load higher than the allowable axis load, the machine tool builder should examine the life by referencing the shaft diameter, bearing, and other factors. Since the standard single-row deep-groove ball bearing is used for the motor bearing, a too high axial load cannot be used. To use a worm or helical gear, in particular, use another bearing.
- The motor bearing is generally fixed with a C-snap ring, and there is a small play in the axial direction. If the axial play affects the positioning in the case of using a worm or helical gear, fit it with another bearing.

3.3.4 Shaft Run-out Precision of a Servo Motor

The shaft run-out precision of each motor is indicated in Chapter 7, "OUTLINE DRAWINGS". The methods of measuring the shaft run-out precision are specified below:

ltem	Measuring method
Shaft diameter run-out	Within 10 mm from the end of the shaft
Run-out of the faucet joint for mounting the flange against the center of the shaft (Only for flange type)	
Run-out of the flange mounting surface against the center of the shaft (Only for flange type)	

3.3.5 Other Notes on Axis Design

Machine movement per 1 revolution of motor shaft

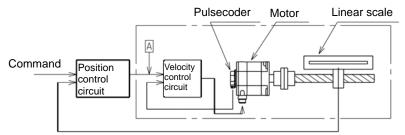
The machine movement per 1 revolution of motor shaft must be determined at the first stage of machine design referring the load torque, load inertia, rapid traverse speed, and relation between minimum increment and resolution of the position sensor mounted on the motor shaft. To determine this amount, the following conditions should be taken into consideration.

- The machine movement per 1 revolution of motor shaft must be such that the desired rapid traverse speed can be obtained. For example, if the maximum motor speed is 1500 min⁻¹ and the rapid traverse speed must be 12 m/min., the machine movement per 1 rev. must be 8 mm/rev. or higher.
- As the machine movement per 1 revolution of motor shaft is reduced, both the load torque and the load inertia reflected to motor shaft also decrease.
 - Therefore, to obtain large thrust, the machine movement per 1 rev. should be the lowest value at which the desired rapid traverse speed can be obtained.
- Assuming that the accuracy of the reduction gear is ideal, it is advantageous to make the machine movement per 1 rev. of motor shaft as low as possible to obtain the highest accuracy in mechanical servo operations. In addition, minimizing the machine movement per 1 rev. of motor shaft can increase the servo rigidity as seen from the machine's side, which can contribute to system accuracy and minimize the influence of external load changes.
- When the machine is operation is characterized by repeated acceleration/deceleration cycles, a heating problem may occur due to the current flow caused by the acceleration and deceleration. Should this occur, the machine travel distance per motor shaft revolution should be modified. Given optimum conditions, the machine travel distance per motor shaft revolution is set such that the motor's rotor inertia equals the load inertia based on motor shaft conversion. For machines such as punch presses and PCB drilling machines, the machine's travel distance per motor shaft revolution should be set so as to satisfy this optimum condition as far as possible, while also considering the rapid traverse rate and increment system.

Precautions for using linear scale

In the case where the machine moves in a linear direction and movement is directly detected by linear scale such as inductosyn, magne-scale etc., special considerations are necessary in comparison with the method where feedback is produced by detecting the motor shaft rotation. This is because the machine movement now directly influences the characteristics of the control system.

The following block diagram shows feedback produced using a linear scale.



The response of this control system is determined by the adjustment value (position loop gain) of the position control circuit. In other words, the position loop gain is determined by the specified response time of the control system. In the diagram above, the section enclosed by the broken line is called the velocity loop.

Unless the response time of this section where position signal is detected is sufficiently shorter than the response time determined by the position loop gain, the system does not operate properly. In other words, when a command signal is put into point A, response time of the machine where position signals are detected must be sufficiently shorter than the response time defined by the position loop gain.

If the response of the sensor section is slow, the position loop gain should be reduced to have the system operate normally, and as a result, the response of the whole system becomes slow. The same problem is caused when inertia is great.

The main causes for slow response are the mass of the machine and the elastic deformation of the machine system. The larger the volume, and the greater the elastic deformation, the slower the response becomes.

As an index for estimating the response of this machine system, the natural frequency of the machine is used, and this is briefly calculated by the following equation.

$$W_m = \frac{1}{2\pi} \times \sqrt{\frac{K_m}{J_L}}$$

W_m: Natural frequency

J_L: Load inertia reflected to motor shaft

K_m: Rigidity of machine system

(=Torque necessary to elastically deform 1[rad] at the motor shaft when the machine table is clamped.)

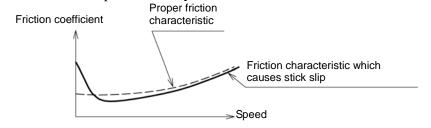
displacement such as 10 [um] or less.

The above values can be obtained by calculating the elastic deformation for each section of the driving system. The machine should be designed so that the value of this natural frequency [Hz] will be more than or equal to the value of the position loop gain [sec⁻¹]. For example, when setting 20 [sec⁻¹] as the value of position loop gain, natural frequency of machine system must be more than 20 [Hz]. In this case, the response of the control system becomes a problem for extremely small amounts of movement. Consequently, the natural frequency should be calculated from the rigidity at extremely small

Stick slip

If machine movement causes a stick slip, the control system does not operate normally. That is, it does not stop where it is supposed to, but a phenomenon occurs where it goes beyond and then back within an extremely small range (hunting).

To avoid stick slip, the machine rigidity should be increased, or friction characteristics of the sliding surface should be improved. When the sliding surface friction characteristic is as in the figure below, stick slip occurs easily.



Value of machine overrun (Damping coefficient of machine system)

When the machine is floated by static pressure, etc., there are cases where the machine keeps on moving within the range of backlash although the motor shaft has stopped. If this amount is large, hunting will also occur. To avoid this, backlash should be reduced (especially the backlash of the last mass where position sensor is mounted) and the appropriate damping should be considered.

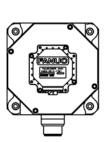
Reciprocating motion over a short distance

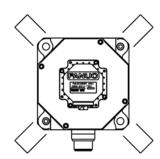
Continuing reciprocating motions over a short distance with a small number of revolutions causes the bearing to become short of lubricant, which can shorten the life of the bearing. When such motions are performed, special care should be taken by, for example, turning the motor at least one turn periodically.

3.3.6 Cautions in Mounting a Servo Motor

The servo motor contains precision sensor, and is carefully machined and assembled to provide the required precision. Pay attention to the following items to maintain the precision and prevent damage to the sensor.

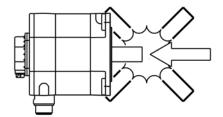
• Secure the servo motor uniformly using four bolt holes provided on the front flange. (For the αiS 1000HV to αiS 3000HV, the motor's own weight must be supported by the feet, and the flange must be used as the reference for alignment to the machine.)



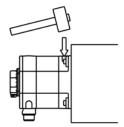


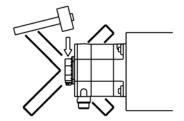
• Ensure that the surface on which the machine is mounted is sufficiently flat.

When mounting on the machine, take care not to apply a shock to the motor.



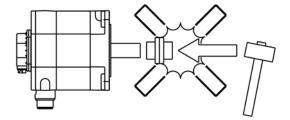
 When it is unavoidable to tap the motor for adjusting the position, etc., use a plastic hammer and tap only the front flange if possible.



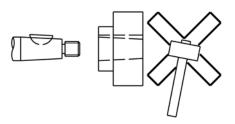


A precision sensor is directly connected to the servo motor shaft. Pay attention to the following items to prevent damage to the sensor.

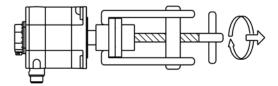
• When connecting the power transmission elements such as a gear, a pulley and a coupling to the shaft, take care not to apply a shock to the shaft.



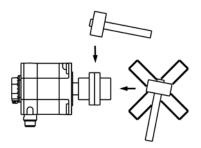
- Generally, in the case of straight shaft, use a locking element for connection with the shaft.
- In the case of tapered shaft, match the tapered surface with the power transmission element and fix by tightening the screw at the end. When the woodruff key is too tight, don't tap it with a hammer. Use the woodruff key mainly for positioning, and use the tapered surface for torque transmission. Machine the tapered surface of the power transmission element so that over 70% of the whole surface is contacted.



• To remove the connected power transmission element, be sure to use a jig such as a gear puller.



• When tapping slightly to remove the tightly contacted tapered surface, tap in the radial direction to prevent a shock in the axial direction.



- Suppress the rotary unbalance of the connected power transmission element to the level as low as possible. It is usually believed that there is no problem in the symmetrical form. Be careful when rotating continuously the asymmetrical different form power transmission element. Even if the vibration caused by the unbalance is as small as 0.5G, it may damage the motor bearing or the sensor.
- An exclusive large oil seal is used in the front flange of the models αiS 8 to αiS 50.

The oil seal surface is made of steel plate. Take care not to apply a force to the oil seal when installing the motor or connecting the power transmission elements.



SELECTING A MOTOR

A servo motor should be selected based on the load on the servo motor, rapid traverse rate, unit, and other conditions. The load on the servo motor is the following types of torque: steady-state load torque (including gravity and friction), acceleration torque required for acceleration/deceleration, and, for a machine tool, cutting torque by cutting force.

When selecting a motor, calculate these loads accurately according to the instructions in this chapter and check that the calculated values satisfy the conditions for selecting a serve motor described in this chapter.

This chapter describes how to calculate the load and other conditions using a table with a horizontal axis as an example.

Chapter 4, "SELECTING A MOTOR", consists of the following sections:

4.1	CONDITIONS FOR SELECTING A SERVO MOTOR	41
4.2	SELECTING A MOTOR	44
4.3	HOW TO FILL IN THE SERVO MOTOR SELECTION	
	DATA TABLE	66
4 4	CHARACTERISTIC CURVE AND DATA SHEET	77

4.1 CONDITIONS FOR SELECTING A SERVO MOTOR

The conditions for selecting a servo motor are given below.

[Selection condition 1] Steady-state load torque

- The steady-state load torque including mechanical friction and gravity must fall within approximately 70% of the stall torque of a motor.

If the steady-state load torque is close to the stall torque, the root-mean-square value of the total torque including the acceleration torque is more likely to exceed the stall torque.

Along the vertical axis, the load may be increased during lifting and at stop due to a mechanical factor. In this case, the theoretically calculated gravity retaining torque must be 60% (less than 60% in some cases) of the stall torque of a motor.

This figure of "within 70% of the steady-state load torque rating" is for reference only. Determine the appropriate torque based upon actual machine tool conditions.

[Selection condition 2] Motor speed

- The motor speed must not exceed the maximum motor speed (rated speed during continuous operation).

Calculate the motor speed and check that the speed does not exceed the maximum motor speed. For continuous operation, check that the speed does not exceed the rated speed.

[Selection condition 3] Load inertia ratio

The load inertia ratio must be appropriate.

The ratio of motor inertia and load inertia (load inertia ratio) greatly affects the controllability of the motor as well as the acceleration/deceleration time in rapid traverse.

When the load inertia does not exceed three times the motor inertia, an ordinary metal cutting machine can be used without problems, while the controllability may have to be lowered a little in some cases.

For a machine for cutting a curve at a high speed, such as a router for woodworking, it is recommended that the load inertia be smaller than or equal to the motor inertia.

If the load inertia is greater than the motor inertia by a factor of more than 3 to 5, the controllability of the motor may be adversely affected. If the load inertia is much larger than three times the motor inertia, adjustment within the normal range may be insufficient. It is desirable to avoid using a motor with such inertia.

[Selection condition 4] Acceleration torque

- Acceleration can be made with a desired time constant.

Since the load torque generally helps deceleration, if acceleration can be executed with a desired time constant, deceleration can be made with the same time constant, through both acceleration and deceleration should be considered in principle. Calculate the acceleration torque and check that the torque required for acceleration is within the intermittent operating zone of the motor

[Selection condition 5] Root-mean-square value of torque

The root-mean-square value of torque in a cycle must be sufficiently greater than the stall torque.

A motor gets hot in proportion to the square of the torque. For a servo motor for which the load condition always changes, the calculated root-mean-square value of torque in a cycle must be sufficiently greater than the stall torque.

Pay attention, in particular, when the cutting load, acceleration/deceleration condition, and other load conditions variously change in a cycle.

When the desired frequency of positioning in rapid traverse becomes greater, the ratio of the time during which the acceleration/deceleration torque is being applied to the entire operation time increases and the root-mean-square value of torque increases. In this case, increasing the acceleration/deceleration time constant is effective to decrease the root-mean-square value of torque.

[Selection condition 6] Percentage duty cycle and ON time with the maximum cutting torque

The time during which the table can be moved with the maximum cutting torque (percentage duty cycle and ON time) must be within a desired range.

The continuously applied torque such as the cutting load may exceed the stall torque. In this case, use overload duty curves to check how the ratio (percentage duty cycle) of the load applying time to the no-load applying time and the time during which the load is being applied (ON time) change.

[Selection condition 7] Dynamic brake stop distance

The stop distance when the dynamic brake is applied at an emergency stop must be within a desired range.

If the stop distance is not within the desired range, the machine may cause a collision at an emergency stop.

Along the vertical axis (for motors with a brake) [Selection condition 8] Brake retaining torque

- The load torque should be within the brake retaining torque. If this cannot be satisfied, counter balance and so forth should be taken into consideration.

The following sections explain the procedure for selecting a motor sequentially for each selection condition. Determine whether each selection condition above is satisfied.

NOTE

When handling units, be extremely careful not to use different systems of units. For example, the weight of an object should be expressed in [kg] in the SI system of units because it is handled as "mass" or [kgf] in the gravitational system of units because it is handled as "force." Inertia is expressed in [kg·m²] in the SI system of units or in [kgf·cm·sec²] in the gravitational system of units.

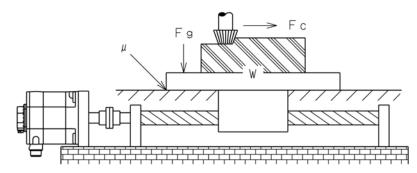
In this manual, both systems of units are written together to support them.

$$(1kg \cdot m^2 = \frac{100}{9.8} kgf \cdot cm \cdot s^2)$$

4.2 **SELECTING A MOTOR**

Sample model for calculations for selecting a servo motor

The following subsections explain how to calculate conditions for selecting a servo motor best suited for a table with a horizontal axis with the following specifications.



Sample mechanical specifications of the table and workpiece

=11760[N]=1200[kgf]

w: Mass of movable parts (table and workpiece) =1200[kg]

Friction coefficient of the sliding surface =0.05η: Efficiency of the driving system (including a ball screw) =0.9

F_g: Gib fastening force (kgf) =490[N]=50[kgf]

 F_c : Thrust counter force caused by the cutting force (kgf)

=4900[N]=500[kgf]

F_{cf}: Force by which the table is pressed against the sliding surface, caused by the moment of cutting force =294[N]=30[kgf]

 Z_1/Z_2 : Gear reduction ratio = 1/1

 T_f : Friction torque applied to the motor shaft =0.8[N·m]=8[kgf·cm]

Sample specifications of the feed screw (ball screw)

D_b: Shaft diameter $=40\times10^{-3}$ [m]=40[mm] L_b: Shaft length =1[m]=1000[mm]P: Pitch $=20\times10^{-3}$ [m/rev]==20[mm/rev]

Sample specifications of the operation of the motor shaft

T _a : Acceleration torque	[N·m][kgf·cm]
V: Workpiece rapid traverse rate	=60[m/min]
V _m : Motor speed in rapid traverse	[min ⁻¹]
t _a : Acceleration time	=0.08[s]
J _M : Motor inertia	[kg·m ²][kgf·cm·sec ²]
J _L : Load inertia	[kg·m ²][kgf·cm·sec ²]
k _s : Position loop gain	$=30[s^{-1}]$

4.2.1 Calculating the Load Torque

When a part moves along an axis at a constant speed, the torque obtained by multiplying the weight of the workpiece driving section by the friction coefficient is always applied. On a vertical or slanted axis, the motor keeps producing torque because it works against gravity. In addition, the motor also produces torque when the machine on the horizontal axis stops in proportion to the load friction. This continuously applied load torque is the steady-state load torque.

In cutting feed, the load torque is applied by cutting thrust. This is the cutting torque.

The above types of torque are generically called the load torque. The load torque applied to the motor shaft is generally given by the following equation:

$$T_m = \frac{F \times l}{2\pi\eta} + T_f$$

 T_m : Load torque applied to the motor shaft [N·m]

F: Force required to move a movable part (table or tool post) along the axis [N]

l: Traveling distance of the machine tool per revolution of the motor = $P \times (Z_1/Z_2)$ [m/rev]

 η : Efficiency of the driving system (including a ball screw)

 T_f : Friction torque of the nut of the ball screw or bearing applied to the motor shaft (input if necessary) [N·m]

The force (F) is mainly given by the following equations:

When cutting is not executed (vertical axis):

 $F=(w-w_c)g=W-W_c$

w_c : Mass of the counterbalance [kg]Wc : Weight of the counterbalance [kgf]

When cutting is not executed (horizontal axis):

$$F=\mu(W+F_g)$$

When cutting is in progress (horizontal axis) (constant load + cutting thrust):

$$F=F_c+\mu(W+F_g+F_{cf})$$

[Example of calculation for condition 1] Steady-state load torque

For a table with a horizontal axis as given as a model, the steady-state load torque when cutting is not executed is calculated as follows:

Example F=0.05× (11760+490)=612.5[N]=62.5[kgf]
$$T_m \!\!=\!\! (612.5 \!\!\times\! 20 \!\!\times\! 10^{\text{-}3} \!\!\times\! 1) \!\!\div\! (2 \!\!\times\! \pi \!\!\times\! 0.9) \!\!+\! 0.8 \\ =\!\! 3.0[\text{N}\!\cdot\!\text{m}] \!\!=\!\! 30.6[\text{kgf}\!\cdot\!\text{cm}]$$

Cautions in calculating the load torque

When calculating the torque, take the following precautions:

• Allow for the friction torque caused by the gib fastening force (F_g).

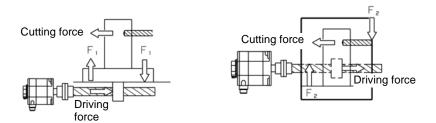
The torque calculated only from the weight of a movable part and the friction coefficient is generally quite small. The gib fastening force and precision of the sliding surface may have a great effect on the torque.

• The pre-load of the bearing or nut of the ball screw, pre-tension of the screw, and other factors may make T_c of the rolling contact considerable.

In a small, lightweight machine tool, the friction torque will greatly affect the entire torque.

Allow for an increase in friction on the sliding surface (F_{cf})
caused by the cutting resistance. The cutting resistance and the
driving force generally do not act through a common point as
illustrated below. When a large cutting resistance is applied, the
moment increases the load on the sliding surface.

When calculating the torque during cutting, allow for the friction torque caused by the load.



- The feedrate may cause the friction torque to vary greatly. Obtain an accurate value by closely examining variations in friction depending on variations in speed, the mechanism for supporting the table (sliding contact, rolling contact, static pressure, etc.), material of the sliding surface, lubricating system, and other factors.
- The friction torque of a single machine varies widely due to adjustment conditions, ambient temperature, and lubrication conditions. Collect a great amount of measurement data of identical models so that a correct load torque can be calculated. When adjusting the gib fastening force and backlash, monitor the friction torque. Avoid generating an unnecessarily great torque.

4.2.2 Calculating the Motor Speed

Calculate the motor speed using the movable part rapid traverse rate and traveling distance per revolution of the motor and check that the calculated motor speed does not exceed the maximum motor speed (rated speed for continuous operation).

$$V_m = \frac{V}{l}$$

V_m: Motor speed in rapid traverse [min⁻¹] V: Workpiece rapid traverse rate [m/min]

l: Traveling distance per revolution of the motor $[m/rev] = P \times Z_1/Z_2$

[Example of calculation for condition 2] Motor speed

When V is 60 [m/min] and 1 is $P \times Z_1/Z_2 = 0.020 \times 1/1 = 0.020$ [m/rev], V_m is 60/0.020 = 3000 [min⁻¹]. This value does not exceed the rated speed of the $\alpha i S$ 22/4000 provisionally selected.

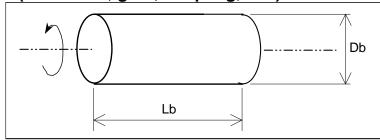
Then, select a motor whose load torque when cutting is not executed (stall torque) is 3.0 [N·m] and whose maximum speed is at least 3000 [min⁻¹] from the data sheet. The αiS 22/4000 (with a stall torque of 22 [N·m]) is provisionally selected with considering the acceleration/deceleration condition described in the following subsection.

4.2.3 Calculating the Load Inertia

Unlike the load torque, an accurate load inertia can be obtained just by calculation.

The inertia of all objects moved by the revolution of a driving motor forms the load inertia of the motor. It does not matter whether the object is rotated or moved along a straight line. Calculate the inertia values of individual moving objects separately, then add the values together, according to a rule, to obtain the load inertia. The inertia of almost all objects can be calculated according to the following basic rules:

Inertia of a cylindrical object (ball screw, gear, coupling, etc.)



The inertia of a cylindrical object rotating about its central axis is calculated as follows:

SI unit

$$J_b = \frac{\pi \gamma_b}{32} D_b^4 L_b \qquad [\text{kg·m}^2]$$

J_b: Inertia [kg·m²]

 γ_b : Weight of the object per unit volume [kg/m³]

D_b: Diameter of the object [m] L_b: Length of the object [m]

Gravitational system of units

$$J_b = \frac{\pi \gamma_b}{32 \times 980} D_b^4 L_b \qquad [\text{kgf} \cdot \text{cm} \cdot \text{s}^2]$$

 J_b : Inertia [kgf·cm·s²]

 γ_b : Weight of the object per unit volume [kg/cm³]

D_b: Diameter of the object [cm]

L_b: Length of the object [cm]

[Example of calculation for condition 3-1] Load inertia

Example)

When the shaft of a ball screw is made of steel $(\gamma=7.8\times10^3[kg/m^3])$, inertia Jb of the shaft is calculated as follows:

When $D_b=0.040[m]$, $L_b=1[m]$,

Jb= $7.8 \times 10^3 \times \pi \div 32 \times 0.040^4 \times 1 = 0.00196 \text{[kg} \cdot \text{m}^2\text{]} (=0.0200 \text{[kgf} \cdot \text{cm} \cdot \text{s}^2\text{]})$

$$(1kg \cdot m^2 = \frac{100}{9.8} kgf \cdot cm \cdot s^2)$$

Inertia of a heavy object moving along a straight line (table, workpiece, etc.)

SI unit

$$J_b = W \times \left(\frac{l}{2\pi}\right)^2 \qquad [kg \cdot m^2]$$

W: Weight of the object moving along a straight line [kg]

l: Traveling distance along a straight line per revolution of the motor [m]

Gravitational system of units

$$J_b = \frac{W}{980} \times \left(\frac{l}{2\pi}\right)^2 \qquad [\text{kgf-cm-s}^2]$$

W: Weight of the object moving along a straight line [kgf]

l: Traveling distance along a straight line per revolution of the motor [cm]

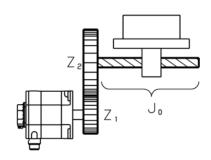
[Example of calculation for condition 3-2] Load inertia

Example)

When W is 1200(kg) and l is 20(mm), J_w of a table and workpiece is calculated as follows:

 $J_w = 1200 \times (0.020 \div 2 \div \pi)^2 = 0.01216 \text{ [kg} \cdot \text{m}^2\text{]} = 0.1241 \text{[kgf} \cdot \text{cm} \cdot \text{s}^2\text{]}$

Inertia of an object whose speed is increased above or decreased below the speed of the motor shaft



The inertia applied to the motor shaft by inertia J_0 is calculated as follows:

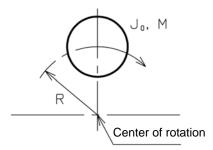
$$J = \left(\frac{Z_1}{Z_2}\right)^2 \times J_0 \quad or \quad \left(\frac{1}{Z}\right)^2 \times J_0$$

 J_0 : Inertia before the speed is changed

 Z_1,Z_2 : Number of teeth when the gear connection

1/Z: Deceleration ratio

Inertia of a cylindrical object in which the center of rotation is displaced



$$J = J_0 + MR^2$$

J₀: Inertia around the center of the object

M: Weight of the objectR: Radius of rotation

The above equation is used to calculate the inertia of, for example, a large gear which is hollowed out in order to reduce the inertia and weight.

The sum of the inertia values calculated above is J (load inertia) for accelerating the motor.

Cautions as to the limitations on load inertia

The load inertia has a great effect on the controllability of the motor as well as the time for acceleration/deceleration in rapid traverse. When the load inertia is increased, the following two problems may occur: When a command is changed, it takes more time for the motor to reach the speed specified by the new command. When a machine tool is moved along two axes at a high speed to cut an arc or curve, a larger error occurs.

When the load inertia is smaller than or equal to the rotor inertia of the motor, those problems will not occur. When the load inertia is up to three times the rotor inertia, the controllability may have to be lowered a little. Actually, this will not adversely affect the operation of an ordinary metal cutting machine. If a router for woodworking or a machine to cut a curve at a high speed is used, it is recommended that the load inertia be smaller than or equal to the rotor inertia.

When the load inertia is greater than the rotor inertia by a factor of more than 3 to 5, the controllability of the motor will be adversely affected.

If the load inertia much larger than three times the rotor inertia, an adjustment in the normal range may be insufficient. Avoid using a machine with such a great load inertia.

[Example of calculation for condition 3-3] Load inertial ratio

The sum of J_b and J_w calculated in examples of calculation 3-1 and 3-2 is load inertia J_L , so the load inertia can be calculated as follows:

$$J_L = 0.00196 + 0.01216 = 0.01412 \text{ [kg} \cdot \text{m}^2\text{]}$$

The motor inertial of the αiS 22/4000 is 0.0053 [kg·m²] and the load inertia ratio is 2.7 times the motor inertia. This value is within the allowable range.

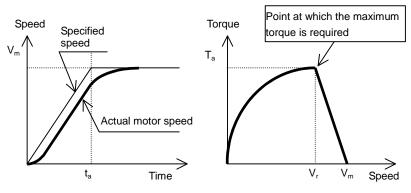
4.2.4 Calculating the Acceleration Torque

Calculate the acceleration torque required for the motor to accelerate and then obtain the torque required for acceleration by calculating the total torque including the steady-state load torque calculated before. Next, confirm the result is included in the intermittent operation area for the motor.

4.2.4.1 Calculating acceleration torque

Assuming that the motor shaft operates ideally in the acceleration/deceleration mode determined by the NC, calculate the angular acceleration. Multiply the angular acceleration by the entire inertia (motor inertia + load inertia). The product is the acceleration torque. In rapid traverse, there are linear acceleration/deceleration and feed-forward during rapid traverse + bell-shaped acceleration/deceleration. The equations for calculating the acceleration torque in each mode are given below.

Acceleration torque in linear acceleration/deceleration



When the torque is T_a and the speed is V_r in the above figure, the maximum torque is required. The equations for calculating T_a and V_r are given below:

$$T_a = V_m \times \frac{2\pi}{60} \times \frac{1}{t_a} \times (J_M + J_L / \eta) \times (1 - e^{-k_s \cdot t_a})$$

$$V_r = V_m \times \{1 - \frac{1}{t_o \cdot k_o} (1 - e^{-k_s \cdot t_a})\}$$

 $T_a: \ Acceleration \ torque \ [N{\cdot}m]$

V_m: Motor speed in rapid traverse [min⁻¹]

t_a: Acceleration time [sec]

 J_M : Motor inertia [kg·m²]

J_L: Load inertia [kg·m²]

 V_r : Motor speed at which the acceleration torque starts to decrease $[\min^{-1}]$

k_s: Position loop gain [sec⁻¹]

η: Machine tool efficiency

e: base of a natural logarithm (= 2.71)

[Example of calculation for condition 4-1] Example of calculation

Try to perform linear acceleration/deceleration under the following condition.

 $V_m=3000 \text{ [min}^{-1}\text{]}$ $t_a=0.08 \text{ [s]}$

 $k_s = 30 [s^{-1}]$

 $J_L=0.01412 [kg \cdot m^2]$

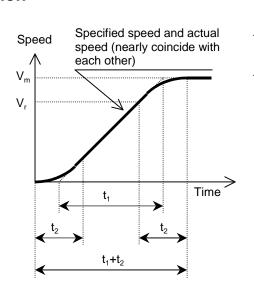
Select the αiS 22/4000 provisionally selected in example of calculation <1>.

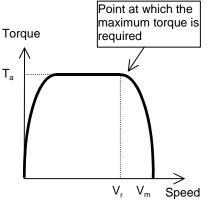
 J_M motor inertia is 0.0053 [kg·m²] when αiS 22/4000 is selected, so the load inertia is calculated as follows:

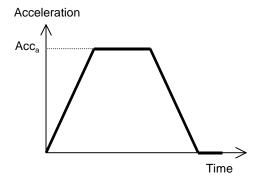
$$\begin{split} T_a &= 3000 \times (2\pi/60) \times (1/0.08) \times (0.0053 + 0.01412 \div 0.9) \times (1 - e^{-30 \times 0.08}) \\ &= 74.9 [\text{N} \cdot \text{m}] = 765 [\text{kgf} \cdot \text{cm}] \end{split}$$

 $V_r = 3000 \times \{1 - 1/(0.08 \times 30) \times (1 - e^{-30 \times 0.08})\} = 1863 [min^{-1}]$

Acceleration torque in feed-forward during rapid traverse + bell-shaped acceleration/deceleration







When the feed-forward coefficient is large enough, the acceleration torque in feed-forward during rapid traverse + bell-shaped acceleration/deceleration can approximate to the value obtained with the feed-forward coefficient = 1. When the feed-forward coefficient is 1, the equations for calculating the acceleration torque (T_a) , speed (V_r) , and maximum workpiece acceleration (Acc_a) are given below:

$$T_{a} = V_{m} \times \frac{2\pi}{60} \times \frac{1}{t_{I}} \times (J_{M} + J_{L}/\eta\eta)$$

$$V_{r} = V_{m} \times (1 - \frac{t_{2}}{2t_{1}})$$

$$Acc_{a} = V_{m} \times \frac{2\pi}{60} \times \frac{1}{t_{L}} \times P$$

 T_a : Acceleration torque [N·m]

V_m: Motor speed in rapid traverse [min⁻¹]

t₁: Acceleration time constant T1 [sec]

t₂: Acceleration time constant T2 [sec]

 J_M : Motor inertia [kg·m²]

 J_L : Load inertia [kg·m²]

η: Machine tool efficiency

 V_r : Motor speed at which the acceleration torque starts to decrease [min⁻¹]

Acc_a: Maximum workpiece acceleration [m/sec⁻²]=[G]

P: Pitch [m/rev]

(Reference)

Minimizing t_1 and increasing t_2 by the same amount allows the maximum workpiece acceleration (Acc_a) to be increased and the motor speed at which the acceleration torque starts to decrease (V_r) to be decreased. This allows the efficient use of the motor acceleration torque.

If t_2 is too large, the positioning completion time $(t_1 + t_2)$ tends to increase.

Consequently, achieving a balance between t_1 and t_2 is effective in obtaining required specifications of the machine.

4.2.4.2 Calculating the torque required by the motor shaft in acceleration

To obtain the torque required by the motor shaft (T), add the steady-state load torque (T_m) to the acceleration torque (T_a) . (Cutting torque Tcf is assumed not to be applied.)

 $T = T_a + T_m$

T : Torque required by the motor axis

 T_a : Acceleration torque T_m : Steady-state load torque

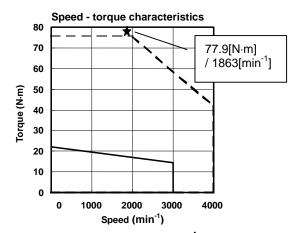
[Example of calculation for condition 4-2] Acceleration torque

When T_m is 3.0 [N·m] as calculated in example of calculation 1 and T_a is 74.9 [N·m] as calculated in example of calculation 4-1, the acceleration torque (T) is calculated as follows:

 $T = 74.9[N \cdot m] + 3.0[N \cdot m] = 77.9[N \cdot m]$

The speed when the maximum torque is required (V_r) is 1863 $[min^{-1}]$.

The speed-torque characteristics of the αiS 22/4000, given below, show that the point of 77.9 [N·m]/1863 [min⁻¹] is beyond the intermittent operating zone of the αiS 22/4000 (the torque is insufficient).



Speed - torque characteristics for αi S 22/4000

If it is impossible to change the operation specifications of the shaft (such as to increase the acceleration time), a larger motor must be selected.

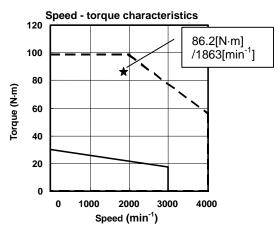
Select the αiS 30/4000 (motor inertia (J_M) = 0.0076 [kg·m²], 1.9 times load inertia ratio) and calculate the acceleration torque again.

 $T_a = 83.2[N \cdot m] = 849[kgf \cdot cm]$

 $V_r = 1863 [min^{-1}]$

 $T=83.2[N \cdot m]+3.0[N \cdot m] = 86.2[N \cdot m]$

The speed-torque characteristics of the αiS 30/4000, given below, show that the point of 86.2 [N·m]/1863 [min⁻¹] is within the intermittent operating zone of the αiS 30/4000 (acceleration is possible).



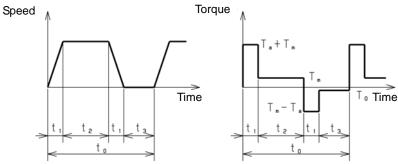
Speed - torque characteristics for αi S 30/4000

4.2.5 Calculating the Root-mean-square Value of the Torques

A motor gets hot in proportion to the square of the torque. For a servo motor for which the load condition always changes, the calculated root-mean-square value of torque in a cycle must be sufficiently greater than the stall torque.

Root-mean-square value of torque in acceleration/deceleration in rapid traverse

First, generate an operation cycle which performs acceleration/deceleration in rapid traverse with a desired frequency of positioning in rapid traverse. Write the time-speed graph and time-torque graph as shown below.



From the time-torque graph, obtain the root-mean-square value of torques applied to the motor during the single operation cycle. Check whether the value is smaller than or equal to the torque at stall.

$$T_{rms} = \sqrt{\frac{\left(T_a + T_m\right)^2 t_1 + T_m^2 t_2 + \left(T_a - T_m\right)^2 t_1 + T_0^2 t_3}{t_0}}$$

T_a: Acceleration torque

T_m: Friction torque

T_o: Torque when stopped

When T_{rms} falls within 90% of the stall torque T_s , the servo motor can be used. (The entire thermal efficiency and other margins must be considered.)

NOTE

The motor actually rotates, but the determination must be based on the stall torque.

When the motor is being operated at high speed for a comparatively large proportion of the time, you must take the rotating speed of the motor into consideration and evaluate whether output can be specified in terms of a continuous operation torque.

[Example of calculation for condition 5] Root-mean-square value of the torques

$$\alpha iS$$
 30/4000 ($T_s = 3.0[N \cdot m] = 306[kgf \cdot cm]$), $T_a = 83.2[N \cdot m]$, $T_m = T_0 = 3.0[N \cdot m]$, $t_1 = 0.08[sec]$, $t_2 = 2.0[sec]$, $t_3 = 3.0[sec]$

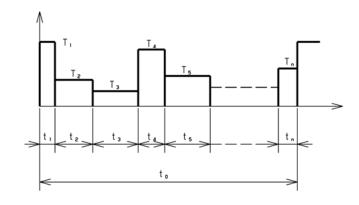
$$T_{ms} = \sqrt{\frac{\left(83.2 + 3.0\right)^{2} \times 0.08 + 3.0^{2} \times 2.0 + \left(83.2 - 3.0\right)^{2} \times 0.08 + 3.0^{2} \times 3}{0.08 \times 2 + 2.0 + 3}}$$

$$= 15.0[\text{N} \cdot \text{m}] < \text{T}_{\text{s}} \times 0.9 = 30 \times 0.9 = 27[\text{N} \cdot \text{m}]$$

The $\alpha i S30/4000$ can be used for operation.

Root-mean-square value of torque in a cycle in which the load varies

If the load conditions (cutting load, acceleration/deceleration conditions, etc.) vary widely in a single cycle, write a time-torque graph according to the operation cycle, as in above item. Obtain the root-mean-square value of the torques and check that the value is smaller than or equal to the torque at stall.



$$T_{rms} = \sqrt{\frac{T_1^2 t_1 + T_2^2 t_2 + T_3^2 t_3 + \dots + T_n^2 t_n}{t_0}}$$

$$t_0 = t_1 + t_2 + t_3 + \ldots + t_n$$

NOTE

The motor actually rotates, but the determination must be based on the stall torque.

When the motor is being operated at high speed for a comparatively large proportion of the time, you must take the rotating speed of the motor into consideration and evaluate whether output can be specified in terms of a continuous operation torque.

4.2.6 Calculating the Percentage Duty Cycle and ON Time with the Maximum Cutting Torque

Confirm that the time (duty percentage and ON time) during which the maximum cutting torque can be applied for cutting is shorter than the desired cutting time.

First, calculate the load torque applied when the cutting thrust (F_c) is applied to the motor shaft (T_{ms}) . When this load torque is smaller than the product of the motor stall torque (T_s) and thermal efficiency (α) , the motor can be used in continuous cutting. If the value is greater than the product, follow the procedure below to calculate the ON time during which the maximum cutting load torque (T_{ms}) can be applied to the motor (t_{ON}) and the percentage ratio (percentage duty cycle with the maximum cutting torque) of the ON time to the total time of a single cutting cycle (t).

 α is assumed to be 0.9. Calculate the percentage considering the specifications of the machine.

Determining whether continuous operation can be performed with the maximum cutting torque

Calculate the percentage duty cycle, according to the following figure and expressions.

 $T_{ms} < T_s \times \alpha$

Operation can be continued with the maximum cutting torque. (The percentage duty cycle with the maximum cutting torque is 100%.)

 $T_{ms} > T_s \times \alpha$

Calculate the percentage duty cycle, according to the following figure and expressions.

[Example of calculation for condition 6-1] Percentage duty cycle and ON time with the maximum cutting torque

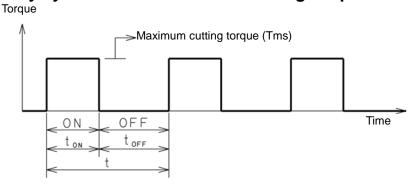
The load torque in cutting is calculated as follows:

$$\begin{split} F &= F_c + \mu(W + F_g + F_{cf}) \\ F &= 4900 + 0.05 \times (11760 + 490 + 294) = 5527[N] = 564[kgf] \\ T_m &= (5527 \times 20 \times 10^{-3} \times 1) \div (2 \times \pi \times 0.9) + 0.8 = 20.3[N \cdot m] = 208[kgf \cdot cm] \end{split}$$

The stall torque of the $\alpha i S30/4000$ (T_s) is 30 [N·m] = 306 [kgf·cm]. T_s× α = 30×0.9 = 27[N·m]>T_{ms} = 20.3[N·m]

No problems will occur in continuous cutting.

Calculating the percentage duty cycle with the maximum cutting torque



If the load torque (T_{ms}) is greater than the product of the motor stall torque (T_s) and thermal efficiency (α) , calculate the root-mean-square value of torque applied in a single cutting cycle. Specify t_{ON} and t_{OFF} so that the value does not exceed the product of the motor stall torque (T_s) and thermal efficiency (α) . Then, calculate the percentage duty cycle with the maximum cutting torque as shown below.

Percentage duty cycle with the maximum cutting torque (Tms)

$$= \frac{ton}{ton + toff} \times 100[\%]$$

[Example of calculation for condition 6-2] Percentage duty cycle and ON time with the maximum cutting force

Example)

Assume that Tms is $40 [N \cdot m]$ (Tm is $3.0 [N \cdot m]$).

$$\sqrt{\frac{40^2 t_{on} + 3^2 t_{off}}{t_{on} + t_{off}}} < 27[Nm] \text{ (90\% of the stall torque of the } \alpha i \text{S}$$

30/4000)

Therefore,

$$\frac{t_{on}}{t_{off}}$$
 < 0.83

The above ratio of the non-cutting time to the cutting time is required. The percentage duty cycle is calculated as follows:

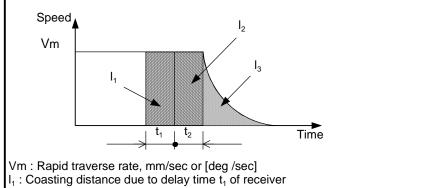
$$\frac{\text{ton}}{\text{ton} + \text{toff}} \times 100 = 45.3\%$$

Limitations on ON time

The period during which continuous operation under an overload is allowed is also restricted by the OVC alarm level and overload duty cycle characteristics. Refer to Subsection 4.4.1, "Performance Curves" for details

4.2.7 Calculating the Dynamic Brake Stop Distance

The equation for calculating the coasting distance when an abnormality occurs and the machine tool is stopped by dynamic braking with both ends of the motor power line shorted (dynamic brake stop distance) is given below:



l₂: Coasting distance due to deceleration time t₂ of magnetic contactor (MCC)

l₃: Coasting distance by dynamic braking after magnetic contactor has been operated

 (t_1+t_2) is usually about 0.05 [sec].

Coasting distance due = $Vm \times (t_2 + t_2) + (J_M + J_L) \times (A \times No + B \times No^3) \times L$ [mm] or [deg]

 J_M : Motor inertia [kg·m²] [kgf·cm·s²]

J_L: Load inertia [kg·m²] [kgf·cm·s²]

N_O: Motor speed at rapid traverse [min⁻¹]

L: Machine movement on one-rotation of motor [mm/rev] or [deg/rev]

 $(N_0/60\times L=V_m)$

A: Coefficient A for calculating the dynamic brake stop distance

B: Coefficient B for calculating the dynamic brake stop distance

For details of A and B, see the table on the next item.

For J_M , see the data sheet of each motor in the Chapter 6, "SPECIFICATIONS."

There are two ways of shortening this dynamic brake stop distance: Emergency stop distance shortening function, and emergency stop distance shortening function effective also during power interruptions (additional hardware is required).

NOTE

- 1 The resistor element, which is built into the amplifier, for the dynamic brake is designed based on energy generated when the load inertia becomes five times the motor inertia and the motor stops from its maximum rotational speed. If exceeding the above condition, contact FANUC.
- 2 For the αi S 22/6000HV, make sure that the load inertia is not more than three times the motor inertia.

If exceeding the above condition, contact FANUC.

[Example of calculation for condition 7] Dynamic brake stop distance

```
Assume that the desired stop distance is 150 [mm]. Coasting distance =  (3000/60 \times 20) [\text{mm/sec}] \times 0.05 [\text{sec}] + (0.0076 [\text{kg} \cdot \text{m}^2] + 0.01412 [\text{kg} \cdot \text{m}^2]) \times (4.0 \times 10^{-2} \times 3000 [\text{min}^{-1}] + 3.1 \times 10^{-9} \times 3000^{3} [\text{min}^{-1}]) \times 20 [\text{mm/rev}]  = 138mm
```

It has been shown that the machine tool can be stopped within the desired stop distance.

Finally, the αiS 30/4000 which satisfies selection conditions 1 to 6 is selected.

Coefficients for dynamic brake calculation

αi S series (200-V system)

Model	SI u	unit	Gravitational system of units		
	Α	В	Α	В	
αiS2/5000 ^(Note)	1.9×10 ⁻¹	9.0×10 ⁻⁸	1.9×10 ⁻²	8.8 × 10 ⁻⁹	
αiS2/6000 ^(Note)	2.9×10 ⁻¹	1.3×10 ⁻⁷	2.8×10 ⁻²	1.3×10 ⁻⁸	
αiS4/5000 ^(Note)	7.6×10 ⁻²	5.4×10 ⁻⁸	7.4×10 ⁻³	5.2×10 ⁻⁹	
αiS8/4000	1.8×10 ⁻¹	1.1×10 ⁻⁸	1.8×10 ⁻²	1.1×10 ⁻⁹	
αiS8/6000	4.2×10 ⁻¹	4.4×10 ⁻⁹	4.1×10 ⁻²	4.3×10 ⁻¹⁰	
α <i>i</i> S12/4000	1.1×10 ⁻¹	4.1×10 ⁻⁹	1.1×10 ⁻²	4.0×10 ⁻¹⁰	
α <i>i</i> S22/4000	5.8×10 ⁻²	5.2×10 ⁻⁹	5.7×10 ⁻³	5.1×10 ⁻¹⁰	
α <i>i</i> S22/6000	1.2×10 ⁻¹	2.9×10 ⁻⁹	1.2×10 ⁻²	2.9×10 ⁻¹⁰	
α <i>i</i> S30/4000	4.0×10 ⁻²	3.1×10 ⁻⁹	3.9×10 ⁻³	3.0×10 ⁻¹⁰	
α <i>i</i> S40/4000	2.9×10 ⁻²	2.2×10 ⁻⁹	2.8×10 ⁻³	2.2×10 ⁻¹⁰	
α <i>i</i> S50/3000	2.1×10 ⁻²	1.4×10 ⁻⁹	2.0×10 ⁻³	1.4×10 ⁻¹⁰	
αi S50/3000 with fan	2.1×10 ⁻²	1.4×10 ⁻⁹	2.0×10 ⁻³	1.4×10 ⁻¹⁰	
α <i>i</i> S100/2500	1.1×10 ⁻²	2.2×10 ⁻⁹	1.0×10 ⁻³	2.2×10 ⁻¹⁰	
αi S100/2500 with fan	1.1×10 ⁻²	2.2×10 ⁻⁹	1.0×10 ⁻³	2.2×10 ⁻¹⁰	
αi S200/2500	5.8×10 ⁻³	1.1×10 ⁻⁹	5.7×10 ⁻⁴	1.1×10 ⁻¹⁰	
αi S200/2500 with fan	5.8×10 ⁻³	1.1×10 ⁻⁹	5.7×10 ⁻⁴	1.1×10 ⁻¹⁰	
αiS300/2000	4.4×10 ⁻³	7.9×10 ⁻¹⁰	4.3×10 ⁻⁴	7.8×10 ⁻¹¹	
α <i>i</i> /2000	2.3×10 ⁻³	5.0×10 ⁻¹⁰	2.2×10 ⁻⁴	4.9×10 ⁻¹¹	

NOTE

When servo amplifier αi SV 20/40 is used to drive model αi S2/5000, αi S2/6000, or αi S4/5000 (L axis), the values of A and B are as follows:

Model	SI u	unit	Gravitational system of units		
	A B		Α	В	
α <i>i</i> S2/5000	4.6×10 ⁻¹	3.7×10 ⁻⁸	4.5×10 ⁻²	3.6×10 ⁻⁹	
α <i>i</i> S2/6000	6.9×10 ⁻¹	5.6×10 ⁻⁸	6.8×10 ⁻²	5.5×10 ⁻⁹	
α <i>i</i> S4/5000	3.1×10 ⁻¹	1.3×10 ⁻⁸	3.0×10 ⁻²	1.3×10 ⁻⁹	

The values of A and B are calculated by assuming that the resistance of the power line is 0.05Ω per phase. The values will vary slightly according to the resistance value of the power line.

αiS series (400-V system)

Model	-	unit	Gravitational system of units		
	Α	В	Α	В	
α <i>i</i> S2/5000HV	3.9×10 ⁻¹	4.4×10 ⁻⁸	3.8×10 ⁻²	4.4×10 ⁻¹⁰	
α <i>i</i> S2/6000HV	5.9×10 ⁻¹	6.7×10 ⁻⁸	5.8×10 ⁻²	6.8×10 ⁻¹⁰	
α <i>i</i> S4/5000HV	2.6×10 ⁻¹	1.6×10 ⁻⁸	2.5×10 ⁻²	1.5×10 ⁻⁹	
α <i>i</i> S8/4000HV	1.4×10 ⁻¹	1.4×10 ⁻⁸	1.4×10 ⁻²	1.4×10 ⁻⁹	
α <i>i</i> S8/6000HV	3.2×10 ⁻¹	5.8×10 ⁻⁹	3.1×10 ⁻²	5.6×10 ⁻¹⁰	
α <i>i</i> S12/4000HV	8.4×10 ⁻²	5.3×10 ⁻⁹	8.2×10 ⁻³	5.2×10 ⁻¹⁰	
α <i>i</i> S22/4000HV	1.2×10 ⁻¹	2.5×10 ⁻⁹	1.2×10 ⁻²	2.5×10 ⁻¹⁰	
α <i>i</i> S22/6000HV	2.1×10 ⁻¹	1.7×10 ⁻⁹	2.1×10 ⁻²	1.7×10 ⁻¹⁰	
α <i>i</i> S30/4000HV	6.7×10 ⁻²	1.8×10 ⁻⁹	6.6×10 ⁻³	1.8×10 ⁻¹⁰	
α <i>i</i> S40/4000HV	4.9×10 ⁻²	1.3×10 ⁻⁹	4.8×10 ⁻³	1.3×10 ⁻¹⁰	
α <i>i</i> S50/3000HV	6.3×10 ⁻³	4.5×10 ⁻⁹	6.2×10 ⁻⁴	4.4×10 ⁻¹⁰	
lpha iS50/3000HV with fan	6.3×10 ⁻³	4.5×10 ⁻⁹	6.2×10 ⁻⁴	4.4×10 ⁻¹⁰	
α <i>i</i> S100/2500HV	3.0×10 ⁻³	8.1×10 ⁻⁹	2.9×10 ⁻⁴	7.9×10 ⁻¹⁰	
αi S100/2500HV with fan	3.0×10 ⁻³	8.1×10 ⁻⁹	2.9×10 ⁻⁴	7.9×10 ⁻¹⁰	
α <i>i</i> S200/2500HV	1.6×10 ⁻³	4.1×10 ⁻⁹	1.6×10 ⁻⁴	4.0×10 ⁻¹⁰	
αi S200/2500HV with fan	1.6×10 ⁻³	4.1×10 ⁻⁹	1.6×10 ⁻⁴	4.0×10 ⁻¹⁰	
α <i>i</i> S300/2000HV	2.1×10 ⁻³	1.7×10 ⁻⁹	2.0×10 ⁻⁴	1.7×10 ⁻¹⁰	
α <i>i</i> S500/2000HV	1.1×10 ⁻³	1.0×10 ⁻⁹	1.1×10 ⁻⁴	1.0×10 ⁻¹⁰	
α <i>i</i> S1000/2000HV	6.3×10 ⁻⁴	5.9×10 ⁻¹⁰	6.2×10 ⁻⁵	5.8×10 ⁻¹¹	
α <i>i</i> S2000/2000HV	3.3×10 ⁻⁴	1.3×10 ⁻¹⁰	3.2×10 ⁻⁵	1.3×10 ⁻¹¹	
α <i>i</i> S3000/2000HV	1.7×10 ⁻⁴	7.4×10 ⁻¹¹	1.6×10 ⁻⁵	7.3×10 ⁻¹²	

The values of A and B are calculated by assuming that the resistance of the power line is 0.05Ω per phase. The values will vary slightly according to the resistance value of the power line.

αi F series (200-V system)

Model	SI	unit	Gravitational system of units		
	Α	В	Α	В	
α <i>i</i> F1/5000 ^(Note)	5.0×10 ⁻¹	2.6×10 ⁻⁷	4.9×10 ⁻²	2.5×10 ⁻⁸	
α <i>i</i> F2/5000 ^(Note)	1.8×10 ⁻¹	1.6×10 ⁻⁷	1.7×10 ⁻²	1.6×10 ⁻⁸	
α <i>i</i> F4/4000	4.5×10 ⁻¹	2.8×10 ⁻⁸	4.4×10 ⁻²	2.8×10 ⁻⁹	
α <i>i</i> F8/3000	1.4×10 ⁻¹	1.7×10 ⁻⁸	1.4×10 ⁻²	1.7×10 ⁻⁹	
α <i>i</i> F12/3000	1.9×10 ⁻¹	1.7×10 ⁻⁸	1.9×10 ⁻²	1.7×10 ⁻⁹	
α <i>i</i> F22/3000	6.0×10 ⁻²	9.9×10 ⁻⁹	5.9×10 ⁻³	9.7×10 ⁻¹⁰	
α <i>i</i> F30/3000	5.8×10 ⁻²	3.9×10 ⁻⁹	5.7×10 ⁻³	3.8×10 ⁻¹⁰	
α <i>i</i> F40/3000	2.6×10 ⁻²	6.0×10 ⁻⁹	2.5×10 ⁻³	5.8×10 ⁻¹⁰	
αi F40/3000 with fan	2.6×10 ⁻²	6.0×10 ⁻⁹	2.5×10 ⁻³	5.8×10 ⁻¹⁰	

NOTE

When servo amplifier αi SV 20/40 is used to drive model αi F1/5000 or αi F2/5000 (L axis), the values of A and B are as follows:

Model	SI	unit	Gravitational system of units		
	Α	В	Α	В	
α <i>i</i> F1/5000	1.2	1.1×10 ⁻⁷	1.2×10 ⁻¹	1.0×10 ⁻⁸	
α <i>i</i> F2/5000	4.9×10 ⁻¹	5.8×10 ⁻⁸	4.8×10 ⁻²	5.7×10 ⁻⁹	

The values of A and B are calculated by assuming that the resistance of the power line is 0.05Ω per phase. The values will vary slightly according to the resistance value of the power line.

αi F series (400-V system)

Model	SI u	ınit	Gravitational system of units		
	Α	В	Α	В	
α <i>i</i> F4/4000HV	3.9×10 ⁻¹	3.3×10 ⁻⁸	3.8×10 ⁻²	3.2×10 ⁻⁹	
α <i>i</i> F8/3000HV	1.1×10 ⁻¹	2.2×10 ⁻⁸	1.1×10 ⁻²	2.2×10 ⁻⁹	
α <i>i</i> F12/3000HV	1.5×10 ⁻¹	2.3×10 ⁻⁸	1.4×10 ⁻²	2.2×10 ⁻⁹	
α <i>i</i> F22/3000HV	4.5×10 ⁻²	1.3×10 ⁻⁸	4.4×10 ⁻³	1.3×10 ⁻⁹	

The values of A and B are calculated by assuming that the resistance of the power line is 0.05Ω per phase. The values will vary slightly according to the resistance value of the power line.

4.3 HOW TO FILL IN THE SERVO MOTOR SELECTION DATA TABLE

Select a suitable motor according to load conditions, rapid traverse rate, increment system and other factors. To aid in selecting the correct motor, we recommend filling in the "Servo Motor Selection Data Table" on the following page.

This section describes the items to fill in the Servo Motor Selection Data Table.

4.3.1 Servo Motor Selection Data Table

The Servo Motor Selection Data Table for the SI system of units and that for the gravitational system of units are given on the following pages.

Servo Motor Selection Data Table

SI unit

User name	Kind of machine tool	
CNC equipment	Type of machine tool	
Spindle motor		

Item			Axis			
Specifications of moving object			71/10			
* Weight of moving object (including work	niece etc.)		kg		I	1
* Axis movement direction (horizontal, ver		ant)	Ng			
* Angle of the slant	tioai, rotation, si	arit)	deg			
* Counterbalance (forth)			N			
* Table support (sliding, rolling, static pres	scuro)		IN			
Table support (sliding, folling, static pres	Diameter		mm			
* Ball screw	Pitch		mm			
Dall Screw						
	Length Diameter of pi	nion	mm			
* Rack and pinion			mm			
+ = :	Thickness of p	oinion	mm			
* Friction coefficient						
Machine tool efficiency						
* Total gear ratio						
Mechanical specifications			T		T	1
Traveling distance of the machine tool per revolution of the motor		mm/rev				
Least input increment of NC			mm			
* Rapid traverse feedrate			mm/min			
Motor speed in rapid traverse			1/min			
* Total load inertia applied to the motor sh	naft (*1)		kg·m²			
Inertia of coupling, reduction gear and pul	lley		kg⋅m²			
* Steady-state load torque (*2)			N⋅m			
* Cutting thrust			N			
Maximum cutting torque			N⋅m			
Required percentage duty cycle/ON time with the maximum cutting torque		ım	%			
Positioning distance			mm			
Required positioning time (*3)			sec			
In-position set value			mm			
Rapid traverse positioning frequency (con	tinuous, intermi	ttent)	times/min			
Dynamic brake stop distance			mm			
Motor specifications and characteristics						
Motor type						
Pulsecoder						
Shaft shape						
Brake (Yes/No)						
Feed-forward during rapid traverse (Yes/N	No)					
Acceleration/deceleration time constant in		T ₁	m⋅sec			
traverse		T ₂	m⋅sec			
Position loop gain			1/sec			

Be sure to fill in units other than the above if used. (Sometimes "deg" is used instead of "mm" for the rotary axis.)

- Note required values for selecting the motor.
- *1 If possible enter the total load inertia. If you enter the inertia of coupling, reduction gear and pulley (motor shaft conversion) in the next item, you can also calculate the total load inertia by adding the weight of the moving object and ball screw values by logical calculation in the case of a linear shaft.
- *2 Steady-state load torque refers to the steady-state components such as friction (holding torque is included in the case of a gravity shaft) when the motor is rotating at a fixed speed. Enter the state-state load torque as far as possible. If details are unknown, use a value calculated logically from the weight and friction coefficient. Enter the steady-state load torque of the rotary axis in the same way as for load inertia as it cannot be calculated logically. You need not enter the torque required for acceleration/deceleration.

 Servo delay and setting times must also be taken into consideration in the positioning time.

(**) Comments		

Servo Motor Selection Data Table

Gravitational system of units

User name	Kind of machine tool	
CNC equipment	Type of machine tool	
Spindle motor		

Item		Axis		
Specifications of moving object				
* Weight of moving object (including work	piece, etc.)	kgf		
* Axis movement direction (horizontal, ver	tical, rotation, slant)			
* Angle of the slant	<u> </u>	deg		
* Counterbalance (forth)		kgf		
* Table support (sliding, rolling, static pres	ssure)	Ŭ		
	Diameter	mm		
* Ball screw	Pitch	mm		
Dail SCIEW	Length	mm		
	Diameter of pinion	mm		
* Rack and pinion	Thickness of pinion	mm		
* Friction coefficient				
Machine tool efficiency				
* Total gear ratio				
Mechanical specifications				
Traveling distance of the machine tool pe	r revolution of the motor	mm/rev		
Least input increment of NC		mm		
* Rapid traverse feedrate		mm/min		
Motor speed in rapid traverse		1/min		
* Total load inertia applied to the motor sh	naft (*1)	kgf·cm·s ²		
Inertia of coupling, reduction gear and pul	` '	kgf·cm·s ²		
* Steady-state load torque (*2)		kgf-cm		
* Cutting thrust		kgf		
Maximum cutting torque		kgf-cm		
Required percentage duty cycle/ON time cutting torque	Required percentage duty cycle/ON time with the maximum			
Positioning distance		mm		
Required positioning time (*3)		sec		
In-position set value		mm		
Rapid traverse positioning frequency (con	tinuous, intermittent)	times/min		
Dynamic brake stop distance	·	mm		
Motor specifications and characteristics		•		
Motor type				
Pulsecoder				
Shaft shape				
Brake (Yes/No)				
Feed-forward during rapid traverse (Yes/N	lo)			
Acceleration/deceleration time constant in traverse		m·sec		
	T ₂	m·sec		
Position loop gain		1/sec		

Be sure to fill in units other than the above if used. (Sometimes "deg" is used instead of "mm" for the rotary axis.)

- Note required values for selecting the motor.
- *1 If possible enter the total load inertia. If you enter the inertia of coupling, reduction gear and pulley (motor shaft conversion) in the next item, you can also calculate the total load inertia by adding the weight of the moving object and ball screw values by logical calculation in the case of a linear shaft.
- *2 Steady-state load torque refers to the steady-state components such as friction (holding torque is included in the case of a gravity shaft) when the motor is rotating at a fixed speed. Enter the state-state load torque as far as possible. If details are unknown, use a value calculated logically from the weight and friction coefficient. Enter the steady-state load torque of the rotary axis in the same way as for load inertia as it cannot be calculated logically. You need not enter the torque required for acceleration/deceleration.

 Servo delay and setting times must also be taken into consideration in the positioning time.

(**) Comments			

4.3.2 Explanation of Items

4.3.2.1 Title

User name

Fill in this blank with the name of the user.

Kind of machine tool

Fill in this blank with a general name of machine tools, such as lathe, milling machine, machining center, and others.

Type of machine tool

Fill in this blank with the type of machine tool decided by machine tool builder.

CNC equipment

Fill in this blank with the name of CNC (16*i*-MB, 21*i*-TB, PM*i*-D, etc.) employed.

Spindle motor

Enter the specifications and output of the spindle motor. (This item is needed when selecting PS.)

Axis

Fill in this blank with names of axes practically employed in CNC command.

If the number of axes exceeds 4 axes, enter them in the second sheet.

4.3.2.2 Specifications of moving object

Be sure to enter data in this row. Data entered here is needed for determining the approximate motor load conditions (inertia, load torque).

- Mass(weight) of driven parts

Enter the mass(weight) of driven parts, such as table, tool post, etc. by the maximum value including the weight of workpiece, jig, and so on. Do not include the weight of the counter balance in the next item in this item.

- Axis movement direction

Enter horizontal, vertical, slant, or rotation as the movement directions of driven parts such as the table and tool post.

Be sure to enter data because the axis movement direction is required for calculating the steady-state load torque and regenerative energy.

- Angle of the slant

Enter the angle which the movement direction forms with a horizontal surface only when the movement direction slants upward.

Be sure to enter data because the axis movement direction is required for calculating the steady-state load torque and regenerative energy.

- Counter balance

Enter the weight of the counter balance in the vertical axis, if provided.

Enter whether the counter balance is made by a weight or force as this influences inertia.

- Table support

Enter the type of table slide (e.g. rolling, sliding or static pressure). Enter a special slide way material like Turcite, if used. Also enter the friction coefficient value. This item is significant in estimating the friction coefficient for calculating mainly the load torque.

- Ball screw

For a ball screw, enter the diameter, pitch, and length in order.

If a rack and pinion or other mechanism is used, also enter the traveling distance of the machine tool per revolution of the pinion.

- Rack and pinion

For a rack and pinion, enter the diameter and thickness of the pinion.

- Friction coefficient

Enter the friction coefficient of the table.

- Machine tool efficiency

This value is used for calculating the transfer efficiency of motor output on a machine tool. Standard value is 0.9.

Generally, a drop in transfer efficiency is expected if a reduction gear having a large deceleration rate is used.

- Total gear ratio

Enter the gear ratio between the ball screw and the servo motor, gear ratio between the final stage pinion and the servo motor in case of the rack pinion drive, or gear ratio between the table and the motor in case of rotary table.

4.3.2.3 Mechanical specifications

Enter basic data that is required for selecting the motor.

For details on how to calculate each of the items, see Section 4.2, "SELECTING A MOTOR."

- Movement per rotation of motor

Enter the movement of the machine tool when the motor rotates one turn.

Example

- When the pitch of ball screw is 12 [mm] and the gear ratio is 2/3,

 $12 \text{ [mm]} \times 2/3 = 8 \text{ [mm]}$

When the gear ratio is 1/72 in rotary table; $360 \text{ [deg.]} \times 1/72 = 5 \text{ [deg.]}$

- Least input increment CNC

Enter the least input increment of NC command. (The standard value is 0.001 [mm].)

- Rapid traverse rate

Enter the rapid traverse rate required for machine tool specifications.

- Motor speed in rapid traverse

Enter the motor speed during rapid traverse.

