FANUC

GE Fanuc Automation

Computer Numerical Control Products

AC Spindle Motor αiB Series

Descriptions

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Warnings, Cautions, and Notes as Used in this Publication

Warning

Warning notices are used in this publication to emphasize that hazardous voltages, currents, temperatures, or other conditions that could cause personal injury exist in this equipment or may be associated with its use.

In situations where inattention could cause either personal injury or damage to equipment, a Warning notice is used.

Caution

Caution notices are used where equipment might be damaged if care is not taken.

Note

Notes merely call attention to information that is especially significant to understanding and operating the equipment.

This document is based on information available at the time of its publication. While efforts have been made to be accurate, the information contained herein does not purport to cover all details or variations in hardware or software, nor to provide for every possible contingency in connection with installation, operation, or maintenance. Features may be described herein which are not present in all hardware and software systems. GE Fanuc Automation assumes no obligation of notice to holders of this document with respect to changes subsequently made.

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SAFETY PRECAUTIONS

This "Safety Precautions" section describes the precautions which must be observed to ensure safety when using FANUC AC SPINDLE MOTOR αi_B series.
Users of any spindle motor model are requested to read this manual carefully before using the spindle 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 this manual. They are invited to ask FANUC previously about what behavior or action is prohibited.

Contents

1.1 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.

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

1.2 WARNING

⚠ WARNING

- 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.

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

Motors are heavy. When moving them, use a crane or lift as required. (For the weight of motors, refer to Chapter 1 in Part I.)
When moving a motor using a crane or lift, use a hanging bolt if the motor has a corresponding tapped hole, or textile rope if it has no tapped hole. If a motor is attached with a machine or any other heavy stuff, do not use a hanging bolt to move the motor as the hanging bolt and/or motor may get broken.
When moving a motor, be careful not to apply excessive force to its windings as the windings may break and/or their insulation may deteriorate.

- 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 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 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 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.

- 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 their respective motor specification manuals for details.

- Connect power wires securely so that they will not get loose.

A failure to observe this caution may cause a wire to be disconnected, resulting in a ground fault, short circuit, or electric shock.

⚠ WARNING

- Do not supply the power to the motor while any terminal is exposed.

A failure to observe this caution is very dangerous because you may get electric shocks if your body or any conductive stuff touches an exposed terminal.

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

A rotating part may catch your cloths or fingers. Before starting a motor, ensure that there is no stuff that can fly away (such as a key) on the motor.

- 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.

- 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.

- 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 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.

- Ensure that motors and related components are mounted securely.

If a motor or its component slips out of place or comes off when the motor is running, it is very dangerous.

- When designing and assembling a machine tool, make it compliant with EN60204-1.

To ensure the safety of the machine tool and satisfy European standards, when designing and assembling a machine tool, make it compliant with EN60204-1. For details of the standards, refer to the standards.

1.3 CAUTION

⚠ CAUTION

- 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.

- 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.

- 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 their
respective specification manuals.

1.4 NOTE

NOTE

- Do not step or sit 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 storing a motor, put it in a dry (non-condensing) place at room temperature (0 to 40 °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.

- 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. For a nameplate for a built-in spindle motor, keep the nameplate with the spindle.

- 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. Be very careful when handling plastic portions, sensors, and windings, because they are very liable to break. Especially, avoid lifting a motor by pulling its plastic portion, winding, or power cable.

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

Such a test can damage elements in the sensor.

- When testing the winding or insulation resistance of a motor, satisfy the conditions stipulated in IEC34.

Testing a motor under a condition severer than those specified in IEC34 may damage the motor.

- 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.

- Do not modify a motor.

Do not modify a motor unless directed by FANUC. Modifying a motor may cause a failure or trouble in it.

- 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 their respective specification manuals for details of the operating and environmental conditions for motors.

NOTE

- 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.

- 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.

- 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 their respective specification manuals, 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.

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

INTRODUCTION

This manual includes information of following models.

FANUC AC SPINDLE MOTOR αi_B series

Standard type	
Single winding	**Double windings (Speed range switching control)**
α50L/25000i_B α80M/15000i_B α80L/8000i_B α100S/12500i_B α112M/15000i_B	α80S/20000i_B α112SS/20000i_B α112S/15000i_B α112L/15000i_B α112LL/15000i_B α132M/14000i_B α132L/14000i_B α160S/13000i_B α160M/13000i_B α160L/13000i_B α160LL/13000i_B α180M/6000i_B α180L/6000i_B α180LL/8000i_B α200M/6000i_B α200L/6000i_B α250M/3000i_B
High-speed type	
Single winding	**Double windings (Speed range switching control)**
α40S/70000i_B α80S/40000i_B	α100S/20000i_B α112S/20000i_B α112M/20000i_B α112L/20000i_B α112L/25000i_B α132L/25000i_B α160M/20000i_B α160L/20000i_B α160LL/20000i_B

⚠ CAUTION
The motors cannot be driven normally if incorrect handling or assembling is applied. Read "II.INSTRUCTION", especially "1.GENERAL", before designing or assembling the spindle.

NOTE
1 The above models with some exceptions are certified by a certification organization (TÜV Rheinland).
2 Many drawings in this manual are drawn by Third Angle Projection Method.
3 Amplifier information is in the latest edition of Descriptions FANUC SERVO AMPLIFIER αi series (B-65282EN). Refer to the manual to get information about the amplifier.

CONSTRUCTION

This manual consists of following three parts.

I. SPECIFICATIONS

Output characteristics, dimensions, cooling conditions, and so on are shown here.

II. INSTRUCTION

Installation instructions for the built-in motor are shown here. Refer to this part when you design or assemble a spindle.

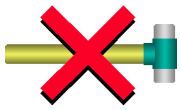
APPENDIX

Formulas for acceleration time, specification number, rotor sleeve, switching unit and so on are shown here.

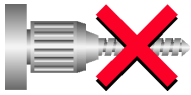
HANDLING OF BUILT-IN MOTOR

> ⚠ **CAUTION**
> You should read this clause before handling a built-in motor.
> If you handle the motor incorrectly, some trouble or accident will occur. Refer to Part II.
> The word “Motor” described here means stator, rotor, sensor and all parts of the motor.

- Avoid impact or excessive force. It will damage motor parts. Often it will not operate normally if motor parts are damaged.



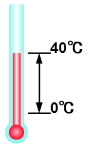
- Do not machine on the parts without FANUC’s permission. Machine only on the parts designated by FANUC.



- Rotor may be deformed by incorrect method of machining. Refer to the Chapter II-3 for correct instructions.

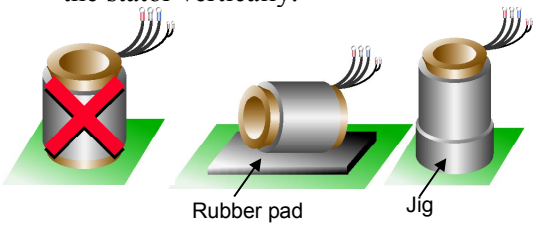
- Protect the motor from water, oil, solvent and other chemicals that may damage the motor insulation, and from conductive dust that may cause shorts in the motor.

- Do not heat or cool if it is unnecessary. Especially be careful to the heat shock.



- Some magnetic elements are used for a sensor and must be kept away from magnetic fields. A screw driver which had magnetic tip may damage the sensor.

- Place the stator sidewise as shown to store. Using a rubber pad is preferable. Use jigs to protect the windings if you want to store the stator vertically.



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I. SPECIFICATIONS

CONSTRUCTION OF THIS PART

This part includes followings.

NOTE
Refer to II.INSTRUCTION before installing a motor in a spindle. The part describes how to handle, assemble, and modify motors properly and contains information required to satisfy IEC and other standards.

1 SPECIFICATIONS

1.1 STANDARD TYPE

Item			Model name / Type No.(A06B-) *8	αL/25000iB 1615-B120#Z318	αS/20000iB 1621-B120#Z312		αM/15000iB 1623-B170#Z011
					Low	High	
*1 Rated output	S1 continuous (Max. current)	kW (A)		1.5 (12)	1.5 (10)	1.5 (13)	1.5 (11)
	S2 short time Rated minutes (Max. current)				2.2 5min. (16)		2.2 15min. (14)
	S3 40% (Max. current)						
	S3 25% (Max. current)			3.7 (23)		3.7 (21)	
*2 Rated speed	Base	min^{-1}		10000	4500	8000	3000
	Power constant			17000	10000	20000	12000
	Maximum			25000	15000	20000	15000
Rated Max. torque	S1 continuous	Nm		1.4	3.2		4.8
	S2 or S3			3.5	7.0		7.0
Power factor				0.74	0.69		0.68
Rated voltage of motor input *3		V_{AC}		144-183	122-191		144-217
Winding connection				Δ	Y	Δ	Δ
Power leads connection *5				Connection B	Connection E		Connection A
Number of poles				4	4		4
Resistance of winding *10		mΩ ±5%		303	754	251	436
Insulation class				F	F		F
Temperature rise of winding		K		≤105	≤105		≤105
Required clearance		mm		3	3		3
Overheating temperature setting		±5°C		140	130		130
IC code				IC9U7A7	IC9U7A7		IC9U7A7
Coolant	Temperature	°C		20	20	20	20
	Temperature rise	K		≤4	≤2	≤2	≤2
	Flowing rate	Liter/min		≥12.0	≥12.0		≥12.9
	Specific heat	J/g·K		1.87	1.87		1.87
	Density	g/cm^3		0.78	0.78		0.78
	Pressure *11	kPa		≤2940	≤2940		≤2940
Capacity of cooler *12		W		≥1200	≥1000		≥1160
BZi sensor *4				T211	T201		T401
Weight	Stator	kg		3	4		6
	Rotor			0.6	1.2		3
Rotor inertia		kgm^2		0.0002	0.002		0.003
Allowable overload *6		kW		4.4	2.6	4.4	2.6
Spindle amplifier module (SPM-)				5.5i	5.5i		2.2i
AC reactor (A81L-0001-) *13				-	-		-
Date for choice of PSM *7		kW		1.5/4.6	1.5/4.8		1.5/2.7
Parameter spec. (A06B-6111-) *9							

NOTE
- All specifications are guaranteed when using FANUC's amplifier and providing the cooling system required.
- All specification are guaranteed when input voltage of amplifier is 200/220/230VAC. (except for the αL/25000iB and αLL/20000iB with the 400 V specification)
- IEC34 and VDE0110 etc. should be applied to conform to CE marking when installing the motor in a spindle. Refer to the standards for details.
- Use motors under following condition.
  Room temperature form 0 to 40°C, 1000m or less above sea level, vibration acceleration of 1 G or less at no load or 10 G or less at cutting, dry environment, non-condensation.

α80L/8000*i*B 1625-B170#Z011	α100L/12500*i*B 1641-B120#Z011	α112SS/20000*i*B 1661-B120#Z312		Model name Type No.(A06B-) *8		
		Low	High			Item
1.1 (20)	2.2 (21)	2.2 (28)	2.2 (17)	kW (A)	S1 continuous (Max. current)	Rated output *1
3.7 30min. (28)	3.7 30min. (29)				S2 short time Rated minutes (Max. current)	
		5.5 (31)	5.5 (33)		S3 40% (Max. current)	
		5.5 (S3 10%) (53)			S3 25% (Max. current)	
1500	1500	1070	5000	min^{-1}	Base	Rated speed *2
8000	8000	5000	20000		Power constant	
8000	12500	5000	20000		Maximum	
7.0	14.0	20		Nm	S1 continuous	Rated Max. torque
23.6	23.6	49			S2 or S3	
0.74	0.75	0.66		Power factor		
114-217	105-218	99-176		V_{AC}	Rated voltage of motor input *3	
Δ	Δ	Y	Δ	Winding connection		
Connection A	Connection B	Connection E		Power leads connection *5		
4	4	4		Number of poles		
427	328	510	170	mΩ ±5%	Resistance of winding *10	
F	F	F		Insulation class		
≤105	≤105	≤105		K	Temperature rise of winding	
3	3	3		mm	Required clearance	
130	140	140		±5°C	Overheating temperature setting	
IC9U7A7	IC9U7A7	IC9U7A7		IC code		
20	20	20	20	°C	Temperature	Coolant
≤5	≤3	≤4	≤4	K	Temperature rise	
≥12.1	≥12.0	≥13.0		Liter/min	Flowing rate	
1.87	1.87	1.87		J/g·K	Specific heat	
0.78	0.78	0.78		g/cm^3	Density	
≤2940	≤2940	≤2940		kPa	Pressure *11	
≥1160	≥1160	≥4900		W	Capacity of cooler *12	
T401	T401	T201		BZ*i* sensor *4		
9	11	7		kg	Stator	Weight
4	5	3			Rotor	
0.004	0.008	0.008		kgm^2	Rotor inertia	
4.4	4.4	6.6		kW	Allowable overload *6	
5.5*i*	5.5*i*	11*i*		Spindle amplifier module (SPM-)		
-	-	-		AC reactor (A81L-0001-) *13		
1.1/4.8	2.2/5.5	2.2/7.9		kW	Date for choice of PSM *7	
				Parameter spec. (A06B-6111-) *9		

*1 Data indicate the output of constant power range.
*2 This speed is applied for S1 continuous rated. Refer to 2. POWER CURVES for details.
*3 This is not an input voltage of amplifier. This indicates that the input voltage of motor is changed when the motor output changes within the rated output and speed.
*4 A860-2120-Txxx. For velocity and position feedback. Install to a rotating axis. Refer to 3.3 SENSOR.
*5 Refer to 2.3 POWER LEADS CONNECTION in the Part II.
*6 Reference data, applied for 1 minute. This value is not guaranteed.
*7 Reference data of Continuous/Maximum(at acceleration) output for the choice of PSM.
*8 The number indicates the type number of the standard model. For other specification numbers such as of a model with a different sensor, refer to E. SPECIFICATION NUMBER in APPENDIX.
*9 Refer to the manual, the latest edition of Parameter Manual (B-65280EN) for details.
*10 The resistance of winding indicates reference data between the amplifier (SPM) and motor after motor power leads connection (the actual resistance differs slightly depending on the length of the used power cable). To measure the resistance of winding, refer to 2.2 CHECKING THE WINDING RESISTANCE in II. INSTRUCTION before connection.
*11 Adjust the coolant pressure according to the O-ring you use.
*12 Actual calorie which must be removed from the motor is calculated as follows.
Q(W)=Flowing rate(ℓ/min)×Specific heat(J/gK)×Density(g/cm^3)×Temperature rise(K)×1000÷60
*13 The model for which this item is given requires an AC reactor between the motor and amplifier (SPM). Refer to 3.5 REACTOR.

Item			Model name / Type No.(A06B-) *8		
			α112S/15000*i*B 1671-B120#Z311		α112M/15000*i*B 1673-B120#Z311
			Low	High	
*1 Rated output	S1 continuous (Max. current)	kW (A)	5.5 (66)	5.5 (40)	5.5 (41)
	S2 SHORT TIME Rated minutes (Max. current)			7.5 30min. (48)	7.5 30min. (51)
	S3 40% (Max. current)				
	S3 25% (Max. current)		7.5 (85)		
*2 Rated speed	Base	min^{-1}	1200	6000	1500
	Power constant		6000	15000	6000
	Maximum		6000	15000	15000
Rated Max. torque	S1 continuous	Nm	44		35
	S2 or S3		60		48
Power factor			0.63		71
Rated voltage of motor input *3		V_{AC}	79-194		132-189
Winding connection			Y	Δ	Δ
Power leads connection *5			Connection E		Connection B
Number of poles			4		4
Resistance of winding *10		mΩ ±5%	95	32	112
Insulation class			H		F
Temperature rise of winding		K	≤125		≤105
Required clearance		mm	3		3
Overheating temperature setting		±5°C	155		140
IC code			IC9U7A7		IC9U7A7
Coolant	Temperature	°C	20		20
	Temperature rise	K	≤5	≤5	≤3
	Flowing rate	Liter/min	≥13.2		≥12.9
	Specific heat	J/g·K	1.87		1.87
	Density	g/cm^3	0.78		0.78
	Pressure *11	kPa	≤2940		≤2940
Capacity of cooler *12		W	≥5200		≥1160
BZ*i* sensor *4			T401		T401
Weight	Stator	kg	10		25
	Rotor		5		8
Rotor inertia		kgm^2	0.012		0.018
Allowable overload *6		kW	9.0		9.0
Spindle amplifier module (SPM-)			22*i*		11*i*
AC reactor (A81L-0001-) *13			-		-
Date for choice of PSM *7		kW	5.5/9.9		5.5/12
Parameter spec. (A06B-6111-) *9					

NOTE
- All specifications are guaranteed when using FANUC's amplifier and providing the cooling system required.
- All specification are guaranteed when input voltage of amplifier is 200/220/230VAC. (except for the α112L/25000*i*B and α160LL/20000*i*B with the 400 V specification)
- IEC34 and VDE0110 etc. should be applied to conform to CE marking when installing the motor in a spindle. Refer to the standards for details.
- Use motors under following condition.
  Room temperature form 0 to 40°C, 1000m or less above sea level, vibration acceleration of 1 G or less at no load or 10 G or less at cutting, dry environment, non-condensation.

α112L/15000*i*B 1675-B100#Z311		α112LL/15000*i*B 1676-B100#Z311		Model name Type No.(A06B-) *8		
Low	High	Low	High			Item
15 (88)	18.5 (107)	15 (88)	18.5 (117)	kW (A)	S1 continuous (Max. current)	*1 Rated output
18.5 15min. (105)	22 15min. (123)	18.5 15min. (104)	22 15min. (132)		S2 short time Rated minutes (Max. current)	
					S3 40% (Max. current)	
18.5 (139)		18.5 (137)			S3 25% (Max. current)	
1500	5000	1200	3500	min^{-1}	Base	*2 Rated speed
3500	12500	2800	12000		Power constant	
3500	15000	4500	15000		Maximum	
95		119		Nm	S1 continuous	Rated Max. torque
167		204			S2 or S3	
0.74		0.73		Power factor		
133-182		94-177		V_{AC}	Rated voltage of motor input *3	
Y	Y	Y	Y	Winding connection		
Connection D		Connection D		Power leads connection *5		
4		4		Number of poles		
91	40	100	44	mΩ ±5%	Resistance of winding *10	
H		H		Insulation class		
≤125		≤125		K	Temperature rise of winding	
3		3		mm	Required clearance	
180		180		±5°C	Overheating temperature setting	
IC9U7A7		IC9U7A7		IC code		
20	20	20	20	°C	Temperature	Coolant
≤12	≤15	≤18	≤18	K	Temperature rise	
≥12.0		≥12.9		Liter/min	Flowing rate	
1.87		1.87		J/g·K	Specific heat	
0.78		0.78		g/cm^3	Density	
≤2940		≤2940		kPa	Pressure *11	
≥4200		≥5200		W	Capacity of cooler *12	
T401		T401		BZ*i* sensor *4		
28		38		kg	Stator	Weight
10		12			Rotor	
0.022		0.028		kgm^2	Rotor inertia	
22.2	26.4	22.2	26.4	kW	Allowable overload *6	
30*i*		30*i*		Spindle amplifier module (SPM-)		
-		-		AC reactor (A81L-0001-) *13		
18.5/29.4		18.5/27.6		kW	Date for choice of PSM *7	
				Parameter spec. (A06B-6111-) *9		

*1 Data indicate the output of constant power range.
*2 This speed is applied for S1 continuous rated. Refer to 2. POWER CURVES for details.
*3 This is not an input voltage of amplifier. This indicates that the input voltage of motor is changed when the motor output changes within the rated output and speed.
*4 A860-2120-Txxx. For velocity and position feedback. Install to a rotating axis. Refer to 3.3 SENSOR.
*5 Refer to 2.3 POWER LEADS CONNECTION in the Part II.
*6 Reference data, applied for 1 minute. This value is not guaranteed.
*7 Reference data of Continuous/Maximum(at acceleration) output for the choice of PSM.
*8 The number indicates the type number of the standard model. For other specification numbers such as of a model with a different sensor, refer to E. SPECIFICATION NUMBER in APPENDIX.
*9 Refer to the manual, the latest edition of Parameter Manual (B-65280EN) for details.
*10 The resistance of winding indicates reference data between the amplifier (SPM) and motor after motor power leads connection (the actual resistance differs slightly depending on the length of the used power cable). To measure the resistance of winding, refer to 2.2 CHECKING THE WINDING RESISTANCE in II. INSTRUCTION before connection.
*11 Adjust the coolant pressure according to the O-ring you use.
*12 Actual calorie which must be removed from the motor is calculated as follows.
Q(W)=Flowing rate(ℓ/min)×Specific heat(J/gK)×Density(g/cm^3)×Temperature rise(K)×1000÷60
*13 The model for which this item is given requires an AC reactor between the motor and amplifier (SPM). Refer to 3.5 REACTOR.

Item			Model name / Type No.(A06B-) *8	α132M/14000*i*B 1713-B100#Z311		α132L/14000*i*B 1705-B140#Z311	
				Low	High	Low	High
*1 Rated output	S1 continuous (Max. current)	kW (A)		15 (81)	18.5 (99)	15 (100)	22 (124)
	S2 short time Rated minutes (Max. current)			18.5 15min. (97)	22 10min. (114)	22, 18.5, 18.5 5, 15, 30min. (141,121,115)	25 30min. (133)
	S3 40% (Max. current)						
	S3 25% (Max. current)			18.5 (119)			
*2 Rated speed	Base	min^{-1}		1400	5000	1000	5500
	Power constant			2500	14000	2000	14000
	Maximum			2500	14000	3000	14000
Rated Max. torque	S1 continuous	Nm		102		143	
	S2 or S3			161		233	
Power factor				81		74	
Rated voltage of motor input *3		V_{AC}		135-185		133-195	
Winding connection				Y	Y	Y	Δ
Power leads connection *5				Connection D		Connection H	
Number of poles				4		4	
Resistance of winding *10		mΩ ±5%		69	29	114	19
Insulation class				F		F	
Temperature rise of winding		K		≤105		≤105	
Required clearance		mm		3		3	
Overheating temperature setting		±5°C		155		155	
IC code				IC9U7A7		IC9U7A7	
Coolant	Temperature	°C		20	20	20	20
	Temperature rise	K		≤7	≤19	≤7	≤17
	Flowing rate	Liter/min		≥13.5		≥13.5	
	Specific heat	J/g·K		1.87		1.87	
	Density	g/cm^3		0.78		0.78	
	Pressure *11	kPa		≤2940		≤2940	
Capacity of cooler *12		W		≥5200		≥5200	
BZ*i* sensor *4				T401		T401	
Weight	Stator	kg		43		42	
	Rotor			10		14	
Rotor inertia		kgm^2		0.028		0.039	
Allowable overload *6		kW		18	26.4	26.4	30
Spindle amplifier module (SPM-)				30*i*		30*i*	
AC reactor (A81L-0001-) *13				-		-	
Date for choice of PSM *7		kW		18.5/27.3		22/35	
Parameter spec. (A06B-6111-) *9							

NOTE
- All specifications are guaranteed when using FANUC's amplifier and providing the cooling system required.
- All specification are guaranteed when input voltage of amplifier is 200/220/230VAC. (except for the α112L/25000*i*B and α160LL/20000*i*B with the 400 V specification)
- IEC34 and VDE0110 etc. should be applied to conform to CE marking when installing the motor in a spindle. Refer to the standards for details.
- Use motors under following condition.
  Room temperature form 0 to 40°C, 1000m or less above sea level, vibration acceleration of 1 G or less at no load or 10 G or less at cutting, dry environment, non-condensation.

α160S/13000*i*B 1721-B120#Z311		α160M/13000*i*B 1723-B120#Z311		Model name Type No.(A06B-) *8		
Low	High	Low	High			Item
11 (70)	11 (73)	5.5 (58)	11 (79)	kW (A)	S1 continuous (Max. current)	*1 Rated output
15 30min. (72)	15 30min. (91)				S2 short time Rated minutes (Max. current)	
15 (91)			18.5 (112)		S3 40% (Max. current)	
		7.5 (S3 15%) (100)	18.5 (126)		S3 25% (Max. current)	
750	1400	300	850	min^{-1}	Base	*2 Rated speed
1400	6000	850	3250		Power constant	
1400	13000	850	13000		Maximum	
140		175		Nm	S1 continuous	Rated Max. torque
208		326			S2 or S3	
84		71		Power factor		
142-189		109-177		V_{AC}	Rated voltage of motor input *3	
Y	Δ	Y	Δ	Winding connection		
Connection E		Connection E		Power leads connection *5		
4		4		Number of poles		
192	64	273	91	mΩ ±5%	Resistance of winding *10	
F		H		Insulation class		
≤105		≤125		K	Temperature rise of winding	
3		3		mm	Required clearance	
140		155		±5°C	Overheating temperature setting	
IC9U7A7		IC9U7A7		IC code		
20	20	20		°C	Temperature	Coolant
≤8	≤6	≤6	≤4	K	Temperature rise	
≥14.5		≥14.5		Liter/min	Flowing rate	
1.87		1.87		J/g·K	Specific heat	
0.78		0.78		g/cm^3	Density	
≤2940		≤2940		kPa	Pressure *11	
≥5200		≥2900		W	Capacity of cooler *12	
T401		T401		BZ*i* sensor *4		
35		37		kg	Stator	Weight
13		16			Rotor	
0.059		0.070		kgm^2	Rotor inertia	
18		9.0	22.2	kW	Allowable overload *6	
22*i*		30*i*		Spindle amplifier module (SPM-)		
-		-		AC reactor (A81L-0001-) *13		
11/17.9		11/28.6		kW	Date for choice of PSM *7	
				Parameter spec. (A06B-6111-) *9		

*1 Data indicate the output of constant power range.
*2 This speed is applied for S1 continuous rated. Refer to 2. POWER CURVES for details.
*3 This is not an input voltage of amplifier. This indicates that the input voltage of motor is changed when the motor output changes within the rated output and speed.
*4 A860-2120-Txxx. For velocity and position feedback. Install to a rotating axis. Refer to 3.3 SENSOR.
*5 Refer to 2.3 POWER LEADS CONNECTION in the Part II.
*6 Reference data, applied for 1 minute. This value is not guaranteed.
*7 Reference data of Continuous/Maximum(at acceleration) output for the choice of PSM.
*8 The number indicates the type number of the standard model. For other specification numbers such as of a model with a different sensor, refer to E. SPECIFICATION NUMBER in APPENDIX.
*9 Refer to the manual, the latest edition of Parameter Manual (B-65280EN) for details.
*10 The resistance of winding indicates reference data between the amplifier (SPM) and motor after motor power leads connection (the actual resistance differs slightly depending on the length of the used power cable). To measure the resistance of winding, refer to 2.2 CHECKING THE WINDING RESISTANCE in II. INSTRUCTION before connection.
*11 Adjust the coolant pressure according to the O-ring you use.
*12 Actual calorie which must be removed from the motor is calculated as follows.
Q(W)=Flowing rate(ℓ/min)×Specific heat(J/gK)×Density(g/cm^3)×Temperature rise(K)×1000÷60
*13 The model for which this item is given requires an AC reactor between the motor and amplifier (SPM). Refer to 3.5 REACTOR.

Item			Model name Type No.(A06B-) *8	α160L/13000i_B 1725-B120#Z311		α160LL/13000i_B 1726-B100#Z311	
				Low	High	Low	High
*1 Rated output	S1 continuous (Max. current)	kW (A)		7.5 ( )	7.5 ( )	15 (84)	25 (114)
	S2 short time Rated minutes (Max. current)			11 30min. ( )	11 30min. ( )	22 10min. (114)	30 30min. (133)
	S3 40% (Max. current)						
	S3 25% (Max. current)					22 (133)	
*2 Rated speed	Base	min^{-1}		360	800	600	2500
	Power constant			800	10000	2000	10000
	Maximum			800	13000	3000	13000
Rated Max. torque	S1 continuous	Nm		199		238	
	S2 or S3			292		420	
Power factor						0.80	
Rated voltage of motor input *3		V_{AC}				133-190	
Winding connection				Y	Δ	Y	Y
Power leads connection *5				Connection E		Connection D	
Number of poles				4		4	
Resistance of winding *10		mΩ $\pm$5%		208	69	133	62
Insulation class				F		H	
Temperature rise of winding		K		$\leq$105		$\leq$125	
Required clearance		mm		3		3	
Overheating temperature setting		$\pm$5°C		140		155	
IC code				IC9U7A7		IC9U7A7	
Coolant	Temperature	°C				20	20
	Temperature rise	K				$\leq$17	$\leq$17
	Flowing rate	Liter/min				$\geq$10.1	
	Specific heat	J/g·K				1.87	
	Density	g/cm^3				0.78	
	Pressure *11	kPa				$\leq$2940	
Capacity of cooler *12		W				$\geq$3740	
BZi sensor *4				T401		T401	
Weight	Stator	kg		52		65	
	Rotor			23		28	
Rotor inertia		kgm^2		0.101		0.121	
Allowable overload *6		kW		13.2		26.4	36
Spindle amplifier module (SPM-)				22i		30i	
AC reactor (A81L-0001-) *13				-		-	
Date for choice of PSM *7		kW		7.5/16.4		25/39.4	
Parameter spec. (A06B-6111-) *9							

NOTE
- All specifications are guaranteed when using FANUC's amplifier and providing the cooling system required.
- All specification are guaranteed when input voltage of amplifier is 200/220/230VAC. (except for the α112L/25000i_B and α160LL/20000i_B with the 400 V specification)
- IEC34 and VDE0110 etc. should be applied to conform to CE marking when installing the motor in a spindle. Refer to the standards for details.
- Use motors under following condition.
  Room temperature form 0 to 40°C, 1000m or less above sea level, vibration acceleration of 1 G or less at no load or 10 G or less at cutting, dry environment, non-condensation.