- Motor shaft converted load inertia

Enter a load inertia applied by the moving object reflected on the motor shaft

Do not include the inertia of the motor proper in this value. For details on this calculation, see Subsection 4.2.3, "Calculating the Load Inertia."

In the case of a linear shaft, enter the load inertia calculated by logical calculation if you enter the next item. In the case of a rotary shaft, however, the load inertia cannot be calculated by logical calculation. Enter values to two digits past the decimal point. (e.g. $0.2865 \rightarrow 0.29$)

- Inertia of coupling, reduction gear and pulley

Enter load inertia applied on transfer mechanisms other than couplings, moving objects and ball screw.

Enter values to two digits past the decimal point. (e.g. $0.2865 \rightarrow 0.29$)

- Steady-state load torque

Enter the torque obtained by calculating the force applied for moving the machine tool and state-state components such as friction (including holding torque in the case of a gravity shaft) reflected on the motor shaft when it is rotating at a fixed speed. (Do not include any torque required for acceleration/deceleration in this item.) If details are unknown, use a value calculated logically from the weight and friction coefficient. Enter the steady-state load torque of the rotary axis in the same way as for load inertia as it cannot be calculated logically.

If the load torque values differ during lifting and lowering in the vertical axis, enter both values. Also, if the load torque values differ during rapid traverse and cutting feed, enter a notice to that effect.

Since torque produced in low speed without cutting may be applied even when the motor has stopped, a sufficient allowance is necessary as compared with the continued rated torque of the motor. Suppress this load torque so that it is lower than 70% of the rated torque.

- Cutting thrust

Enter the maximum value of the force applied during cutting by the force in the feed axis direction.

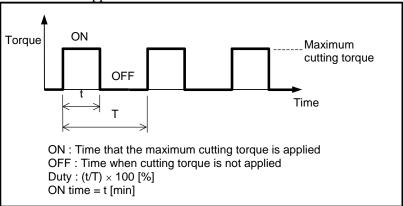
- Maximum cutting torque

Enter the torque value on the motor shaft corresponding to the maximum value of the above cutting thrust. When you enter this value, add the steady-state load to the motor shaft converted value for the cutting thrust.

Since the torque transfer efficiency may substantially deteriorate to a large extent due to the reaction from the slideway, etc. produced by the cutting thrust, obtain an accurate value by taking measured values in similar machine tools and other data into account.

- Maximum cutting duty / ON time

Enter the duty time and ON time with the maximum cutting torque in the above item applied.



- Positioning distance

Enter the distance as a condition required for calculating the rapid traverse positioning frequency.

When an exclusive positioning device is used, enter this value together with the desired positioning time below.

- Required positioning time

Enter the required positioning time when an exclusive positioning device is used.

When the device is actually attached on the machine tool, note that servo delay and setting times must also be taken into consideration in the positioning time.

- In-position set value

Enter the in-position set value as a condition required for calculating the above positioning times when an exclusive positioning device is used.

Note that the positioning time changes according to this value.

- Rapid traverse positioning frequency

Enter the rapid traverse positioning frequency by the number of times per minute.

Enter whether the value is for continuous positioning over a long period of time or for intermittent positioning within a fixed period of time. (This value is used to check the OVC alarm and whether the motor is overheated or not by a flowing current during acceleration/deceleration, or to check the regenerative capacity of the amplifier.)

4.3.2.4 Motor specifications and characteristics

- Motor type

Enter the motor type, if desired.

- Pulsecoder

Enter the specifications (absolute or increment, number of pulses: 1,000,000 or 16,000,000) of the feedback sensor (Pulsecoder) built into the motor.

- Shaft shape

Enter the shape of the motor shaft.

- Brake (Yes/No)

Enter whether or not the motor has a brake.

- Feed-forward during rapid traverse

Enter whether or not feed-forward control during rapid traverse is used.

Generally, feed-forward control can reduce the delay time in executing servo commands. However, overheating of the motor is more likely to occur as a higher torque is required for acceleration/deceleration.

Since mechanical shock increases in linear acceleration/deceleration, the bell-shaped acceleration/deceleration or fine acceleration/deceleration (FAD) function is generally used together with feed-forward control.

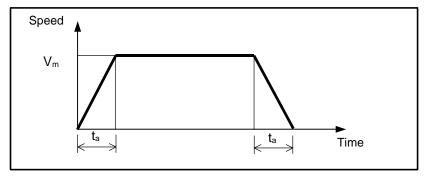
- Acceleration/deceleration time constant at rapid traverse

Enter the acceleration/deceleration time constant in rapid traverse.

The acceleration/deceleration time is determined according to the load inertia, load torque, motor output torque, and working speed.

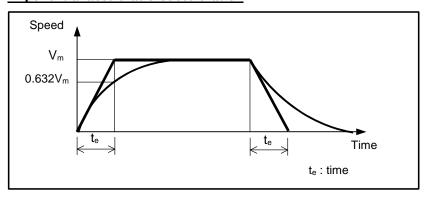
The acceleration/deceleration mode in rapid traverse is linear acceleration/deceleration or feed-forward during rapid traverse + bell-shaped acceleration/deceleration. Enter T_1 only for linear acceleration/deceleration or T_1 and T_2 for feed-forward during rapid traverse + bell-shaped acceleration/deceleration.

Linear acceleration/deceleration



When cutting feed is important, enter the time constant in cutting feed. The acceleration/deceleration mode in cutting feed is linear acceleration/deceleration, exponential acceleration/deceleration, or bell-shaped acceleration/deceleration. Enter $t_{\rm e}$ only for the time constant in cutting feed.

Exponential acceleration/deceleration



- Position loop gain

Fill in this blank with a value which is considered to be settable judging it from the inertia value based on experiences.

Since this value is not always applicable due to rigidity, damping constant, and other factors of the machine tool, it is usually determined on the actual machine tool. If the position sensor is mounted outside the motor, this value is affected by the machine tool rigidity, backlash amount, and friction torque value. Enter these values without fail.

- Dynamic brake stop distance

Enter the coasting distance when an abnormality occurs and the machine tool is stopped by dynamic braking with both ends of the motor power line shorted.

4.4 CHARACTERISTIC CURVE AND DATA SHEET

The performance of each motor is described by the characteristic curves and data sheet given below.

4.4.1 Characteristic Curves

The characteristic curves representing the "speed-torque characteristics" and "overload duty characteristic" are given for each motor model.

Speed-torque characteristics

Speed-torque characteristics indicate the relationship between the output torque and speed of the motor.

In the continuous operating zone, the motor winding temperature and pulsecoder temperature are protected from exceeding the following overheat temperatures when the ambient temperature is 20°C, and an ideal sine wave is present.

• Motor winding: 140°C

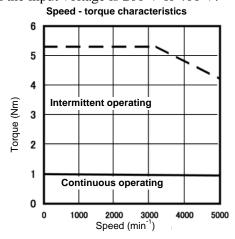
• Pulsecoder: 100°C

In the continuous operating zone, the motor can be used continuously with any combination of a speed and a torque. In the intermittent operating zone outside the continuous operating zone, the motor is used intermittently using a duty cycle curve.

The torque decreases by 0.11% for the αiS series or by 0.19% for the αiF series according to the negative temperature coefficient of magnetic materials every time the ambient temperature increases by 1°C after it exceeds 20°C.

The intermittent operating zone may be limited by the motor input voltage.

The values of the αiS series and αiF series in the data sheets are observed when the input voltage is 200 V or 400 V.

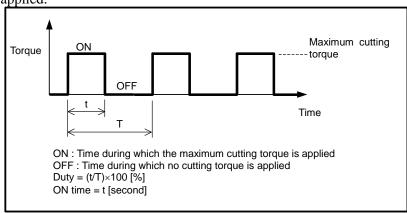


Example of αi F 1/5000

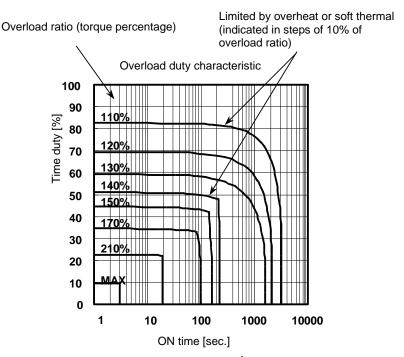
Overload duty characteristic

The percentage duty cycle indicates the ratio of the time during which torque can be applied to the total time of a single cycle.

The ON time indicates the time during which the torque is being applied.



Overload duty characteristics indicate the relationship between the percentage duty cycle (%) and ON time (load time) in which the motor can intermittently be operated with no temperature limit in the range exceeding the continuous rated torque.



Overload duty characteristic for αi S 50/3000 with fan

The duty calculation procedure is shown below:

- <1> Calculate Torque percent by formula (b) below.
- <2> Motor can be operated at any point on and inside the curve (according to the limits by overheating or overcurrent alarms) corresponding to the given over load conditions obtained form <1>.
- <3> Calculate t_F by formula (a)

$$t_{F} = t_{R} \times \left(\frac{100}{Dutypercent} - 1\right) - ---(a)$$

$$TMD = \frac{Load\ torque}{Continuous\ rated\ torque} - ---(b)$$

$$t_{F}: \text{"OFF" time}$$

$$t_{R}: \text{"ON" time}$$

The values of t_R and t_F obtained form the above mentioned procedure shows the ones limited by motor thermal conditions.

The motor temperature limits for determining overload duty curves are determined according to the motor temperature limit (overheat alarm) and according to the soft thermal function of monitoring the current by servo soft for a rapid increase in temperature (overcurrent alarm). The overload duty characteristic determined according to the overheat alarm is represented with a curve within a relatively long time range of at least about 100 seconds of the load time. That determined according to the overcurrent alarm is represented with a curve within a relatively short time range of up to about 100 seconds. The final overload duty characteristic is represented with the curve described using either characteristic value, whichever is shorter. For the soft function of monitoring overcurrent, the settings differ depending on the motor. If the motor is in the overload status at a motor speed of about 0, an overcurrent (OVC) alarm may be issued for a time shorter than described. Note that another restriction may be imposed depending on the use condition since driving device (such as an amplifier), Pulsecoder, and other devices contain a thermal protection device.

4.4.2 Data Sheet

The data sheet gives the values of motor parameters relating to the performance.

The values of parameters are those under the following conditions.

- The ambient temperature for the motor is 20°C.
- The error is $\pm 10\%$.
- The drive current of the motor is pure sine wave.

The following parameters are given on the data sheet:

Stall torque: T_s [N·m]

Torque that allows the motor to operate continuously at 0 [min⁻¹].

Stall current : Is [Arms]

Maximum effective current value that allows the motor to operate continuously at 0 [min⁻¹].

Rated output : P_r [kW]

Maximum speed at which the motor can continuously operate

Rating rotation speed : N_r [min⁻¹]

Maximum speed at which the motor can continuously operate

Maximum rotation speed: N_{max} [min⁻¹]

Maximum speed at which the motor can operate

Maximum torque : T_{max} [min⁻¹]

Maximum motor torque

More specifically, torque with which the motor can intermittently be operated within the current restricted range (from 0 [min⁻¹] to the beginning of dropping of the shoulder)

The maximum torque value is generally the product of the torque constant of each motor and the current limit of the amplifier. This value varies according to fluctuations in the power supply, motor parameters, and limits of the amplifier. For some models, when the maximum current flows through the motor, the maximum torque may be lower than the calculated value (the product of the motor torque constant and the current limit of the amplifier) due to magnetic saturation and other factors.

Motor inertia : J_m [kg·m²] [kgf·cm·sec²]

Motor rotor inertia

The values for the standard specification with no brake and for the specification with a brake are given.

Torque constant : K_t [N·m/Arms] [kgf·cm/Arms]

This is known as torque sensitivity and represents the torque developed per ampere of phase current. This value is a motor-specific constant, and is calculated by the flux distribution and location of coils in the armature, and the dimensions of the motor.

The torque constant decreases by 0.11% for the αiS series or by 0.19% for the αiF series according to the temperature coefficient of the magnet every time the temperature of the magnet increases by 1°C after it exceeds 20°C.

Back EMF (electromotive force) constant: Kv [Vrms·sec] ([Vrms·sec/rad])

This indicates the strength of a permanent magnet and is a motor-specific constant. This is the voltage generated when the rotor is externally and mechanically rotated.

Back EMF is a motor-specific constant, and is also calculated by the flux distribution and location of coils in the armature, and the dimensions of the motor. Expressed in [min⁻¹] units, back EMF has the dimensions of [Vrms/min⁻¹]. The relationship can be given as:

 $[Vrms\cdot sec/rad] = [9.55 \times Vrms/min^{-1}] (9.55 = 60/(2\pi))$

The back EMF constant is indicated as the RMS voltage per phase, so multiple by $\sqrt{3}$ to obtain the actual terminal voltage.

The relationship between the torque constant (K_t) and back EMF constant (K_v) can also be given as:

Gravitational system of units

 K_t [kgf·cm/Arms] = 30.6 K_v [Vrms·sec/rad] **SI unit**

 K_t [N·m/Arms] = 3 K_v [Vrms·sec/rad]

For this reason, when back EMF constant (K_v) drops lower than the demagnetization of the magnet, the torque constant (K_t) also drops by the same ratio.

Example)

For the αiS 2/5000

The torque constant is $K_t = 6.2[kgf \cdot cm/Arms] = 0.61 [N \cdot m/Arms]$, and the back electromotive force is $K_v = 0.20[Vrms \cdot sec/rad]$; therefore, the above equation can be satisfied.

Winding resistance : R $[\Omega]$

Resistance per phase of the motor

Mechanical time constant : t_m [sec]

This is a function of the initial rate of rise in velocity when a step voltage is applied. It is calculated from the following relationship.

$$t_m = \frac{J_m \cdot R_a}{K_t \cdot K_v}$$

Jm: Rotor inertia [kg·m²]

Ra : Resistance of the armature $[\Omega]$

Thermal time constant : t_t [min]

This is a function of the initial rate of rise of winding temperature at rated current. It is defined as the time required to attain 63.2 percent of the final temperature rise.

Axis friction torque : T_f [N·m] [kgf·cm]

This is the no-load torque required just to rotate the rotor.

Mass: w [kg]

This is the mass of the motor.

The masses of the motor with brakes and that without brakes are indicated.

Maximum current of applicable servo amplifiers

Applicable servo amplifiers are briefly described.

For more specific servo amplifiers, see Section 2.2, "APPLICABLE AMPLIFIERS."

5

CONDITIONS FOR APPROVAL RELATED TO THE IEC60034 STANDARD

This chapter describes the conditions the following FANUC AC servo motor αi series must clear before they can be approved for the IEC60034 standard. For details on EMC compliance authorization, refer to the separate manual "Compliance with EMC Directives."

Chapter 5, "CONDITIONS FOR APPROVAL RELATED TO THE IEC60034 STANDARD", consists of the following sections:

5.1	TYPES OF MOTORS TO BE APPROVED	84
5.2	APPROVED SPECIFICATIONS	86
5.3	CONNECTORS REQUIRED FOR APPROVAL	89

5.1 TYPES OF MOTORS TO BE APPROVED

The following FANUC AC Servo Motor αi series can comply with the IEC60034 standard if you follow the descriptions in this chapter. The TUV mark is printed on the nameplates of the following motors. The FANUC AC Servo Motor α*i* series has two types of motors: one type is driven by FANUC servo amplifiers (for 200 to 240 VAC) and the other type is driven by FANUC servo amplifiers (400 to 480 VAC).

αiS series (200V)

Model name	Motor specification number
α <i>i</i> S 2/5000	A06B-0212-Bxxx
αiS 2/6000	A06B-0218-Bxxx
αiS 4/5000	A06B-0215-Bxxx
αiS 8/4000	A06B-0235-Bxxx
αiS 8/6000	A06B-0232-Bxxx
α <i>i</i> S 12/4000	A06B-0238-Bxxx
α <i>i</i> S 22/4000	A06B-0262-Bxxx
αiS 22/6000	A06B-0265-Bxxx
α <i>i</i> S 30/4000	A06B-0268-Bxxx
α <i>i</i> S 40/4000	A06B-0272-Bxxx
lpha iS 50/3000,	A06B-0275-Bxxx
lpha iS 50/3000 with fan	A00B-0273-BXXX
α <i>i</i> S 100/2500	A06B-0285-Bxxx
lpha iS 100/2500 with fan	A00B-0283-BXXX
α <i>i</i> S 200/2500	A06B-0288-Bxxx
lpha iS 200/2500 with fan	A00D-0200-DXXX
αiS 300/2000	A06B-0292-Bxxx
αiS 500/2000	A06B-0295-Bxxx

αiS series (400V)

Model name	Motor specification number
α <i>i</i> S 2/5000HV	A06B-0213-Bxxx
α <i>i</i> S 2/6000HV	A06B-0219-Bxxx
α <i>i</i> S 4/5000HV	A06B-0216-Bxxx
α <i>i</i> S 8/4000HV	A06B-0236-Bxxx
α <i>i</i> S 8/6000HV	A06B-0233-Bxxx
α <i>i</i> S 12/4000HV	A06B-0239-Bxxx
α <i>i</i> S 22/4000HV	A06B-0266-Bxxx
α <i>i</i> S 22/6000HV	A06B-0263-Bxxx
α <i>i</i> S 30/4000HV	A06B-0269-Bxxx
α <i>i</i> S 40/4000HV	A06B-0273-Bxxx
lpha iS 50/3000HV,	A00D 0070 Duny
lpha iS 50/3000HV with fan	A06B-0276-Bxxx
α <i>i</i> S 100/2500HV	A06D 0206 Days
lpha iS 100/2500HV with fan	A06B-0286-Bxxx

B-65262EN/05 5.CONDITIONS FOR APPROVAL RELATED TO THE IEC60034 STANDARD

Model name	Motor specification number
α <i>i</i> S 200/2500HV	AOCD OOOD Dawn
lpha iS 200/2500HV with fan	A06B-0289-Bxxx
α <i>i</i> S 300/2000HV	A06B-0293-Bxxx
α <i>i</i> S 500/2000HV	A06B-0296-Bxxx
α <i>i</i> S 1000/2000HV	A06B-0298-Bxxx

αi F series (200V)

Model name	Motor specification number
α <i>i</i> F 1/5000	A06B-0202-Bxxx
α <i>i</i> F 2/5000	A06B-0205-Bxxx
α <i>i</i> F 4/4000	A06B-0223-Bxxx
α <i>i</i> F 8/3000	A06B-0227-Bxxx
α <i>i</i> F 12/3000	A06B-0243-Bxxx
α <i>i</i> F 22/3000	A06B-0247-Bxxx
α <i>i</i> F 30/3000	A06B-0253-Bxxx
α <i>i</i> F 40/3000,	A06B-0257-Bxxx
αi F 40/3000 with fan	AUOD-UZ37-BXXX

αi F series (400V)

Model name	Motor specification number
α <i>i</i> F 4/4000HV	A06B-0225-Bxxx
α <i>i</i> F 8/3000HV	A06B-0229-Bxxx
α <i>i</i> F 12/3000HV	A06B-0245-Bxxx
α <i>i</i> F 22/3000HV	A06B-0249-Bxxx

5.2 APPROVED SPECIFICATIONS

The following specifications are approved for the IEC60034 standard.

5.2.1 Motor Speed (IEC60034-1)

The "rated-output speed" and "allowable maximum speed" are given on the data sheet in Chapter 6, "SPECIFICATIONS."

The rated-output speed is the speed which specifies the rated output. The allowable maximum speeds are specified in such a way that the

The allowable maximum speeds are specified in such a way that the approval conditions of the IEC60034-1 standard, as they relate to rotational speed, are satisfied.

When the allowable maximum speeds are used, the characteristics are not guaranteed.

5.2.2 Output (IEC60034-1)

The "rated output" available with a motor is given on the data sheet in Chapter 6, "SPECIFICATIONS." The rated output is guaranteed as continuous output for the rated-output speed under Insulation Class F.

The output in an intermittent operation range is not specified.

5.2.3 Protection Type (IEC60034-5)

Motor protection confirms to IP65. (Models with fan are not included. The Pulsecoder connector is waterproof when engaged.)

IP6x: Completely dust-proof machine

This structure completely prevents dust from entering the machine.

IPx5: Sprinkle-proof machines

A sprinkle-proof machine shall not suffer inadvertent influence when they are exposed to water sprinkled from nozzles at any angle to the machine.

The conditions of the IPx5 type test are as follows:

Nozzle inside diameter	
Amount of sprinkled water	0.0125 [m ³ /min]
Water pressure at the nozzle	
Test time for a 1-m ² surface area of the made	chine to be
tested	1 [min]
Minimum test time	3 [min]
Distance between the nozzle and machine.	Approximately 3 [m]

↑ CAUTION

IPx5 evaluates machines for waterproofness in a short-term test as described above, allowing chances that the machines may get dry after the test. If a machine is exposed to liquids other than water or so continuously to water that it cannot get dry, it may suffer inadvertent influence even if the degree of exposure is low.

5.2.4 Cooling Method (IEC60034-6)

The motor cooling methods are as listed below.

Motor model	IC code	Method
αiS 50/3000 with fan, αiS 100/2500 with fan, αiS 200/2500 with fan, αiS 300/2000, αiS 500/2000, αiS 50/3000HV with fan, αiS 100/2500HV with fan, αiS 200/2500HV with fan, αiS 300/2000HV, αiS 500/2000HV, αiS 1000/2000HV, αiF 40/3000 with fan	IC416	Fully closed; Air-cooled by a external independence fan
Models except for the above	IC410	Fully closed; cooled by a natural air flow

5.2.5 Mounting Method (IEC60034-7)

 αiS 2 to αiS 500, αiS 2HV to αiS 500HV, αiF 1 to αiF 40, and αiF 4HV to αiF 22HV can be mounted using the following method:

IMB5: Flange mounting with the shaft facing sideways(from the rear)

IMV1: Flange mounting with the shaft facing upward(from the rear)

IMV3: Flange mounting with the shaft facing downward(from the rear)

The αiS 1000/2000HV can be mounted as follows. Consult with FANUC for any other mounting method.

IMB3: Feet bottom mounting with the shaft facing sideways(from the rear)

IMB6: Left feet side mounting with the shaft facing sideways(from the rear)

IMB7: Right feet side mounting with the shaft facing sideways(from the rear)

IMV5: Foot mounting with the shaft facing downward(from the rear) IMV6: Foot mounting with the shaft facing upward(from the rear)

5.2.6 Grounding (IEC60204-1)

For each servo motor, continuity between the ground terminal and housing of the power connector has been checked based on the IEC60204-1 safety standard and it has been ensured that it satisfies the standard.

The ground wire to be connected to the motor must have a diameter not smaller than the diameter of each phase wire.

5.2.7 Remarks

For details on EMC compliance authorization, refer to the separate manual "Compliance with EMC Directives"

Mechanical and electrical safety of each motor should be evaluated after the motor is mounted on the machine.

5.3 CONNECTORS REQUIRED FOR APPROVAL

Power connector and fan connector

The power and cooling fan must be connected to the motor with a TUV-approved connector and a cable clamp. For details, see Section 3.2, "CONNECTING A SERVO MOTOR".

• The TUV-approved plug connectors and cable clamps in Chapter 11, "CONNECTORS ON THE CABLE SIDE", are approved by TUV that they conform to the safety standard VDE0627 when combined with the FANUC AC Servo Motor αi series. As indicated in the table below, several manufacturers offer other plug connectors. For information about whether the plug connectors satisfy the safety standard when combined with the FANUC AC servo motor αi series, contact the corresponding manufacturer. Contact the manufacturers if you require details of their products.

Manufacturer	Product series name
Tyco Electronics AMP	Dynamic Series
Hirose Electric (HRS)	H/MS310 TUV-conforming series
Japan Aviation Electronics Industry (JAE)	JL04V series
DDK Ltd. (DDK)	CE05 series

• If a cable or conduit hose seal adapter is used, consult an appropriate connector maker.

6

SPECIFICATIONS

The specifications and characteristics of each motor of the FANUC AC Servo Motor αi series are described separately with characteristic curves and a data sheet.

For information about the characteristic curves and data sheet, see Section 4.4, "CHARACTERISTIC CURVE AND DATA SHEET".

Chapter 6, "SPECIFICATIONS", consists of the following sections:

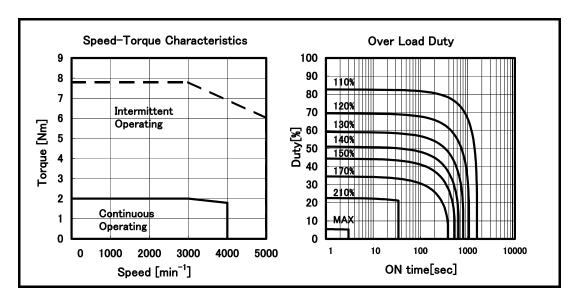
6.1	α <i>i</i> S SERIES (200V)	92
	αiS 2/5000	92
	αiS 2/6000	
	αiS 4/5000	94
	αiS 8/4000	
	αiS 8/6000	96
	αiS 12/4000	97
	αiS 22/4000	98
	αiS 22/6000	99
	αiS 30/4000	100
	αiS 40/4000	101
	αiS 50/3000	102
	αiS 50/3000 with Fan	103
	αiS 100/2500	104
	αiS 100/2500 with Fan	105
	αiS 200/2500	106
	αiS 200/2500 with Fan	107
	αiS 300/2000	108
	αiS 500/2000	109
6.2	α <i>i</i> S SERIES (400V)	110
	αiS 2/5000HV	110
	αiS 2/6000HV	111
	αiS 4/5000HV	112
	αiS 8/4000HV	113
	αiS 8/6000HV	114
	αiS 12/4000HV	115
	αiS 22/4000HV	116
	αiS 22/6000HV	117
	αiS 30/4000HV	118
	αiS 40/4000HV	119
	αiS 50/3000HV	120
	αiS 50/3000HV with Fan	121
	αiS 100/2500HV	122

	αiS 100/2500HV with Fan	123
	αiS 200/2500HV	124
	αiS 200/2500HV with Fan	125
	αiS 300/2000HV	126
	αiS 500/2000HV	127
	αiS 1000/2000HV	128
	αiS 2000/2000HV	129
	αiS 3000/2000HV	130
6.3	α <i>i</i> F SERIES (200V)	131
	α <i>i</i> F 1/5000	131
	α <i>i</i> F 2/5000	132
	α <i>i</i> F 4/4000	133
	α <i>i</i> F 8/3000	134
	α <i>i</i> F 12/3000	135
	α <i>i</i> F 22/3000	136
	α <i>i</i> F 30/3000	137
	α <i>i</i> F 40/3000	138
	α <i>i</i> F 40/3000 with Fan	139
6.4	α <i>i</i> F SERIES (400V)	140
	α <i>i</i> F 4/4000HV	140
	αiF 8/3000HV	141
	α <i>i</i> F 12/3000HV	142
	α <i>i</i> F 22/3000HV	143

6.1 αi S SERIES (200V)

Model αi S 2/5000

Specification A06B-0212-B□0□



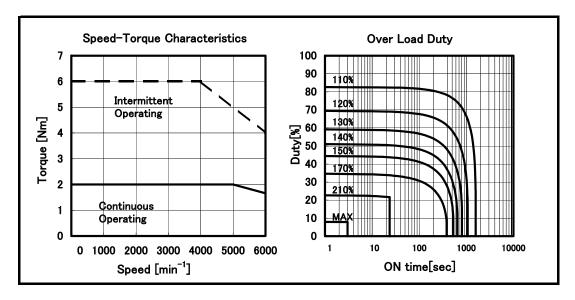
Parameter	Symbol		Value	Unit
Stall Torque (*)	Ts	2.0		Nm
		20		kgfcm
Stall Current (*)	ls	3.3		A (rms)
Rated Output (*)	Pr	0.75		kW
		1.0		HP
Rating Speed	Nr	4000		min ⁻¹
Maximum Speed	Nmax	5000		min ⁻¹
Maximum Torque (*)	Tmax	7.8		Nm
		80		kgfcm
Rotor Inertia	Jm	0.000291		kgm ²
		0.00297		kgfcms ²
Rotor Inertia (with Brake)	Jm	0.000311		kgm²
		0.00317		kgfcms ²
Torque constant (*)	Kt	0.61		Nm/A (rms)
		6.2		kgfcm/A (rms)
Back EMF constant (1phase) (*)	Ke	21		V (rms)/1000 min ⁻¹
	Kv	0.20		V (rms)sec/rad
Armature Resistance (1 phase) (*)	Ra	1.4		Ω
Mechanical time constant	tm	0.003		s
Thermal time constant	tt	15		min
Static friction	Tf	0.1		Nm
		1		kgfcm
Weight	W	2.8		kg
Weight (with Brake)	W	3.8		kg
Max. Current of Servo Amp.	Imax	20		A (peak)

^(*) The values are the standard values at 20°C and the tolerance is $\pm 10\%$.

The speed-torque characteristics very depending on the type of software, parameter setting, and input voltage of the digital servo software. (The above figures show average values.)

Model αi S 2/6000

Specification A06B-0218-B □ 0 □



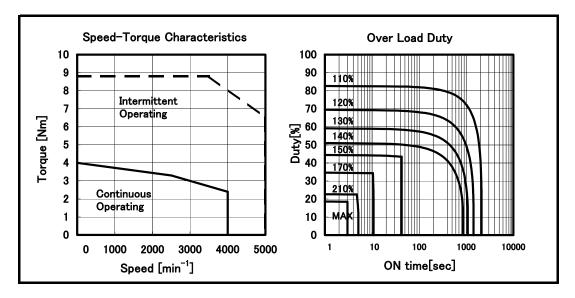
Parameter	Symbol		Value	Unit
Stall Torque (*)	Ts	2.0		Nm
		20		kgfcm
Stall Current (*)	ls	4.0		A (rms)
Rated Output (*)	Pr	1.0		kW
		1.3		HP
Rating Speed	Nr	6000		min ⁻¹
Maximum Speed	Nmax	6000		min ⁻¹
Maximum Torque (*)	Tmax	6		Nm
		61		kgfcm
Rotor Inertia	Jm	0.000291		kgm ²
		0.00297		kgfcms ²
Rotor Inertia (with Brake)	Jm	0.000311		kgm ²
		0.00317		kgfcms ²
Torque constant (*)	Kt	0.50		Nm/A (rms)
		5.1		kgfcm/A (rms)
Back EMF constant (1phase) (*)	Ke	17		V (rms)/1000 min ⁻¹
	Kv	0.17		V (rms)sec/rad
Armature Resistance (1 phase) (*)	Ra	1.4		Ω
Mechanical time constant	tm	0.005		S
Thermal time constant	tt	15		min
Static friction	Tf	0.1		Nm
		1		kgfcm
Weight	W	3.0		kg
Weight (with Brake)	W	4.0		kg
Max. Current of Servo Amp.	lmax	20		A (peak)

^(*) The values are the standard values at 20° C and the tolerance is $\pm 10\%$.

The speed-torque characteristics very depending on the type of software, parameter setting, and input voltage of the digital servo software. (The above figures show average values.)

Model αi S 4/5000

Specification A06B-0215-B□0□



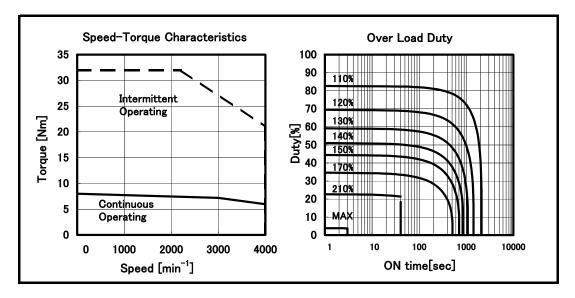
Data sheet

Parameter	Symbol		Value	Unit
Stall Torque (*)	Ts	4.0		Nm
		41		kgfcm
Stall Current (*)	Is	6.1		A (rms)
Rated Output (*)	Pr	1.0		kW
		1.3		HP
Rating Speed	Nr	4000		min ⁻¹
Maximum Speed	Nmax	5000		min ⁻¹
Maximum Torque (*)	Tmax	8.8		Nm
		90		kgfcm
Rotor Inertia	Jm	0.000515		kgm ²
		0.00526		kgfcms ²
Rotor Inertia (with Brake)	Jm	0.000535		kgm ²
		0.00546		kgfcms ²
Torque constant (*)	Kt	0.66		Nm/A (rms)
		6.7		kgfcm/A (rms)
Back EMF constant (1phase) (*)	Ke	23		V (rms)/1000 min ⁻¹
	Kv	0.22		V (rms)sec/rad
Armature Resistance (1 phase) (*)	Ra	0.61		Ω
Mechanical time constant	tm	0.002		S
Thermal time constant	tt	20		min
Static friction	Tf	0.2		Nm
		2		kgfcm
Weight	W	4.3		kg
Weight (with Brake)	W	5.3		kg
Max. Current of Servo Amp.	lmax	20		A (peak)

^(*) The values are the standard values at 20°C and the tolerance is $\pm 10\%$.

Model αi S 8/4000

Specification A06B-0235-B□0□



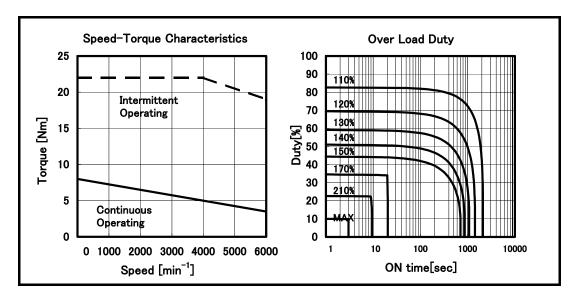
Parameter	Symbol		Value	Unit
Stall Torque (*)	Ts	8.0		Nm
		82		kgfcm
Stall Current (*)	ls	11.1		A (rms)
Rated Output (*)	Pr	2.5		kW
		3.3		HP
Rating Speed	Nr	4000		min ⁻¹
Maximum Speed	Nmax	4000		min ⁻¹
Maximum Torque (*)	Tmax	32		Nm
		327		kgfcm
Rotor Inertia	Jm	0.00117		kgm ²
		0.0119		kgfcms ²
Rotor Inertia (with Brake)	Jm	0.00124		kgm ²
		0.0127		kgfcms ²
Torque constant (*)	Kt	0.72		Nm/A (rms)
		7.3		kgfcm/A (rms)
Back EMF constant (1phase) (*)	Ke	25		V (rms)/1000 min ⁻¹
	Kv	0.24		V (rms)sec/rad
Armature Resistance (1 phase) (*)	Ra	0.31		Ω
Mechanical time constant	tm	0.002		S
Thermal time constant	tt	20		min
Static friction	Tf	0.3		Nm
		3		kgfcm
Weight	W	7.4		kg
Weight (with Brake)	W	9.6		kg
Max. Current of Servo Amp.	Imax	80		A (peak)

^(*) The values are the standard values at 20° C and the tolerance is $\pm 10\%$.

The speed-torque characteristics very depending on the type of software, parameter setting, and input voltage of the digital servo software. (The above figures show average values.)

Model αi S 8/6000

Specification A06B-0232-B□0□



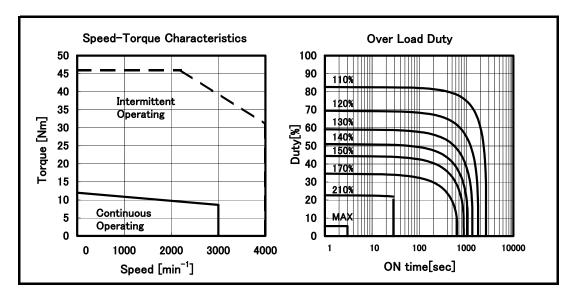
Parameter	Symbol		Value	Unit
Stall Torque (*)	Ts	8.0		Nm
		82		kgfcm
Stall Current (*)	ls	17.9		A (rms)
Rated Output (*)	Pr	2.2		kW
		3.0		HP
Rating Speed	Nr	6000		min ⁻¹
Maximum Speed	Nmax	6000		min ⁻¹
Maximum Torque (*)	Tmax	22		Nm
		224		kgfcm
Rotor Inertia	Jm	0.00117		kgm ²
		0.0119		kgfcms ²
Rotor Inertia (with Brake)	Jm	0.00124		kgm ²
		0.0127		kgfcms ²
Torque constant (*)	Kt	0.45		Nm/A (rms)
		4.6		kgfcm/A (rms)
Back EMF constant (1phase) (*)	Ke	16		V (rms)/1000 min ⁻¹
	Kv	0.15		V (rms)sec/rad
Armature Resistance (1 phase) (*)	Ra	0.13		Ω
Mechanical time constant	tm	0.002		s
Thermal time constant	tt	20		min
Static friction	Tf	0.3		Nm
		3		kgfcm
Weight	W	8.0		kg
Weight (with Brake)	W	10.0		kg
Max. Current of Servo Amp.	Imax	80		A (peak)

^(*) The values are the standard values at 20° C and the tolerance is $\pm 10\%$.

The speed-torque characteristics very depending on the type of software, parameter setting, and input voltage of the digital servo software. (The above figures show average values.)

Model αi S 12/4000

Specification A06B-0238-B□0□



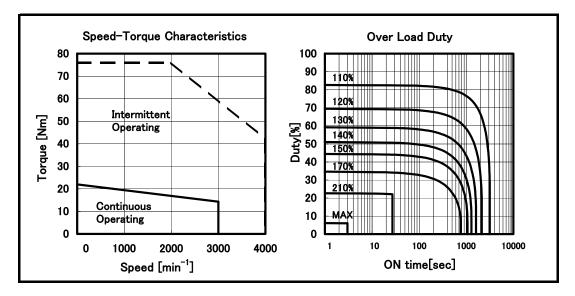
Parameter	Symbol		Value	Unit
Stall Torque (*)	Ts	12		Nm
		122		kgfcm
Stall Current (*)	ls	13.4		A (rms)
Rated Output (*)	Pr	2.7		kW
		3.6		HP
Rating Speed	Nr	3000		min ⁻¹
Maximum Speed	Nmax	4000		min ⁻¹
Maximum Torque (*)	Tmax	46		Nm
		469		kgfcm
Rotor Inertia	Jm	0.00228		kgm ²
		0.0233		kgfcms ²
Rotor Inertia (with Brake)	Jm	0.00235		kgm ²
		0.0240		kgfcms ²
Torque constant (*)	Kt	0.90		Nm/A (rms)
		9.2		kgfcm/A (rms)
Back EMF constant (1phase) (*)	Ke	31		V (rms)/1000 min ⁻¹
	Kv	0.30		V (rms)sec/rad
Armature Resistance (1 phase) (*)	Ra	0.18		Ω
Mechanical time constant	tm	0.002		S
Thermal time constant	tt	25		min
Static friction	Tf	0.3		Nm
		3		kgfcm
Weight	W	11.9		kg
Weight (with Brake)	W	14.1		kg
Max. Current of Servo Amp.	Imax	80		A (peak)

^(*) The values are the standard values at 20° C and the tolerance is $\pm 10\%$.

The speed-torque characteristics very depending on the type of software, parameter setting, and input voltage of the digital servo software. (The above figures show average values.)

Model αi S 22/4000

Specification A06B-0265-B□0□



Parameter	Symbol		Value	Unit
Stall Torque (*)	Ts	22		Nm
		224		kgfcm
Stall Current (*)	ls	27.9		A (rms)
Rated Output (*)	Pr	4.5		kW
		6.0		HP
Rating Speed	Nr	3000		min ⁻¹
Maximum Speed	Nmax	4000		min ⁻¹
Maximum Torque (*)	Tmax	76		Nm
		776		kgfcm
Rotor Inertia	Jm	0.00527		kgm ²
		0.0538		kgfcms ²
Rotor Inertia (with Brake)	Jm	0.00587		kgm ²
		0.0599		kgfcms ²
Torque constant (*)	Kt	0.79		Nm/A (rms)
		8.0		kgfcm/A (rms)
Back EMF constant (1phase) (*)	Ke	28		V (rms)/1000 min ⁻¹
	Kv	0.26		V (rms)sec/rad
Armature Resistance (1 phase) (*)	Ra	0.075		Ω
Mechanical time constant	tm	0.002		S
Thermal time constant	tt	30		min
Static friction	Tf	0.8		Nm
		8		kgfcm
Weight	W	17		kg
Weight (with Brake)	W	23		kg
Max. Current of Servo Amp.	Imax	160		A (peak)

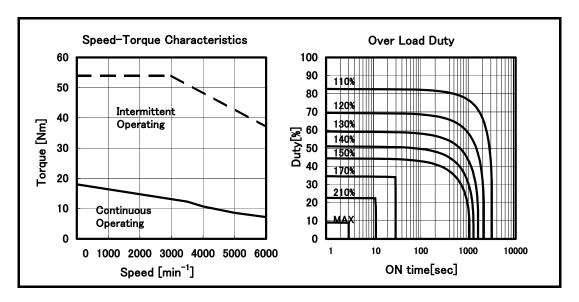
^(*) The values are the standard values at 20° C and the tolerance is $\pm 10^{\circ}$ C.

The speed-torque characteristics very depending on the type of software, parameter setting, and input voltage of the digital servo software. (The above figures show average values.)

Overload Duty shows the specification for rotating, and if the motor is stopping, Soft Alarm will occur shorter time. When the motor speed is less than 1 rpm for over 10 sec., use under stall torque.

Model αi S 22/6000

Specification A06B-0262-B□0□



Parameter	Symbol		Value	Unit
Stall Torque (*)	Ts	18		Nm
		184		kgfcm
Stall Current (*)	Is	34.1		A (rms)
Rated Output (*)	Pr	4.5		kW
		6.0		HP
Rating Speed	Nr	6000		min ⁻¹
Maximum Speed	Nmax	6000		min ⁻¹
Maximum Torque (*)	Tmax	54		Nm
		551		kgfcm
Rotor Inertia	Jm	0.00527		kgm ²
		0.0538		kgfcms ²
Rotor Inertia (with Brake)	Jm	0.00587		kgm ²
		0.0599		kgfcms ²
Torque constant (*)	Kt	0.53		Nm/A (rms)
		5.4		kgfcm/A (rms)
Back EMF constant (1phase) (*)	Ke	18		V (rms)/1000 min ⁻¹
	Kv	0.18		V (rms)sec/rad
Armature Resistance (1 phase) (*)	Ra	0.039		Ω
Mechanical time constant	tm	0.002		S
Thermal time constant	tt	30		min
Static friction	Tf	0.8		Nm
		8		kgfcm
Weight	W	17		kg
Weight (with Brake)	W	23		kg
Max. Current of Servo Amp.	Imax	160		A (peak)

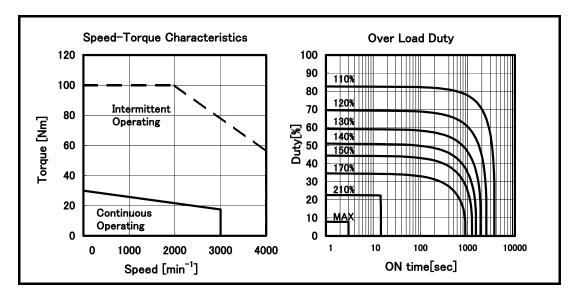
^(*) The values are the standard values at 20°C and the tolerance is ±10%.

The speed-torque characteristics very depending on the type of software, parameter setting, and input voltage of the digital servo software. (The above figures show average values.)

Overload Duty shows the specification for rotating, and if the motor is stopping, Soft Alarm will occur shorter time. When the motor speed is less than 1 rpm for over 10 sec., use under stall torque.

Model αi S 30/4000

Specification A06B-0268-B□0□



Parameter	Symbol		Value	Unit
Stall Torque (*)	Ts	30		Nm
		306		kgfcm
Stall Current (*)	ls	31.7		A (rms)
Rated Output (*)	Pr	5.5		kW
		7.3		HP
Rating Speed	Nr	3000		min ⁻¹
Maximum Speed	Nmax	4000		min ⁻¹
Maximum Torque (*)	Tmax	100		Nm
		1020		kgfcm
Rotor Inertia	Jm	0.00759		kgm ²
		0.0774		kgfcms ²
Rotor Inertia (with Brake)	Jm	0.00819		kgm ²
		0.0836		kgfcms ²
Torque constant (*)	Kt	0.95		Nm/A (rms)
		9.7		kgfcm/A (rms)
Back EMF constant (1phase) (*)	Ke	33		V (rms)/1000 min ⁻¹
	Kv	0.32		V (rms)sec/rad
Armature Resistance (1 phase) (*)	Ra	0.062		Ω
Mechanical time constant	tm	0.002		s
Thermal time constant	tt	35		min
Static friction	Tf	0.8		Nm
		8		kgfcm
Weight	W	23		kg
Weight (with Brake)	W	29		kg
Max. Current of Servo Amp.	Imax	160		A (peak)

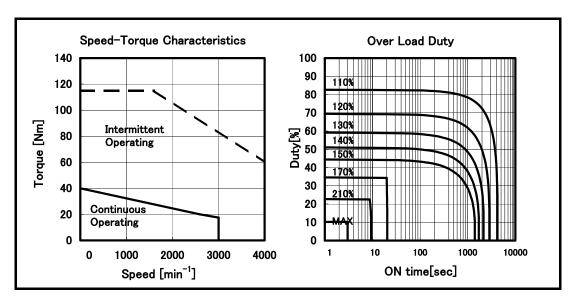
^(*) The values are the standard values at 20° C and the tolerance is $\pm 10\%$.

The speed-torque characteristics very depending on the type of software, parameter setting, and input voltage of the digital servo software. (The above figures show average values.)

Overload Duty shows the specification for rotating, and if the motor is stopping, Soft Alarm will occur shorter time. When the motor speed is less than 1 rpm for over 10 sec., use under stall torque.

Model αi S 40/4000

Specification A06B-0272-B \square 0 \square A06B-0272-B \square 2 \square



Data sheet

Parameter	Symbol		Value	Unit
Stall Torque (*)	Ts	40		Nm
		408		kgfcm
Stall Current (*)	ls	36.2		A (rms)
Rated Output (*)	Pr	5.5		kW
		7.3		HP
Rating Speed	Nr	3000		min ⁻¹
Maximum Speed	Nmax	4000		min ⁻¹
Maximum Torque (*)	Tmax	115		Nm
		1170		kgfcm
Rotor Inertia	Jm	0.00990		kgm ²
		0.101		kgfcms ²
Rotor Inertia (with Brake)	Jm	0.0105		kgm ²
		0.107		kgfcms ²
Torque constant (*)	Kt	1.10		Nm/A (rms)
		11.3		kgfcm/A (rms)
Back EMF constant (1phase) (*)	Ke	39		V (rms)/1000 min ⁻¹
	Kv	0.37		V (rms)sec/rad
Armature Resistance (1 phase) (*)	Ra	0.058		Ω
Mechanical time constant	tm	0.001		S
Thermal time constant	tt	40		min
Static friction	Tf	1.2		Nm
		12		kgfcm
Weight	W	28		kg
Weight (with 35Nm Brake)	W	34		kg
Weight (with 70Nm Brake)	W	38		kg
Max. Current of Servo Amp.	Imax	160		A (peak)

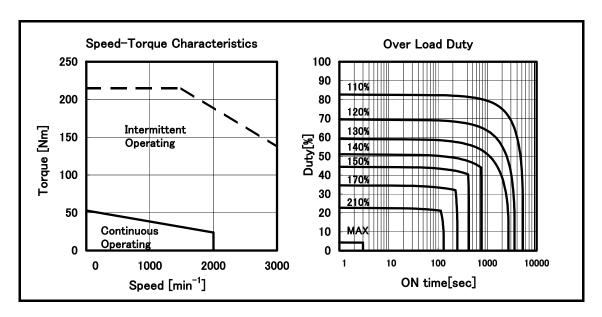
^(*) The values are the standard values at 20°C and the tolerance is $\pm 10\%$.

The speed-torque characteristics very depending on the type of software, parameter setting, and input voltage of the digital servo software. (The above figures show average values.)

Overload Duty shows the specification for rotating, and if the motor is stopping, Soft Alarm will occur shorter time. When the motor speed is less than 1 rpm for over 10 sec., use under stall torque.

Model αi S 50/3000

Specification A06B-0275-B \square 0 \square A06B-0275-B \square 2 \square



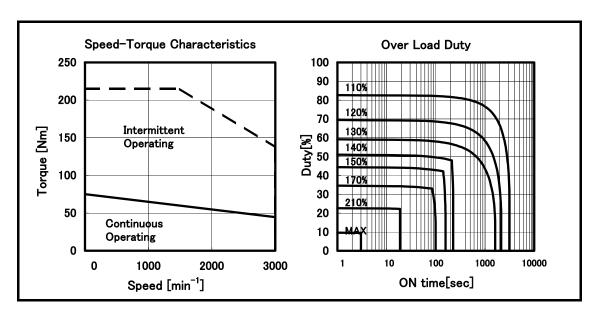
Data sheet

Parameter	Symbol		Value	Unit
Stall Torque (*)	Ts	53		Nm
		541		kgfcm
Stall Current (*)	ls	53		A (rms)
Rated Output (*)	Pr	5.0		kW
		6.7		HP
Rating Speed	Nr	2000		min ⁻¹
Maximum Speed	Nmax	3000		min ⁻¹
Maximum Torque (*)	Tmax	215		Nm
		2190		kgfcm
Rotor Inertia	Jm	0.0145		kgm ²
		0.148		kgfcms ²
Rotor Inertia (with Brake)	Jm	0.0151		kgm ²
•		0.154		kgfcms ²
Torque constant (*)	Kt	0.95		Nm/A (rms)
. ,,		9.7		kgfcm/A (rms)
Back EMF constant (1phase) (*)	Ke	33		V (rms)/1000 min ⁻¹
	Κv	0.32		V (rms)sec/rad
Armature Resistance (1 phase) (*)	Ra	0.024		Ω
Mechanical time constant	tm	0.001		s
Thermal time constant	tt	50		min
Static friction	Tf	1.8		Nm
		18		kgfcm
Weight	w	39		kg
Weight (with 35Nm Brake)	w	45		kg
Weight (with 70Nm Brake)	w	49		kg
Max. Current of Servo Amp.	lmax	360		A (peak)

^(*) The values are the standard values at 20°C and the tolerance is $\pm 10\%$.

Model αi S 50/3000 with Fan

Specification A06B-0275-B \square 1 \square A06B-0275-B \square 3 \square



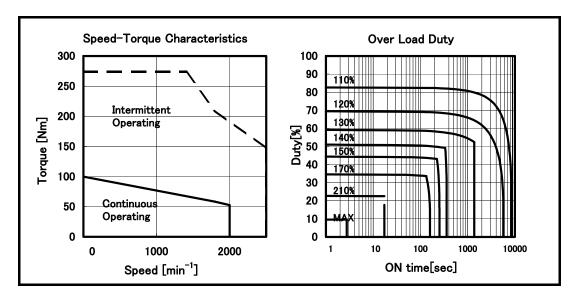
Parameter	Symbol		Value	Unit
Stall Torque (*)	Ts	75		Nm
		765		kgfcm
Stall Current (*)	Is	79		A (rms)
Rated Output (*)	Pr	14		kW
		19		HP
Rating Speed	Nr	3000		min ⁻¹
Maximum Speed	Nmax	3000		min ⁻¹
Maximum Torque (*)	Tmax	215		Nm
		2190		kgfcm
Rotor Inertia	Jm	0.0145		kgm ²
		0.148		kgfcms ²
Rotor Inertia (with Brake)	Jm	0.0151		kgm ²
		0.154		kgfcms ²
Torque constant (*)	Kt	0.95		Nm/A (rms)
		9.7		kgfcm/A (rms)
Back EMF constant (1phase) (*)	Ke	33		V (rms)/1000 min ⁻¹
	Kv	0.32		V (rms)sec/rad
Armature Resistance (1 phase) (*)	Ra	0.024		Ω
Mechanical time constant	tm	0.001		s
Thermal time constant	tt	30		min
Static friction	Tf	1.8		Nm
		18		kgfcm
Weight	w	42		kg
Weight (with 35Nm Brake)	w	48		kg
Weight (with 70Nm Brake)	w	52		kg
Max. Current of Servo Amp.	Imax	360		A (peak)

^(*) The values are the standard values at 20°C and the tolerance is $\pm 10\%$.

The speed-torque characteristics very depending on the type of software, parameter setting, and input voltage of the digital servo software. (The above figures show average values.)

Model αi S 100/2500

Specification A06B-0285-B□0□



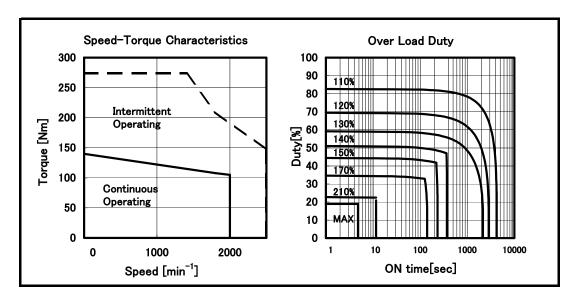
Data sheet

Parameter	Symbol		Value	Unit
Stall Torque (*)	Ts	100		Nm
		1020		kgfcm
Stall Current (*)	ls	79		A (rms)
Rated Output (*)	Pr	11		kW
		15		HP
Rating Speed	Nr	2000		min ⁻¹
Maximum Speed	Nmax	2500		min ⁻¹
Maximum Torque (*)	Tmax	274		Nm
		2800		kgfcm
Rotor Inertia	Jm	0.0252		kgm ²
		0.257		kgfcms ²
Rotor Inertia (with Brake)	Jm	0.0262		kgm ²
		0.267		kgfcms ²
Torque constant (*)	Kt	1.27		Nm/A (rms)
		13.0		kgfcm/A (rms)
Back EMF constant (1phase) (*)	Ke	44		V (rms)/1000 min ⁻¹
	Kv	0.42		V (rms)sec/rad
Armature Resistance (1 phase) (*)	Ra	0.013		Ω
Mechanical time constant	tm	0.0006		s
Thermal time constant	tt	80		min
Static friction	Tf	2.2		Nm
		22		kgfcm
Weight	W	95		kg
Weight (with Brake)	W	110		kg
Max. Current of Servo Amp.	Imax	360		A (peak)

^(*) The values are the standard values at 20° C and the tolerance is $\pm 10\%$.

Model αi S 100/2500 with Fan

Specification A06B-0285-B□1□



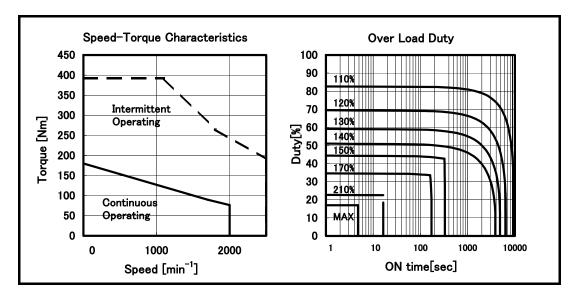
Parameter	Symbol	1	Value	Unit
Stall Torque (*)	Ts	140		Nm
		1430		kgfcm
Stall Current (*)	ls	111		A (rms)
Rated Output (*)	Pr	22		kW
		30		HP
Rating Speed	Nr	2000		min ⁻¹
Maximum Speed	Nmax	2500		min ⁻¹
Maximum Torque (*)	Tmax	274		Nm
		2800		kgfcm
Rotor Inertia	Jm	0.0252		kgm ²
		0.257		kgfcms ²
Rotor Inertia (with Brake)	Jm	0.0262		kgm ²
		0.267		kgfcms ²
Torque constant (*)	Kt	1.27		Nm/A (rms)
		13.0		kgfcm/A (rms)
Back EMF constant (1phase) (*)	Ke	44		V (rms)/1000 min ⁻¹
	Kv	0.42		V (rms)sec/rad
Armature Resistance (1 phase) (*)	Ra	0.013		Ω
Mechanical time constant	tm	0.0006		s
Thermal time constant	tt	40		min
Static friction	Tf	2.2		Nm
		22		kgfcm
Weight	W	100		kg
Weight (with Brake)	W	115		kg
Max. Current of Servo Amp.	Imax	360		A (peak)

^(*) The values are the standard values at 20° C and the tolerance is $\pm 10\%$.

The speed-torque characteristics very depending on the type of software, parameter setting, and input voltage of the digital servo software. (The above figures show average values.)

Model αi S 200/2500

Specification A06B-0288-B□0□



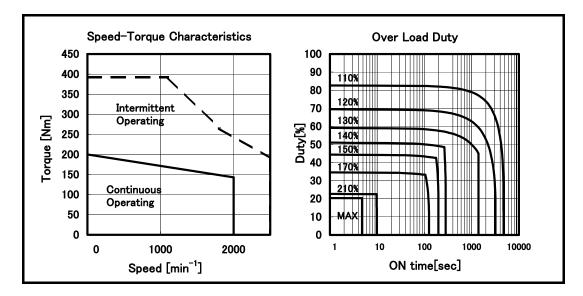
Data sheet

Parameter	Symbol		Value	Unit
Stall Torque (*)	Ts	180		Nm
		1840		kgfcm
Stall Current (*)	Is	105		A (rms)
Rated Output (*)	Pr	16		kW
		21		HP
Rating Speed	Nr	2000		min ⁻¹
Maximum Speed	Nmax	2500		min ⁻¹
Maximum Torque (*)	Tmax	392		Nm
		4000		kgfcm
Rotor Inertia	Jm	0.0431		kgm ²
		0.440		kgfcms ²
Rotor Inertia (with Brake)	Jm	0.0441		kgm ²
		0.450		kgfcms ²
Torque constant (*)	Kt	1.71		Nm/A (rms)
		17.4		kgfcm/A (rms)
Back EMF constant (1phase) (*)	Ke	60		V (rms)/1000 min ⁻¹
	Kv	0.57		V (rms)sec/rad
Armature Resistance (1 phase) (*)	Ra	0.011		Ω
Mechanical time constant	tm	0.0005		s
Thermal time constant	tt	90		min
Static friction	Tf	2.2		Nm
		22		kgfcm
Weight	W	140		kg
Weight (with Brake)	W	155		kg
Max. Current of Servo Amp.	Imax	360		A (peak)

^(*) The values are the standard values at 20° C and the tolerance is $\pm 10\%$.

Model αi S 200/2500 with Fan

Specification A06B-0288-B□1□



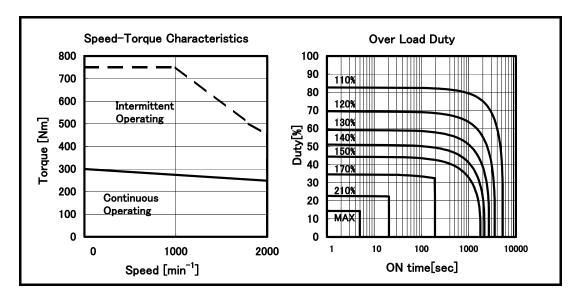
Parameter	Symbol		Value	Unit
Stall Torque (*)	Ts	200		Nm
		2040		kgfcm
Stall Current (*)	ls	115		A (rms)
Rated Output (*)	Pr	30		kW
		40		HP
Rating Speed	Nr	2000		min ⁻¹
Maximum Speed	Nmax	2500		min ⁻¹
Maximum Torque (*)	Tmax	392		Nm
		4000		kgfcm
Rotor Inertia	Jm	0.0431		kgm ²
		0.440		kgfcms ²
Rotor Inertia (with Brake)	Jm	0.0441		kgm ²
		0.450		kgfcms ²
Torque constant (*)	Kt	1.71		Nm/A (rms)
		17.4		kgfcm/A (rms)
Back EMF constant (1phase) (*)	Ke	60		V (rms)/1000 min ⁻¹
	Κv	0.57		V (rms)sec/rad
Armature Resistance (1 phase) (*)	Ra	0.011		Ω
Mechanical time constant	tm	0.0005		S
Thermal time constant	tt	45		min
Static friction	Tf	2.2		Nm
		22		kgfcm
Weight	w	145		kg
Weight (with Brake)	W	160		kg
Max. Current of Servo Amp.	Imax	360		A (peak)

^(*) The values are the standard values at 20°C and the tolerance is $\pm 10\%$.

The speed-torque characteristics very depending on the type of software, parameter setting, and input voltage of the digital servo software. (The above figures show average values.)

Model αi S 300/2000

Specification A06B-0292-B□1□



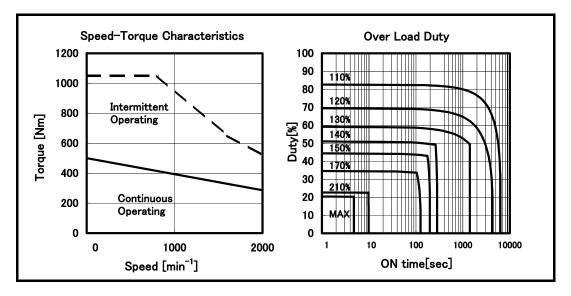
Parameter	Symbol		Value	Unit
Stall Torque (*)	Ts	300		Nm
		3060		kgfcm
Stall Current (*)	ls	193		A (rms)
Rated Output (*)	Pr	52		kW
		70		HP
Rating Speed	Nr	2000		min ⁻¹
Maximum Speed	Nmax	2000		min ⁻¹
Maximum Torque (*)	Tmax	750		Nm
		7650		kgfcm
Rotor Inertia	Jm	0.0787		kgm ²
		0.803		kgfcms ²
Rotor Inertia (with Brake)	Jm	-		kgm ²
		-		kgfcms ²
Torque constant (*)	Kt	1.55		Nm/A (rms)
		15.8		kgfcm/A (rms)
Back EMF constant (1phase) (*)	Ke	54		V (rms)/1000 min ⁻¹
	Κv	0.52		V (rms)sec/rad
Armature Resistance (1 phase) (*)	Ra	0.012		Ω
Mechanical time constant	tm	0.001		S
Thermal time constant	tt	50		min
Static friction	Tf	4.0		Nm
		41		kgfcm
Weight	w	180		kg
Weight (with Brake)	W	-		kg
Max. Current of Servo Amp.	Imax	360 x 2		A (peak)

^(*) The values are the standard values at 20°C and the tolerance is $\pm 10\%$.

The speed-torque characteristics very depending on the type of software, parameter setting, and input voltage of the digital servo software. (The above figures show average values.)

Model αi S 500/2000

Specification A06B-0295-B□1□



Parameter	Symbol		Value	Unit
Stall Torque (*)	Ts	500		Nm
		5100		kgfcm
Stall Current (*)	ls	230		A (rms)
Rated Output (*)	Pr	60		kW
		80		HP
Rating Speed	Nr	2000		min ⁻¹
Maximum Speed	Nmax	2000		min ⁻¹
Maximum Torque (*)	Tmax	1050		Nm
		10700		kgfcm
Rotor Inertia	Jm	0.127		kgm ²
		1.30		kgfcms ²
Rotor Inertia (with Brake)	Jm	-		kgm ²
,		-		kgfcms ²
Torque constant (*)	Kt	2.16		Nm/A (rms)
		22.0		kgfcm/A (rms)
Back EMF constant (1phase) (*)	Ke	75		V (rms)/1000 min ⁻¹
	Kv	0.72		V (rms)sec/rad
Armature Resistance (1 phase) (*)	Ra	0.012		Ω
Mechanical time constant	tm	0.001		S
Thermal time constant	tt	60		min
Static friction	Tf	4.0		Nm
		41		kgfcm
Weight	w	240		kg
Weight (with Brake)	w	-		kg
Max. Current of Servo Amp.	lmax	360 x 2		A (peak)

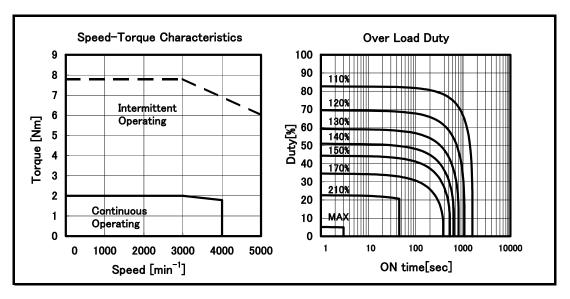
^(*) The values are the standard values at 20°C and the tolerance is ±10%.

The speed-torque characteristics very depending on the type of software, parameter setting, and input voltage of the digital servo software. (The above figures show average values.)

6.2 αi S SERIES (400V)

Model αi S 2/5000 HV

Specification A06B-0213-B□0□



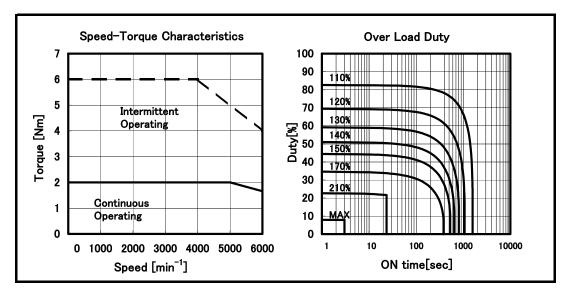
Parameter	Symbol		Value	Unit
Stall Torque (*)	Ts	2.0		Nm
		20		kgfcm
Stall Current (*)	ls	1.6		A (rms)
Rated Output (*)	Pr	0.75		kW
		1.0		HP
Rating Speed	Nr	4000		min ⁻¹
Maximum Speed	Nmax	5000		min ⁻¹
Maximum Torque (*)	Tmax	7.8		Nm
		80		kgfcm
Rotor Inertia	Jm	0.000291		kgm ²
		0.00297		kgfcms ²
Rotor Inertia (with Brake)	Jm	0.000311		kgm ²
		0.00317		kgfcms ²
Torque constant (*)	Kt	1.22		Nm/A (rms)
		12.4		kgfcm/A (rms)
Back EMF constant (1phase) (*)	Ke	42		V (rms)/1000 min ⁻¹
	Κv	0.40		V (rms)sec/rad
Armature Resistance (1 phase) (*)	Ra	5.4		Ω
Mechanical time constant	tm	0.003		s
Thermal time constant	tt	15		min
Static friction	Tf	0.1		Nm
		1		kgfcm
Weight	W	2.8		kg
Weight (with Brake)	W	3.8		kg
Max. Current of Servo Amp.	lmax	10		A (peak)

^(*) The values are the standard values at 20°C and the tolerance is $\pm 10\%$.

The speed-torque characteristics very depending on the type of software, parameter setting, and input voltage of the digital servo software. (The above figures show average values.)

Model αi S 2/6000 HV

Specification A06B-0219-B□0□



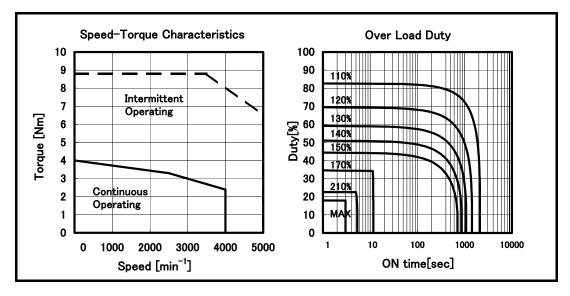
Parameter	Symbol		Value	Unit
Stall Torque (*)	Ts	2.0		Nm
		20		kgfcm
Stall Current (*)	ls	2.0		A (rms)
Rated Output (*)	Pr	1.0		kW
		1.3		HP
Rating Speed	Nr	6000		min ⁻¹
Maximum Speed	Nmax	6000		min ⁻¹
Maximum Torque (*)	Tmax	6		Nm
		61		kgfcm
Rotor Inertia	Jm	0.000291		kgm ²
		0.00297		kgfcms ²
Rotor Inertia (with Brake)	Jm	0.000311		kgm ²
		0.00317		kgfcms ²
Torque constant (*)	Kt	0.99		Nm/A (rms)
		10.1		kgfcm/A (rms)
Back EMF constant (1phase) (*)	Ke	35		V (rms)/1000 min ⁻¹
	Kv	0.33		V (rms)sec/rad
Armature Resistance (1 phase) (*)	Ra	5.6		Ω
Mechanical time constant	tm	0.005		s
Thermal time constant	tt	15		min
Static friction	Tf	0.1		Nm
		1		kgfcm
Weight	W	3.0		kg
Weight (with Brake)	W	4.0		kg
Max. Current of Servo Amp.	Imax	10		A (peak)

^(*) The values are the standard values at 20° C and the tolerance is $\pm 10\%$.

The speed-torque characteristics very depending on the type of software, parameter setting, and input voltage of the digital servo software. (The above figures show average values.)

Model αi S 4/5000 HV

Specification A06B-0216-B □ 0 □



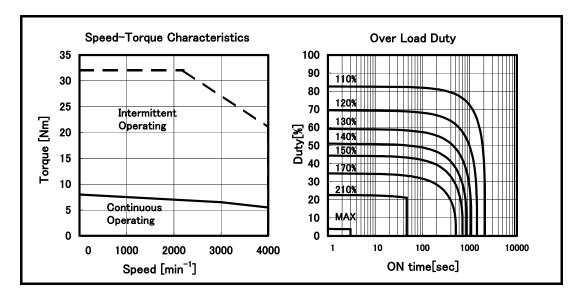
Parameter	Symbol		Value	Unit
Stall Torque (*)	Ts	4.0		Nm
		41		kgfcm
Stall Current (*)	ls	3.0		A (rms)
Rated Output (*)	Pr	1.0		kW
		1.3		HP
Rating Speed	Nr	4000		min ⁻¹
Maximum Speed	Nmax	5000		min ⁻¹
Maximum Torque (*)	Tmax	8.8		Nm
		90		kgfcm
Rotor Inertia	Jm	0.000515		kgm ²
		0.00526		kgfcms ²
Rotor Inertia (with Brake)	Jm	0.000535		kgm ²
		0.00546		kgfcms ²
Torque constant (*)	Kt	1.32		Nm/A (rms)
		13.4		kgfcm/A (rms)
Back EMF constant (1phase) (*)	Ke	46		V (rms)/1000 min ⁻¹
	Kv	0.44		V (rms)sec/rad
Armature Resistance (1 phase) (*)	Ra	2.8		Ω
Mechanical time constant	tm	0.003		S
Thermal time constant	tt	20		min
Static friction	Tf	0.2		Nm
		2		kgfcm
Weight	W	4.3		kg
Weight (with Brake)	W	5.3		kg
Max. Current of Servo Amp.	lmax	10		A (peak)

^(*) The values are the standard values at 20° C and the tolerance is $\pm 10\%$.

The speed-torque characteristics very depending on the type of software, parameter setting, and input voltage of the digital servo software. (The above figures show average values.)

Model αi S 8/4000 HV

Specification A06B-0236-B □ 0 □



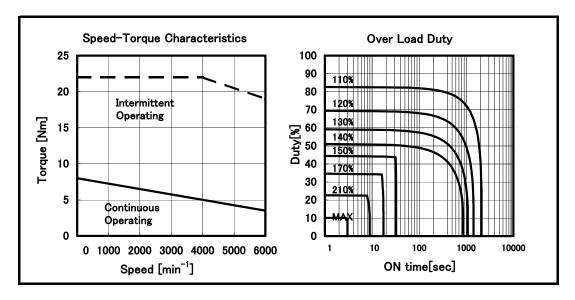
Parameter	Symbol		Value	Unit
Stall Torque (*)	Ts	8.0		Nm
		82		kgfcm
Stall Current (*)	ls	5.6		A (rms)
Rated Output (*)	Pr	2.3		kW
		3.1		HP
Rating Speed	Nr	4000		min ⁻¹
Maximum Speed	Nmax	4000		min ⁻¹
Maximum Torque (*)	Tmax	32		Nm
		327		kgfcm
Rotor Inertia	Jm	0.00117		kgm ²
		0.0119		kgfcms ²
Rotor Inertia (with Brake)	Jm	0.00124		kgm ²
		0.0127		kgfcms ²
Torque constant (*)	Kt	1.44		Nm/A (rms)
		14.7		kgfcm/A (rms)
Back EMF constant (1phase) (*)	Ke	50		V (rms)/1000 min ⁻¹
	Kv	0.48		V (rms)sec/rad
Armature Resistance (1 phase) (*)	Ra	1.3		Ω
Mechanical time constant	tm	0.002		s
Thermal time constant	tt	20		min
Static friction	Tf	0.3		Nm
		3		kgfcm
Weight	W	7.4		kg
Weight (with Brake)	W	9.6		kg
Max. Current of Servo Amp.	lmax	40		A (peak)

^(*) The values are the standard values at 20° C and the tolerance is $\pm 10\%$.

The speed-torque characteristics very depending on the type of software, parameter setting, and input voltage of the digital servo software. (The above figures show average values.)

Model αi S 8/6000 HV

Specification A06B-0233-B□0□



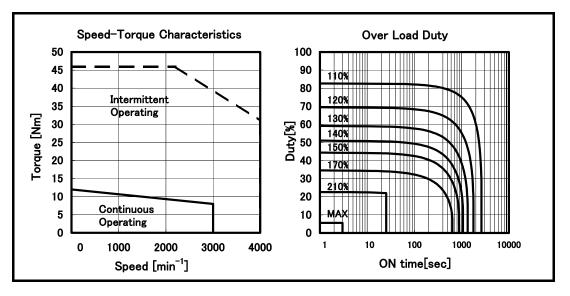
Parameter	Symbol		Value	Unit
Stall Torque (*)	Ts	8.0		Nm
		82		kgfcm
Stall Current (*)	ls	9.0		A (rms)
Rated Output (*)	Pr	2.2		kW
		3.0		HP
Rating Speed	Nr	6000		min ⁻¹
Maximum Speed	Nmax	6000		min ⁻¹
Maximum Torque (*)	Tmax	22		Nm
		224		kgfcm
Rotor Inertia	Jm	0.00117		kgm ²
		0.0119		kgfcms ²
Rotor Inertia (with Brake)	Jm	0.00124		kgm ²
		0.0127		kgfcms ²
Torque constant (*)	Kt	0.89		Nm/A (rms)
		9.1		kgfcm/A (rms)
Back EMF constant (1phase) (*)	Ke	31		V (rms)/1000 min ⁻¹
	Kv	0.30		V (rms)sec/rad
Armature Resistance (1 phase) (*)	Ra	0.50		Ω
Mechanical time constant	tm	0.002		s
Thermal time constant	tt	20		min
Static friction	Tf	0.3		Nm
		3		kgfcm
Weight	W	8.0		kg
Weight (with Brake)	W	10.0		kg
Max. Current of Servo Amp.	Imax	40		A (peak)

^(*) The values are the standard values at 20° C and the tolerance is $\pm 10^{\circ}$ C.

The speed-torque characteristics very depending on the type of software, parameter setting, and input voltage of the digital servo software. (The above figures show average values.)

Model αi S 12/4000 HV

Specification A06B-0239-B □ 0 □



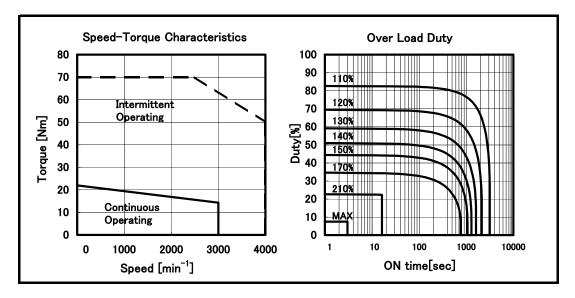
Parameter	Symbol		Value	Unit
		40	value	
Stall Torque (*)	Ts	12		Nm
		122		kgfcm
Stall Current (*)	ls	6.7		A (rms)
Rated Output (*)	Pr	2.5		kW
		3.4		HP
Rating Speed	Nr	3000		min ⁻¹
Maximum Speed	Nmax	4000		min ⁻¹
Maximum Torque (*)	Tmax	46		Nm
		469		kgfcm
Rotor Inertia	Jm	0.00228		kgm ²
		0.0233		kgfcms ²
Rotor Inertia (with Brake)	Jm	0.00235		kgm ²
		0.0240		kgfcms ²
Torque constant (*)	Kt	1.80		Nm/A (rms)
		18.4		kgfcm/A (rms)
Back EMF constant (1phase) (*)	Ke	63		V (rms)/1000 min ⁻¹
, . ,	Kv	0.60		V (rms)sec/rad
Armature Resistance (1 phase) (*)	Ra	0.84		Ω
Mechanical time constant	tm	0.002		s
Thermal time constant	tt	25		min
Static friction	Tf	0.3		Nm
		3		kgfcm
Weight	w	11.9		kg
Weight (with Brake)	w	14.1		kg
Max. Current of Servo Amp.	Imax	40		A (peak)

^(*) The values are the standard values at 20°C and the tolerance is $\pm 10\%$.

The speed-torque characteristics very depending on the type of software, parameter setting, and input voltage of the digital servo software. (The above figures show average values.)

Model αi S 22/4000 HV

Specification A06B-0266-B□0□



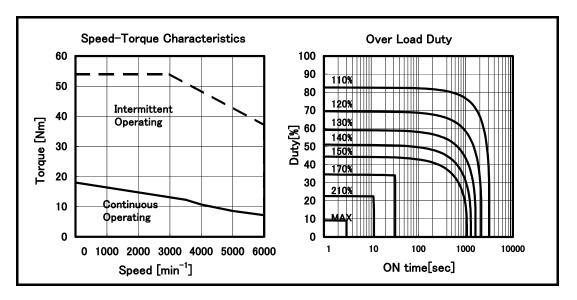
Parameter	Symbol		Value	Unit
Stall Torque (*)	Ts	22		Nm
		224		kgfcm
Stall Current (*)	ls	15.5		A (rms)
Rated Output (*)	Pr	4.5		kW
		6.0		HP
Rating Speed	Nr	3000		min ⁻¹
Maximum Speed	Nmax	4000		min ⁻¹
Maximum Torque (*)	Tmax	70		Nm
		714		kgfcm
Rotor Inertia	Jm	0.00527		kgm ²
		0.0538		kgfcms ²
Rotor Inertia (with Brake)	Jm	0.00587		kgm ²
		0.0599		kgfcms ²
Torque constant (*)	Kt	1.42		Nm/A (rms)
		14.5		kgfcm/A (rms)
Back EMF constant (1phase) (*)	Ke	50		V (rms)/1000 min ⁻¹
	Kv	0.47		V (rms)sec/rad
Armature Resistance (1 phase) (*)	Ra	0.25		Ω
Mechanical time constant	tm	0.002		S
Thermal time constant	tt	30		min
Static friction	Tf	0.8		Nm
		8		kgfcm
Weight	W	17		kg
Weight (with Brake)	W	23		kg
Max. Current of Servo Amp.	Imax	80		A (peak)

^(*) The values are the standard values at 20° C and the tolerance is $\pm 10\%$.

The speed-torque characteristics very depending on the type of software, parameter setting, and input voltage of the digital servo software. (The above figures show average values.)

Model αi S 22/6000HV

Specification A06B-0263-B □ 0 □



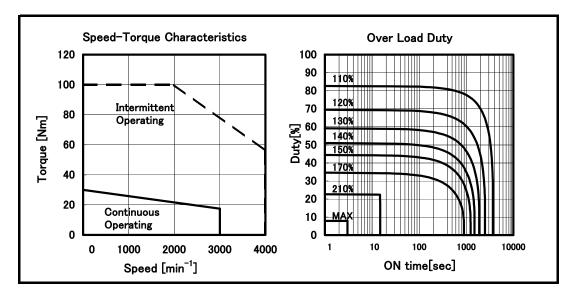
Parameter	Symbol		Value	Unit
Stall Torque (*)	Ts	18		Nm
		184		kgfcm
Stall Current (*)	ls	17.1		A (rms)
Rated Output (*)	Pr	4.5		kW
		6.0		HP
Rating Speed	Nr	6000		min ⁻¹
Maximum Speed	Nmax	6000		min ⁻¹
Maximum Torque (*)	Tmax	54		Nm
		551		kgfcm
Rotor Inertia	Jm	0.00527		kgm ²
		0.0538		kgfcms ²
Rotor Inertia (with Brake)	Jm	0.00587		kgm ²
		0.0599		kgfcms ²
Torque constant (*)	Kt	1.06		Nm/A (rms)
		10.8		kgfcm/A (rms)
Back EMF constant (1phase) (*)	Ke	37		V (rms)/1000 min ⁻¹
	Kv	0.35		V (rms)sec/rad
Armature Resistance (1 phase) (*)	Ra	0.16		Ω
Mechanical time constant	tm	0.002		S
Thermal time constant	tt	30		min
Static friction	Tf	0.8		Nm
		8		kgfcm
Weight	W	17		kg
Weight (with Brake)	W	23		kg
Max. Current of Servo Amp.	lmax	80		A (peak)

^(*) The values are the standard values at 20°C and the tolerance is $\pm 10\%$.

The speed-torque characteristics very depending on the type of software, parameter setting, and input voltage of the digital servo software. (The above figures show average values.)

Model αi S 30/4000 HV

Specification A06B-0269-B□0□



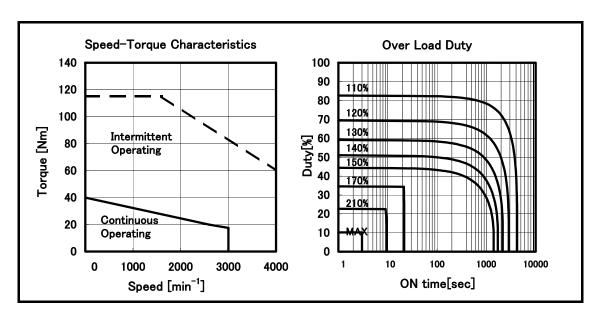
Parameter	Symbol		Value	Unit
Stall Torque (*)	Ts	30		Nm
		306		kgfcm
Stall Current (*)	ls	15.9		A (rms)
Rated Output (*)	Pr	5.5		kW
		7.4		HP
Rating Speed	Nr	3000		min ⁻¹
Maximum Speed	Nmax	4000		min ⁻¹
Maximum Torque (*)	Tmax	100		Nm
		1020		kgfcm
Rotor Inertia	Jm	0.00759		kgm ²
		0.0774		kgfcms ²
Rotor Inertia (with Brake)	Jm	0.00819		kgm ²
		0.0836		kgfcms ²
Torque constant (*)	Kt	1.90		Nm/A (rms)
		19.4		kgfcm/A (rms)
Back EMF constant (1phase) (*)	Ke	66		V (rms)/1000 min ⁻¹
	Kv	0.63		V (rms)sec/rad
Armature Resistance (1 phase) (*)	Ra	0.25		Ω
Mechanical time constant	tm	0.002		S
Thermal time constant	tt	35		min
Static friction	Tf	0.8		Nm
		8		kgfcm
Weight	W	23		kg
Weight (with Brake)	W	29		kg
Max. Current of Servo Amp.	Imax	80		A (peak)

^(*) The values are the standard values at 20° C and the tolerance is $\pm 10\%$.

The speed-torque characteristics very depending on the type of software, parameter setting, and input voltage of the digital servo software. (The above figures show average values.)

Model αi S 40/4000 HV

Specification A06B-0273-B□0□ A06B-0273-B□2□



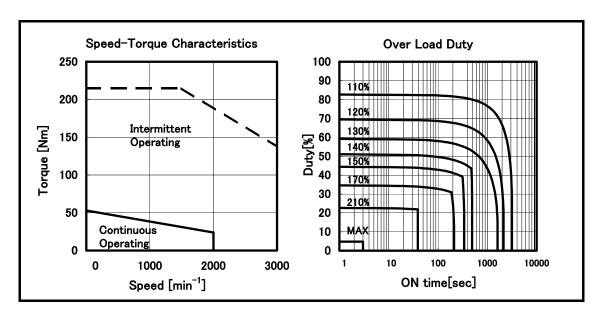
Parameter	Symbol		Value	Unit
Stall Torque (*)	Ts	40		Nm
		408		kgfcm
Stall Current (*)	ls	18.1		A (rms)
Rated Output (*)	Pr	5.5		kW
		7.4		HP
Rating Speed	Nr	3000		min ⁻¹
Maximum Speed	Nmax	4000		min ⁻¹
Maximum Torque (*)	Tmax	115		Nm
		1170		kgfcm
Rotor Inertia	Jm	0.00990		kgm ²
		0.101		kgfcms ²
Rotor Inertia (with Brake)	Jm	0.0105		kgm ²
		0.107		kgfcms ²
Torque constant (*)	Kt	2.21		Nm/A (rms)
		22.6		kgfcm/A (rms)
Back EMF constant (1phase) (*)	Ke	77		V (rms)/1000 min ⁻¹
	Κv	0.74		V (rms)sec/rad
Armature Resistance (1 phase) (*)	Ra	0.23		Ω
Mechanical time constant	tm	0.001		S
Thermal time constant	tt	40		min
Static friction	Tf	1.2		Nm
		12		kgfcm
Weight	W	28		kg
Weight (with 35Nm Brake)	W	34		kg
Weight (with 70Nm Brake)	W	38		kg
Max. Current of Servo Amp.	Imax	80		A (peak)

^(*) The values are the standard values at 20°C and the tolerance is $\pm 10\%$.

The speed-torque characteristics very depending on the type of software, parameter setting, and input voltage of the digital servo software. (The above figures show average values.)

Model αi S 50/3000 HV

Specification A06B-0276-B \square 0 \square A06B-0276-B \square 2 \square



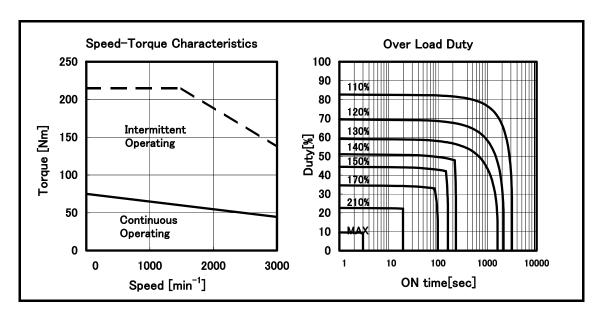
Parameter	Symbol		Value	Unit
Stall Torque (*)	Ts	53		Nm
		541		kgfcm
Stall Current (*)	ls	28		A (rms)
Rated Output (*)	Pr	5.0		kW
		6.8		HP
Rating Speed	Nr	2000		min ⁻¹
Maximum Speed	Nmax	3000		min ⁻¹
Maximum Torque (*)	Tmax	215		Nm
		2190		kgfcm
Rotor Inertia	Jm	0.0145		kgm ²
		0.148		kgfcms ²
Rotor Inertia (with Brake)	Jm	0.0151		kgm ²
		0.154		kgfcms ²
Torque constant (*)	Kt	1.90		Nm/A (rms)
		19.4		kgfcm/A (rms)
Back EMF constant (1phase) (*)	Ke	66		V (rms)/1000 min ⁻¹
	Κv	0.63		V (rms)sec/rad
Armature Resistance (1 phase) (*)	Ra	0.10		Ω
Mechanical time constant	tm	0.001		s
Thermal time constant	tt	30		min
Static friction	Tf	1.8		Nm
		18		kgfcm
Weight	w	39		kg
Weight (with 35Nm Brake)	W	45		kg
Weight (with 70Nm Brake)	W	49		kg
Max. Current of Servo Amp.	lmax	180		A (peak)

^(*) The values are the standard values at 20°C and the tolerance is $\pm 10\%$.

The speed-torque characteristics very depending on the type of software, parameter setting, and input voltage of the digital servo software. (The above figures show average values.)

Model αi S 50/3000 HV with Fan

Specification A06B-0276-B \square 1 \square A06B-0276-B \square 3 \square



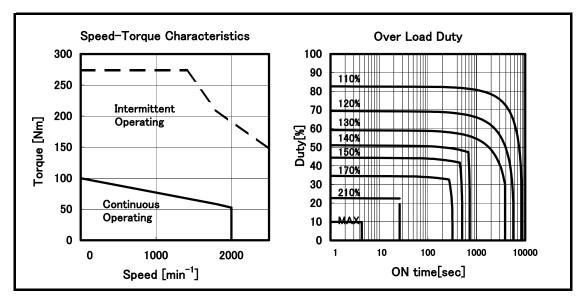
Data sheet

Parameter	Symbol		Value	Unit
Stall Torque (*)	Ts	75		Nm
		765		kgfcm
Stall Current (*)	ls	40		A (rms)
Rated Output (*)	Pr	14		kW
		19		HP
Rating Speed	Nr	3000		min ⁻¹
Maximum Speed	Nmax	3000		min ⁻¹
Maximum Torque (*)	Tmax	215		Nm
		2190		kgfcm
Rotor Inertia	Jm	0.0145		kgm ²
		0.148		kgfcms ²
Rotor Inertia (with Brake)	Jm	0.0151		kgm ²
		0.154		kgfcms ²
Torque constant (*)	Kt	1.90		Nm/A (rms)
		19.4		kgfcm/A (rms)
Back EMF constant (1phase) (*)	Ke	66		V (rms)/1000 min ⁻¹
	Kv	0.63		V (rms)sec/rad
Armature Resistance (1 phase) (*)	Ra	0.10		Ω
Mechanical time constant	tm	0.001		S
Thermal time constant	tt	30		min
Static friction	Tf	1.8		Nm
		18		kgfcm
Weight	W	42		kg
Weight (with 35Nm Brake)	W	48		kg
Weight (with 70Nm Brake)	W	52		kg
Max. Current of Servo Amp.	Imax	180		A (peak)

^(*) The values are the standard values at 20°C and the tolerance is $\pm 10\%$.

Model αi S 100/2500 HV

Specification A06B-0286-B□0□



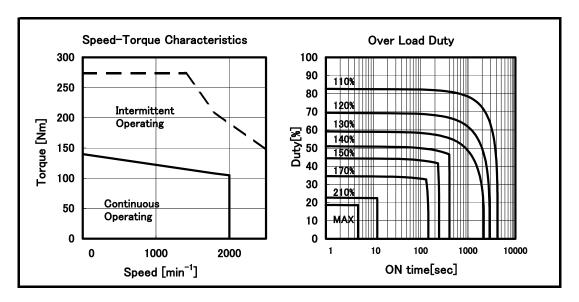
Parameter	Symbol		Value	Unit
Stall Torque (*)	Ts	100		Nm
		1020		kgfcm
Stall Current (*)	ls	40		A (rms)
Rated Output (*)	Pr	11		kW
		15		HP
Rating Speed	Nr	2000		min ⁻¹
Maximum Speed	Nmax	2500		min ⁻¹
Maximum Torque (*)	Tmax	274		Nm
		2800		kgfcm
Rotor Inertia	Jm	0.0252		kgm ²
		0.257		kgfcms ²
Rotor Inertia (with Brake)	Jm	0.0262		kgm ²
		0.267		kgfcms ²
Torque constant (*)	Kt	2.53		Nm/A (rms)
		25.8		kgfcm/A (rms)
Back EMF constant (1phase) (*)	Ke	88		V (rms)/1000 min ⁻¹
	Kv	0.84		V (rms)sec/rad
Armature Resistance (1 phase) (*)	Ra	0.052		Ω
Mechanical time constant	tm	0.0006		s
Thermal time constant	tt	80		min
Static friction	Tf	2.2		Nm
		22		kgfcm
Weight	W	95		kg
Weight (with Brake)	W	110		kg
Max. Current of Servo Amp.	Imax	180		A (peak)

^(*) The values are the standard values at 20°C and the tolerance is ±10%.

The speed-torque characteristics very depending on the type of software, parameter setting, and input voltage of the digital servo software. (The above figures show average values.)

Model $\,\alpha i\,$ S 100/2500HV with Fan

Specification A06B-0286-B□1□



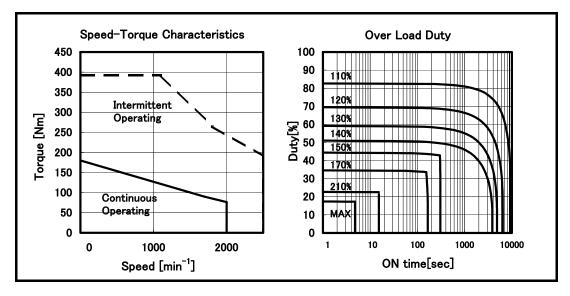
Parameter	Symbol		Value	Unit
Stall Torque (*)	Ts	140		Nm
		1430		kgfcm
Stall Current (*)	ls	55		A (rms)
Rated Output (*)	Pr	22		kW
		30		HP
Rating Speed	Nr	2000		min ⁻¹
Maximum Speed	Nmax	2500		min ⁻¹
Maximum Torque (*)	Tmax	274		Nm
		2800		kgfcm
Rotor Inertia	Jm	0.0252		kgm ²
		0.257		kgfcms ²
Rotor Inertia (with Brake)	Jm	0.0262		kgm ²
		0.267		kgfcms ²
Torque constant (*)	Kt	2.53		Nm/A (rms)
		25.8		kgfcm/A (rms)
Back EMF constant (1phase) (*)	Ke	88		V (rms)/1000 min ⁻¹
	Kv	0.84		V (rms)sec/rad
Armature Resistance (1 phase) (*)	Ra	0.052		Ω
Mechanical time constant	tm	0.0006		s
Thermal time constant	tt	40		min
Static friction	Tf	2.2		Nm
		22		kgfcm
Weight	W	100		kg
Weight (with Brake)	W	115		kg
Max. Current of Servo Amp.	lmax	180		A (peak)

^(*) The values are the standard values at 20°C and the tolerance is ±10%.

The speed-torque characteristics very depending on the type of software, parameter setting, and input voltage of the digital servo software. (The above figures show average values.)

Model αi S 200/2500 HV

Specification A06B-0289-B □ 0 □



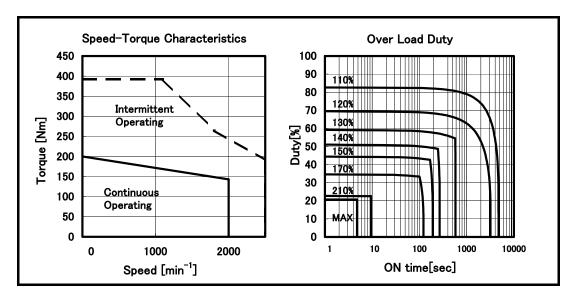
Data sheet

Parameter	Symbol		Value	Unit
Stall Torque (*)	Ts	180		Nm
		1840		kgfcm
Stall Current (*)	ls	53		A (rms)
Rated Output (*)	Pr	16		kW
		21		HP
Rating Speed	Nr	2000		min ⁻¹
Maximum Speed	Nmax	2500		min ⁻¹
Maximum Torque (*)	Tmax	392		Nm
		4000		kgfcm
Rotor Inertia	Jm	0.0431		kgm²
		0.440		kgfcms ²
Rotor Inertia (with Brake)	Jm	0.0441		kgm ²
		0.450		kgfcms ²
Torque constant (*)	Kt	3.4		Nm/A (rms)
		35		kgfcm/A (rms)
Back EMF constant (1phase) (*)	Ke	119		V (rms)/1000 min ⁻¹
	Κv	1.1		V (rms)sec/rad
Armature Resistance (1 phase) (*)	Ra	0.046		Ω
Mechanical time constant	tm	0.0005		s
Thermal time constant	tt	90		min
Static friction	Tf	2.2		Nm
		22		kgfcm
Weight	W	140		kg
Weight (with Brake)	W	155		kg
Max. Current of Servo Amp.	lmax	180		A (peak)

^(*) The values are the standard values at 20° C and the tolerance is $\pm 10\%$.

Model αi S 200/2500HV with Fan

Specification A06B-0289-B□1□



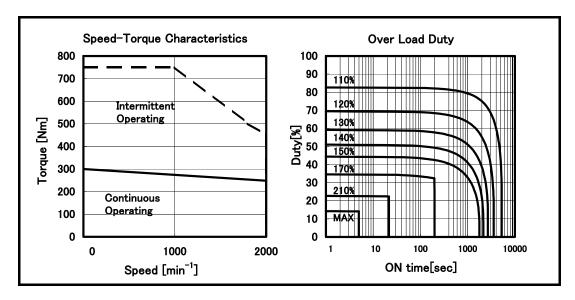
Parameter	Symbol		Value	Unit
Stall Torque (*)	Ts	200		Nm
		2040		kgfcm
Stall Current (*)	ls	58		A (rms)
Rated Output (*)	Pr	30		kW
		40		HP
Rating Speed	Nr	2000		min ⁻¹
Maximum Speed	Nmax	2500		min ⁻¹
Maximum Torque (*)	Tmax	392		Nm
		4000		kgfcm
Rotor Inertia	Jm	0.0431		kgm ²
		0.440		kgfcms ²
Rotor Inertia (with Brake)	Jm	0.0441		kgm ²
		0.450		kgfcms ²
Torque constant (*)	Kt	3.4		Nm/A (rms)
		35		kgfcm/A (rms)
Back EMF constant (1phase) (*)	Ke	119		V (rms)/1000 min ⁻¹
	Kv	1.1		V (rms)sec/rad
Armature Resistance (1 phase) (*)	Ra	0.046		Ω
Mechanical time constant	tm	0.0005		S
Thermal time constant	tt	45		min
Static friction	Tf	2.2		Nm
		22		kgfcm
Weight	W	145		kg
Weight (with Brake)	W	160		kg
Max. Current of Servo Amp.	lmax	180		A (peak)

^(*) The values are the standard values at 20° C and the tolerance is $\pm 10\%$.

The speed-torque characteristics very depending on the type of software, parameter setting, and input voltage of the digital servo software. (The above figures show average values.)

Model αi S 300/2000 HV

Specification A06B-0293-B□1□



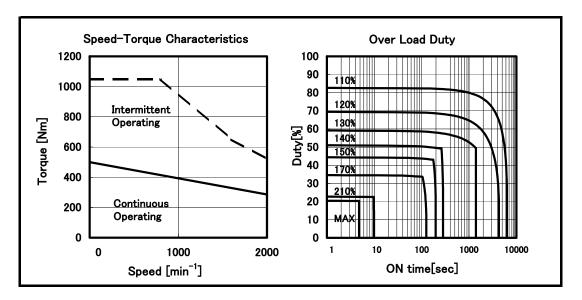
Data sheet

Parameter	Symbol		Value	Unit
Stall Torque (*)	Ts	300		Nm
		3060		kgfcm
Stall Current (*)	ls	96		A (rms)
Rated Output (*)	Pr	52		kW
		70		HP
Rating Speed	Nr	2000		min ⁻¹
Maximum Speed	Nmax	2000		min ⁻¹
Maximum Torque (*)	Tmax	750		Nm
		7650		kgfcm
Rotor Inertia	Jm	0.0787		kgm ²
		0.803		kgfcms ²
Rotor Inertia (with Brake)	Jm	-		kgm ²
		-		kgfcms ²
Torque constant (*)	Kt	3.1		Nm/A (rms)
		32		kgfcm/A (rms)
Back EMF constant (1phase) (*)	Ke	109		V (rms)/1000 min ⁻¹
	Kv	1.0		V (rms)sec/rad
Armature Resistance (1 phase) (*)	Ra	0.048		Ω
Mechanical time constant	tm	0.001		s
Thermal time constant	tt	50		min
Static friction	Tf	4.0		Nm
		41		kgfcm
Weight	W	180		kg
Weight (with Brake)	W	-		kg
Max. Current of Servo Amp.	lmax	360		A (peak)

^(*) The values are the standard values at 20° C and the tolerance is $\pm 10\%$.

Model αi S 500/2000 HV

Specification A06B-0296-B□1□



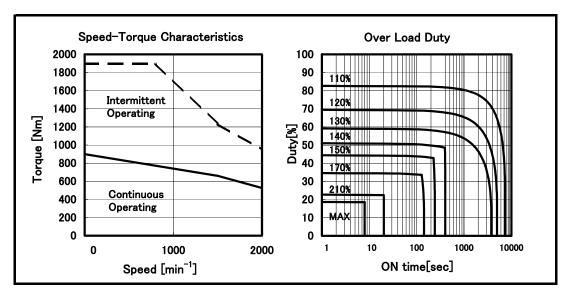
Parameter	Symbol		Value	Unit
Stall Torque (*)	Ts	500		Nm
		5100		kgfcm
Stall Current (*)	ls	115		A (rms)
Rated Output (*)	Pr	60		kW
		80		HP
Rating Speed	Nr	2000		min ⁻¹
Maximum Speed	Nmax	2000		min ⁻¹
Maximum Torque (*)	Tmax	1050		Nm
		10700		kgfcm
Rotor Inertia	Jm	0.127		kgm ²
		1.30		kgfcms ²
Rotor Inertia (with Brake)	Jm	-		kgm ²
		-		kgfcms ²
Torque constant (*)	Kt	4.3		Nm/A (rms)
		44		kgfcm/A (rms)
Back EMF constant (1phase) (*)	Ke	151		V (rms)/1000 min ⁻¹
	Kv	1.4		V (rms)sec/rad
Armature Resistance (1 phase) (*)	Ra	0.050		Ω
Mechanical time constant	tm	0.001		s
Thermal time constant	tt	60		min
Static friction	Tf	4.0		Nm
		41		kgfcm
Weight	W	240		kg
Weight (with Brake)	W	-		kg
Max. Current of Servo Amp.	lmax	360		A (peak)

^(*) The values are the standard values at 20°C and the tolerance is ±10%.

The speed-torque characteristics very depending on the type of software, parameter setting, and input voltage of the digital servo software. (The above figures show average values.)

Model αi S 1000/2000 HV

Specification A06B-0298-B□1□



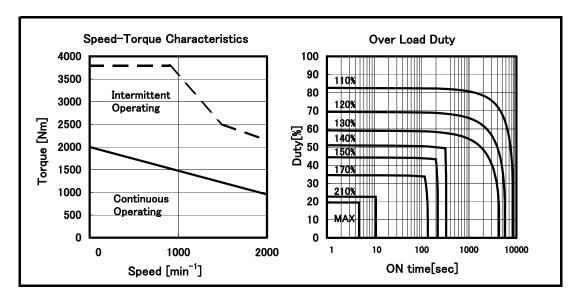
Parameter	Symbol		Value	Unit
Stall Torque (*)	Ts	900		Nm
		9180		kgfcm
Stall Current (*)	ls	220		A (rms)
Rated Output (*)	Pr	110		kW
		150		HP
Rating Speed	Nr	2000		min ⁻¹
Maximum Speed	Nmax	2000		min ⁻¹
Maximum Torque (*)	Tmax	1900		Nm
		19400		kgfcm
Rotor Inertia	Jm	0.417		kgm ²
		4.26		kgfcms ²
Rotor Inertia (with Brake)	Jm	-		kgm ²
		-		kgfcms ²
Torque constant (*)	Kt	4.1		Nm/A (rms)
		42		kgfcm/A (rms)
Back EMF constant (1phase) (*)	Ke	143		V (rms)/1000 min ⁻¹
	Kv	1.4		V (rms)sec/rad
Armature Resistance (1 phase) (*)	Ra	0.011		Ω
Mechanical time constant	tm	0.0008		s
Thermal time constant	tt	70		min
Static friction	Tf	6.0		Nm
		61		kgfcm
Weight	W	470		kg
Weight (with Brake)	W	-		kg
Max. Current of Servo Amp.	lmax	360 x 2		A (peak)

^(*) The values are the standard values at 20°C and the tolerance is ±10%.

The speed-torque characteristics very depending on the type of software, parameter setting, and input voltage of the digital servo software. (The above figures show average values.)

Model αi S 2000/2000 HV

Specification A06B-0091-B□4□



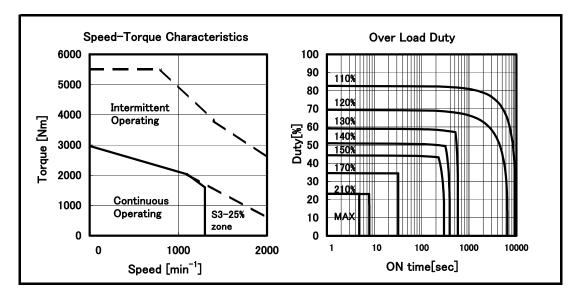
Parameter	Symbol		Value	Unit
Stall Torque (*)	Ts	2000		Nm
		20400		kgfcm
Stall Current (*)	ls	450		A (rms)
Rated Output (*)	Pr	200		kW
		270		HP
Rating Speed	Nr	2000		min ⁻¹
Maximum Speed	Nmax	2000		min ⁻¹
Maximum Torque (*)	Tmax	3800		Nm
		38800		kgfcm
Rotor Inertia	Jm	1.97		kgm ²
		20.1		kgfcms ²
Rotor Inertia (with Brake)	Jm	-		kgm ²
		-		kgfcms ²
Torque constant (*)	Kt	4.4		Nm/A (rms)
		45		kgfcm/A (rms)
Back EMF constant (1phase) (*)	Ke	155		V (rms)/1000 min ⁻¹
	Kv	1.5		V (rms)sec/rad
Armature Resistance (1 phase) (*)	Ra	0.0038		Ω
Mechanical time constant	tm	0.001		s
Thermal time constant	tt	80		min
Static friction	Tf	32		Nm
		327		kgfcm
Weight	W	1000		kg
Weight (with Brake)	W	-		kg
Max. Current of Servo Amp.	lmax	360 x 4		A (peak)

^(*) The values are the standard values at 20°C and the tolerance is ±10%.

The speed-torque characteristics very depending on the type of software, parameter setting, and input voltage of the digital servo software. (The above figures show average values.)

Model αi S 3000/2000 HV

Specification A06B-0092-B□4□



Parameter	Symbol		Value	Unit
Stall Torque (*)	Ts	3000		Nm
		30600		kgfcm
Stall Current (*)	ls	490		A (rms)
Rated Output (*)	Pr	220		kW
		300		HP
Rating Speed	Nr	1300		min ⁻¹
Maximum Speed	Nmax	2000		min ⁻¹
Maximum Torque (*)	Tmax	5500		Nm
		56100		kgfcm
Rotor Inertia	Jm	3.48		kgm ²
		35.5		kgfcms ²
Rotor Inertia (with Brake)	Jm	-		kgm ²
		-		kgfcms ²
Torque constant (*)	Kt	6.1		Nm/A (rms)
		62		kgfcm/A (rms)
Back EMF constant (1phase) (*)	Ke	211		V (rms)/1000 min ⁻¹
	Kv	2.0		V (rms)sec/rad
Armature Resistance (1 phase) (*)	Ra	0.0035		Ω
Mechanical time constant	tm	0.001		s
Thermal time constant	tt	90		min
Static friction	Tf	32		Nm
		327		kgfcm
Weight	W	1500		kg
Weight (with Brake)	W	-		kg
Max. Current of Servo Amp.	lmax	360 x 4		A (peak)

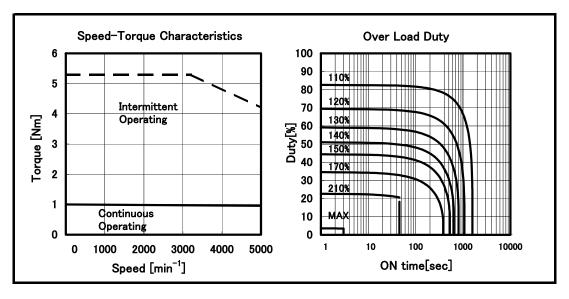
^(*) The values are the standard values at 20°C and the tolerance is ±10%.

The speed-torque characteristics very depending on the type of software, parameter setting, and input voltage of the digital servo software. (The above figures show average values.)

6.3 αi F SERIES (200V)

Model αi F 1/5000

Specification A06B-0202-B□0□



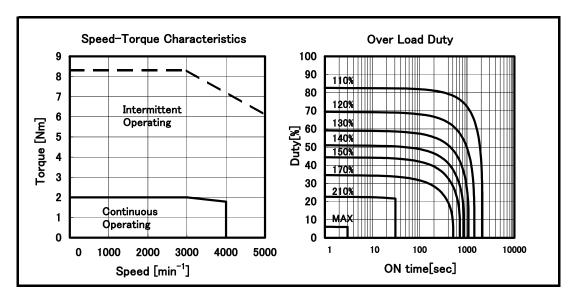
Parameter	Symbol		Value	Unit
Stall Torque (*)	Ts	1.0		Nm
		10		kgfcm
Stall Current (*)	ls	2.7		A (rms)
Rated Output (*)	Pr	0.50		kW
		0.67		HP
Rating Speed	Nr	5000		min ⁻¹
Maximum Speed	Nmax	5000		min ⁻¹
Maximum Torque (*)	Tmax	5.3		Nm
		54		kgfcm
Rotor Inertia	Jm	0.000305		kgm ²
		0.00311		kgfcms ²
Rotor Inertia (with Brake)	Jm	0.000325		kgm ²
		0.00332		kgfcms ²
Torque constant (*)	Kt	0.38		Nm/A (rms)
		3.8		kgfcm/A (rms)
Back EMF constant (1phase) (*)	Ke	13		V (rms)/1000 min ⁻¹
	Kv	0.13		V (rms)sec/rad
Armature Resistance (1 phase) (*)	Ra	1.4		Ω
Mechanical time constant	tm	0.009		S
Thermal time constant	tt	15		min
Static friction	Tf	0.1		Nm
		1		kgfcm
Weight	w	2.8		kg
Weight (with Brake)	W	3.8		kg
Max. Current of Servo Amp.	lmax	20		A (peak)

^(*) The values are the standard values at 20° C and the tolerance is $\pm 10\%$.

The speed-torque characteristics very depending on the type of software, parameter setting, and input voltage of the digital servo software. (The above figures show average values.)

Model αi F 2/5000

Specification A06B-0205-B□0□



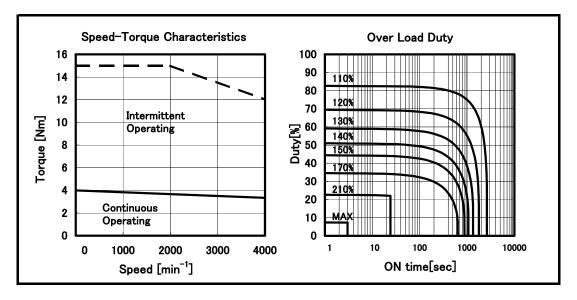
Parameter	Symbol		Value	Unit
Stall Torque (*)	Ts	2.0		Nm
		20		kgfcm
Stall Current (*)	ls	3.5		A (rms)
Rated Output (*)	Pr	0.75		kW
		1.0		HP
Rating Speed	Nr	4000		min ⁻¹
Maximum Speed	Nmax	5000		min ⁻¹
Maximum Torque (*)	Tmax	8.3		Nm
		85		kgfcm
Rotor Inertia	Jm	0.000526		kgm ²
		0.00537		kgfcms ²
Rotor Inertia (with Brake)	Jm	0.000546		kgm ²
		0.00557		kgfcms ²
Torque constant (*)	Kt	0.57		Nm/A (rms)
		5.8		kgfcm/A (rms)
Back EMF constant (1phase) (*)	Ke	20		V (rms)/1000 min ⁻¹
	Kv	0.19		V (rms)sec/rad
Armature Resistance (1 phase) (*)	Ra	1.1		Ω
Mechanical time constant	tm	0.005		s
Thermal time constant	tt	20		min
Static friction	Tf	0.2		Nm
		2		kgfcm
Weight	W	4.3		kg
Weight (with Brake)	W	5.3		kg
Max. Current of Servo Amp.	lmax	20		A (peak)

^(*) The values are the standard values at 20°C and the tolerance is ±10%.

The speed-torque characteristics very depending on the type of software, parameter setting, and input voltage of the digital servo software. (The above figures show average values.)

Model αi F 4/4000

Specification A06B-0223-B□0□



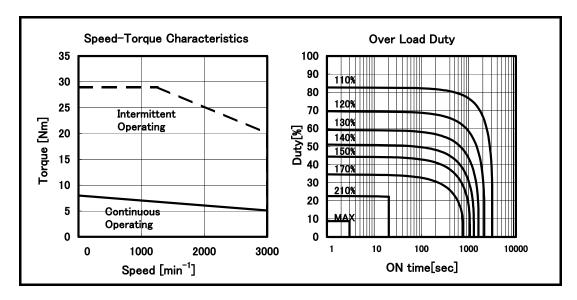
Parameter	Symbol		Value	Unit
Stall Torque (*)	Ts	4.0		Nm
		41		kgfcm
Stall Current (*)	ls	7.7		A (rms)
Rated Output (*)	Pr	1.4		kW
		1.9		HP
Rating Speed	Nr	4000		min ⁻¹
Maximum Speed	Nmax	4000		min ⁻¹
Maximum Torque (*)	Tmax	15		Nm
		153		kgfcm
Rotor Inertia	Jm	0.00135		kgm ²
		0.0138		kgfcms ²
Rotor Inertia (with Brake)	Jm	0.00142		kgm ²
		0.0145		kgfcms ²
Torque constant (*)	Kt	0.52		Nm/A (rms)
		5.3		kgfcm/A (rms)
Back EMF constant (1phase) (*)	Ke	18		V (rms)/1000 min ⁻¹
	Kv	0.17		V (rms)sec/rad
Armature Resistance (1 phase) (*)	Ra	0.40		Ω
Mechanical time constant	tm	0.006		S
Thermal time constant	tt	25		min
Static friction	Tf	0.3		Nm
		3		kgfcm
Weight	W	7.5		kg
Weight (with Brake)	W	9.7		kg
Max. Current of Servo Amp.	lmax	40		A (peak)

^(*) The values are the standard values at 20°C and the tolerance is ±10%.

The speed-torque characteristics very depending on the type of software, parameter setting, and input voltage of the digital servo software. (The above figures show average values.)

Model αi F 8/3000

Specification A06B-0227-B □ 0 □



Data sheet

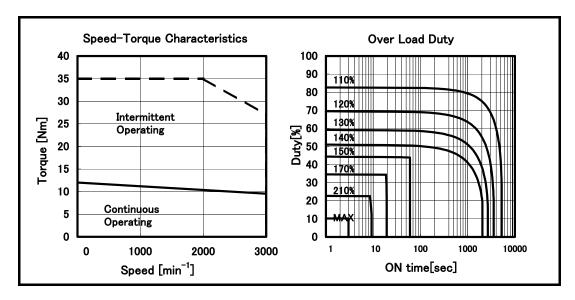
Parameter	Symbol		Value	Unit
Stall Torque (*)	Ts	8.0		Nm
		82		kgfcm
Stall Current (*)	ls	8.4		A (rms)
Rated Output (*)	Pr	1.6		kW
		2.1		HP
Rating Speed	Nr	3000		min ⁻¹
Maximum Speed	Nmax	3000		min ⁻¹
Maximum Torque (*)	Tmax	29		Nm
		296		kgfcm
Rotor Inertia	Jm	0.00257		kgm ²
		0.0262		kgfcms ²
Rotor Inertia (with Brake)	Jm	0.00264		kgm ²
		0.0269		kgfcms ²
Torque constant (*)	Kt	0.95		Nm/A (rms)
		9.7		kgfcm/A (rms)
Back EMF constant (1phase) (*)	Ke	33		V (rms)/1000 min ⁻¹
	Kv	0.32		V (rms)sec/rad
Armature Resistance (1 phase) (*)	Ra	0.51		Ω
Mechanical time constant	tm	0.004		s
Thermal time constant	tt	30		min
Static friction	Tf	0.3		Nm
		3		kgfcm
Weight	W	12.3		kg
Weight (with Brake)	W	14.5		kg
Max. Current of Servo Amp.	lmax	40		A (peak)

^(*) The values are the standard values at 20° C and the tolerance is $\pm 10\%$.

The speed-torque characteristics very depending on the type of software, parameter setting, and input voltage of the digital servo software. (The above figures show average values.)

Model αi F 12/3000

Specification A06B-0243-B □ 0 □



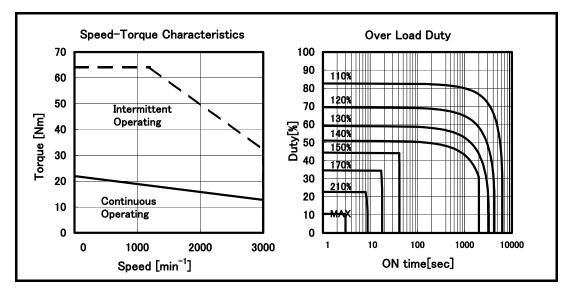
Parameter	Symbol		Value	Unit
Stall Torque (*)	Ts	12		Nm
		122		kgfcm
Stall Current (*)	ls	18.1		A (rms)
Rated Output (*)	Pr	3.0		kW
		4.0		HP
Rating Speed	Nr	3000		min ⁻¹
Maximum Speed	Nmax	3000		min ⁻¹
Maximum Torque (*)	Tmax	35		Nm
		357		kgfcm
Rotor Inertia	Jm	0.00620		kgm ²
		0.0633		kgfcms ²
Rotor Inertia (with Brake)	Jm	0.00680		kgm ²
		0.0694		kgfcms ²
Torque constant (*)	Kt	0.66		Nm/A (rms)
		6.8		kgfcm/A (rms)
Back EMF constant (1phase) (*)	Ke	23		V (rms)/1000 min ⁻¹
	Kv	0.22		V (rms)sec/rad
Armature Resistance (1 phase) (*)	Ra	0.16		Ω
Mechanical time constant	tm	0.007		s
Thermal time constant	tt	50		min
Static friction	Tf	0.8		Nm
		8		kgfcm
Weight	W	18		kg
Weight (with Brake)	W	24		kg
Max. Current of Servo Amp.	Imax	80		A (peak)

^(*) The values are the standard values at 20°C and the tolerance is $\pm 10\%$.

The speed-torque characteristics very depending on the type of software, parameter setting, and input voltage of the digital servo software. (The above figures show average values.)

Model αi F 22/3000

Specification A06B-0247-B□0□



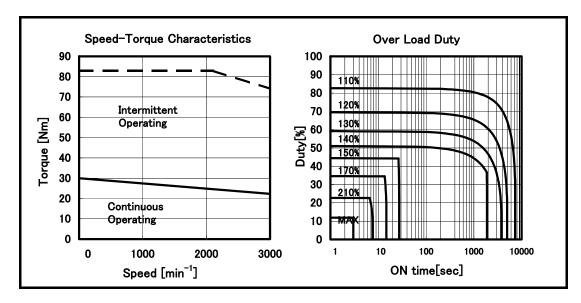
Parameter	Symbol		Value	Unit
Stall Torque (*)	Ts	22		Nm
		224		kgfcm
Stall Current (*)	ls	18.4		A (rms)
Rated Output (*)	Pr	4.0		kW
		5.4		HP
Rating Speed	Nr	3000		min ⁻¹
Maximum Speed	Nmax	3000		min ⁻¹
Maximum Torque (*)	Tmax	64		Nm
		653		kgfcm
Rotor Inertia	Jm	0.0120		kgm ²
		0.122		kgfcms ²
Rotor Inertia (with Brake)	Jm	0.0126		kgm ²
		0.129		kgfcms ²
Torque constant (*)	Kt	1.20		Nm/A (rms)
		12.2		kgfcm/A (rms)
Back EMF constant (1phase) (*)	Ke	42		V (rms)/1000 min ⁻¹
	Kv	0.40		V (rms)sec/rad
Armature Resistance (1 phase) (*)	Ra	0.16		Ω
Mechanical time constant	tm	0.004		s
Thermal time constant	tt	60		min
Static friction	Tf	1.2		Nm
		12		kgfcm
Weight	W	29		kg
Weight (with Brake)	W	35		kg
Max. Current of Servo Amp.	Imax	80		A (peak)

^(*) The values are the standard values at 20° C and the tolerance is $\pm 10\%$.

The speed-torque characteristics very depending on the type of software, parameter setting, and input voltage of the digital servo software. (The above figures show average values.)

Model αi F 30/3000

Specification A06B-0253-B□0□



Parameter	Symbol		Value	Unit
Stall Torque (*)	Ts	30		Nm
		306		kgfcm
Stall Current (*)	ls	39.0		A (rms)
Rated Output (*)	Pr	7.0		kW
		9.3		HP
Rating Speed	Nr	3000		min ⁻¹
Maximum Speed	Nmax	3000		min ⁻¹
Maximum Torque (*)	Tmax	83		Nm
		847		kgfcm
Rotor Inertia	Jm	0.0170		kgm ²
		0.173		kgfcms ²
Rotor Inertia (with Brake)	Jm	0.0176		kgm ²
		0.180		kgfcms ²
Torque constant (*)	Kt	0.77		Nm/A (rms)
		7.8		kgfcm/A (rms)
Back EMF constant (1phase) (*)	Ke	27		V (rms)/1000 min ⁻¹
	Κv	0.26		V (rms)sec/rad
Armature Resistance (1 phase) (*)	Ra	0.040		Ω
Mechanical time constant	tm	0.003		s
Thermal time constant	tt	70		min
Static friction	Tf	1.8		Nm
		18		kgfcm
Weight	W	40		kg
Weight (with Brake)	W	46		kg
Max. Current of Servo Amp.	Imax	160		A (peak)

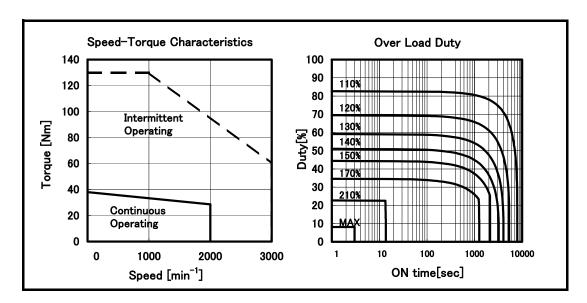
^(*) The values are the standard values at 20°C and the tolerance is ±10%.

The speed-torque characteristics very depending on the type of software, parameter setting, and input voltage of the digital servo software. (The above figures show average values.)

Overload Duty shows the specification for rotating, and if the motor is stopping, Soft Alarm will occur shorter time. When the motor speed is less than 1 rpm for over 10 sec., use under stall torque.

Model αi F 40/3000

Specification A06B-0257-B \square 0 \square A06B-0257-B \square 2 \square



Parameter	Symbol		Value	Unit
Stall Torque (*)	Ts	38		Nm
		388		kgfcm
Stall Current (*)	Is	32.3		A (rms)
Rated Output (*)	Pr	6.0		kW
		8.0		HP
Rating Speed	Nr	2000		min ⁻¹
Maximum Speed	Nmax	3000		min ⁻¹
Maximum Torque (*)	Tmax	130		Nm
		1330		kgfcm
Rotor Inertia	Jm	0.0220		kgm ²
		0.224		kgfcms ²
Rotor Inertia (with Brake)	Jm	0.0226		kgm ²
		0.231		kgfcms ²
Torque constant (*)	Kt	1.18		Nm/A (rms)
		12.0		kgfcm/A (rms)
Back EMF constant (1phase) (*)	Ke	41		V (rms)/1000 min ⁻¹
	Kv	0.39		V (rms)sec/rad
Armature Resistance (1 phase) (*)	Ra	0.068		Ω
Mechanical time constant	tm	0.003		s
Thermal time constant	tt	75		min
Static friction	Tf	1.8		Nm
		18		kgfcm
Weight	W	51		kg
Weight (with 35Nm Brake)	W	57		kg
Weight (with 70Nm Brake)	W	61		kg
Max. Current of Servo Amp.	Imax	160		A (peak)

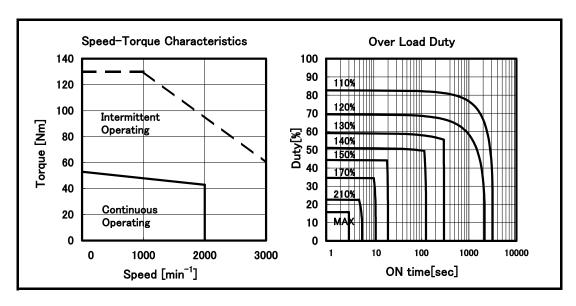
^(*) The values are the standard values at 20°C and the tolerance is $\pm 10\%$.

The speed-torque characteristics very depending on the type of software, parameter setting, and input voltage of the digital servo software. (The above figures show average values.)

Overload Duty shows the specification for rotating, and if the motor is stopping, Soft Alarm will occur shorter time. When the motor speed is less than 1 rpm for over 10 sec., use under stall torque.

Model αi F 40/3000 with Fan

Specification A06B-0257-B□1□ A06B-0257-B□3□



Parameter	Symbol Value			Unit
	_	50	value	
Stall Torque (*)	Ts	53		Nm
		541		kgfcm
Stall Current (*)	Is	45.0		A (rms)
Rated Output (*)	Pr	9.0		kW
		12		HP
Rating Speed	Nr	2000		min ⁻¹
Maximum Speed	Nmax	3000		min ⁻¹
Maximum Torque (*)	Tmax	130		Nm
		1330		kgfcm
Rotor Inertia	Jm	0.0220		kgm ²
		0.224		kgfcms ²
Rotor Inertia (with Brake)	Jm	0.0226		kgm ²
		0.231		kgfcms ²
Torque constant (*)	Kt	1.18		Nm/A (rms)
		12.0		kgfcm/A (rms)
Back EMF constant (1phase) (*)	Ke	41		V (rms)/1000 min ⁻¹
	Kv	0.39		V (rms)sec/rad
Armature Resistance (1 phase) (*)	Ra	0.068		Ω
Mechanical time constant	tm	0.003		S
Thermal time constant	tt	30		min
Static friction	Tf	1.8		Nm
		18		kgfcm
Weight	w	54		kg
Weight (with 35Nm Brake)	W	60		kg
Weight (with 70Nm Brake)	W	64		kg
Max. Current of Servo Amp.	lmax	160		A (peak)

^(*) The values are the standard values at 20°C and the tolerance is $\pm 10\%$.

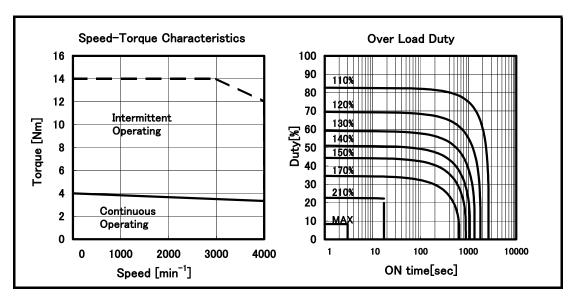
The speed-torque characteristics very depending on the type of software, parameter setting, and input voltage of the digital servo software. (The above figures show average values.)

Overload Duty shows the specification for rotating, and if the motor is stopping, Soft Alarm will occur shorter time. When the motor speed is less than 1 rpm for over 10 sec., use under stall torque.

6.4 αi F SERIES (400V)

Model αi F 4/4000 HV

Specification A06B-0225-B□0□



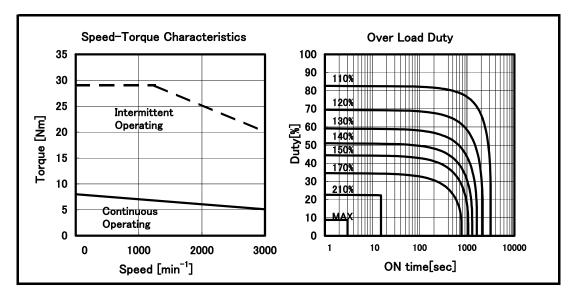
Parameter	Symbol		Value	Unit
Stall Torque (*)	Ts	4.0		Nm
		41		kgfcm
Stall Current (*)	ls	4.1		A (rms)
Rated Output (*)	Pr	1.4		kW
		1.9		HP
Rating Speed	Nr	4000		min ⁻¹
Maximum Speed	Nmax	4000		min ⁻¹
Maximum Torque (*)	Tmax	14		Nm
		143		kgfcm
Rotor Inertia	Jm	0.00135		kgm ²
		0.0138		kgfcms ²
Rotor Inertia (with Brake)	Jm	0.00142		kgm ²
		0.0145		kgfcms ²
Torque constant (*)	Kt	0.98		Nm/A (rms)
		10.0		kgfcm/A (rms)
Back EMF constant (1phase) (*)	Ke	34		V (rms)/1000 min ⁻¹
	Κv	0.33		V (rms)sec/rad
Armature Resistance (1 phase) (*)	Ra	1.5		Ω
Mechanical time constant	tm	0.006		S
Thermal time constant	tt	25		min
Static friction	Tf	0.3		Nm
		3		kgfcm
Weight	W	7.5		kg
Weight (with Brake)	W	9.7		kg
Max. Current of Servo Amp.	lmax	20		A (peak)

^(*) The values are the standard values at 20° C and the tolerance is $\pm 10\%$.