α180M/6000*i*B 1743-B100#Z011		α180L/6000*i*B 1745-B100#Z011		Model name Type No.(A06B-) *8		
Low	High	Low	High			Item
11 (52)	11 (78)	18.5 (83)	22 (97)	kW (A)	S1 continuous (Max. current)	*1 Rated output
15 20min. (67)	15 30min. (99)	22 30, 15min. (96, 129)	30 30min. (125)		S2 short time Rated minutes (Max. current)	
15 (74)					S3 40% (Max. current)	
15 (93)					S3 25% (Max. current)	
450	800	500	1500	min^{-1}	Base	*2 Rated speed
800	6000	800	2500		Power constant	
800	6000	1500	6000		Maximum	
233		353		Nm	S1 continuous	Rated Max. torque
477		600			S2 or S3	
0.82		0.83		Power factor		
115-222		157-218		V_{AC}	Rated voltage of motor input *3	
Y	Y	Y	Y	Winding connection		
Connection D		Connection D		Power leads connection *5		
4		4		Number of poles		
258	117	137	70	mΩ ±5%	Resistance of winding *10	
F		H		Insulation class		
≤105		≤125		K	Temperature rise of winding	
3		3		mm	Required clearance	
140		155		±5°C	Overheating temperature setting	
IC9U7A7		IC9U7A7		IC code		
20	20	20	20	°C	Temperature	Coolant
≤16	≤9	≤16	≤12	K	Temperature rise	
≥13.8		≥9.7		Liter/min	Flowing rate	
1.78		1.87		J/g·K	Specific heat	
0.87		0.78		g/cm^3	Density	
≤2940		≤2940		kPa	Pressure *11	
≥4900		≥3740		W	Capacity of cooler *12	
T401		T401		BZ*i* sensor *4		
63		70		kg	Stator	Weight
38		40			Rotor	
0.190		0.260		kgm^2	Rotor inertia	
18		26.4	36	kW	Allowable overload *6	
30*i*		30*i*		Spindle amplifier module (SPM-)		
-		-		AC reactor (A81L-0001-) *13		
11/25.6		22/34.8		kW	Date for choice of PSM *7	
				Parameter spec. (A06B-6111-) *9		

*1 Data indicate the output of constant power range.
*2 This speed is applied for S1 continuous rated. Refer to 2. POWER CURVES for details.
*3 This is not an input voltage of amplifier. This indicates that the input voltage of motor is changed when the motor output changes within the rated output and speed.
*4 A860-2120-Txxx. For velocity and position feedback. Install to a rotating axis. Refer to 3.3 SENSOR.
*5 Refer to 2.3 POWER LEADS CONNECTION in the Part II.
*6 Reference data, applied for 1 minute. This value is not guaranteed.
*7 Reference data of Continuous/Maximum(at acceleration) output for the choice of PSM.
*8 The number indicates the type number of the standard model. For other specification numbers such as of a model with a different sensor, refer to E. SPECIFICATION NUMBER in APPENDIX.
*9 Refer to the manual, the latest edition of Parameter Manual (B-65280EN) for details.
*10 The resistance of winding indicates reference data between the amplifier (SPM) and motor after motor power leads connection (the actual resistance differs slightly depending on the length of the used power cable). To measure the resistance of winding, refer to 2.2 CHECKING THE WINDING RESISTANCE in II. INSTRUCTION before connection.
*11 Adjust the coolant pressure according to the O-ring you use.
*12 Actual calorie which must be removed from the motor is calculated as follows.
Q(W)=Flowing rate(ℓ/min)×Specific heat(J/gK)×Density(g/cm^3)×Temperature rise(K)×1000÷60
*13 The model for which this item is given requires an AC reactor between the motor and amplifier (SPM). Refer to 3.5 REACTOR.

Item			Model name / Type No.(A06B-) *8	αLL/8000iB 1746-B100#Z011		αM/6000iB 1753-B120#Z313	
				Low	High	Low	High
*1 Rated output	S1 continuous (Max. current)	kW (A)		18.5 (112)	22 (121)	15 (96)	15 (103)
	S2 short time Rated minutes (Max. current)			22 30min. (131)	25 30min. (131)	22 30min. (116)	22 30min. (142)
	S3 40% (Max. current)						
	S3 25% (Max. current)					22 (132)	
*2 Rated speed	Base	min^{-1}		350	1300	485	900
	Power constant			1200	8000	900	3800
	Maximum			1500	8000	900	6000
Rated Max. torque	S1 continuous	Nm		504		295	
	S2 or S3			600		433	
Power factor				0.80		0.74	
Rated voltage of motor input *3		V_{AC}		146-215		119-193	
Winding connection				Y	Y	Y	Δ
Power leads connection *5				Connection D		Connection E	
Number of poles				4		6	
Resistance of winding *10		mΩ ±5%		112	47	116	39
Insulation class				H		H	
Temperature rise of winding		K		≤125		≤125	
Required clearance		mm		3		3	
Overheating temperature setting		±5°C		155		180	
IC code				IC9U7A7		IC9U7A7	
Coolant	Temperature	°C		20	20	20	20
	Temperature rise	K		≤19	≤16	≤12	≤10
	Flowing rate	Liter/min		≥12.0		≥12.0	
	Specific heat	J/g·K		1.78		1.87	
	Density	g/cm^3		0.87		0.78	
	Pressure *11	kPa		≤2940		≤2940	
Capacity of cooler *12		W		≥4900		≥3740	
BZi sensor *4				T401		T611	
Weight	Stator	kg		102		56	
	Rotor			48		25	
Rotor inertia		kgm^2		0.307		0.206	
Allowable overload *6		kW		26.4	30	26.4	
Spindle amplifier module (SPM-)				30i		30i	
AC reactor (A81L-0001-) *13				-		-	
Date for choice of PSM *7		kW		22/35.1		15/29	
Parameter spec. (A06B-6111-) *9							

NOTE
- All specifications are guaranteed when using FANUC's amplifier and providing the cooling system required.
- All specification are guaranteed when input voltage of amplifier is 200/220/230VAC. (except for the α112L/25000iB and α160LL/20000iB with the 400 V specification)
- IEC34 and VDE0110 etc. should be applied to conform to CE marking when installing the motor in a spindle. Refer to the standards for details.
- Use motors under following condition.
  Room temperature form 0 to 40°C, 1000m or less above sea level, vibration acceleration of 1 G or less at no load or 10 G or less at cutting, dry environment, non-condensation.

αL/6000*i*B 1755-B120#Z316		αM/3000*i*B 1773-B140#Z316		Model name Type No.(A06B-) *8		
Low	High	Low	High			Item
15 (131)	15 (131)	37 (197)	37 (169)	kW (A)	S1 continuous (Max. current)	*1 Rated output
22 30min. (184)	22 30min. (183)	45 30, 15min. (233, 267)	45 30min. (257)		S2 short time Rated minutes (Max. current)	
					S3 40% (Max. current)	
22 (199)					S3 25% (Max. current)	
360	650	360	650	min^{-1}	Base	*2 Rated speed
650	4500	650	2000		Power constant	
650	6000	650	3000		Maximum	
398		981		Nm	S1 continuous	Rated Max. torque
700		1432			S2 or S3	
0.76		0.75		Power factor		
90-159		133-196		V_{AC}	Rated voltage of motor input *3	
Y	Δ	Y	Δ	Winding connection		
Connection E		Connection F <3>-<4>		Power leads connection *5		
6		6		Number of poles		
74	25	53	18	mΩ ±5%	Resistance of winding *10	
H		H		Insulation class		
≤125		≤125		K	Temperature rise of winding	
3		3		mm	Required clearance	
180		180		±5°C	Overheating temperature setting	
IC9U7A7		IC9U7A7		IC code		
20	20	20	20	°C	Temperature	Coolant
≤16	≤8	≤19	≤12	K	Temperature rise	
≥12.0		≥18.5		Liter/min	Flowing rate	
1.87		1.87		J/g·K	Specific heat	
0.78		0.78		g/cm^3	Density	
≤2940		≤2940		kPa	Pressure *11	
≥4900		≥8500		W	Capacity of cooler *12	
T511		T511		BZ*i* sensor *4		
74		140		kg	Stator	Weight
31		75			Rotor	
0.258		0.920		kgm^2	Rotor inertia	
26.4		60		kW	Allowable overload *6	
45*i*		55*i*		Spindle amplifier module (SPM-)		
-		-		AC reactor (A81L-0001-) *13		
15/28.9		37/58.6		kW	Date for choice of PSM *7	
				Parameter spec. (A06B-6111-) *9		

*1 Data indicate the output of constant power range.
*2 This speed is applied for S1 continuous rated. Refer to 2. POWER CURVES for details.
*3 This is not an input voltage of amplifier. This indicates that the input voltage of motor is changed when the motor output changes within the rated output and speed.
*4 A860-2120-Txxx. For velocity and position feedback. Install to a rotating axis. Refer to 3.3 SENSOR.
*5 Refer to 2.3 POWER LEADS CONNECTION in the Part II.
*6 Reference data, applied for 1 minute. This value is not guaranteed.
*7 Reference data of Continuous/Maximum(at acceleration) output for the choice of PSM.
*8 The number indicates the type number of the standard model. For other specification numbers such as of a model with a different sensor, refer to E. SPECIFICATION NUMBER in APPENDIX.
*9 Refer to the manual, the latest edition of Parameter Manual (B-65280EN) for details.
*10 The resistance of winding indicates reference data between the amplifier (SPM) and motor after motor power leads connection (the actual resistance differs slightly depending on the length of the used power cable). To measure the resistance of winding, refer to 2.2 CHECKING THE WINDING RESISTANCE in II. INSTRUCTION before connection.
*11 Adjust the coolant pressure according to the O-ring you use.
*12 Actual calorie which must be removed from the motor is calculated as follows.
Q(W)=Flowing rate(ℓ/min)×Specific heat(J/gK)×Density(g/cm^3)×Temperature rise(K)×1000÷60
*13 The model for which this item is given requires an AC reactor between the motor and amplifier (SPM). Refer to 3.5 REACTOR.

1.2 HIGH-SPEED TYPE

Item			Model name / Type No.(A06B-) *8	αi40S/70000 1601-B120#Z618	αi80S/40000 1631-B120#Y618	αi100S/20000 1641-B121#X617	
						Low	High
*1 Rated output	S1 continuous (Max. current)	kW (A)		0.55 ( )	13 (96)	7.5 (49)	11 (69)
	S2 short time Rated minutes (Max. current)			0.75 15min. ( )	18.5 1min. (127)	11 10min. (64)	15 30min. (83)
	S3 40% (Max. current)						
	S3 25% (Max. current)						
*2 Rated speed	Base	min^{-1}		70000	30000	3300	7500
	Power constant			-	40000	5500	12000
	Maximum			70000	40000	5500	20000
Rated Max. torque	S1 continuous	Nm		0.075	4.1	22	
	S2 or S3			0.10	5.9	28	
Power factor						0.67	
Rated voltage of motor input *3		V_{AC}				149-210	
Winding connection				Δ	Δ	Y	Δ
Power leads connection *5				Connection B	Connection B	Connection E	
Number of poles				2	2	4	
Resistance of winding *10		mΩ ±5%		99	21	150	50
Insulation class				F	F	F	
Temperature rise of winding		K		≤105	≤105	≤105	
Required clearance		mm		3	3	3	
Overheating temperature setting		±5°C		140	140	140	
IC code				IC9U7A7	IC9U7A7	IC9U7A7	
Coolant	Temperature	°C		20	20	20	20
	Temperature rise	K		≤3	≤11	≤5.6	≤5.6
	Flowing rate	Liter/min		≥14.5	≥14.5	≥14.5	
	Specific heat	J/g·K		1.78	1.78	1.87	
	Density	g/cm^3		0.87	0.87	0.78	
	Pressure *11	kPa		≤2940	≤2940	≤2940	
Capacity of cooler *12		W		≥1500	≥6000	≥2900	
BZi sensor *4				T211	T211	T411	
Weight	Stator	kg		3	15	11	
	Rotor			0.3	2	4	
Rotor inertia		kgm^2		0.00008	0.004	0.007	
Allowable overload *6		kW		0.90	22.2	13.2	18
Spindle amplifier module (SPM-)				2.2i	45i	22i	
AC reactor (A81L-0001-) *13				0142	0154	-	
Date for choice of PSM *7		kW		0.55/1	13/24.4	11/19.5	
Parameter spec. (A06B-6111-) *9							

NOTE
- All specifications are guaranteed when using FANUC's amplifier and providing the cooling system required.
- All specification are guaranteed when input voltage of amplifier is 200/220/230VAC. (except for the αi112L/25000 and αi160LL/20000 with the 400 V specification)
- IEC34 and VDE0110 etc. should be applied to conform to CE marking when installing the motor in a spindle. Refer to the standards for details.
- Use motors under following condition.
  Room temperature form 0 to 40°C, 1000m or less above sea level, vibration acceleration of 1 G or less at no load or 10 G or less at cutting, dry environment, non-condensation.

αi12S/20000iB 1662-B120#Z317		αi12M/20000iB 1673-B100#Y617		Model name Type No.(A06B-) *8		
Low	High	Low	High			Item
7.5 (58)	11 (70)	10 (85)	15 (89)	kW (A)	S1 continuous (Max. current)	*1 Rated output
	15, 18.5 30, 10min. (84,100)	15 10min. (115)	18.5 30min. (98)		S2 short time Rated minutes (Max. current)	
					S3 40% (Max. current)	
11 (25%, 15%) (78,98)					S3 25% (Max. current)	
2300	6000	1500	10000	min^{-1}	Base	*2 Rated speed
6000	15000	6000	20000		Power constant	
6000	20000	6000	20000		Maximum	
31		64		Nm	S1 continuous	Rated Max. torque
60		95			S2 or S3	
0.75		0.65		Power factor		
118-190		114-193		V_{AC}	Rated voltage of motor input *3	
Y	Δ	Y	Y	Winding connection		
Connection E		Connection D		Power leads connection *5		
4		4		Number of poles		
170	57	82	37	mΩ ±5%	Resistance of winding *10	
F		F		Insulation class		
≤105		≤105		K	Temperature rise of winding	
3		3		mm	Required clearance	
140		140		±5°C	Overheating temperature setting	
IC9U7A7		IC9U7A7		IC code		
20	20	20	20	°C	Temperature	Coolant
≤8	≤14	≤8	≤10	K	Temperature rise	
≥12.0		≥12.0		Liter/min	Flowing rate	
1.87		1.87		J/g·K	Specific heat	
0.78		0.78		g/cm^3	Density	
≤2940		≤2940		kPa	Pressure *11	
≥4000		≥4000		W	Capacity of cooler *12	
T411		T411		BZi sensor *4		
10		25		kg	Stator	Weight
5		8			Rotor	
0.011		0.017		kgm^2	Rotor inertia	
13.2	22.2	18	22.2	kW	Allowable overload *6	
30i		30i		Spindle amplifier module (SPM-)		
-		-		AC reactor (A81L-0001-) *13		
11/24.4		15/25.6		kW	Date for choice of PSM *7	
				Parameter spec. (A06B-6111-) *9		

*1 Data indicate the output of constant power range.
*2 This speed is applied for S1 continuous rated. Refer to 2. POWER CURVES for details.
*3 This is not an input voltage of amplifier. This indicates that the input voltage of motor is changed when the motor output changes within the rated output and speed.
*4 A860-2120-Txxx. For velocity and position feedback. Install to a rotating axis. Refer to 3.3 SENSOR.
*5 Refer to 2.3 POWER LEADS CONNECTION in the Part II.
*6 Reference data, applied for 1 minute. This value is not guaranteed.
*7 Reference data of Continuous/Maximum(at acceleration) output for the choice of PSM.
*8 The number indicates the type number of the standard model. For other specification numbers such as of a model with a different sensor, refer to E. SPECIFICATION NUMBER in APPENDIX.
*9 Refer to the manual, the latest edition of Parameter Manual (B-65280EN) for details.
*10 The resistance of winding indicates reference data between the amplifier (SPM) and motor after motor power leads connection (the actual resistance differs slightly depending on the length of the used power cable). To measure the resistance of winding, refer to 2.2 CHECKING THE WINDING RESISTANCE in II. INSTRUCTION before connection.
*11 Adjust the coolant pressure according to the O-ring you use.
*12 Actual calorie which must be removed from the motor is calculated as follows.
Q(W)=Flowing rate(ℓ/min)×Specific heat(J/gK)×Density(g/cm^3)×Temperature rise(K)×1000÷60
*13 The model for which this item is given requires an AC reactor between the motor and amplifier (SPM). Refer to 3.5 REACTOR.

Item			Model name / Type No.(A06B-) *8	α112L/20000*i*B 1675-B100#Y617		α112L/25000*i*B 1675-B140#X627	
				Low	High	Low	High
*1 Rated output	S1 continuous (Max. current)	kW (A)		15 (87)	18.5 (103)	15 ( )	25 ( )
	S2 short time Rated minutes (Max. current)			18.5 15min. (101)	22 15min. (118)		37 15min. (111)
	S3 40% (Max. current)						
	S3 25% (Max. current)			18.5 (117)		25 (25%, 15%) (,)	
*2 Rated speed	Base	min^{-1}		1800	8000	2000	8000
	Power constant			4000	20000	8000	15000
	Maximum			4000	20000	8000	25000
Rated Max. torque	S1 continuous	Nm		80		72	
	S2 or S3			118		159	
Power factor				0.67			
Rated voltage of motor input *3		V_{AC}		161-191			
Winding connection				Y	Y	Y	Y
Power leads connection *5				Connection D		Connection G	
Number of poles				4		4	
Resistance of winding *10		mΩ ±5%		91	40		
Insulation class				H			
Temperature rise of winding		K		≤125			
Required clearance		mm		3			
Overheating temperature setting		±5°C		180			
IC code				IC9U7A7		IC9U7A7	
Coolant	Temperature	°C		20	20		
	Temperature rise	K		≤10	≤12		
	Flowing rate	Liter/min		≥12.0			
	Specific heat	J/g·K		1.87			
	Density	g/cm^3		0.78			
	Pressure *11	kPa		≤2940			
Capacity of cooler *12		W		≥4000			
BZ*i* sensor *4				T411		T411	
Weight	Stator	kg		28			
	Rotor			9			
Rotor inertia		kgm^2		0.021			
Allowable overload *6		kW		22.2	26.4		
Spindle amplifier module (SPM-)				30*i*		45HV*i*	
AC reactor (A81L-0001-) *13				-		0154	
Date for choice of PSM *7		kW		18.5/32.7			
Parameter spec. (A06B-6111-) *9							

NOTE
- All specifications are guaranteed when using FANUC's amplifier and providing the cooling system required.
- All specification are guaranteed when input voltage of amplifier is 200/220/230VAC. (except for the α112L/25000*i*B and α160LL/20000*i*B with the 400 V specification)
- IEC34 and VDE0110 etc. should be applied to conform to CE marking when installing the motor in a spindle. Refer to the standards for details.
- Use motors under following condition.
  Room temperature form 0 to 40°C, 1000m or less above sea level, vibration acceleration of 1 G or less at no load or 10 G or less at cutting, dry environment, non-condensation.

α132L/25000*i*B 1705-B140#Y617		α160M/20000*i*B 1723-B140#Y627		Model name Type No.(A06B-) *8		
Low	High	Low	High			Item
15 (103)	18.5 (92)	11 (62)	18.5 (105)	kW (A)	S1 continuous (Max. current)	*1 Rated output
18.5 30min. (118)	22 15min. (111)	15 15min. (73)	22 30min. (121)		S2 SHORT TIME Rated minutes (Max. current)	
		15 (87)			S3 40% (Max. current)	
		15 (108)			S3 25% (Max. current)	
1000	6000	850	4200	min^{-1}	Base	*2 Rated speed
2000	20000	3000	20000		Power constant	
2000	25000	3000	20000		Maximum	
143		124		Nm	S1 continuous	Rated Max. torque
177		239			S2 or S3	
		0.82		Power factor		
		132-194		V_{AC}	Rated voltage of motor input *3	
Y	Δ	Y	Δ	Winding connection		
Connection F <1>-<4>		Connection F <1>-<4>		Power leads connection *5		
4		4		Number of poles		
114	10	166	14	mΩ ±5%	Resistance of winding *10	
H		H		Insulation class		
≤125		≤125		K	Temperature rise of winding	
3		3		mm	Required clearance	
155		180		±5°C	Overheating temperature setting	
IC9U7A7		IC9U7A7		IC code		
20	20	20	20	°C	Temperature	Coolant
≤14	≤14	≤7	≤18	K	Temperature rise	
≥13.5		≥13.5		Liter/min	Flowing rate	
1.87		1.87		J/g·K	Specific heat	
0.78		0.78		g/cm^3	Density	
≤2940		≤2940		kPa	Pressure *11	
≥5200		≥5800		W	Capacity of cooler *12	
T411		T411		BZ*i* sensor *4		
42		37		kg	Stator	Weight
13		15			Rotor	
0.037		0.068		kgm^2	Rotor inertia	
22.2	26.4	18	26.4	kW	Allowable overload *6	
30*i*		30*i*		Spindle amplifier module (SPM-)		
-		-		AC reactor (A81L-0001-) *13		
18.5/29		18.5/29		kW	Date for choice of PSM *7	
				Parameter spec. (A06B-6111-) *9		

*1 Data indicate the output of constant power range.
*2 This speed is applied for S1 continuous rated. Refer to 2. POWER CURVES for details.
*3 This is not an input voltage of amplifier. This indicates that the input voltage of motor is changed when the motor output changes within the rated output and speed.
*4 A860-2120-Txxx. For velocity and position feedback. Install to a rotating axis. Refer to 3.3 SENSOR.
*5 Refer to 2.3 POWER LEADS CONNECTION in the Part II.
*6 Reference data, applied for 1 minute. This value is not guaranteed.
*7 Reference data of Continuous/Maximum(at acceleration) output for the choice of PSM.
*8 The number indicates the type number of the standard model. For other specification numbers such as of a model with a different sensor, refer to E. SPECIFICATION NUMBER in APPENDIX.
*9 Refer to the manual, the latest edition of Parameter Manual (B-65280EN) for details.
*10 The resistance of winding indicates reference data between the amplifier (SPM) and motor after motor power leads connection (the actual resistance differs slightly depending on the length of the used power cable). To measure the resistance of winding, refer to 2.2 CHECKING THE WINDING RESISTANCE in II. INSTRUCTION before connection.
*11 Adjust the coolant pressure according to the O-ring you use.
*12 Actual calorie which must be removed from the motor is calculated as follows.
Q(W)=Flowing rate(ℓ/min)×Specific heat(J/gK)×Density(g/cm^3)×Temperature rise(K)×1000÷60
*13 The model for which this item is given requires an AC reactor between the motor and amplifier (SPM). Refer to 3.5 REACTOR.

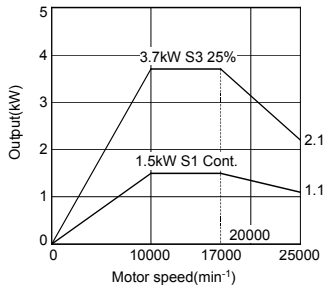
Item			Model name / Type No.(A06B-) *8	αL/20000iB 1725-B140#Y617		αLL/20000iB 1726-B140#Y617	
				Low	High	Low	High
*1 Rated output	S1 continuous (Max. current)	kW (A)		15 (96)	25 (115)	32 ( )	50 ( )
	S2 short time Rated minutes (Max. current)			22 10min. (123)	30 30min. (132)	44 10min. ( )	55 10min. ( )
	S3 40% (Max. current)						
	S3 25% (Max. current)					44 ( )	
*2 Rated speed	Base	min^{-1}		750	2500	1600	12000
	Power constant			2000	6000	4000	20000
	Maximum			3000	20000	6000	20000
Rated Max. torque	S1 continuous	Nm		191		191	
	S2 or S3			263		350	
Power factor				0.81			
Rated voltage of motor input *3		V_{AC}		136-190			
Winding connection				Y	Y	Y	Δ
Power leads connection *5				Connection G		Connection F <1>-<4>	
Number of poles				4		4	
Resistance of winding *10		mΩ ±5%		112	28	124	10
Insulation class				F			
Temperature rise of winding		K		≤105			
Required clearance		mm		3			
Overheating temperature setting		±5°C		155			
IC code				IC9U7A7		IC9U7A7	
Coolant	Temperature	°C		20	20		
	Temperature rise	K		≤11	≤16		
	Flowing rate	Liter/min		≥12.0			
	Specific heat	J/g·K		1.87			
	Density	g/cm^3		0.78			
	Pressure *11	kPa		≤2940			
Capacity of cooler *12		W		≥4500			
BZi sensor *4				T411		T411	
Weight	Stator	kg		52		65	
	Rotor			22		27	
Rotor inertia		kgm^2		0.098		0.119	
Allowable overload *6		kW		26.4	36	52.8	66
Spindle amplifier module (SPM-)				30i		75HVi	
AC reactor (A81L-0001-) *13				-		0154	
Date for choice of PSM *7		kW		25/39.6		50/76.3	
Parameter spec. (A06B-6111-) *9							

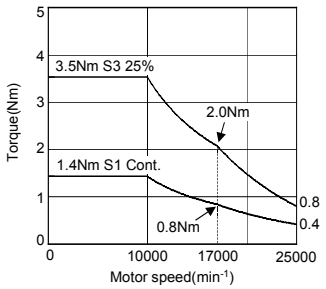
NOTE
- All specifications are guaranteed when using FANUC's amplifier and providing the cooling system required.
- All specification are guaranteed when input voltage of amplifier is 200/220/230VAC. (except for the αL/25000iB and αLL/20000iB with the 400 V specification)
- IEC34 and VDE0110 etc. should be applied to conform to CE marking when installing the motor in a spindle. Refer to the standards for details.
- Use motors under following condition.
  Room temperature form 0 to 40°C, 1000m or less above sea level, vibration acceleration of 1 G or less at no load or 10 G or less at cutting, dry environment, non-condensation.

2 POWER CURVES

2.1 STANDARD TYPE

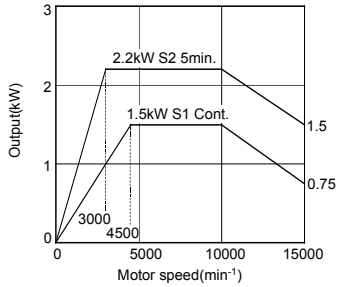
α50L/25000*i*B (A06B-1615-B120#Z318)

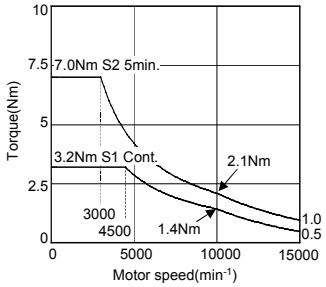




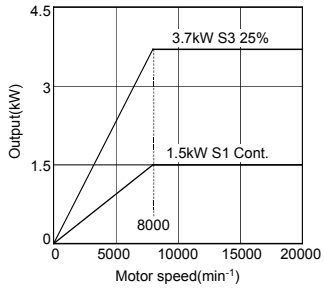
α80S/20000*i*B (A06B-1621-B120#Z312)

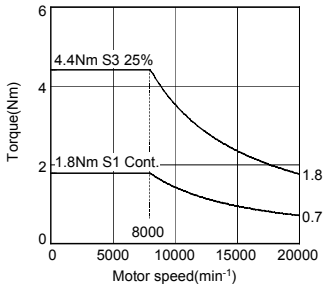
Low winding



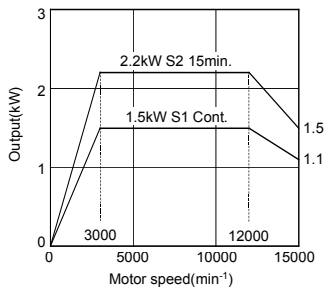


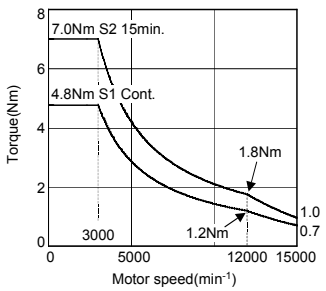
High winding



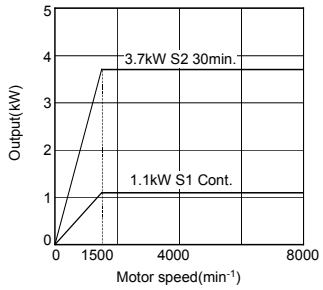


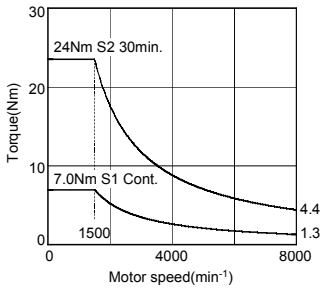
α80M/15000*i*B (A06B-1623-B170#Z011)



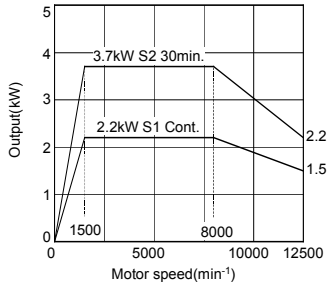


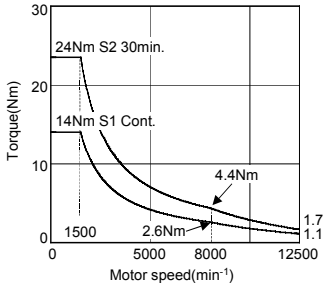
α80L/8000*i*B (A06B-1625-B170#Z011)





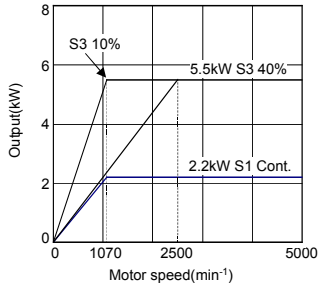
α100S/12500*i*B (A06B-1641-B120#Z011)

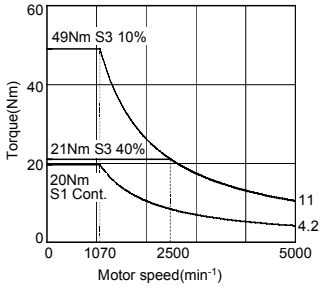


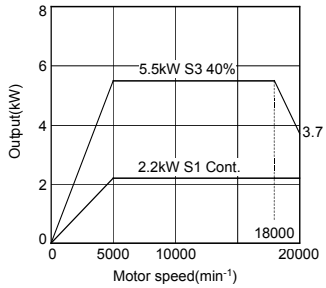


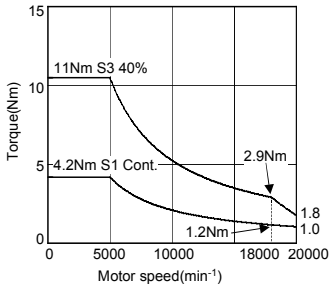
α112SS/20000*i*B (A06B-1661-B120#Z312)