The speed-torque characteristics very depending on the type of software, parameter setting, and input voltage of the digital servo software. (The above figures show average values.)

Model αi F 8/3000 HV

Specification A06B-0229-B□0□



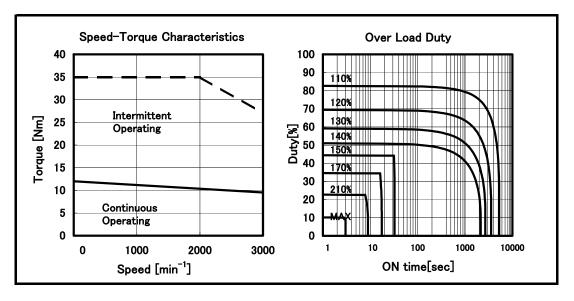
Parameter	Symbol		Value	Unit
Stall Torque (*)	Ts	8.0		Nm
		82		kgfcm
Stall Current (*)	ls	4.2		A (rms)
Rated Output (*)	Pr	1.6		kW
		2.1		HP
Rating Speed	Nr	3000		min ⁻¹
Maximum Speed	Nmax	3000		min ⁻¹
Maximum Torque (*)	Tmax	29		Nm
		296		kgfcm
Rotor Inertia	Jm	0.00257		kgm ²
		0.0262		kgfcms ²
Rotor Inertia (with Brake)	Jm	0.00264		kgm ²
		0.0269		kgfcms ²
Torque constant (*)	Kt	1.90		Nm/A (rms)
		19.5		kgfcm/A (rms)
Back EMF constant (1phase) (*)	Ke	66		V (rms)/1000 min ⁻¹
	Kv	0.63		V (rms)sec/rad
Armature Resistance (1 phase) (*)	Ra	1.9		Ω
Mechanical time constant	tm	0.004		s
Thermal time constant	tt	30		min
Static friction	Tf	0.3		Nm
		3		kgfcm
Weight	W	12.3		kg
Weight (with Brake)	W	14.5		kg
Max. Current of Servo Amp.	Imax	20		A (peak)

^(*) The values are the standard values at 20°C and the tolerance is ±10%.

The speed-torque characteristics very depending on the type of software, parameter setting, and input voltage of the digital servo software. (The above figures show average values.)

Model αi F 12/3000 HV

Specification A06B-0245-B□0□



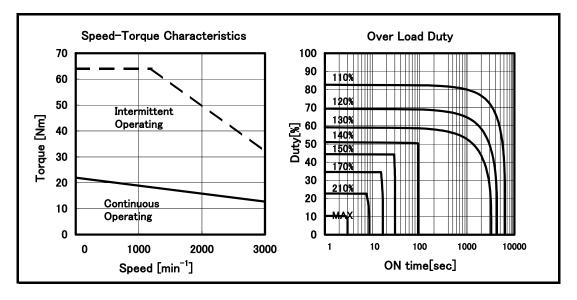
Parameter	Symbol		Value	Unit
Stall Torque (*)	Ts	12		Nm
		122		kgfcm
Stall Current (*)	ls	9.0		A (rms)
Rated Output (*)	Pr	3.0		kW
		4.0		HP
Rating Speed	Nr	3000		min ⁻¹
Maximum Speed	Nmax	3000		min ⁻¹
Maximum Torque (*)	Tmax	35		Nm
		357		kgfcm
Rotor Inertia	Jm	0.00620		kgm ²
		0.0633		kgfcms ²
Rotor Inertia (with Brake)	Jm	0.00680		kgm ²
		0.0694		kgfcms ²
Torque constant (*)	Kt	1.33		Nm/A (rms)
		13.6		kgfcm/A (rms)
Back EMF constant (1phase) (*)	Ke	46		V (rms)/1000 min ⁻¹
	Kv	0.44		V (rms)sec/rad
Armature Resistance (1 phase) (*)	Ra	0.65		Ω
Mechanical time constant	tm	0.007		S
Thermal time constant	tt	50		min
Static friction	Tf	0.8		Nm
		8		kgfcm
Weight	w	18		kg
Weight (with Brake)	W	24		kg
Max. Current of Servo Amp.	lmax	40		A (peak)

^(*) The values are the standard values at 20°C and the tolerance is ±10%.

The speed-torque characteristics very depending on the type of software, parameter setting, and input voltage of the digital servo software. (The above figures show average values.)

Model αi F 22/3000 HV

Specification A06B-0249-B□0□



Parameter	Symbol		Value	Unit
Stall Torque (*)	Ts	22		Nm
		224		kgfcm
Stall Current (*)	ls	9.1		A (rms)
Rated Output (*)	Pr	4.0		kW
		5.4		HP
Rating Speed	Nr	3000		min ⁻¹
Maximum Speed	Nmax	3000		min ⁻¹
Maximum Torque (*)	Tmax	64		Nm
		653		kgfcm
Rotor Inertia	Jm	0.0120		kgm²
		0.122		kgfcms ²
Rotor Inertia (with Brake)	Jm	0.0126		kgm ²
		0.129		kgfcms ²
Torque constant (*)	Kt	2.41		Nm/A (rms)
		24.6		kgfcm/A (rms)
Back EMF constant (1phase) (*)	Ke	84		V (rms)/1000 min ⁻¹
	Κv	0.80		V (rms)sec/rad
Armature Resistance (1 phase) (*)	Ra	0.66		Ω
Mechanical time constant	tm	0.004		s
Thermal time constant	tt	60		min
Static friction	Tf	1.2		Nm
		12	1	kgfcm
Weight	w	29		kg
Weight (with Brake)	W	35		kg
Max. Current of Servo Amp.	lmax	40		A (peak)

^(*) The values are the standard values at 20° C and the tolerance is $\pm 10\%$.

The speed-torque characteristics very depending on the type of software, parameter setting, and input voltage of the digital servo software. (The above figures show average values.)

7

OUTLINE DRAWINGS

This chapter presents outline drawings of the FANUC AC servo motors (motor outline drawings of the motor, shaft shape, allowable axis load, shaft run-out precision, power pin layout, and terminal box).

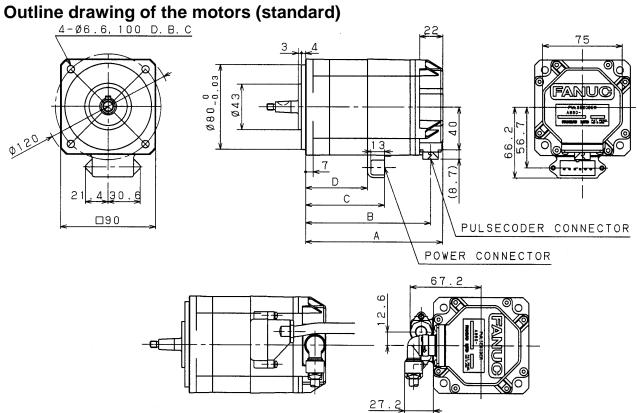
Chapter 7, "OUTLINE DRAWINGS", consists of the following sections:

7.1	MODELS αiS 2 TO αiS 4, αiS 2 HV TO αiS 4 HV, AND αiF 1
	TO α <i>i</i> F 2145
7.2	MODELS αiS 8 TO αiS 12, αiS 8 HV TO αiS 12 HV, αiF 4 TO
	α <i>i</i> F 8, α <i>i</i> F 4 HV TO α <i>i</i> F 8 HV151
7.3	MODELS αiS 22 TO αiS 50, αiS 22HV TO αiS 50HV, αiS 50
	WITH FAN, αiS 50HV WITH FAN, αiF 12 TO αiF 40, αiF
	12HV TO α <i>i</i> F 22HV, AND α <i>i</i> F 40 WITH FAN158
7.4	MODELS αiS 100, αiS 200, αiS 100 WITH FAN, αiS 200
	WITH FAN, αiS 100 HV, αiS 200 HV, αiS 100HV WITH FAN,
	AND αiS 200HV WITH FAN167
7.5	MODELS αiS 300, αiS 500, αiS 300 HV, AND αiS 500 HV 174
7.6	MODEL αiS 1000 HV178
7.7	MODELS αiS 2000 HV AND αiS 3000 HV182

7.1 MODELS lpha iS 2 TO lpha iS 4, lpha iS 2 HV TO lpha iS 4 HV, AND αi F 1 TO αi F 2

7.1.1 **Outline Drawing of the Motors**

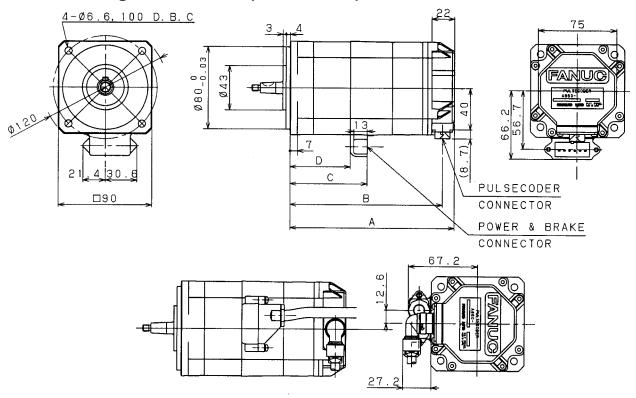




DIMENSION WITH CONNECTOR

MODEL В С Α D αi S 2, αi S 2HV, αi F 1 130 119 75 59 αiS 4, αiS 4HV, αiF 2 166 155 111 95

Outline drawing of the motors (with a brake)



DIMENSION WITH CONNECTOR

MODEL	Α	В	С	D
α <i>i</i> S 2, α <i>i</i> S 2 HV, α <i>i</i> F 1	159	148	75	59
α <i>i</i> S 4, α <i>i</i> S 4 HV, α <i>i</i> F 2	195	184	111	95

7.1.2 Shaft Shape

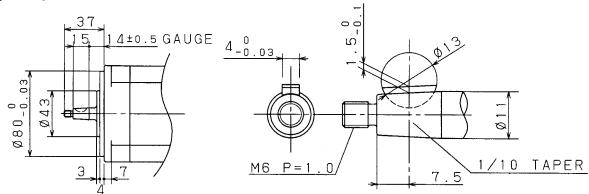
Shaft shape types

The shafts of the motors have the following shapes:

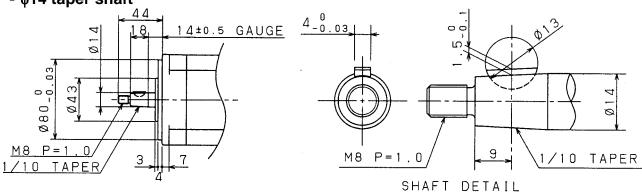
	Taper shaft	Straight shaft	Straight shaft with key way
αiS 2/5000	φ11	φ10	φ10
αiS 2/6000	φ11	φ10	φ10
αiS 4/5000	φ14	φ14	φ14
α <i>i</i> S 2/5000 HV	φ11	φ10	φ10
α <i>i</i> S 2/6000 HV	φ11	φ10	φ10
α <i>i</i> S 4/5000 HV	φ14	φ14	φ14
α <i>i</i> F 1/5000	φ11	φ10	φ10
α <i>i</i> F 2/5000	φ11	φ10	ф10

Shaft details

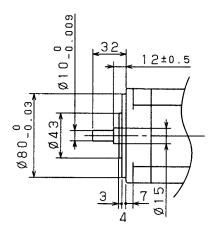
- φ11 taper shaft



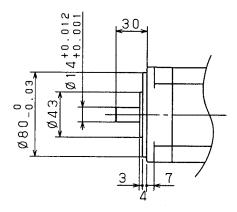
- φ14 taper shaft



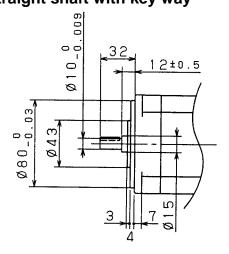
- φ10 straight shaft

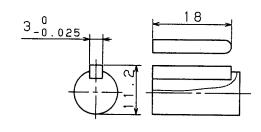


- φ14 straight shaft

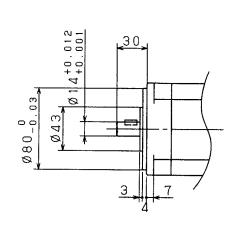


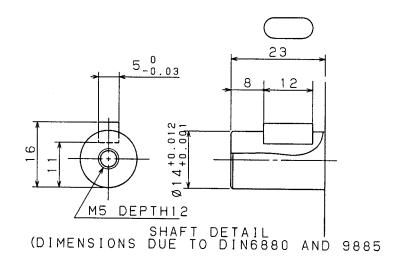
- ϕ 10 straight shaft with key way





- φ14 straight shaft with key way





7.1.3 Allowable Axis Load

The allowable axis load is indicated below. For details of the allowable axis load, see Chapter 3, "USAGE".

Radial load	Axial load	(Reference) Front bearing specification
245[N] (25 [kgf])	78[N] (8 [kgf])	6003

7.1.4 Shaft Run-out Precision

The shaft run-out precision is indicated below. For details of the shaft run-out precision, see Chapter 3, "USAGE".

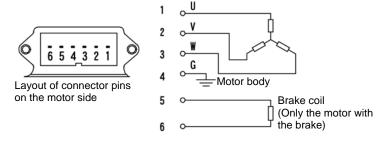
Shaft dia. run-out	Faucet joint run-out	Mounting face run-out
0.02mm or less	0.04mm or less	0.05mm or less

7.1.5 Power and Brake Connector

Manufacture: Tyco Electronics AMP Manufacturer specification: 1473060-2

The power and brake connector has a dripproof property when engaged with the connector on the cable side.

The following shows the shape and pin layout of the power connector.



NOTE

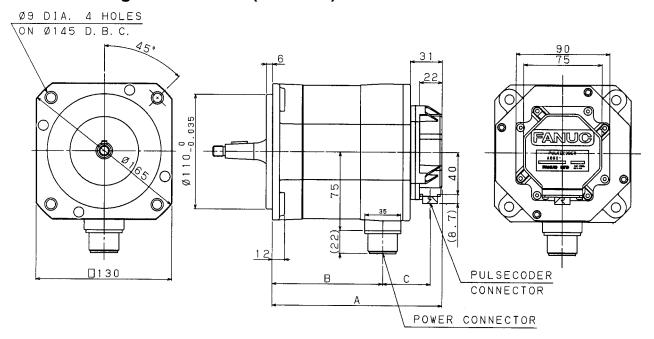
No surge absorber for brake is contained in the motor. Prepare a surge absorber in the power magnetics cabinet.

For the specifications, shape, and pin layout of the pulsecoder connector, see Section 8.1, "PULSECODER".

7.2 MODELS αi S 8 TO αi S 12, αi S 8 HV TO αi S 12 HV, αi F 4 TO αi F 8, αi F 4 HV TO αi F 8 HV

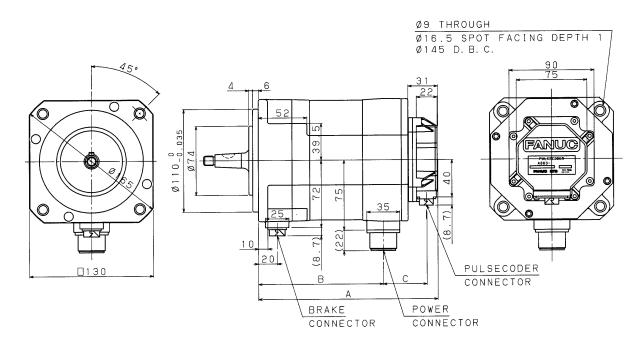
7.2.1 Outline Drawing of the Motors

Outline drawing of the motors (standard)



MODEL	Α	В	С
α <i>i</i> S 8, α <i>i</i> S 8 HV, α <i>i</i> F 4, α <i>i</i> F 4HV	166	108	47
α <i>i</i> S 12, α <i>i</i> S 12 HV α <i>i</i> F 8, α <i>i</i> F 8 HV	222	164	47

Outline drawing of the motors (with a brake)



MODEL	Α	В	С
α <i>i</i> S 8, α <i>i</i> S 8 HV, α <i>i</i> F 4, α <i>i</i> F 4HV	191	133	47
αίS 12, αίS 12 HV αίF 8, αίF 8 HV	247	189	47

7.2.2 Shaft Shape

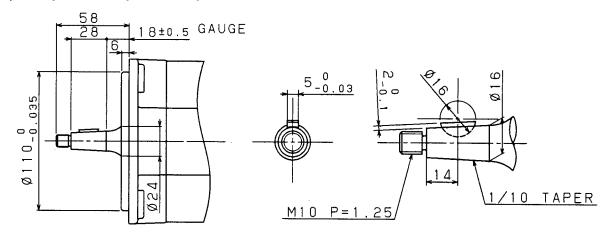
Shaft shape types

The shafts of the motors have the following shapes:

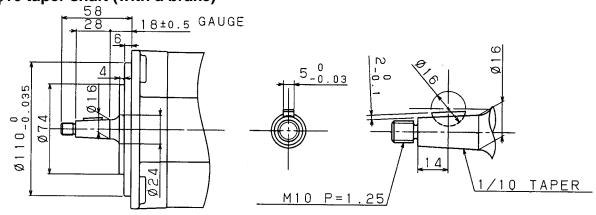
	Taper shaft Straight shaft Str		Straight shaft with key way
αiS 8/4000	φ16	φ19	φ19
αiS 8/6000	φ16	φ19	φ19
α <i>i</i> S 12/4000	φ16	φ24	φ24
α <i>i</i> S 8/4000 HV	φ16	φ19	φ19
αiS 8/6000 HV	φ16	φ19	φ19
α <i>i</i> S 12/4000 HV	φ16	φ24	φ24
α <i>i</i> F 4/4000	φ16	φ19	φ19
α <i>i</i> F 8/3000	φ16	φ19	φ19
α <i>i</i> F 4/4000 HV	φ16	φ19	φ19
α <i>i</i> F 8/3000 HV	φ16	φ19	φ19

Shaft details

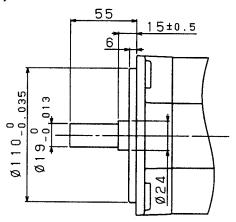
- φ16 taper shaft (standard)



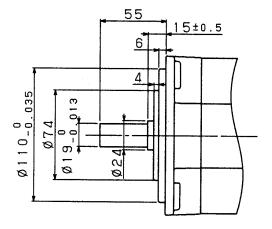
- φ16 taper shaft (with a brake)



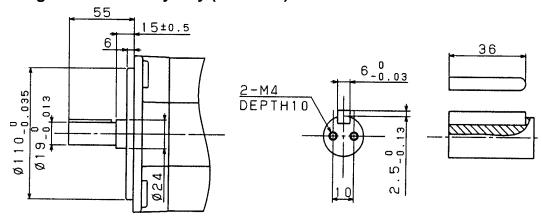
- φ19 straight shaft (standard)



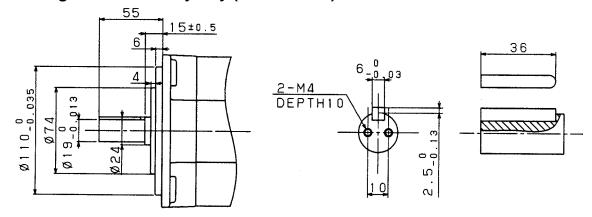
- φ19 straight shaft (with a brake)



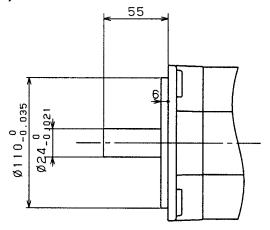
- ϕ 19 straight shaft with key way (standard)



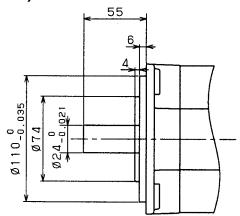
- φ19 straight shaft with key way (with a brake)



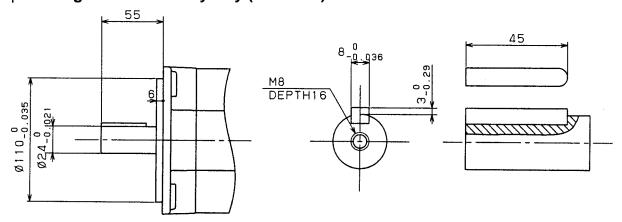
- φ24 straight shaft (standard)



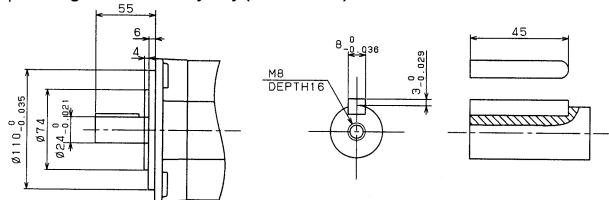
- φ24 straight shaft (with a brake)



- ϕ 24 straight shaft with key way (standard)



- φ24 straight shaft with key way (with a brake)



7.2.3 Allowable Axis Load

The allowable axis load is indicated below. For details of the allowable axis load, see Chapter 3, "USAGE".

Radial load	Axial load	(Reference) Front bearing specification
686[N] (70 [kgf])	196[N] (20 [kgf])	6205

7.2.4 Shaft Run-out Precision

The shaft run-out precision is indicated below. For details of the shaft run-out precision, see Chapter 3, "USAGE".

Shaft dia. run-out	Faucet joint run-out	Mounting face run-out
0.02mm or less	0.04mm or less	0.05mm or less

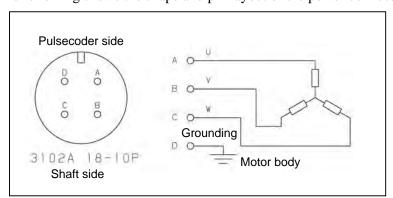
7.2.5 Power Connector

Manufacture: Hirose Electric

Manufacturer specification: H/MS3102A18-10P-D-T(10)

As the power connector a receptacle connector having a dripproof property by itself (when it is not engaged) is used as standard. Strictly speaking, this power connector does not meet the MS standard, but it can be used as a connector compatible with the MS-standard round connector.

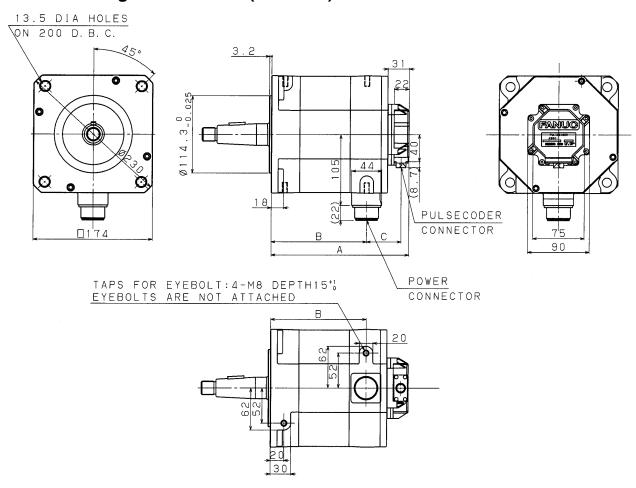
The following shows the shape and pin layout of the power connector.



For the specifications, shapes, and pin layouts of the connectors of the pulsecoder and brake, see Section 8.1, "PULSECODER".

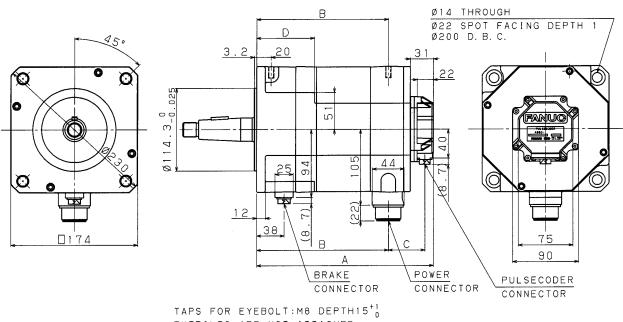
- 7.3 MODELS αi S 22 TO αi S 50, αi S 22HV TO αi S 50HV, αi S 50 WITH FAN, αi S 50HV WITH FAN, αi F 12 TO αi F 40, αi F 12HV TO αi F 22HV, AND αi F 40 WITH FAN
- **7.3.1** Outline Drawing of the Motors

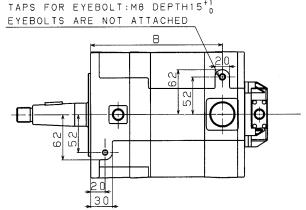
Outline drawing of the motors (standard)



MODEL	Α	В	С
α <i>i</i> S 22, α <i>i</i> S 22 HV		141	
α <i>i</i> F 12, α <i>i</i> F 12 HV	202		
α <i>i</i> S 30, α <i>i</i> S 30 HV	239	178	
α <i>i</i> S 40, α <i>i</i> S 40 HV	070	245	50
α <i>i</i> F 22, α <i>i</i> F 22 HV	276	215	50
α <i>i</i> S 50, α <i>i</i> S 50 HV	350	289	
α <i>i</i> F 30	350	209	
α <i>i</i> F 40	424	363	

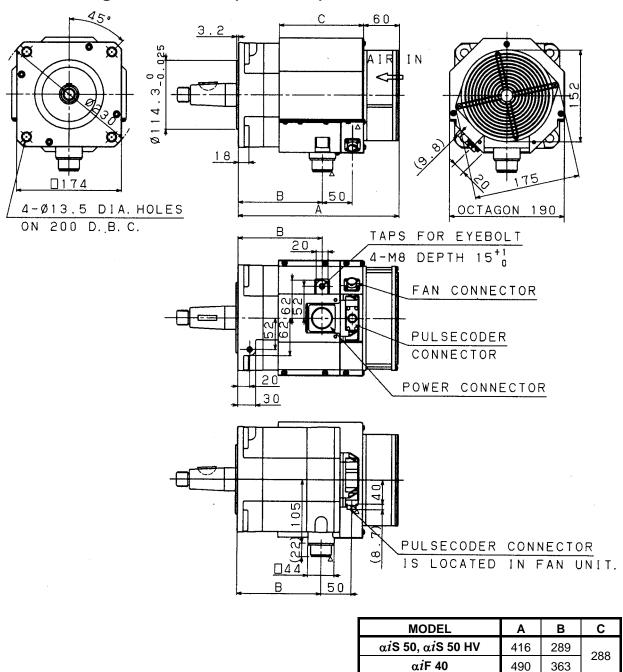
Outline drawing of the motors (with a brake)





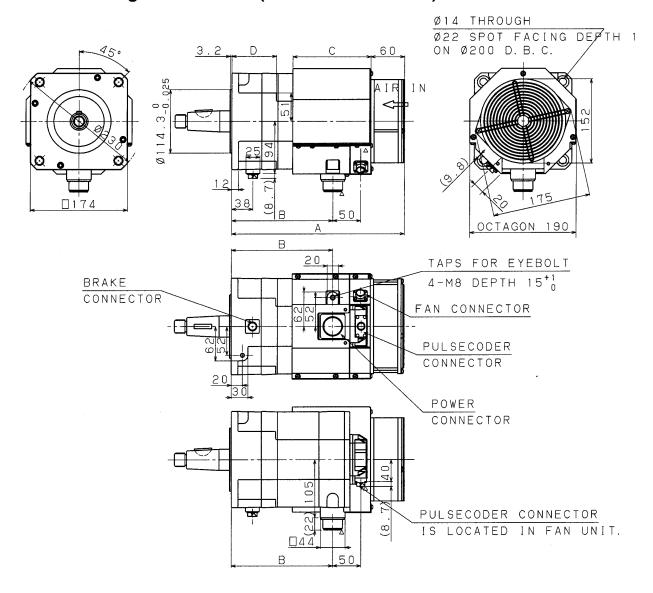
MODEL	BRAKE	Α	В	С	D
α <i>i</i> S 22, α <i>i</i> S 22 HV, α <i>i</i> F 12, α <i>i</i> F 12 HV		243	182		
α <i>i</i> S 30, α <i>i</i> S 30 HV		280	219		
α <i>i</i> S 40, α <i>i</i> S 40 HV, α <i>i</i> F 22, α <i>i</i> F 22 HV	35N·m	317	256	50	80
α <i>i</i> S 50, α <i>i</i> S 50 HV, α <i>i</i> F 30		391	330		
α <i>i</i> F 40		465	404		
α <i>i</i> S 40, α <i>i</i> S 40 HV		342	281		
α <i>i</i> S 50, α <i>i</i> S 50 HV	70N⋅m	416	355	50	105
α <i>i</i> F 40		490	429		

Outline drawing of the motors (with a fan)



The motor does not include a circuit breaker for protecting the fan. Prepare such a circuit breaker in the power magnetics cabinet.

Outline drawing of the motors (with a fan and brake)



MODEL	BRAKE	Α	В	С	D
α <i>i</i> S 50, α <i>i</i> S 50HV	35N·m	457	330	288	80
α <i>i</i> F 40	SON-III	531	404	200	80
α <i>i</i> S 50, α <i>i</i> S 50HV	70N·m	482	355	288	105
α <i>i</i> F 40		556	429	200	105

The motor does not include a circuit breaker for protecting the fan. Prepare such a circuit breaker in the power magnetics cabinet.

7.3.2 Shaft Shape

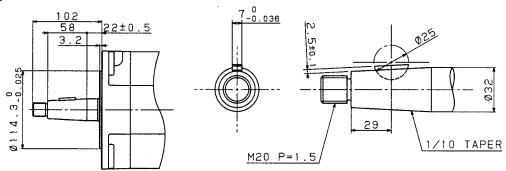
Shaft shape types

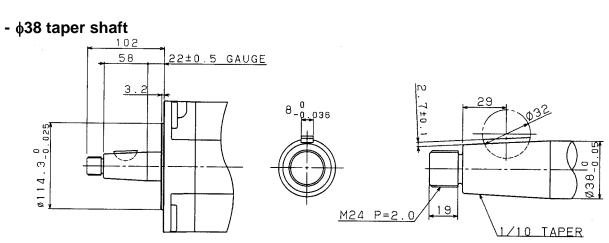
The shafts of the motors have the following shapes:

	Taper shaft	Straight shaft	Straight shaft with key way
α <i>i</i> S 22/4000	φ32	φ35	ф35
α <i>i</i> S 22/6000	φ32	φ35	ф35
α <i>i</i> S 30/4000	φ32	φ35	ф35
α <i>i</i> S 40/4000	φ32	φ35	ф35
lpha iS 50/3000 $lpha i$ S 50/3000 with fan	ф38	ф35	-
α <i>i</i> S 22/4000 HV	φ32	ф35	ф35
α <i>i</i> S 22/6000 HV	φ32	ф35	ф35
α <i>i</i> S 30/4000 HV	ф32	ф35	ф35
α <i>i</i> S 40/4000 HV	φ32	φ35	ф35
lpha iS 50/3000 HV $lpha i$ S 50/3000 HV with fan	ф38	ф35	-
α <i>i</i> F 12/3000	φ32	ф35	ф35
α <i>i</i> F 22/3000	φ32	φ35	ф35
α <i>i</i> F 30/3000	φ32	φ35	ф35
lpha iF 40/3000 $lpha i$ F 40/3000 with fan	ф38	ф35	ф35
α <i>i</i> F 12/3000 HV	ф32	ф35	ф35
α <i>i</i> F 22/3000 HV	ф32	φ35	ф35

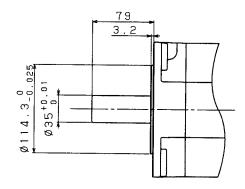
Shaft details

- ϕ 32 taper shaft

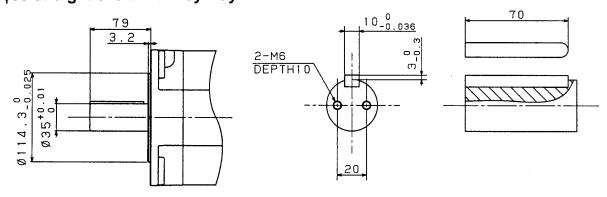




- ϕ 35 straight shaft



- φ35 straight shaft with key way



7.3.3 Allowable Axis Load

The allowable axis load is indicated below. For details of the allowable axis load, see Chapter 3, "USAGE".

Radial load	Axial load	(Reference) Front bearing specification
1960[N] (200 [kgf])	588[N] (60 [kgf])	6208

7.3.4 Shaft Run-out Precision

The shaft run-out precision is indicated below. For details of the shaft run-out precision, see Chapter 3, "USAGE".

Shaft dia. run-out	Faucet joint run-out	Mounting face run-out		
0.03mm or less	0.05mm or less	0.06mm or less		

7.3.5 Connector

Types of power connectors

The following power connectors are used for the motors:

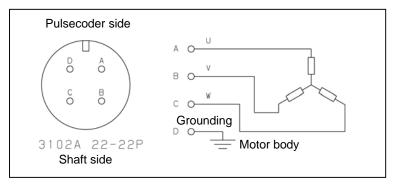
Motor	Power connector
α <i>i</i> S 22/4000	MS 22-22P compatible connector
αiS 22/6000	MS 22-22P compatible connector
αiS 30/4000	MS 22-22P compatible connector
α <i>i</i> S 40/4000	MS 22-22P compatible connector
α <i>i</i> S 50/3000	MC 24 40D compatible connector
lpha iS 50/3000 with fan	MS 24-10P compatible connector
α <i>i</i> S 22/4000 HV	MS 22-22P compatible connector
α <i>i</i> S 22/6000 HV	MS 22-22P compatible connector
α <i>i</i> S 30/4000 HV	MS 22-22P compatible connector
α <i>i</i> S 40/4000 HV	MS 22-22P compatible connector
α <i>i</i> S 50/3000 HV	MC 22 22D competible connector
lpha iS 50/3000 HV with fan	MS 22-22P compatible connector
α <i>i</i> F 12/3000	MS 22-22P compatible connector
α <i>i</i> F 22/3000	MS 22-22P compatible connector
α <i>i</i> F 30/3000	MS 22-22P compatible connector
α <i>i</i> F 40/3000	MC 22 22D compatible connector
lpha iF 40/3000 with fan	MS 22-22P compatible connector
α <i>i</i> F 12/3000 HV	MS 22-22P compatible connector
α <i>i</i> F 22/3000 HV	MS 22-22P compatible connector

MS22-22P compatible connector

Manufacture: Japan Aviation Electronics Industry Manufacturer specification: JL04 HV-2E22-22PE-BT-R

As the power connector a receptacle connector having a dripproof property by itself (when it is not engaged) is used as standard. Strictly speaking, this power connector does not meet the MS standard, but it can be used as a connector compatible with the MS-standard round connector.

The following shows the specification, shape, and pin layout of the power connector.

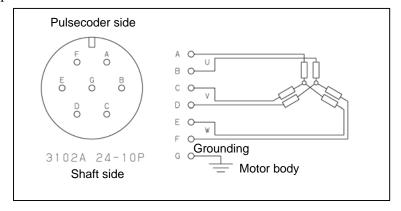


MS24-10P compatible connector

Manufacture: Japan Aviation Electronics Industry Manufacturer specification: JL04V-2E24-10PE(G)-B-R

As the power connector a receptacle connector having a dripproof property by itself (when it is not engaged) is used as standard. Strictly speaking, this power connector does not meet the MS standard, but it can be used as a connector compatible with the MS-standard round connector.

The following shows the specification, shape, and pin layout of the power connector.

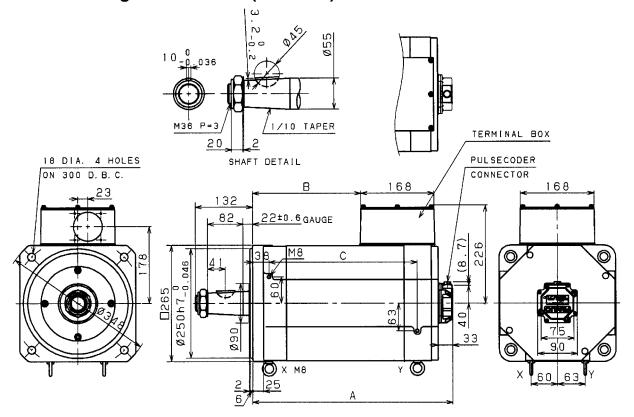


For the specifications, shapes, and pin layouts of the connectors of the pulsecoder, brake, and fan, see separate chapters.

7.4 MODELS αi S 100, αi S 200, αi S 100 WITH FAN, αi S 200 WITH FAN, αi S 100 HV, αi S 200 HV, αi S 100HV WITH FAN, AND αi S 200HV WITH FAN

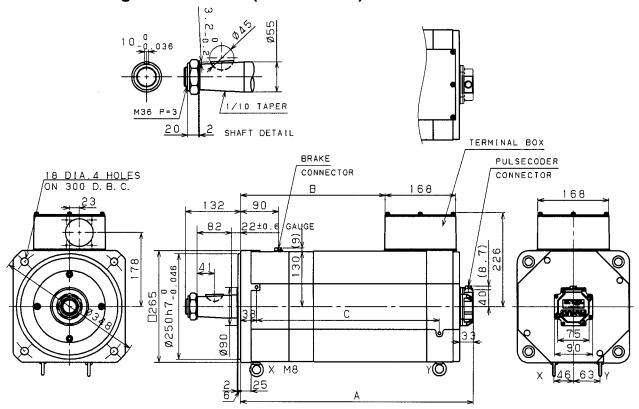
7.4.1 Outline Drawing of the Motors

Outline drawing of the motors (standard)



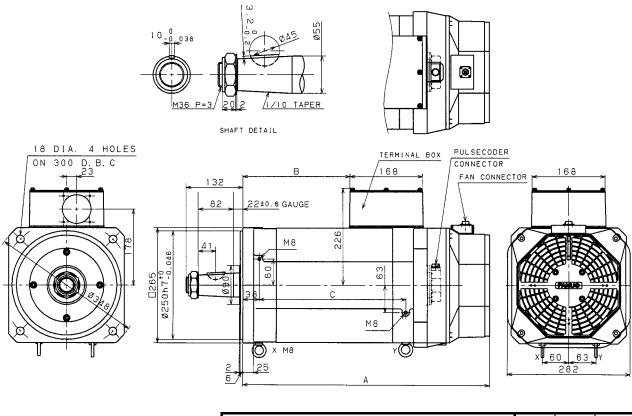
MODEL	Α	В	С
α <i>i</i> S 100, α <i>i</i> S 100 HV	339	129	220
α <i>i</i> S 200, α <i>i</i> S 200 HV	459	249	340

Outline drawing of the motors (with a brake)



MODEL	Α	В	С
α <i>i</i> S 100, α <i>i</i> S 100 HV	435	225	316
α <i>i</i> S 200, α <i>i</i> S 200 HV	555	345	436

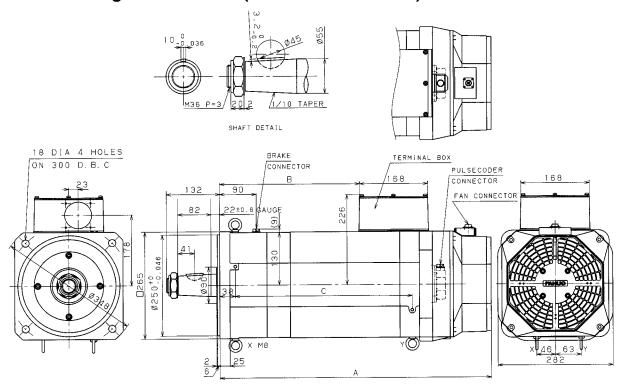
Outline drawing of the motors (with a fan)



MODEL	Α	В	С
lpha iS 100 with fan and $lpha i$ S 100 HV with fan	452	129	220
lpha iS 200 with fan and $lpha i$ S 200 HV with fan	572	249	340

The motor does not include a circuit breaker for protecting the fan. Prepare such a circuit breaker in the power magnetics cabinet.

Outline drawing of the motors (with a fan and brake)



MODEL	Α	В	С
lpha iS 100 with fan and $lpha i$ S 100 HV with fan	548	225	316
lpha iS 200 with fan and $lpha i$ S 200 HV with fan	668	345	436

The motor does not include a circuit breaker for protecting the fan. Prepare such a circuit breaker in the power magnetics cabinet.

7.4.2 Allowable Axis Load

The allowable axis load is indicated below. For details of the allowable axis load, see Chapter 3, "USAGE".

Radial load	Axial load	(Reference) Front bearing specification
8820[N] (900 [kgf])	2450[N] (250 [kgf])	6312

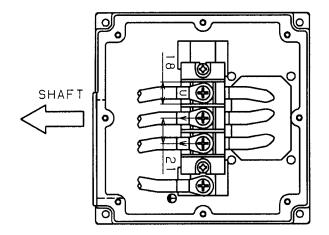
7.4.3 Shaft Run-out Precision

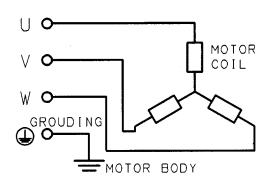
The shaft run-out precision is indicated below. For details of the shaft run-out precision, see Chapter 3, "USAGE".

Shaft dia. run-out	Faucet joint run-out	Mounting face run-out		
0.05mm or less	0.06mm or less	0.08mm or less		

7.4.4 Power Terminal Layout

The following shows the power terminal layout in the terminal box.





Power terminal size and ground terminal size: M6

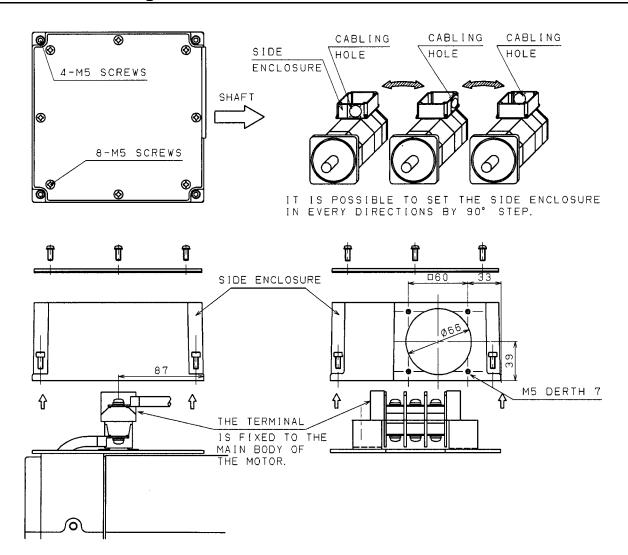
Tightening torque: 3.5 N⋅m to 4.5 N⋅m

⚠ CAUTION

- Securely connect power wires and short bars to the terminal block with the specified tightening torque according to the procedure described in this section. If the motor runs with a terminal loosely connected, the terminal block may get abnormally hot, resulting in a fire. The terminal may also be disconnected, resulting in a ground fault, short circuit, or electric shock.
- 2 To keep the insulation distance, note the following points:
 - When attaching a crimp terminal to the end of a power wire, always cover the crimping section of the crimp terminal with an insulating tube.

 When an insulating cover is mounted on the terminal block, screw the power wires and remount the cover in place before using the motor.

7.4.5 Cabling

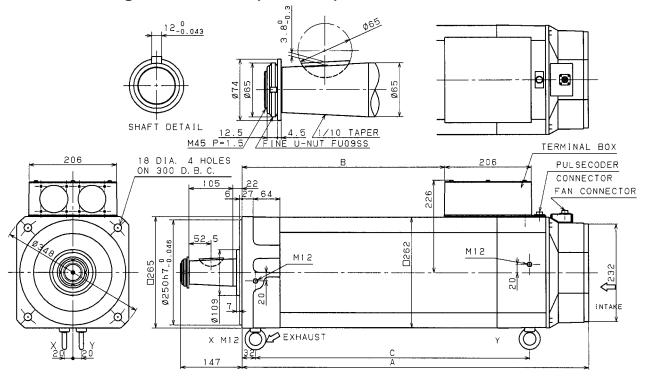


- 1. Before cabling, the motor can be dismantled by removing the four M5 hexagon socket head bolts and the eight M5 pan head screws. At the time of installation, check that the waterproofing rubber packing is not damaged, then install it with a tightening torque of 2.0 N·m to 2.5 N·m. At this time, ensure that foreign matter is not caught.
- 2. To meet the IP level, a protection such as a conduit is required for the cabling hole. See Subsection 3.1.2, "Usage Considering Environmental Resistance".
- 3. The enclosure of the terminal box can be oriented in any direction in steps of 90°.
- 4. For the specifications, shapes, and pin layouts of the connectors of the pulsecoder, brake, and fan, see separate chapters.

7.5 MODELS αi S 300, αi S 500, αi S 300 HV, AND αi S 500 HV

7.5.1 Outline Drawing of the Motors

Outline drawing of the motors (standard)



MODEL	Α	В	С
α <i>i</i> S 300, α <i>i</i> S 300 HV	620	279	448
α <i>i</i> S 500, α <i>i</i> S 500 HV	828	487	656

The motor does not include a circuit breaker for protecting the fan. Prepare such a circuit breaker in the power magnetics cabinet.

7.5.2 Allowable Axis Load

The allowable axis load is indicated below. For details of the allowable axis load, see Chapter 3, "USAGE".

Radial load	Axial load	(Reference) Front bearing specification
11760[N] (1200 [kgf])	1960[N] (200 [kgf])	NU2214

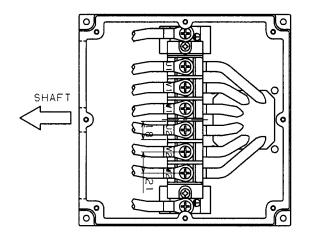
7.5.3 Shaft Run-out Precision

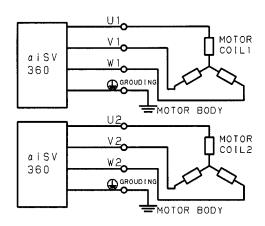
The shaft run-out precision is indicated below. For details of the shaft run-out precision, see Chapter 3, "USAGE".

Shaft dia. run-out	Faucet joint run-out	Mounting face run-out	
0.06mm or less	0.06mm or less	0.08mm or less	

7.5.4 Power Terminal Layout (for αi S 300 and αi S 500)

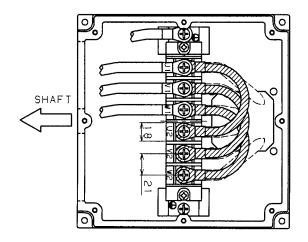
The following shows the power terminal layout in the terminal box.

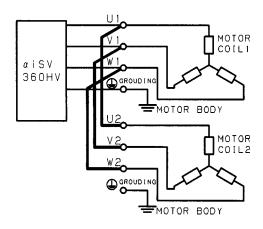




Power terminal size and ground terminal size: M6 Tightening torque: 3.5 N·m to 4.5 N·m

7.5.5 Power Terminal Layout (for αi S 300HV and αi S 500HV)





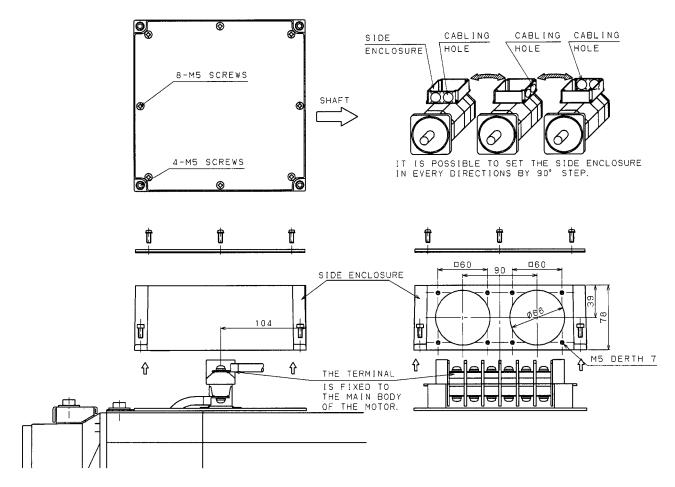
Power terminal size and ground terminal size: M6 Tightening torque: 3.5 N·m to 4.5 N·m

⚠ CAUTION

- 1 Securely connect power wires and short bars to the terminal block with the specified tightening torque according to the procedure described in this section. If the motor runs with a terminal loosely connected, the terminal block may get abnormally hot, resulting in a fire. The terminal may also be disconnected, resulting in a ground fault, short circuit, or electric shock.
- 2 To keep the insulation distance, note the following points:
 - When attaching a crimp terminal to the end of a power wire, always cover the crimping section of the crimp terminal with an insulating tube.

 When an insulating cover is mounted on the terminal block, screw the power wires and remount the cover in place before using the motor.

7.5.6 Cabling (for αi S 300, αi S 500, αi S 300HV, and αi S 500HV)

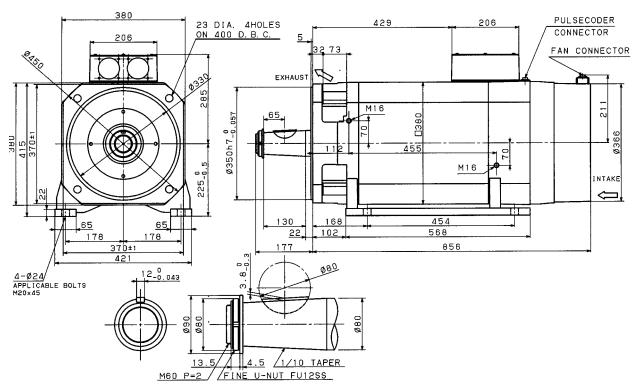


- 1. Before cabling, the motor can be dismantled by removing the four M5 hexagon socket head bolts and the eight M5 pan head screws. At the time of installation, check that the waterproofing rubber packing is not damaged, then install it with a tightening torque of 2.0 N·m to 2.5 N·m. At this time, ensure that foreign matter is not caught.
- 2. To meet the IP level, a protection such as a conduit is required for the cabling hole. See Subsection 3.1.2, "Usage Considering Environmental Resistance".
- 3. The enclosure of the terminal box can be oriented in any direction in steps of 90°.
- 4. For the specifications, shapes, and pin layouts of the connectors of the pulsecoder and fan, see separate chapters.

7.6 MODEL αi S 1000 HV

7.6.1 Outline Drawing of the Motors

Outline drawing of the motors (standard)



- SHAFT DETAIL
 - 1. The motor does not include a circuit breaker for protecting the fan. Prepare such a circuit breaker in the power magnetics cabinet.
 - 2. The motor cannot be mounted on the machine with the flange alone. Support the weight of the motor by securing the foot by four bolts. Use the flange as the reference for centering with the machine.
 - 3. Consult with FANUC for any other mounting method.

7.6.2 Allowable Axis Load

The allowable axis load is indicated below. For details of the allowable axis load, see Chapter 3, "USAGE".

Radial load	Axial load	(Reference) Front bearing specification
13720[N] (*)	1960[N]	6317
(1400 [kgf])	(200 [kgf])	Double bearing

(*) Ensure also that the maximum momentary radial load does not exceed the value above.

The shaft can break due to fatigue.

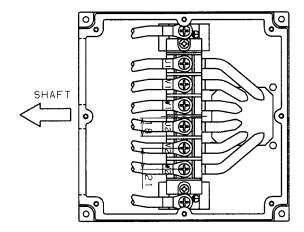
7.6.3 Shaft Run-out Precision

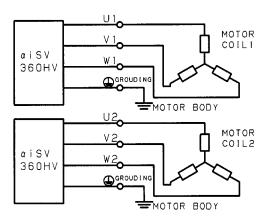
The shaft run-out precision is indicated below. For details of the shaft run-out precision, see Chapter 3, "USAGE".

Shaft dia. run-out	Faucet joint run-out	Mounting face run-out
0.08mm or less	0.11mm or less	0.14mm or less

7.6.4 Power Terminal Layout

The following shows the power terminal layout in the terminal box.





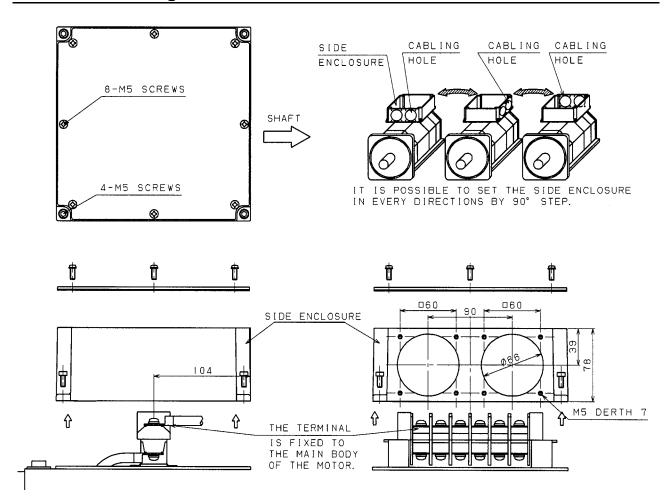
Power terminal size and ground terminal size: M6 Tightening torque: 3.5 N·m to 4.5 N·m

⚠ CAUTION

- 1 Securely connect power wires and short bars to the terminal block with the specified tightening torque according to the procedure described in this section. If the motor runs with a terminal loosely connected, the terminal block may get abnormally hot, resulting in a fire. The terminal may also be disconnected, resulting in a ground fault, short circuit, or electric shock.
- 2 To keep the insulation distance, note the following points:
 - When attaching a crimp terminal to the end of a power wire, always cover the crimping section of the crimp terminal with an insulating tube.

 When an insulating cover is mounted on the terminal block, screw the power wires and remount the cover in place before using the motor.

7.6.5 Cabling

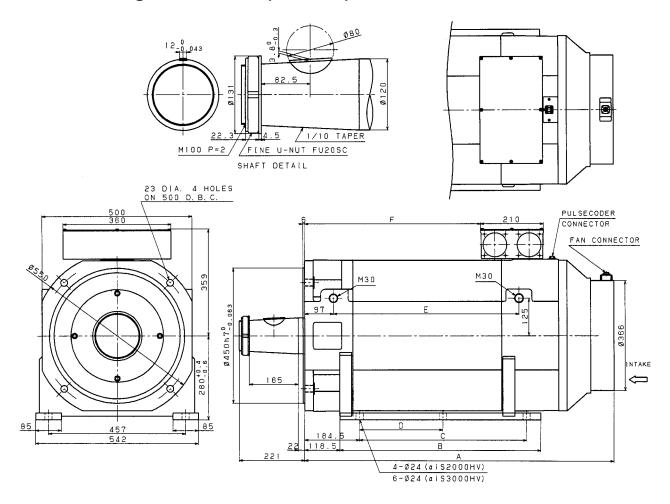


- 1. Before cabling, the motor can be dismantled by removing the four M5 hexagon socket head bolts and the eight M5 pan head screws. At the time of installation, check that the waterproofing rubber packing is not damaged, then install it with a tightening torque of 2.0 N·m to 2.5 N·m. At this time, ensure that foreign matter is not caught.
- 2. To meet the IP level, a protection such as a conduit is required for the cabling hole. See Subsection 3.1.2, "Usage Considering Environmental Resistance".
- 3. The enclosure of the terminal box can be oriented in any direction in steps of 90°.
- 4. For the specifications, shapes, and pin layouts of the connectors of the pulsecoder and fan, see separate chapters.

7.7 MODELS αi S 2000 HV AND αi S 3000 HV

7.7.1 Outline Drawing of the Motors

Outline drawing of the motors (standard)



MODEL	Α	В	С	D	E	F
α <i>i</i> S 2000HV	1036	674	560	_	623	588
α <i>i</i> S 3000HV	1436	1074	960	560	1023	988

- 1. The motor does not include a circuit breaker for protecting the fan. Prepare such a circuit breaker in the power magnetics cabinet.
- 2. The motor cannot be mounted on the machine with the flange alone. At the time of mounting, ensure that the shaft is horizontal and the foot faces downward. Support the weight of the motor by securing the foot by bolts. Use the flange as the reference for centering with the machine.
- 3 Consult with FANUC for any other mounting method.

7.7.2 Allowable Axis Load

The allowable axis load is indicated below. For details of the allowable axis load, see Chapter 3, "USAGE".

Radial load	Axial load	(Reference) Front bearing specification
40000[N] (4080[kgf])	4000[N] ([410kgf])	NU2226

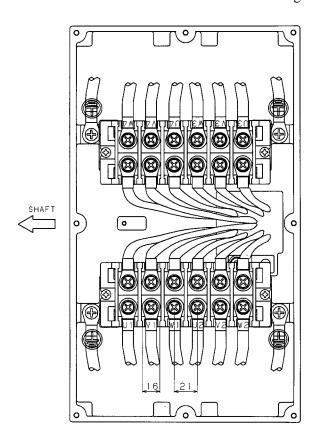
7.7.3 Shaft Run-out Precision

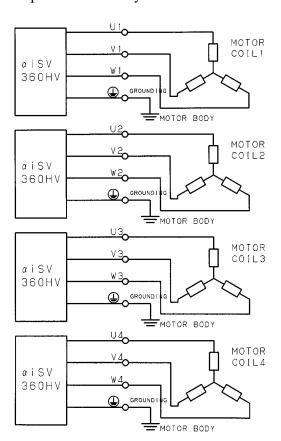
The shaft run-out precision is indicated below. For details of the shaft run-out precision, see Chapter 3, "USAGE".

Shaft dia. run-out	Faucet joint run-out	Mounting face run-out
0.08mm or less	0.13mm or less	0.16mm or less

7.7.4 Power Terminal Layout

The following shows the power terminal layout in the terminal box.





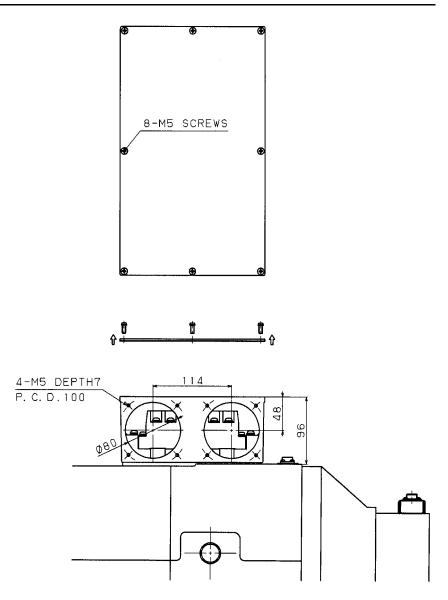
Power terminal size and ground terminal size: M6 Tightening torque: 3.5 N·m to 4.5 N·m

! CAUTION

- Securely connect power wires and short bars to the terminal block with the specified tightening torque according to the procedure described in this section. If the motor runs with a terminal loosely connected, the terminal block may get abnormally hot, resulting in a fire. The terminal may also be disconnected, resulting in a ground fault, short circuit, or electric shock.
- To keep the insulation distance, note the following points:When attaching a crimp terminal to the end of a

power wire, always cover the crimping section of the crimp terminal with an insulating tube. When an insulating cover is mounted on the terminal block, screw the power wires and remount the cover in place before using the motor.

7.7.5 Cabling



- 1. Before cabling, the motor can be dismantled by removing the eight M5 pan head screws. At the time of installation, check that the waterproofing rubber packing is not damaged, then install it with a tightening torque of 2.0 N·m to 2.5 N·m. At this time, ensure that foreign matter is not caught.
- 2. To meet the IP level, a protection such as a conduit is required for the cabling hole. See Subsection 3.1.2, "Usage Considering Environmental Resistance".
- 3. For the specifications, shapes, and pin layouts of the connectors of the pulsecoder and fan, see separate chapters.

FEEDBACK SENSOR

All αi series AC servo motors contain Pulsecoder (optical encoder) as
a feedback sensor which detects position and velocity.
Separate type position sensors are also available for detecting a
position by attaching directly to a ball screw or machine

Chapter 8, "FEEDBACK SENSOR", consists of the following sections:

8.1	PULSECODER	187
8.2	SEPARATE PULSECODER	190

8.1 PULSECODER

All αi AC servo motors feature Pulsecoder (optical encoder). The Pulsecoder outputs position information and an alarm signal. The outline drawing of Pulsecoder is not given in this section because it is contained in a motor. See the outline drawing (Chapter 7, "OUTLINE DRAWINGS") of each motor model.

8.1.1 Types of Pulsecoders and Designation

The following table lists the types of Pulsecoders.

Pulsecoder type	Resolution [Division/rev]	Absolute/ incremental	Applicable motor
α <i>i</i> Α 1000	1,000,000	Absolute	
α <i>i</i> I 1000	1,000,000	Incremental	All models
α <i>i</i> Α 16000	16,000,000	Absolute	

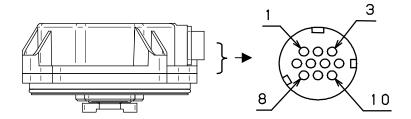
For how to specify Pulsecoder, see the Chapter 2, "ORDERING SPECIFICATION NUMBER" because Pulsecoder is specified together with a motor.

8.1.2 Connecting Pulsecoder

Connector

Manufacture: Japan Aviation Electronics Industry Manufacturer specification: JN2AS10UL1-R

The connector of the αi series Pulsecoder is dripproof when engaged with the cable connector. (When the motor is left singly, the connector is dripproof when the cap mounted at shipment is fit in the connector.) The signals of the αi series Pulsecoder are arranged as follows:



Signal name	Pin No.		
	α <i>i</i> Α 1000 α <i>i</i> Α 16000	α <i>i</i> I 1000	
RD	6	6	
*RD	5	5	
+5V	8,9	8,9	
0V	7,10	7,10	
FG +6V	3	3	
+6V	4	-	

Connector kits

For information on connectors and crimping jigs required for creating a feedback cable, see Chapter 11, "CONNECTORS ON THE CABLE SIDE."

NOTE

If the motor is mounted on a movable part, or a flexible tube is used for the connector, excessive force may be applied to the connector. In this case, fix the feedback cable to prevent the connector from being broken.

Connecting Pulsecoder to an amplifier

For cables connecting Pulsecoder and amplifier, refer to "FANUC SERVO AMPLIFIER αi series Descriptions (B-65282EN)" or FANUC SERVO AMPLIFIER βi series Descriptions (B-65322EN)." In particular, special care should be taken when the Pulsecoder is connected to an I/O link amplifier. For details, refer to the description of the I/O link amplifier in "FANUC SERVO AMPLIFIER βi series Descriptions (B-65322EN)".

8.1.3 Absolute-type Pulsecoder

When the CNC is turned off, the Pulsecoder position detection function is backed up by battery. So, when the CNC is next turned on, the operator does not have to perform reference position return.

For backup, a battery unit must be installed in the CNC or servo amplifier.

If a low-battery indication appears on the CNC, replace the new battery as soon as possible.

For this Pulsecoder, the function is backed up for about 10 minutes by a backup capacitor when the battery is removed. In the backup status, the battery can be replaced when the power to the servo amplifier is off.

The operator does not also have to perform reference position return after replacing the feedback cable or servo amplifier.

8.2 SEPARATE PULSECODER

For detecting a position by attaching directly to a ball screw or a machine, use a separate Pulsecoder.

8.2.1 Separate Pulsecoder Type and Designation

Separate Pulsecoder are available.

Separate Pulsecoder name	Resolution	Allowanble maximum speed	Absolute/ incremental	Ordering number
αA1000S	1,000,000 /rev	4000min ⁻¹	Absolute	A860-0372-T001

8.2.2 Separate Pulsecoder Specifications

Pulsecoder α A1000S

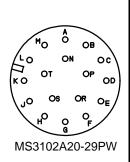
Item		Specification
Power voltage		5 [V]±5%
Current consumptio	n	Up to 0.3 [A]
Working temperature ra	ange	0 to +60 [°C]
Resolution		1,000,000 [/rev.]
Maximum speed of rota	ation	4000 [min ⁻¹]
Input shaft inertia		Up to 1×10 ⁻⁴ [kg·m ²]
Input shaft startup torque		Up to 0.1 [N⋅m]
Input shoft allowable load	Radial	100 [N]
Input shaft allowable load	Axial	50 [N]
Shaft diameter run-o	ut	0.02×10 ⁻³ [m]
		Dust-proof, drip-proof
Structure		(IP55 or equivalent: when water-proof
		connector is fitted)
Vibration resistance acceleration		5 [G] (50 to 2,000[Hz])
Weight		Approx. 0.75 [kg]

8.2.3 Connecting a Separate Type Pulsecoder

The layout of connector pins is shown below.

For the connection diagram for separate type Pulsecoders, refer to the relevant NC connection manual.

Layout of Connector Pins of Pulsecoder $\alpha A1000S$



0:	Pin No.	
Signal name	αA1000S MS3102A20-29PW	
SD	А	
*SD	D	
REQ	F	
*REQ	G	
+5V	J,K	
0V	N,T	
Shield	Н	
+6VA	R	
0VA	S	

8.2.4 Outline Drawings of Separate Pulsecoder

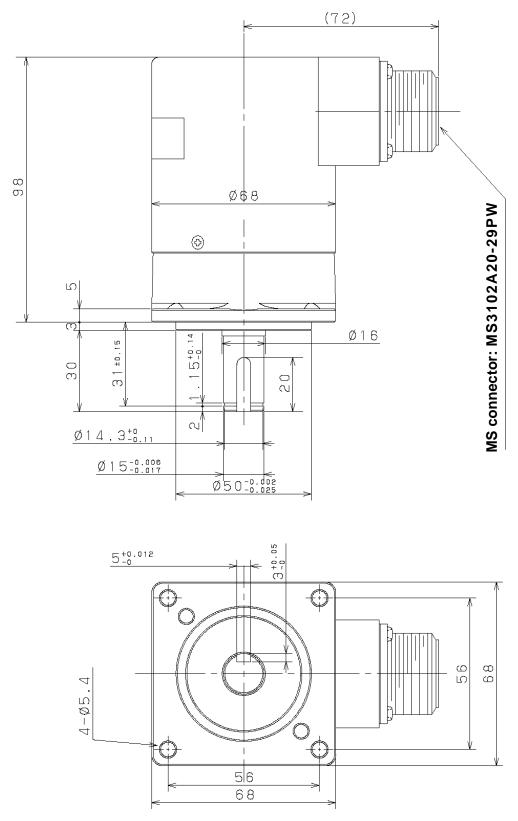


Fig. 8.2.4 Pulsecoder $\alpha A1000S$

8.2.5 Cautions when Using a Separate Type Pulsecoder

Pay attention to the following items when using the separate Pulsecoder.

- Increase the machine rigidity between the servo motor and the Pulsecoder to minimize mechanical vibration. If the machine rigidity is low or the structure vibrates, poor performance, over shoot is likely to occur.
- When the separate Pulsecoder is used, the influence of gear, ball screw pitch error or table inclination is decreased and the positioning accuracy and geometrical accuracy (roundness, etc.) are increased, but the smoothness may deteriorate due to the elasticity in the machine between the servo motor and the separate Pulsecoder.
- It is necessary to use the built-in Pulsecoder with a resolution equal to or finer than that of the separate Pulsecoder.

To connect the separate Pulsecoder to the CNC, connect only the signals described in the connecting manual.

When the other signal is connected, the unit may occur malfunction.

9.BUILT-IN BRAKE

9

BUILT-IN BRAKE

Some models of the FANUC AC Servo Motor αi series use motors that contain a holding brake to prevent falling along a vertical axis. This chapter explains the specifications of built-in brakes and gives cautions.

The motor with a built-in brake differs from that with no brake in outside dimensions. For the outside dimensions, see the Chapter 7, "OUTLINE DRAWINGS."

Chapter 9, "BUILT-IN BRAKE", consists of the following sections:

9.1	BRAKE SPECIFICATIONS	195
9.2	CONNECTING A BRAKE	196
9.3	CAUTIONS	200
9.4	REDUCING THE BRAKE SHAFT FALL AMOUNT	201

9.1 BRAKE SPECIFICATIONS

The specifications of built-in brakes are listed below.

Motor model		Unit	αiS 2, αiS 4, αiF 1, αiF 2 (Including HV)	α <i>i</i> S 8, α <i>i</i> S 12, α <i>i</i> F 4, α <i>i</i> F 8 (Including HV)
Broko	torque	Nm	3	8
Diake	lorque	kgf-cm	31	82
Respons	Release	msec	60	80
e time	Brake	msec	20	20
D	Voltage	V	24VDC (±10%)	
Power	Current	Α	0.9	1.1
supply	Wattage	W	22	26
Weight increase		kg	Approx. 1.0	Approx. 2.2
In artia i	In outle for any and		0.00002	0.00007
Inertia increase		kgf-cm-s ²	0.0002	0.0007

Motor model		Unit	αiS 22 to αiS 50, αiF 12 to αiF 40, (Including HV) (Including fan-equipped models) Standard brake	αiS 40, αiS 50, αiF 40 (Including HV) (Including fan-equipped models) High-torque brake	lpha iS 100, $lpha i$ S 200, (Including HV) (Including fan-equipped models)
Broko	torquo	Nm	35	70	150
Diake	Brake torque		357	714	1530
Respons	Release	msec	160	300	360
e time	Brake	msec	30	50	60
D	Voltage	V	24VDC (±10%)		
Power	Current	А	1.2	2.4	2.5
supply	Wattage	W	29	58	60
Weight increase		kg	Approx. 6.0	Approx. 10	Approx. 15
Inertia increase		kg⋅m²	0.0006	0.0009	0.0010
		kgf-cm-s2	0.006	0.009	0.010

The values shown above are standard values at 20°C.

9.BUILT-IN BRAKE

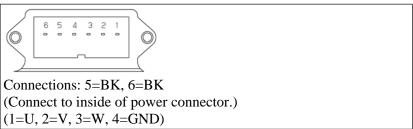
9.2 CONNECTING A BRAKE

9.2.1 Brake Connectors

The following shows the shape and pin arrangement of the brake connectors.

For the connected cables and the connectors on the cable side, see Chapter 11, "CONNECTORS ON THE CABLE SIDE"...

For models αi S 2 to αi S 4 and αi F 1 to αi F 2



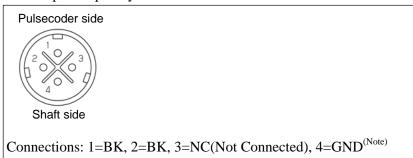
* BK indicates a power supply (24 VDC, 0 VDC) for the brake. The brake is nonpolarized.

For models αi S 8 to αi S 200 and αi F 4 to αi F 40

Manufacture: Japan Aviation Electronics Industry Manufacturer specification: JN2AS04MK2-R

This connector alone is dripproof.

The shape and pin layout of the connector are shown below.



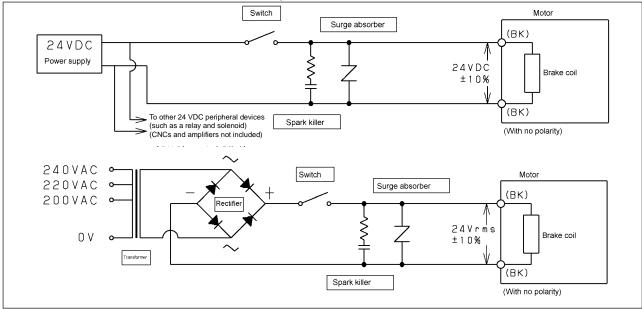
* BK indicates a power supply (24 VDC, 0 VDC) for the brake. The brake is nonpolarized.

NOTE

Since pin 4 is connected to the brake cabinet, it can be used when the shield wire of a brake cable needs to be connected. B-65262EN/05 9.BUILT-IN BRAKE

9.2.2 Connection of the Brakes

Configure a brake circuit by referencing the following brake connection diagrams and the recommended parts shown in the following section.



- 1 Use 24 VDC as power for the brake of the FANUC AC servo motor αi series. Power produced by full-wave rectification after transforming commercial power (50 Hz/60 Hz) is also available.
- 2 Use a power supply separate from the 24-V power supply for the CNC and amplifier as the power supply for the brake. If the control power supply is also used for the brake, an CNC or amplifier malfunction or another danger may occur. The power supply for a relay, solenoid, or another peripheral device can be used for the brake. Be careful of the power capacity and changes in voltage due to changes in load.
- 3 For full-wave rectification, transform the secondary side voltage obtained during energization of the brake into approximately 29 VAC by taking voltage drop in the rectifier or cable into account. In this case, check the power capacity and power voltage fluctuations sufficiently and then make sure the fluctuations of the voltage applied to the brake during energization falls within 24 Vrms ±10%. Switch the transformer's primary side input to a desired position such as 100-110-120 VAC or 200-220-240 VAC.
- 4 If the contact is installed on the DC side (at the position shown in the figure), the life of the contact is generally shortened due to the surge voltage at brake off. Provide an adequate contact capacity and always use a surge absorber and spark killer for protecting the contact.
- 5 You can use either positive or negative power pin to connect the brake because the brake coil is nonpolarized.
- 6 Use a shielded cable as required.

9.BUILT-IN BRAKE

9.2.3 Recommended Parts in Brake Circuits

The following table lists the recommended parts to be used as components of a brake circuit and their specifications.

Models αi S 2 to αi S 50 and αi F 1 to αi F 40 (3N·m brake, 8N·m brake, or 35N·m brake)

Name	Model No.	Name of Manufacturer	Specifications	FANUC Procurement Dwg. No.
Surge absorber	ERZV10D820	Matsusihita Electric Industrial Co., Ltd.	Varistor voltage 82V Max. allowable voltage 50VAC	-
Spark killer	XEB0471	OKAYA ELECTRIC IND. CO., LTD.	47Ω / $0.1\mu F$ Withstand voltage 400 V min.	•
Switch	-	-	Rated load capacity (resistance load) 250VAC 10A / 30VDC 10A or more	•
Rectifier	D3SB60 (Note 1)	SHINDENGEN ELECTRIC MFG. CO., LTD.	Withstand voltage 400 V min. Maximum output current: 2.3 A (with no fin)	A06B-6050-K112

NOTE

1 At an ambient temperature of 20°C, the temperature of the rectifier rises to about 60°C when one brake axis is used or to about 90°C when two brake axes are used. Use a radiator fin as required.

When the αiS 40, αiS 50, or αiF 40 motor with a high-torque (70N·m) brake is used, recommended components of the brake circuit and their specifications are listed below.

Models αi S 40, αi S 50, and αi F 40 (70N·m brake)

Name	Model No.	Name of Manufacturer	Specifications	FANUC Procurement Dwg. No.
Surge absorber	ERZV20D820 (Note 2)	Matsusihita Electric Industrial Co., Ltd.	Varistor voltage 82V Max. allowable voltage 50VAC	-
Spark killer	XEB0471	OKAYA ELECTRIC IND. CO., LTD.	47Ω / 0.1μF Withstand voltage 400 V min.	-
Switch	-	-	Rated load capacity (resistance load) (Note 3) 250VAC 20A / 30VDC 20A or more	-
Rectifier	D3SB60 (Note 4)	SHINDENGEN ELECTRIC MFG. CO., LTD.	Withstand voltage 400 V min. Maximum output current: 2.3 A (with no fin)	A06B-6050-K112

NOTE

- 2 The recommended surge absorber capacitance is larger than that for the 35N·m brake.
- 3 The recommended switch contact capacity is larger than that for the 35N·m brake.
- 4 Use a radiator fin. In addition, use one brake axis per rectifier.

B-65262EN/05 9.BUILT-IN BRAKE

Models αi S 100 to αi S 200 (150N·m brake)

Name	Model No.	Name of Manufacturer	Specifications	FANUC Procurement Dwg. No.
Surge	ERZV20D820	Matsusihita Electric	Varistor voltage 82V	
absorber	ERZ V 20 D 6 2 0	Industrial Co., Ltd.	Max. allowable voltage 50VAC	•
Spark	VED0474	OKAYA ELECTRIC	47Ω / 0.1μF	
killer	XEB0471	IND. CO., LTD.	Withstand voltage 400 V min.	•
Switch	-	_	Rated load capacity (resistance load) 250VAC 20A / 30VDC 20A or more	-
Rectifier	D3SB60 (Note 5)	SHINDENGEN ELECTRIC MFG. CO., LTD.	Withstand voltage 400 V min. Maximum output current: 2.3 A (with no fin)	A06B-6050-K112

NOTE

5 Use a radiator fin. In addition, use one brake axis per rectifier.

9.BUILT-IN BRAKE B-65262EN/05

CAUTIONS

⚠ CAUTION

Pay attention to the following points when motors with built-in brakes are used.

- 1 The built-in brake is designed to holding. The brake cannot be used for ordinary braking. If the brake is use for braking, a failure can occur.
- The brake cannot be used as a support for stopping, with the motor placed in the excitation state. This causes an abnormal heat of the motor.
- 3 Before releasing the brake, check that motor excitation is turned
 - In the case where a brake operation (axis fixing) is performed, turn off motor excitation after the brake operation.
- The total length of a model such as the αi F40 with a built-in brake is much longer than that of the model with no built-in brake. Be careful not to apply excessive force to the opposite side of the mounting flange or to apply excessive acceleration to the entire motor.



⚠ WARNING

On the machine, install a stop device for securing safety.

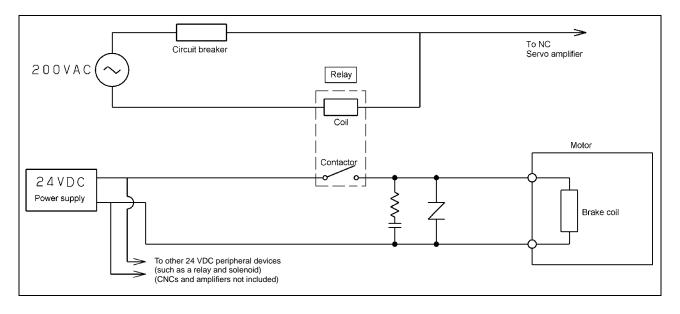
The brake built into the servo motor is not a stop device for securing safety. The machine may not be held if a failure occurs.

B-65262EN/05 9.BUILT-IN BRAKE

9.4 REDUCING THE BRAKE SHAFT FALL AMOUNT

During use of a motor with a brake, the amount of falling along an axis at a power failure or emergency stop, or when the CNC power supply is turned off during excitation of the motor may become an issue. To operate the brake immediately and reduce the amount of falling along an axis to a minimum, note the following points:

- (1) To operate the brake immediately, the switch and relay for controlling on and off must be installed on the DC side (at the position shown in the following figure) of the break circuit. If the contact is installed on the AC side (between the transformer's secondary side and rectifier), it takes time until braking starts because of the current returned to the rectifier diodes.
- (2) To reduce the amount of falling along a vertical axis, the switch or relay must be turned off at a power failure as soon as possible. To turn the relay off immediately at a power failure, it is effective to supply the relay driving power from the main power supply whenever possible as shown in the following figure.
- (3) To prevent the shaft from falling during an emergency stop, it is sometimes effective to use the "brake control function" in the servo software. This function enables continuous excitation of the motor until the motor built-in brake operates. For details, see Parameter Manual (B-65270EN).



10.COOLING FAN B-65262EN/05

10 COOLING FAN

Cooling fans are available for the models αiS 50 with fan, αiS 100 with fan, αiS 200 with fan, αiS 300, αiS 500, αiS 50HV with fan, αiS 100HV with fan, αiS 200HV with fan, αiS 300HV, αiS 500HV, αiS 3000HV, αiS 40 with fan. This chapter describes these cooling fans.

Chapter 10, "COOLING FAN", consists of the following sections:

10.1 COOLING FAN SPECIFICATIONS	203
10.2 CONNECTING A COOLING FAN	205
10.3 COOLING FAN PROTECTION CIRCUIT	208

B-65262EN/05 10.COOLING FAN

10.1 COOLING FAN SPECIFICATIONS

The specifications of the fan supplied with each motor are listed below.

αi S 50 with fan, αi S 50HV with fan, αi F 40 with fan

	Single-phase 200 VAC			
Input voltage	50 Hz	60 Hz		
	170 to 220 VAC	170 to 242 VAC		
Rated input	31W ±10%	30W ±10%		
Rated current	0.23A ±10%	0.2A ±10%		
Degree of protection (IEC34-5)	IP	00		

NOTE

For the models with fan, the degree of protection of the fan connector section is

αi S 100 with fan to αi S 500 and αi S 100HV with fan to αi S 500HV

Motor model	α <i>i</i> S 200/25 α <i>i</i> S 30	00 with fan 00 with fan 0/2000 0/2000	lpha iS 100/2500 HV with fan $lpha i$ S 200/2500 HV with fan $lpha i$ S 300/2000 HV $lpha i$ S 500/2000 HV		
	Three-phas	se 200 VAC	Three-phase 400 VAC		
Input voltage	50 Hz	60 Hz	50 Hz	60 Hz	
	170 to 240 VAC	170 to 240 VAC	323 to 440 VAC	391 to 528 VAC	
Rated input	60 W	90 W	80 W	120 W	
Steady-state current	0.2 A _{rms}	$0.3 A_{rms}$	0.2 A _{rms}	0.2 A _{rms}	
Protection circuit set temperature	140 °C				
Degree of protection (IEC34-5)	IP00				

NOTE

For the models with fan, the degree of protection of the fan connector section is IP00.

NOTE

Pay attention to the driving voltage.

The driving voltage of the fan equals the driving voltage of the motor. For the αi S 100 with fan to αi S 500 models, **three-phase**, **200 VAC** is used. For the αi S 100HV with fan to αi S 500HV models, **three-phase**, **400 VAC** is used.

10.COOLING FAN B-65262EN/05

αi S 1000HV, αi S 2000HV, and αi S 3000HV

Motor model	α <i>i</i> S 1000/2000 HV		α <i>i</i> S 2000/2000 HV α <i>i</i> S 3000/2000 HV	
		Three-phas	se 400 VAC	
Input voltage	50 Hz	60 Hz	50 Hz	60 Hz
	320 to 460 VAC	320 to 460 VAC	340 to 480 VAC	340 to 480 VAC
Rated input	120 W	170 W	550 W	800 W
Steady-state current	0.2 A _{rms}	0.3 A _{rms}	0.8 A _{rms}	1.3 A _{rms}
Protection circuit set temperature	140 °C			
Degree of protection (IEC34-5)	IP00			

NOTE

For the models with fan, the degree of protection of the fan connector section is IP00.

NOTE

Pay attention to the driving voltage.

The driving voltage of the fan equals the driving voltage of the motor. For the αi S 1000HV to αi S 3000HV, **three-phase**, **400 VAC** is used. Note that the driving voltage differs from that of the conventional motor, the α 1000HV.

B-65262EN/05 10.COOLING FAN

10.2 CONNECTING A COOLING FAN

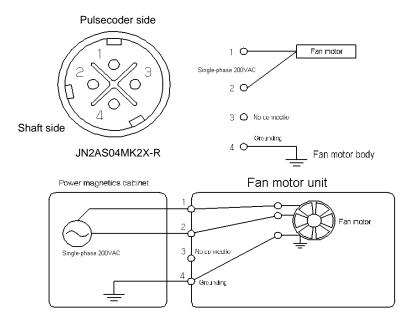
The following figure shows how to connect to a fan unit. Note that the input voltage is different for each unit. For the connected cable and the connector on the cable side, see Chapter 11, "CONNECTORS ON THE CABLE SIDE".

αi S 50 with fan, αi S 50HV with fan, and αi F 40 with fan

Manufacture: Japan Aviation Electronics Industry Manufacturer specification: JN2AS04MK2X-R

This connector is not dripproof.

The shape and pin layout of the connector are shown below.



A fan motor can be connected to terminal 1 or 2.

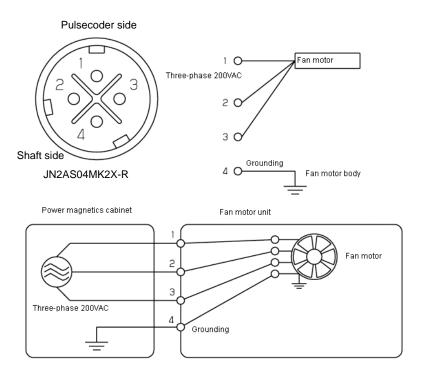
10.COOLING FAN B-65262EN/05

αi S 100 with fan to αi S 500

Manufacture: Japan Aviation Electronics Industry Manufacturer specification: JN2AS04MK2X-R

This connector is not dripproof.

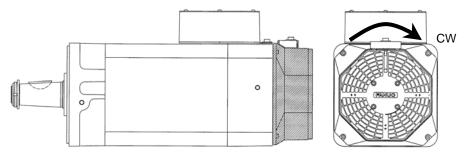
The shape and pin layout of the connector are shown below.



If the three phases are connected incorrectly, the fan rotates in the reverse direction.

Be sure to connect the three phases correctly.

If the three phases are connected incorrectly, the fan rotates in the reverse direction but the direction of air flow is the same because the fan is a radial fan. However, the fan rotating in the reverse direction produces a less air flow, resulting in a degraded effect of cooling and increased load current. So, the fan can overheat and stop.



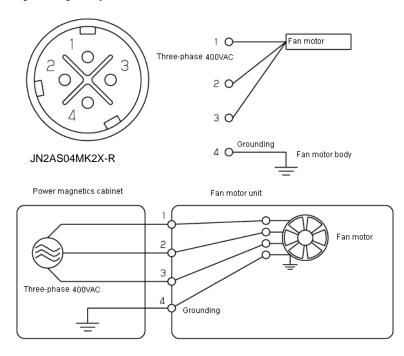
B-65262EN/05 10.COOLING FAN

αi S 100HV with fan to αi S 3000HV

Manufacture: Japan Aviation Electronics Industry Manufacturer specification: JN2AS04MK2X-R

This connector alone is not dripproof.

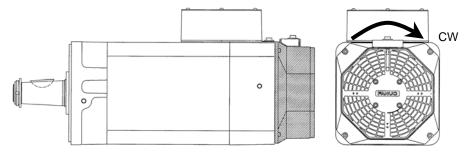
The shape and pin layout of the connector are shown below.



If the three phases are connected incorrectly, the fan rotates in the reverse direction.

Be sure to connect the three phases correctly.

If the three phases are connected incorrectly, the fan rotates in the reverse direction but the direction of air flow is the same because the fan is a radial fan. However, the fan rotating in the reverse direction produces a less air flow, resulting in a degraded effect of cooling and increased load current. So, the fan can overheat and stop.

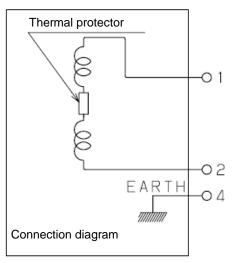


10.COOLING FAN B-65262EN/05

10.3 COOLING FAN PROTECTION CIRCUIT

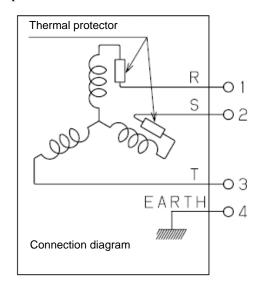
The fan motor inside the cooling fan includes a protection circuit based on a thermal protector.

lpha iS 50 with fan, lpha iS 50HV with fan, lpha iF 40 with fan



αi S 100 with fan to αi S 500 αi S 100HV with fan to αi S 3000HV

A thermal protector is installed in two positions, namely, phase R and phase S.



NOTE

A thermal protector operates when the temperature of the winding inside the fan motor rises to 140°C.

11

CONNECTORS ON THE CABLE SIDE

This chapter describes the specifications of the connectors on the cable side that are to be connected to a motor. For the specifications and pin layout of the connector mounted on a motor, see Chapter 7, "OUTLINE DRAWINGS".

This chapter classifies connectors by the following groups:

Group	Servo motor name
Group A	αiS 2/5000, αiS 2/6000, αiS 4/5000,
	lpha iS 2/5000 HV, $lpha i$ S 2/6000 HV, $lpha i$ S 4/5000 HV,
	α <i>i</i> F 1/5000, α <i>i</i> F 2/5000
Group B	αiS 8/4000, αiS 8/6000, αiS 12/4000,
	αiS 8/4000 HV, αiS 8/6000 HV, αiS 12/4000 HV,
	α <i>i</i> F 4/4000, α <i>i</i> F 8/3000,
	α <i>i</i> F 4/4000 HV, α <i>i</i> F 8/3000 HV
Group C	αiS 22/4000, αiS 22/6000, αiS 30/4000, αiS 40/4000,
	lpha iS 22/4000 HV, $lpha i$ S 22/6000 HV, $lpha i$ S 30/4000 HV,
	α <i>i</i> S 40/4000 HV, α <i>i</i> S 50/3000 HV,
	αi S 50/3000 HV with fan,
	α <i>i</i> F 12/3000, α <i>i</i> F 22/3000, α <i>i</i> F 30/3000,
	αi F 40/3000, αi F 40/3000 with fan,
	αiF 12/3000 HV, αiF 22/3000 HV
Group D	lpha iS 50/3000, $lpha i$ S 50/3000 with fan
Group E	αi S 100/2500, αi S 100/2500 with fan,
	αi S 200/2500, αi S 200/2500 with fan,
	αi S 100/2500HV, αi S 100/2500HV with fan,
	lpha iS 200/2500HV, $lpha i$ S 200/2500HV with fan
Group F	αiS 300/2000, αiS 500/2000,
	αiS 300/2000 HV, αiS 500/2000 HV,
	α <i>i</i> S 1000/2000 HV,
	aiS 2000/2000 HV, αiS 3000/2000 HV

Chapter 11, "CONNECTORS ON THE CABLE SIDE", consists of the following sections:

11.1 CC	ONNECTORS FOR SIGNALS (FOR ALL αi SERIES	
M	(ODELS)	210
11.2 CC	ONNECTORS FOR POWER	214
11.3 CC	ONNECTORS FOR THE BRAKE	220
11.4 CC	ONNECTORS FOR THE FAN	221
11.5 CO	ONNECTION TO A CONDUIT HOSE	223

11.1 CONNECTORS FOR SIGNALS (FOR ALL αi SERIES MODELS)

For all servo motors of the αi series, a small dedicated connector is used for signals.

The connector is dripproof when engaged with the motor connector.

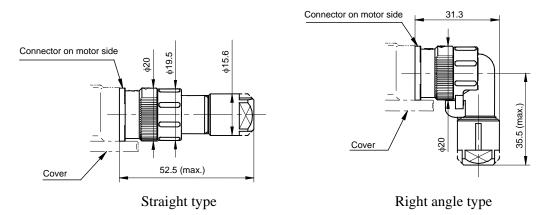
There are two types of connectors depending on how a cable is connected to a connector; the crimp type and the solder type. For the crimp type connector, a dedicated crimping tool is required.

The diameter of the cable used is restricted considering cable clamp and voltage drop. The connectors for signals do not have to conform to IEC60034.

Crimp type connector

			For signal		
Connector	Straight type	JN1-22-22S: Contact (Japan A	JN2DS10SL1-R or JN2DS10SL2-R: Connector, JN1-22-22S: Contact (Japan Aviation Electronics Industry) A06B-6114-K204#S (FANUC specification) * Including the contact		
specifications	Right angle type	JN2FS10SL1-R or JN2FS10SL JN1-22-22S: Contact (Japan A	N2FS10SL1-R or JN2FS10SL2-R: Connector, N1-22-22S: Contact (Japan Aviation Electronics Industry) N06B-6114-K204#E (FANUC specification) * Including the contact		
Insulation exte	ernal diameter	φ1.5 or less			
Compatible cable O.D.		 φ5.7 to φ7.3: JN2DS10SL1-R or JN2FS10SL1-R φ6.5 to φ8.0: JN2DS10SL2-R or JN2FS10SL2-R * With the FANUC specifications, two types of bushings: for φ5.7 to φ7.3 and for φ6.5 to φ8.0 are included. 			
		Cable length: 28 m or less	Cable length: 50 m or less		
	5V,0V	0.3 mm ² × 2	0.5mm ² × 2 * Use a cable of which strand configuration is 20/0.18 or 104/0.08.		
Used wire	6V	0.3 mm ²	0.5mm ² * Use a cable of which strand configuration is 20/0.18 or 104/0.08.		
	RD,*RD	Twi	sted pair of at least 0.18 mm ²		
Tool for crim	ning torminal	AWG#21 (0.5mm ² :20/0.18), AWG#23 (0.3mm ²), AWG#25 (0.18mm ²)	CT150-2-JN1-E (Japan Aviation Electronics Industry) A06B-6114-K201#JN1E (FANUC specification)		
Tool for crimping terminal		AWG#20 (0.5mm ² :104/0.08), AWG#21 (0.5mm ² :20/0.18), AWG#25 (0.18mm ²)	CT150-2-JN1-D (Japan Aviation Electronics Industry) A06B-6114-K201#JN1D (FANUC specification)		
Tool for pullin	g terminal out	ET-JN1(Japan Aviation Electronics Industry) A06B-6114-K201#JN1R (FANUC specification)			

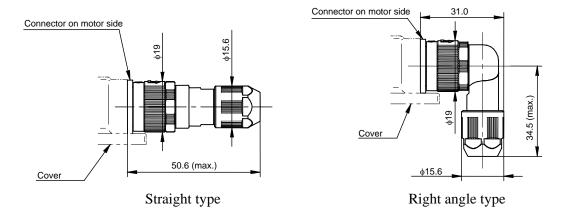
The outside dimensions of each type of connector when engaged are shown below:



Solder type connector

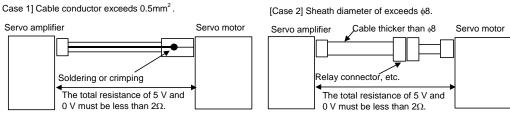
Soluer typ		For s	ignal		
	Ctroight tupo	HR34B-12WPA-10S or HR34B-12WPB-10	A-10S or HR34B-12WPB-10S (Hirose Electric)		
Connector	Straight type	A06B-6114-K205#S (FANUC specification)			
specifications	Right angle	HR34B-12WLPA-10S or HR34B-12WLPB-	10S (Hirose Electric)		
	type	A06B-6114-K205#E (FANUC specification)			
Applicable	e wire size	AWG#20 or less (φ0.8mm or less)			
•		φ5.7 to φ7.3: HR34B-12WPA-10S or HR34B-12WLPA-10S			
Commetible	aabla O D	φ6.5 to φ8.0: HR34B-12WPB-10S or HR34B-12WLPB-10S			
Compatible	cable O.D.	* FANUC specification includes two types of bushings and end nuts for φ5.7 to φ7.3			
		and for φ6.5 to φ8.0.			
		Cable length: 28 m or less	Cable length: 50 m or less		
l lood wine	5V,0V	0.3 mm ² × 2	0.5 mm ² × 2		
Used wire	6V	0.3 mm ²	0.5mm ²		
	RD,*RD	Twisted pair of a	t least 0.18 mm ²		

The outside dimensions of each type of connector when engaged are shown below:





- 1 In case that the cable is prepared by MTB, total resistance of 5V and 0V must be less than 2Ω .
- 2 Pulsecoder side connector can accept maximum 0.5mm^2 (wire construction 20/0.18 or 104/0.08, diameter $\phi 1.5$ or less) wire and sheath diameter is $\phi 5.7$ to $\phi 8.0$. In case of using thicker wire or cable, take measures described below.

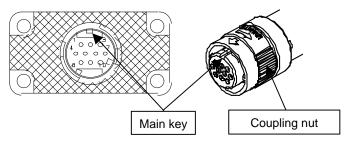


3 In case of incremental Pulsecoder, 6V is not necessary to be connected.

Procedure for engaging feedback cable connectors

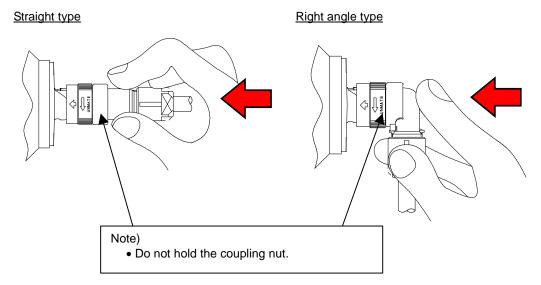
Engage the feedback cable connectors according to the procedure described below, and check that they are engaged securely.

1 Checking the mating surfaces and the key direction Check that the mating surfaces are free from any substance such as foreign particles or oil.



2 Engaging the connectors

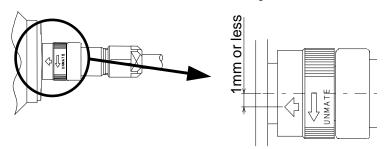
Hold the connector at the position shown in the figure, insert it straightforward until it snaps into place.



3 Checking the engaged status

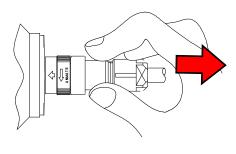
<1> Check that the arrow on the connector is positioned at the center as shown in the figure below.

If the arrow is not at the center, turn the coupling nut by hand so that the arrow is at the correct position.

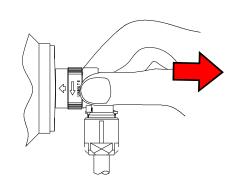


<2> Hold the connector at the position shown in the following figure, and check that the connector does not come off when it is pulled lightly.

Straight type



Right angle type



Note)

- Do not pull the cable.
- Pull the connector straightforward.

11.2 CONNECTORS FOR POWER

11.2.1 Connectors for Power (for Group A)

Dedicated connectors which are TUV approved are available as the connector for power for the αiS 2 to αiS 4, αiS 2 HV to αiS 4 HV, and αiF 1 to αiF 2. These connectors differ from the conventional α series connectors in connectors and contacts.

For the connector of the motor with a brake, perform cabling for the power and cabling for the brake at the same time.

The following subsection describes the specifications as a connector kit. These connectors are dripproof when engaged.

To connect the cable, a dedicated crimping tool must be used.

Consider crimping and cable clamp. Also note that there are restrictions.

		For power	
	Straight type	1473063-2 (Tyco Electronics AMP)	
Connector kit specifications	(standard)	A06B-6114-K220#S (FANUC specification)	
(Including the contact)	Right angle type (CAUTION 1)	1473393-2 (Tyco Electronics AMP)	
		A06B-6114-K220#E (FANUC specification)	
Applicable wire size (CAUTION 2)		AWG#18 to 16	
Insulation external diameter (CAUTION 3)		φ1.8 to 2.8	
Compatible cable O.D. (CAUTION 4)		φ9.2 to φ9.9, φ9.9 to φ11.4	
Tool for orimning t	orminal (CAUTION 5)	91579-1 (Tyco Electronics AMP)	
Tool for crimping terminal (CAUTION 5)		A06B-6114-K221#C (FANUC specification)	
Tool for pulling terminal out (CAUTION 5)		1463329-1 (Tyco Electronics AMP)	
roor for pulling terr	ninai out	A06B-6114-K221#R (FANUC specification)	

⚠ CAUTION

- 1 For the right angle type, a cable juts from the motor in a vertical direction. To connect a conduit hose to the connector, use the right angle type. (The straight type cannot be used due to dimensional restrictions.)
- 2 The contact is of the crimp type. Be careful of the applicable wire.
- 3 The crimping contact crimps the covering in addition to the wire. Follow the dimensions listed above.
 - An insulation of a smaller diameter may be able to be connected by a wire or tool, however. For details, contact Tyco Electronics AMP.
- 4 To satisfy the TUV-approved and waterproof performance, a cable of an outside diameter within the applicable cable clamp range must be used.
 - The connector kit includes two types of rubber bushings (cable clamps): one for $\phi 9.2$ to $\phi 9.9$ (blue) and the other for $\phi 9.9$ to $\phi 11.4$ (black).
- 5 Dedicated tools are required for crimping and extracting the contact. Keep them on hand when required.

11.2.2 Connectors for Power (for Groups B to D)

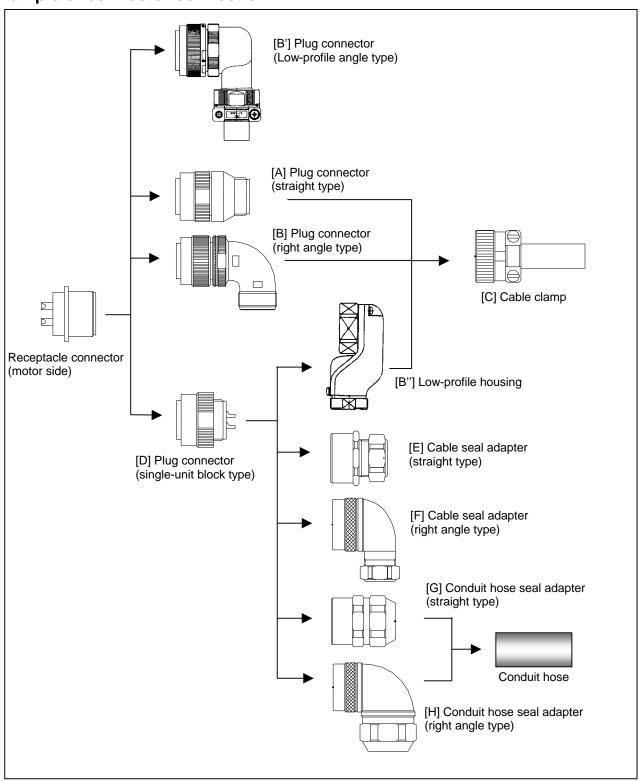
To meet the IEC60034 standard, TUV-approved plug connectors and cable clamps should be used in connecting the power cable. To meet the IEC60034 standard by using a cable or conduit hose seal adapter, contact the manufacturer for details. FANUC can provide TUV-approved types (waterproof) and waterproof types as plug connectors on the cable side for the FANUC αi series AC servo motors; all these connectors are black. Of course, conventional plug connectors may be used, because they are MS-compatible. The specifications of each connector are explained based on the examples shown below.

Ordering specification number of the power connector kit

The specification numbers used for ordering a power connector kit from FANUC are listed below. The power connector kit contains a plug connector on the cable side (waterproof conforming to IP67, TUV approved type) described subsequently.

Group Power connector kit specification		Content		
	A06B-6079-K810	Single block type connector		
Group B	A06B-6079-K811	Straight type connector + cable clamp		
	A06B-6079-K812	Right angle type connector + cable clamp		
	A06B-6079-K813	Single block type connector		
Group C	A06B-6079-K814	Straight type connector + cable clamp		
	A06B-6079-K815	Right angle type connector + cable clamp		
	A06B-6079-K816	Single block type connector		
Group D	A06B-6079-K817	Straight type connector + cable clamp		
	A06B-6079-K818	Right angle type connector + cable clamp		

Example of connector connection



Specifications of plug connectors on the cable side (support for waterproof IP67, TUV-approved type)

Listed below are the specifications of waterproof (conforming to IP67), TUV-approved plug connectors on the cable side, supplied by some manufacturers. For details of the connectors, contact each manufacturer.

Model Name	[D] Single Block Type Plug Connector	[A] Straight Type Plug Connector	[B] Right angle Type Plug Connector	[B'] Low-profile angle type plug connector	[B"] Low- profile housing	[C] Cable Clamp
			(1): 51	(with clamp)		
	H/MS3106A 18-10S-D-T(13)	H/MS3106A 18-10S-D-T(10)	(Hirose Elec H/MS3108A 18-10S-D-T(10)	(1) H/MS3108/ 18-10S-DT10E (2) H/MS3108/ 18-10S-DT10E	O(10)	H/MS3057-10A (10)
Group B	Solder pot diameter φ2.6 Applicable wire 3.45mm ² or less		Solder pot diameter		Compatible cable O.D. φ10.3 - φ14.3	
Group C	JL04V-6A22- 22SE-R (Both (1) and (2))	(Ja (1) JL04V-6A22- 22SE-EB-R (2) JL04V-6A22- 22SE-EB1-R	(1) JL04V-8A22- 22SE-EB-R (2) JL04V-8A22- 22SE-EB1-R	onics Industry)	(1) JL04-22 EBA (2) Not supported	(1)JL04-2022CK (14)-R (2)JL04-2428CK (20)-R
	Solder pot diameter φ5.3 Applicable wire 10mm ² or less (Applicable wire 5.5mm ² or less In the case of single block + low-profile housing)			•	ble cable O.D.	
Group D	JL04V-6A24- 10SE(G)-R	(Ja JL04V-6A24- 10SE(G)-EB-R	pan Aviation Electro JL04V-8A24- 10SE(G)-EB-R	onics Industry)	JL04-24 EBA	(3)JL04-2428CK (17)-R (4)JL04-2428CK (20)-R
		l diameter ∮3.5 (G ter .5mm² or less (G te less)			•	ble cable O.D. 18, (4) φ18 - φ20

^{*} For the connectors of size 22-22, the part number of the plug connector differs depending on the type of cable clamp.

^{*} For the connectors of size 24-10, the part number of the plug connector differs depending on the type of cable clamp.

^{*} The items preceded by the same number in () correspond to each other.

⚠ CAUTION

1 TUV have certified that the plug connectors and cable clamps listed above, when combined with the FANUC AC Servo Motor αi S series and αi F series, satisfy the VDE0627 safety standard.

Several manufacturers offer other plug connectors. For information about whether the plug connectors satisfy the safety standard when combined with the FANUC αi series, contact the corresponding manufacturer.

- Hirose Electric (HRS) : H/MS310 TUV-conforming series
- Japan Aviation Electronics Industry (JAE): JL04V series
- DDK Ltd. (DDK): CE05 series

Specifications of plug connectors on the cable side (support for waterproof IP67)

Listed below are the specifications of waterproof (conforming to IP67) plug connectors on the cable side, supplied by some manufacturers. For details of the connectors, contact each manufacturer.

Model Name	[D] Single Block Type Plug Connector	[A] Straight Type Plug Connector	[B] Right Angle Type Plug Connector	[B] Low-profile angle type plug connector	[B"] Low-profile housing	[C] Cable Clamp
		,	apan Aviation Elec	ctronics Industry)	T	
	JA06A-18-10S	JA06A-18-10S	JA08A-18-10S		JL04V-18EBA	JL04-18CK
	-J1-R	-J1-EB-R	-J1-EB-R			(13)-R
		1	(Hirose E	lectric)	1	1
Group B	H/MS3106A	H/MS3106A	H/MS3108B	H/MS08A18-1		H/MS3057
	18-10S(13)	18-10S(10)	18-10S(10)	0S-DT10D(10)		-10A(10)
		T	(DDK L	td.)	7	
	D/MS3106A	D/MS3106A	D/MS3108A			CE3057
	18-10S-B(D190)	18-10S-B-BSS	18-10S-B-BAS			-10A-1-D
	(Japan Aviation Electronics Industry)					
	JA06A-22-22S	JA06A-22-22S	JA08A-22-22S		JL04V-22EBA	JL04-2022
	-J1-R	-J1-EB-R	-J1-EB-R			CK (14)-R
	(Hirose Electric)					
Group C	H/MS3106A	H/MS3106A	H/MS3108B	H/MS08A22-2		H/MS3057
	22-22S(13)	22-22S(10)	22-22S(10)	2S-DT12D(10)		-12A(10)
	(DDK Ltd.)					
	D/MS3106A	D/MS3106A	D/MS3108A			CE3057
	22-22S-B(D190)	22-22S-B-BSS	22-22S-B-BAS			-12A-1-D
		(J	apan Aviation Elec	ctronics Industry)		
	JA06A-24-10S	JA06A-24-10S	JA08A-24-10S		JL04V-24EBA	JL04-2428
	-J1-R	-J1-EB-R	-J1-EB-R			CK (17)-R
			(Hirose E	lectric)		
Group D	H/MS3106A	H/MS3106A	H/MS3108B			H/MS3057
	24-10S(13)	24-10S(10)	24-10S(10)			-16A(10)
			(DDK L	_td.)		
	D/MS3106A	D/MS-3106A	D/MS3108A			CE3057
	24-10S-B(D190)	24-10S-B-BSS	24-10S-B-BAS			-16A-1-D

11.3 CONNECTORS FOR THE BRAKE

The connector for the brake for group A is the same as the power connector. See Section 11.2, "CONNECTORS FOR POWER".

The following subsections describe the connectors for the brake for groups B to E.

11.3.1 Connectors for the Brake (for Groups B to E)

The models αiS 8 to αiS 200, αiS 8 HV to αiS 200 HV, and αiF 4 to αiF 40, and αiF 4 HV to αiF 22 HV use a dedicated connector to connect the built-in brake cable.

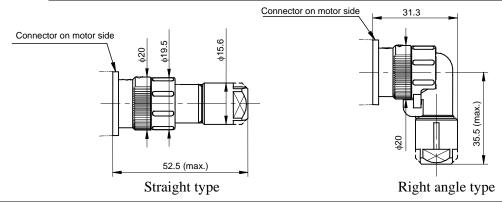
This connector is dripproof. It is connected by soldering, so no special tool is required.

This connector differs from conventional connectors used for the α series. The following subsection explains this connector.

Consider soldering, cable clamp, and voltage drop. Also note that there are restrictions. The connector for the 24-V brake does not conform to the IEC60034 standard.

Specifications of connectors for brake

Connector	Straight type	JN2DS04FK2-R (Japan Aviation Electronics Industry) A06B-6114-K213#S (FANUC specification)		
specifications	Right angle	JN2FS04FK2-R (Japan Aviation Electronics Industry) A06B-6114-K213#E (FANUC specification)		
Applicable wire size		AWG#16 or less (1.25mm ² or less) * Solder pot diameter φ1.9		
Insulation exte	rnal diameter	φ2.7 or less		
Compatible	cable O.D.	φ6.5 to 8.0		
Example of applicable wire Applicable wire size and cable length		300-V two-conductor vinyl heavy-duty power cord cable VCTF (JIS C 3306) or equivalent		
		0.75mm ² (AWG#18) when cable length 30 m or less 1.25mm ² (AWG#16) when cable length 50 m or less		



⚠ CAUTION

- 1 The same body is used for the brake and fan connectors. They differ in the key position to prevent an improper insertion.
- 2 If the cable length is longer than or equal to 50 m, take measures such as installation of repeaters so that the sum of wire resistance (for both ways) becomes 1.5Ω or less.
- 3 For details of brakes, see Chapter 9, "BUILT-IN BRAKE."

11.4 CONNECTORS FOR THE FAN

The models αiS 50 with fan to αiS 500, αiS 50 HV with fan to αiS 3000 HV, and αiF 40 with fan use a dedicated connector to connect the cooling fan and power supply for the fan.

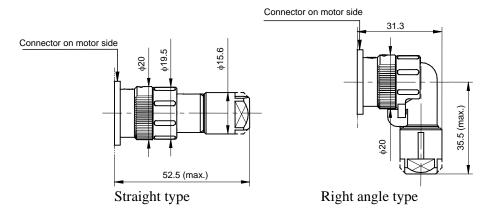
This connector is dripproof. It is connected by soldering, so no special tool is required.

This connector differs from conventional connectors used for the α series. The following subsection explains this connector.

Consider soldering, cable clamp, and voltage drop. Also note that there are restrictions.

Specifications of connectors for fan

<u> </u>						
		lpha iS 50/3000 with fan	lpha iS 100/2500 with fan	lpha iS 100/2500 HV with fan		
		αi S 50/3000HV with fan αi S 200/2500 with fan		lpha iS 200/2500 HV with fan		
		αi F 40/3000 with fan	αi F 40/3000 with fan αi S 300/2000			
Motor	models		lpha iS 500/2000	α <i>i</i> S 500/2000 HV		
				lpha iS 1000/2000 HV		
				α <i>i</i> S 2000/2000 HV		
				α <i>i</i> S 3000/2000 HV		
	Ctraight tura	JN2DS04FK2X-R (Japan Aviation Electronics Industry)				
Connector	Straight type	A06B-6114-K214#S (FANUC specification)				
specifications	Right angle	JN2FS04FK2X-R (Japan Aviation Electronics Industry)				
		A06B-6114-K214#E (FANUC specification)				
Applicable	e wire size	AWG#16 or less (1.25mm ² or less)				
Арріісавів	WITE SIZE	* Solder pot diameter φ1.9				
Insulation exte	ernal diameter	φ2.7 or less				
Compatible	cable O.D.		φ6.5 to 8.0			
Example of a	pplicable wire	300-V two-conductor vinyl heavy-duty power cord cable VCTF (JIS C 3306) or equivalent	300-V rated cable	600-V rated cable (300/500-V rated cable: IEC standard)		
• •	size and cable gth	0.5 mm ² or more (AWG#20)				



! CAUTION

- 1 The same body is used for the brake and fan connectors. They differ in the key position to prevent an improper insertion.
- 2 If the cable length is longer than or equal to 50 m, take measures such as installation of repeaters so that the sum of wire resistance (for both ways) becomes 1.5Ω or less.
- 3 For details of brakes, see Chapter 10, "BUILT-IN BRAKE."

11.5 CONNECTION TO A CONDUIT HOSE

This section gives information on the specifications of several adapters to be connected that are made by conduit hose manufacturers for reference purposes.

Before using an adapter, contact the corresponding conduit hose manufacturer.

Specifications of plug connectors on the cable side

(Waterproof type/seal adapter specifications)

	[E]	[F]	[G]	[H]
Model	Cable	Cable	Conduit hose	Conduit hose
Name	Seal adapter	Seal adapter	Seal adapter	Seal adapter
	Straight type	Right angle type	Straight type	Right angle type
For power				
Group A			N2BM20-FN4 (SANKEI) MAS-SG16-M20 (NEOFLEX)	
Group B	C2KD1218 (SANKEI) YSO 18-12-14 (DAIWA DENGYOU) ACS-12RL-MS18F (NIPPON FLEX) CG12S-JL18 (NEOFLEX)	C29KD1218 (SANKEI) YLO 18-12-14 (DAIWA DENGYOU) ACA-12RL-MS18F (NIPPON FLEX) CG12A-JL18 (NEOFLEX)	KMKD1618 (SANKEI) MSA 16-18 (DAIWA DENGYOU) RCC-104RL-MS18F (NIPPON FLEX) MAS16S-JL18 (NEOFLEX)	KM90KD1618 (SANKEI) MAA 16-18 (DAIWA DENGYOU) RCC-304RL-MS18F (NIPPON FLEX) MAS16A-JL18 (NEOFLEX)
Group C	C2KD1622 (SANKEI) YSO 22-12-14 (DAIWA DENGYOU) ACS-16RL-MS22F (NIPPON FLEX) CG16S-JL22 (NEOFLEX)	C29KD1622 (SANKEI) YLO 22-12-14 (DAIWA DENGYOU) ACA-16RL-MS22F (NIPPON FLEX) CG16A-JL22 (NEOFLEX)	KMKD2222 (SANKEI) MSA 22-22 (DAIWA DENGYOU) RCC-106RL-MS22F (NIPPON FLEX) MAS22S-JL22 (NEOFLEX)	KM90KD2222 (SANKEI) MAA 22-22 (DAIWA DENGYOU) RCC-306RL-MS22F (NIPPON FLEX) MAS22A-JL22 (NEOFLEX)
Group D	C2KD2024 (SANKEI) YSO 24-15-17 (DAIWA DENGYOU) ACS-20RL-MS24F (NIPPON FLEX) CG22S-JL24 (NEOFLEX)	C29KD2024 (SANKEI) YLO 24-15-17 (DAIWA DENGYOU) ACA-20RL-MS24F (NIPPON FLEX) CG22A-JL24 (NEOFLEX)	KMKD2224 (SANKEI) MSA 22-24 (DAIWA DENGYOU) RCC-106RL-MS24F (NIPPON FLEX) MAS22S-JL24 (NEOFLEX)	KM90KD2224 (SANKEI) MAA 22-24 (DAIWA DENGYOU) RCC-306RL-MS24F (NIPPON FLEX) MAS22A-JL24 (NEOFLEX)

Specifications of plug connectors on the cable side (Waterproof type/seal adapter specifications)

Model Name	[E] Cable Seal adapter Straight type	[F] Cable Seal adapter Right angle type	[G] Conduit hose Seal adapter Straight type	[H] Conduit hose Seal adapter Right angle type
For signal				
Common to all models			N2KY16-FN3 (SANKEI) PCJN-12-M13F (DAIWA DENGYOU) RQJN-M13-9 RQJN-M13-16 (NEOFLEX)	
For brake				
Common to all models			N2KY16-FN3 (SANKEI) PCJN-12-M13F (DAIWA DENGYOU) RQJN-M13-9 RQJN-M13-16 (NEOFLEX)	

B-65262EN/05 INDEX

INDEX

<α>	Checking a Delivered Servo Motor and Storing	
αiF SERIES (200V)131	a Servo Motor	24
αiF SERIES (400V)140	CONDITIONS FOR APPROVAL RELATED TO	
αiS SERIES (200V)92	THE IEC60034 STANDARD	83
αiS SERIES (400V)110	CONDITIONS FOR SELECTING A SERVO MOT	OR 41
(400 V)110	CONNECTING A BRAKE	196
<a>	CONNECTING A COOLING FAN	205
Absolute-type Pulsecoder189	Connecting a Separate Type Pulsecoder	191
Allowable Axis Load 150,157,165,171,175,179,183	CONNECTING A SERVO MOTOR	26
Allowable Axis Load for a Servo Motor32	Connecting Pulsecoder	188
Ambient Temperature, Humidity, Installation Height,	Connection of the Brakes	197
and Vibration14	CONNECTION TO A CONDUIT HOSE	223
APPLICABLE AMPLIFIERS10	Connections Related to a Servo Motor	26
APPROVED SPECIFICATIONS86	Connector	165
.0.	CONNECTORS FOR POWER	214
	Connectors for Power (for Group A)	214
Brake Connectors	Connectors for Power (for Groups B to D)	215
BRAKE SPECIFICATIONS195	CONNECTORS FOR SIGNALS (FOR ALL αi SER	RIES
BUILT-IN BRAKE194	MODELS)	210
<c></c>	CONNECTORS FOR THE BRAKE	220
Cabling173,181,185	Connectors for the Brake (for Groups B to E)	220
Cabling (for αiS 300, αiS 500, αiS 300HV, and	CONNECTORS FOR THE FAN	221
α <i>i</i> S 500HV)177	CONNECTORS ON THE CABLE SIDE	209
Calculating acceleration torque51	CONNECTORS REQUIRED FOR APPROVAL	89
Calculating the Acceleration Torque51	COOLING FAN	202
Calculating the Dynamic Brake Stop Distance60	COOLING FAN PROTECTION CIRCUIT	208
Calculating the Load Inertia48	COOLING FAN SPECIFICATIONS	203
Calculating the Load Torque45	Cooling Method (IEC60034-6)	87
Calculating the Motor Speed47	<d></d>	
Calculating the Percentage Duty Cycle and ON Time		90
with the Maximum Cutting Torque58	Data Sheet	80
Calculating the Root-mean-square Value of the Torques 56	DEFINITION OF WARNING, CAUTION, AND	- 6
Calculating the torque required by the motor shaft in	NOTE	S-2
acceleration54	<e></e>	
CAUTIONs-6	Explanation of Items	69
CAUTION LABELs-10	15 .	
CAUTIONS200	< F >	2.
Cautions in Mounting a Servo Motor37	Fastening the Shaft	
Cautions when Using a Separate Type Pulsecoder 193	FEATURE	
CHARACTERISTIC CURVE AND DATA SHEET77	FEEDBACK SENSOR	186
Characteristic Curves77	<g></g>	
	CENEDAL	1

INDEX B-65262EN/05

Grounding (IEC60204-1)88	Power Connector157
<h></h>	Power Terminal Layout172,180,184
HOW TO FILL IN THE SERVO MOTOR SELECTION	Power Terminal Layout (for αiS 300 and αiS 500)175
DATA TABLE66	Power Terminal Layout (for αiS 300HV and
DATA TABLE00	α <i>i</i> S 500HV)176
<l></l>	PREFACEp-1
LINEUP OF THE SERIES2	Protection Type (IEC60034-5)87
<m></m>	PULSECODER187
Mechanical specifications	<r></r>
Methods for coupling the shaft28	Recommended Parts in Brake Circuits
MODEL αiS 1000 HV178	REDUCING THE BRAKE SHAFT FALL AMOUNT 201
MODELS αi S 100, αi S 200, αi S 100 WITH FAN,	Remarks
αi S 200 WITH FAN, αi S 100 HV, αi S 200 HV,	.0.
αiS 100HV WITH FAN, AND	<\$>
α <i>i</i> S 200HV WITH FAN167	SAFETY PRECAUTIONSs-1
MODELS αiS 2 TO αiS 4, αiS 2 HV TO αiS 4 HV,	SELECTING A MOTOR
AND α <i>i</i> F 1 TO α <i>i</i> F 2145	SEPARATE PULSECODER
MODELS αiS 2000 HV AND αiS 3000 HV182	Separate Pulsecoder Specifications
MODELS αiS 22 TO αiS 50, αiS 22HV TO αiS 50HV,	Separate Pulsecoder Type and Designation190
αi S 50 WITH FAN, αi S 50HV WITH FAN, αi F 12	Separating and Disposing of a Servo Motor25
TO αi F 40, αi F 12HV TO αi F 22HV, AND	Servo Motor Selection Data Table
α <i>i</i> F 40 WITH FAN158	Shaft Run-out Precision 150,157,165,171,175,179,183
MODELS αiS 300, αiS 500, αiS 300 HV, AND	Shaft Run-out Precision of a Servo Motor
αiS 500 HV174	Shaft Shape
MODELS αiS 8 TO αiS 12, αiS 8 HV TO αiS 12 HV,	SPECIFICATIONS
αi F 4 TO αi F 8, αi F 4 HV TO αi F 8 HV151	Specifications of moving object70
Motor specifications and characteristics75	<t></t>
Motor Speed (IEC60034-1)86	Title69
MOUNTING A SERVO MOTOR28	TYPES OF MOTORS TO BE APPROVED84
Mounting Method (IEC60034-7)88	Types of Pulsecoders and Designation187
<n></n>	<u></u>
NOTEs-8	USAGE
_	Usage Considering Environmental Resistance15
<0>	USE ENVIRONMENT FOR SERVO MOTORS14
ORDERING SPECIFICATION NUMBER5,6	
Other Notes on Axis Design	< <i>W</i> >
Outline Drawing of the Motors	WARNINGs-3
145,151,158,167,174,178,182	
OUTLINE DRAWINGS144	
Outline Drawings of Separate Pulsecoder192	
Output (IEC60034-1)86	
<p></p>	
Power and Brake Connector150	

Revision Record

FANUC AC SERVO MOTOR αi series DESCRIPTIONS (B-65262EN)

			• Addition of models αi S 22/6000 and αi S 22/6000HV	Contents
			Sep., 2008	Date
			05	Edition
 Changing of model names of following series αis→αiS, αi→αiF Addition of models αiS 2/6000 and αiS 8/6000 Addition of high-torque brake (70Nm) Addition of models αiS 100 with fan to αiS 200HV with fan Addition of models αiS 2000HV to 3000HV Correction of errors 	 Addition of Servo motor αis series Addition of Servo motor α(HV)is series Deletion of Servo motor αMi series Deletion of Servo motor αM(HV)i series Deletion of Servo motor αCi series 	 Addition of model α40i (with fan) Addition of models αΜ50i, αΜ50i (with fan), αΜ100i, αΜ200i, αΜ300i, and αΜ500i Addition of Servo motor α(HV)i series Addition of Servo motor αM(HV)i series Correction of errors 		Contents
Jan., 2007	Mar., 2003	Jun., 2002	Jun., 2001	Date
40	03	05	10	Edition

B-65262EN/05

* B - 6 5 2 6 2 E N / 0 5 . 0 5 *

FANUC AC SERVO MOTOR αi series DESCRIPTIONS αi S 1000/2000HV (A06B-0098-B010)

1. Type of applied technical documents

Name	FANUC AC SERVO MOTOR $lpha i$ series DESCRIPTIONS
Spec. No. /Version	B-65262EN/05-01

2.Summary of Change

Group	Name	New, Add, Correct, Delete,	Applicable Data
Basic Function	AC Servo Motor αίS 1000/2000HV (A06B-0098-B010)	New	JUL.2008
Optional Function			
Unit			
Maintenance Parts			
Notice			
Correction			
Another			

				TITLE		
				AC SERVO MOTOR $lpha i$ series DESCRIPTIONS		
				αis 1000/2000HV (A06B-0098-B010)		
01	08.07.02	Yamaguchi	Newly designed	DRAW. No. B-65262EN/05-01		CUST.
Ed.	Date	Design.	Description	FANUC LTD	SHEET	1/12

1. GENERAL

Following motor is added to FANUC AC SERVO MOTOR lpha i series .

· *\tilde{XiS}* 1000/2000HV (A06B-0098-B010)

This motor is upper compatible with the previous motor of $\alpha i S$ 1000/2000HV (A06B-0298-B010). The specification of this motor is enhanced by following points.

- · maximum torque at high speed
- · continuous torque

The differences between the previous motor and the new motor are shown below.

- · applicable amplifiers
- · servo parameters
- · the dynamic brake stopping distance
- · the full length (connector position of a fan motor)
- · position of eyebolts
- · the specifications of a fan motor

The details of difference is described on page 10,11,12.

This motor is based on IEC60034-1. The certification from TUV is planned to be taken at Dec.2008

Note)

The items that are not mentioned in this report correspond to FANUC AC SERVO MOTOR αi series .

Please refer to FANUC AC SERVO MOTOR αi series DESCRIPTION B-65262EN, too.

				TITLE		
				AC SERVO MOTOR αi series DESCRIPTIONS		
				αis 1000/2000HV (A06B-0098-B010)		
01	08.07.02	Yamaguchi	Newly designed	DRAW. No. B-65262EN/05-01		CUST.
Ed.	Date	Design.	Description	FANUC LTD	SHEET	2/12

2. DESIGNATION

Motor specification numbers have the following format.

A06B-0098-Babc

0098: 0.00: 1000/2000HV

a

0: Taper Shaft Type

b

1: With a cooling fan

<u>c</u>

0: Pulsecoder αi A 1000

3. APPLICABLE AMPLIFIER

Applicable amplifiers for QiS 1000/2000HV

(LEVEL LID Varaion)	α i SV 360HV x 2 (A06B-6127-H109 x2)
(LEVEL LID Vargion)	α <i>i</i> PS 100HV x1 (A06B-6150-H100 x1)

^{*)} The torque tandem control option or the PWM distribution module is requied.

! CAUTION

- 1 If a motor is used in a combination other than those listed above, it may become broken.
- 2 For details on the servo amplifier, refer to "FANUC SERVO AMPLIFIER αi series DESCRIPTIONS (B-65282EN)".