Low winding



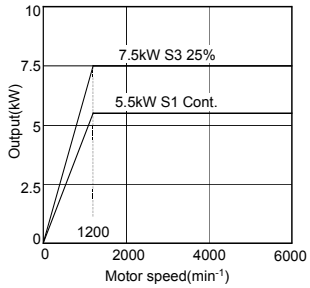


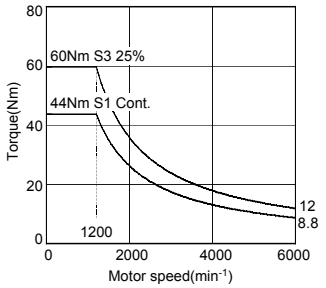




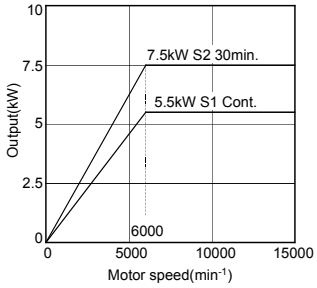
α112S/15000*i*B (A06B-1671-B120#Z311)

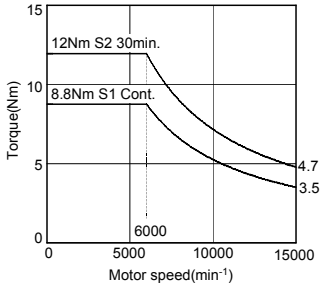
Low winding



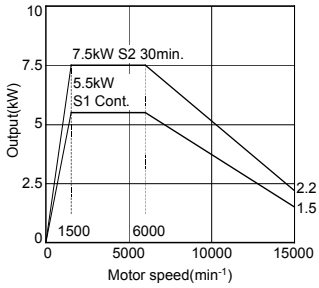


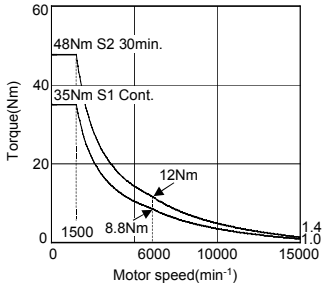
High winding





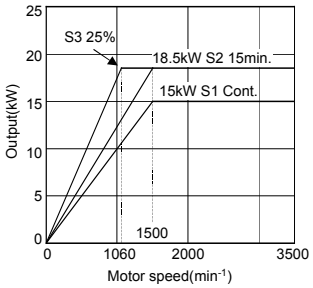
α112M/15000*i*B (A06B-1673-B120#Z311)

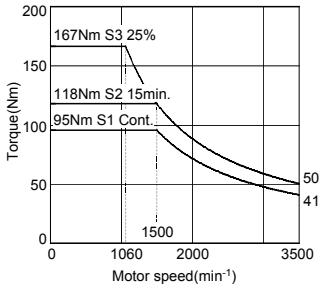




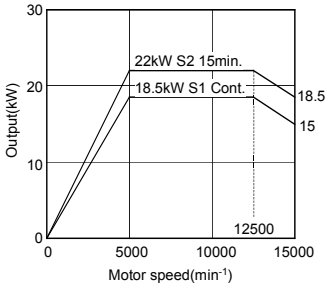
α112L/15000*i*B (A06B-1675-B100#Z311)

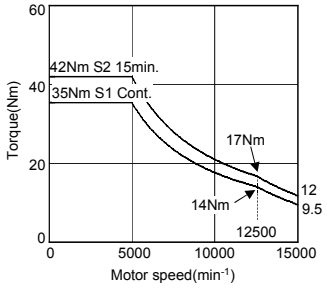
Low winding





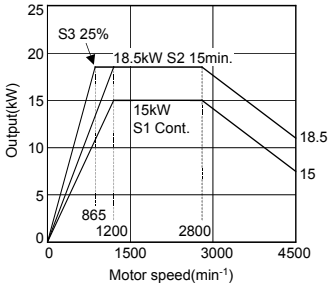
High winding

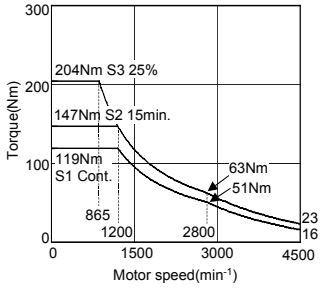




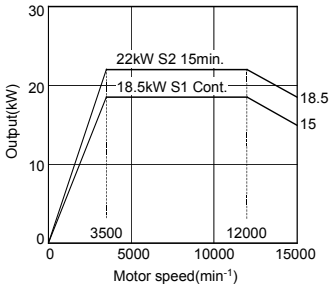
α112LL/15000*i*B (A06B-1676-B100#Z311)

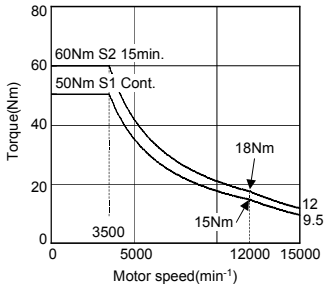
Low winding





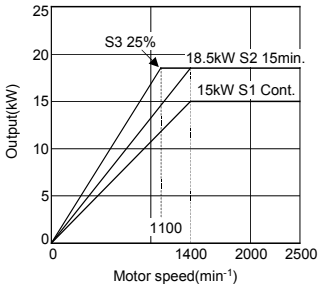
High winding

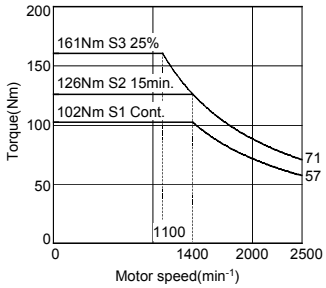




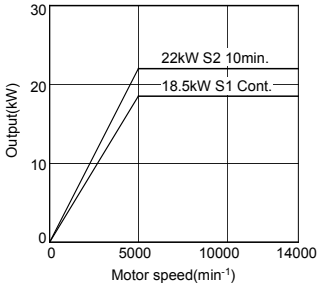
α132M/14000*i*B (A06B-1713-B100#Z311)

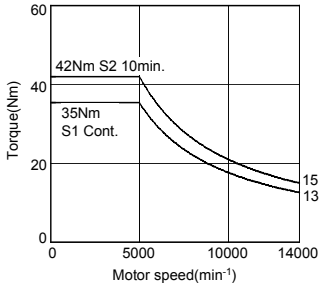
Low winding





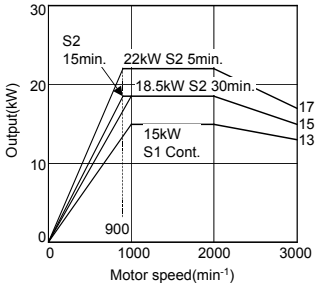
High winding

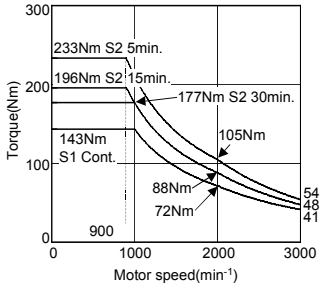




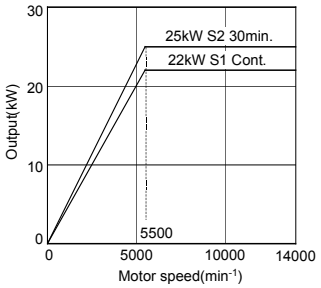
α132L/14000*i*B (A06B-1705-B140#Z311)

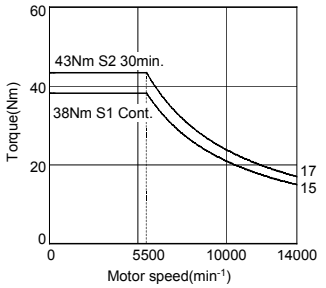
Low winding





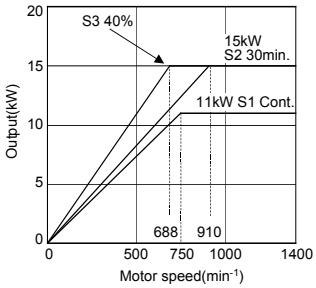
High winding

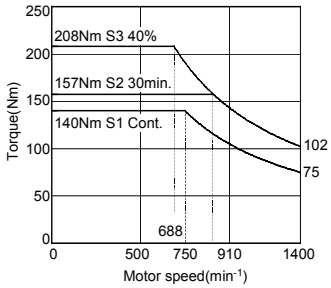




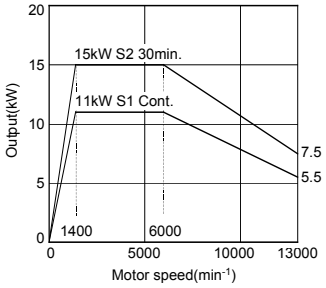
α160S/13000*i*B (A06B-1721-B120#Z311)

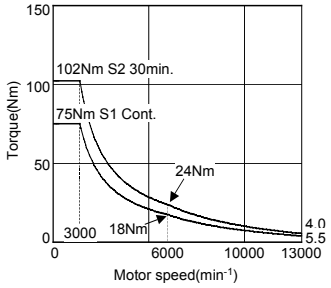
Low winding





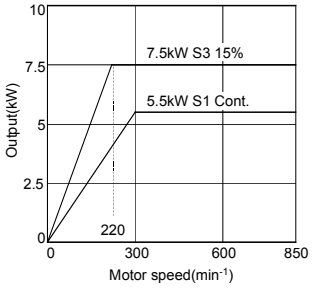
High winding

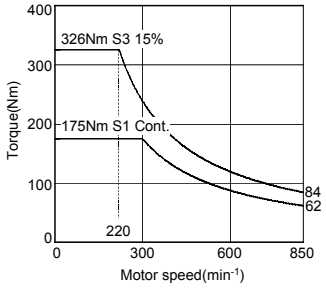




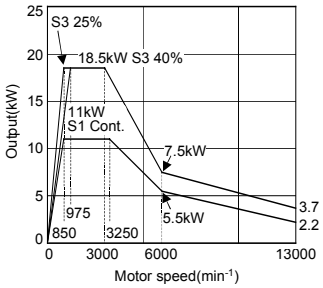
α160M/13000*i*B (A06B-1723-B120#Z311)

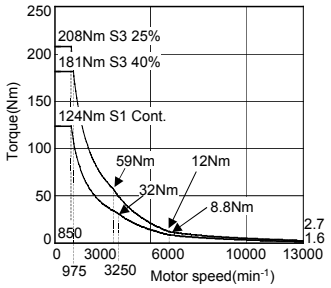
Low winding





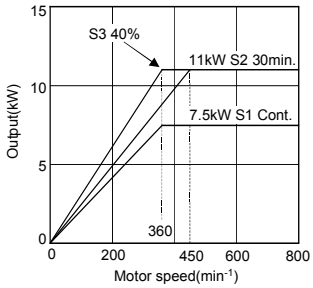
High winding

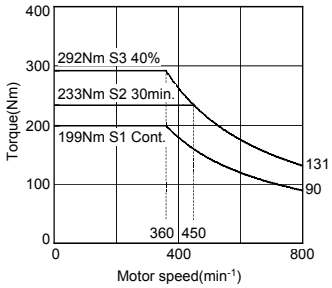




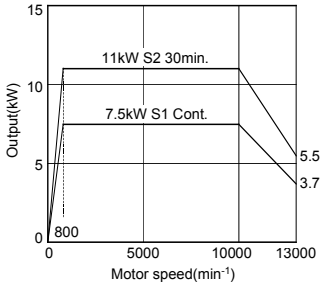
α160L/13000*i*B (A06B-1725-B120#Z311)

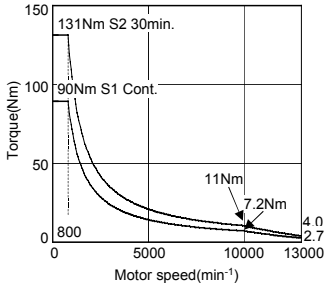
Low winding





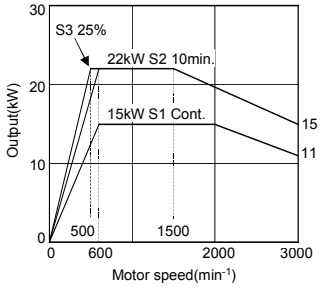
High winding

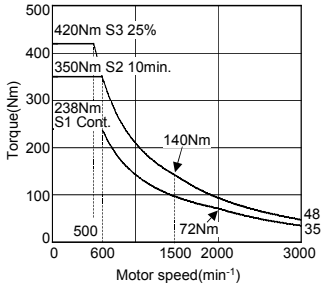




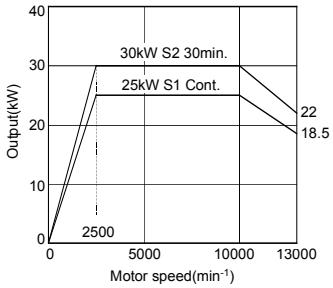
α160LL/13000*i*B (A06B-1726-B100#Z311)

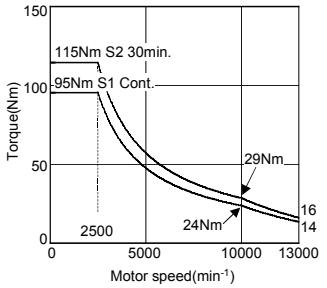
Low winding





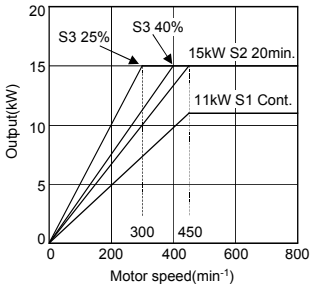
High winding

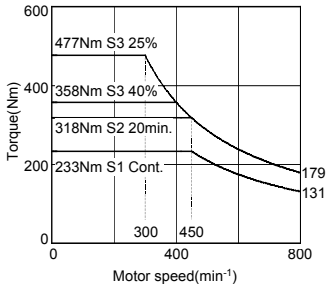




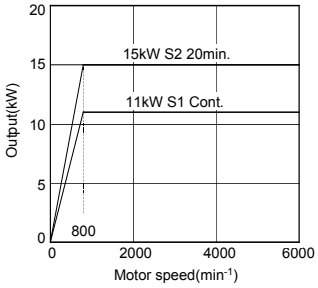
α180M/6000*i*B (A06B-1743-B100#Z011)

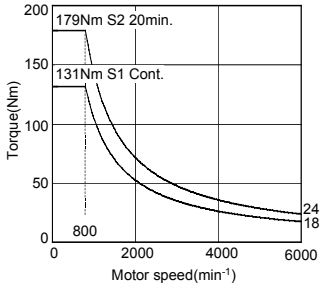
Low winding





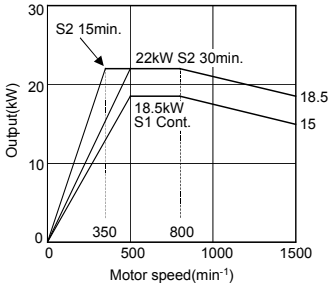
High winding

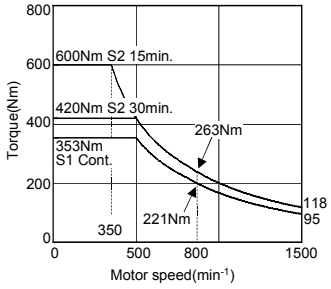




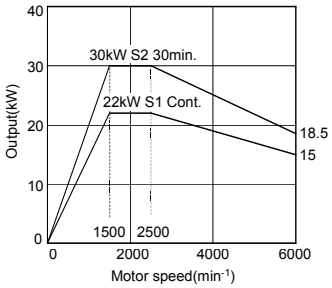
α180L/6000*i*B (A06B-1745-B100#Z011)

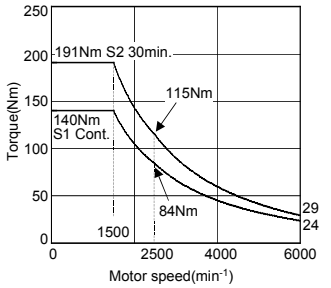
Low winding





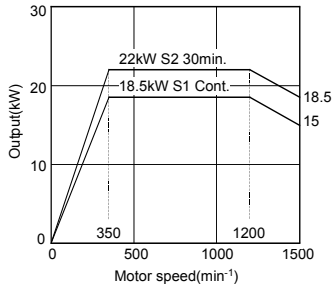
High winding

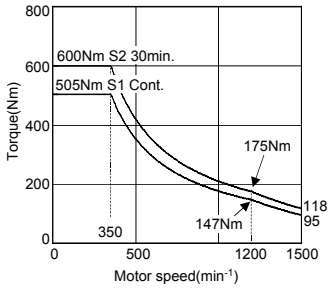




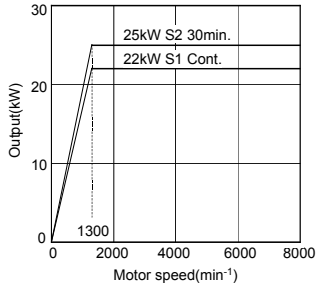
α180LL/8000*i*B (A06B-1746-B100#Z011)

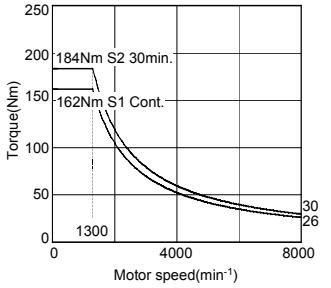
Low winding





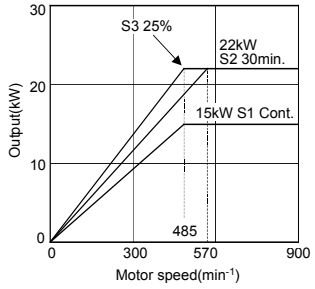
High winding

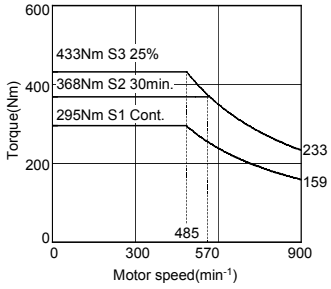




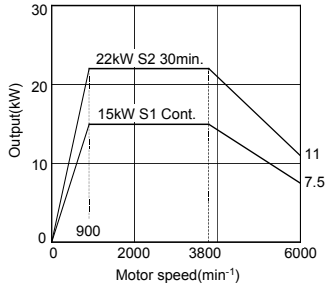
α200M/6000*i*B (A06B-1753-B120#Z313)

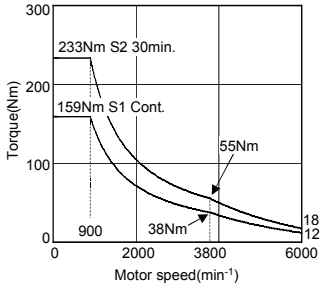
Low winding





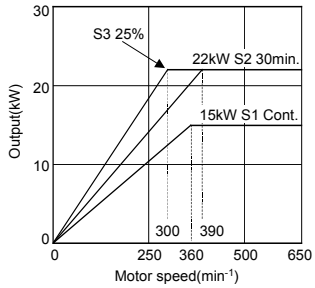
High winding

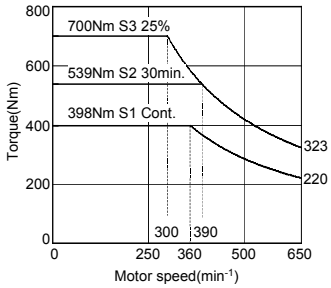




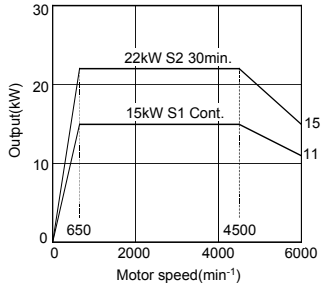
α200L/6000*i*B (A06B-1755-B120#Z316)

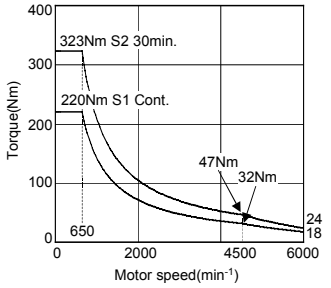
Low winding





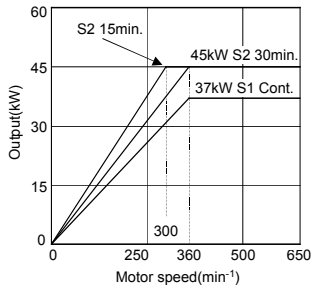
High winding

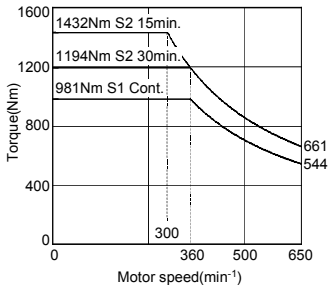




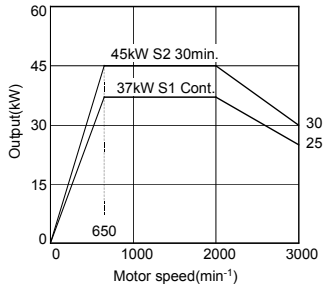
α250M/3000*i*B (A06B-1773-B140#Z316)

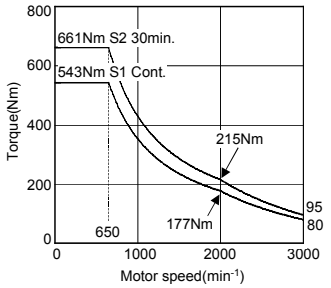
Low winding





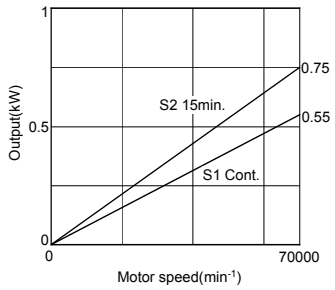
High winding

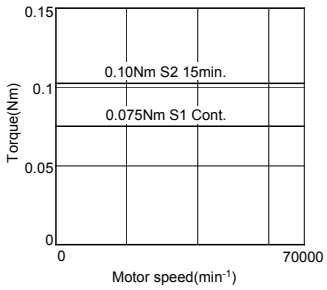




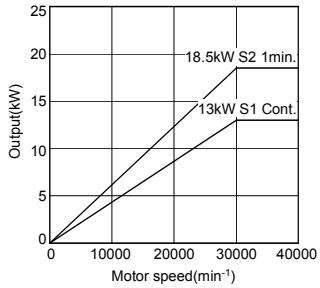
2.2 HIGH-SPEED TYPE

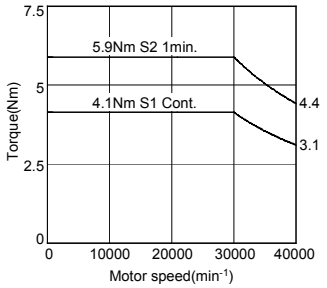
α40S/70000*i*B (A06B-1601-B120#Z618)





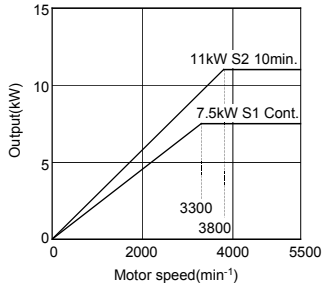
α80S/40000*i*B (A06B-1631-B120#Y618)

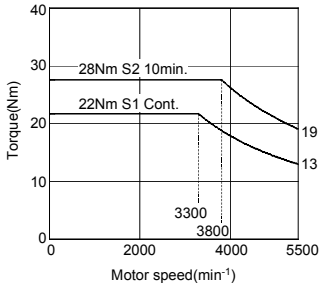




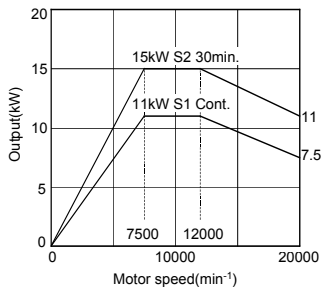
α100S/20000*i*B (A06B-1641-B121#X617)

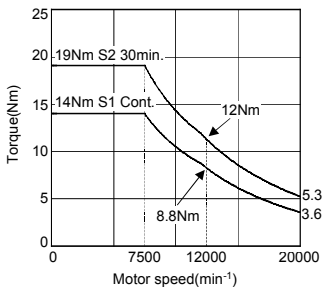
Low winding





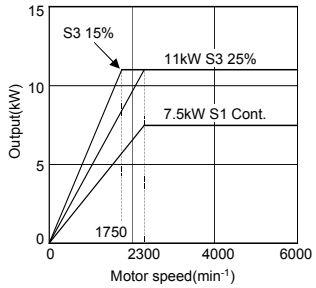
High winding

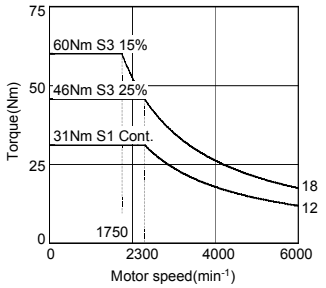




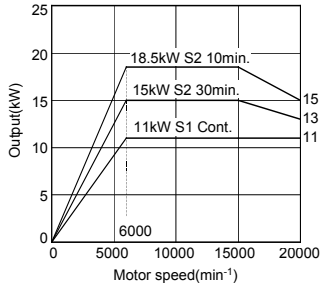
α112S/20000*i*B (A06B-1662-B120#Z317)

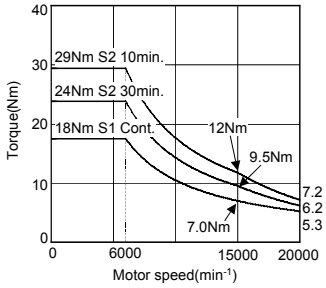
Low winding





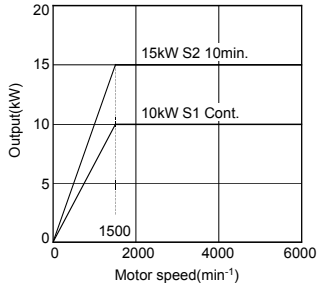
High winding

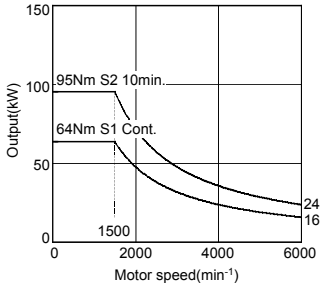




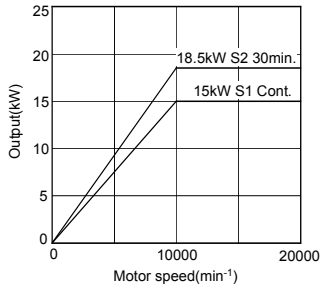
α112M/20000*i*B (A06B-1673-B100#Y617)

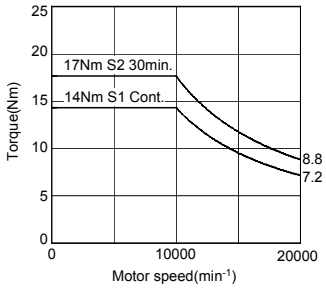
Low winding





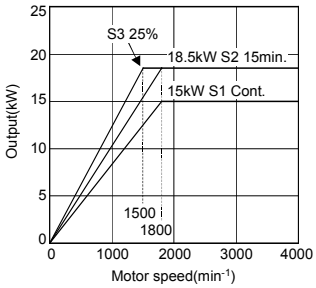
High winding

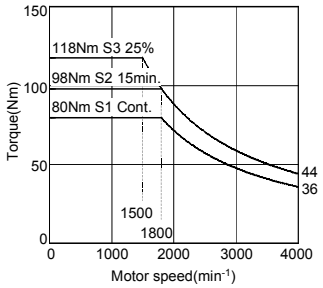




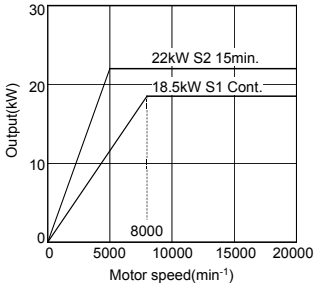
α112L/20000*i*B (A06B-1675-B100#Y617)

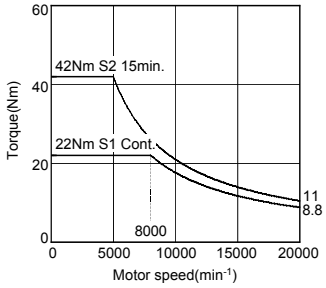
Low winding





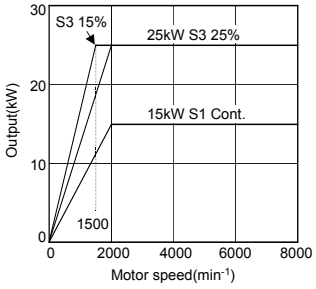
High winding

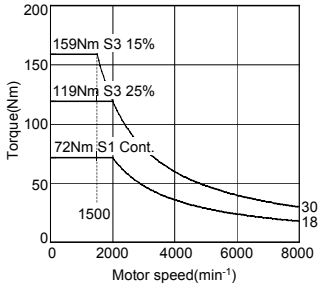




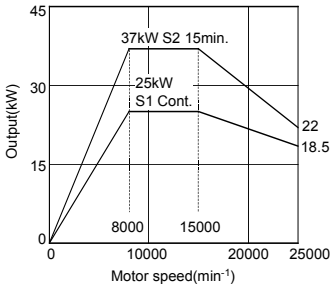
α112L/25000*i*B (A06B-1675-B140#X627)