				TITLE		
				AC SERVO MOTOR $lpha i$ series DESCRIPTIONS		
				αis 1000/2000HV (A06B-0098-B010)		
01	08.07.02	Yamaguchi	Newly designed	DRAW. No. B-65262EN/05-01 CUST.		CUST.
Ed.	Date	Design.	Description	FANUC LTD	SHEET	3/12

4. Output data for selecting αi PS amplifiers

MOTOR MODEL	Continuous output	Maximum output		
α <i>i</i> S 1000/2000HV (0098)	125kW	198kW		

A CAUTION

1 These data is only for selecting the PS and it doesn't guarantee the power of motors.

5. COEFFICIENTS FOR CALCULATING THE DYNAMIC BRAKE STOPPING DISTANCE

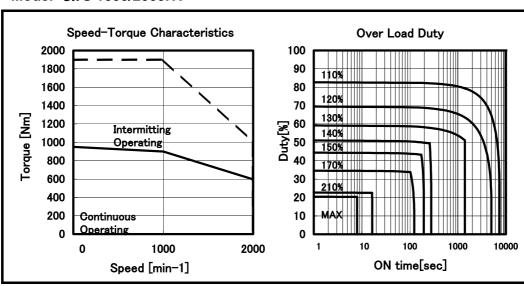
SI unit

Motor model	А	В
α <i>i</i> S 1000/2000HV (0098)	6.6×10 ⁻⁴	1.2×10 ⁻⁹

				TITLE		
			AC SERVO MOTOR $lpha i$ series DESCR			RIPTIONS
			αis 1000/2000HV (A06B-0098-B010)			1
01	08.07.02	Yamaguchi	Newly designed	ly designed B-65262EN/05-01 c		CUST.
Ed.	Date	Design.	Description	FANUC LTD	SHEET 4/12	

6. SPECIFICATIONS

Model αiS 1000/2000HV



Specification: A06B-0098-B010

Data sheet

Parameter	Symbol Value		e Unit
Stall Torque (*)	Ts	950	Nm
		9690	kgfcm
Stall Current (*)	ls	230	A (rms)
Rated Output (*)	Pr	125	kW
		160	HP
Rating Speed	Nr	2000	min ⁻¹
Maximum Speed	Nmax	2000	min ⁻¹
Maximum Torque (*)	Tmax	1900	Nm
		19400	kgfcm
Rotor Inertia	Jm	0.42	kgm ²
		4.29	kgfcms ²
Rotor Inertia (with Brake)	Jm	-	kgm ²
		-	kgfcms ²
Torque constant (*)	Kt	4.0	Nm/A (rms)
		41	kgfcm/A (rms)
Back EMF constant (1phase) (*	Ke	140	V (rms)/1000 min ⁻¹
	Kv	1.3	V (rms)sec/rad
Armature Resistance (1 phase)	Ra	0.010	Ω
Mechanical time constant	tm	0.0008	s
Thermal time constant	tt	70	min
Static friction	Tf	4.0	Nm
		41	kgfcm
Weight	w	470	kg
Weight (with Brake)	W		kg
Max. Current of Servo Amp.	Imax	360 x 2	A (peak)

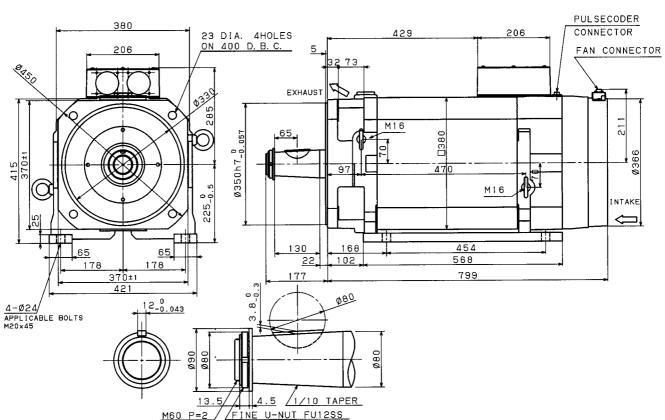
^(*) The values are the standard values at 20° C and the tolerance is $\pm 10\%$. The speed-torque characteristics very depending on the type of software, parameter setting, and input voltage of the digital servo software. (The above figures show average values.)

				TITLE		
				AC SERVO MOTOR $lpha i$ serie	es DESCI	RIPTIONS
			αis 1000/2000HV (A06B-0098-B010)			
01	08.07.02	Yamaguchi	Newly designed	DRAW. No. B-65262EN/05-01 CUST.		CUST.
Ed.	Date	Design.	Description	FANUC LTD	SHEET	5/12

7. OUTLINE DRAWINGS

7-1. Outline Drawing of the Motor

Model QiS 1000/2000HV



- SHAFT DETAIL
 - The motor does not include a circuit breaker for protecting the fan.
 Prepare such a breaker in the power magnetics cabinet.
 - 2. The motor cannot be mounted on the machine with the flange alone. The motor's own weight must be supported by the feet. The flange should be used for center adjustment to the machine.

Specification: A06B-0098-B010

7-2. Allowable Axis Load, Shaft Run-out Precsion, Power Terminal Layout, and Cabling

These specifications are the same as those of previous motor αi S 1000/2000HV (A06B-0298-B010). Refer to the FANUC AC SERVO MOTOR αi series DESCRIPTION B-65262EN.

				TITLE		
				AC SERVO MOTOR αi series DESCRIPTIONS		
				αis 1000/2000HV (A06B-0098-B010)		
01	08.07.02	Yamaguchi	Newly designed	DRAW. No. B-65262EN/05-01		CUST.
Ed.	Date	Design.	Description	FANUC LTD	SHEET 6/12	

8. COOLING FAN

The specifications of the cooling fan applied to $\alpha i S$ 1000/2000HV (A06B-0098-B010) are listed below.

For the detail of connecting and the pin layouts of the connectors, refer to the FANUC AC SERVO MOTOR αi series DESCRIPTION B-65262EN.

Motor model	α <i>i</i> S 1000/2000HV (0098)		
	Three-phase 400VAC		
Input voltage	50Hz	60Hz	
	AC340V to 480V	AC340V to 528V	
Rated input	200W	260W	
Steady-state current	0.3A _{rms}	0.4A _{rms}	
Protection circuit set temperature	140°C		
Degree of protection (IEC34-5)	IP00		

NOTE

- 1. For the models with fan, the degree of protection of the fan connector section is IP00.
- 2. Pay attention to the driving voltage. This fan motor is driven by three-phase,400VAC.

				TITLE		
				AC SERVO MOTOR $lpha i$ series DESCRIPTIONS		
				αis 1000/2000HV (A06B-0098-B010)		
01	08.07.02	Yamaguchi	Newly designed	DRAW. No. B-65262EN/05-01		CUST.
Ed.	Date	Design.	Description	FANUC LTD	SHEET	7/12

9. SERVO PARAMETERS

The parameter table for the model αis 1000/2000HV (A06B-0098-B010) is shown in the next table. Please set the appropriate parameters manually according to the table. Applicable servo software series and editions are shown below.

(Series 30i, 31i, 32i)

Series 90D0/Q(17) and subsequent editions

Series 90E0/Q(17) and subsequent editions

(Series 0*i*-D)

Series 90C5/A(01) and subsequent editions

Series 90E5/A(01) and subsequent editions

(Series 15*i*-B,16*i*-B,18*i*-B,21*i*-B,0*i*-B,Power Mate *i*)

Series 90B1/C(03) and subsequent editions

(Series 0i-C)

Series 90B8/C(03) and subsequent editions

(Digital servo adapter)

Series 90B2/C(03) and subsequent editions



/ CAUTION

If a motor is used in a wrong parameter, it may become broken.

At Jul.2008, Servo software dosen't support automatic setting.

10. OTHER SPECIFICATIONS

The items that are not mentioned in this report correspond to FANUC AC SERVO MOTOR αi series. Please refer to FANUC AC SERVO MOTOR αi series DESCRIPTION B-65262EN, too.

				TITLE		
				AC SERVO MOTOR $lpha i$ series DESCRIPTIONS		
				αis 1000/2000HV (A06B-0098-B010)		
01	08.07.02	Yamaguchi	Newly designed	DRAW. No. B-65262EN/05-01		CUST.
Ed.	Date	Design.	Description	FANUC LTD	SHEET	8/12

α*i*S 1000/2000HV(0098)

servo parameter : HRV2 control

			α <i>i</i> S1000
	Motor model		
		.c	/2000HV
	-	ecification	0098
	Drive		HRV2
symbol	FS15i	FS16i etc	
	1808	2003	00001000
	1809		01000011
	1883	2005	00000000
	1884	2006	00000000
	1951	2007	00000000
	1952	2008	00000000
	1953	2009	00000000
	1954	2010	00000000
	1955	2011	00000000
	1956	2012	00000000
	1707	2013	00000000
	1708	2014 2018	00000000
	1960		01000000
	1750	2210	00000000
	1751 2713	2211	00011010
	2713	2300 2301	00000000
PK1	1852	2040	00000000
PK1 PK2			1260
PK3	1853 1854	2041 2042	-8010 -1362
PK1V	1855	2042	263
PK2V	1856	2043	-2357
PK3V	1857	2044	- <u>2</u> 337
PK4V	1858	2045	-8235
POA1	1859	2040	1610
BLCMP	1860	2047	0
DPFMX	1861	2049	0
POK1	1862	2050	956
POK2	1863	2051	510
RESERV	1864		0
PPMAX	1865	2053	21
PDDP	1866	2054	3787
PHYST	1867	2055	319
EMFCMP	1868	2056	0
PVPA	1869	2057	-2320
PALPH	1870		-2500
PPBAS	1871		0
TQLIM	1872	2060	7282
EMFLMT	1873	2061	0
POVC1	1877	2062	32309
POVC2	1878	2063	5734
TGALMLV	1892	2064	4
POVCLMT	1893	2065	27346
PK2VAUX	1894		0
FILTER	1895	2067	0
FALPH	1961	2068	0
VFFLT	1962	2069	0
ERBLM	1963	2070	0
PBLCT	1964		0
SFCCML	1965	2072	0
PSPTL	1966	2073	0
AALPH	1967	2074	12288

I	FS15i	FS16i etc	
OSCTPL	1970	2077	0
PDPCH	1971	2078	0
PDPCL	1972	2079	0
DPFEX	1973	2080	0
DPFZW	1974	2081	0
BLENDL	1975	2082	0
MOFCTL	1976	2083	0
RTCURR	1979	2086	2960
TDPLD	1980	2087	0
MCNFB	1981	2088	0
BLBSL	1982	2089	0
ROBSTL	1983	2090	0
ACCSPL	1984	2091	0
ADFF1	1985	2092	0
VMPK3V	1986	2093	0
BLCMP2	1987	2094	0
AHDRTL	1988	2095	0
RADUSL	1989	2096	0
SMCNT	1990	2097	0
DEPVPL	1991	2098	0
ONEPSL	1992	2099	400
INPA1	1993	2100	0
INPA2	1994	2101	0
DBLIM	1995	2102	0
ABVOF	1996	2103	0
ABTSH	1997	2104	0
TRQCST	1998	2105	27963
LP24PA	1999	2106	0
VLGOVR	1700	2107	0
RESERV	1701	2108	0
BELLTC	1702	2109	0
MGSTCM	1703	2110	785
DETQLM	1704	2111	2300
AMRDML	1705	2112	0
NFILT	1706	2113	0
NINTCT	1735	2127	11851
MFWKCE	1736	2128	4500
MFWKBL	1752	2129	1038
LP2GP	1753	2130	0
LP4GP	1754	2131	0
LP6GP	1755	2132	0
PHDLY1	1756	2133	2570
PHDLY2	1757	2134	12810
DGCSMM	1782	2159	0
TRQCUP	1783	2160	0
OVCSTP	1784	2161	140
POVC21	1785	2162	32745
POVC22	1786	2163	292
POVCLMT2		2164	13952
MAXCRT	1788	2165	365
ACCBSLM	2717	2304	0
ACDCEND	2718	2305	22 1112
DCIDBS	2723	2310	1112

				TITLE		
				AC SERVO MOTOR $lpha i$ series DESCRIPTIONS		
				αis 1000/2000HV (A06B-0098-B010)		
01	08.07.02	Yamaguchi	Newly designed	DRAW. No. B-65262EN/05-01		CUST.
Ed.	Date	Design.	Description	FANUC LTD	SHEET	9/12

ı

11. The differences between the previous motor and the new motor

This section shows the differences between the previous motor and the new motor.

11-1. Ordering numbers

There is difference in the ordering numbers.

previous motor : A06B-0298-B010 new motor : A06B-0098-B010

11-2. Specifications of torque charactaristics

The specification of new motor is enhanced by the continuous power and the maximum output at high speed. Represent values are shown in the below table.

Motor model	Maximum output at high speed	Continuous output
previous α <i>i</i> S 1000/2000HV (A06B-0298-B010)	200kW	110kW
new �� <i>i</i> S 1000/2000HV (A06B-0098-B010)	220kW	125kW

11-3. Applicable amplifiers and servo parameters

There is difference in applicable amplifiers and servo parameters. The specification of the new motor is enhanced with LEVEL-UP amplifiers and new servo parameter.

11-4. The dynamic brake stopping distance

The dynamic brake stopping distance of new motor will be longer than that of the previous motor, on the whole case. Pay attention, at replacing the previous motors.

Coefficients for calculating the dynamic brake stopping distance (SI unit)

Motor model	Α	В
previous α <i>i</i> S 1000/2000HV (A06B-0298-B010)	6.3×10 ⁻⁴	5.9×10 ⁻¹⁰
new QtiS 1000/2000HV (A06B-0098-B010)	6.6×10 ⁻⁴	1.2×10 ⁻⁹

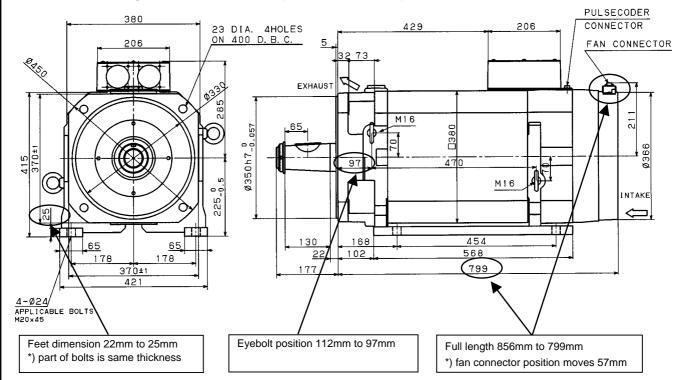
				TITLE		
				AC SERVO MOTOR αi series DESCRIPTIONS		
				α1S 1000/2000HV (A06B-0098-B010)		
01	08.07.02	Yamaguchi	Newly designed	DRAW. No. B-65262EN/05-01		CUST.
Ed.	Date	Design.	Description	FANUC LTD	SHEET	10/12

11-5. Outline drawing

For outside dimension, there are difference in following points. (refer the below drawing)

- 1. feet thickness (the part for the bolts is the same thickness)
- 2. evebolts
- 3. the full length

Outline Drawing *Qi*S 1000/2000HV (A06B-0098-B010)



11-6. Cooling fan specification

The specification of fan motors are shown in below table. Connecting a cooling fan is the same.

Motor model	αis 1000/2000HV (0298)		αis 1000/2000HV (0098)	
	Three-phase 400VAC		Three-phase 400VAC	
Input voltage	50Hz	60Hz	50Hz	60Hz
	AC320V to 460V	AC320V to 460V	AC340V to 480V	AC340V to 528V
Rated input	120W	170W	200W	260W
Steady-state current	0.2A _{rms}	0.3A _{rms}	0.3A _{rms}	0.4A _{rms}
Protection circuit set temperature	140°C		140°C	
Degree of protection (IEC34-5)	IP00 IP00		00	

				TITLE		
				AC SERVO MOTOR $lpha i$ series DESCRIPTIONS		
				αis 1000/2000HV (A06B-0098-B010)		
01	08.07.02	Yamaguchi	Newly designed	DRAW. No. B-65262EN/05-01		CUST.
Ed.	Date	Design.	Description	FANUC LTD	SHEET	11/12

12. Maintenance for the previous αiS1000/2000HV

When maintenancing for the previous $\Omega i S1000/2000HV$ (A06B-0298-B010), it is possible to use the new $\Omega i S1000/2000HV$ (A06B-0098-B010) ,without changing amplifiers and servo parameters.

The new αi S1000/2000HV (A06B-0098-B010) with old amplifiers and old servo parameters is also upper compatible with the previous αi S1000/2000HV (A06B-0298-B010) at following points.

- · maximun torque : a little enhanced
- \cdot continuous torque : a little enhanced

At replacing, take care of the following differences.

- · dynamic brake stopping distance
- · outline
- · specification of a cooling fan

For a axis of multi motor's drive with torque tandem control, do not mix previous motors and new motors. There will be a little difference in output torque for the same torque command.

				TITLE	oc DESCI	DIDTIONS
				AC SERVO MOTOR $lpha i$ series DESCRIPTIONS $lpha i$ S 1000/2000HV (A06B-0098-B010)		
01	08.07.02	Yamaguchi	Newly designed	DRAW. No. B-65262EN/05-01		CUST.
Ed.	Date	Design.	Description	FANUC LTD	SHEET	12/12

FANUC AC SERVO MOTOR αi series DESCRIPTIONS lpha iS2000HV for spindle use

1. Type of applied technical documents

Name	FANUC AC SERVO MOTOR $lpha i$ series DESCRIPTIONS
Spec. No. /Version	B-65262EN/05-02

2.Summary of Change

Group	Name	New, Add, Correct, Delete,	Applicable Data
Basic Function	AC Servo Motor αi S 2000/2000HV for spindle use	New	AUG.2008
Optional Function			
Unit			
Maintenance Parts			
Notice			
Correction			
Another			

				TITLE		
				AC SERVO MOTOR $lpha i$ serie	es DESCI	RIPTIONS
				lpha iS2000HV for spindle use		
01	08.08.20	Yamaguchi	Newly designed	DRAW. No. B-65262EN/05-02		CUST.
Ed.	Date	Design.	Description	FANUC LTD	SHEET	1/8

1. GENERAL

Following motor is added to FANUC AC SERVO MOTOR αi series .

· *Qİ*S 2000/2000HV (A06B-0091-B140#0058)

This motor is suitable for spindle use.

This motor is different from the present motor of $\alpha i S$ 2000HV.

This motor is based on IEC60034-1. The certification from TUV is planned to be taken at $2009\,$

Note)

The items that are not mentioned in this report correspond to FANUC AC SERVO MOTOR αi series .

Please refer to FANUC AC SERVO MOTOR lpha i series DESCRIPTION B-65262EN, too.

				TITLE		
				AC SERVO MOTOR $lpha i$ serie	es DESCF	RIPTIONS
				lpha iS2000HV for spindle use		
01	08.08.20	Yamaguchi	Newly designed	DRAW. No. B-65262EN/05-02		CUST.
Ed.	Date	Design.	Description	FANUC LTD	SHEET	2/8

2. DESIGNATION

Motor odering numbers have the following format.

A06B-0091-Babc#0058

 $0091 : \alpha is 2000/2000HV$

a

1: Straight shaft type

b

4: With a cooling fan

<u>c</u>

0 : Pulsecoder **\Omegai**A 1000

*)Taper shaft type and straight shaft with a key way can be odered for option.



Specity the odering numbers with '#0058' for Ωi S2000HV of spindle use.

3. APPLICABLE AMPLIFIER

Applicable amplifiers are shown in following table.

lpha iS2000/2000HV*	αiSV 360HV x 4 (LEVEL UP Version)
(A06B-0091-B140#0058)	A06B-6127-H109 x4

*) When driving with Series 30i, 31i, 32i, PDM(PWM Distribution module) is not necessary. The torque tandem control option is requied.

♠ CAUTION

- 1 If a motor is used in a combination other than those listed above, it may become broken.
- 2 For details on the servo amplifier, refer to "FANUC SERVO AMPLIFIER αi series DESCRIPTIONS (B-65282EN)" .

				TITLE		
				AC SERVO MOTOR $lpha i$ serie	es DESCF	RIPTIONS
				lpha iS2000HV for spindle use		
01	08.08.20	Yamaguchi	Newly designed	DRAW. No. B-65262EN/05-02		CUST.
Ed.	Date	Design.	Description	FANUC LTD	SHEET	3/8

4. Output data for selecting αiPS amplifiers

When calculating of capability , use these values for spindle motors. Use the power supply module of "LEVEL UP Version" .

MOTOR MODEL	Continuous output	Maximum output
α <i>i</i> S2000/2000HV	200kW	280kW
(A06B-0091-B140#0058)	2001111	2001(11

Four αi PS 75HV(A06B-6150-H075) are aplicable power supply modules for driving only one αi S2000/2000HV with 200kW cont.

! CAUTION

1 These data is only for selecting the PS and it doesn't guarantee the power of motors.

5. COEFFICIENTS FOR CALCULATING THE DYNAMIC BRAKE STOPPING DISTANCE

SI unit

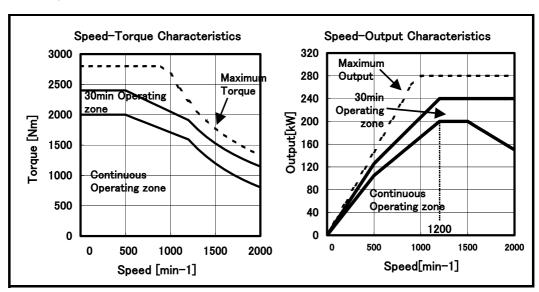
Motor model	Α	В
α <i>i</i> S2000/2000HV (A06B-0091-B140#0058)	3.3×10 ⁻⁴	1.3×10 ⁻¹⁰

Maximum torque of dynamic breke is 2450Nm. It is possible not to use dynamic breke. When removing the dynamic brake modules, contact FANUC.

				TITLE		
				AC SERVO MOTOR $lpha i$ serie	es DESCI	RIPTIONS
				lpha iS2000HV for spindle use		
01	08.08.20	Yamaguchi	Newly designed	DRAW. No. B-65262EN/05-02		CUST.
Ed.	Date	Design.	Description	FANUC LTD	SHEET	4/8

6. SPECIFICATIONS

Model αiS 2000/2000HV



Specification: A06B-0091-B140#0058

Data sheet

Parameter	Symbol		Value	Unit
Cont. Rated Torque (*)	Ts	2000		Nm
(at const. rated torque range)		20400		kgfcm
Cont. Rated Current (*)	ls	450		A (rms)
Rated Output (*)	Pr	200		kW
		267		HP
Maximum Speed	Nmax	2000		min ⁻¹
Maximum Torque (*)	Tmax	2800		Nm
		28600		kgfcm
Rotor Inertia	Jm	1.97		kgm ²
		20.1		kgfcms ²
Torque constant (*)	Kt	4.4		Nm/A (rms)
		45		kgfcm/A (rms)
Back EMF constant (1 phase) (*	Ke	155		V (rms)/1000 min ⁻¹
	Κv	1.5		V (rms)sec/rad
Armature Resistance (1 phase)	Ra	0.0038		Ω
Mechanical time constant	tm	0.001		s
Thermal time constant	tt	80		min
Static friction	Tf	32		Nm
		327		kgfcm
Weight	w	1000		kg

^(*) The values are the standard values at 20°C and the tolerance is $\pm 10\%$.

The speed-torque characteristics very depending on the type of software, parameter setting, and input voltage of the digital servo software. (The above figures show average values.) Max torque and max output are limited by servo soft.

It is possible to change the limited output value.

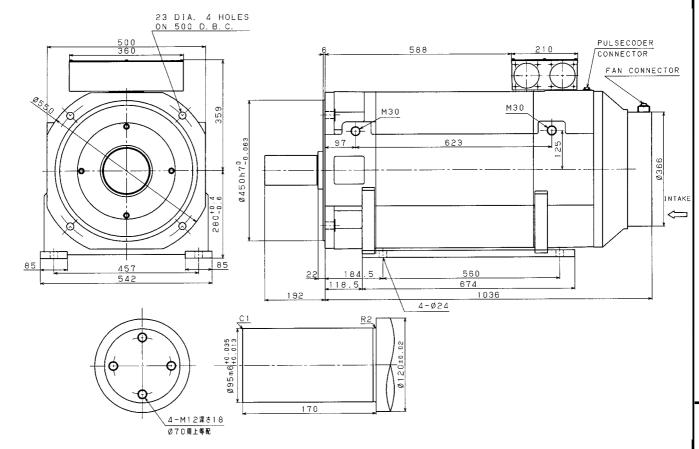
				TITLE		
				AC SERVO MOTOR $lpha i$ serie	es DESCI	RIPTIONS
				lpha iS2000HV for spindle use		
01	08.08.20	Yamaguchi	Newly designed	DRAW. No. B-65262EN/05-02		CUST.
Ed.	Date	Design.	Description	FANUC LTD	SHEET	5/8

7. OUTLINE DRAWINGS

7-1. Outline Drawing of the Motor

Model QiS 2000/2000HV

Specification: A06B-0091-B140#0058



- The motor does not include a circuit breaker for protecting the fan.
 Prepare such a breaker in the power magnetics cabinet.
- 2. The motor cannot be mounted on the machine with the flange alone. The motor's own weight must be supported by the feet down. The flange should be used for center adjustment to the machine.

7-2. Allowable Axis Load,

The Allowable axis load is indicated below. For the detail of the allowable axis load, see FANUC AC SERVO MOTOR αi series DESCRIPTION B-65262EN.

Radial load	Axial load	(Reference) Front bearing specification
8820[N] (900 [kgf])	1960[N] (200 [kgf])	6226

				AC SERVO MOTOR αi series DESCRIPTIONS		
				αi S2000HV for spindle use		
01	08.08.20	Yamaguchi	Newly designed	DRAW. No. B-65262EN/05-02		CUST.
Ed.	Date	Design.	Description	FANUC LTD	SHEET	6/8

7-3. Shaft Run-out Precsion, Power Terminal Layout, and Cabling

These specifications are the same as those of previous motor αi S 2000/2000HV (A06B-0091-B040). Refer to the FANUC AC SERVO MOTOR αi series DESCRIPTION B-65262EN.

8. COOLING FAN

These specifications are the same as those of previous motor αi S 2000/2000HV (A06B-0091-B040). Refer to the FANUC AC SERVO MOTOR αi series DESCRIPTION B-65262EN.

9. SERVO PARAMETERS

The parameter table for the model $\alpha i S$ 2000/2000HV (A06B-0091-B140#0058) is shown in the next table. Applicable servo software series and editions are shown below.

(Series 30*i*, 31*i*, 32*i*) Series 90D0/U(21) and subsequent editions Series 90E0/U(21) and subsequent editions

! CAUTION

If a motor is used in a wrong parameter, it may become broken.

It is possible to set the parameters with manually setting of below parameters after auto loading of parameter ID459.

Parameter ID	459
Parameter numbers	No.2014=00100000
needed to change	No.2090=320
needed to change	No.2093=100

10. OTHER SPECIFICATIONS

The items that are not mentioned in this report correspond to FANUC AC SERVO MOTOR αi series. Please refer to FANUC AC SERVO MOTOR αi series DESCRIPTION B-65262EN, too.

				AC SERVO MOTOR αi series DESCRIPTIONS		
				αi S2000HV for spindle use		
01	08.08.20	Yamaguchi	Newly designed	DRAW. No. B-65262EN/05-02		CUST.
Ed.	Date	Design.	Description	FANUC LTD	SHEET	7/8

αi S 2000/2000HV(A06B-0091-B140#0058)

servo parameter: HRV2 control

		α <i>i</i> S2000
	Motor model	/2000HV
		for spindle
	Motor specification	0091#0058
	Drive	HRV2
symbol	FS30i , 31i	
	2003	00001000
	2004	01000011
	2005	00000000
	2006	00000000
	2007	00100000
	2008	00000000
	2009	00000000
	2010	00000000
	2011 2012	00000000
	2012	00000000
	2013	00100000
	2014	0100000
	2210	00000000
	2211	10011110
	2300	00000000
	2301	00000000
PK1	2040	643
PK2	2041	-3600
PK3	2042	-1358
PK1V	2043	502
PK2V	2044	-4500
PK3V	2045	0
PK4V	2046	-8235
POA1	2047	843
BLCMP DPFMX	2048 2049	0
POK1	2050	956
POK2	2051	510
RESERV	2052	0
PPMAX	2053	21
PDDP	2054	3787
PHYST	2055	319
EMFCMP	2056	0
PVPA	2057	-3363
PALPH	2058	-3200
PPBAS	2059	0
TQLIM	2060	7282
EMFLMT	2061	0
POVC1	2062	32309 5734
POVC2	2063 2064	5/34 4
TGALMLV POVCLMT	2064	27346
PK2VAUX	2066	0
FILTER	2067	0
FALPH	2068	0
VFFLT	2069	0
ERBLM	2070	0
PBLCT	2071	0
SFCCML	2072	0
PSPTL	2073	0
AALPH	2074	12288

l I	FS30i, 31i	
OSCTPL	2077	0
PDPCH	2078	0
PDPCL	2079	0
DPFEX	2080	0
DPFZW	2081	0
BLENDL	2082	0
MOFCTL	2083	0
RTCURR	2086	2893
TDPLD	2087	0
MCNFB	2088	0
BLBSL	2089	0
ROBSTL	2090	320
ACCSPL	2091	0
ADFF1	2092	0
VMPK3V	2093	100
BLCMP2	2094	0
AHDRTL	2095	0
RADUSL	2096	0
SMCNT	2097	0
DEPVPL	2098	0
ONEPSL	2099	400
INPA1	2100	0
INPA2	2101	0
DBLIM	2102	0
ABVOF		0
ABTSH	2103 2104	0
TRQCST	2105	6221
LP24PA	2106	0
VLGOVR	2106 2107	0
RESERV	2108	0
BELLTC		0
MGSTCM	2109 2110	784
DETQLM	2111	1510
AMRDML	2112	0
NFILT	2112 2113	0
NINTCT	2127	3449
MFWKCE	2128	3000
MFWKBL	2129	1291
LP2GP	2130	0
LP4GP	2131 2132	0
LP6GP	2132	0
PHDLY1	2133	260
PHDLY2	2134	6420
DGCSMM	2159	0
TRQCUP	2160	0
OVCSTP	2161	140
POVC21	2162	32745
POVC22	2163	292
POVCLMT2	2164	13952
MAXCRT	2165	365
ACCBSLM	2304	2720
ACDCEND	2305	4114
DCIDBS	2310	1236

The parameters with '*' are different from auto loading paremeters of ID459.

				TITLE		
				AC SERVO MOTOR αi series DESCRIPTIONS		
				αi S2000HV for spindle use		
01	08.08.20	Yamaguchi	Newly designed	DRAW. No. B-65262EN/05-02		CUST.
Ed.	Date	Design.	Description	FANUC LTD	SHEET	8/8

FANUC AC SERVO MOTOR αi series DESCRIPTIONS αi S 1000/2000HV (A06B-0098-B010)

1. Type of applied technical documents

Name	FANUC AC SERVO MOTOR $lpha i$ series DESCRIPTIONS
Spec. No. /Version	B-65262EN/05-01

2.Summary of Change

Group	Name	New, Add, Correct, Delete,	Applicable Data
Basic Function	AC Servo Motor αίS 1000/2000HV (A06B-0098-B010)	New	JUL.2008
Optional Function			
Unit			
Maintenance Parts			
Notice			
Correction			
Another			

				TITLE		
				AC SERVO MOTOR $lpha i$ series DESCRIPTIONS		
				αis 1000/2000HV (A06B-0098-B010)		
01	08.07.02	Yamaguchi	Newly designed	DRAW. No. B-65262EN/05-01		CUST.
Ed.	Date	Design.	Description	FANUC LTD	SHEET	1/12

1. GENERAL

Following motor is added to FANUC AC SERVO MOTOR lpha i series .

· *\tilde{XiS}* 1000/2000HV (A06B-0098-B010)

This motor is upper compatible with the previous motor of $\alpha i S$ 1000/2000HV (A06B-0298-B010). The specification of this motor is enhanced by following points.

- · maximum torque at high speed
- · continuous torque

The differences between the previous motor and the new motor are shown below.

- · applicable amplifiers
- · servo parameters
- · the dynamic brake stopping distance
- · the full length (connector position of a fan motor)
- · position of eyebolts
- · the specifications of a fan motor

The details of difference is described on page 10,11,12.

This motor is based on IEC60034-1. The certification from TUV is planned to be taken at Dec.2008

Note)

The items that are not mentioned in this report correspond to FANUC AC SERVO MOTOR αi series .

Please refer to FANUC AC SERVO MOTOR αi series DESCRIPTION B-65262EN, too.

				TITLE		
				AC SERVO MOTOR αi series DESCRIPTIONS		
				αis 1000/2000HV (A06B-0098-B010)		
01	08.07.02	Yamaguchi	Newly designed	DRAW. No. B-65262EN/05-01		CUST.
Ed.	Date	Design.	Description	FANUC LTD	SHEET	2/12

2. DESIGNATION

Motor specification numbers have the following format.

A06B-0098-Babc

0098: 0.00: 1000/2000HV

a

0: Taper Shaft Type

b

1: With a cooling fan

<u>c</u>

0: Pulsecoder αi A 1000

3. APPLICABLE AMPLIFIER

Applicable amplifiers for QiS 1000/2000HV

(LEVEL LID Varaion)	α i SV 360HV x 2 (A06B-6127-H109 x2)
(LEVEL LID Vargion)	α <i>i</i> PS 100HV x1 (A06B-6150-H100 x1)

^{*)} The torque tandem control option or the PWM distribution module is requied.

! CAUTION

- 1 If a motor is used in a combination other than those listed above, it may become broken.
- 2 For details on the servo amplifier, refer to "FANUC SERVO AMPLIFIER αi series DESCRIPTIONS (B-65282EN)".

				TITLE		
				AC SERVO MOTOR $lpha i$ series DESCRIPTIONS		
				αis 1000/2000HV (A06B-0098-B010)		
01	08.07.02	Yamaguchi	Newly designed	DRAW. No. B-65262EN/05-01		CUST.
Ed.	Date	Design.	Description	FANUC LTD	SHEET	3/12

4. Output data for selecting αi PS amplifiers

MOTOR MODEL	Continuous output	Maximum output	
α <i>i</i> S 1000/2000HV (0098)	125kW	198kW	

A CAUTION

1 These data is only for selecting the PS and it doesn't guarantee the power of motors.

5. COEFFICIENTS FOR CALCULATING THE DYNAMIC BRAKE STOPPING DISTANCE

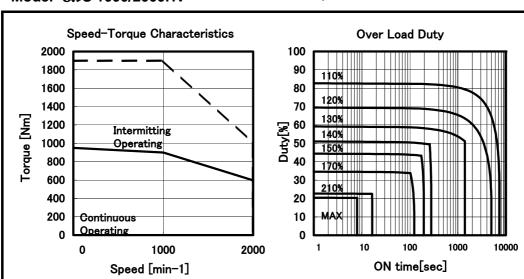
SI unit

Motor model	А	В
α <i>i</i> S 1000/2000HV (0098)	6.6×10 ⁻⁴	1.2×10 ⁻⁹

				TITLE		
				AC SERVO MOTOR αi series DESCRIPTIONS		
				αis 1000/2000HV (A06B-0098-B010)		
01	08.07.02	Yamaguchi	Newly designed	DRAW. No. B-65262EN/05-01		CUST.
Ed.	Date	Design.	Description	FANUC LTD SHEET		4/12

6. SPECIFICATIONS

Model αiS 1000/2000HV



Specification: A06B-0098-B010

Data sheet

Data sheet				
Parameter	Symbol		Value	Unit
Stall Torque (*)	Ts	950		Nm
		9690		kgfcm
Stall Current (*)	Is	230		A (rms)
Rated Output (*)	Pr	125		kW
		160		HP
Rating Speed	Nr	2000		min ⁻¹
Maximum Speed	Nmax	2000		min ⁻¹
Maximum Torque (*)	Tmax	1900		Nm
		19400		kgfcm
Rotor Inertia	Jm	0.42		kgm ²
		4.29		kgfcms ²
Rotor Inertia (with Brake)	Jm	-		kgm ²
		-		kgfcms ²
Torque constant (*)	Kt	4.0		Nm/A (rms)
		41		kgfcm/A (rms)
Back EMF constant (1phase) (*	Ke	140		V (rms)/1000 min ⁻¹
	Kv	1.3		V (rms)sec/rad
Armature Resistance (1 phase)	Ra	0.010		Ω
Mechanical time constant	tm	0.0008		s
Thermal time constant	tt	70		min
Static friction	Tf	4.0		Nm
		41		kgfcm
Weight	W	470		kg
Weight (with Brake)	w	-		kg
Max. Current of Servo Amp.	Imax	360 x 2		A (peak)

^(*) The values are the standard values at 20°C and the tolerance is ±10%.

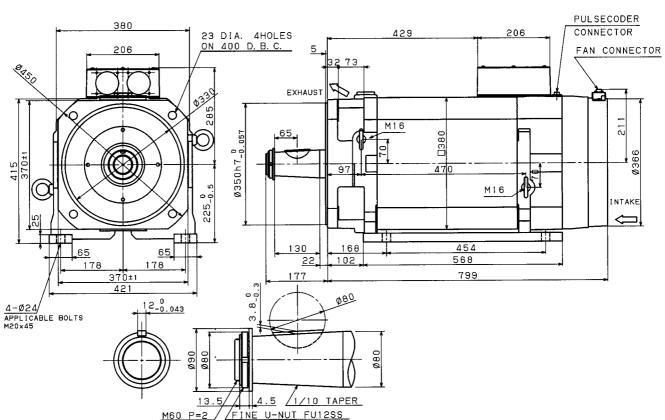
The speed-torque characteristics very depending on the type of software, parameter setting, and input voltage of the digital servo software. (The above figures show average values.)

				TITLE		
				AC SERVO MOTOR $lpha i$ series DESCRIPTIONS		
				αis 1000/2000HV (A06B-0098-B010)		
01	08.07.02	Yamaguchi	Newly designed	DRAW. No. B-65262EN/05-01		CUST.
Ed.	Date	Design.	Description	FANUC LTD	SHEET	5/12

7. OUTLINE DRAWINGS

7-1. Outline Drawing of the Motor

Model QiS 1000/2000HV



- SHAFT DETAIL
 - The motor does not include a circuit breaker for protecting the fan.
 Prepare such a breaker in the power magnetics cabinet.
 - 2. The motor cannot be mounted on the machine with the flange alone. The motor's own weight must be supported by the feet. The flange should be used for center adjustment to the machine.

Specification: A06B-0098-B010

7-2. Allowable Axis Load, Shaft Run-out Precsion, Power Terminal Layout, and Cabling

These specifications are the same as those of previous motor αi S 1000/2000HV (A06B-0298-B010). Refer to the FANUC AC SERVO MOTOR αi series DESCRIPTION B-65262EN.

				TITLE		
				AC SERVO MOTOR αi series DESCRIPTIONS		
				αis 1000/2000HV (A06B-0098-B010)		
01	08.07.02	Yamaguchi	Newly designed	DRAW. No. B-65262EN/05-01		CUST.
Ed.	Date	Design.	Description	FANUC LTD	SHEET	6/12

8. COOLING FAN

The specifications of the cooling fan applied to $\alpha i S$ 1000/2000HV (A06B-0098-B010) are listed below.

For the detail of connecting and the pin layouts of the connectors, refer to the FANUC AC SERVO MOTOR αi series DESCRIPTION B-65262EN.

Motor model	αis 1000/2000HV (0098)		
	Three-phase 400VAC		
Input voltage	50Hz	60Hz	
	AC340V to 480V	AC340V to 528V	
Rated input	200W	260W	
Steady-state current	0.3A _{rms}	0.4A _{rms}	
Protection circuit set temperature	140°C		
Degree of protection (IEC34-5)	IP00		

NOTE

- 1. For the models with fan, the degree of protection of the fan connector section is IP00.
- 2. Pay attention to the driving voltage. This fan motor is driven by three-phase,400VAC.

				TITLE		
				AC SERVO MOTOR αi series DESCRIPTIONS		
				αis 1000/2000HV (A06B-0098-B010)		
01	08.07.02	Yamaguchi	Newly designed	DRAW. No. B-65262EN/05-01		CUST.
Ed.	Date	Design.	Description	FANUC LTD	SHEET	7/12

9. SERVO PARAMETERS

The parameter table for the model αis 1000/2000HV (A06B-0098-B010) is shown in the next table. Please set the appropriate parameters manually according to the table. Applicable servo software series and editions are shown below.

(Series 30i, 31i, 32i)

Series 90D0/Q(17) and subsequent editions

Series 90E0/Q(17) and subsequent editions

(Series 0*i*-D)

Series 90C5/A(01) and subsequent editions

Series 90E5/A(01) and subsequent editions

(Series 15*i*-B,16*i*-B,18*i*-B,21*i*-B,0*i*-B,Power Mate *i*)

Series 90B1/C(03) and subsequent editions

(Series 0i-C)

Series 90B8/C(03) and subsequent editions

(Digital servo adapter)

Series 90B2/C(03) and subsequent editions



/ CAUTION

If a motor is used in a wrong parameter, it may become broken.

At Jul.2008, Servo software dosen't support automatic setting.

10. OTHER SPECIFICATIONS

The items that are not mentioned in this report correspond to FANUC AC SERVO MOTOR αi series. Please refer to FANUC AC SERVO MOTOR αi series DESCRIPTION B-65262EN, too.

				TITLE		
				AC SERVO MOTOR αi series DESCRIPTIONS		
				αis 1000/2000HV (A06B-0098-B010)		
01	08.07.02	Yamaguchi	Newly designed	DRAW. No. B-65262EN/05-01		CUST.
Ed.	Date	Design.	Description	FANUC LTD	SHEET	8/12

α*i*S 1000/2000HV(0098)

servo parameter : HRV2 control

			α <i>i</i> S1000		
	Motor mo				
		.c	/2000HV		
	-	ecification	0098		
	Drive		HRV2		
symbol	FS15i	FS16i etc			
	1808	2003	00001000		
	1809		01000011		
	1883	2005	00000000		
	1884	2006	00000000		
	1951	2007	00000000		
	1952	2008	00000000		
	1953	2009	00000000		
	1954	2010	00000000		
	1955	2011	00000000		
	1956	2012	00000000		
	1707	2013	00000000		
	1708	2014 2018	00000000		
	1960		01000000		
	1750	2210	00000000		
	1751 2713	2211	00011010		
	2713	2300 2301	00000000		
PK1	1852	2040	00000000		
PK1 PK2			1260		
PK3	1853 1854	2041 2042	-8010 -1362		
PK1V	1855	2042	263		
PK2V	1856	2043	-2357		
PK3V	1857	2044	- <u>2</u> 337		
PK4V	1858	2045	-8235		
POA1	1859	2040	1610		
BLCMP	1860	2047	0		
DPFMX	1861	2049	0		
POK1	1862	2050	956		
POK2	1863	2051	510		
RESERV	1864		0		
PPMAX	1865	2053	21		
PDDP	1866	2054	3787		
PHYST	1867	2055	319		
EMFCMP	1868	2056	0		
PVPA	1869	2057	-2320		
PALPH	1870		-2500		
PPBAS	1871		0		
TQLIM	1872	2060	7282		
EMFLMT	1873	2061	0		
POVC1	1877	2062	32309		
POVC2	1878	2063	5734		
TGALMLV	1892	2064	4		
POVCLMT	1893	2065	27346		
PK2VAUX	1894		0		
FILTER	1895	2067	0		
FALPH	1961	2068	0		
VFFLT	1962	2069	0		
ERBLM	1963	2070	0		
PBLCT	1964		0		
SFCCML	1965	2072	0		
PSPTL	1966	2073	0		
AALPH	1967	2074	12288		

I	FS15i	FS16i etc	
OSCTPL	1970	2077	0
PDPCH	1971	2078	0
PDPCL	1972	2079	0
DPFEX	1973	2080	0
DPFZW	1974	2081	0
BLENDL	1975	2082	0
MOFCTL	1976	2083	0
RTCURR	1979	2086	2960
TDPLD	1980	2087	0
MCNFB	1981	2088	0
BLBSL	1982	2089	0
ROBSTL	1983	2090	0
ACCSPL	1984	2091	0
ADFF1	1985	2092	0
VMPK3V	1986	2093	0
BLCMP2	1987	2094	0
AHDRTL	1988	2095	0
RADUSL	1989	2096	0
SMCNT	1990	2097	0
DEPVPL	1991	2098	0
ONEPSL	1992	2099	400
INPA1	1993	2100	0
INPA2	1994	2101	0
DBLIM	1995	2102	0
ABVOF	1996	2103	0
ABTSH	1997	2104	0
TRQCST	1998	2105	27963
LP24PA	1999	2106	0
VLGOVR	1700	2107	0
RESERV	1701	2108	0
BELLTC	1702	2109	0
MGSTCM	1703	2110	785
DETQLM	1704	2111	2300
AMRDML	1705	2112	0
NFILT	1706	2113	0
NINTCT	1735	2127	11851
MFWKCE	1736	2128	4500
MFWKBL	1752	2129	1038
LP2GP	1753	2130	0
LP4GP	1754	2131	0
LP6GP	1755	2132	0
PHDLY1	1756	2133	2570
PHDLY2	1757	2134	12810
DGCSMM	1782	2159	0
TRQCUP	1783	2160	0
OVCSTP	1784	2161	140
POVC21	1785	2162	32745
POVC22	1786	2163	292
POVCLMT2		2164	13952
MAXCRT	1788	2165	365
ACCBSLM	2717	2304	0
ACDCEND	2718	2305	22 1112
DCIDBS	2723	2310	1112

				TITLE		
				AC SERVO MOTOR $lpha i$ series DESCRIPTIONS		
				αis 1000/2000HV (A06B-0098-B010)		
01	08.07.02	Yamaguchi	Newly designed	DRAW. No. B-65262EN/05-01		CUST.
Ed.	Date	Design.	Description	FANUC LTD	SHEET	9/12

ı

11. The differences between the previous motor and the new motor

This section shows the differences between the previous motor and the new motor.

11-1. Ordering numbers

There is difference in the ordering numbers.

previous motor : A06B-0298-B010 new motor : A06B-0098-B010

11-2. Specifications of torque charactaristics

The specification of new motor is enhanced by the continuous power and the maximum output at high speed. Represent values are shown in the below table.

Motor model	Maximum output at high speed	Continuous output	
previous 001 1000/2000HV (A06B-0298-B010)	200kW	110kW	
new <i>Qti</i> S 1000/2000HV (A06B-0098-B010)	220kW	125kW	

11-3. Applicable amplifiers and servo parameters

There is difference in applicable amplifiers and servo parameters. The specification of the new motor is enhanced with LEVEL-UP amplifiers and new servo parameter.

11-4. The dynamic brake stopping distance

The dynamic brake stopping distance of new motor will be longer than that of the previous motor, on the whole case. Pay attention, at replacing the previous motors.

Coefficients for calculating the dynamic brake stopping distance (SI unit)

Motor model	Α	В
previous α <i>i</i> S 1000/2000HV (A06B-0298-B010)	6.3×10 ⁻⁴	5.9×10 ⁻¹⁰
new QtiS 1000/2000HV (A06B-0098-B010)	6.6×10 ⁻⁴	1.2×10 ⁻⁹

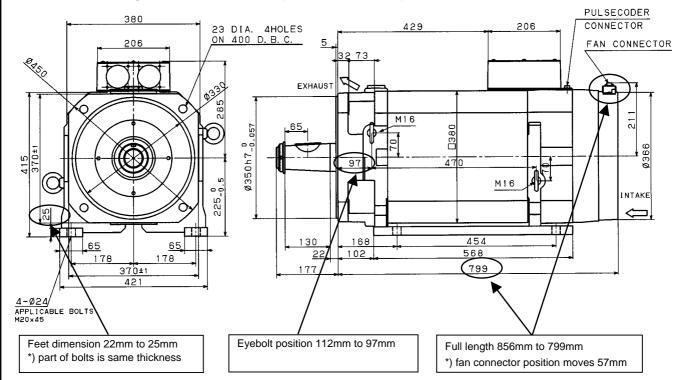
				TITLE			
				oxed AC SERVO MOTOR $lpha i$ series DESCRIPTIONS			
				Cts 1000/2000HV (A06B-0098-B010)			
01	08.07.02	Yamaguchi	Newly designed	DRAW. No. B-65262EN/05-01 CUST.		CUST.	
Ed.	Date	Design.	Description	FANUC LTD	SHEET	10/12	

11-5. Outline drawing

For outside dimension, there are difference in following points. (refer the below drawing)

- 1. feet thickness (the part for the bolts is the same thickness)
- 2. eyebolts
- 3. the full length

Outline Drawing *Qi*S 1000/2000HV (A06B-0098-B010)



11-6. Cooling fan specification

The specification of fan motors are shown in below table. Connecting a cooling fan is the same.

Motor model	αis 1000/20	00HV (0298)	αis 1000/2000HV (0098)		
	Three-phas	se 400VAC	Three-phas	se 400VAC	
Input voltage	50Hz	60Hz	50Hz	60Hz	
	AC320V to 460V	AC320V to 460V	AC340V to 480V	AC340V to 528V	
Rated input	120W	170W	200W	260W	
Steady-state current	0.2A _{rms}	0.3A _{rms}	0.3A _{rms}	0.4A _{rms}	
Protection circuit set temperature	140°C		140°C		
Degree of protection (IEC34-5)	IP	00	IP00		

				TITLE			
				AC SERVO MOTOR αi series DESCRIPTIONS			
				αis 1000/2000HV (A06B-0098-B010)			
01	08.07.02	Yamaguchi	Newly designed	DRAW. No. B-65262EN/05-01 CUST.		CUST.	
Ed.	Date	Design.	Description	FANUC LTD SHEET 11		11/12	

12. Maintenance for the previous αiS1000/2000HV

When maintenancing for the previous $\Omega i S1000/2000HV$ (A06B-0298-B010), it is possible to use the new $\Omega i S1000/2000HV$ (A06B-0098-B010) ,without changing amplifiers and servo parameters.

The new αi S1000/2000HV (A06B-0098-B010) with old amplifiers and old servo parameters is also upper compatible with the previous αi S1000/2000HV (A06B-0298-B010) at following points.

- · maximun torque : a little enhanced
- \cdot continuous torque : a little enhanced

At replacing, take care of the following differences.

- · dynamic brake stopping distance
- · outline
- · specification of a cooling fan

For a axis of multi motor's drive with torque tandem control, do not mix previous motors and new motors. There will be a little difference in output torque for the same torque command.

				AC SERVO MOTOR αi series DESCRIPTIONS				
				αi S 1000/2000HV (A06B-0098-B010)				
01	08.07.02	Yamaguchi	Newly designed	DRAW. No. B-65262EN/05-01 CUST.		CUST.		
Ed.	Date	Design.	Description	FANUC LTD SHEET 12/1		12/12		

Feedback connector for $\alpha \emph{\textbf{i}}/\beta \emph{\textbf{i}}$ series servo motor

1. Type of applied technical documents

Name	FANUC AC SERVO MOTOR α i series DESCRIPTION	FANUC AC SERVO MOTOR β i series DESCRIPTION	
Spec. No./ Version	B-65262EN/05	B-65302EN/03	

2. Summary of change

Group	Name/Outline	New, Add Correct, Delete	Applicable date
Basic Function			
Optional Function			
Unit			
Maintenance Parts			
Notice			
Correction			
Another	The feedback connector specification of the new manufacturer is added.	Add	2008.11

				Title	Feedback connector servo motor	for α <i>i</i> / β <i>i</i>	<i>i</i> series
				Draw.	B-65262EN B-65302EN		
01	08.11.17	Takamizawa	Terashima	Terashima			
Edit	Date	Design	Description	FA	NUC LTD.	PAGE	1/3

3. Outline

As the connector of feedback cable for servo motor, crimp type by HIROSE ELECTRIC CO., LTD is newly added to the lineup.

Available connector type:

Crimp type by JAPAN AVIATION ELECTRONICS INDUSTRY, LTD Solder type by HIROSE ELECTRIC CO., LTD.
Crimp type by HIROSE ELECTRIC CO., LTD. (added)

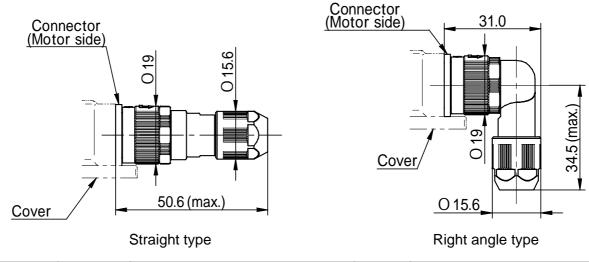
These connectors are applicable for all models of αi series and βi 0.4 to 22.

4. Added Specifications

Crimp type connector (Hirose Electric)

		For signal				
Connector	Straight type	HR34B-12WPA-	HR34B-12WPA-10SC or HR34B-12WPB-10SC (Hirose Electric's spec			
specification	Right angle type	HR34B-12WLPA	-10SC or HR34	4B-12WLF	PB-10SC	(Hirose Electric's spec.)
Contact s	pecification	Strip contact : HF	R34B-SC1-211	Loos	se piece co	ontact : HR34B-SC1-111
Applicable	e wire size	φ1.7mm or less				
C = == = = +! - -	Cable O.D	φ 5.7 to φ 7.3 : H	R34B-12WPA-	10SC or F	HR34B-12V	WLPA-10SC
Compatible	Cable O.D.	φ 6.5 to φ 8.0 : HR34B-12WPB-10SC or HR34B-12WLPB-10SC				
		Cable length:28m or less		Cable length:50m or less		
Used	5V,0V	0.3	mm² ×2		$0.5 \text{mm}^2 \times 2$	
wire	6V	C).3mm ²			0.5mm ²
	RD,*RD		Twi	st pair of a	at least 0.1	8mm ²
_		Handy crimping t	ool	HT102/F	HR34B-1	(Hirose Electric's spec.)
	Tool for crimping terminal		Main unit	CM-105		(Hirose Electric's spec.)
crimping			Applicator	AP105-I	HR34B-1	(Hirose Electric's spec.)
Tool for pulling terminal out		crimping tool Applicator AP105-HR34B-1 (Hirose Electric's spec.) RP6-SC-TP (Hirose Electric's spec.)				

The outside dimensions of each type of connector when engaged are shown below.



				Title	Feedback connector servo motor	for α <i>i</i> / β <i>i</i>	series
				Draw.	B-65262EN B-65302EN		I
01	08.11.17	Takamizawa	Terashima		•		
Edit	Date	Design	Description	FA	NUC LTD.	PAGE	2/3

	5. Atten							
						ELECTRIC CO., LTD is		
	different from the one of JAPAN AVIATION ELECTRONICS INDUSTRY, be sure to use the same maker's connector, contacts and crimping tool when assembling the							
	conne		aker 3 Connector,	contacts and cm	riping to	or when assembling the		
	COITIE	CIOI.						
					Title	Feedback connector for α <i>i</i> / β <i>i</i> series		
					15	servo motor		
					Draw.	B-65262EN/05 - 03 B-65302EN/03 - 01		
Ω1	00 11 17	Tokomizowo	i .	Taraahima		· · · · · · · · · · · · · · · · · · ·		

Terashima

Description

FANUC LTD.

PAGE

3/3

08.11.17

Date

Edit

Takamizawa

Design

FANUC AC SERVO MOTOR lpha i series DESCRIPTIONS lpha iS 12/6000, lpha iS 12/6000HV

1. Type of applied technical documents

Name	FANUC AC SERVO MOTOR $lpha i$ series DESCRIPTIONS
Spec. No. /Version	B-65262EN/05-04

2.Summary of Change

Group	Name	New, Add, Correct, Delete,	Applicable Data
Basic Function	AC Servo Motor $lpha i$ S 12/6000, $lpha i$ S 12/6000HV	New	Feb.2009
Optional Function			
Unit			
Maintenance Parts			
Notice			
Correction			
Another			

<u> </u>						
				AC SERVO MOTOR αi serie	es DESCI	RIPTIONS
				lpha iS 12/6000, $lpha i$ S 12/6000		
01	09.01.29	Funakubo	Newly designed	DRAW. No. B-65262EN/05-04		CUST.
Ed.	Date	Design.	Description	FANUC LTD	SHEET	1/12

1. GENERAL

Following motors are added to FANUC AC SERVO MOTOR α *i* series.

Motor model	Motor specification	Amplifier
α iS 12/6000	A06B-0230-Bxxx	160A (200V)
α <i>i</i> S 12/6000HV	A06B-0237-Bxxx	80A (400V)

2. SAFETY PRECAUTIONS

- Basically, it is same as the servo motor α *i*S series, so please follow FANUC AC SERVO MOTOR α *i* series DESCRIPTION B-65262EN.
- The load inertia must be smaller than the allowable load inertia mentioned bellow because of the restriction of DB (Dynamic Brake) resistance in the amplifier.

Refer to the following table.

Motor model	Allowable load inertia applied to motor shaft note) except the inertia of motor	Remark
α <i>i</i> S12/6000	0.01142 kgm ² (0.1165 kgfcms2)	5 times of motor inertia
α <i>i</i> S12/6000HV	0.01142 kgm² (0.1165 kgfcms2)	5 times of motor inertia

⚠ WARNING

If the motor and the amplifier are used with the large load inertia over than the allowable load inertia, the amplifier may be damaged.

				TITLE		
				AC SERVO MOTOR $lpha i$ serie	es DESCI	RIPTIONS
				lpha is 12/6000, $lpha i$ s 12/6000		
01	09.01.29	Funakubo	Newly designed	DRAW. No. B-65262EN/05-04		CUST.
Ed.	Date	Design.	Description	FANUC LTD	SHEET	1/12

3. ORDERING SPECIFICATION NUMBER

Models α *i*S 12/6000 α *i*S 12/6000HV

A06B-02xx-By0z#****

XX

30 : Model αiS 12/600037 : Model αiS 12/6000HV

У

0 : Taper shaft1 : Straight shaft

2: Straight shaft with key

3 : Taper shaft with 24VDC brake4 : Straight shaft with 24VDC brake

5: Straight shaft with key and 24VDC brake

note) When a large torque or sharp acceleration is required, the straight shaft with key should not be selected where possible.

<u>Z</u>

0: Pulsecoder αi A 1000
 1: Pulsecoder αi I 1000
 2: Pulsecoder αi A 16000

0000 : Standard type 0100 : IP67 type

4. CHARACTERISTICS CURVE AND DATA SHEET

 $\begin{array}{ll} \alpha \ \emph{i} \text{S} \ 12 \ \emph{6}000 & \text{Page} 6 \\ \alpha \ \emph{i} \text{S} \ 12 \ \emph{6}000 \ \emph{HV} & \text{Page} 7 \end{array}$

5. OUTLINE DRAWINGS

Motor model	Fig. No.
Models α iS 12/6000, α iS 12/6000HV	Fig.4(a)
Models α iS 12/6000, α iS 12/6000HV (with brake)	Fig.4(b)
Models α iS 12/6000, α iS 12/6000HV (shaft option)	Fig.4(c)

				TITLE		
				AC SERVO MOTOR $lpha i$ serie	es DESCI	RIPTIONS
				α <i>i</i> S 12/6000, α <i>i</i> S 12/6000		
01	09.01.29	Funakubo	Newly designed	DRAW. No. B-65262EN/05-04		CUST.
Ed.	Date	Design.	Description	FANUC LTD	SHEET	1/12

6.DATA FOR SELECTING PS

Motor model	Rating output	Maximum output at accelerating
α iS 12/6000	2.2kW	20kW
α iS 12/6000HV	2.2kW	20kW

Note)

These data is only for selecting the PS and it doesn't guarantee the power of motors.

7. COEFFICIENTS FOR CALCULATING THE DYNAMIC BRAKE STOPPING DISTANCE

SI unit

I	. Motor model	А	В	Jm(kgm²)
	α iS 12/6000	1.2E-01	3.6E-09	0.00228
	α iS 12/6000HV	2.1E-01	2.1E-09	0.00228

Gravitational system of units

. Motor model	А	В	Jm(kgfcms ²)
α iS 12/6000	1.2E-02	3.5E-10	0.0233
α <i>i</i> S 12/6000HV	2.0E-02	2.1E-10	0.0233

Caution as for Dynamic Brake

The load inertia must be smaller than the allowable load inertia mentioned bellow because of the restriction of DB (Dynamic Brake) resistance in the amplifier.

Refer to the following table.

Motor model	Allowable load inertia applied to motor shaft note) except the inertia of motor
αiS12/6000	0.01142 kgm² (0.1165 kgfcms²)
α <i>i</i> S12/6000HV	0.01142 kgm² (0.1165 kgfcms²)

⚠ WARNING

If the motor and the amplifier are used with the large load inertia over than the allowable load inertia, the amplifier may be damaged.

				TITLE			
				AC SERVO MOTOR $lpha i$ series DESCRIPTIONS			
				lpha is 12/6000, $lpha i$ s 12/6000			
01	09.01.29	Funakubo	Newly designed	DRAW. No. B-65262EN/05-04		CUST.	
Ed.	Date	Design.	Description	FANUC LTD	SHEET	1/12	

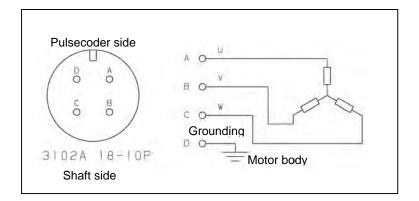
8. POWER CONNECTOR

MS18-10P compatible connector Manufacture: Hirose Electric

Manufacturer specification: H/MS3102A18-10P-D-T(10)

As the power connector a receptacle connector having a dripproof property by itself (when it is not engaged) is used as standard. Strictly speaking, this power connector does not meet the MS standard, but it can be used as a connector compatible with the MS-standard round connector.

The following shows the specification, shape, and pin layout of the power connector.



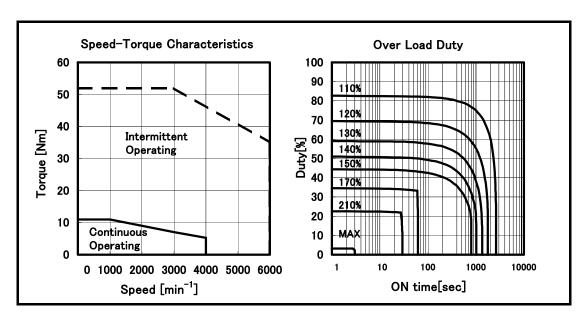
8. OTHER SPECIFICATIONS

Built –in brake, feedback sencer and the connector, allowable axis load, shaft run-out precision, other specifications, are the same as the servo motor α iS series.

Please refer to the following manual as for the datail not mentioned this manual.

FANUC AC SERVO MOTOR α *i* series DESCRIPTION B-65262EN.

				AC SERVO MOTOR αi series DESCRIPTIONS αi S 12/6000, αi S 12/6000			
01	09.01.29	Funakubo	Newly designed	DRAW. No. B-65262EN/05-04		CUST.	
Ed.	Date	Design.	Description	FANUC LTD	SHEET	1/12	



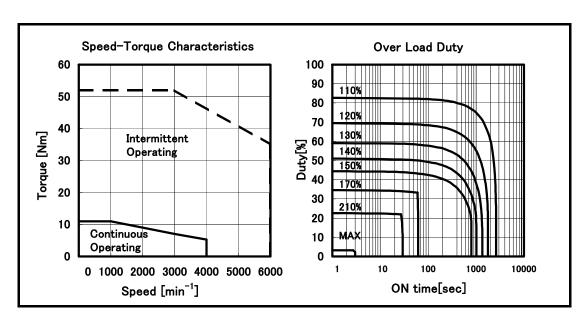
Data sheet

Parameter	Symbol		Value	Unit
Stall Torque (*)	Ts	11		Nm
		112		kgfcm
Stall Current (*)	Is	20.4		A (rms)
Rated Output (*)	Pr	2.2		kW
		3.0		HP
Rating Speed	Nr	4000		min ⁻¹
Maximum Speed	Nmax	6000		min ⁻¹
Maximum Torque (*)	Tmax	52		Nm
		531		kgfcm
Rotor Inertia	Jm	0.00228		kgm ²
		0.0233		kgfcms ²
Rotor Inertia (with Brake)	Jm	0.00235		kgm ²
		0.0240		kgfcms ²
Torque constant (*)	Kt	0.54		Nm/A (rms)
		5.5		kgfcm/A (rms)
Back EMF constant (1 phase) (*)	Ke	19		V (rms)/1000 min ⁻¹
	Kv	0.18		V (rms)sec/rad
Armature Resistance (1 phase) (*)	Ra	0.065		Ω
Mechanical time constant	tm	0.002		s
Thermal time constant	tt	25		min
Static friction	Tf	0.3		Nm
		3		kgfcm
Weight	W	11.9		kg
Weight (with Brake)	W	14.1		kg
Max. Current of Servo Amp.	Imax	160		A (peak)

^(*) The values are the standard values at 20°C and the tolerance is ±10%.