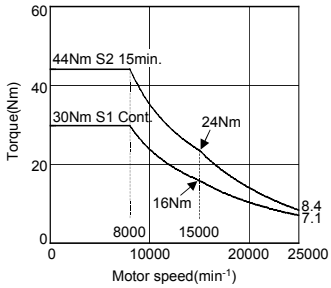
Low winding





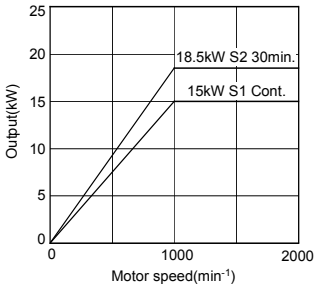
High winding

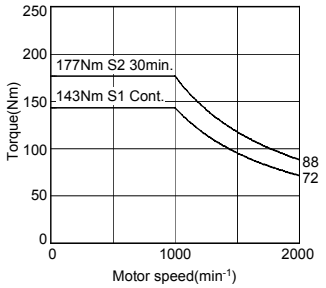




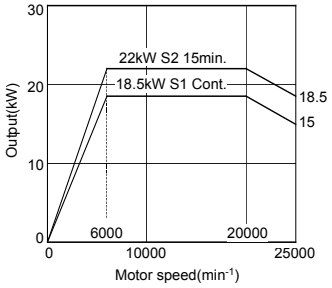
α132L/25000*i*B (A06B-1705-B140#Y617)

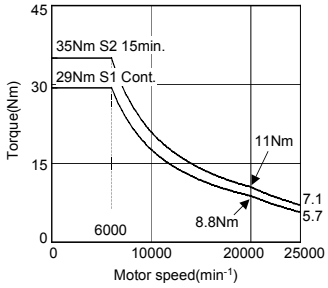
Low winding





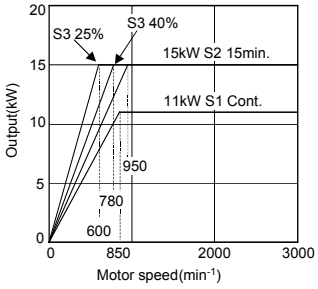
High winding

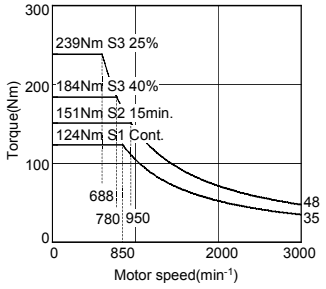




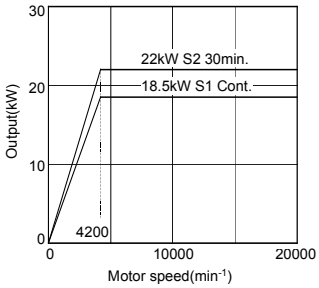
α160M/20000*i*B (A06B-1723-B140#Y627)

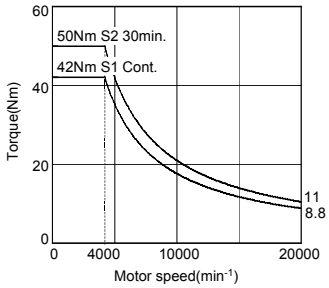
Low winding





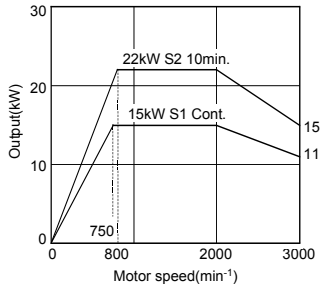
High winding

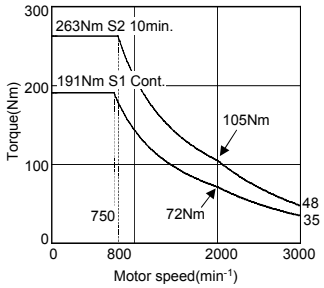




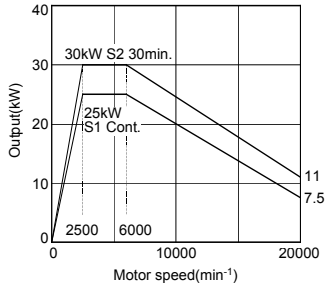
α160L/20000*i*B (A06B-1725-B140#Y617)

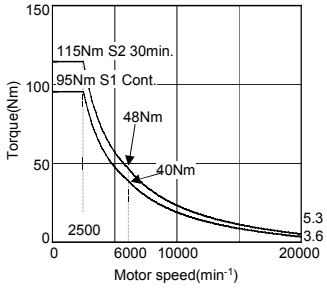
Low winding





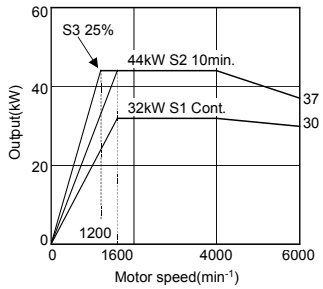
High winding

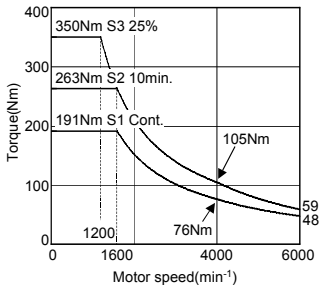




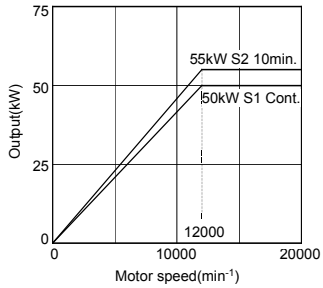
α160LL/20000*i*B (A06B-1726-B140#Y617)

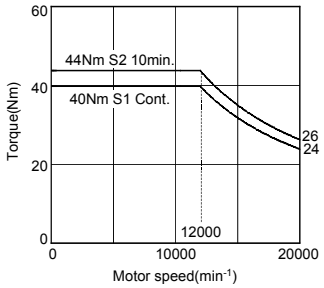
Low winding





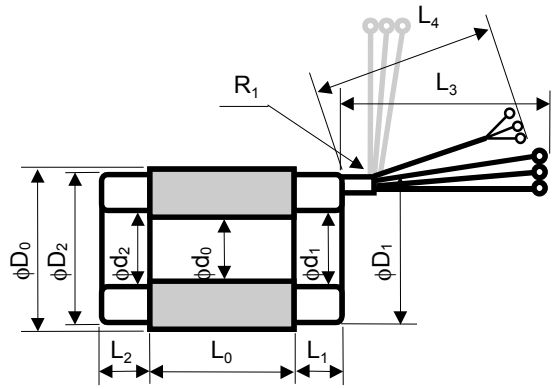
High winding



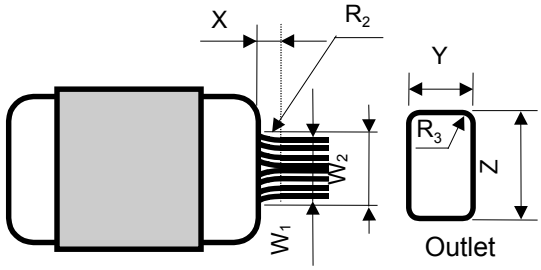


3 DIMENSIONS

3.1 STATOR



Side view(cut away)



Upper view

Unit : mm

	Model name	Type No. (A06B-)	ϕD_0	ϕD_1	ϕD_2	ϕd_0	ϕd_1	ϕd_2	$L_0+L_1+L_2$	L_0	L_1	L_2	L_3	L_4
Standard type	α50L/25000*i*B	1615-B120#Z318	88±0.01	82^{+0}	82^{+0}	(49)	51^{-0}	51^{-0}	154	92	38^{+0}	24^{+0}	1000±20	1000±20
	α80S/20000*i*B	1621-B120#Z312	120±0.01	114^{+0}	114^{+0}	(75)	76^{-0}	76^{-0}	135	58	42^{+0}	35^{+0}	2000±30	2000±30
	α80M/15000*i*B	1623-B170#Z011	120±0.01	112^{+0}	112^{+0}	(75)	76^{-0}	76^{-0}	195	120	40^{+0}	35^{+0}	1000±20	1000±20
	α80L/8000*i*B	1625-B170#Z011	120±0.01	112^{+0}	112^{+0}	(75)	76^{-0}	76^{-0}	245	170	40^{+0}	35^{+0}	2000±30	2000±30
	α100S/12500*i*B	1641-B120#Z011	156±0.01	142^{+0}	142^{+0}	(100)	101^{-0}	101^{-0}	202	110	49^{+0}	43^{+0}	2000±30	2000±30
	α112SS/20000*i*B	1661-B120#Z312	159±0.01	155^{+0}	155^{+0}	(115)	118^{-0}	118^{-0}	155	80	42.5^{+0}	32.5^{+0}	2000±30	2000±30
	α112S/15000*i*B	1671-B120#Z311	180±0.01	174^{+0}	174^{+0}	(115)	118^{-0}	118^{-0}	219	115	57^{+0}	47^{+0}	2000±30	2000±30
	α112M/15000*i*B	1673-B120#Z311	180±0.01	166^{+0}	166^{+0}	(115)	119^{-0}	119^{-0}	284	180	57^{+0}	47^{+0}	2000±30	2000±30
	α112L/15000*i*B	1675-B100#Z311	180±0.01	174^{+0}	174^{+0}	(115)	119^{-0}	119^{-0}	330	226	57^{+0}	47^{+0}	2000±30	2000±30
	α112LL/15000*i*B	1676-B100#Z311	180±0.01	174^{+0}	174^{+0}	(115)	117^{-0}	117^{-0}	394	280	62^{+0}	52^{+0}	2000±30	2000±30
	α132M/14000*i*B	1713-B100#Z311	240±0.02	232^{+0}	232^{+0}	(132)	138^{-0}	138^{-0}	280	160	70^{+0}	50^{+0}	2000±30	2000±30
	α132L/14000*i*B	1705-B140#Z311	210±0.02	206^{+0}	206^{+0}	(132)	137^{-0}	137^{-0}	360	226	77^{+0}	57^{+0}	2000±30	2000±30
	α160S/13000*i*B	1721-B120#Z311	240±0.02	228^{+0}	228^{+0}	(160)	163^{-0}	163^{-0}	270	150	65^{+0}	55^{+0}	2000±30	2000±30
	α160M/13000*i*B	1723-B120#Z311	240±0.02	214^{+0}	210^{+0}	(160)	163^{-0}	163^{-0}	305	182	64^{+0}	59^{+0}	2000±30	2000±30
	α160L/13000*i*B	1725-B120#Z311	240±0.02	228^{+0}	228^{+0}	(160)	163^{-0}	163^{-0}	402	272	69^{+0}	61^{+0}	2000±30	2000±30
	α160LL/13000*i*B	1726-B100#Z311	240±0.02	226^{+0}	226^{+0}	(160)	161^{-0}	161^{-0}	474	332	80^{+0}	62^{+0}	2000±30	2000±30
	α180M/6000*i*B	1743-B100#Z011	292±0.03	281^{+0}	280^{+0}	(190)	199^{-0}	199^{-0}	369	212	85^{+0}	72^{+0}	2000±30	2000±30
	α180L/6000*i*B	1745-B100#Z011	292±0.03	281^{+0}	281^{+0}	(190)	197^{-0}	197^{-0}	463	302	86^{+0}	75^{+0}	2000±30	2000±30
	α180LL/8000*i*B	1746-B100#Z011	292±0.03	281^{+0}	281^{+0}	(190)	197^{-0}	197^{-0}	523	362	86^{+0}	75^{+0}	2000±30	2000±30
	α200M/6000*i*B	1753-B120#Z313	300±0.03	292^{+0}	292^{+0}	(210)	216^{-0}	216^{-0}	322	190	73^{+0}	59^{+0}	2000±30	2000±30
	α200L/6000*i*B	1755-B120#Z316	300±0.03	292^{+0}	292^{+0}	(210)	216^{-0}	216^{-0}	400	250	85^{+0}	65^{+0}	2000±30	2000±30
	α250M/3000*i*B	1773-B140#Z316	370±0.03	350^{+0}	350^{+0}	(265)	267^{-0}	267^{-0}	522	352	97^{+0}	73^{+0}	2000±30	2000±30
High speed type	α40S/70000*i*B	1601-B120#Z618	88±0.01	82^{+0}	82^{+0}	(44)	46^{-0}	46^{-0}	71	30	25^{+0}	16^{+0}	1000±20	1000±20
	α80S/40000*i*B	1631-B120#Y618	150±0.01	150^{+0}	146^{+0}	(90)	91^{-0}	91^{-0}	135	56	44^{+0}	35^{+0}	2000±30	2000±30
	α100S/20000*i*B	1641-B121#X617	156±0.01	144^{+0}	144^{+0}	(100)	101^{-0}	101^{-0}	200	110	46^{+0}	44^{+0}	2000±30	2000±30
	α112S/20000*i*B	1662-B120#Z317	159±0.01	155^{+0}	155^{+0}	(115)	118^{-0}	118^{-0}	200	115	52^{+0}	33^{+0}	2000±30	2000±30
	α112M/20000*i*B	1673-B100#Y617	180±0.01	174^{+0}	174^{+0}	(115)	119^{-0}	119^{-0}	272	180	50^{+0}	42^{+0}	2000±30	2000±30
	α112L/20000*i*B	1675-B100#Y617	180±0.01	174^{+0}	174^{+0}	(115)	119^{-0}	119^{-0}	330	226	57^{+0}	47^{+0}	2000±30	2000±30
	α112L/25000*i*B	1675-B140#X627	180±0.01	174^{+0}	174^{+0}	(115)	118^{-0}	118^{-0}	335	226	62^{+0}	47^{+0}	2000±30	2000±30
	α132L/25000*i*B	1705-B140#Y617	210±0.02	206^{+0}	206^{+0}	(132)	137^{-0}	137^{-0}	360	226	77^{+0}	57^{+0}	2000±30	2000±30
	α160M/20000*i*B	1723-B140#Y627	240±0.02	234^{+0}	234^{+0}	(160)	163^{-0}	163^{-0}	321	182	77^{+0}	62^{+0}	2000±30	2000±30
	α160L/20000*i*B	1725-B140#Y617	240±0.02	234^{+0}	234^{+0}	(160)	163^{-0}	163^{-0}	406	272	72^{+0}	62^{+0}	2000±30	2000±30
	α160LL/20000*i*B	1726-B140#Y617	240±0.02	234^{+0}	234^{+0}	(160)	161^{-0}	161^{-0}	466	332	72^{+0}	62^{+0}	2000±30	2000±30

Unit : mm

	Model name	Type No.(A06B-)	W_1	W_2	R_1	R_2	R_3	X	Y	Z
Standard type	α50L/25000*i*B	1615-B120#Z318	20	30	10-15	10-15	3-5	3 or more	20 or more	40 or more
	α80S/20000*i*B	1621-B120#Z312	20	30	10-15	10-15	3-5	3 or more	20 or more	40 or more
	α80M/15000*i*B	1623-B170#Z011	20	30	10-15	10-15	3-5	3 or more	20 or more	40 or more
	α80L/8000*i*B	1625-B170#Z011	20	30	10-15	10-15	3-5	3 or more	20 or more	40 or more
	α100S/12500*i*B	1641-B120#Z011	40	50	10-15	20-25	3-5	3 or more	20 or more	60 or more
	α112SS/20000*i*B	1661-B120#Z312	50	60	20-25	25-30	3-5	3 or more	20 or more	70 or more
	α112S/15000*i*B	1671-B120#Z311	70	80	30-35	30-35	3-5	3 or more	30 or more	90 or more
	α112M/15000*i*B	1673-B120#Z311	50	60	20-25	25-30	3-5	3 or more	20 or more	70 or more
	α112L/15000*i*B	1675-B100#Z311	70	80	30-35	30-35	3-5	3 or more	30 or more	90 or more
	α112LL/15000*i*B	1676-B100#Z311	70	80	30-35	30-35	3-5	3 or more	30 or more	90 or more
	α132M/14000*i*B	1713-B100#Z311	80	90	35-40	35-40	3-5	3 or more	40 or more	100 or more
	α132L/14000*i*B	1705-B140#Z311	80	90	35-40	35-40	3-5	3 or more	40 or more	100 or more
	α160S/13000*i*B	1721-B120#Z311	50	60	30-35	30-35	3-5	3 or more	30 or more	90 or more
	α160M/13000*i*B	1723-B120#Z311	50	60	30-35	30-35	3-5	3 or more	30 or more	90 or more
	α160L/13000*i*B	1725-B120#Z311	50	60	30-35	30-35	3-5	3 or more	30 or more	90 or more
	α160LL/13000*i*B	1726-B100#Z311	50	60	30-35	30-35	3-5	3 or more	30 or more	90 or more
	α180M/6000*i*B	1743-B100#Z011	70	80	30-35	30-35	3-5	3 or more	30 or more	90 or more
	α180L/6000*i*B	1745-B100#Z011	80	90	35-40	35-40	3-5	3 or more	40 or more	100 or more
	α180LL/8000*i*B	1746-B100#Z011	80	90	35-40	35-40	3-5	3 or more	40 or more	100 or more
	α200M/6000*i*B	1753-B120#Z313	80	90	35-40	35-40	3-5	3 or more	40 or more	100 or more
	α200L/6000*i*B	1755-B120#Z316	80	90	40-45	40-45	3-5	3 or more	40 or more	110 or more
	α250M/3000*i*B	1773-B140#Z316	90	100	40-45	40-45	3-5	3 or more	50 or more	110 or more
High speed type	α40S/70000*i*B	1601-B120#Z618	20	30	10-15	10-15	3-5	3 or more	20 or more	40 or more
	α80S/40000*i*B	1631-B120#Y618	70	80	30-35	30-35	3-5	3 or more	30 or more	90 or more
	α100S/20000*i*B	1641-B121#X617	30	40	25-30	25-30	3-5	3 or more	25 or more	50 or more
	α112S/20000*i*B	1662-B120#Z317	70	80	30-35	30-35	3-5	3 or more	30 or more	90 or more
	α112M/20000*i*B	1673-B100#Y617	60	70	25-30	30-35	3-5	3 or more	25 or more	80 or more
	α112L/20000*i*B	1675-B100#Y617	50	60	30-35	30-35	3-5	3 or more	30 or more	90 or more
	α112L/25000*i*B	1675-B140#X627	70	80	30-35	30-35	3-5	3 or more	30 or more	90 or more
	α132L/25000*i*B	1705-B140#Y617	80	90	35-40	35-40	3-5	3 or more	40 or more	100 or more
	α160M/20000*i*B	1723-B140#Y627	80	90	35-40	35-40	3-5	3 or more	40 or more	100 or more
	α160L/20000*i*B	1725-B140#Y617	80	90	35-40	35-40	3-5	3 or more	40 or more	100 or more
	α160LL/20000*i*B	1726-B140#Y617	80	90	35-45	35-40	3-5	3 or more	40 or more	100 or more

NOTE

- R_1 is the minimum bending radius of power leads.
- Y, Z, and R_3 indicate a recommended outlet size at position X.
- If power leads or thermistor leads (THR leads) is too long, it may be cut to a usable length.
- A marking such as U, V, or W is applied at the end of each power lead. After cutting a power lead, make the power lead capable of being determined which marking is applied on it.
- A tolerance of D_0 represents a machining dimension. The core is laminated, and a distortion of about 0.1mm may occur in subsequent processes which include winding. However, the tolerance of D_0 is allowable for shrink fitting.
- The values in parentheses are for reference. These dimensions are managed by FANUC. It is not necessary to machine.
- To obtain a rated output, use a cooling jacket or equivalent that shown in "3.4 COOLING JACKET". Motors are developed with those cooling jackets. Refer to "3.4 COOLING JACKET".
- Read "II.INSTRUCTION" before designing and assembling a spindle. The motor cannot be driven normally if handle incorrectly.
- The thermistor line of the α112SS/20000*i*B extends from a tap of the power line, starting from a position 180 degrees out of phase. Provide a tap specific to the thermistor line at a position 180 degrees apart from the power line. An alternative is to draw the thermistor line together with the power line while winding the thermistor line along the external coil diameter.

	Model name	Type No.(A06B-)	Power leads cross-sectional area (mm^2)	Number of power leads	Diameter of power leads (mm)	Size of power lead crimp terminal	Power leads Connection
Standard type	α50L/25000*i*B	1615-B120#Z318	2	6	2.8	M4	Connection B
	α80S/20000*i*B	1621-B120#Z312	2	6	2.8	M5	Connection E
	α80M/15000*i*B	1623-B170#Z011	2	3	2.8	None	Connection A
	α80L/8000*i*B	1625-B170#Z011	2	3	2.8	M5	Connection A
	α100S/12500*i*B	1641-B120#Z011	3.5	6	3.5	M5	Connection B
	α112SS/20000*i*B	1661-B120#Z312	5.5	6	4.4	M6	Connection E
	α112S/15000*i*B	1671-B120#Z311	14	6	6.5	M8	Connection E
	α112M/15000*i*B	1673-B120#Z311	5.5	6	4.4	M6	Connection B
	α112L/15000*i*B	1675-B100#Z311	14	6	6.5	M8	Connection D
	α112LL/15000*i*B	1676-B100#Z311	14	6	6.5	M8	Connection D
	α132M/14000*i*B	1713-B100#Z311	22	6	8.6	M8	Connection D
	α132L/14000*i*B	1705-B140#Z311	14	12	6.5	M10	Connection H
	α160S/13000*i*B	1721-B120#Z311	14	6	6.5	M6	Connection E
	α160M/13000*i*B	1723-B120#Z311	14	6	6.5	M6	Connection E
	α160L/13000*i*B	1725-B120#Z311	14	6	6.5	M6	Connection E
	α160LL/13000*i*B	1726-B100#Z311	14	6	6.5	M8	Connection D
	α180M/6000*i*B	1743-B100#Z011	14	6	6.5	M8	Connection D
	α180L/6000*i*B	1745-B100#Z011	22	6	8.6	M8	Connection D
	α180LL/8000*i*B	1746-B100#Z011	22	6	8.6	M8	Connection D
	α200M/6000*i*B	1753-B120#Z313	22	6	8.6	M8	Connection E
	α200L/6000*i*B	1755-B120#Z316	30	6	9.6	M10	Connection E
	α250M/3000*i*B	1773-B140#Z316	22	12	8.6	M8	Connection F <3>-<4>
High speed type	α40S/70000*i*B	1601-B120#Z618	2	3	2.8	M4	Connection B
	α80S/40000*i*B	1631-B120#Y618	8	6	5.1	M8	Connection B
	α100S/20000*i*B	1641-B121#X617	8	6	5.1	M8	Connection E
	α112S/20000*i*B	1662-B120#Z317	14	6	6.5	M8	Connection E
	α112M/20000*i*B	1673-B100#Y617	14	6	6.5	M8	Connection D
	α112L/20000*i*B	1675-B100#Y617	14	6	6.5	M8	Connection D
	α112L/25000*i*B	1675-B140#X627	8	12	5.1	M8	Connection G
	α132L/25000*i*B	1705-B140#Y617	14	12	6.5	M10	Connection F <1>-<4>
	α160M/20000*i*B	1723-B140#Y627	14	12	6.5	M8	Connection F <1>-<4>
	α160L/20000*i*B	1725-B140#Y617	14	12	6.5	M8	Connection G
	α160LL/20000*i*B	1726-B140#Y617	14	12	6.5	M8	Connection F <1>-<4>

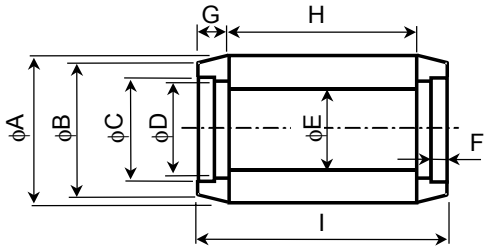
NOTE

- The outer diameter of the thermistor leads (THR leads) is $\phi 5.2 \pm 0.3$mm. This cable consists of two wires (20AWG) and one shield net-wire. Use the diameter of the thermistor lead (5.2) as the minimum bending radius.
- A crimp terminal is attached to each thermistor lead (THR lead).
- To obtain a rated output, use a cooling jacket or equivalent that shown in "3.4 COOLING JACKET". Motors are developed with those cooling jackets. Refer to "3.4 COOLING JACKET".
- Refer to "2.3 POWER LEADS CONNECTIONS" in "II.INSTRUCTION" for details of power leads connection.
- Read "II.INSTRUCTION" before designing and assembling a spindle. The motor cannot be driven normally if handle incorrectly.

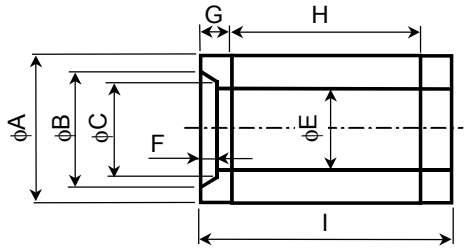
3.2 ROTOR

3.2.1 Dimensions of Rotor

Type A



Type B



Unit : mm

	Model name	Type No.(A06B-)	Type	ϕA	ϕB	ϕC	ϕD	ϕE	F	G	H	I
Standard type	α50L/25000*i*B	1615-B120#Z318	A	49±0.2 (48.6±0.01)	44	38.3	35.8	34.8	-	5	90	100
	α80S/20000*i*B	1621-B120#Z312	A	74.3+0.2/-0 (74.0±0.01)	73.4	53.5	51	41	-	7	56	70
	α80M/15000*i*B	1623-B170#Z011	A	74.15±0.1 (73.90±0.01)	72	44	42	41	3	9	118	136
	α80L/8000*i*B	1625-B170#Z011	A	74.15±0.1 (73.90±0.01)	72	44	42	41	3	9	168	186
	α100S/12500*i*B	1641-B120#Z011	A	99.2 (99.00±0.01)	96	62	58	58	8	13	108	134
	α112SS/20000*i*B	1661-B120#Z312	A	114.5+0.2/-0 (114.2±0.01)	89	84	80	74	-	11	78	100
	α112S/15000*i*B	1671-B120#Z311	A	114.5+0.2/-0 (114.2±0.01)	111	76.5	74.4	74	5	15	113	143
	α112M/15000*i*B	1673-B120#Z311	A	114.5+0.2/-0 (114.2±0.01)	111	76.5	74.4	74	5	15	178	208
	α112L/15000*i*B	1675-B100#Z311	A	114.5+0.2/-0 (114.2±0.01)	111	76.5	74.4	74	5	15	224	254
	α112LL/15000*i*B	1676-B100#Z311	A	114.5+0.2/-0 (114.2±0.01)	111	76.5	74.4	74	5	15	278	308
	α132M/14000*i*B	1713-B100#Z311	A	131.5+0.3/-0 (131.2±0.01)	128	103	91	74	-	15	158	188
	α132L/14000*i*B	1705-B140#Z311	A	131.5+0.3/-0 (131.2±0.01)	128	75	74.4	74	5	15	224	254
	α160S/13000*i*B	1721-B120#Z311	A	159.2±0.1 (158.91±0.02)	155	104	102	101	7	18	148	184
	α160M/13000*i*B	1723-B120#Z311	A	159.2+0.2/-0 (158.91±0.02)	155	104	102	101	7	18	180	216
	α160L/13000*i*B	1725-B120#Z311	A	159.2+0.2/-0 (158.91±0.02)	155	104	102	101	7	18	270	306
	α160LL/13000*i*B	1726-B100#Z311	A	159.0+0.2/-0 (158.72±0.02)	155	-	101	101	-	18	330	366
	α180M/6000*i*B	1743-B100#Z011	A	188.7 (188.32±0.02)	187	127	125	124	5	18	210	246
	α180L/6000*i*B	1745-B100#Z011	A	188.8 (188.48±0.02)	185	127	125	124	5	18	300	336
	α180LL/8000*i*B	1746-B100#Z011	A	189.2 (188.48±0.02)	187	127	125	124	5	18	360	396
	α200M/6000*i*B	1753-B120#Z313	A	209.5±0.1 (209.2±0.02)	204	150	146.5	146	4	15	188	218
	α200L/6000*i*B	1755-B120#Z316	A	209.5±0.1 (209.2±0.02)	204	150	146.5	146	4	15	248	278
	α250M/3000*i*B	1773-B140#Z316	A	264.1+0.2/-0 (263.8±0.02)	260	-	168.5	168	-	21	350	392

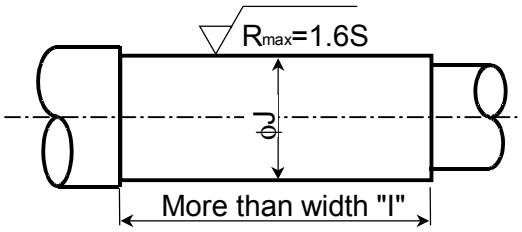
Unit : mm

	Model name	Type No.(A06B-)	Type	ϕA	ϕB	ϕC	ϕD	ϕE	F	G	H	I
High speed type	α40S/70000*i*B	1601-B120#Z618	B	44.0 (43.4±0.01)	31	28	-	28	(6.8)	8	28	44
	α80S/40000*i*B	1631-B120#Y618	B	90±0.1 (89.4±0.01)	-	-	-	59.5±0.1	-	12.8	56	81.6
	α100S/20000*i*B	1641-B121#X617	B	99.3 +0.2/-0 (98.6±0.01)	-	-	-	70	-	12.5	108	133
	α112S/20000*i*B	1662-B120#Z317	A	114.5 +0.2/-0 (114.2±0.01)	89	84	80	74	-	11	113	135
	α112M/20000*i*B	1673-B100#Y617	B	113.7+0.2/-0 (113.4±0.01)	(76.8)	(76)	-	74	(11.6)	(14.8)	178	207
	α112L/20000*i*B	1675-B100#Y617	B	113.7+0.2/-0 (113.4±0.01)	(76.8)	(76)	-	74	(11.6)	(14.8)	224	254
	α112L/25000*i*B	1675-B140#X627	B	113.7+0.2/-0 (113.4±0.01)	(76.8)	(76.8)	-	74	(11.1)	(14.8)	224	254
	α132L/25000*i*B	1705-B140#Y617	B	131.6+0.3/-0 (131.2±0.01)	-	-	-	83.5	-	(15.2)	224	254
	α160M/20000*i*B	1723-B140#Y627	B	159.8±0.2 (158.92±0.01)	105±0.5	105±0.5	-	101	(13.8)	(17.8)	180	216
	α160L/20000*i*B	1725-B140#Y617	B	159.2+0.3/-0 (158.92±0.01)	(105.1)	(105.1)	-	101.4	(13.8)	(17.8)	270	306
	α160LL/20000*i*B	1726-B140#Y617	B	159.2+0.3/-0 (Undetermined)	(105.1)	(105.1)	-	101.4	(13.8)	(17.8)	330	366

NOTE

- The tolerance of dimension I in the above table is all ±2 mm. This tolerance is determined by adding variations in dimensions G and H.
- The dimensions enclosed in parentheses under ϕA indicate finally finished dimensions. Finish the rotor into these dimensions. FANUC does not perform final finish machining.
- For the models of type A rotors for which a value is provided in the width F section of the table, finish ϕC and ϕD into the same dimension as ϕE. Then, perform shrink fitting of the ϕC and ϕD sections with the spindle as with the ϕE section.
- Finish the inner surface of a type B rotor so that the same dimension is indicated along the length except for the width F section and do not make a clearance.
- When cutting fluid is used for machining, remove moisture completely from the core after machining.
- Machine on the parts designated by FANUC. Incorrect machining will affect the motor life. Read "II.INSTRUCTION" before machining.