The speed-torque characteristics very depending on the type of software, parameter setting, and input voltage of the digital servo software. (The above figures show average values.)

				TITLE .			
				AC SERVO MOTOR $lpha l$ series DESCRIPTIONS			
				αis 12/6000, αis 12/6000			
01	09.01.29	Funakubo	Newly designed	DRAW. No. B-65262EN/05-04		CUST.	
Ed.	Date	Design.	Description	FANUC LTD	SHEET	1/12	



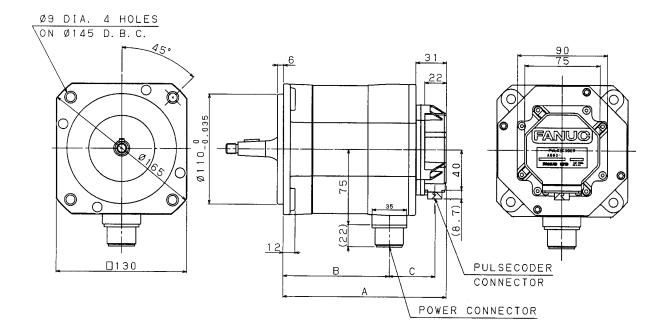
Data sheet

Data sheet						
Parameter	Symbol		Value	Unit		
Stall Torque (*)	Ts	11		Nm		
		112		kgfcm		
Stall Current (*)	ls	10.2		A (rms)		
Rated Output (*)	Pr	2.2		kW		
		3.0		HP		
Rating Speed	Nr	4000		min ⁻¹		
Maximum Speed	Nmax	6000		min ⁻¹		
Maximum Torque (*)	Tmax	52		Nm		
		531		kgfcm		
Rotor Inertia	Jm	0.00228		kgm ²		
		0.0233		kgfcms ²		
Rotor Inertia (with Brake)	Jm	0.00235		kgm ²		
		0.0240		kgfcms ²		
Torque constant (*)	Kt	1.08		Nm/A (rms)		
		11.0		kgfcm/A (rms)		
Back EMF constant (1phase) (*)	Ke	38		V (rms)/1000 min ⁻¹		
	Κv	0.36		V (rms)sec/rad		
Armature Resistance (1 phase) (*)	Ra	0.26		Ω		
Mechanical time constant	tm	0.002		S		
Thermal time constant	tt	25		min		
Static friction	Tf	0.3		Nm		
		3		kgfcm		
Weight	W	11.9		kg		
Weight (with Brake)	W	14.1		kg		
Max. Current of Servo Amp.	Imax	80		A (peak)		

(*) The values are the standard values at 20° C and the tolerance is $\pm 10^{\circ}$ M. The speed-torque characteristics very depending on the type of software, parameter setting, and input voltage of the digital servo software. (The above figures show average values.)

				TITLE			
				AC SERVO MOTOR $lpha i$ series DESCRIPTIONS			
				α <i>i</i> s 12/6000, α <i>i</i> s 12/6000			
01	09.01.29	Funakubo	Newly designed	DRAW. No. B-65262EN/05-04		CUST.	
Ed.	Date	Design.	Description	FANUC LTD	SHEET	1/12	

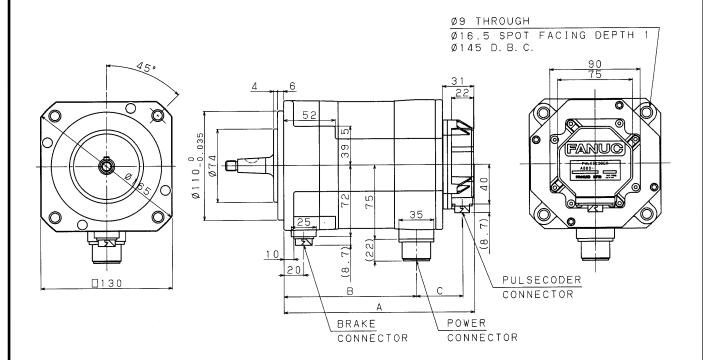
Fig.4(a) Models α iS 12/6000, α iS 12/6000HV



MODEL	Α	В	С
lpha i S 12/6000 $lpha$ i S 12/6000HV	222	164	47

				AC SERVO MOTOR αi series DESCRIPTIONS		
				αis 12/6000, αis 12/6000		
01	09.01.29	Funakubo	Newly designed	DRAW. No. B-65262EN/05-04 CUST.		CUST.
Ed.	Date	Design.	Description	FANUC LTD	SHEET	1/12

Fig.4(b) Models α *i*S 12/6000, α *i*S 12/6000HV (with brake)



MODEL	Α	В	С
α <i>i</i> S 12/6000	247	400	47
α <i>i</i> S 12/6000HV	247	189	47

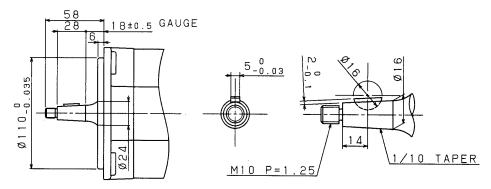
				AC SERVO MOTOR αi series DESCRIPTIONS αi S 12/6000, αi S 12/6000		
01	09.01.29	Funakubo	Newly designed	DRAW. No. B-65262EN/05-04 CUST.		CUST.
Ed.	Date	Design.	Description	FANUC LTD	SHEET	1/12

Fig.4(c) Models α iS 12/6000, α iS 12/6000HV (shaft option)

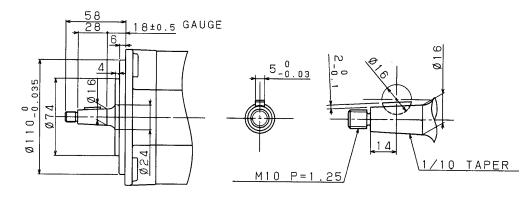
The shafts of the motors have the following shaps.

	Taper shaft	Straight shaft	Straight shaft with keyt way
α <i>i</i> S 12/6000 α <i>i</i> S 12/6000HV	Ф16	Ф24	Ф24

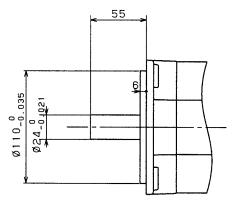
• Ф16 taper shaft (standard)



• Ф16 taper shaft (with a brake)

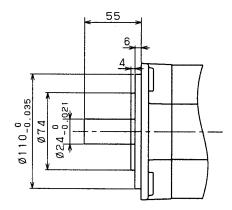


• Ф24 straight shaft (standard)

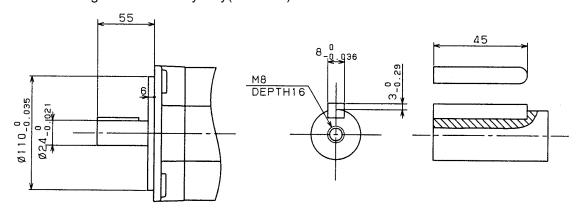


<u> </u>						
				AC SERVO MOTOR αi series DESCRIPTIONS		
				αi s 12/6000, αi s 12/6000		
01	09.01.29	Funakubo	Newly designed	DRAW. No. B-65262EN/05-04 CUST.		CUST.
Ed.	Date	Design.	Description	FANUC LTD	SHEET	1/12

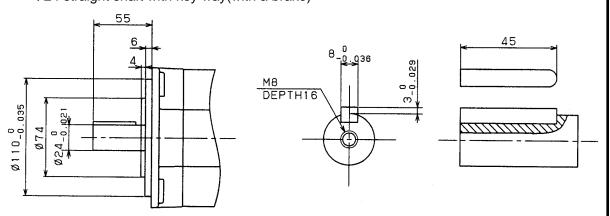
• Ф24 straight shaft (with a brake)



· Ф24 straight shaft with key way(standard)



• Ф24 straight shaft with key way(with a brake)



<u> </u>						
				AC SERVO MOTOR αi series DESCRIPTIONS		
				αi s 12/6000, αi s 12/6000		
01	09.01.29	Funakubo	Newly designed	DRAW. No. B-65262EN/05-04 CUST.		CUST.
Ed.	Date	Design.	Description	FANUC LTD	SHEET	1/12

10.THE STANDARD PARAMETER TABLE (HRV2 CONTROL)

Servo software doesn't support automatic setting so far (Jan. 2009). Please set the appropriate parameters manually according to the table as follows.

	Motor mod	lel	aiS12 /6000	aiS12 /6000HV A06B-0237 -B***	
	Motor Spe	cification	A06B-0230 -B***		
Symbol	FS15i	FS16i,30i etc			
	1808	2003	00001000	00001000	
	1809	2004	00000011	00000011	
	1883	2005	00000000	00000000	
	1884	2006	00000000	00000000	
	1951	2007	00000000	00000000	
	1952	2008	00000000	00000000	
	1953	2009	00000000	00000000	
	1954	2010	00000000	00000000	
	1955	2011	00000000	00000000	
	1956	2012	00000000	00000000	
	1707	2013	00000000	00000000	
	1707	2013	00000000	00000000	
	1750	2210	00000000	00000000	
	1751	2210	00000000	00000000	
				00000000	
	2713	2300	00000000		
	2714	2301	00000000	00000000	
PK1	1852	2040	471	47	
PK2	1853	2041	-2249	-224	
PK3	1854	2042	-1321	-132	
PK1V	1855	2043	43	4:	
PK2V	1856	2044	-387	-38	
PK3V	1857	2045	0		
PK4V	1858	2046	-8235	-823	
POA1	1859	2047	-980	-98	
BLCMP	1860	2048	0		
DPFMX	1861	2049	0		
POK1	1862	2050	956	95	
POK2	1863	2051	510	51	
RESERV	1864	2052	0		
PPMAX	1865	2053	21	2	
PDDP	1866	2054	1894	189	
PHYST	1867	2055	319	31:	
EMFCMP	1868	2056	0		
PVPA	1869	2057	-12808	-1280	
PALPH	1870	2058	-1800	-180	
	1871	2059			
PPBAS TQLIM	1872	2060	7282	728:	
EMFLMT	1873	2061	0	. 20.	
POVC1	1877	2062	32688	3268	
POVC2	1878	2063	998	99	
TGALMLV POVOLMT	1892 1893	2064	2960	296	
POVCLMT PK2VAUX	1894	2066	2960	290	
FILTER	1895	2067	0		
FALPH	1961	2068	0		
VFFLT	1962	2069	0		
ERBLM	1963	2070	0		
PBLCT SFCCML	1964 1965	2071	0		
<u>SPCCIVIL</u> PSPTL	1966	2073	0		
AALPH	1967	2074	12288	1228	
MODEL	1968	2075	0	1	
WKAC	1969	2076	0	1	

			aiS12 /6000	aiS12 /6000HV
Symbol	FS15i	FS16i,30i etc		
OSCTPL	1970	2077	0	0
PDPCH	1971	2078	0	0
PDPCL	1972	2079	0	0
DPFEX	1973	2080	0	0
DPFZW	1974	2081	0	0
BLENDL	1975	2082	0	0
MOFCTL	1976	2083	0	0
SDMR1	1977	2084	0	0
SDMR2	1978	2085	0	0
RTCURR	1979	2086	1181	1181
TDPLD	1980	2087	0	0
MCNFB	1981	2088	0	0
BLBSL	1982	2089	0	0
ROBSTL	1983	2090	0	0
ACCSPL	1984	2091	0	0
ADFF1	1985	2092	0	0
VMPK3V	1986	2093	0	0
BLCMP2	1987	2094	0	0
AHDRTL	1988	2095	0	0
RADUSL	1989	2096	0	0
SMCNT	1990	2097	0	0
DEPVPL	1991	2098	0	0
ONEPSL	1992	2099	400	400
INPA1	1993	2100	0	0
INPA2	1994	2101	0	0
DBLIM	1995	2102	0	0
ABVOF	1996	2103	0	0
ABTSH	1997	2104	0	0
TRQCST	1998	2105	837	837
LP24PA	1999	2106	037	007
VLGOVR	1700	2107	0	0
RESERV	1701	2107	0	0
	1702	2109	0	0
BELLTO			528	
MGSTCM	1703	2110		528
DETQLM	1704	2111	10260	10260
AMRDML NFILT	1705 1706	2112	0	0
141121	11100	2110	Ť	
NINTCT	1735	2127	1146	2292
MFWKCE	1736	2128	667	667
MFWKBL LP2GP	1752 1753	2129 2130	3850 0	3850 0
LP4GP	1754	2131	0	0
LP6GP	1755	2132	0	0
PHDLY1	1756	2133	7690	7690
PHDLY2 DGCSMM	1757	2134 2159	8990 0	8990
TRQCUP	1782 1783	2160	0	0
OVCSTP	1784	2161	0	0
POVC21	1785	2162	32764	32764
POVC22	1786	2163	45	45
POVCLMT2 MAXCRT	1787 1788	2164 2165	1721 165	1721 85

				TITLE		
				AC SERVO MOTOR $lpha i$ series DESCRIPTIONS		
				α <i>i</i> s 12/6000, α <i>i</i> s 12/6000		
01	09.01.29	Funakubo	Newly designed	DRAW. No. B-65262EN/05-04 CUST.		CUST.
Ed.	Date	Design.	Description	FANUC LTD	SHEET	1/12

FANUC AC SERVO MOTOR lpha i series DESCRIPTIONS lpha iS 4/6000, lpha iS 4/6000HV

1. Type of applied technical documents

Name	FANUC AC SERVO MOTOR $lpha i$ series DESCRIPTIONS
Spec. No. /Version	B-65262EN/05

2.Summary of Change

Group	Name	New, Add, Correct, Delete,	Applicable Data
Basic Function	AC Servo Motor $lpha i$ S 4/6000, $lpha i$ S 4/6000HV	New	Jun.2009
Optional Function			
Unit			
Maintenance Parts			
Notice			
Correction			
Another			

		TITLE			
			AC SERVO MOTOR αi series DESCRIP		DESCRIPTIONS
			α <i>i</i> s 4/6000, α <i>i</i> s 4/6000HV		
01	09.05.29	Hosoda	Newly designed	DRAW. No. B-65262EN/05-05	
Ed.	Date	Design.	Description	FANUC LTD	1/8

1. GENERAL

Following motors are added to FANUC AC SERVO MOTOR α *i* series.

Motor model	Motor specification number	Amplifier
α i S4/6000	A06B-0210-Bx0x	20A (200V)
α <i>i</i> S4/6000HV	A06B-0214-Bx0x	10A (400V)

2. ORDERING SPECIFICATION NUMBER

Models αi S 4/6000 αi S 4/6000HV

A06B-02ab-Bc0d#efgh

<u>ab</u>

10 : Model α*i*S4/600014 : Model α*i*S4/6000HV

<u>C</u>

0 : Taper shaft1 : Straight shaft

2: Straight shaft with key

3 : Taper shaft with 24VDC brake4 : Straight shaft with 24VDC brake

5: Straight shaft with key and 24VDC brake

Note) When a large torque or sharp acceleration is required, the straight shaft with key should not be selected where possible.

<u>d</u>

0 : Pulsecoder αi A 1000 1 : Pulsecoder αi I 1000 2 : Pulsecoder αi A 16000

<u>efgh</u>

0000 : Standard type 0100 : IP67 type

3. CHARACTERISTICS CURVE AND DATA SHEET

 α iS4/6000 Page5 α iS4/6000HV Page6

			TITLE .			
			AC SERVO MOTOR $lpha i$ series DESCRIP		RIPTIONS	
			lphais 4/6000, $lpha$ is 4/6000HV			
01	09.05.29	Hosoda	Newly designed	DRAW. No. B-65262EN/05-05 CUST.		CUST.
Ed.	Date	Design.	Description	FANUC LTD	SHEET	2/8

4. OUTLINE DRAWINGS

Outline drawing of these models are identical with those of α *i*S4/5000 (A06B-0215-Bx0x) and α *i*S4/5000HV (A06B-0216-Bx0x).

Please refer to the following manual.

FANUC AC SERVO MOTOR lpha i series DESCRIPTION B-65262EN/05

5. DATA FOR SELECTING PS

Motor model	Rating output	Maximum output at accelerating
α i S4/6000	1.0kW	2.9kW
α i s4/6000HV	1.0kW	2.9kW

Note)

These data are only for selecting the PS and aren't guarantee power of motors.

6. COEFFICIENTS FOR CALCULATING THE DYNAMIC BRAKE CALCULATION

(200V)

Model	SI	unit	Gravitational system of units		
	Α	В	Α	В	
α <i>i</i> S4/6000	1.1×10^{-1}	8.3×10^{-8}	1.1 × 10 ⁻²	8.2×10^{-9}	

(400V)

Model	SI	unit	Gravitational system of units		
	А	В	Α	В	
α <i>i</i> S4/6000HV	3.8×10^{-1}	2.6×10^{-8}	3.8×10^{-2}	2.6×10^{-9}	

Note)

When servo amplifier αi SV20/40(L axis) is used to drive model αi S4/6000, the values of A and B are as follows.

(200V)In case of using to drive servo amplifier αi SV20/40

Model	SI	unit	Gravitational system of units		
	Α	В	Α	В	
α <i>i</i> S4/6000	4.6×10^{-1}	2.1×10^{-8}	4.5×10^{-2}	2.0×10^{-9}	

			TITLE .			
			AC SERVO MOTOR $lpha i$ series DES		es DESCI	RIPTIONS
			αis 4/6000, αis 4/6000HV			
01	09.05.29	Hosoda	Newly designed	DRAW. No. B-65262EN/05-05 CUST.		CUST.
Ed.	Date	Design.	Description	FANUC LTD	SHEET	3/8

<u>7. (</u>	OTHER SI	PECIFICA	<u>TIONS</u>
			Other specifications such as built–in brake, feedback sensor and connector and so on are the same as specifications of AC Servo Motor αi S4/5000 (A06B-0215-Bx0x) and αi S4/5000HV (A06B-0216-Bx0x). Please refer to the following manual as for details not mentioned this manual.
			FANUC AC SERVO MOTOR $lpha i$ series DESCRIPTION B-65262EN/05
			TITLE
			AC SERVO MOTOR $lpha i$ series DESCRIPTIONS $lpha i$ S 4/6000HV
			1

DRAW. No.

B-65262EN/05-05

FANUC LTD

CUST.

4/8

01 09.05.29

Date

Ed.

Hosoda

Design.

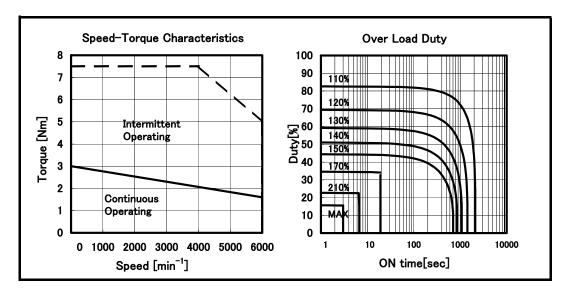
Newly designed

Description

8. CHARACTERISTICS CURVE AND DATA SHEET

Model αi S 4/6000

Specification A06B-0210-B□0□

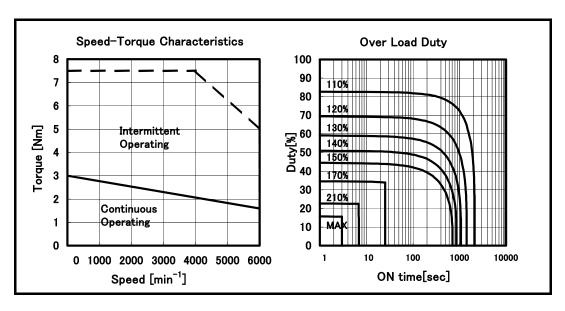


Data sheet

Parameter	Symbol		Value	Unit
Stall Torque (*)	Ts	3.0		Nm
		31		kgfcm
Stall Current (*)	ls	5.6		A (rms)
Rated Output (*)	Pr	1.0		kW
		1.3		HP
Rating Speed	Nr	6000		min ⁻¹
Maximum Speed	Nmax	6000		min ⁻¹
Maximum Torque (*)	Tmax	7.5		Nm
		77		kgfcm
Rotor Inertia	Jm	0.000515		kgm ²
		0.00526		kgfcms ²
Rotor Inertia (with Brake)	Jm	0.000535		kgm ²
		0.00546		kgfcms ²
Torque constant (*)	Kt	0.54		Nm/A (rms)
		5.5		kgfcm/A (rms)
Back EMF constant (1phase) (*)	Ke	19		V (rms)/1000 min ⁻¹
	Kv	0.18		V (rms)sec/rad
Armature Resistance (1 phase) (*)	Ra	0.61		Ω
Mechanical time constant	tm	0.003		s
Thermal time constant	tt	20		min
Static friction	Tf	0.2		Nm
		2		kgfcm
Weight	W	4.5		kg
Weight (with Brake)	W	5.5		kg
Max. Current of Servo Amp.	lmax	20		A (peak)

^(*) The values are the standard values at 20°C and the tolerance is ±10%. The speed-torque characteristics very depending on the type of software, parameter setting, and input voltage of the digital servo software. (The above figures show average values.)

			TITLE AC SERVO MOTOR αi series DESCRIPTIONS			RIPTIONS
			α <i>i</i> s 4/6000, α <i>i</i> s 4/6000HV			
01	09.05.29	Hosoda	Newly designed	ewly designed B-65262EN/05-05		CUST.
Ed.	Date	Design.	Description	FANUC LTD	SHEET	5/8



Data sheet

Parameter	Symbol		Value	Unit
Stall Torque (*)	Ts	3.0		Nm
		31		kgfcm
Stall Current (*)	ls	2.8		A (rms)
Rated Output (*)	Pr	1.0		kW
		1.3		HP
Rating Speed	Nr	6000		min ⁻¹
Maximum Speed	Nmax	6000		min ⁻¹
Maximum Torque (*)	Tmax	7.5		Nm
		77		kgfcm
Rotor Inertia	Jm	0.000515		kgm ²
		0.00526		kgfcms ²
Rotor Inertia (with Brake)	Jm	0.000535		kgm ²
		0.00546		kgfcms ²
Torque constant (*)	Kt	1.08		Nm/A (rms)
		11.0		kgfcm/A (rms)
Back EMF constant (1phase) (*)	Ke	38		V (rms)/1000 min ⁻¹
	Kv	0.36		V (rms)sec/rad
Armature Resistance (1 phase) (*)	Ra	2.8		Ω
Mechanical time constant	tm	0.004		S
Thermal time constant	tt	20		min
Static friction	Tf	0.2		Nm
		2		kgfcm
Weight	w	4.5		kg
Weight (with Brake)	W	5.5		kg
Max. Current of Servo Amp.	Imax	10		A (peak)

^(*) The values are the standard values at 20° C and the tolerance is $\pm 10\%$.

The speed-torque characteristics very depending on the type of software, parameter setting, and input voltage of the digital servo software. (The above figures show average values.)

				TITLE		
				AC SERVO MOTOR $lpha i$ serie	es DESCI	RIPTIONS
				lpha iS 4/6000, $lpha i$ S 4/6000HV		
01	09.05.29	Hosoda	Newly designed	DRAW. No. B-65262EN/05-05		CUST.
Ed.	Date	Design.	Description	FANUC LTD	SHEET	6/8

9. THE STANDARD PARAMETER TABLE (HRV2 CONTROL)

Servo software doesn't support automatic setting so far (Jun. 2009).

Please set the appropriate parameters manually according to the table as follows.

CAUTION

If motors are used in wrong parameters, these may become broken.

		Motor model	αiS4/6000	SFCCML	1965	2072	0
		Motor	0210	PSPTL	1966	2073	0
		specification		AALPH	1967	2074	16384
		Control	HRV2	OSCTPL	1970	2077	0
Symbol	FS15 <i>i</i>	FS16i etc.		PDPCH	1971	2078	0
	1808	2003	00001000	PDPCL	1972	2079	0
	1809	2004	00000011	DPFEX	1973	2080	0
	1883	2005	00000000	DPFZW	1974	2081	0
	1884	2006	00000000	BLENDL	1975	2082	0
	1951	2007	00000000	MOFCTL	1976	2083	0
	1952	2008	00000000	RTCURR	1979	2086	2585
	1953	2009	00000000	TDPLD	1980	2087	0
	1954	2010	00000000	MCNFB	1981	2088	0
	1955	2011	00000000	BLBSL	1982	2089	0
	1956	2012	00000000	ROBSTL	1983	2089	
	1707	2013	00000000	ACCSPL	1984	2090	0
	1708	2014	00000000				0
	1750	2210	00000000	ADFF1	1985	2092	-
	1751	2211	00001010	VMPK3V	1986	2093	0
	2713	2300	00000000	BLCMP2	1987	2094	0
	2714	2301	00000000	AHDRTL	1988	2095	0
PK1	1852	2040	395	RADUSL	1989	2096	0
PK2	1853	2041	-1606	SMCNT	1990	2097	0
PK3	1854	2042	-1277	DEPVPL	1991	2098	0
PK1V	1855	2042	76	ONEPSL	1992	2099	400
PK2V	1856	2043	-678	INPA1	1993	2100	0
PK3V	1857	2044 2045	-078	INPA2	1994	2101	0
PK4V	1858	2045 2046	-8235	DBLIM	1995	2102	0
POA1		2046 2047		ABVOF	1996	2103	0
	1859		5601	ABTSH	1997	2104	0
BLCMP	1860	2048	0	TRQCST	1998	2105	104
DPFMX	1861	2049	0	LP24PA	1999	2106	0
POK1	1862	2050	956	VLGOVR	1700	2107	0
POK2	1863	2051	510	RESERV	1701	2108	0
RESERV	1864	2052	0	BELLTC	1702	2109	0
PPMAX	1865	2053	21	MGSTCM	1703	2110	3092
PDDP	1866	2054	1894	DETQLM	1704	2111	8208
PHYST	1867	2055	319	AMRDML	1705	2112	0
EMFCMP	1868	2056	0	NFILT	1706	2113	0
PVPA	1869	2057	-13326	NINTCT	1735	2127	660
PALPH	1870	2058	-2500	MFWKCE	1736	2128	3000
PPBAS	1871	2059	0	MFWKBL	1752	2129	4365
TQLIM	1872	2060	7282	LP2GP	1753	2130	0
EMFLMT	1873		0	LP4GP	1754	2131	0
POVC1	1877	2062	32310	LP6GP	1755	2132	0
POVC2	1878	2063	5728	PHDLY1	1756	2133	7690
TGALMLV	1892	2064	4	PHDLY2	1757	2134	12830
POVCLMT	1893	2065	17091	DGCSMM	1782	2159	0
PK2VAUX	1894	2066	0	TRQCUP	1783	2160	0
FILTER	1895	2067	0	RESERV	1784	2161	0
FALPH	1961	2068	0	POVC21			22762
VFFLT	1962	2069	0	POVC21	1785	2162	32763
ERBLM	1963		0		1786	2163	58
PBLCT	1964		0	POVCLMT2	1787	2164	9912
I. 250 i	1304	2011	۰	MAXCRT	1788	2165	25

				TITLE		
				AC SERVO MOTOR $lpha i$ serie	es DESCI	RIPTIONS
				lpha iS 4/6000, $lpha i$ S 4/6000HV		
01	09.05.29	Hosoda	Newly designed	DRAW. No. B-65262EN/05-05		CUST.
Ed.	Date	Design.	Description	FANUC LTD	SHEET	7/8

			Motor model	αiS4/6000HV	SFCCML	1965	2072	0
			Motor	A06B-0214-Bx0x	PSPTL	1966	2073	0
			specification	LID) (O	AALPH	1967	2074	16384
0 1 1	E045:		Control	HRV2	OSCTPL	1970	2077	0
Symbol	FS15 <i>i</i>	4000	FS16 <i>i</i> etc.	00004000	PDPCH	1971	2078	0
		1808	2003	00001000	PDPCL	1972	2079	O
		1809	2004	00000011	DPFEX	1973	2080	0
		1883	2005	00000000	DPFZW	1974	2081	0
		1884	2006	00000000	BLENDL	1975	2082	C
		1951	2007	00000000	MOFCTL	1976	2083	C
		1952	2008	0000000	RTCURR	1979	2086	2586
		1953	2009	00000000	TDPLD	1980	2087	2000
		1954	2010	00000000	MCNFB	1981	2088	C
		1955	2011	00000000	BLBSL	1982	2089	0
		1956	2012	00000000	ROBSTL	1983	2090	0
		1707	2013	00000000	ACCSPL	1984	2090	0
		1708	2014	00000000	ADFF1	1985	2092	0
		1750	2210	00000000	VMPK3V			0
		1751	2211	00001010		1986	2093	-
		2713	2300	00000000	BLCMP2	1987	2094	0
		2714	2301	00000000	AHDRTL	1988	2095	0
PK1		1852	2040	432	RADUSL	1989	2096	0
PK2		1853	2041	-1673	SMCNT	1990	2097	0
PK3		1854	2042	-1266	DEPVPL	1991	2098	0
PK1V		1855	2043	77	ONEPSL	1992	2099	400
PK2V		1856	2044	-688	INPA1	1993	2100	0
PK3V		1857	2045	0	INPA2	1994	2101	0
PK4V		1858	2046	-8235	DBLIM	1995	2102	0
POA1		1859	2047	5516	ABVOF	1996	2103	0
BLCMP		1860	2048	0	ABTSH	1997	2104	0
DPFMX		1861	2049	0	TRQCST	1998	2105	104
POK1		1862	2050	956	LP24PA	1999	2106	0
POK2		1863	2051	510	VLGOVR	1700	2107	0
RESERV		1864	2052	0	RESERV	1701	2108	0
PPMAX		1865	2053	21	BELLTC	1702	2109	0
PDDP		1866	2054	1894	MGSTCM	1703	2110	3092
PHYST		1867	2055	319	DETQLM	1704	2111	8208
EMFCMP		1868	2056	0	AMRDML	1705	2112	0
PVPA		1869	2057	-13326		1706	2113	0
PALPH		1870	2058	-2500	NINTCT	1735	2127	1368
PPBAS		1871	2059	0	MFWKCE	1736	2128	3000
TQLIM		1872	2060	7282	MFWKBL	1752	2129	4365
EMFLMT		1873	2061	7202	LP2GP	1753	2130	0
POVC1		1877	2062	22288	LP4GP	1754	2131	0
POVC1		1878	2063	52200	LP6GP	1755	2132	0
TGALMLV		1892	2063 2064		PHDLY1	1756	2133	7690
POVCLMT		1893	2064 2065		PHDLY2	1757	2134	12830
PK2VAUX					DGCSMM	1782	2159	12030
		1894	2066 2067	0	TRQCUP	1783	2160	0
FILTER		1895		_	RESERV	1784	2161	0
FALPH		1961	2068	_				00700
VFFLT		1962	2069		POVC21	1785	2162	32763
ERBLM		1963	2070		POVC22	1786	2163	63
PBLCT		1964	2071		POVCLMT2	1787	2164	10651
SFCCML		1965	2072	0	MAXCRT	1788	2165	10

				AC SERVO MOTOR αi serie	es DESCI	RIPTIONS
				lpha is 4/6000, $lpha i$ s 4/6000HV		
01	09.05.29	Hosoda	Newly designed	DRAW. No. B-65262EN/05-05		CUST.
Ed.	Date	Design.	Description	FANUC LTD	SHEET	8/8

FANUC AC SERVO MOTOR αi series DESCRIPTIONS αi S 50/2000, αi S 50/2000HV, αi S 60/2000, αi S 60/2000HV, αi S 60/3000 with Fan, αi S 60/3000HV with Fan

1. Type of applied technical documents

Name	FANUC AC SERVO MOTOR $lpha i$ series DESCRIPTIONS
Spec. No. /Version	B-65262EN/05

2.Summary of Change

Group	Name	New, Add, Correct, Delete,	Applicable Data
Basic Function	AC Servo Motor αi S 50/2000, αi S 50/2000HV, αi S 60/2000, αi S 60/2000HV, αi S 60/3000 with Fan, αi S 60/3000HV with Fan	New	Jul.2009
Optional Function			
Unit			
Maintenance Parts			
Notice			
Correction			
Another			

				TITLE AC SERVO MOTOR αi series αi S 50/2000, αi S 60/2000,
02	09.08.27	Lee	Correct errors	αi S 60/3000 with Fan
01	09.07.24	Lee	Newly designed	DRAW. No. B-65262EN/05-06 CUST.
Ed.	Date	Design.	Description	FANUC LTD SHEET 1/24

1. GENERAL

This description shows the specification of the following motors.

FANUC AC SERVO MOTOR αi series

- · ais 50/2000
- · αis 50/2000HV
- · ais 60/2000
- · ais 60/2000HV
- · α*i*S 60/3000 with Fan
- · αi S 60/3000HV with Fan

Note)

These motors are based on IEC60034-1.

The items that are not mentioned this report correspond to FANUC AC SERVO MOTOR αi series .

Please refer to FANUC AC SERVO MOTOR αi series DESCRIPTION B-65262EN, too.

				TITLE AC SERVO MOTOR αi series αi S 50/2000, αi S 60/2000,
02	09.08.27	Lee	Correct errors	αi S 60/3000 with Fan
01	09.07.24	Lee	Newly designed	DRAW. No. B-65262EN/05-06 CUST.
Ed.	Date	Design.	Description	FANUC LTD SHEET 2/24

2. TYPE OF MOTORS AND DESIGNATION

Motor specification numbers have the following format.

αίς 50/2000, αίς 50/2000 ΗΥ, αίς 60/2000, αίς 60/2000ΗΥ

A06B-aaaa-Bbcd#efgh

aaaa

The ordering specification number are described on the following table.

<u>bc</u>

00 : Taper Shaft Type10 : Straight Shaft Type

32 : Taper Shaft Type , With a high-torque (70Nm, 24VDC) Brake
 42 : Straight Shaft Type , With a high-torque (70Nm, 24VDC) Brake

* Brake is high-torque (70Nm) brake only.

d

9 : Pulsecoder αiA 1000
 1 : Pulsecoder αiI 1000
 2 : Pulsecoder αiA 16000

efgh

0000: Standard

0100: IP67 specification
* Omitted in case of #0000

αis 60/3000 with Fan, αis 60/3000 HV with Fan

A06B-aaaa-Bbcd#efgh

<u>aaaa</u>

The ordering specification number are described on the following table.

<u>bc</u>

11 : Taper Shaft Type, With a fan11 : Straight Shaft Type, With a fan

Taper Shaft Type , With a high-torque (70Nm, 24VDC) Brake, With a fan
 Straight Shaft Type , With a high-torque (70Nm, 24VDC) Brake, With a fan

* Brake is high-torque (70Nm) brake only.

				TITLE AC SERVO MOTOR α <i>i</i> series α <i>i</i> S 50/2000, α <i>i</i> S 60/2000,
02	09.08.27	Lee	Correct errors	αi S 60/3000 with Fan
01	09.07.24	Lee	Newly designed	DRAW. No. B-65262EN/05-06 CUST.
Ed.	Date	Design.	Description	FANUC LTD SHEET 3/24

<u>d</u>

9 Pulsecoder αiA 1000
 1 Pulsecoder αiI 1000
 2 Pulsecoder αiA 16000

<u>efgh</u>

0000: Standard

* Omitted in case of #0000 * There isn't IP67 type.

The following table lists the allowable combinations of numbers represented symboles in ordering specification numbers.

A06B-aaaa-Bbcd#efgh

Symbol in specification No.	<u>aaaa</u>		<u>t</u>	<u>)</u>			<u>(</u>	2			<u>d</u>		<u>ef</u> g	g <u>h</u>
Servo Motor Name		0	1	3	4	0	1	2	3	0	1	2	0000	0100
α i S 50/2000	0042	0	0	-	-	0	-	-	-	0	0	0	0	0
0.13 50/2000	0042	-	-	0	0	-	-	0	-	0	0	0	0	0
0/40 50/0000 111/	0040	0	0	-	-	0	-	-	-	0	0	0	0	0
α <i>i</i> S 50/2000 HV	0043	-	-	0	0	-	-	0	-	0	0	0	0	0
α i S 60/2000	0044	0	0	•	-	0	-	-	-	0	0	0	0	0
W15 60/2000	0044	-	1	0	0	1	-	0	-	0	0	0	0	0
0/40 00/0000 LIV	0045	0	0	•	•	0	•	•	-	0	0	0	0	0
α i S 60/2000 HV	0045	-	•	0	0	•	-	0	-	0	0	0	0	0
α i S 60/3000		0	0	•	•	•	0	-	•	0	0	0	0	-
with Fan	0278	-	-	0	0	-	-	-	0	0	0	0	0	-
α i S 60/3000 HV	0070	0	0	-	-	-	0	-	-	0	0	0	0	-
with Fan	0279	-	-	0	0	-	-	-	0	0	0	0	0	-

^{*} Brake is high-torque (70Nm) brake.

				AC SERVO MOTOR αi series αi S 50/2000, αi S 60/2000,
02	09.08.27	Lee	Correct errors	αi S 60/3000 with Fan
01	09.07.24	Lee	Newly designed	DRAW. No. B-65262EN/05-06 CUST.
Ed.	Date	Design.	Description	FANUC LTD SHEET 4/24

3. APPLICABLE AMPLIFIER

Combinations of the lpha iS servo motors and the lpha iSV servo amplifiers

	inations of the 410 servo motors and the 410 v servo ampliners								
	RVO TOR	α i S 50 /2000	α i S 50 /2000HV	α i S 60 /2000	α i S 60 /2000 HV	0.1 S 60 /3000 with Fan	(3000 HV) with Fan		
α <i>i</i> SV 160	-	0		0					
α <i>i</i> SV 160L	-	0		0					
α i SV 80/160	M axis	0		0					
••••	L axis	0		0					
α i SV 160/160	M axis	0		0					
α i SV 80HV	-		0		0				
αi SV 80HVL	-		0		0				
α i SV 40/80HV	M axis		0		0				
	L axis		0		0				
Œ i SV 80/80HV	M axis		0		0				
α i SV 360	-					0			
α i SV 180HV	-						0		

A CAUTION

- 1 If a motor is used in a combination other than those listed above, it may become broken.
- 2 For details on the servo amplifier, refer to "FANUC SERVO AMPLIFIER αi series DESCRIPTIONS (B-65282EN)" .

Output data for selecting αi PS amplifiers

MOTOR MODEL	Continuous output	Maximum output
α i S 50/2000	4kW	21kW
α i S 50/2000 HV	4kW	21kW
α <i>i</i> s 60/2000	5kW	25kW
α i S 60/2000 HV	5kW	25kW
α <i>i</i> S 60/3000 with FAN	14kW	40kW
α <i>i</i> S 60/3000 HV with FAN	14kW	40kW

A CAUTION

1 These data is only for selecting the PS and it doesn't guarantee the power of motors.

				AC SERVO MOTOR αi series αi S 50/2000, αi S 60/2000, αi S 60/3000 with Fan		es
02	09.08.27	Lee	Correct errors			
01	09.07.24	Lee	Newly designed	DRAW. No. B-65262EN/05-06 CUST.		CUST.
Ed.	Date	Design.	Description	cription FANUC LTD		5/24

4. COEFFICIENTS FOR CALCULATING THE DYNAMIC BRAKE STOPPING DISTANCE

SI unit

Motor model	А	В
α <i>i</i> S 50/2000	1.3×10 ⁻²	2.3×10 ⁻⁹
α <i>i</i> s 50/2000 HV	2.2×10 ⁻²	1.3×10 ⁻⁹
α i S 50/2000	1.0×10 ⁻²	1.7×10 ⁻⁹
α <i>i</i> s 50/2000 HV	1.7×10 ⁻²	9.8×10 ⁻¹⁰
α <i>i</i> S 60/3000 with FAN	1.2×10 ⁻²	1.4×10 ⁻⁹
α <i>i</i> S 60/3000 HV with FAN	3.8×10 ⁻³	4.4×10 ⁻⁹

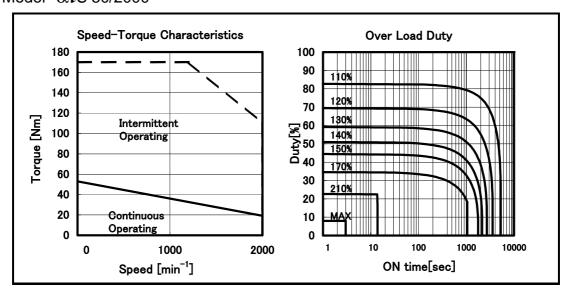
				TITLE AC SERVO MOTOR αi series			
02	09.08.27	Lee	Correct errors	lpha iS 50/2000, $lpha i$ S 60/2000, $lpha i$ S 60/3000 with Fan			
01	09.07.24	Lee	Newly designed	DRAW. No. B-65262EN/05-06 CUST.			
Ed.	Date	Design.	Description	FANUC LTD SHEET 6/24			

5. SPECIFICATIONS

Model αi S 50/2000

Specification: A06B-0042-B*0*

A06B-0042-B*2*



Data sheet

Parameter	Symbol		Value	Unit
Stall Torque (*)	Ts	53		Nm
		541		kgfcm
Stall Current (*)	ls	32.0		A (rms)
Rated Output (*)	Pr	4.0		kW
		5.4		HP
Rating Speed	Nr	2000		min ⁻¹
Maximum Speed	Nmax	2000		min ⁻¹
Maximum Torque (*)	Tmax	170		Nm
		1730		kgfcm
Rotor Inertia	Jm	0.0145		kgm ²
		0.148		kgfcms ²
Rotor Inertia(with 70Nm Brake)	Jm	0.0154		kgm ²
		0.157		kgfcms ²
Torque constant (*)	Kt	1.66		Nm/A (rms)
		16.9		kgfcm/A (rms)
Back EMF constant (1phase) (*)	Ke	58		V (rms)/1000 min ⁻¹
	Κv	0.55		V (rms)sec/rad
Armature Resistance (1 phase) (*)	Ra	0.077		Ω
Mechanical time constant	tm	0.001		S
Thermal time constant	tt	50		min
Static friction	Tf	1.8		Nm
		18		kgfcm
Weight	W	39		kg
Weight(with 70Nm Brake)	W	49		kg
Max. Current of Servo Amp.	Imax	160		A (peak)

^(*) The values are the standard values at 20°C and the tolerance is ±10%.

The speed-torque characteristics very depending on the type of software, parameter setting, and input voltage of the digital servo software. (The above figures show average values.)

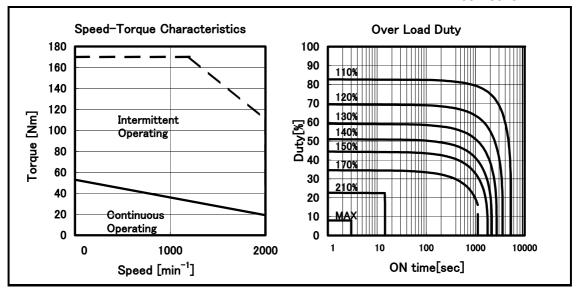
Overload Duty shows the specification for rotating, and if the motor is stopping, Soft Alarm will occur shorter time. When the motor speed is less than 1 rpm for over 10 sec., use under stall torque.

				TITLE AC SERVO MOTOR αi series αi S 50/2000, αi S 60/2000,
02	09.08.27	Lee	Correct errors	αi S 60/3000 with Fan
01	09.07.24	Lee	Newly designed	DRAW. No. B-65262EN/05-06 CUST.
Ed.	Date	Design.	Description	FANUC LTD SHEET 7/24

Model α*i*S 50/2000 HV

Specification: A06B-0043-B*0*

A06B-0043-B*2*



Data sheet

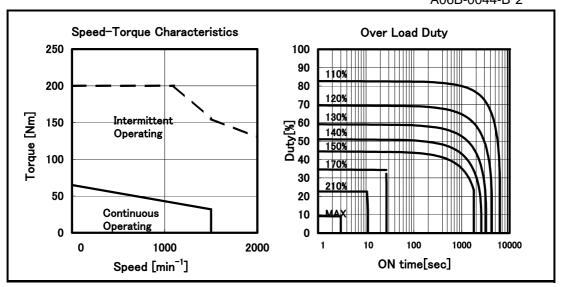
Parameter	Symbol Value			Unit	
Stall Torque (*)	Ts	53		Nm	
		541		kgfcm	
Stall Current (*)	ls	16.0		A (rms)	
Rated Output (*)	Pr	4.0		kW	
		5.4		HP	
Rating Speed	Nr	2000		min ⁻¹	
Maximum Speed	Nmax	2000		min ⁻¹	
Maximum Torque (*)	Tmax	170		Nm	
		1730		kgfcm	
Rotor Inertia	Jm	0.0145		kgm ²	
		0.148		kgfcms ²	
Rotor Inertia(with 70Nm Brake)	Jm	0.0154		kgm ²	
		0.157		kgfcms ²	
Torque constant (*)	Kt	3.3		Nm/A (rms)	
		34		kgfcm/A (rms)	
Back EMF constant (1phase) (*)	Ke	115		V (rms)/1000 min ⁻¹	
	Κv	1.1		V (rms)sec/rad	
Armature Resistance (1 phase) (*)	Ra	0.31		Ω	
Mechanical time constant	tm	0.001		s	
Thermal time constant	tt	50		min	
Static friction	Tf	1.8		Nm	
		18		kgfcm	
Weight	w	39		kg	
Weight(with 70Nm Brake)	W	49		kg	
Max. Current of Servo Amp.	lmax	80		A (peak)	

^(*) The values are the standard values at 20°C and the tolerance is ±10%. The speed-torque characteristics very depending on the type of software, parameter setting, and input voltage of the digital servo software. (The above figures show average values.)

				TITLE AC SERVO MOTOR αi series αi S 50/2000, αi S 60/2000,		
02	09.08.27	Lee	Correct errors	αi S 60/3000 with Fan		
01	09.07.24	Lee	Newly designed	DRAW. No. B-65262EN/05-06 CUST.		CUST.
Ed.	Date	Design.	Description	FANUC LTD	SHEET	8/24

Model αi S 60/2000

Specification : A06B-0044-B*0* A06B-0044-B*2*



Data sheet

Parameter	Symbol		Value	Unit
Stall Torque (*)	Ts	65		Nm
		663		kgfcm
Stall Current (*)	ls	34.3		A (rms)
Rated Output (*)	Pr	5.0		kW
		6.7		HP
Rating Speed	Nr	1500		min ⁻¹
Maximum Speed	Nmax	2000		min ⁻¹
Maximum Torque (*)	Tmax	200		Nm
		2040		kgfcm
Rotor Inertia	Jm	0.0195		kgm ²
		0.199		kgfcms ²
Rotor Inertia(with 70Nm Brake)	Jm	0.0204		kgm ²
		0.208		kgfcms ²
Torque constant (*)	Kt	1.89		Nm/A (rms)
		19.3		kgfcm/A (rms)
Back EMF constant (1phase) (*)	Ke	66		V (rms)/1000 min ⁻¹
	Kv	0.63		V (rms)sec/rad
Armature Resistance (1 phase) (*)	Ra	0.074		Ω
Mechanical time constant	tm	0.001		s
Thermal time constant	tt	60		min
Static friction	Tf	1.8		Nm
		18		kgfcm
Weight	w	50		kg
Weight(with 70Nm Brake)	W	60		kg
Max. Current of Servo Amp.	lmax	160		A (peak)

^(*) The values are the standard values at 20°C and the tolerance is $\pm 10\%$.

The speed-torque characteristics very depending on the type of software, parameter setting, and input voltage of the digital servo software. (The above figures show average values.)

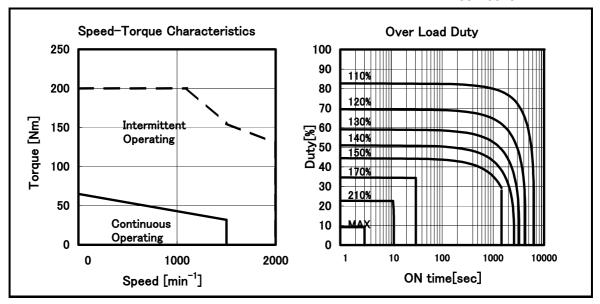
Overload Duty shows the specification for rotating, and if the motor is stopping, Soft Alarm will occur shorter time. When the motor speed is less than 1 rpm for over 10 sec., use under stall torque.

				AC SERVO MOTOR αi series αi S 50/2000, αi S 60/2000,		
02	09.08.27	Lee	Correct errors	αi S 60/3000 with Fan		
01	09.07.24	Lee	Newly designed	DRAW. No. B-65262EN/05-06 CUST.		
Ed.	Date	Design.	Description	FANUC LTD SHEET 9/24		

Model αi S 60/2000 HV

Specification : A06B-0045-B*0*

A06B-0045-B*2*



Data sheet

Parameter	Symbol		Value	Unit	
Stall Torque (*)	Ts	65		Nm	
		663		kgfcm	
Stall Current (*)	ls	17.2		A (rms)	
Rated Output (*)	Pr	5.0		kW	
		6.7		HP	
Rating Speed	Nr	1500		min ⁻¹	
Maximum Speed	Nmax	2000		min ⁻¹	
Maximum Torque (*)	Tmax	200		Nm	
		2040		kgfcm	
Rotor Inertia	Jm	0.0195		kgm ²	
		0.199		kgfcms ²	
Rotor Inertia(with 70Nm Brake)	Jm	0.0204		kgm ²	
		0.208		kgfcms ²	
Torque constant (*)	Kt	3.8		Nm/A (rms)	
		39		kgfcm/A (rms)	
Back EMF constant (1phase) (*)	Ke	132		V (rms)/1000 min ⁻¹	
	Κv	1.3		V (rms)sec/rad	
Armature Resistance (1 phase) (*)	Ra	0.30		Ω	
Mechanical time constant	tm	0.001		S	
Thermal time constant	tt	60		min	
Static friction	Tf	1.8		Nm	
		18		kgfcm	
Weight	w	50		kg	
Weight(with 70Nm Brake)	W	60		kg	
Max. Current of Servo Amp.	lmax	80		A (peak)	

^(*) The values are the standard values at 20°C and the tolerance is $\pm 10\%$.

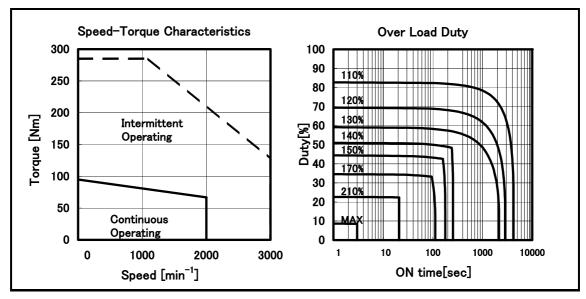
The speed-torque characteristics very depending on the type of software, parameter setting, and input voltage of the digital servo software. (The above figures show average values.)

				TITLE AC SERVO MOTOR α <i>i</i> series α <i>i</i> S 50/2000, α <i>i</i> S 60/2000,
02	09.08.27	Lee	Correct errors	αi S 60/3000 with Fan
01	09.07.24	Lee	Newly designed	DRAW. No. B-65262EN/05-06 CUST.
Ed.	Date	Design.	Description	FANUC LTD SHEET 10/24

Model αi S 60/3000 with Fan

Specification : A06B-0278-B*1*

A06B-0278-B*3*



Data sheet

Parameter	Symbol		Value	Unit
Stall Torque (*)	Ts	95		Nm
		969		kgfcm
Stall Current (*)	ls	75		A (rms)
Rated Output (*)	Pr	14		kW
		19		HP
Rating Speed	Nr	2000		min ⁻¹
Maximum Speed	Nmax	3000		min ⁻¹
Maximum Torque (*)	Tmax	285		Nm
		2910		kgfcm
Rotor Inertia	Jm	0.0195		kgm ²
		0.199		kgfcms ²
Rotor Inertia(with 70Nm Brake)	Jm	0.0204		kgm ²
		0.208		kgfcms ²
Torque constant (*)	Kt	1.26		Nm/A (rms)
		12.9		kgfcm/A (rms)
Back EMF constant (1phase) (*)	Ke	44		V (rms)/1000 min ⁻¹
	Κv	0.42		V (rms)sec/rad
Armature Resistance (1 phase) (*)	Ra	0.033		Ω
Mechanical time constant	tm	0.001		S
Thermal time constant	tt	40		min
Static friction	Tf	1.8		Nm
		18		kgfcm
Weight	w	53		kg
Weight(with 70Nm Brake)	W	63		kg
Max. Current of Servo Amp.	Imax	360		A (peak)

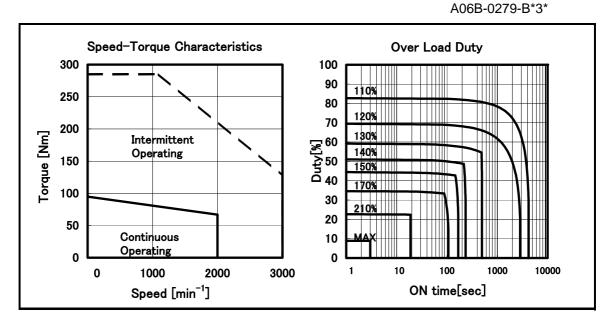
^(*) The values are the standard values at 20°C and the tolerance is $\pm 10\%$.

The speed-torque characteristics very depending on the type of software, parameter setting, and input voltage of the digital servo software. (The above figures show average values.)

				TITLE AC SERVO MOTOR αi series	
02	09.08.27	Lee	Correct errors	lpha iS 50/2000, $lpha i$ S 60/2000, $lpha i$ S 60/3000 with Fan	
01	09.07.24	Lee	Newly designed	DRAW. No. B-65262EN/05-06 CUST.	
Ed.	Date	Design.	Description	FANUC LTD SHEET 11/24	

Model αi S 60/3000 HV with Fan

Specification : A06B-0279-B*1*



Data sheet

Data sheet				
Parameter	Symbol	Value		Unit
Stall Torque (*)	Ts	95		Nm
		969		kgfcm
Stall Current (*)	ls	38		A (rms)
Rated Output (*)	Pr	14		kW
		19		HP
Rating Speed	Nr	2000		min ⁻¹
Maximum Speed	Nmax	3000		min ⁻¹
Maximum Torque (*)	Tmax	285		Nm
		2910		kgfcm
Rotor Inertia	Jm	0.0195		kgm ²
		0.199		kgfcms ²
Rotor Inertia(with 70Nm Brake)	Jm	0.0204		kgm ²
		0.208		kgfcms ²
Torque constant (*)	Kt	2.52		Nm/A (rms)
		25.7		kgfcm/A (rms)
Back EMF constant (1phase) (*)	Ke	88		V (rms)/1000 min ⁻¹
	Κv	0.84		V (rms)sec/rad
Armature Resistance (1 phase) (*)	Ra	0.13		Ω
Mechanical time constant	tm	0.001		s
Thermal time constant	tt	40		min
Static friction	Tf	1.8		Nm
		18		kgfcm
Weight	w	53		kg
Weight(with 70Nm Brake)	w	63		kg
Max. Current of Servo Amp.	lmax	180		A (peak)

(*) The values are the standard values at 20° C and the tolerance is $\pm 10\%$. The speed-torque characteristics very depending on the type of software, parameter setting, and input

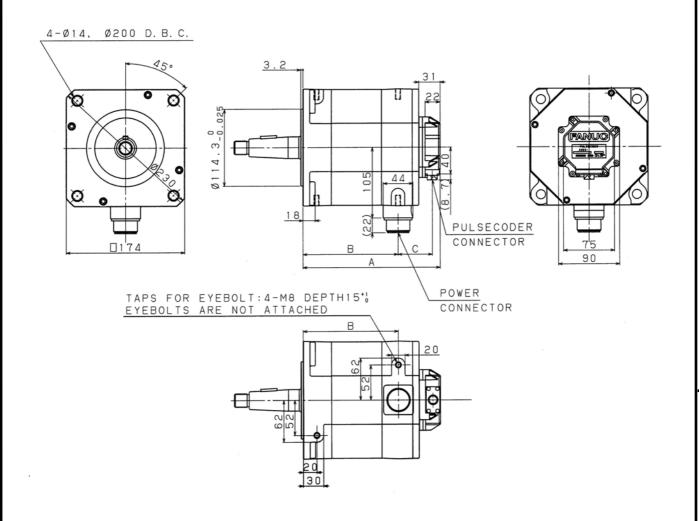
voltage of the digital servo software. (The above figures show average values.)

				AC SERVO MOTO αi S 50/2000, αi S		es
02	09.08.27	Lee	Correct errors	αi S 60/3000 with	•	
01	09.07.24	Lee	Newly designed	B-65262EN/05	06	CUST.
Ed.	Date	Design.	Description	FANUC LTD	SHEET	12/24

6. OUTLINE DRAWINGS

6-1. Outline Drawing of the Motors

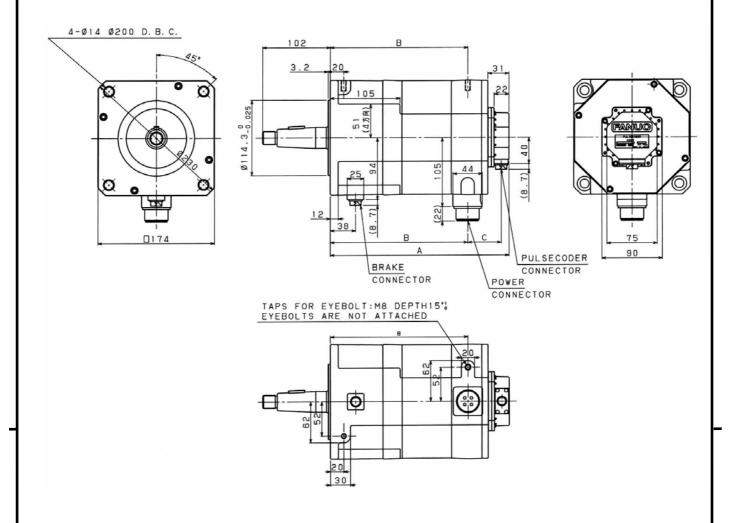
Outline Drawing of the Motor (standard)



	Α	В	С	
α <i>i</i> s 50/2000	350	289		
lpha iS 50/2000 HV	330	209	50	
α <i>i</i> s 60/2000	404	200	50	
α <i>i</i> s 60/2000 HV	424	363		

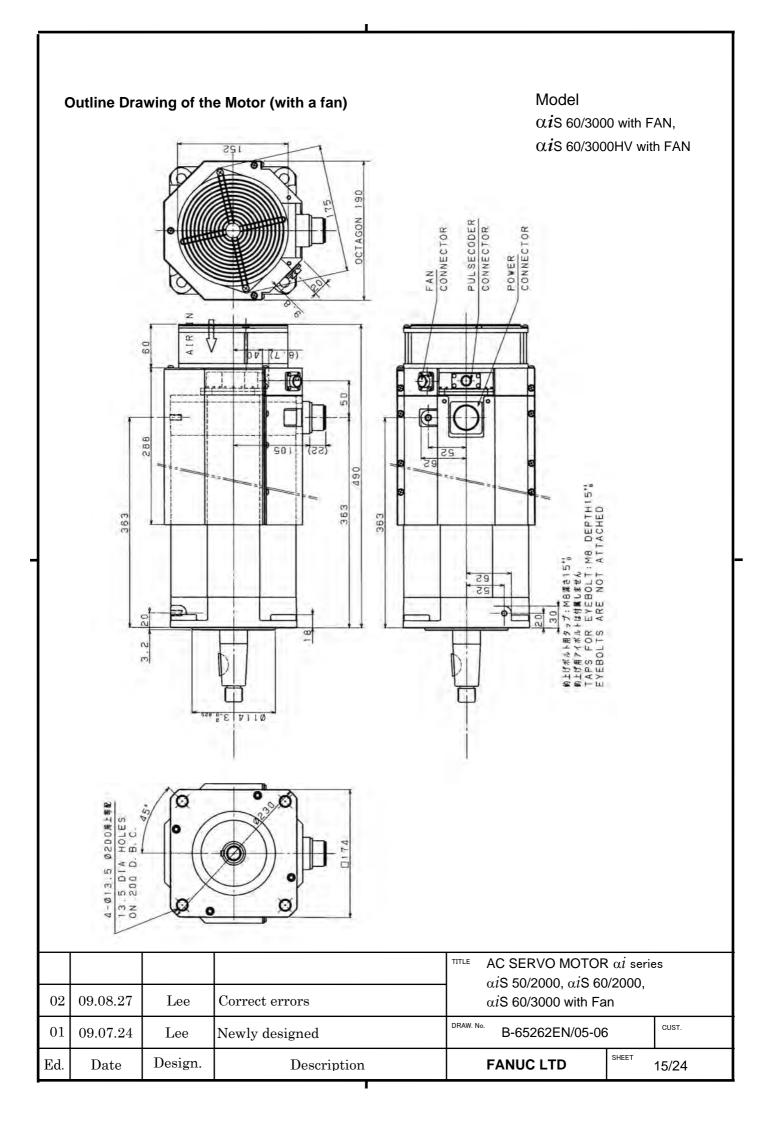
				TITLE AC SERVO MOTOR $lpha i$ series
02	09.08.27	Lee	Correct errors	lpha iS 50/2000, $lpha i$ S 60/2000, $lpha i$ S 60/3000 with Fan
01	09.07.24	Lee	Newly designed	DRAW. No. B-65262EN/05-06 CUST.
Ed.	Date	Design.	Description	FANUC LTD SHEET 13/24

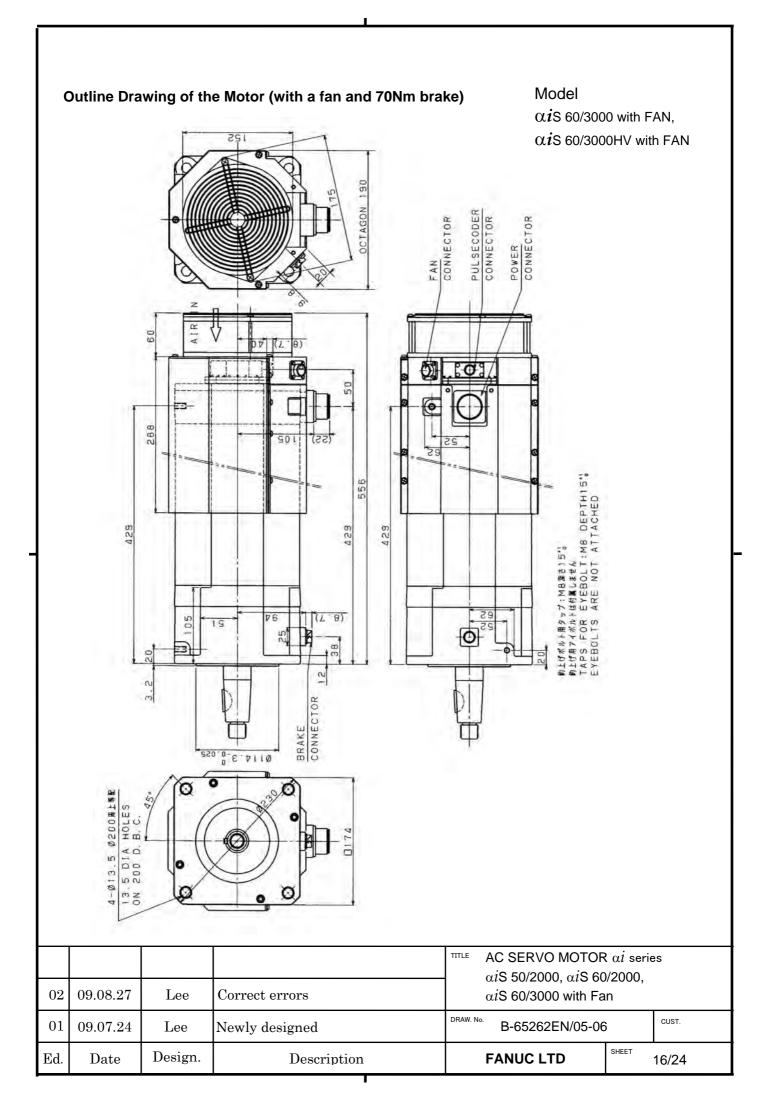
Outline Drawing of the Motor (with a brake)



	BRAKE	Α	В	С
α <i>i</i> s 50/2000 α <i>i</i> s 50/2000 HV	70Nm	416	355	
αis 60/2000	701	400	400	50
α <i>i</i> S 60/2000 HV	70Nm	490	429	

				AC SERVO MOTOR αi series αi S 50/2000, αi S 60/2000,
02	09.08.27	Lee	Correct errors	αi S 60/3000 with Fan
01	09.07.24	Lee	Newly designed	DRAW. No. B-65262EN/05-06 CUST.
Ed.	Date	Design.	Description	FANUC LTD SHEET 14/24





6-2. Shaft Shape

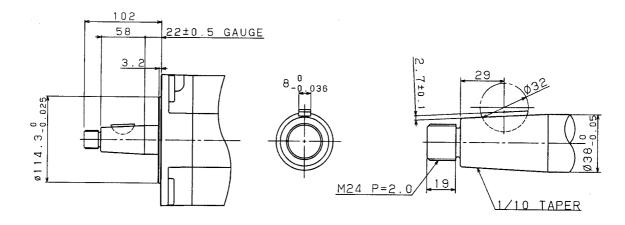
Shaft shape types

The shafts of the motors have the following shapes.