3.2.2 Reference Size of Spindle Shaft



Unit : mm

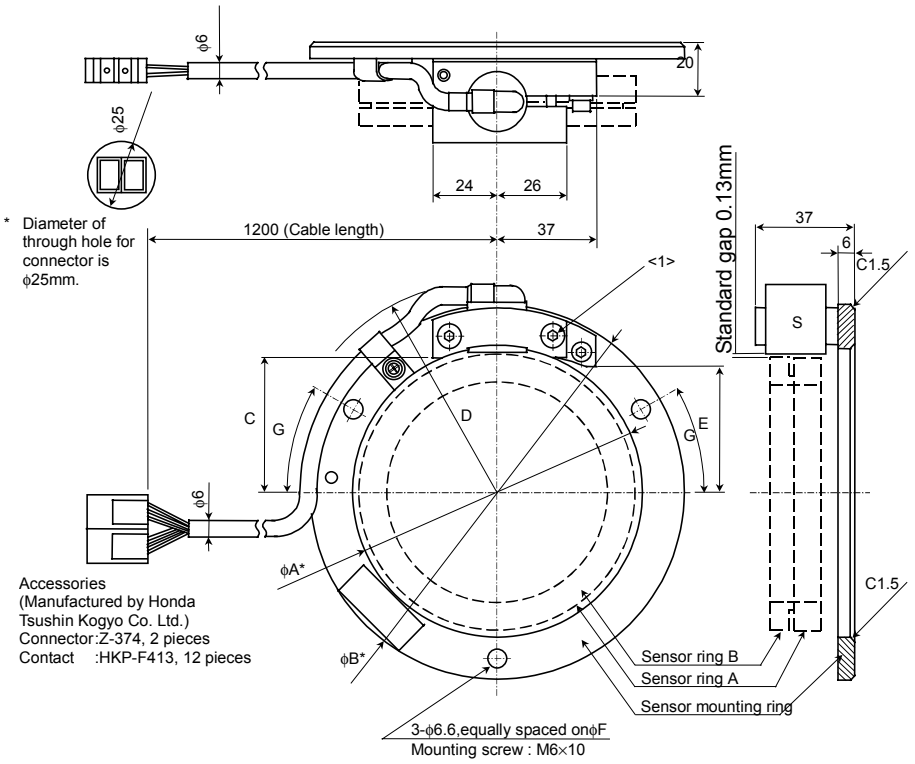
	Model name	Type No.(A06B-)	Rotor inner surface not machined	Rotor inner surface machined	
			ϕJ	ϕJ	Interference for shrinking
Standard type	α50L/25000*i*B	1615-B120#Z318	34.827≤J≤34.832	35.0≤J≤35.5	10 to 30μm
	α80S/20000*i*B	1621-B120#Z312	-	41.4≤J≤42.0	20 to 40μm
	α80M/15000*i*B	1623-B170#Z011	-	41.4≤J≤42.0	25 to 65μm
	α80L/8000*i*B	1625-B170#Z011	-	41.4≤J≤42.0	25 to 65μm
	α100S/12500*i*B	1641-B120#Z011	-	58.4≤J≤59.0	30 to 70μm
	α112SS/20000*i*B	1661-B120#Z312	-	74.6≤J≤77.0	60 to 90μm
	α112S/15000*i*B	1671-B120#Z311	-	74.6≤J≤77.0	40 to 80μm
	α112M/15000*i*B	1673-B120#Z311	-	74.6≤J≤77.0	40 to 80μm
	α112L/15000*i*B	1675-B100#Z311	-	74.6≤J≤77.0	40 to 80μm
	α112LL/15000*i*B	1676-B100#Z311	-	74.6≤J≤77.0	40 to 80μm
	α132M/14000*i*B	1713-B100#Z311	-	74.6≤J≤77.0	50 to 80μm
	α132L/14000*i*B	1705-B140#Z311	-	74.6≤J≤77.0	50 to 80μm
	α160S/13000*i*B	1721-B120#Z311	-	101.4≤J≤103.0	60 to 100μm
	α160M/13000*i*B	1723-B120#Z311	-	101.4≤J≤103.0	60 to 100μm
	α160L/13000*i*B	1725-B120#Z311	-	101.4≤J≤103.0	60 to 100μm
	α160LL/13000*i*B	1726-B100#Z311	-	101.4≤J≤103.0	60 to 100μm
	α180M/6000*i*B	1743-B100#Z011	-	124.4≤J≤125.0	40 to 80μm
	α180L/6000*i*B	1745-B100#Z011	-	125.5≤J≤126.1	40 to 80μm
	α180LL/8000*i*B	1746-B100#Z011	-	124.4≤J≤125.0	40 to 80μm
	α200M/6000*i*B	1753-B120#Z313	-	146.4≤J≤147.0	40 to 80μm
	α200L/6000*i*B	1755-B120#Z316	-	146.4≤J≤147.0	40 to 80μm
	α250M/3000*i*B	1773-B140#Z316	-	168.4≤J≤170.0	37 to 67μm
High speed type	α40S/70000*i*B	1601-B120#Z618	28.090≤J≤28.095	-	-
	α80S/40000*i*B	1631-B120#Y618	-	J=60.2	110 to 130μm
	α100S/20000*i*B	1641-B121#X617	-	70.4≤J≤70.5	35 to 55μm
	α112S/20000*i*B	1662-B120#Z317	-	74.4≤J≤77.0	60 to 90μm
	α112M/20000*i*B	1673-B100#Y617	-	74.4≤J≤77.0	115 to 130μm
	α112L/20000*i*B	1675-B100#Y617	-	74.4≤J≤77.0	115 to 130μm
	α112L/25000*i*B	1675-B140#X627	-	74.4≤J≤75.0	125 to 145μm
	α132L/25000*i*B	1705-B140#Y617	-	84.0≤J≤84.5	116 to 135μm
	α160M/20000*i*B	1723-B140#Y627	101.13≤J≤101.14	101.4≤J≤103.0	130 to 155μm
	α160L/20000*i*B	1725-B140#Y617	-	101.4≤J≤103.0	130 to 155μm
	α160LL/20000*i*B	1726-B140#Y617	-	101.4≤J≤103.0	130 to 155μm

NOTE

- For a model for which no data is indicated for "Rotor inner surface not machined," machine the inner surface of the rotor and spindle so that the specified range of the "interference for shrinking" is reserved. Determine the diameter of the spindle within the range indicated as dimension J in the table.
- For a model for which data is indicated for "Rotor inner surface not machined," no inner surface machining is recommended. Finish the spindle within the dimension J range. When machining the inner surface of the rotor, follow the above note.
- When cutting fluid is used for machining, remove moisture completely from the core after machining.
- Machine on the parts designated by FANUC. Incorrect machining will affect the motor life. Read "II.INSTRUCTION" before machining.

3.3 BZ*i* SENSOR

3.3.1 With Mounting Ring

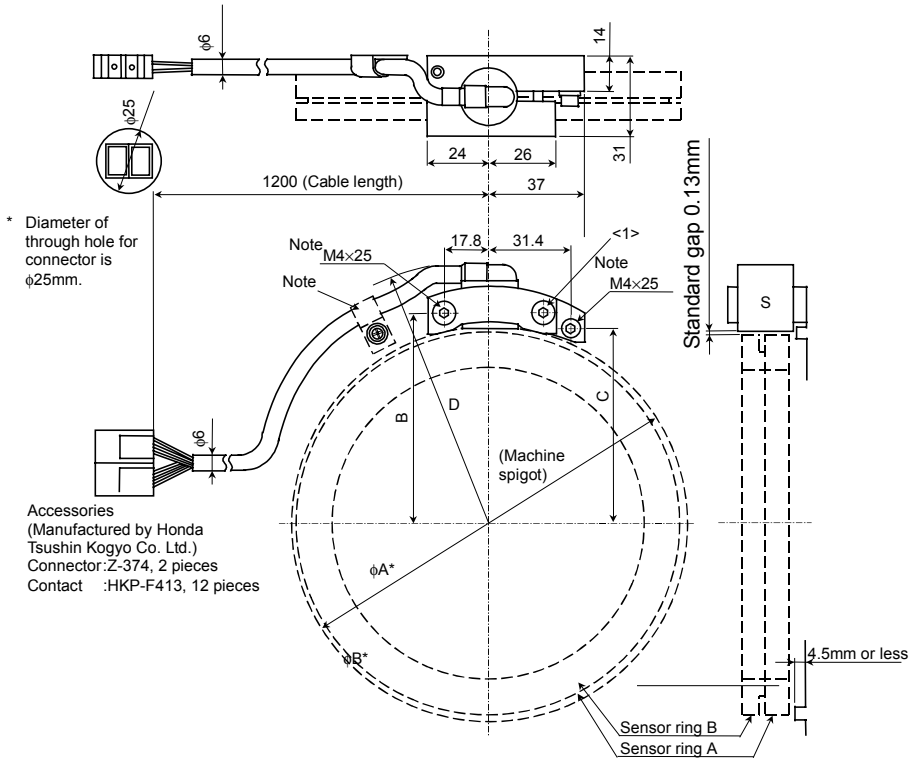


Sensor type No.	Sensor ring	Number of teeth	φA *	φB *	C	D	E	φF	G
A860-2120-T201 A860-2120-T211	Ring 1 Ring 2	128	56H6+0.019/-0.0	100h6+0.0/-0.022	25	R57	20	78	10°
A860-2120-T401 A860-2120-T411	Ring 3 Ring 4	256	108+0.040/+0.020	140h6+0.0/-0.025	51	R80	46	124	30°

Refer to the following section "3.3.3 Sensor Ring" for details of sensor rings.

NOTE
- Use this sensor under 80°C.
- Handle these precision parts with special care. In particular, never apply external force to part S.
- The sensor consists of electric circuit. Therefore, keep away from dust, oil, and any other harmful things.
- The dimensions marked with asterisk are applied to the fitting diameter. Be sure to install the sensor so that it is aligned with the inner or outer diameter of the guide. Otherwise, the detector may produce incorrect output.
- The gap between sensor and detecting ring is preadjusted. The output signal may not indicate the target value due to a dimensional error of the mounting spigot. When mounting the sensor, check the output signal. If the signal does not indicate the target value, loosen screw <1> which clamps the sensor to adjust the gap. Torque screw <1> to 20 kgfcm or less. For how to adjust the output signal, refer to "II. INSTRUCTION."
- Connect the shield wire.
- For easy maintenance, mount the sensor at a position where it can be replaced easily.
- Sensor rings with the same specification number can be replaced with each other.
- Sensor rings with different specification numbers cannot be used in combination.
- Mating connectors are provided with the sensor.

3.3.2 Without Mounting Ring

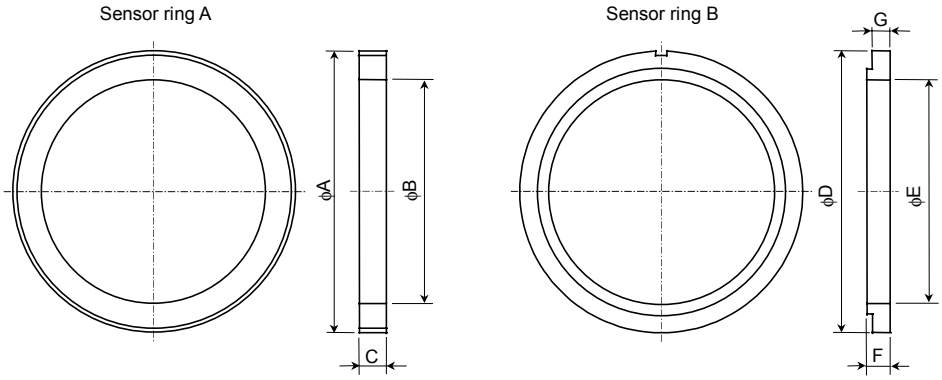


Sensor type No.	Sensor ring	Number of teeth	ϕA	B	C	D
A860-2120-T511	Ring 5	384	158+0.0/-0.025	84.3	78.3	R110
A860-2120-T611	Ring 6	512	210+0.0/-0.030	110.8	104.8	R140

Refer to the following section "3.3.3 Sensor Ring" for details of sensor rings.

NOTE
- Use this sensor under 80°C.
- Handle these precision parts with special care. In particular, never apply external force to part S.
- The sensor consists of electric circuit. Therefore, keep away from dust, oil, and any other harmful things.
- Mount the sensor, pressing it against the spigot (dimension ϕA) on the machine (the height of the spigot on the machine is 4.5 mm or less). If a dimension of the spigot on the machine is incorrect, a correct signal may not be output.
- The gap between sensor and detecting ring is preadjusted. The output signal may not indicate the target value due to a dimensional error of the mounting spigot. When mounting the sensor, check the output signal. If the signal does not indicate the target value, loosen screw <1> which clamps the sensor to adjust the gap. Torque screw <1> to 20 kgfcm or less. For how to adjust the output signal, refer to "II. INSTRUCTION."
- Use M4 x 25 mm screws for mounting.
- Connect the shield wire.
- For easy maintenance, mount the sensor at a position where it can be replaced easily.
- Sensor rings with the same specification number can be replaced with each other.
- Sensor rings with different specification numbers cannot be used in combination.
- Mating connectors are provided with the sensor.

3.3.3 Sensor Ring



Dimensions

	Sensor ring A (phase A/B ring)			Sensor ring B (phase Z ring)			
	ϕA	ϕB	C	ϕD	ϕE	F	G
Ring 1, 2	52+0.0/-0.020	40+0.016/-0.0	10±0.1	52+0.0/-0.020	40+0.016/-0.0	8.6±0.1	6.7
Ring 3, 4	103.2+0.0/-0.020	82+0.0/-0.018	10±0.1	103.2+0.0/-0.020	82+0.0/-0.018	8.6±0.1	6.7
Ring 5	154.4+0.0/-0.020	125+0.025/-0.0	10±0.1	154.4+0.0/-0.020	125+0.025/-0.0	8.6±0.1	6.7
Ring 6	205.6+0.0/-0.020	160+0.020/-0.0	10±0.1	205.6+0.0/-0.020	160+0.020/-0.0	8.6±0.1	6.7

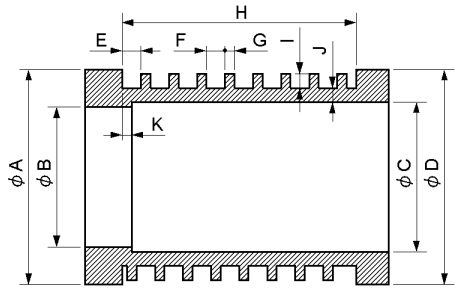
NOTE
- Press fit the rings on a sleeve, then install the sleeve on the spindle shaft.
- Used ring can be recycled only one time.
- The circumference has special teeth. Therefore carefully protect against deformation and chipping due to external force.
- Check the feedback signal after mounting the sensor. Adjustment procedure is shown in part II “INSTRUCTION.”

Allowable maximum speed

	Ring 1	Ring 2	Ring 3	Ring 4	Ring 5	Ring 6
Sensor type No.	T201	T211	T401	T411	T511	T611
Number of teeth	128	128	256	256	384	512
Max. speed (min^{-1})	20,000	70,000	15,000	30,000	15,000	10,000

NOTE
- Interference for shrink fitting of the rings is changed according to the maximum speed of spindle. Refer to part II “INSTRUCTION.”

3.4 COOLING JACKET (REFERENCE)



Unit : mm

	Model name	Type No.(A06B-)	ϕA	ϕB	ϕC	ϕD	E	F	G	H	I	J	K
Standard type	α50L/25000*i*B	1615-B120#Z311	127	87	88	120	18	11	4	116	7	11	11
	α80S/20000*i*B	1621-B120#Z312	150	119	120	145	21	16.5	3.5	87	6.8	6	14
	α80M/15000*i*B	1623-B170#Z011	144	119	120	145	10	21.5	3.5	121.5	6	5.5	1
	α80L/8000*i*B	1625-B170#Z011	144	119	120	145	10	21.5	3.5	171.5	6	5.5	1
	α100S/12500*i*B	1641-B120#Z011	177	155	156	180	10	20	5	102	5	5.5	-4
	α112SS/20000*i*B	1661-B120#Z312	195	158	159	191	20	8.5	3.5	139	11.5	6.5	28
	α112S/15000*i*B	1671-B120#Z311	230	178	180	220	20	8.5	4.5	130	10	15	5
	α112M/15000*i*B	1673-B120#Z311	230	178	180	220	20	8.5	4.5	195	10	15	5
	α112L/15000*i*B	1675-B100#Z311	230	178	180	220	20	8.5	4.5	241	10	15	5
	α112LL/15000*i*B	1676-B100#Z311	230	178	180	220	20	8.5	4.5	295	10	15	5
	α132M/14000*i*B	1713-B100#Z311	302	238	240	290	27	10	5	209	13.8	14	14
	α132L/14000*i*B	1705-B140#Z311	292	208	210	280	22	10	6	273	21.8	16	14
	α160S/13000*i*B	1721-B120#Z311	302	238	240	290	15	12	4	227	14.8	14	31.5
	α160M/13000*i*B	1723-B120#Z311	302	238	240	290	25	12	4	259	14.8	14	31.5
	α160L/13000*i*B	1725-B120#Z311	302	238	240	290	25	12	4	349	14.8	14	31.5
	α160LL/13000*i*B	1726-B100#Z311	312	238	240	300	32.5	13	5	408	16	18	26
	α180M/6000*i*B	1743-B100#Z011	315	286	292	350	21	14	4	240	5	9	24
	α180L/6000*i*B	1745-B100#Z011	333	288	292	329	26	11.5	3	343	10	11	20.5
	α180LL/8000*i*B	1746-B100#Z011	336	288	292	336	16	11	4	361	5	17	-11
	α200M/6000*i*B	1753-B120#Z313	353	298	300	348	34	14	5	240	14.5	12	25
	α200L/6000*i*B	1755-B120#Z316	353	298	300	348	34	14	5	300	14.5	12	25
	α250M/3000*i*B	1773-B140#Z316	470	366	370	435	25	14	4	367	15.5	18	5
High speed type	α40S/70000*i*B	1601-B120#Z618	120	87	88	120	6	6	2	46	7.5	8	4.5
	α80S/40000*i*B	1631-B120#Y618	190	148	150	180	17	9	5	78	9	9	10.5
	α100S/20000*i*B	1641-B121#X617	177	155	156	180	10	20	5	102	5	5.5	-4
	α112S/20000*i*B	1662-B120#Z317	207	158	159	195	19	8.5	3.5	150	11	8.5	10
	α112M/20000*i*B	1673-B100#Y617	230	178	180	220	20	8.5	4.5	195	10	15	5
	α112L/20000*i*B	1675-B100#Y617	230	178	180	220	20	8.5	4.5	241	10	15	5
	α112L/25000*i*B	1675-B140#X627	230	178	180	220	20	8.5	4.5	241	10	15	5
	α132L/25000*i*B	1705-B140#Y617	292	208	210	280	22	10	6	273	21.8	16	14
	α160M/20000*i*B	1723-B140#Y627	302	238	240	290	25	12	4	259	14.8	14	31.5
	α160L/20000*i*B	1725-B140#Y617	302	238	240	290	25	12	4	349	14.8	14	31.5
	α160LL/20000*i*B	1726-B140#Y617	312	238	240	300	32.5	13	5	408	16	18	26

NOTE

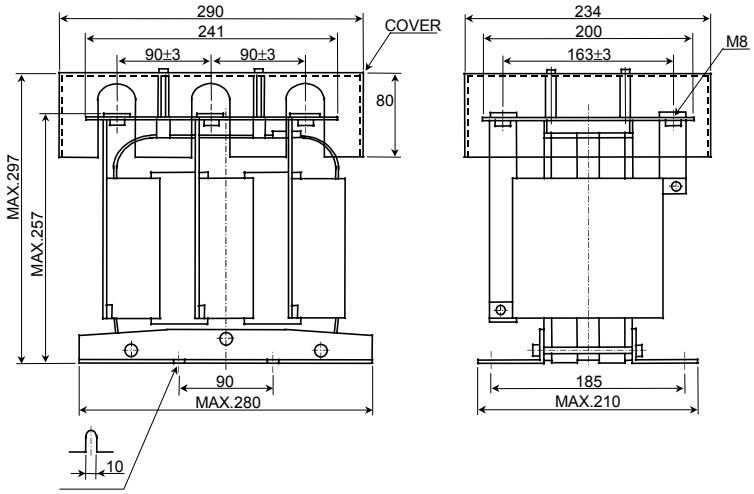
- Recommended material is FC iron.
- These data do not include interference for the stator shrink fitting. Calculate the proper interference to fit the stator correctly. Refer to part II “INSTRUCTION” for details of interference.
- These cooling jacket were used for test of built-in spindle motor at FANUC. These dimensions are just for reference. But the rated output may be changed if the dimensions vary much from these. Because this is one of the cooling conditions.
- Number of spirals are not the same with the figure above. Calculate the actual number of spirals using data shown in the table.

3.5 REACTOR

It is necessary to connect the reactor between the motor and the amplifier (SPM) for α40S/70000*i*B, for α80S/40000*i*B, for α112L/25000*i*B, and for α160LL/20000*i*B.
Connect the following reactor specified for each model.
For reactor connection, refer to "2.5 CABLE CONNECTION (OUTLINE)" in "II. INSTRUCTION."

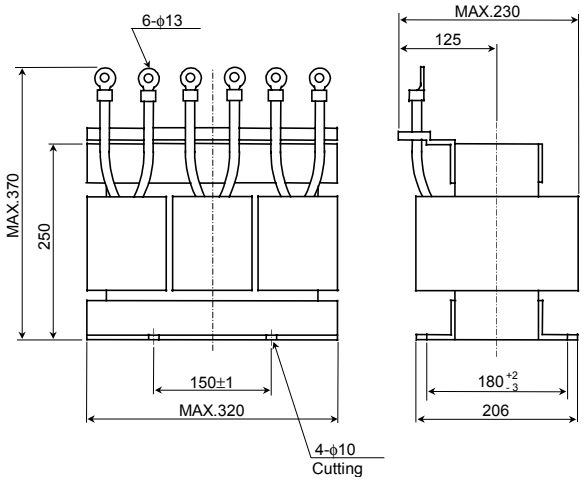
Reactor for α40S/70000*i*B (Specification number : A81L-0001-0142)

Inductance: 0.08 mH, three phases, rated current: 180 A,
insulation class: H, highest temperature: 125°C, weight: 30 kg



Reactor for α160LL/20000*i*B, α112L/25000*i*B and α80S/40000*i*B (Specification number : A81L-0001-0154)

Inductance: 0.08 mH, three phases, rated current: 180 A,
insulation class: H, highest temperature: 115°C, weight: 58 kg



NOTE
- If the specified reactor is not used, the life of the motor may adversely be affected considerably.
- Consider the setting place of the reactor. There is a possibility of high temperature rise up to about 100°C.
- Protect the reactor from oil, water and conductive dust.
- These are sample drawing. Actual figure may be different from the drawing above.
- The A81L-0001-0142 is supplied with an acrylic cover on the terminals.

II. INSTRUCTION

CONSTRUCTION OF THIS PART

This partedited for the parson who design and assemble a spindle. Read this chapter before design and assemble the spindle.

1 GENERAL

1.1 NOTES

Prohibition against machining any part that is not designated by FANUC

Note the following points to use built-in spindle motors properly.

> ⚠ **CAUTION**
> 1 Never machine the stator. Also never machine any pin hole for fixing the stator.
> 2 Do not machine parts of the rotor unless designated by FANUC. For details, refer to "3. ROTOR."

Liquid cooling

FANUC's built-in spindle motors are developed based on liquid cooling. You will not obtain the rated output by air cooling. Use liquid cooling system so that the rated output can be obtained.

Recommended coolant : ISO VG2 (e.g. Idemitsu Super Multi 2)

Be sure to use a coolant for which a manufacturing safety data sheet (MSDS) is issued. When handing the coolant, refer to the data sheet. When disposing of coolant, follow the related government and local laws and rules.

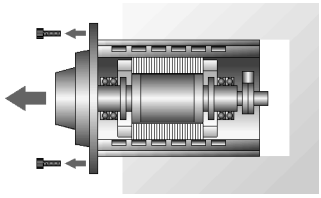
Thermistor

Do not cool the thermistor locally. Over heat of motor may not be detected. A thermistor is located in the coil in the power lead outlet of the stator.

Easy maintenance

Consider some structure for easy maintenance.

The structure that stator, rotor and sensor can be disassembled by each unit (spindle unit) is preferable.



Dry condition

A built-in spindle motor is an electric component. It may be damaged by liquid like water and oil. Therefore keep away from these. And also, keep away from the outer air. To supply air into a spindle, use complete dry air, if not water will condense on and in the motor. Air containing moisture may cause failure when it condenses in the motor.

Record the manufacturing number

Write down and remember the serial number on the lead wire of stator, and the manufacturing number on the side of rotor, so that you can find the manufacturing number of the motor that is used in the machine tool when maintenance.

Check resistance and insulation

Before and after assembling a spindle, check the resistance and insulation of winding. And also, check these on regular intervals.

> ⚠ **WARNING**
> Shut down the power supply and disconnect the leads which are connected to the amplifier before measuring to prevent an electric shock.
> And insulate the terminals that are not used.

- Winding resistance

Use milli-ohm meter to measure the winding resistance according to the following procedure. Insulate the terminals that are not used while measuring. For details of the measuring method and winding resistance, refer to "2.2 CHECKING THE WINDING RESISTANCE."

> **NOTE**
> Use milli-ohm meter to measure the resistance. General ohm meter cannot measure the resistance correctly.

- Insulation between winding and frame

Measure at 500VDC with mega-ohm tester. And judge according to following.

Over 100MΩ
: Good

10 - 100MΩ
: Deterioration has begun. It does not affect normal use. But check the insulation on regular intervals.

1 - 10MΩ
: Special care is required. Check the insulation on regular intervals.

Under 1MΩ
: Damaged. Change the motor to the new one.

> ⚠ **CAUTION**
> Shut down the power supply and disconnect the leads connected to the amplifier before checking the resistance and insulation to prevent an electric shock. Also insulate the terminals that are not used.

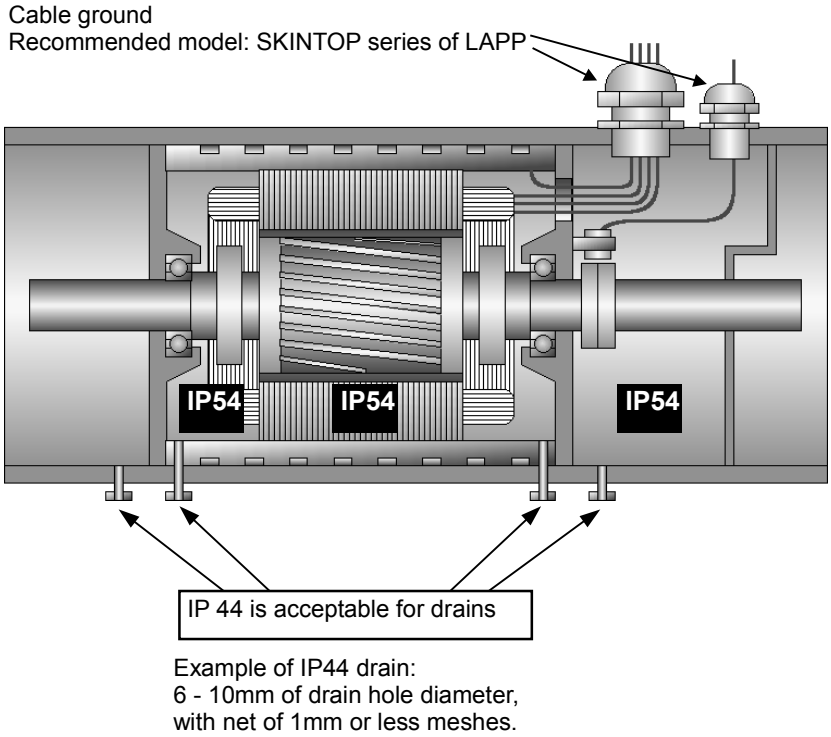
1.2 PROTECTION CLASS (WATER AND DUST PROOF)

Protection class of a spindle should be IP54 or more, and the part of drain should be IP44 or more.
(Refer to the IEC34-5 standard for details of IP.)

When appropriate protection is not maintained, contamination like oil, water, cutting dust and so on have to be removed through drains. Some structure of the spindle has to be prepared so that the contamination cannot reach the motor and sensor.

When you need the lubrication system using oil and air inside a spindle, an insulating oil has to be used for lubrication. And a drain also has to be prepared to remove the oil and its mist from the spindle.

Recommended insulating oil
for cooling : Idemitsu Super Multi 2 (ISO VG2)
for lubrication : Mulpose 32, Nippon oil company



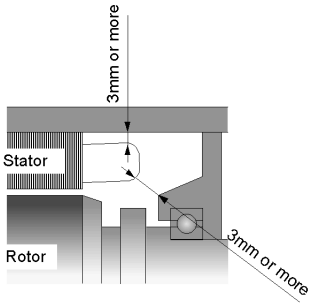
Example of IP44 drain:
6 - 10mm of drain hole diameter,
with net of 1mm or less meshes.

⚠ CAUTION
FANUC cannot guarantee the normal operation and safety, when the motor is not protected from contamination.

1.3 CLEARANCE AND CREEPAGE (DISTANCE FOR INSULATION)

Clearance

Clearance between windings and other metallic materials has to be 3mm or more, and this condition has to be applied for all directions of windings. These are described in VDE0110. Refer to VDE0110 for details to conform to CE marking.



Creepage distance

Creepage distance depends on materials used for insulation. In the case of general plastic material under IP54 condision, it has to be 2.5mm or more. Refer to VDE0110 for details.

NOTE
Clearance and creepage distance described here change depending on environment and materials. Therefore confirm actual value that is suitable for your machine system.

Terminal block and connector

Use IEC- or UL-certified terminal blocks and connectors for power leads connection when required.
For the clearance and creepage distance between terminals, conform to IEC664-1.

1.4 SATISFYING STANDARDS

Note on assembly

When installing a built-in spindle motor on a machine, satisfy Article 19 of IEC60204-1. For details, refer to the standard.

IEC60204-1 (excerpts from the standard)

19 TESTS AND VERIFICATION

19.1 GENERAL

This standard specifies general requirements for electric equipment mounted on machines. Tests related to special types of machines are specified in specific product standards. If no product standard specific to a machine is specified, one or more tests listed below may be conducted as appropriate tests, but continuity in the protection bonding circuit shall always be verified (refer to Article 19.2).

- Verification of the match between electric equipment and technical document
- Continuity in the protection bonding circuit (Refer to Article 19.2.)
- Insulation resistance test (Refer to Article 19.3.)
- Voltage test (Refer to Article 19.4.)
- Protection against residual voltage (Refer to Article 19.5.)
- Function test (Refer to Article 19.6.)

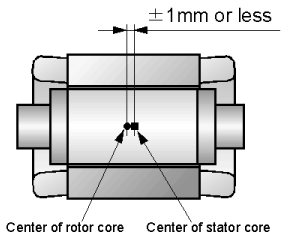
It is desirable to conduct the above tests in the listed order. If electric equipment is modified, the requirements in Article 19.7 shall be applied.

(The rest is omitted.)

1.5 DEVIATION

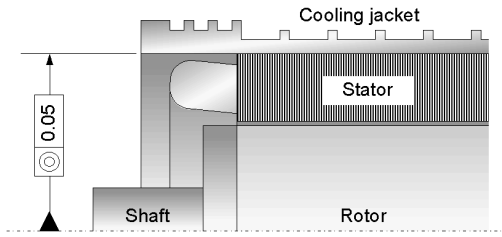
Deviation of stator and rotor

Deviation between center of stator core and center of rotor core must be ±1mm or less. (The rotor core does not extend off the end faces of the stator core.) Over 1mm deviation causes reduction of output power.



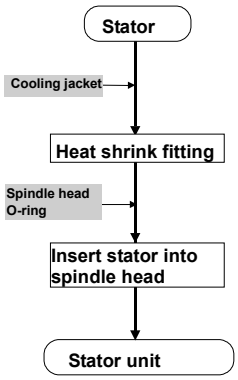
Eccentricity of stator and cooling jacket

To prevent a stator from being eccentric, the inside diameter of the cooling jacket must not be eccentric more than 0.05mm with respect to the spindle shaft.



2 STATOR

This chapter describes how to assemble a stator. An outline is shown below. Read the notes described above in addition to this chapter carefully before assembling a stator.



For cooling jackets, "3. DIMENSIONS" in "I. SPECIFICATIONS" lists reference dimensions.

2.1 HEAT SHRINK FITTING

- Stator outer diameter is machined within the proper tolerance. But it sometimes has distortion of 0.1mm after winding procedure. Even if there is the distortion of 0.1mm in the stator outer diameter, it is an allowable distortion for heat shrink with a cooling jacket. But the jacket will deform when it is not enough thick.

- A stator is made of laminated steel, and a gap may be generated between layers around the perimeter. Use the stator fit into the jacket by shrinking with ignoring the gap.

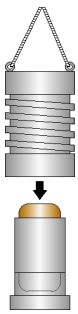
- In principle it is recommended that the installation of the stator into the jacket be by shrinking. The following is the recommended value of the shrinkage amount. In actual practice it is recommended that a shrinkage margin (interference) be used.

Model name	Shrinkage margin(mm)
α112LL*i*B or smaller	0.01 to 0.02
α160L*i*B or smaller	0.01 to 0.03
α160LL*i*B or larger	0.02 to 0.05

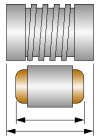
NOTE
Shrinkage margin shown above must be applied to the diameter of the stator. And these data are for the iron jacket. In case of other material is used, shrinkage margin must change according to the material characteristics.

- For method of heating of cooling jacket, an electric oven is the best.

- Handle with care when you install the stator so that the winding is not damaged. Refer to the figure at right before shrinking.



- It is the best for the winding if the cooling jacket covers all of it.



⚠ WARNING
When installing the stator, the jacket becomes very hot. Also the jacket or stator is very heavy. Therefore be careful not to get hurt or burnt.

2.2 CHECKING THE WINDING RESISTANCE

Measure the winding resistance before connecting the power leads of the stator. For the measured values, see the table below according to the marking on each power lead.

> ⚠ **CAUTION**
> Shut down the power supply and disconnect the leads connected to the amplifier before checking the resistance to prevent an electric shock.
> Also insulate the terminals that are not used.

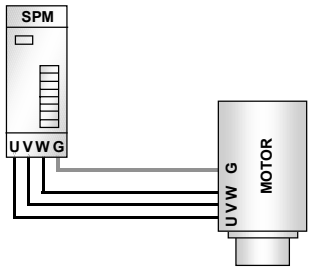
> **NOTE**
> Use a milli-ohm meter to measure the resistance. Ordinary resistance meters cannot measure the resistance correctly.

Unit : mΩ

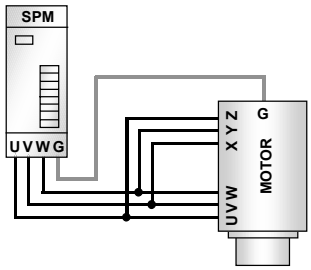
	Model name / Type No. (A06B-)	Measured leads	U-V V-W W-U	U-X V-Y W-Z	U_1-V_1 V_1-W_1 W_1-U_1	U_2-V_2 V_2-W_2 W_2-U_2	U-X_1 V-Y_1 W-Z_1	U_2-X V_2-Y W_2-Z
Standard type	αi50L/25000	1615-B120#Z311	-	432-478	-	-	-	-
	αi80S/20000	1621-B120#Z312	-	358-396	-	-	-	-
	αi80M/15000	1623-B170#Z011	419-463	-	-	-	-	-
	αi80L/8000	1625-B170#Z011	406-450	-	-	-	-	-
	αi100S/12500	1641-B120#Z011	-	467-517	-	-	-	-
	αi112SS/20000	1661-B120#Z312	-	242-268	-	-	-	-
	αi112S/15000	1671-B120#Z311	-	45-50	-	-	-	-
	αi112M/15000	1673-B120#Z311	-	160-176	-	-	-	-
	αi112L/15000	1675-B100#Z311	-	-	86-96	37-42	-	-
	αi112LL/15000	1676-B100#Z311	-	-	95-105	41-46	-	-
	αi132M/14000	1713-B100#Z311	-	-	65-73	27-31	-	-
	αi132L/14000	1705-B140#Z311	-	-	-	-	27-30	27-30
	αi160S/13000	1721-B120#Z311	-	91-101	-	-	-	-
	αi160M/13000	1723-B120#Z311	-	131-146	-	-	-	-
	αi160L/13000	1725-B120#Z311	-	98-110	-	-	-	-
	αi160LL/13000	1726-B100#Z311	-	-	126-140	58-66	-	-
	αi180M/6000	1743-B100#Z011	-	-	242-273	110-124	-	-
	αi180L/6000	1745-B100#Z011	-	-	130-144	66-74	-	-
	αi180LL/8000	1746-B100#Z011	-	-	106-118	44-49	-	-
	αi200M/6000	1753-B120#Z313	-	55-61	-	-	-	-
	αi200L/6000	1755-B120#Z316	-	35-39	-	-	-	-
	αi250M/3000	1773-B140#Z316	-	-	-	-	50-56	50-56
High-speed type	αi40S/70000	1601-B120#Z618	-	141-156	-	-	-	-
	αi80S/40000	1631-B120#Y618	-	29-33	-	-	-	-
	αi100S/20000	1641-B121#X617	-	70-79	-	-	-	-
	αi112S/20000	1662-B120#Z317	-	81-89	-	-	-	-
	αi112M/20000	1673-B100#Y617	-	-	77-87	34-39	-	-
	αi112L/20000	1675-B100#Y617	-	-	86-96	37-42	-	-
	αi112L/25000	1675-B140#X627	-	-	-	-	xx-xx	xx-xx
	αi132L/25000	1705-B140#Y617	-	-	-	-	27-30	27-30
	αi160M/20000	1723-B140#Y627	-	-	-	-	39-44	39-44
	αi160L/20000	1725-B140#Y617	-	-	-	-	26-30	26-30
	αi160LL/20000	1726-B140#Y617	-	-	-	-	29-33	29-33

2.3 POWER LEADS CONNECTION

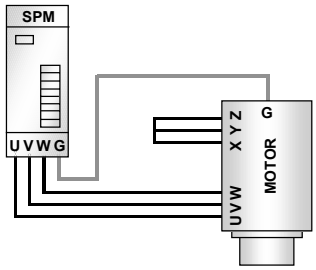
• Connection A



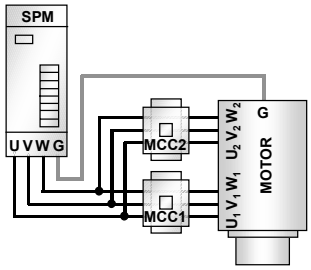
• Connection B



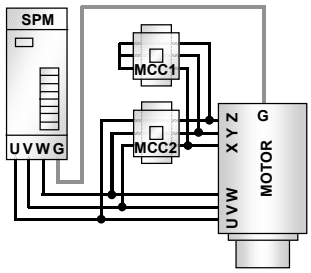
• Connection C



• Connection D



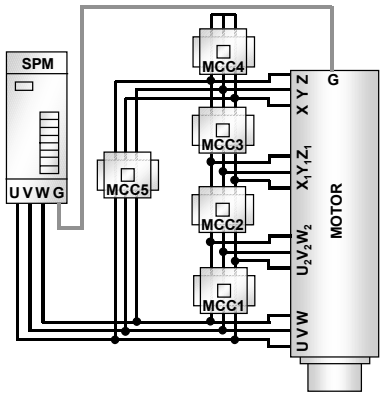
• Connection E



• Switching of MCC (Connection D, E)

	Low speed winding	High speed winding
MCC1	ON	OFF
MCC2	OFF	ON

• Connection F

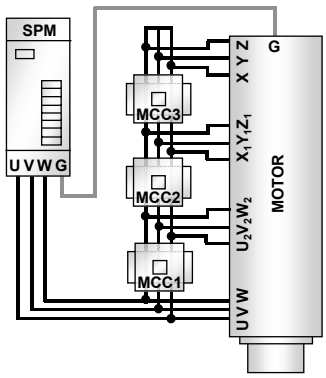


• Switching of MCC (Connection F)

	<1>	<2>	<3>	<4>
MCC1	OFF	OFF	ON	ON
MCC2	ON	ON	OFF	OFF
MCC3	OFF	OFF	ON	ON
MCC4	ON	OFF	ON	OFF
MCC5	OFF	ON	OFF	ON

Which item among <1> to <4> in the table applies to the low or speed winding differs depending on the model. For how to connect each model, refer to "1. SPECIFICATIONS" in "I. SPECIFICATIONS."

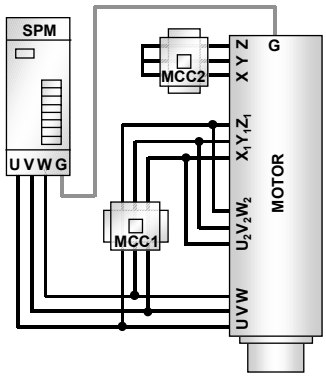
• Connection G



• Switching of MCC (Connection G)

	Low speed winding	High speed winding
MCC1	OFF	ON
MCC2	ON	OFF
MCC3	OFF	ON

• Connection H



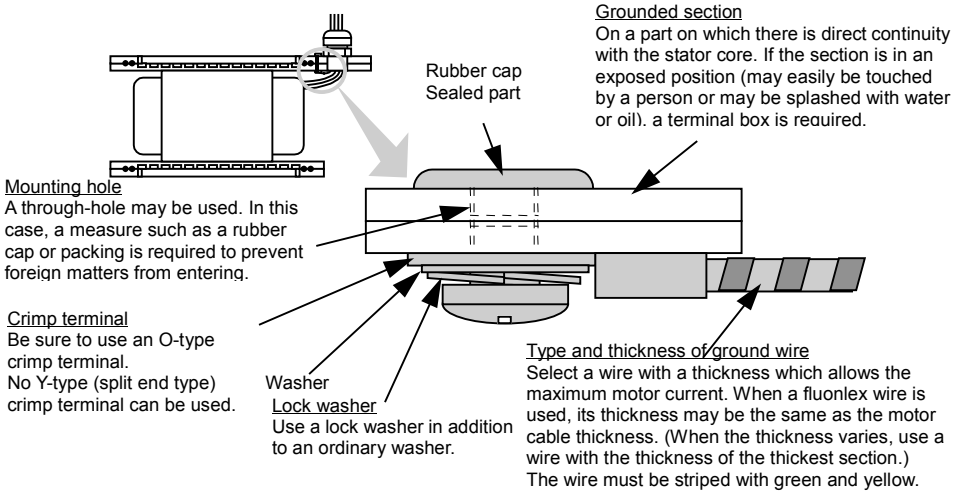
• Switching of MCC (Connection H)

	Low speed winding	High speed winding
MCC1	OFF	ON
MCC2	ON	OFF

NOTE
1 MCC (switching unit) is not attached to the built-in motor.
2 Refer to "1.SPECIFICATIONS" in part I for the connection of each model.
3 Use yellow-green stripe cable for the ground wire.
4 Use O-type crimp terminal and spring washer so that the terminal does not loosen.
5 Connect only one cable with one terminal except when the terminal is designed so that it may connect two or more cables.
6 Refer to the Descriptions (B-65282EN) of FANUC SERVO AMPLIFIER αi series to get more information about the connection of the motor and amplifier.

2.4 GROUNDING A MOTOR

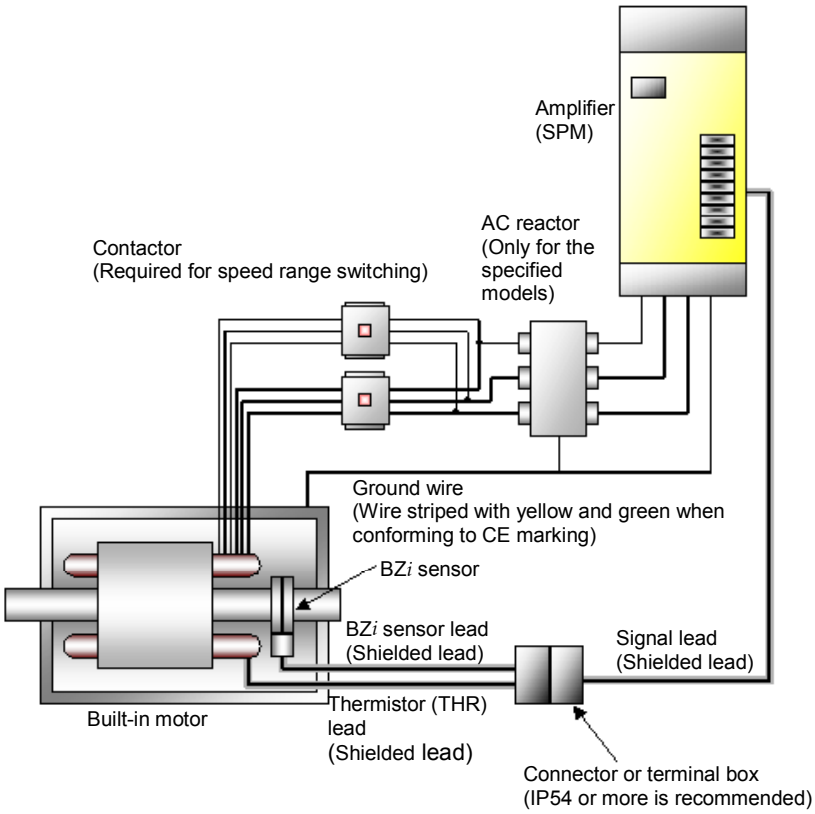
Built-in spindle motors require frame grounding. Be sure to apply frame grounding for the motors.
The following shows an example of a CE marking correspondence.



> ⚠ **WARNING**
> Be sure to ground the motor, referencing the above instructions, to prevent shock hazards and malfunctions.

> **NOTE**
> 1 If a motor is not grounded, a motor failure or malfunction may occur.
> 2 The motor is not supplied with ground wire and related parts. Prepare them, referencing the maximum current listed in "1. SPECIFICATIONS" in "I. SPECIFICATIONS."

2.5 CABLE CONNECTION (OUTLINE)

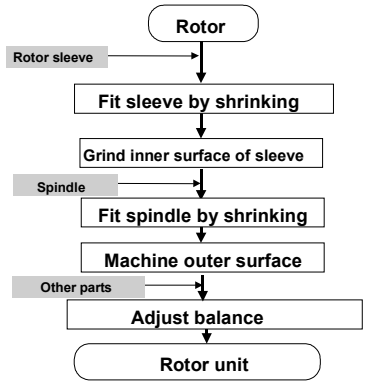


NOTE

These diagrams are just for reference. Refer to "4.SENSOR", “POWER LEADS CONNECTION”, Descriptions (B-65282EN) of FANUC SERVO AMPLIFIER αi series, and Maintenance Manual (B-65285EN) for details. And refer to “2.3 POWER LEADS CONNECTION” for details.

3 ROTOR

This chapter describes how to assemble a rotor. An outline is shown below. Read the notes described above in addition to this chapter carefully before assembling a rotor.

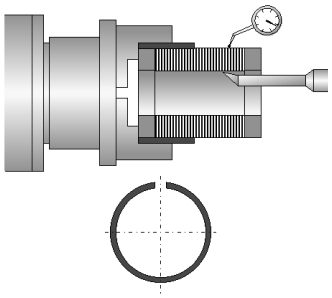


For rotor sleeves, "C. ROTOR SLEEVE" in "APPENDIX" lists reference dimensions.

3.1 MACHINING AND FINISHING

Method

When machining the inner surface of the rotor, chuck the outer surface of the rotor based on the outer surface as shown in the figure.
As shown in the diagram, if the rotor is gripped by a divided jig, the chucking is more stable. Further, when the stroke of the tool axis is sufficiently longer than the rotor length, finish the rotor without changing the grip.



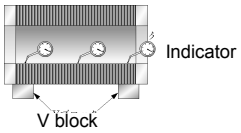
Precision

Outer and inner diameter of the rotor must be finished in the precision shown bellow.

Inner diameter (Machine the rotor alone.)

Circularity	20μm or better
Camber	30μm or better

Camber measuring (reference)



Outer diameter (Machine after shrinking with spindle.)

Roughness	12S or better
Circularity	40μm or better
Concentricity between rotor outer diameter and spindle center	25μm or better

Cutting condition (Reference)

	Roughing		**Semi-finishing**	**Finishing**
	Standard type	**High speed type**	**All types**	**All types**
Cutting speed (m/min.)	40	35	50	50
Feed speed (mm/rev.)	0.2	0.2	0.2	0.1
Depth of cut(mm)	1	1	0.35	0.1

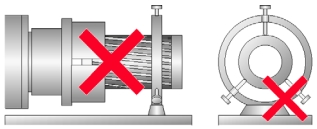
⚠ CAUTION
FANUC cutting conditions are shown above for reference. The above conditions do not guarantee that the rotor can always be machined without problems under the conditions. A rotor is made of layered silicon steel sheets up to 1 mm thick. A rotor may easily be deformed (bend, crack between layers, or elongation along the length) when machined with an unnatural method or cutting condition. In this case, it is desirable to moderate the conditions or replace the tip a little earlier.

Used tips (reference)

SANDVIK TPMT16T308-MM 2015 or TCMT16T308-MM 1025,
TUNGALLOY CNMG120404-TM TD915,
and etc.

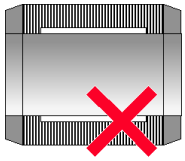
Steady rest

Avoid using as steady rest. As the rotor has slots on its outer wall, the runout of the rotor increases if it is supported by a rest.



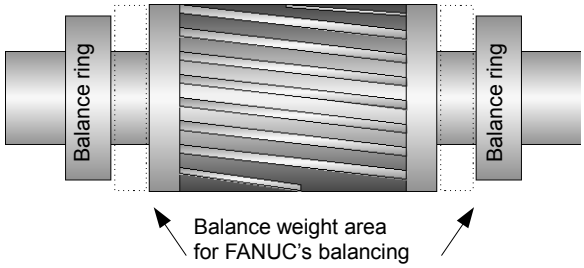
Clearance

When machining a rotor, avoid making a clearance as shown at right. The inner wall of the rotor must form a perfectly cylindrical surface. As the rotor is made of laminated steel, it has low rigidity and is likely to be deformed at the clearance while operation.



3.2 ADJUSTING THE BALANCE

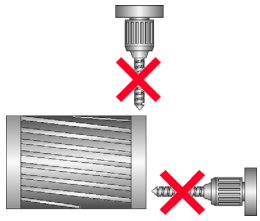
- After the rotor is mounted on a spindle (see section 3.3), balance the entire spindle by separately installing balance rings. It is recommended to use a Non-magnetic material like stainless steel for the ring. If a magnetic material is used for the ring, keep enough distance from the rotor to the ring, for example, more than 20mm.



- Width about 20mm from the both side of the rotor are used for balancing at FANUC. Be sure not to interfere with other parts, as sometimes some balance weight is attached. Do not use the taps on the rotor to balance the spindle.

- When you are going to rotate the motor at 8,000min^{-1} or higher, high precision balance adjustment is needed within 5cm×0.5g.

- Avoid machining on the rotor end ring. For example, do not make a balancing hole in it.



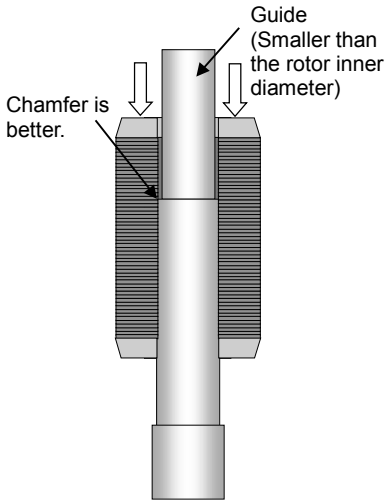
3.3 HEAT SHRINK FITTING

- Heat shrink fitting is recommended for mounting method of a rotor to a spindle. Use press machine when the interference is large. But in this case, avoid the deformation of the spindle and the rotor.

- When mounting the rotor, the rotor has to be heated in an electric oven to a maximum temperature of 200°C. 180°C is preferable. When heated to 200°C, the rotor color may change. But this will not affect the characteristics of the rotor.

- For the high speed type rotor, cool and heat shrink fitting is recommended, as the heat expansion of each part that is used in the rotor is different. Cool the spindle (in refrigerator), and heat the rotor (in electric oven), and then fit them.

- If guided at the spindle shaft side at the insertion, it can be assembled smoothly

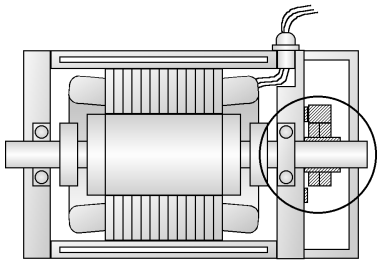


⚠ WARNING
When shrinking the rotor or spindle, it is very hot and heavy. Therefore, be careful not to get hurt or burnt.

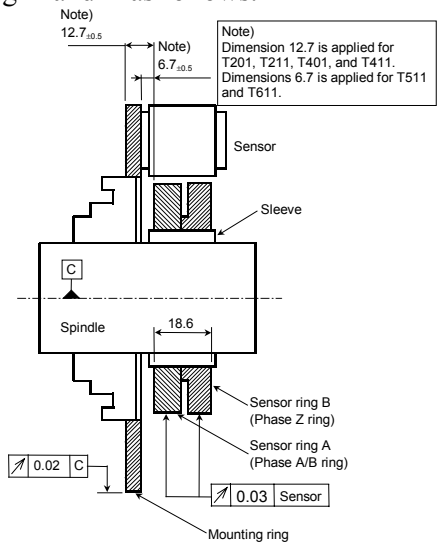
4 BZ*i* SENSOR

4.1 MOUNTING

Mount the BZ*i* sensor on the motor power lead side of the spindle so that sensor ring A and sensor (mounting ring and holder) are located at the motor side. If the sensor is installed incorrectly, the motor cannot be controlled normally.



Install sensor ring A and B as follows.



- Fit the rings into the sleeve by shrinking and fit the sleeve into the spindle by shrinking. Make sensor rings A and B in contact with each other.

- To use the A860-2120-T201, T211, T401, or T411 BZ*i* sensor, mount the sensor so that the distance between the end of the sensor mounting ring and sensor ring A is 12.7±0.5.

- To use the A860-2120-T511 or T611 BZ*i* sensor, mount the sensor so that the distance between the end of the sensor and sensor ring A is 6.7±0.5.

- The runout of the detecting rings must be within 0.03mm.

- The runout of the mounting ring and the center of spindle must be within 0.02mm.

4.2 INTERFERENCE

The following table lists the interference for shrink fitting for the sensor ring at each maximum speed.

Unit : μm

Max. speed	T201	T211	T401	T411	T511	T611
(min^{-1})	Ring 1	Ring 2	Ring 3	Ring 4	Ring 5	Ring 6
3000	ϕ6 to ϕ32	ϕ6 to ϕ32	ϕ7 to ϕ35	ϕ7 to ϕ35	ϕ8 to ϕ43	ϕ11 to ϕ41
3500	ϕ6 to ϕ32	ϕ6 to ϕ32	ϕ7 to ϕ35	ϕ7 to ϕ35	ϕ9 to ϕ44	ϕ13 to ϕ43
4500	ϕ6 to ϕ32	ϕ6 to ϕ32	ϕ7 to ϕ35	ϕ7 to ϕ35	ϕ11 to ϕ46	ϕ19 to ϕ49
6000	ϕ6 to ϕ32	ϕ6 to ϕ32	ϕ9 to ϕ37	ϕ9 to ϕ37	ϕ15 to ϕ50	ϕ29 to ϕ59
8000	ϕ6 to ϕ32	ϕ6 to ϕ32	ϕ11 to ϕ39	ϕ11 to ϕ39	ϕ24 to ϕ59	ϕ47 to ϕ77
10000	ϕ6 to ϕ32	ϕ6 to ϕ32	ϕ14 to ϕ42	ϕ14 to ϕ42	ϕ35 to ϕ70	ϕ71 to ϕ101
12000	ϕ7 to ϕ33	ϕ7 to ϕ33	ϕ18 to ϕ46	ϕ18 to ϕ46	ϕ47 to ϕ82	-
15000	ϕ8 to ϕ34	ϕ8 to ϕ34	ϕ26 to ϕ54	ϕ26 to ϕ54	ϕ71 to ϕ106	-
20000	ϕ10 to ϕ36	ϕ10 to ϕ36	-	ϕ41 to ϕ69	-	-
25000	-	ϕ12 to ϕ38	-	ϕ62 to ϕ90	-	-
30000	-	ϕ15 to ϕ41	-	ϕ87 to ϕ115	-	-
40000	-	ϕ23 to ϕ49	-	-	-	-
50000	-	ϕ33 to ϕ59	-	-	-	-
60000	-	ϕ43 to ϕ69	-	-	-	-
70000	-	ϕ57 to ϕ83	-	-	-	-

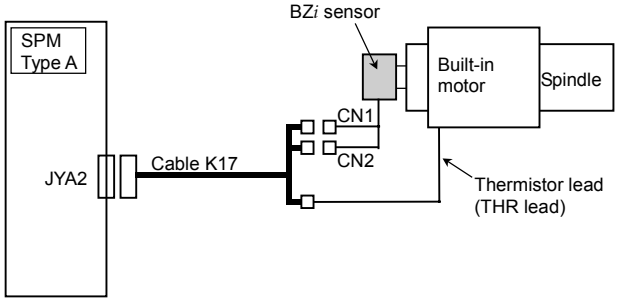
⚠ CAUTION
If incorrect interference is applied, the rings will loosen or deform while spindle rotates.

NOTE
These rings cannot be used at over specified speed shown above. Refer to "3.3 BZ*i* SENSOR" in part I for details of allowable maximum speed of rings.

4.3 BZ*i* SENSOR CONNECTION

Connection diagram (outline)

Connect the SPM and BZ*i* sensor as shown in the figure below.