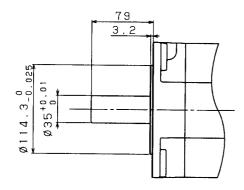
Motor	Taper shaft	Straight shaft	Straight shaft with key way
lpha iS 50/2000, $lpha i$ S 50/2000 HV, $lpha i$ S 60/2000, $lpha i$ S 60/2000 HV, $lpha i$ S 60/3000 with Fan, $lpha i$ S 60/3000 HV with Fan	ф38	φ35	-

Shaft details

- φ38 taper shaft



- φ35 Straight shaft



				TITLE AC SERVO MOTOR αi series	
02	09.08.27	Lee	Correct errors	lpha iS 50/2000, $lpha i$ S 60/2000, $lpha i$ S 60/3000 with Fan	
01	09.07.24	Lee	Newly designed	DRAW. No. B-65262EN/05-06 CUST.	
Ed.	Date	Design.	Description	FANUC LTD SHEET 17/24	

6-3. Allowable Axis Load

The allowable axis load is indicated below.

For details of the allowable axis load, see FANUC AC SERVO MOTOR αi series DESCRIPTION B-65262EN.

Radial load	Axial load	(Reference) Front bearing specification
1960[N] (200 [kgf])	588[N] (60 [kgf])	6208

6-4. Shaft Run-out Precision

The shaft run-out precision is indicated below.

For details of the shaft run-out precision, see FANUC AC SERVO MOTOR αi series DESCRIPTION B-65262EN.

Shaft dia. run-out	Faucet joint run-out	Mounting face run-out	
0.03mm or less	0.05mm or less	0.06mm or less	

6-5. Connector

Motor	Power connector	
α <i>i</i> S 60/3000 with FAN	MS 24-10P compatible connector	
lpha iS 50/2000, $lpha i$ S 50/2000 HV, $lpha i$ S 60/2000, $lpha i$ S 60/2000 HV, $lpha i$ S 60/3000 HV with FAN	MS 22-22P compatible connector	

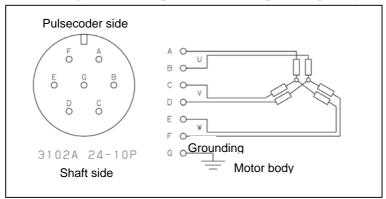
				AC SERVO MOTOR αi series αi S 50/2000, αi S 60/2000, αi S 60/3000 with Fan		
02	09.08.27	Lee	Correct errors			
01	09.07.24	Lee	Newly designed	DRAW. No. B-65262EN/05-06 CUST.		
Ed.	Date	Design.	Description	FANUC LTD SHEET 18/24		

T

MS24-10P compatible connector

Manufacture: Japan Aviation Electronics Industry Manufacturer specification: JL04V-2E24-10PE(G)-B-R

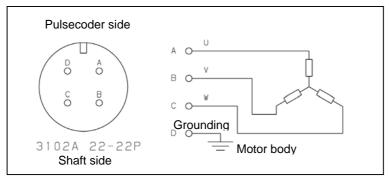
As the power connector a receptacle connector having a dripproof property by itself (when it is not engaged) is used as standard. Strictly speaking, this power connector does not meet the MS standard, but it can be used as a connector compatible with the MS-standard round connector. The following shows the specification, shape, and pin layout of the power connector.



MS22-22P compatible connector

Manufacture: Japan Aviation Electronics Industry
Manufacturer specification: JL04 HV-2E22-22PE-BT-R

As the power connector a receptacle connector having a dripproof property by itself (when it is not engaged) is used as standard. Strictly speaking, this power connector does not meet the MS standard, but it can be used as a connector compatible with the MS-standard round connector. The following shows the specification, shape, and pin layout of the power connector.



For the specifications, shapes, and pin layouts of the connectors of the pulsecoder, refer to the FANUC AC SERVO MOTOR αi series DESCRIPTION B-65262EN.

				AC SERVO MOTOR αi series αi S 50/2000, αi S 60/2000, αi S 60/3000 with Fan		
02	09.08.27	Lee	Correct errors			
01	09.07.24	Lee	Newly designed	DRAW. No. B-65262EN/05-06 CUST.		
Ed.	Date	Design.	Description	FANUC LTD SHEET 19/24		

7. BRAKE

The brake built in αiS 60 is the high-toruge brake(70Nm).

For the detail of the high-torque brake and the pin layouts of the connectors, refer to the FANUC AC SERVO MOTOR αi series DESCRIPTION B-65262EN.

⚠ WARNING

Install a stop equipment on the machine side to secure the safety.

The built-in brake is not a stop equipment to secure the safety.

In case of a wrong use or a failure, the built-in brake may not hold the machine.

Pay careful attention to the safety measures on the machine side.

! CAUTION

Do not use the built-in brake for a working brake.

The built-in brake is used as a holding brake.

If the built-in brake is used as a working brake, it causes a failure.

8. COOLING FAN

The cooling fan applied to αi S 60 is the same with the one that applied to αi S 50 and αi F 40. For the detail of the cooling fan and the pin layouts of the connectors, refer to the FANUC AC SERVO MOTOR αi series DESCRIPTION B-65262EN.

				AC SERVO MOTOR αi series αi S 50/2000, αi S 60/2000, αi S 60/3000 with Fan		
02	09.08.27	Lee	Correct errors			
01	09.07.24	Lee	Newly designed	DRAW. No. B-65262EN/05-06 CUST.		
Ed.	Date	Design.	Description	FANUC LTD SHEET 20/24		

T

9. SERVO PARAMETERS

9-1. Auto loading

Each parameter ID for auto loading is as follows.

Motor model	Parameter ID (HRV2 control)
α <i>i</i> S 50/2000	Not ready
α <i>i</i> S 50/2000 HV	Not ready
α <i>i</i> S 60/2000	Not ready
α <i>i</i> S 60/2000 HV	Not ready
lpha iS 60/3000 with FAN	328
lpha iS 60/3000 HV with FAN	329

Note)

As for αi S 50/2000, αi S 50/2000 HV, αi S 60/2000, αi S 60/2000 HV servo software doesn't support automatic setting so far (Jul. 2009). Please set the appropriate parameters manually according to the table as shown in the next page.

9-2. Parameter Table

Parameter table for the model αi S 50/2000, αi S 50/2000 HV, αi S 60/2000, αi S 60/2000 HV, αi S 60/3000 with Fan , αi S 60/3000 HV with Fan are shown in the next page.

Please set the appropriate parameters manually according to the table.

! CAUTION

If a motor is used in a wrong parameter, it may become broken.

10. OTHER SPECIFICATIONS

The items that are not mentioned this report correspond to FANUC AC SERVO MOTOR αi series . Please refer to FANUC AC SERVO MOTOR αi series DESCRIPTION B-65262EN, too.

				AC SERVO MOTOR αi series αi S 50/2000, αi S 60/2000,		
02	09.08.27	Lee	Correct errors	αi S 60/3000 with Fan		
01	09.07.24	Lee	Newly designed	DRAW. No. B-65262EN/05-06 CUST.		
Ed.	Date	Design.	Description	FANUC LTD SHEET 21/24		

<u>αiS 50/2000, αiS 50/2000 HV</u>

servo parameter : HRV2 control

			α iS50	α iS50
	Motor mode	el .	/2000	/2000HV
	Motor Spec		0042	0043
	тосог орос	moderon	HRV2	HRV2
Symbol	FS15i	FS16i etc	TITAL	111(12
Cymbol	1808	2003	00001000	00001000
	1809	2003	00001000	00001000
	1883	2004	00000011	000000011
			00000000	00000000
	1884	2006		
	1951	2007	00000000	00000000
	1952	2008	00000000	00000000
	1953	2009	00000000	00000000
	1954	2010	00000000	00000000
	1955	2011	00000000	00000000
	1956	2012	00000000	00000000
	1707	2013	00000000	00000000
	1708	2014	00000000	00000000
	1750	2210	00000000	00000000
	1751	2211	00001010	00001010
	2713	2300	00000000	00000000
	2714	2301	00000000	00000000
DIG	1050	00.40	1500	1500
PK1	1852	2040	1539	1539
PK2	1853	2041	-7321	-7321
PK3	1854	2042	-1344	-1344
PK1V	1855	2043	90	90
PK2V	1856	2044	-802	-802
PK3V	1857	2045	0	0
PK4V	1858	2046	-8235	-8235
POA1	1859	2047	4731	4731
BLCMP	1860	2048	0	0
DPFMX	1861	2049	0	0
POK1	1862	2050	956	956
POK2	1863	2051	510	510
RESERV	1864	2052	0	0
PPMAX	1865	2053	31979	31979
PDDP	1866	2054	3	3
PHYST	1867	2055	319	319
EMFCMP	1868	2056	0	0
PVPA	1869	2057	-3867	-3867
PALPH	1870	2058	-3393	-3393
PPBAS	1871	2059	0	0
TQLIM	1872	2060	7282	7282
EMFLMT	1873	2061	0	0
POVC1	1877	2062	32515	32501
POVC2	1878	2063	3166	3332
TGALMLV	1892	2064	4	4
POVCLMT	1893	2065	9418	9912
PK2VAUX	1894	2066	0	0
FILTER	1895	2067	0	0
FALPH	1961	2068	0	0
VFFLT	1962	2069	0	0
ERBLM	1963	2070	0	0
PBLCT	1964	2071	0	0
SFCCML	1965	2072	0	0
PSPTL	1966	2073	0	0
AALPH	1967	2074	8192	8192
MODEL	1968	2075	0	0
1				

			lpha iS50 /2000	lpha iS50 /2000HV
Symbol	FS15i	FS16i etc		
WKAC	1969	2076	0	0
OSCTPL	1970	2077	0	0
PDPCH	1971	2078	0	0
PDPCL	1972	2079	0	0
DPFEX	1973	2080	0	0
DPFZW	1974	2081	0	0
BLENDL	1975	2082	0	0
MOFCTL	1976	2083	0	0
SDMR1	1977	2084	0	0
SDMR2	1978	2085	0	0
RTCURR	1979	2086	1856	1856
TDPLD	1980	2087	0	0
MCNFB	1981	2088	0	0
BLBSL	1982	2089	0	0
ROBSTL	1983	2090	0	0
ACCSPL	1984	2091	0	0
ADFF1	1985	2092	0	0
VMPK3V	1986	2093	0	0
BLCMP2	1987	2094	0	0
AHDRTL	1988	2095	0	0
RADUSL	1989	2096	0	0
SMCNT	1990	2097	0	0
DEPVPL	1991	2098	0	0
ONEPSL	1992	2099	400	400
INPA1	1993	2100	0	0
INPA2	1994	2101	0	0
DBLIM	1995	2102	0	0
ABVOF	1996	2103	0	0
ABTSH	1997	2104	0	0
TRQCST	1998	2105	2569	2569
LP24PA	1999	2106	0	0
VLGOVR	1700	2107	0	0
RESERV	1701	2108	0	0
BELLTC	1702	2109	0	0
MGSTCM	1703	2110	1032	1032
DETQLM	1704	2111	4954	4954
AMRDML	1705	2112	0	0
NFILT	1706	2113	0	0
NINTCT	1735	2127	2825	5651
MFWKCE	1736	2128	4601	4601
MFWKBL	1752	2129	1296	1296
LP2GP	1753	2130	0	0
LP4GP	1754	2131	0	0
LP6GP	1755	2132	0	0
PHDLY1	1756	2133	2570	2570
PHDLY2	1757	2134	12814	12814
DGCSMM	1782	2159	0	0
TRQCUP	1783	2160	0	0
OVCSTP	1784	2161	128	0
POVC21	1785	2162	32764	32764
POVC22	1786	2163	51	48
POVCLMT2	1787	2164	6831	6829
MAXCRT	1788	2165	165	85

				AC SERVO MOTOR αi series αi S 50/2000, αi S 60/2000, αi S 60/3000 with Fan		
02	09.08.27	Lee	Correct errors			
01	09.07.24	Lee	Newly designed	DRAW. No. B-65262EN/05-06 CUST.		CUST.
Ed.	Date	Design.	Description	FANUC LTD SHEET 22/24		22/24

<u>αiS 60/2000, αiS 60/2000 HV</u>

servo parameter : HRV2 control

			α iS60	αiS60
	Motor mode		/2000	/2000HV
	Motor Spec	ification	0044	0045
			HRV2	HRV2
Symbol	FS15i	FS16i etc		
	1808	2003	00001000	00001000
	1809	2004	00000011	00000011
	1883	2005	00000000	00000000
	1884	2006	00000000	00000000
	1951	2007	00000000	00000000
	1952	2008	00000000	00000000
	1953	2009	00000000	00000000
	1954	2010	00000000	00000000
	1955	2011	00000000	00000000
	1956	2012	00000000	00000000
	1707	2013	00000000	00000000
	1708	2014	00000000	00000000
	1750	2210	00000000	00000000
	1751	2211	00001010	00001010
	2713	2300	00000000	00000000
	2714	2301	00000000	00000000
PK1	1852	2040	1358	1358
PK2	1853	2041	-6767	-676
PK3	1854	2042	-1344	-134
PK1V	1855	2043	103	10:
PK2V	1856	2044	-925	-92
PK3V	1857	2045	0	
PK4V	1858	2046	-8235	-823
POA1	1859	2047	4103	4103
BLCMP	1860	2048	0	(
DPFMX	1861	2049	0	
POK1	1862	2050	956	950
POK2	1863	2051	510	510
RESERV	1864	2052	0	(
PPMAX	1865	2053	31979	3197
PDDP	1866	2054	3	
PHYST	1867	2055	319	319
EMFCMP	1868	2056	0	
PVPA	1869	2057	-3097	-309
PALPH	1870	2058	-2995	-299
PPBAS	1871	2059	0	
TQLIM	1872	2060	7282	728
EMFLMT	1873	2061	0	0070
POVC1	1877	2062	32515	3250
POVC2	1878	2063	3166	333
TGALMLV	1892	2064	4	001
POVCLMT	1893	2065	9418	991
PK2VAUX	1894	2066	0	
FILTER	1895	2067	0	
FALPH	1961	2068	0	
VFFLT	1962	2069	0	
ERBLM	1963	2070	0	
PBLCT	1964	2071	0	(
SFCCML PSPTL	1965	2072	0	(
	1966	2073		
AALPH MODEL	1967 1968	2074 2075	0	(
MODEL	1900	20/0	. 0	'

			α iS60 /2000	lpha iS60 /2000HV
Symbol	FS15i	FS16i etc		
WKAC	1969	2076	0	0
OSCTPL	1970	2077	0	0
PDPCH	1971	2078	0	0
PDPCL	1972	2079	0	0
DPFEX	1973	2080	0	0
DPFZW	1974	2081	0	0
BLENDL	1975	2082	0	0
MOFCTL	1976	2083	0	0
SDMR1	1977	2084	0	0
SDMR2	1978	2085	0	0
RTCURR	1979	2086	2018	2018
TDPLD	1980	2087	0	0
MCNFB	1981	2088	0	0
BLBSL	1982	2089	0	0
ROBSTL	1983	2090	0	0
ACCSPL	1984	2091	0	0
ADFF1	1985	2092	0	0
VMPK3V	1986	2093	0	0
BLCMP2	1987	2094	0	0
AHDRTL	1988	2095	0	0
RADUSL	1989	2096	0	0
SMCNT	1990	2097	0	0
DEPVPL	1991	2098	0	0
ONEPSL	1992	2099	400	400
INPA1	1993	2100	0	0
INPA2	1994	2100	0	0
DBLIM	1995	2102	0	0
ABVOF	1996	2102	0	0
	1997		0	0
ABTSH TRQCST	1997	2104 2105	2942	2942
			_	_
LP24PA	1999	2106	0	0
VLGOVR	1700	2107	0	0
RESERV	1701	2108	0	0
BELLTC	1702	2109	0	0
MGSTCM	1703	2110	1544	1544
DETQLM	1704	2111	3151	3151
AMRDML	1705	2112	0	0
NFILT	1706	2113	0	0
NINTCT	1735	2127	5498	5498
MFWKCE	1736	2128	4004	4004
MFWKBL	1752	2129	1302	1302
LP2GP	1753	2130	0	0
LP4GP	1754	2131	0	0
LP6GP	1755	2132	0	0
PHDLY1	1756	2133	4146	4146
PHDLY2	1757	2134	12821	12821
DGCSMM	1782	2159	0	0
TRQCUP	1783	2160	0	0
OVCSTP	1784	2161	128	0
POVC21	1785	2162	32761	32764
POVC22	1786	2163	81	51
POVCLMT2	1787	2164	8124	7077
MAXCRT	1788	2165	165	85

				TITLE AC SERVO MOTOR αi series αi S 50/2000, αi S 60/2000,		
02	09.08.27	Lee	Correct errors	αi S 60/3000 with Fan		
01	09.07.24	Lee	Newly designed	DRAW. No. B-65262EN/05-06 CUST.		
Ed.	Date	Design.	Description	FANUC LTD SHEET	23/24	

αiS 60/3000 with Fan, αiS 60/3000 HV with Fan servo parameter: HRV2 control

			α iS60	α iS60	
	Motor mode	Motor model		/3000HV	
	Motor Spec	ification	0278	0279	
	•		HRV2	HRV2	
Symbol	FS15i	FS16i etc			
-	1808	2003	00001000	00001000	
	1809	2004	00000011	01000011	
	1883	2005	00000000	00000000	
	1884	2006	00000000	00000000	
	1951	2007	00000000	00000000	
	1952	2008	00000000	00000000	
	1953	2009	00000000	00000000	
	1954	2010	00000000	00000000	
	1955	2011	00000000	00000000	
	1956	2012	00000000	00000000	
	1707	2013	00000000	00000000	
	1708	2014	00000000	00000000	
	1750	2210	00000000	00000000	
	1751	2211	00001010	00001010	
	2713	2300	00000000	00000000	
	2714	2301	00000000	00000000	
		2001	0000000	0000000	
PK1	1852	2040	1191	1131	
PK2	1853	2041	-6320	-5966	
PK3	1854	2042	-1347	-1345	
PK1V	1855	2043	69	69	
PK2V	1856	2044	-617	-617	
PK3V	1857	2045	0	017	
PK4V	1858	2046	-8235	-8235	
POA1	1859	2047	6152	6152	
BLCMP	1860	2048	0102	0102	
DPFMX	1861	2049	0	0	
POK1	1862	2050	956	956	
POK2	1863	2051	510	510	
RESERV	1864	2052	0	0	
PPMAX	1865	2053	31979	31979	
PDDP	1866	2054	31373	31373	
PHYST	1867	2055	319	319	
EMFCMP	1868	2056	0	0	
PVPA	1869	2057	-4619	-4620	
PALPH	1870	2058	-2000	-2000	
PPBAS	1871	2059	0	0	
TQLIM	1872	2060	7282	7282	
EMFLMT	1873	2061	0	0	
POVC1	1877	2062	32388	32388	
POVC2	1878	2063	4744	4745	
TGALMLV	1892	2064	4	4	
POVCLMT	1893	2065	14138	14140	
PK2VAUX	1894	2066	0	0	
FILTER	1895	2067	0	0	
FALPH	1961	2068	0	0	
VFFLT	1962	2069	0	0	
ERBLM	1963	2070	0	0	
PBLCT	1964	2071	0	0	
SFCCML	1965	2072	0	0	
PSPTL	1966	2073	0	0	
AALPH	1967	2074	8192	4096	
MODEL	1968	2075	0132	0	
MODEL	1000	2010	U	U	

	E015:	I=0.10: .	αiS60 /3000	lpha iS60 /3000HV
Symbol	FS15i	FS16i etc		
WKAC	1969	2076	0	0
OSCTPL	1970	2077	0	0
PDPCH	1971	2078	0	0
PDPCL	1972	2079	0	0
DPFEX	1973	2080	0	0
DPFZW	1974	2081	0	0
BLENDL	1975	2082	0	0
MOFCTL	1976	2083	0	0
SDMR1	1977	2084	0	0
SDMR2	1978	2085	0	0
RTCURR	1979	2086	1937	1937
TDPLD	1980	2087	0	0
MCNFB	1981	2088	0	0
BLBSL	1982	2089	0	0
ROBSTL	1983	2090	0	0
ACCSPL	1984	2091	0	0
ADFF1	1985	2092	0	0
VMPK3V	1986	2093	0	0
BLCMP2	1987	2094	0	0
AHDRTL	1988	2095	0	0
RADUSL	1989	2096	0	0
SMCNT	1990	2097	0	0
DEPVPL	1991	2098	0	0
ONEPSL	1992	2098	400	400
INPA1	1993	2100	0	0
INPA1	1993	2100	0	0
				0
DBLIM ABVOF	1995	2102 2103	0	
	1996		0	0
ABTSH	1997	2104	0	0
TRQCST	1998	2105	4411	4411
LP24PA	1999	2106	0	0
VLGOVR	1700	2107	0	0
RESERV	1701	2108	0	0
BELLTC	1702	2109	0	0
MGSTCM	1703	2110	519	519
DETQLM	1704	2111	5220	5220
AMRDML	1705	2112	0	0
NFILT	1706	2113	0	0
NINTCT	1735	2127	2852	5393
MFWKCE	1736	2128	5000	3000
MFWKBL	1752	2129	1300	1300
LP2GP	1753	2130	0	0
LP4GP	1754	2131	0	0
LP6GP	1755	2132	0	0
PHDLY1	1756	2133	5150	5150
PHDLY2	1757	2134	8990	8990
DGCSMM	1782	2159	0	0
TRQCUP	1783	2160	0	0
OVCSTP	1784	2161	0	0
POVC21	1785	2162	32742	32742
POVC22	1786	2163	327	327
POVCLMT2	1787	2164	5973	5974
MAXCRT	1788	2165	365	185

				AC SERVO MOTOR αi series αi S 50/2000, αi S 60/2000, αi S 60/3000 with Fan		
02	09.08.27	Lee	Correct errors			
01	09.07.24	Lee	Newly designed	DRAW. No. B-65262EN/05-06 CUST.		
Ed.	Date	Design.	Description	FANUC LTD SHEET 24/24		

T

FANUC AC SERVO MOTOR lpha i series DESCRIPTIONS lpha iS 1000/3000HV

1. Type of applied technical documents

Name	FANUC AC SERVO MOTOR $lpha i$ series DESCRIPTIONS
Spec. No. /Version	B-65262EN/05

2.Summary of Change

Group	Name	New, Add, Correct, Delete,	Applicable Data
Basic Function	AC Servo Motor αiS 1000/3000HV	New	AUG.2009
Optional Function			
Unit			
Maintenance Parts			
Notice			
Correction			
Another			

				TITLE .		
				AC SERVO MOTOR $\alpha\imath$ series DESCRIPTIONS		
				α <i>i</i> s 1000/3000HV		
01	09.08.03	Takimoto	Newly designed	DRAW. No. B-65262EN/05-07 CUST.		CUST.
Ed.	Date	Design.	Description	FANUC LTD	SHEET	1/12

1. GENERAL

Following motor is added to FANUC AC SERVO MOTOR αi series .

· αis 1000/3000HV

This motor is based on IEC60034-1. The TUV mark is printed on the nameplates of this motor.

Note)

The items that are not mentioned in this report correspond to FANUC AC SERVO MOTOR αi series .

Please refer to FANUC AC SERVO MOTOR lpha i series DESCRIPTION B-65262EN, too.

				AC SERVO MOTOR αi series DESCRIPTIONS		
				α <i>i</i> s 1000/3000HV		
01	09.08.03	Takimoto	Newly designed	DRAW. No. B-65262EN/05-07		CUST.
Ed.	Date	Design.	Description	FANUC LTD	SHEET	2/12

2. DESIGNATION

Motor specification numbers have the following format.

A06B-0099-Babc

 $0099 : \alpha is 1000/3000HV$

a

0: Taper Shaft Type

b

5: With a cooling fan

 \mathbf{c}

0: Pulsecoder αi A 1000

3. APPLICABLE AMPLIFIER

Applicable amplifiers for αi S 1000/3000HV

Servo amplifiers	α i SV 360HV x 4 (A06B-6127-H109 x4)
Power supply	(XiPS 75HV x2 (A06B-6150-H075 x2)

Power supply αi PS 45HV x4(A06B-6150-H045 x4) is also available.

The above power supply combination can be slected, when the acceleration-time constant is not identical to the deceleration-time constant and the maximum motor torque is used during deceleration as in pressing machines or injection molding machines.

*) The tandem control option or the PWM distribution module is requied.

! CAUTION

- 1 If a motor is used in a combination other than those listed above, it may become broken.
- 2 For details on the servo amplifier, refer to "FANUC SERVO AMPLIFIER αi series DESCRIPTIONS (B-65282EN)".

				AC SERVO MOTOR αi series DESCRIPTIONS			
				α <i>i</i> s 1000/3000HV			
01	09.08.03	Takimoto	Newly designed	DRAW. No. B-65262EN/05-07		CUST.	
Ed.	Date	Design.	Description	FANUC LTD	SHEET	3/12	

4. Output data for selecting αiPS amplifiers

MOTOR MODEL	Continuous output	Maximum output
α <i>i</i> S 1000/3000HV	170kW	350kW

^CAUTION

1 These data is only for selecting the PS and it doesn't guarantee the power of motors.

5. COEFFICIENTS FOR CALCULATING THE DYNAMIC BRAKE STOPPING DISTANCE

SI unit

Motor model	А	В
α i S 1000/3000HV	8.8×10 ⁻⁴	7.1×10 ⁻¹⁰

			AC SERVO MOTOR αi series DESCRIPTIONS				
				α <i>i</i> S 1000/3000HV			
01	09.08.03	Takimoto	Newly designed	DRAW. No. B-65262EN/05-07 CUST.		CUST.	
Ed.	Date	Design.	Description	FANUC LTD	SHEET	4/12	

6. SPECIFICATIONS

Model αiS 1000/3000HV Specification : A06B-0099-B050

Speed-Torque Characteristics Over Load Duty 3000 100 90 110% 2500 80 120% 70 2000 130% [%] 60 \$250 40 Torque [Nm] Intermittent 140% Operating 1500 1000 30 Continuous Operating 20 500 10 0 1000 1000 2000 3000 100 10000 Speed [min⁻¹] ON time[sec]

Data sheet

Data sheet	ا ۽ ماحدد ا		Value	l Unit
Parameter	Symbol	1	Value	
Stall Torque (*)	Ts	1100		Nm
		11200		kgfcm
Stall Current (*)	ls	404		A (rms)
Rated Output (*)	Pr	170		kW
		230		HP
Rating Speed	Nr	2500		min ⁻¹
Maximum Speed	Nmax	3000		min ⁻¹
Maximum Torque (*)	Tmax	2400		Nm
		24500		kgfcm
Rotor Inertia	Jm	0.458		kgm ²
		4.67		kgfcms ²
Rotor Inertia (with Brake)	Jm	-		kgm ²
		-		kgfcms ²
Torque constant (*)	Kt	2.72		Nm/A (rms)
		27.8		kgfcm/A (rms)
Back EMF constant (1phase) (*)	Ke	95		V (rms)/1000 min ⁻¹
	Kv	0.91		V (rms)sec/rad
Armature Resistance (1 phase) (*)	Ra	0.0050		Ω
Mechanical time constant	tm	0.0009		s
Thermal time constant	tt	70		min
Static friction	Tf	4.0		Nm
		41		kgfcm
Weight	w	500		kg
Weight (with Brake)	w	-		kg
Max. Current of Servo Amp.	lmax	360 x 4		A (peak)

^(*) The values are the standard values at 20° C and the tolerance is $\pm 10\%$.

				TITLE		
				AC SERVO MOTOR $lpha i$ series DESCRIPTIONS		RIPTIONS
				α <i>i</i> S 1000/3000HV		
01	09.08.03	Takimoto	Newly designed	DRAW. No. B-65262EN/05-07 CUST.		CUST.
Ed.	Date	Design.	Description	FANUC LTD	SHEET	5/12

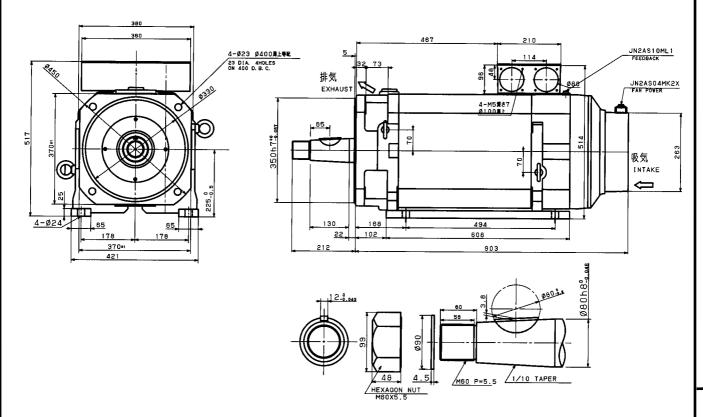
The speed-torque characteristics very depending on the type of software, parameter setting, and input voltage of the digital servo software. (The above figures show average values.)

7. OUTLINE DRAWINGS

7-1. Outline Drawing of the Motor

Model αi S 1000/3000HV

Specification: A06B-0099-B050



- The motor does not include a circuit breaker for protecting the fan.
 Prepare such a breaker in the power magnetics cabinet.
- 2. The motor cannot be mounted on the machine with the flange alone. The motor's own weight must be supported by the feet. The flange should be used for center adjustment to the machine.

				AC SERVO MOTOR αi series DESCRIPTIONS αi S 1000/3000HV		RIPTIONS
01	09.08.03	Takimoto	Newly designed	DRAW. No. B-65262EN/05-07 CUST.		CUST.
Ed.	Date	Design.	Description	FANUC LTD	SHEET	6/12

7-2. Allowable Axis Load

The allowable axis load is indicated below. Refer to the FANUC AC SERVO MOTOR αi series DESCRIPTION B-65262EN.

Radial load	Axial load	(Reference) Front bearing specification	
13720[N] (*) (1400[kgf])	1960[N] (200[kgf])	6317	

(*) Ensure also that the maximum momentary radial load does not exceed the value above. The shaft can break due to fatigue.

7-3. Shaft Run-out Precsion

The allowable axis load is indicated below.

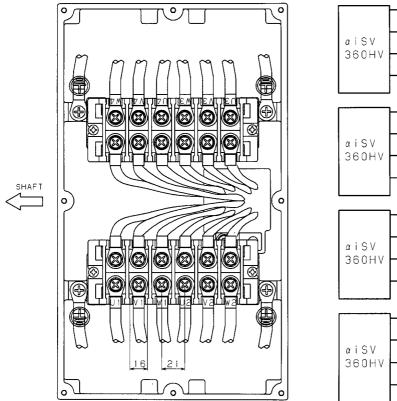
Refer to the FANUC AC SERVO MOTOR αi series DESCRIPTION B-65262EN.

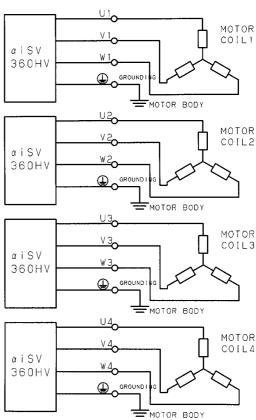
Shaft dia. run-out	Faucet joint run-out	Mounting face run-out
0.08mm or less	0.11mm or less	0.14mm or less

				TITLE		
				AC SERVO MOTOR αi series DESCRIPTIONS		
				α <i>i</i> s 1000/3000HV		
01	09.08.03	Takimoto	Newly designed	DRAW. No. B-65262EN/05-07		CUST.
Ed.	Date	Design.	Description	FANUC LTD	SHEET	7/12

7-4. Power Terminal Layout

The following shows the power terminal layout in the terminal box.





Power terminal size and ground terminal size: M6

Tightening torque: 3.5 N·m to 4.5 N·m

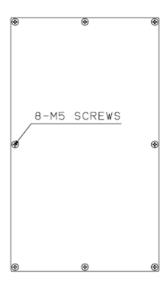
! CAUTION

- Securely connect power wires and short bars to the terminal block with the specified tightening torque according to the procedure described in this section. If the motor runs with a terminal loosely connected, the terminal block may get abnormally hot, resulting in a fire. The terminal may also be disconnected, resulting in a ground fault, short circuit, or electric shock.
- 2 To keep the insulation distance, note the following points: When attaching a crimp terminal to the end of a power wire, always cover the crimping section of the crimp terminal with an insulating tube.

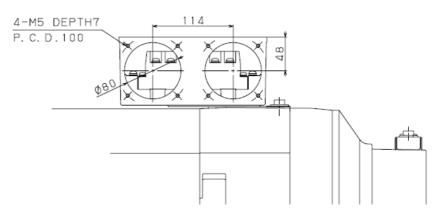
When an insulating cover is mounted on the terminal block, screw the power wires and remount the cover in place before using the motor.

				AC SERVICIMOTOR OI series DESCRIPTIONS		DIDTIONS
				AC SERVO MOTOR α1 series DESCRIPTIONS		RIPTIONS
				α <i>i</i> s 1000/3000HV		
01	09.08.03	Takimoto	Newly designed	DRAW. No. B-65262EN/05-07		CUST.
Ed.	Date	Design.	Description	FANUC LTD	SHEET	8/12

7-5. Cabling







- 1. Before cabling, the motor can be dismantled by removing the eight M5 pan head screws. At the time of installation, check that the waterproofing rubber packing is not damaged, then install it with a tightening torque of $2.0~\mathrm{N\cdot m}$ to $2.5~\mathrm{N\cdot m}$. At this time, ensure that foreign matter is not caught.
- 2. To meet the IP level, a protection such as a conduit is required for the cabling hole. Refer to the FANUC AC SERVO MOTOR αi series DESCRIPTION B-65262EN.
- 3. For the specifications, shapes, and pin layouts of the connectors of the pulsecoder and fan, refer to the FANUC AC SERVO MOTOR αi series DESCRIPTION B-65262EN.

				TITLE		
				AC SERVO MOTOR $lpha i$ series DESCRIPTIONS		RIPTIONS
				α <i>i</i> S 1000/3000HV		
01	09.08.03	Takimoto	Newly designed	DRAW. No. B-65262EN/05-07 CUST.		CUST.
Ed.	Date	Design.	Description	FANUC LTD	SHEET	9/12

8. COOLING FAN

For the detail of connecting and the pin layouts of the connectors, refer to the FANUC AC SERVO MOTOR αi series DESCRIPTION B-65262EN.

Motor model	α <i>i</i> S 1000/3000HV		
	Three-phase	e 400VAC	
Input voltage	50Hz	60Hz	
	AC340V to 480V	AC340V to 528V	
Rated input	550W	800W	
Steady-state current	0.8A _{rms}	1.3A _{rms}	
Protection circuit set temperature	140°C		
Degree of protection (IEC34-5)	IP00		

NOTE

- 1. For the models with fan, the degree of protection of the fan connector section is IP00.
- 2. Pay attention to the driving voltage. This fan motor is driven by three-phase,400VAC.

				AC SERVO MOTOR αi series DESCRIPTIONS αi S 1000/3000HV		
01	09.08.03	Takimoto	Newly designed	DRAW. No. B-65262EN/05-07		CUST.
Ed.	Date	Design.	Description	FANUC LTD	SHEET	10/12

9. SERVO PARAMETERS

The parameter table for the model αiS 1000/3000HV is shown in the next table. Please set the appropriate parameters manually according to the table. The tandem control option or the PDM (PWM distribution module) is requied. Applicable servo software series and editions are shown below.

 For drive with tandem contorl option (Series 30i, 31i, 32i)
 Series 90E0/U(21) and subsequent editions
 Series 90E1/01.0 and subsequent editions

2. For drive with PDM (PWM distribution module) (Series 0*i*-D)

Series 90C5/D(04) and subsequent editions Series 90E5/D(04) and subsequent editions (Series 16i-B,18i-B,21i-B,Power Mate i) Series 90B1/C(03) and subsequent editions Series 90BP/B(02) and subsequent editions (Digital servo adapter) Series 90B2/C(03) and subsequent editions

Please refer to PWM distribution module DESCRIPTION A-72562E-029.

Servo software will support automatic setting in future for each series.

To use torque control, please ask separately.



If a motor is used in a wrong parameter, it may become broken.

10. OTHER SPECIFICATIONS

The items that are not mentioned in this report correspond to FANUC AC SERVO MOTOR αi series. Please refer to FANUC AC SERVO MOTOR αi series DESCRIPTION B-65262EN, too.

				AC SERVO MOTOR αi series DESCRIPTIONS αi S 1000/3000HV		
01	09.08.03	Takimoto	Newly designed	DRAW. No. B-65262EN/05-07 CUST.		CUST.
Ed.	Date	Design.	Description	FANUC LTD	SHEET	11/12

αi S 1000/3000HV (Applicable amplifiers : αi SV 360HV x 4) servo parameter : HRV2 control

			αiS1000
	Motor mod	lel	/3000HV
	Motor spec		0099
	Driver		HRV2
		For tandem	
stmbol	FS16i etc	control option	For PDM
30111001	2003	00001000	00001000
	2004	00000011	00000011
	2005	00000011	00000011
	2006	00000000	00000000
	2007	00000000	00000000
	2008	00000000	00000000
	2009	00000000	00000000
	2010	00000000	00000000
	2011	00000000	00000000
	2012	00000000	00000000
-	2012	0000000	00000001
—	2013	00000000	00000001
 	2014	01000000	01000000
 	2210	0000000	0000000
	2211	10011010	00011010
	2301	10000000	10000000
PK1	2040	960	960
PK2	2040	-6554	-6554
PK3	2041	-1362	-1362
PK1V	2042	191	191
PK2V	2043	-1708	-1708
PK3V	2044	0	0
PK4V	2045	-8235	-8235
POA1	2040	2221	2221
BLCMP	2047	0	_
DPFMAX	2048	0	0
POK1	2050	956	956
POK2	2051	510	510
RESERV	2052	0	0
PPMAX	2053	21	21
PDDP	2054	1894	1894
PHYST	2055	319	319
EMFCMP	2056	0	0
PVPA	2057	-4620	-4620
PALPH	2058	-2500	-2500
PPBAS	2059	0	2300
TQLMT	2060	7282	7282
EMFLMT	2061	0	7202
POVC1	2062	32488	32488
POVC2	2063	3503	3503
TGALMLV	2064	4	1
POVCLMT	2065	18280	18280
PK2VAUX	2066	0	0
FILTER	2067	0	0
FALPH	2068	0	0
VFFLT	2069	0	0
ERBLM	2070	0	0
PBLCT	2070	0	0
SFCCML	2071	0	0
PSPTL		0	0
AALPH	2073 2074	12288	12288
	2074	12200	12288

		For tandem	
	FS16i etc	control option	For PDM
OSCTPL	2077	0	0
PDPCH	2078	0	0
PDPCL	2079	0	0
DPFEX	2080	0	0
DPFZW	2081	0	0
BLENDL	2082	0	0
MOFCTL	2083	0	0
RTCURR	2086	2599	2599
TDPLD	2087	0	0
MCNFB	2088	0	0
BLBSL	2089	0	0
ROBSTL	2090	0	0
ACCSPL	2091	0	0
ADFF1	2092	0	0
CMPK3V	2093	0	0
BLCMP2	2094	0	0
AHDRTL	2095	0	0
RADUSL	2096	0	0
SMCNT	2097	0	0
DEPVPL	2098	0	0
ONEPSL			400
INPA1	2099	400	
INPAT INPA2	2100	0	0
	2101	0	0
DBLIM ABVOF	2102	0	0
	2103	0	0
ABTSH	2104	0	0
TRQCST	2105	3807	3807
LP24PA	2106	0	0
VLGOVR	2107	0	0
RESERV	2108	0	0
BELLTC	2109	0	0
MGSTCM	2110	1040	1040
DETQLM	2111	3242	3242
AMRDML	2112	0	0
NFILT	2113	0	0
NINTCT	2127	9876	9876
MFWKCE	2128	4500	4500
MFWKBL	2129	1556	1556
LP2GP	2130	0	0
LP4GP	2131	0	0
LP6GP	2132	0	0
PHDLY1	2133	2580	2580
PHDLY2	2134	6418	6418
DGCSMM	2159	0	0
TRQCUP	2160	0	0
OVCSTP	2161	140	140
POVC21	2162	32721	32721
POVC22	2163	589	589
POVCLMT2	2164	13952	13952
MAXCRT	2165	365	0
ACDCEND	2305	29	29
DCIDBS	2310	1648	1648
	20.0	1010	1010

				TITLE AC SERVO MOTOR αi series DESCRIPTIONS		
				α <i>i</i> S 1000/3000HV		
01	09.08.03	Takimoto	Newly designed	DRAW. No. B-65262EN/05-07 CUST.		CUST.
Ed.	Date	Design.	Description	FANUC LTD	SHEET	12/12

FANUC AC SERVO MOTOR lpha i series DESCRIPTIONS lpha iS 300/3000HV, lpha iS 500/3000HV

1. Type of applied technical documents

Name	FANUC AC SERVO MOTOR $lpha i$ series DESCRIPTIONS
Spec. No. /Version	B-65262EN/05

2.Summary of Change

Group	Name	New, Add, Correct, Delete,	Applicable Data
Basic Function	AC Servo Motor $lpha i$ S 300/3000HV , $lpha i$ S 500/3000HV	New	NOV.2009
Optional Function			
Unit			
Maintenance Parts			
Notice			
Correction			
Another			

			TITLE			
			AC SERVO MOTOR $lpha i$ series DESCRIPTIO		RIPTIONS	
				lpha iS 300/3000HV , $lpha i$ S 500/3000HV		
01	09.11.11	Saitou	Newly designed	DRAW. No. B-65262EN/05-08 CUST.		CUST.
Ed.	Date	Design.	Description	FANUC LTD	SHEET	1/13

1. GENERAL

Following motor is added to FANUC AC SERVO MOTOR αi series .

- · αis 300/3000HV
- · ais 500/3000HV

This motor is based on IEC60034-1. The TUV mark is printed on the nameplates of this motor.

Note)

The items that are not mentioned in this report correspond to FANUC AC SERVO MOTOR $\alpha \emph{i}$ series .

Please refer to FANUC AC SERVO MOTOR αi series DESCRIPTION B-65262EN, too.

				AC SERVO MOTOR αi series DESCRIPTIONS		RIPTIONS
				αis 300/3000HV , αis 500/3000HV		
01	09.11.11	Saitou	Newly designed	DRAW. No. B-65262EN/05-08		CUST.
Ed.	Date	Design.	Description	FANUC LTD	SHEET	2/13

2. DESIGNATION

Motor specification numbers have the following format.

A06B-aaaa-Bbcd

<u>aaaa</u>

0290: αi S 300/3000HV 0297: αi S 500/3000HV

b

0: Taper Shaft Type

c

1: With a cooling fan

d

0: Pulsecoder αi A 1000

3. APPLICABLE AMPLIFIER

Applicable amplifiers for lpha iS 300/3000HV and lpha iS 500/3000HV

ovic 200/2000 IV	Servo amplifiers $lpha i$ SV	α <i>i</i> SV 540HV (A06B-6127-H110)
α <i>i</i> S 300/3000HV	Power supply $lpha i$ PS	α <i>i</i> PS 60HV (A06B-6150-H060)
orio 500/000011V	Servo amplifiers $lpha i$ SV	α <i>i</i> SV 540HV (A06B-6127-H110)
α <i>i</i> S 500/3000HV	Power supply $lpha i$ PS	α <i>i</i> PS 75HV (A06B-6150-H075)

! CAUTION

- 1 If a motor is used in a combination other than those listed above, it may become broken.
- 2 For details on the servo amplifier, refer to "FANUC SERVO AMPLIFIER αi series DESCRIPTIONS (B-65282EN)" .

				TITLE AC SERVO MOTOR αi series DESCRIPTIONS		
				αis 300/3000HV , αis 500/3000HV		
01	09.11.11	Saitou	Newly designed	DRAW. No. B-65262EN/05-08 CUST.		CUST.
Ed.	Date	Design.	Description	FANUC LTD	SHEET	3/13

4. Output data for selecting αiPS amplifiers

MOTOR MODEL	Continuous output	Maximum output	
α i S 300/3000HV	55kW	143kW	
α i S 500/3000HV	60kW	160kW	

! CAUTION

1 These data is only for selecting the PS and it doesn't guarantee the power of motors.

5. COEFFICIENTS FOR CALCULATING THE DYNAMIC BRAKE STOPPING DISTANCE

SI unit

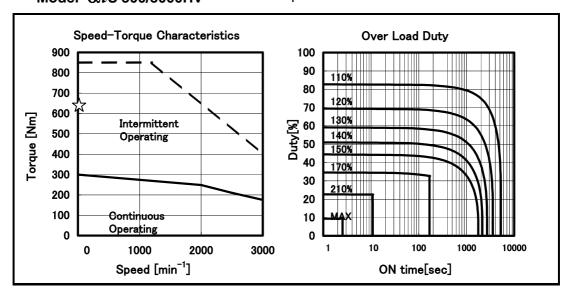
Motor model	А	В
α i S 300/3000HV	2.9×10 ⁻³	1.2×10 ⁻⁹
α <i>i</i> S 500/3000HV	1.6×10 ⁻³	7.1×10 ⁻¹⁰

When the load inertia is less than 3 times as large as the motor inertia, A06B-6079-H401 is available as the dynamic brake module. When the load inertia is more than 3 times as large as the motor inertia, please ask separately.

			TITLE			
			AC SERVO MOTOR αi series DESCRII αi S 300/3000HV , αi S 500/3000HV		RIPTIONS	
01	09.11.11	Saitou	Newly designed	DRAW. No. B-65262EN/05-08 CUST.		CUST.
Ed.	Date	Design.	Description	FANUC LTD	SHEET	4/13

6. SPECIFICATIONS

Model αis 300/3000HV Specification : A06B-0290-B010



Data sheet

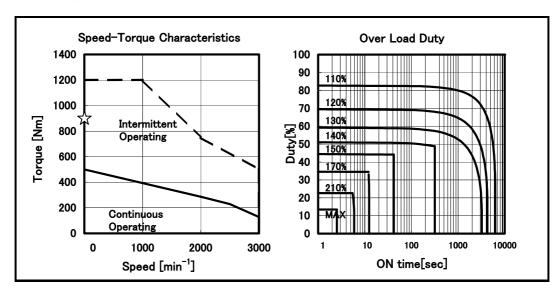
Parameter	Symbol		Value	Unit
Stall Torque (*)	Ts	300		Nm
		3060		kgfcm
Stall Current (*)	ls	117		A (rms)
Rated Output (*)	Pr	55		kW
		74		HP
Rating Speed	Nr	2500		min ⁻¹
Maximum Speed	Nmax	3000		min ⁻¹
Maximum Torque (*)	Tmax	850		Nm
		8670		kgfcm
Rotor Inertia	Jm	0.0787		kgm ²
		0.803		kgfcms ²
Rotor Inertia	Jm	-		kgm ²
		-		kgfcms ²
Torque constant (*)	Kt	2.57		Nm/A (rms)
		26.2		kgfcm/A (rms)
Back EMF constant (1phase) (*)	Ke	90		V (rms)/1000 min ⁻¹
	Kv	0.86		V (rms)sec/rad
Armature Resistance (1 phase) (*)	Ra	0.029		Ω
Mechanical time constant	tm	0.001		s
Thermal time constant	tt	50		min
Static friction	Tf	4.0		Nm
		41		kgfcm
Weight	W	180		kg
Weight	W	-		kg
Max. Current of Servo Amp.	Imax	540		A (peak)

^(*) The values are the standard values at 20°C and the tolerance is ±10%. The speed-torque characteristics very depending on the type of software, parameter setting, and input voltage of the digital servo software. (The above figures show average values.)

Max torque is limited by 630Nm at under 20rpm.

				TITLE		
				AC SERVO MOTOR $lpha i$ series DESCRIPTIONS		
				lpha iS 300/3000HV , $lpha i$ S 500/3000HV		
01	09.11.11	Saitou	Newly designed	DRAW. No. B-65262EN/05-08 CUST.		CUST.
Ed.	Date	Design.	Description	FANUC LTD	SHEET	5/13

Model αiS 500/3000HV



Specification: A06B-0297-B010

Data sheet

Parameter	Symbol		Value	Unit
Stall Torque (*)	Ts	500		Nm
		5100		kgfcm
Stall Current (*)	ls	140		A (rms)
Rated Output (*)	Pr	60		kW
		80		HP
Rating Speed	Nr	2000		min ⁻¹
Maximum Speed	Nmax	3000		min ⁻¹
Maximum Torque (*)	Tmax	1200		Nm
		12200		kgfcm
Rotor Inertia	Jm	0.127		kgm ²
		1.30		kgfcms ²
Rotor Inertia(with Brake)	Jm	-		kgm ²
		-		kgfcms ²
Torque constant (*)	Kt	3.5		Nm/A (rms)
		36		kgfcm/A (rms)
Back EMF constant (1phase) (*)	Ke	121		V (rms)/1000 min ⁻¹
	Κv	1.2		V (rms)sec/rad
Armature Resistance (1 phase) (*)	Ra	0.026		Ω
Mechanical time constant	tm	0.0008		s
Thermal time constant	tt	60		min
Static friction	Tf	4.0		Nm
		41		kgfcm
Weight	w	240		kg
Weight(with Brake)	w	-		kg
Max. Current of Servo Amp.	lmax	540		A (peak)

^(*) The values are the standard values at 20°C and the tolerance is ±10%. The speed-torque characteristics very depending on the type of software, parameter setting, and input voltage of the digital servo software. (The above figures show average values.) Max torque is limited by 900Nm at under 20rpm.

				TITLE		
				AC SERVO MOTOR $lpha i$ series DESCRIPTIONS		
				lphais 300/3000HV , $lpha$ is 500/3000HV		
01	09.11.11	Saitou	Newly designed	DRAW. No. B-65262EN/05-08		CUST.
Ed.	Date	Design.	Description	FANUC LTD	SHEET	6/13

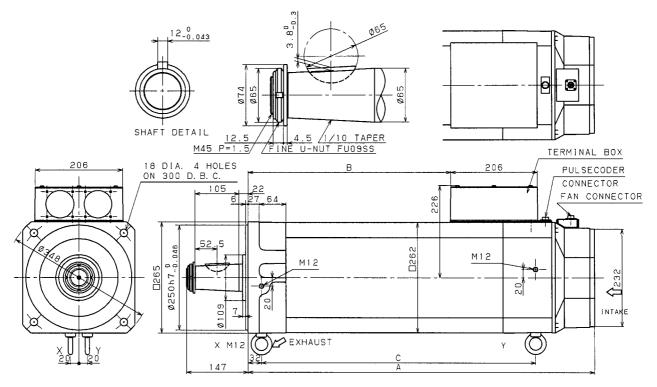
7. OUTLINE DRAWINGS

7-1. Outline Drawing of the Motor

Model αi S 300/3000HV αi S 500/3000HV

Specification: A06B-0290-B010

A06B-0297-B010



MODEL	Α	В	С
α <i>i</i> s 300/3000HV	620	279	448
α <i>i</i> s 500/3000HV	828	487	656

The motor does not include a circuit breaker for protecting the fan.
 Prepare such a breaker in the power magnetics cabinet.

				AC SERVO MOTOR αi series DESCRIPTIONS αi S 300/3000HV , αi S 500/3000HV		
01	09.11.11	Saitou	Newly designed	DRAW. No. B-65262EN/05-08		CUST.
Ed.	Date	Design.	Description	FANUC LTD SHEET 7/1		7/13

7-2. Allowable Axis Load

The allowable axis load is indicated below. Refer to the FANUC AC SERVO MOTOR αi series DESCRIPTION B-65262EN.

Radial load	Axial load	(Reference) Front bearing specification	
11760[N] (*) (1200[kgf])	1960[N] (200[kgf])	NU2214	

(*) Ensure also that the maximum momentary radial load does not exceed the value above. The shaft can break due to fatigue.

7-3. Shaft Run-out Precsion

The allowable axis load is indicated below.

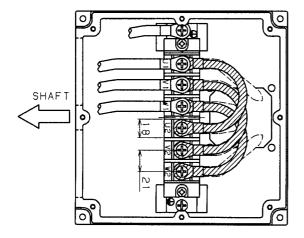
Refer to the FANUC AC SERVO MOTOR αi series DESCRIPTION B-65262EN.

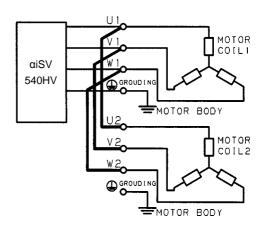
Shaft dia. run-out	Faucet joint run-out	Mounting face run-out
0.06mm or less	0.06mm or less	0.08mm or less

—						
				TITLE		
				AC SERVO MOTOR αi series DESCRIPTIONS		
				α1S 300/3000HV , α1S 500/3000HV		
01	09.11.11	Saitou	Newly designed	DRAW. No. B-65262EN/05-08		CUST.
Ed.	Date	Design.	Description	FANUC LTD	SHEET	8/13

7-4. Power Terminal Layout

The following shows the power terminal layout in the terminal box.





Power terminal size and ground terminal size: M6

Tightening torque: 3.5 N·m to 4.5 N·m

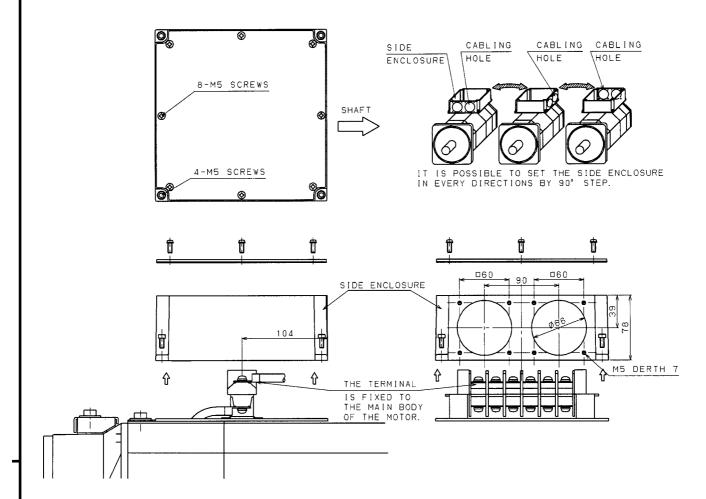
^CAUTION

- Securely connect power wires and short bars to the terminal block with the specified tightening torque according to the procedure described in this section. If the motor runs with a terminal loosely connected, the terminal block may get abnormally hot, resulting in a fire. The terminal may also be disconnected, resulting in a ground fault, short circuit, or electric shock.
- 2. An incorrect connection of jumper wires cause abnormal heat generation, equipment malfunction or damage of a motor.
- To keep the insulation distance, note the following points:
 When attaching a crimp terminal to the end of a power wire, always cover the crimping section of the crimp terminal with an insulating tube.

When an insulating cover is mounted on the terminal block, screw the power wires and remount the cover in place before using the motor.

				TITLE		
				AC SERVO MOTOR αi series DESCRIPTIONS		
				lpha iS 300/3000HV , $lpha i$ S 500/3000HV		
01	09.11.11	Saitou	Newly designed	DRAW. No. B-65262EN/05-08		CUST.
Ed.	Date	Design.	Description	FANUC LTD	SHEET	9/13

7-5. Cabling



- 1. Before cabling, the motor can be dismantled by removing the four M5 hexagon socket head bolts and the eight M5 pan head screws. At the time of installation, check that the waterproofing rubber packing is not damaged, then install it with a tightening torque of 2.0 N⋅m to 2.5 N⋅m. At this time, ensure that foreign matter is not caught.
- 2. To meet the IP level, a protection such as a conduit is required for the cabling hole. Refer to the FANUC AC SERVO MOTOR αi series DESCRIPTION B-65262EN.
- 2. For the specifications, shapes, and pin layouts of the connectors of the pulsecoder and fan, refer to the FANUC AC SERVO MOTOR αi series DESCRIPTION B-65262EN.

				TITLE		
				AC SERVO MOTOR $lpha i$ series DESCRIPTIONS		
				lpha iS 300/3000HV , $lpha i$ S 500/3000HV		
01	09.11.11	Saitou	Newly designed	DRAW. No. B-65262EN/05-08 CUST.		CUST.
Ed.	Date	Design.	Description	FANUC LTD	SHEET	10/13

8. COOLING FAN

For the detail of connecting and the pin layouts of the connectors, refer to the FANUC AC SERVO MOTOR αi series DESCRIPTION B-65262EN.

Motor model	lpha iS 300/3000HV, $lpha i$ S 500/3000HV		
	Three-phase 400VAC		
Input voltage	50Hz	60Hz	
	AC323V to 440V	AC391V to 528V	
Rated input	80W	120W	
Steady-state current	0.2A _{rms}	0.2A _{rms}	
Protection circuit set temperature	140°C		
Degree of protection (IEC34-5)	IP00		

NOTE

- 1. For the models with fan, the degree of protection of the fan connector section is IP00.
- 2. Pay attention to the driving voltage. This fan motor is driven by three-phase,400VAC.

				TITLE		
				AC SERVO MOTOR $lpha i$ series DESCRIPTIONS		
				lpha iS 300/3000HV , $lpha i$ S 500/3000HV		
01	09.11.11	Saitou	Newly designed	DRAW. No. B-65262EN/05-08 CUST		CUST.
Ed.	Date	Design.	Description	FANUC LTD	SHEET	11/13

9. SERVO PARAMETERS

9-1. Parameter Table

The parameter table for the model $\alpha i S$ 300/3000HV and $\alpha i S$ 500/3000HV is shown in the next table. Please set the appropriate parameters manually according to the table. Applicable servo software series and editions are shown below.

(Series 16*i*-B,18*i*-B,21*i*-B,Power Mate *i*) Series 90BP/F(06) and subsequent editions

When system software other than listed above is required, please ask separately.

A CAUTION

If a motor is used in a wrong parameter, it may become broken.

9-2. Auto loading

Each parameter ID for auto loading is as follows.

Motor model	Parameter ID (HRV2 control)	
α <i>i</i> s 300/3000HV	344	
α <i>i</i> s 500/3000HV	347	

10. OTHER SPECIFICATIONS

The items that are not mentioned in this report correspond to FANUC AC SERVO MOTOR αi series. Please refer to FANUC AC SERVO MOTOR αi series DESCRIPTION B-65262EN, too.

				AC SERVO MOTOR αi series DESCRIPTIONS αi S 300/3000HV , αi S 500/3000HV		
01	09.11.11	Saitou	Newly designed	DRAW. No. B-65262EN/05-08		CUST.
Ed.	Date	Design.	Description	FANUC LTD	12/13	

 αi S 300/3000HV (Applicable amplifiers : αi SV 540HV) αiS 500/3000HV (Applicable amplifiers : αiSV 540HV) servo parameter : HRV2 control

	Motor	αiS300	α iS500
	Model	/3000HV	/3000HV
	Motor		
	Specification	0290	0297
	Driver	HRV2	HRV2
symbol	FS16i etc		
,		00001000	00001000
		00000011	
	2011	00000000	00000000
	2013	00000000	00000000
	2014	00000000	00000000
	2211	00011010	00011010
PK1	2040	821	1344
PK2	2041	-5450	-7296
PK3	2042	-1355	-1356
PK1V	2043	91	111
PK2V	2044	-819	-996
PK3V	2045	0	0
PK4V	2046	-8235	-8235
POA1	2047	4633	3811
BLCMP	2048	0	0
DPFMAX	2049	0	0
POK1	2050	956	956
POK2	2051	510	510
CGONT	2052	0	0
PPMAX	2053	21	21
PDDP	2054	1894	1894
PHYST	2055	319	319
EMFCMP	2056	0	0
PVPA	2057	-5646	-3856
PALPH	2058	-1800	-2900
PPBAS	2059	0	0
TQLMT	2060	7282	7282
EMFLMT	2061	0	0
OVC1	2062	32380	32380
OVC2	2063	4850	4850
TGALMLV	2064	4	4
OVCLMT	2065	12155	12155

symbol	FS16i etc		
AALPH	2074	12288	12288
RTCURR	2086	2000	2482
DEPVPL	2098		0
ONEPSL	2099	400	400
DBLIM	2102		0
TRQCST	2105	13494	18125
MGSTCM	2110	523	521
DETQLM	2111	2960	2953
NINTCT	2127	7720	8021
MFWKCE	2128	4300	2500
MFWKBL	2129	1556	1041
LP2GP	2130	0	0
LP4GP	2131	0	0
LP6GP	2132	0	0
PHDLY1	2133	3100	3093
PHDLY2	2134	6422	6418
DGCSMM	2159	0	0
TRQCUP	2160	0	0
RESERV	2161	140	140
POVC21	2162	32700	32700
POVC22	2163	853	853
POVCLMT2	2164	10644	10644
MAXCRT	2165	0	0
	2302	20	20
	2305	29	32
	2310	1700	1400
	2316	5394	5394

	1					
				TITLE		
				AC SERVO MOTOR $lpha i$ series DESCRIPTIONS		
				lpha iS 300/3000HV , $lpha i$ S 500/3000HV		
01	09.11.11	Saitou	Newly designed	DRAW. No. B-65262EN/05-08 CUST.		CUST.
Ed.	Date	Design.	Description	FANUC LTD	SHEET	13/13