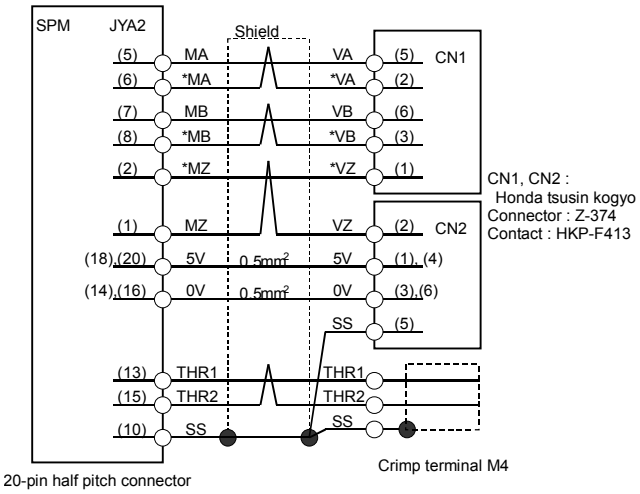


For details of connection and connector pin assignment, refer to the next page.

Refer to the DESCRIPTIONS (B-65282EN) of FANUC SERVO AMPLIFIER α*i* series for cable 17 and more detail information.

NOTE
1 Prepare the cable K17 by yourself.
2 Thermistor lead is connected to the motor.
3 There is no problem that the cable K17 is connected on the way to CN1 and CN2. But use IP54 or more connector or terminal box.
4 Refer to the DESCRIPTIONS (B-65282EN) of FANUC SERVO AMPLIFIER α*i* series for more detail information.

Connection (Details)



Cable specification :
$0.18mm^2$ twisted pair 4 pairs + $0.5mm^2$ 6 common shelded cable
Recommended wire : A66L-0001-0368

> ⚠ **CAUTION**
> When only one lead is to be connected for 5V and 0V each, use 20-pin and 16-pin connectors to prevent damage to the sensor due to wrong connector connection.

Pin assignment

Connector JYA2

9	5V	10	#	19	#	20	5V
7	MB	8	*MB	17	#	18	5V
5	MA	6	*MA	15	THR2	16	0V
3	#	4	#	13	THR1	14	0V
1	MZ	2	*MZ	11	#	12	0V

> **NOTE**
> Do not connect the pins marked with # because input/output signals for an option PCB may be connected.

Connector CN1

1	*VZ	4	
2	*VA	5	VA
3	*VB	6	VB

Connector CN2

1	5V	4	5V
2	VZ	5	SS
3	0V	6	0V

4.4 FEEDBACK SIGNAL ADJUSTMENT

Check the feedback signal after installing the BZ*i* sensor. Pins for checking are on the check board. The check board is not attached to the amplifier or to the motor. (Specification No. : A06B-6078-H001) Refer to the MAINTENANCE MANUAL (B-65285EN) of FANUC SERVO MOTOR α*i* series for details of the check board.

> ⚠ **CAUTION**
> Do not contact the rings with the sensor when adjusting the gap between them. It will damage them.

> **NOTE**
> Check the feedback signal after setting the parameters concerning the sensor. The feedback signal is output correctly after CNC loads the parameters.

Pins for checking

Use pins shown below for the feedback signal checking.
Connect the check board to the JY1 connector of SPM and then check the output signals on the following terminals.

Main spindle

Speed feedback	Position feedback	One rotation signal	Sensor signal input connector
PA1,PB1	PA1,PB1	PS1	JYA2

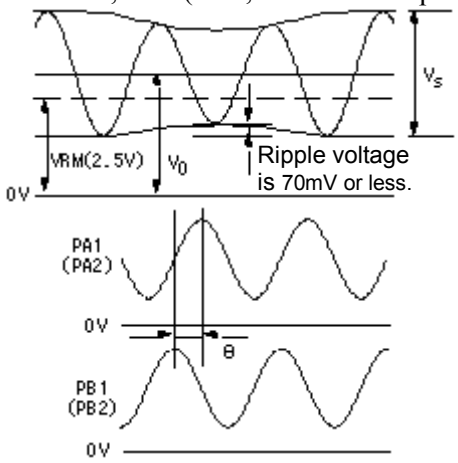
Sub spindle (in case of using sub spindle/spindle switching control)

Speed feedback	Position feedback	One rotation signal	Sensor signal input connector
PA2,PB2	PA2,PB2	PS2	JYA2

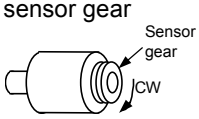
Speed and position feedback signal

Measuring condition :

Rotation : Clockwise, Counterclockwise
Speed : 1500min^{-1}
Pins : PA1, PB1 (PA2, PB2 for sub spindle)



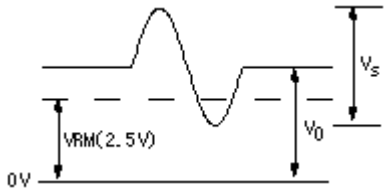
Mount the sensor so that the output signal ripple voltage is 70 mV or less.
Check that the measured value falls into the target value range listed below.

Point to be checked	Target value	Caution
Amplitude of Vs	0.5 – 1.2V_{p-p}	
Offset of V_O	2.5V±100mV	Use digital voltmeter and DC range.
Phase difference θ	90±3°	When the spindle rotates CW viewed from the sensor gear 

One rotation signal

Measuring condition :

Rotation : Clockwise, Counterclockwise
Speed : 1500min^{-1}
Pins : PS1 (PS2 for sub spindle)



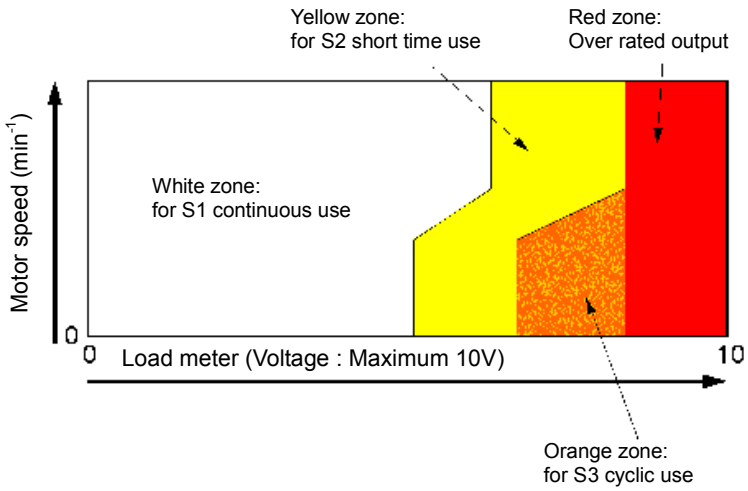
Check that the measured value falls into the target value range listed below.

Point to be checked	Target value	Caution
Amplitude of Vs	0.5V or more	
Offset of V_O	2.5V±100mV	Use digital voltmeter and DC range.

5 LOAD METER (DYNAMOMETER)

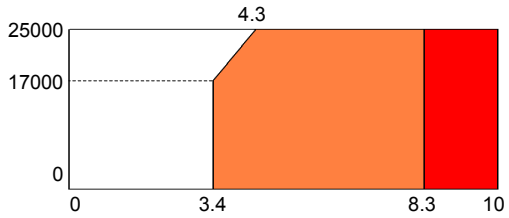
A load meter (dynamometer) indicates the load factor. The load factor is the ratio of average output to the maximum output of the spindle motor when the spindle of the machine tool operates with no load and during cutting. Maximum output is equal to 10V. The voltage is output to pin No.16 of JY1 connector in spindle amplifier module(SPM). Refer to the DESCRIPTIONS (B-65282EN) of FANUC SERVO AMPLIFIER αi series for details of connector and pin assignment.

Explanation



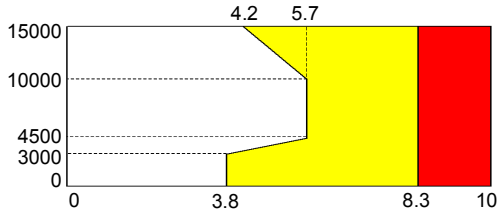
5.1 STANDARD TYPE

α50L/25000*i*B (A06B-1615-B120#Z318)

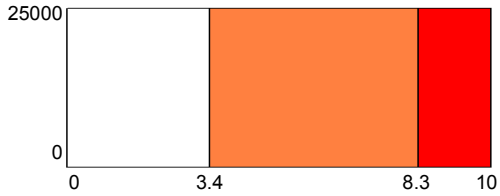


α80S/20000*i*B (A06B-1621-B120#Z312)

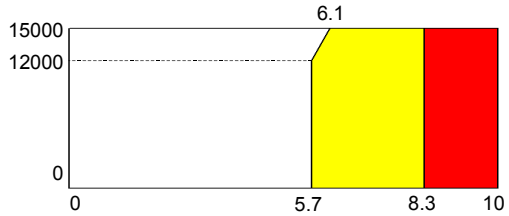
Low speed winding



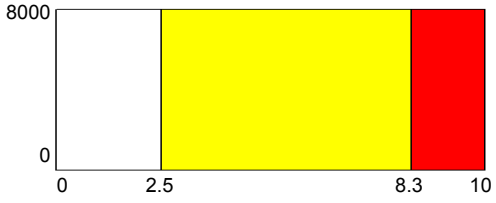
High speed winding



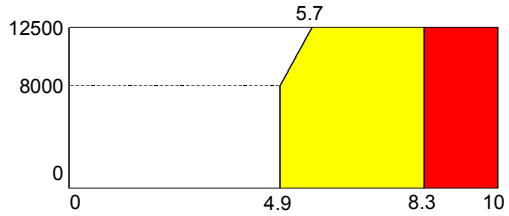
α80M/15000*i*B (A06B-1623-B170#Z011)



α80L/8000*i*B (A06B-1625-B170#Z011)



α100S/12500*i*B (A06B-1641-B120#Z011)



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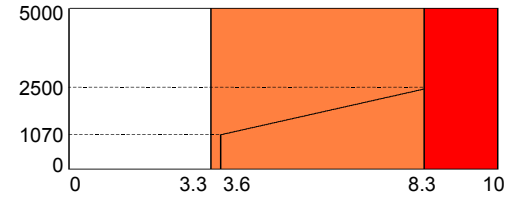

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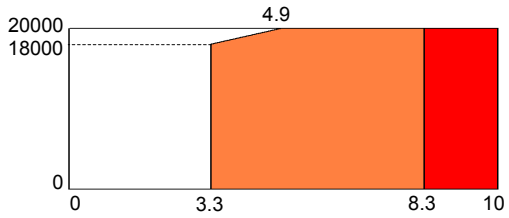
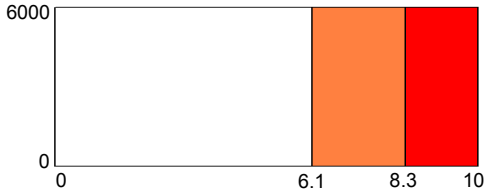
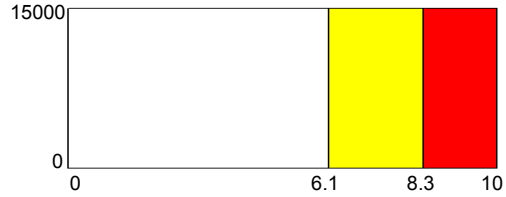


α112S/15000*i*B (A06B-1671-B120#Z311)

Low speed winding



High speed winding



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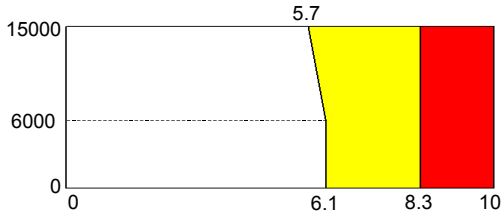

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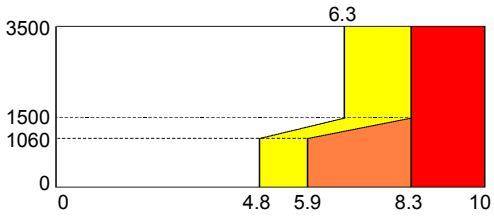

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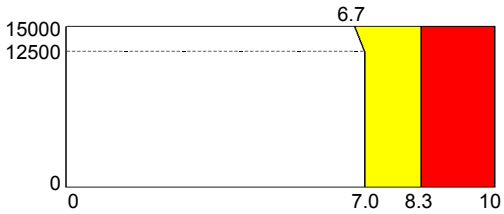

α112LL/15000*i*B (A06B-1676-B100#Z311)

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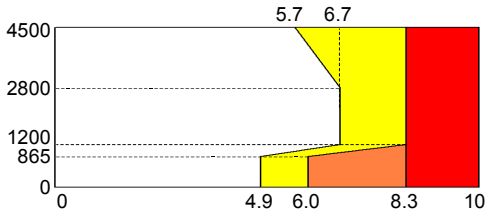

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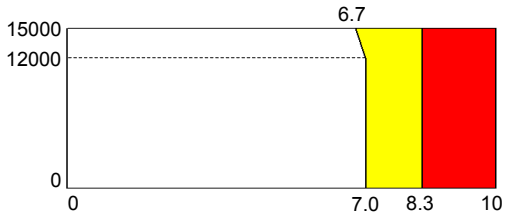

α132M/14000*i*B (A06B-1713-B100#Z311)

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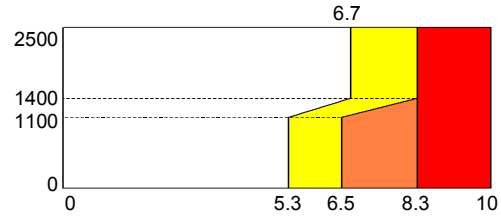

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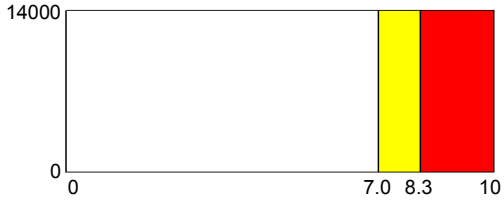

α132L/14000*i*B (A06B-1705-B140#Z311)

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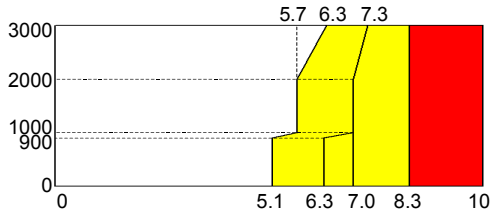

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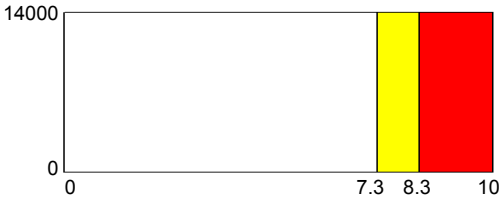
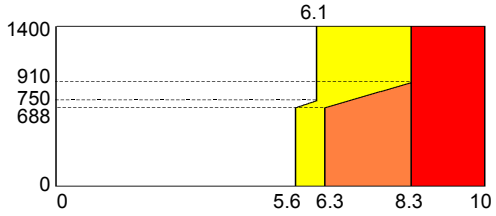


α160S/13000*i*B (A06B-1721-B120#Z311)

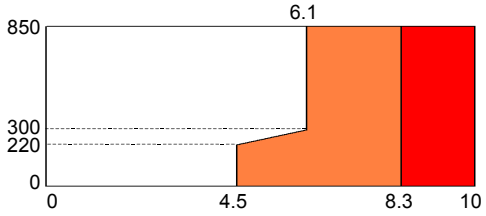
Low speed winding



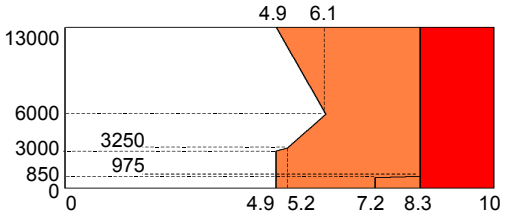
High speed winding

α160M/13000*i*B (A06B-1723-B120#Z311)

Low speed winding

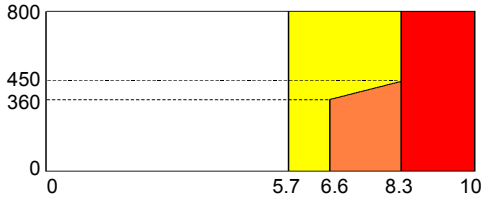


High speed winding



α160L/13000*i*B (A06B-1725-B120#Z311)

Low speed winding



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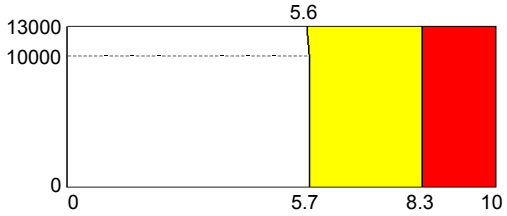
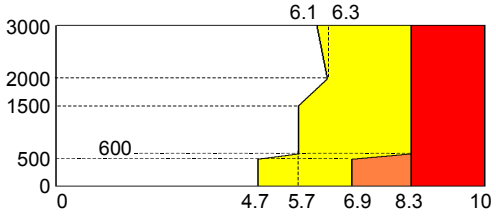
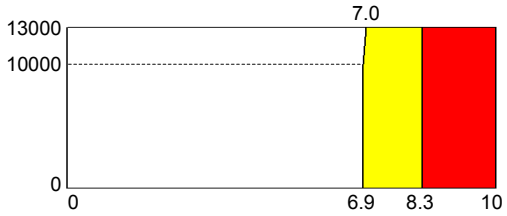


α160LL/13000*i*B (A06B-1726-B100#Z311)

Low speed winding

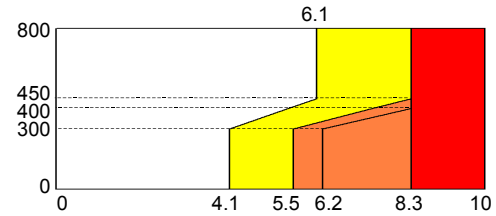


High speed winding

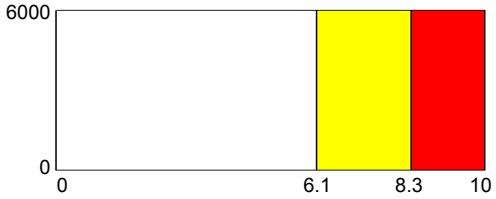


α180M/6000*i*B (A06B-1743-B100#Z011)

Low speed winding



High speed winding



α180L/6000*i*B (A06B-1745-B100#Z011)

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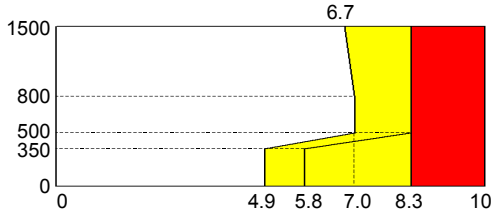
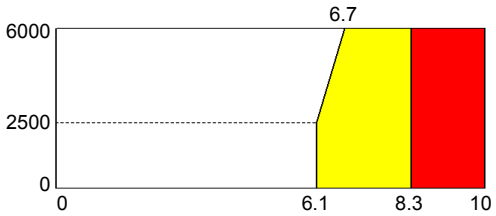
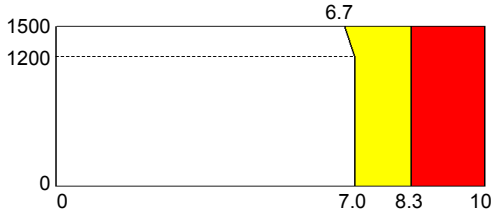


High speed winding



α180LL/8000*i*B (A06B-1746-B100#Z011)

Low speed winding



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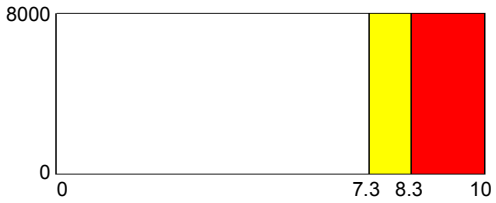
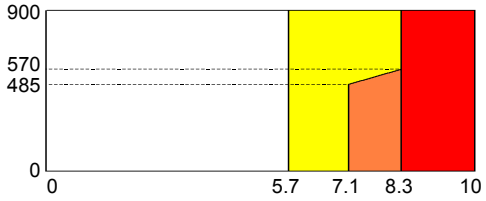
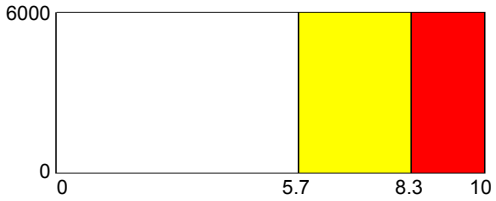


α200M/6000*i*B (A06B-1753-B120#Z313)

Low speed winding

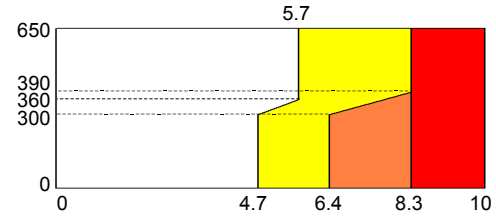


High speed winding



α200L/6000*i*B (A06B-1755-B120#Z316)

Low speed winding



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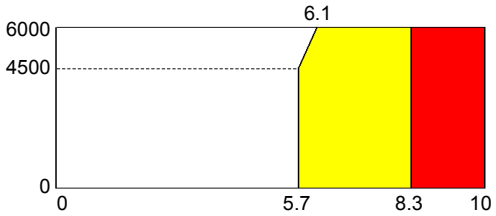

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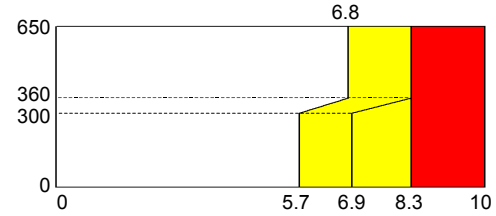

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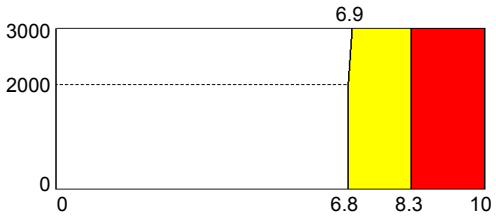
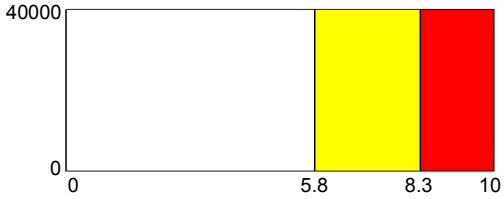


5.2 HIGH SPEED TYPE

α40S/70000*i*B (A06B-1601-B120#Z618)

α80S/40000*i*B (A06B-1631-B120#Y618)



α100S/20000*i*B (A06B-1641-B121#X617)

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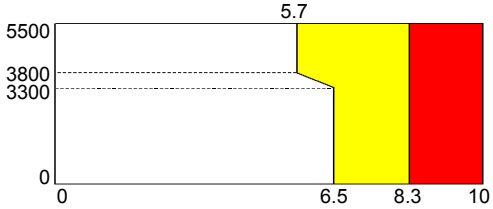
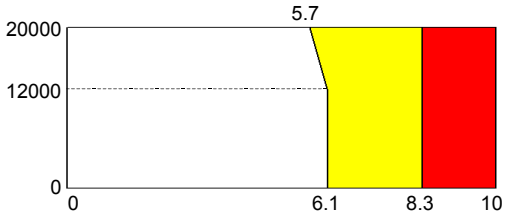


High speed winding



α112S/20000*i*B (A06B-1662-B120#Z317)

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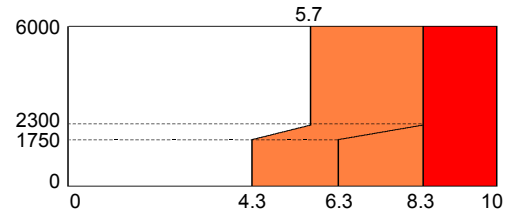
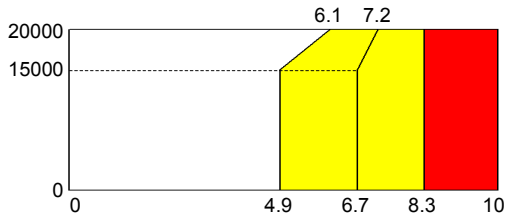
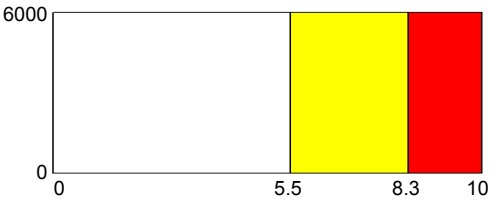


High speed winding



α112M/20000*i*B (A06B-1673-B100#Y617)

Low speed winding



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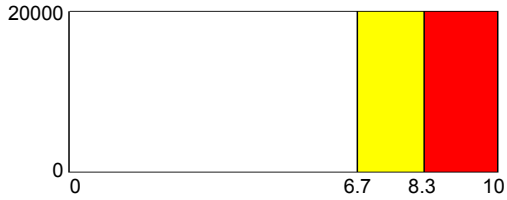
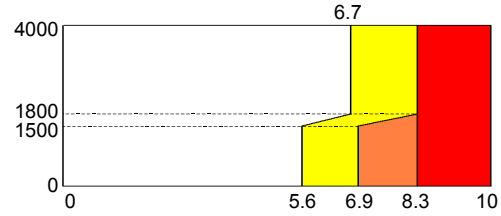
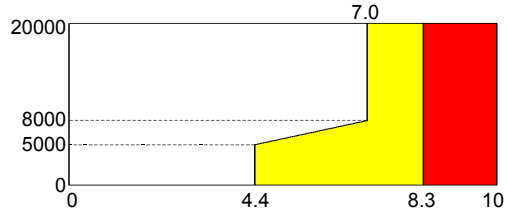


α112L/20000*i*B (A06B-1675-B100#Y617)

Low speed winding

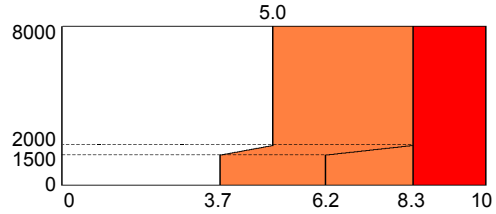


High speed winding



α112L/25000*i*B (A06B-1675-B140#X627)

Low speed winding



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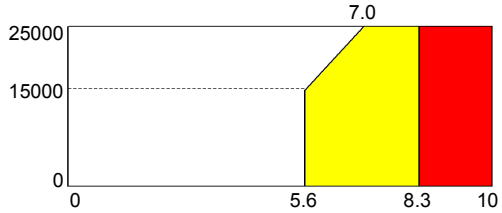
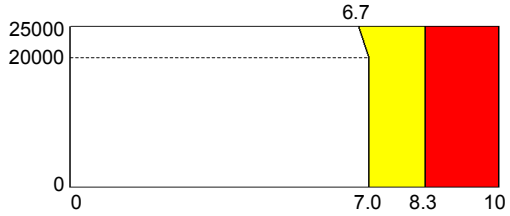


α132L/25000*i*B (A06B-1705-B140#Y617)

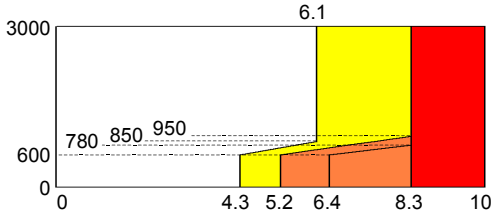
Low speed winding

High speed winding

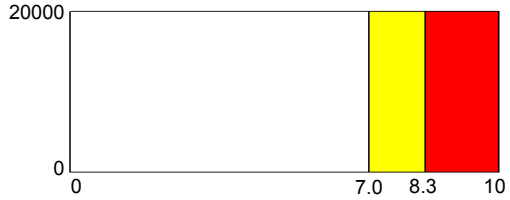


α160M/20000*i*B (A06B-1723-B140#Y627)

Low speed winding

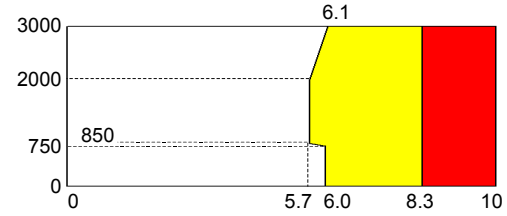


High speed winding

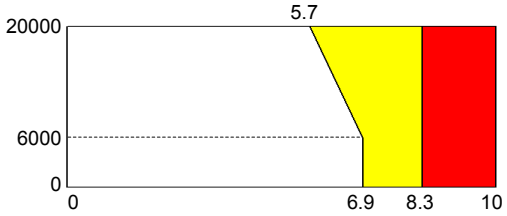


α160L/20000*i*B (A06B-1725-B140#Y617)

Low speed winding

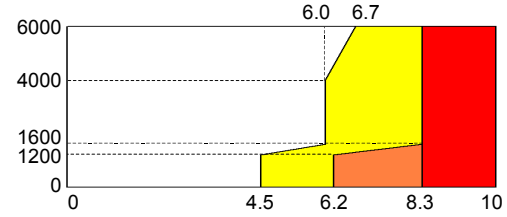


High speed winding

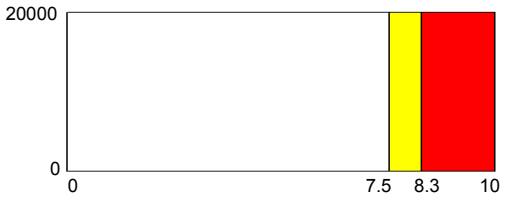


α160LL/20000*i*B (A06B-1726-B140#Y617)

Low speed winding



High speed winding



APPENDIX

CONSTRUCTION OF APPENDIX

Appendix includes many reference data and information.

A DEFINITION OF RATING

The IEC34 standard uses symbols S1, S2, and S3 according to the types of motor rating. Each type of rating is described below:

Continuous rating (S1)

The motor can continuously be run at the indicated output.
Example)
15kW S1, 15kW S1 Cont.
Meaning)
The motor can continuously be run at an output of 15 kW.

Short-time rating (S2)

The motor can be run at the indicated output within the indicated time at room temperature.
Example)
18.5kW S2 30min.
Meaning)
The motor can be run at an output of 18.5 kW only for 30 minutes at room temperature.

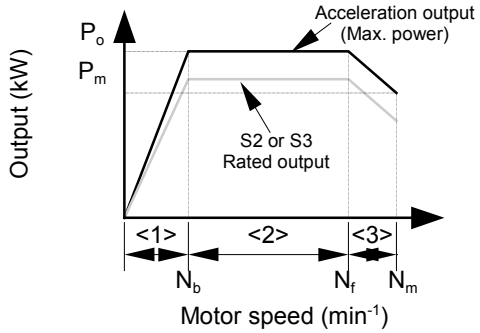
Cyclic rating (S3)

The motor is run and stopped in a cycle of 10 minutes.
The ratio of the motor running time to 10 minutes is indicated as a percentage (%).
Example)
22kW S3 25%, 25% ED 22kW
Meaning)
The motor can be run at an output of 22 kW when the total of the motor running time is 2 minutes and 30 seconds in a 10-minute cycle. (The motor is stopped for the rest of 7 minutes and 30 seconds.)
Remarks)
ED means the cyclic rating (S3).
ED is an abbreviation of Einschaltdauer (running time) in German.

B ACCELERATION TIME

In acceleration, the output of the built-in AC spindle motor is 120% of S2 or S3 rated output.

The acceleration time required for acceleration can be calculated from the expressions below. As the load torque of the machine is not considered in this calculation, the actual acceleration time is slightly longer than the time calculated here.



J_L	: Load inertia converted into motor shaft [kgm^2]
J_m	: Motor inertia [kgm^2]
P_o , P_m	: Output [kW]
N_b , N_f , N_m	: Motor speed [min^{-1}]

<1> Acceleration time (t_1)in the constant torque region ($0 \rightarrow N_b$)

$$t_1 = 0.01097 \cdot \frac{(J_L + J_m) \cdot N_b^{\,2}}{P_o \cdot 1000} \quad [\text{sec}]$$

<2> Acceleration time (t_2) in the constant output region ($N_b \rightarrow N_f$)

$$t_2 = 0.01097 \cdot \frac{(J_L + J_m) \cdot (N_f^{\,2} - N_b^{\,2})}{2 \cdot P_o \cdot 1000} \quad [\text{sec}]$$

<3> Acceleration time (t_3) in the output reduction region ($N_f \rightarrow N_m$)

$$t_3 = 0.01097 \cdot \frac{(J_L + J_m) \cdot (N_m - N_f) \cdot \left\{ (N_m - N_f) - \frac{P_o \cdot N_m - P_m \cdot N_f}{P_m - P_o} \cdot \ln \frac{P_m}{P_o} \right\}}{(P_m - P_o) \cdot 1000} \quad [\text{sec}]$$

$\therefore$ Total acceleration time (t) from 0 to N_m : $t=t_1+t_2+t_3$ [sec]

C COOLING CONDITION

IC code

IC code means "International Cooling" and it indicates the cooling system for a motor standardized in IEC34-6.
All FANUC's built-in AC spindle motors are developed under IC9U7A7 and this means all motors require separated oil cooling system. We have not recommended other cooling systems.

Actual calorie must be removed

You can calculate easily the actual calories that must be removed from the built-in motor according to the formula below using data shown in "I. SPECIFICATIONS". All data are got in the examinations based on IEC34 using the recommended cooling jacket .

$$\text{Removed calories } Q(W) = \frac{\{\text{Coolant temperature rise}(K)\} \times \{\text{Flow rate}(l/min.)\} \times \{\text{Specific heat}(J/gK)\} \times \{\text{Density}(g/cm^3)\} \times 1000}{60}$$

Capacity of cooler

Actual calories that must be removed can be calculated easily. But required minimum capacity of cooler will be different from this, as there are some heat diffusion to the environment and some heat production in the other parts used in the cooling system and in the spindle. Therefore considering safety,

Capacity of cooler =
Calculated calories+Produced calories in other parts
(You can deduct the calories if you know the diffusion to the environment.)

is preferable.

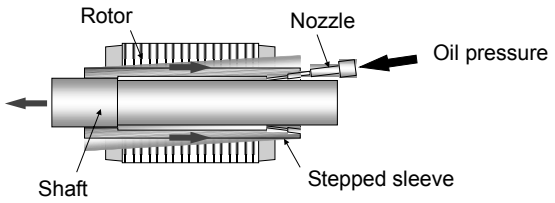
Coolant temperature setting

Physically, more calories can be removed if the coolant temperature is set lower. But the lower coolant temperature will cause condensation in or on the motor, and it will affect the motor life. Therefore, basically, set the coolant temperature higher than the room temperature.

D ROTOR SLEEVE (REFERENCE)

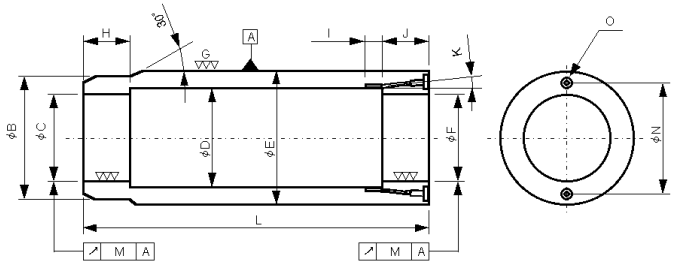
Rotor sleeve (Stepped sleeve)

Using a stepped sleeve in the inner diameter of rotor, the rotor can be separated from the shaft using the oil pressure (from 30MPa to 80MPa) in the stepped sleeve, and maintenance ability of rotor will be improved. Refer to the next page for reference.



NOTE
1 Shrink fit the stepped sleeve to the rotor, and then shrink fit the sleeve to the spindle. These reference data cannot be applied for other shrinking method. (It is not examined in FANUC.)
2 The stepped sleeve cannot be separated from the rotor. You can separated the shaft from the rotor sleeve.
3 Prepare the stepped sleeve and the nozzle by yourself. They are not attached to the motor.

Dimensions (Reference)



Unit : mm

	Model name	Type No. (A06B-)	B	ϕC	ϕD	ϕF	H	I	J	K(deg)	L
Standard	α50L/25000*i*	1615-B120#Z311									
	α80S/20000*i*	1621-B120#Z312									
	α80M/15000*i*	1623-B170#Z011									
	α80L/8000*i*	1625-B170#Z011									
	α100S/12500*i*	1641-B120#Z011	57	44.9	46	44.7	18	-	18	6	134
	α112SS/20000*i*	1661-B120#Z312									
	α112S/15000*i*	1671-B120#Z311	73.5	59.1	61	58.9	20	6.6 or less	20	6	143
	α112M/15000*i*	1673-B120#Z311	73.5	59.1	61	58.9	20	6.6 or less	20	6	208
	α112L/15000*i*	1675-B100#Z311	73.5	59.1	61	58.9	20	6.6 or less	20	6	266
	α112LL/15000i_B	1676-B100#Z311	73.5	59.1	61	58.9	20	6.6 or less	20	6	320
	α132M/14000i_B	1713-B100#Z311									
	α132L/14000i_B	1705-B140#Z311	73.5	59.1	61	58.9	20	6.6 or less	20	6	266
	α160S/13000i_B	1721-B120#Z311									
	α160M/13000i_B	1723-B120#Z311	100.5	85.2	86.5	85.0	25	6.6 or less	26	8	228
	α160L/13000i_B	1725-B120#Z311	100.5	83.6	85.0	83.3	27	-	27	8	318
	α160LL/13000i_B	1726-B100#Z311	101.5	77.1	79.0	76.9	30	6.6 or less	30	6	377
	α180M/6000i_B	1743-B100#Z011	123.5	93.8	95.0	93.3	27	-	27	8	253
	α180L/6000i_B	1745-B100#Z011									
	α180LL/8000i_B	1746-B100#Z011									
	α200M/6000i_B	1753-B120#Z313									
	α200L/6000i_B	1755-B120#Z316									
	α250M/3000i_B	1773-B140#Z316									
High speed type	α40S/70000i_B	1601-B120#Z618									
	α80S/40000i_B	1631-B120#Y618	59.2	46.9	48	46.7	15	-	15	6	113
	α100S/20000i_B	1641-B121#X617									
	α112S/20000i_B	1662-B120#Z317	73.5	59.1	61	58.9	20	6.6 or less	20	6	143
	α112M/20000i_B	1673-B100#Y617	73.5	59.1	61	58.9	20	6.6 or less	20	6	208
	α112L/20000i_B	1675-B100#Y617	73.5	59.1	61	58.9	20	6.6 or less	20	6	266
	α112L/25000i_B	1675-B140#X627									
	α132L/25000i_B	1705-B140#Y617									
	α160M/20000i_B	1723-B140#Y627	100.5	85.2	86.5	85.0	25	6.6 or less	26	8	228
	α160L/20000i_B	1725-B140#Y617	100.5	83.6	85.0	83.3	27	-	27	8	318
	α160LL/20000i_B	1726-B140#Y617	101.5	77.1	79.0	76.9	30	6.6 or less	30	6	377

NOTE

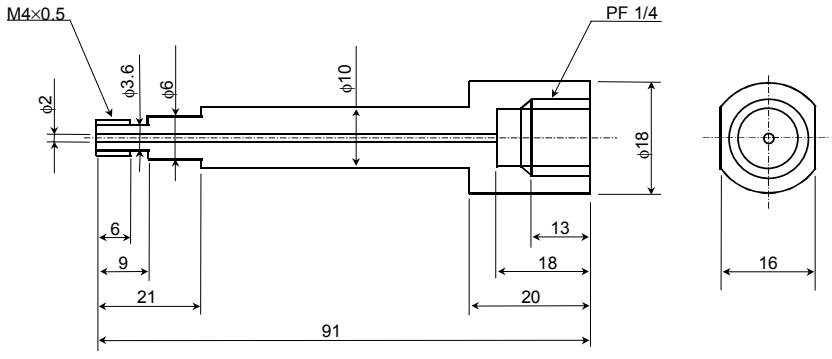
- All data shown above are just for reference. The model for which data is not indicated is not examined in FANUC.
- Material is HRC25-28, and heat treatment (refining) is recommended. Use magnetic material for the sleeve.
- ϕE and interference between the sleeve and the rotor must be as same as the data of "ϕE", "ϕJ" and "Interference" shown in the section "3.2 ROTOR" in part I.
- There is a possibility that the rotor cannot be separated from the spindle, if H and J are largely different form this table.
- Calculate ϕC, ϕF and their tolerance so that the Interference between the shaft and the sleeve is as same as "Interference" shown in the section "3.2 ROTOR" in part I.
- Do not make a clearance between ϕE. and the inner surface of the rotor. It causes the deformation of the rotor.
- Consider the oil pressure, from 30MPa to 80Mpa.

Unit : mm

	Model name	Type No. (A06B-)	M	ϕN	O
Standard type	α50L/25000i_B	1615-B120#Z311			
	α80S/20000i_B	1621-B120#Z312			
	α80M/15000i_B	1623-B170#Z011			
	α80L/8000i_B	1625-B170#Z011			
	α100S/12500i_B	1641-B120#Z011	0.02-0.05	(53)	2-M4×0.5 Depth 8: ϕ2; ϕ6 Counterboring Depth 1
	α112SS/20000i_B	1661-B120#Z312			
	α112S/15000i_B	1671-B120#Z311	0.02-0.05	(67)	2-M4×0.5 Depth 8: ϕ2; ϕ6 Counterboring Depth 1
	α112M/15000i_B	1673-B120#Z311	0.02-0.05	(67)	2-M4×0.5 Depth 8: ϕ2; ϕ6 Counterboring Depth 1
	α112L/15000i_B	1675-B100#Z311	0.02-0.05	(67)	2-M4×0.5 Depth 8: ϕ2; ϕ6 Counterboring Depth 1
	α112LL/15000i_B	1676-B100#Z311	0.02-0.05	(67)	2-M4×0.5 Depth 8: ϕ2; ϕ6 Counterboring Depth 1
	α132M/14000i_B	1713-B100#Z311			-
	α132L/14000i_B	1705-B140#Z311	0.02-0.05	(67)	2-M4×0.5 Depth 8: ϕ2; ϕ6 Counterboring Depth 1
	α160S/13000i_B	1721-B120#Z311			
	α160M/13000i_B	1723-B120#Z311	0.02-0.05	(96)	2-M4×0.5 Depth 8: ϕ2; ϕ6 Counterboring Depth 1
	α160L/13000i_B	1725-B120#Z311	0.02-0.05	(95)	2-M4×0.5 Depth 8: ϕ2; ϕ6 Counterboring Depth 1
	α160LL/13000i_B	1726-B100#Z311	0.02-0.05	(90)	2-M4×0.5 Depth 8: ϕ2; ϕ6 Counterboring Depth 1
	α180M/6000i_B	1743-B100#Z011	0.02-0.05	(110)	2-M4×0.5 Depth 8: ϕ2; ϕ6 Counterboring Depth 1
	α180L/6000i_B	1745-B100#Z011			
	α180LL/8000i_B	1746-B100#Z011			
	α200M/6000i_B	1753-B120#Z313			
	α200L/6000i_B	1755-B120#Z316			
	α250M/3000i_B	1773-B140#Z316			
High speed type	α40S/70000i_B	1601-B120#Z618			
	α80S/40000i_B	1631-B120#Y618	0.01	(55)	2-M4×0.5 Depth 8: ϕ2; ϕ6 Counterboring Depth 1
	α100S/20000i_B	1641-B121#X617			
	α112S/20000i_B	1662-B120#Z317	0.02-0.05	(67)	2-M4×0.5 Depth 8: ϕ2; ϕ6 Counterboring Depth 1
	α112M/20000i_B	1673-B100#Y617	0.02-0.05	(67)	2-M4×0.5 Depth 8: ϕ2; ϕ6 Counterboring Depth 1
	α112L/20000i_B	1675-B100#Y617	0.02-0.05	(67)	2-M4×0.5 Depth 8: ϕ2; ϕ6 Counterboring Depth 1
	α112L/25000i_B	1675-B140#X627			
	α132L/25000i_B	1705-B140#Y617			
	α160M/20000i_B	1723-B140#Y627	0.02-0.05	(96)	2-M4×0.5 Depth 8: ϕ2; ϕ6 Counterboring Depth 1
	α160L/20000i_B	1725-B140#Y617	0.02-0.05	(95)	2-M4×0.5 Depth 8: ϕ2; ϕ6 Counterboring Depth 1
	α160LL/20000i_B	1726-B140#Y617	0.02-0.05	(90)	2-M4×0.5 Depth 8: ϕ2; ϕ6 Counterboring Depth 1

NOTE
- All data shown above are just for reference. The model for which data is not indicated is not examined in FANUC.
- ϕN changes if the stopper is on the J side or if the L changes. Therefore change ϕN according to your spindle design.
- Tap of O is for the nozzle shown below.
- Consider the oil pressure, from 30MPa to 80MPa.

Nozzle (Reference)



E CONTACTOR (SPEED RANGE SWITCHING UNIT)

A speed range switching motor requires a contactor (speed range switching unit). The motor is supplied with no contactor. Place an order with FANUC for the contactor or prepare the contactor according to the specifications by yourself.

NOTE
When placing an order with FANUC, for details of each model such as the drawing number, specification, and dimensions, refer to the DESCRIPTIONS (B-65282EN) of FANUC SERVO AMPLIFIER αi series.

F SPECIFICATION NUMBER

	Model name	Specification number	BZ*i* sensor	Applicable amplifier(SPM)
Standard type	α50L/25000*i*B	A06B-1615-B120#Z318	A860-2120-T211	A06B-6111-H006#H550
	α80S/20000*i*B	A06B-1621-B120#Z312 A06B-1621-B120#Z317	A860-2120-T201 A860-2120-T411	A06B-6111-H006#H550 A06B-6111-H006#H550
	α80M/15000*i*B	A06B-1623-B170#Z011 A06B-1623-B170#Z012 A06B-1623-B170#Z016	A860-2120-T401 A860-2120-T201 A860-2120-T511	A06B-6111-H002#H550 A06B-6111-H002#H550 A06B-6111-H002#H550
	α80L/8000*i*B	A06B-1625-B170#Z011 A06B-1625-B170#Z012 A06B-1625-B170#Z016	A860-2120-T401 A860-2120-T201 A860-2120-T511	A06B-6111-H006#H550 A06B-6111-H006#H550 A06B-6111-H006#H550
	α100S/12500*i*B	A06B-1641-B120#Z011 A06B-1641-B120#Z012 A06B-1641-B120#Z016	A860-2120-T401 A860-2120-T201 A860-2120-T511	A06B-6111-H006#H550 A06B-6111-H006#H550 A06B-6111-H006#H550
	α112SS/20000*i*B	A06B-1661-B120#Z312 A06B-1661-B120#Z317	A860-2120-T201 A860-2120-T411	A06B-6111-H011#H550 A06B-6111-H011#H550
	α112S/15000*i*B	A06B-1671-B120#Z311 A06B-1671-B120#Z312 A06B-1671-B120#Z316	A860-2120-T401 A860-2120-T201 A860-2120-T511	A06B-6111-H022#H550 A06B-6111-H022#H550 A06B-6111-H022#H550
	α112M/15000*i*B	A06B-1673-B120#Z311 A06B-1673-B120#Z312 A06B-1673-B120#Z316	A860-2120-T401 A860-2120-T201 A860-2120-T511	A06B-6111-H011#H550 A06B-6111-H011#H550 A06B-6111-H011#H550
	α112L/15000*i*B	A06B-1675-B100#Z311 A06B-1675-B100#Z312 A06B-1675-B100#Z316	A860-2120-T401 A860-2120-T201 A860-2120-T511	A06B-6111-H030#H550 A06B-6111-H030#H550 A06B-6111-H030#H550
	α112LL/15000*i*B	A06B-1676-B100#Z311 A06B-1676-B100#Z312 A06B-1676-B100#Z316	A860-2120-T401 A860-2120-T201 A860-2120-T511	A06B-6111-H030#H550 A06B-6111-H030#H550 A06B-6111-H030#H550
	α132M/14000*i*B	A06B-1713-B100#Z311 A06B-1713-B100#Z312 A06B-1713-B100#Z316	A860-2120-T401 A860-2120-T201 A860-2120-T511	A06B-6111-H030#H550 A06B-6111-H030#H550 A06B-6111-H030#H550
	α132L/14000*i*B	A06B-1705-B140#Z311 A06B-1705-B140#Z312 A06B-1705-B140#Z316	A860-2120-T401 A860-2120-T201 A860-2120-T511	A06B-6111-H030#H550 A06B-6111-H030#H550 A06B-6111-H030#H550
	α160S/13000*i*B	A06B-1721-B120#Z311 A06B-1721-B120#Z312 A06B-1721-B120#Z316	A860-2120-T401 A860-2120-T201 A860-2120-T511	A06B-6111-H022#H550 A06B-6111-H022#H550 A06B-6111-H022#H550
	α160M/13000*i*B	A06B-1723-B120#Z311 A06B-1723-B120#Z312 A06B-1723-B120#Z316	A860-2120-T401 A860-2120-T201 A860-2120-T511	A06B-6111-H030#H550 A06B-6111-H030#H550 A06B-6111-H030#H550
	α160L/13000*i*B	A06B-1725-B120#Z311 A06B-1725-B120#Z312 A06B-1725-B120#Z316	A860-2120-T401 A860-2120-T201 A860-2120-T511	A06B-6111-H022#H550 A06B-6111-H022#H550 A06B-6111-H022#H550
	α160LL/13000*i*B	A06B-1726-B100#Z311 A06B-1726-B100#Z312 A06B-1726-B100#Z316	A860-2120-T401 A860-2120-T201 A860-2120-T511	A06B-6111-H030#H550 A06B-6111-H030#H550 A06B-6111-H030#H550
	α180M/6000*i*B	A06B-1743-B100#Z011 A06B-1743-B100#Z013 A06B-1743-B100#Z016	A860-2120-T401 A860-2120-T611 A860-2120-T511	A06B-6111-H030#H550 A06B-6111-H030#H550 A06B-6111-H030#H550
	α180L/6000*i*B	A06B-1745-B100#Z011 A06B-1745-B100#Z013 A06B-1745-B100#Z016	A860-2120-T401 A860-2120-T611 A860-2120-T511	A06B-6111-H030#H550 A06B-6111-H030#H550 A06B-6111-H030#H550
	α180LL/8000*i*B	A06B-1746-B100#Z011 A06B-1746-B100#Z013 A06B-1746-B100#Z016	A860-2120-T401 A860-2120-T611 A860-2120-T511	A06B-6111-H030#H550 A06B-6111-H030#H550 A06B-6111-H030#H550
	α200M/6000*i*B	A06B-1753-B120#Z313 A06B-1753-B120#Z311 A06B-1753-B120#Z316	A860-2120-T611 A860-2120-T401 A860-2120-T511	A06B-6111-H030#H550 A06B-6111-H030#H550 A06B-6111-H030#H550
	α200L/6000*i*B	A06B-1755-B120#Z316 A06B-1755-B120#Z311 A06B-1755-B120#Z313	A860-2120-T511 A860-2120-T401 A860-2120-T611	A06B-6111-H045#H550 A06B-6111-H045#H550 A06B-6111-H045#H550
	α250M/3000*i*B	A06B-1773-B140#Z316 A06B-1773-B140#Z311 A06B-1773-B140#Z313	A860-2120-T511 A860-2120-T401 A860-2120-T611	A06B-6111-H055#H550 A06B-6111-H055#H550 A06B-6111-H055#H550

	Model name	Specification number	BZ*i* sensor	Applicable amplifier(SPM)
High speed	**α40S/70000*i*B**	A06B-1601-B120#Z618	A860-2120-T211	A06B-6111-H002#H550
	α80S/40000*i*B	A06B-1631-B120#Y618	A860-2120-T211	A06B-6111-H045#H550
	α100S/20000*i*B	A06B-1641-B121#X617 A06B-1641-B121#X612	A860-2120-T411 A860-2120-T201	A06B-6111-H022#H550 A06B-6111-H022#H550
	α112S/20000*i*B	A06B-1662-B120#Z317 A06B-1662-B120#Z312	A860-2120-T411 A860-2120-T201	A06B-6111-H030#H550 A06B-6111-H030#H550
	α112M/20000*i*B	A06B-1673-B100#Y617 A06B-1673-B100#Y612	A860-2120-T411 A860-2120-T201	A06B-6111-H030#H550 A06B-6111-H030#H550
	α112L/20000*i*B	A06B-1675-B100#Y617 A06B-1675-B100#Y612	A860-2120-T411 A860-2120-T201	A06B-6111-H030#H550 A06B-6111-H030#H550
	α112L/25000*i*B	A06B-1675-B140#X627 A06B-1675-B140#X628	A860-2120-T411 A860-2120-T211	A06B-6121-H045#H550 A06B-6121-H045#H550
	α132L/25000*i*B	A06B-1705-B140#Y617 A06B-1705-B140#Y618	A860-2120-T411 A860-2120-T211	A06B-6111-H030#H550 A06B-6111-H030#H550
	α160M/20000*i*B	A06B-1723-B140#Y627 A06B-1723-B140#Y622	A860-2120-T411 A860-2120-T201	A06B-6111-H030#H550 A06B-6111-H030#H550
	α160L/20000*i*B	A06B-1725-B140#Y617 A06B-1725-B140#Y612	A860-2120-T411 A860-2120-T201	A06B-6111-H030#H550 A06B-6111-H030#H550
	α160LL/20000*i*B	A06B-1726-B140#Y617 A06B-1726-B140#Y612	A860-2120-T411 A860-2120-T201	A06B-6121-H075#H550 A06B-6121-H075#H550

NOTE
- The combination of sensor which is not described here is not prepared.
- Specifications of each model are shown in "I. SPECIFICATIONS".
- For the specifications of the SPM, refer to the Descriptions (B-65282EN) of FANUC SERVO AMPLIFIER α*i* series.
- Contact our sales department for details.

G SELECTION DATA TABLE

We suggest the correct and proper driving conditions and usage of the built-in AC spindle motor to our customers according to the following sheets that we received.

Please fill up the following sheets and submit to our sales department before you select and use the built-in AC spindle motor.

Selection data table

• Your Data

Company	
Your Name	
Section	
Tel. No.	
Fax. No.	

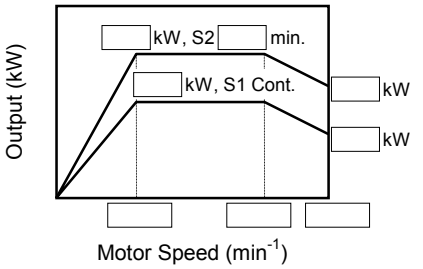
• Machine Type

Name	
Type	Lathe MC Others( )
Number of motors	/machine
Motor direction	Vertical Horizontal Others( )
Workpiece	
CNC model	
Required	/month

• Specification

Power supply		V Hz
Stator	Outer Diameter Length	mm mm
Rotor	Inner Diameter Length	mm mm
Sensor ring	Outer diameter Inner diameter	mm mm
Acceleration		sec
Rigid tapping	Available Unavailable Arrival speed Acceleration time	 min^{-1} sec
Speed range switching	Available Unavailable Others( )	

Output characteristics(Power curves)
Refer to the next page.



Please prepare another paper, if the pattern is different from this diagram.

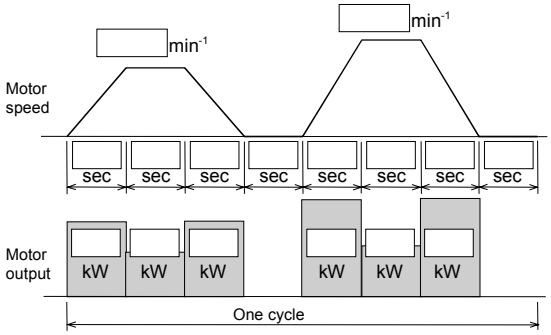
Please fill the cell with a drawing number of motor, if you would like to use a current model.

Drawing No.	A06B-

• Driving Condition

Maximum speed **Maximum torque**	min^{-1} Nm
Spindle inertia	kgm^2
Continuous Load **Maximum Load**	kW kW
Continuous working time	hours/day
Intermittent cutting	Available(G) Unavailable
Average power	kW

Cyclic time of cutting
Refer to the next page.



Please prepare another paper, if the pattern is different from this diagram.

• Remark

Please write down here, if there is some remark.

Note to users

1. Sever driving condition affect the motor life. Therefore please inform to us the final driving condition after it is defined.
2. The motor is assumed to be used at a place 1000 m or less above sea level at an ambient temperature of 0 to 40°C in an environment in which the motor is free from condensation.
3. For the protection class (water and dust proof) of a spindle, IP54 or more is recommended.
4. If a motor is not used under the above environmental conditions or recommended conditions, the motor may not deliver its 100% performance. After determining the final use conditions, contact FANUC again to check whether the conditions are acceptable.
5. Refer to the next page for your convenience.

How to fill out the selection data table

- Your Data

  We would like to use this data to give some information for you.

- Machine Type
  - Name

    Final commercial name of your machine for our distinction.
  - Number of motors

    Number of SPINDLE motors in the machine you are designing.
  - Workpiece

    If you would like to use some special piece, write the name into Others.
  - CNC model

    Model name of CNC.

    e.g. FS16B
  - Required

    Number of motor requirement per month. Estimated value is acceptable.

    If you use two spindle motors per machine, the number of motor requirement is multiplied by 2.

- Specification

  * If you would like to use a current model, you are not necessary to fill this section. In this case, please fill the cell of Drawing No.

    If you would like to use RIGID TAPPING, fill the cell of Rigid Tapping.
  - Power supply

    Voltage and frequency of power supply to an amplifier. (not to a motor)
  - Stator, Rotor, Sensor ring (BZ*i* sensor)

    Select from the this manual or catalog of built-in spindle motor.
  - Acceleration

    Acceleration time from 0 to the maximum speed.
  - Rigid tapping

    Fill the cell if you would like to use RIGID TAPPING.
  - Speed range switching

    Check Unavailable if you do not want to use Speed range switching control.
  - Output characteristics (Power curves)

    Fill the cells for S1 continuous rating and S2 intermittent rating. If you would like to use a motor under S3 and other ratings, please prepare another paper.

    * For the definition of rating such as S1 and S2, refer to the IEC34 international standard.
  - Drawing No.

    Fill the cell if you would like to use a current model.

• Driving Condition

- Maximum speed, Maximum torque

  Maximum speed and torque of machine specification. If the machine has some differential, use values of motor speed and torque (not values of spindle).

- Spindle inertia

  Actual value of spindle inertia. Use SI unit.

- Continuous load, Maximum load

  Continuous and maximum load at cutting.

- Continuous working time

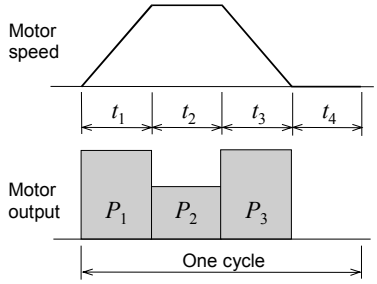
  Continuous working time of machine for a day, including intermittent intervals.

- Intermittent cutting

  If the machine used for intermittent heavy cutting, check Available. And write acceleration value. Estimated value used for your machine designing is acceptable.

- Average power

  Average power is calculated from the formula shown below.



  Average power P_{avg}

$$P_{avg} = \sqrt{\frac{P_1^2 t_1 + P_2^2 t_2 + P_3^2 t_3 + \ldots}{t_1 + t_2 + t_3 + t_4 + \ldots}}$$

  * If the average power exceeds the S1 continuous rated power, it influences a motor life. Therefore, you had better to define the average power within the S1 continuous rated power.

• Remark

  Write remarks and special information if they are.

If you have any questions about the selection data table, contact our sales department freely.

INDEX

Revision Record

FANUC AC SPINDLE MOTOR αi_B series DESCRIPTIONS (B-65292EN)

03	Feb., 2003	• The series name and model name were changed. • An addition was made to the α112L/25000i_B lineup. • Errors were corrected and descriptions were added to the blank sections.			
02	Jun., 2002	• A description of the αB80S/20000i was added. • Errors were corrected and descriptions were added to the blank sections.			
01	Dec., 2001	———————————————			
Edition	Date	Contents	Edition	Date	Contents