FANUC

GE Fanuc Automation

Computer Numerical Control Products

Alpha Series Built-in AC Spindle Motor

Descriptions Manual

GFZ-65202EN/02 *March 1997*

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.

GE Fanuc Automation makes no representation or warranty, expressed, implied, or statutory with respect to, and assumes no responsibility for the accuracy, completeness, sufficiency, or usefulness of the information contained herein. No warranties of merchantability or fitness for purpose shall apply.

©Copyright 1997 GE Fanuc Automation North America, Inc.
All Rights Reserved.

FANUC SERVO MOTOR series
SAFETY PRECAUTIONS

This "Safety Precautions" section describes the precautions which must be observed to ensure safety when using FANUC servo motors (including spindle motors). Users of any servo motor model are requested to read the "Safety Precautions" carefully before using the servo motor.
The users are also requested to read this manual carefully and understand each function of the motor for correct use (For the built–in spindle motor α series, this manual provides detailed assembly handling procedures).
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 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.

* For built–in spindle motors, the term "motor" in this manual refers to all the motor parts, including the stator, rotor, and sensor.

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

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 their respective specification manuals.)
  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 this manual for details.

WARNING

- **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.

- **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.

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

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

- **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.

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.

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

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

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

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

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

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

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 detector.**

  Such a test can damage elements in the detector.

- **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.

NOTE

- **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 this manual for details of the operating and environmental conditions for motors.

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

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

- **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 this 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 this manual, 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 this manual, 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 BUILT-IN AC SPINDLE MOTOR α series

Standard type

Single winding	Double windings (Speed range switching control)
α B80M-1.5	α B112L-5.5
α B80L-1.1	α B112L-18.5
α B100S-2.2	α B112LL-5.5
α B112S-3.7	α B112LL-18.5
α B112M-5.5	α B132L-5.5
α B160S-5.5	α B160M-5.5
	α B160M-11
	α B160L-7.5
	α B160LL-25
	α B180M-11
	α B180L-22
	α B180LL-22
	α B225M-15

High-speed type

Single winding	Double windings (Speed range switching control)
α B80S-5.5/40000 *	α B100L-11/25000
α B100S-11/30000	α B112M-15/20000
α B100S-11/20000	α B112L-18.5/20000
	α B112L-18.5/24000**
	α B160LL-22/15000

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
- Asterisk marked models are now under development. Therefore the specification may be changed.
- Double asterisks marked model is now under modification. Therefore the specificatio may be changed.
- All models have got approvals of Notify Body, TÜV Rheinland, excepting the models less than 30,000min^{-1}.
- Many drawings in this manual are drawn by Third Angle Projection Method.
- Amplifier information is in the latest edition of Descriptions FANUC CONTROL MOTOR AMPLIFIER α series (B-65162E). 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.
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.

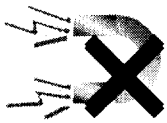
■ Do not machine on the parts without FANUC's permission. Machine only on the parts designated by FANUC.

■ 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.

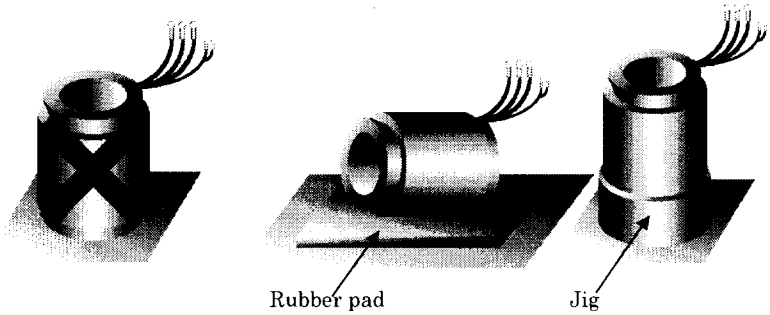


Table of Contents

I. SPECIFICATIONS

CONSTRUNCTION OF THIS PART

This part includes followings.

NOTE
Refer to Ⅱ.INSTRUCTION before installing a motor in a spindle. It includes some important things to do for safety or to conform to the IEC standard.

1 SPECIFICATIONS

1.1 STANDARD TYPE

Item			Model name / Type No. *8	α B80M-1.5 1211-B113#1xxx	α B80L-1.1 1212-B413#1xxx	α B100S-2.2 1221-B413#1xxx	α B112S-3.7 1231-B413#1xxx	α B112M-5.5 1232-B412#1xxx
*1 Rated output	S1 Continuous (Max. current)	kW (A)		1.5 (11)	1.1 (20)	2.2 (21)	3.7 (25)	5.5 (38)
	S2 Short time Rated minutes (Max. current)			2.2 15min. (14)	3.7 30min. (28)	3.7 30min. (29)	5.5 30min. (33)	7.5 30min. (48)
	S3 40% (Max. current)							
	S3 25% (Max. current)							
*2 Rated speed	Base	min^{-1}		3000	1500	1500	1500	1500
	Power constant			12000	8000	8000	4500	6000
	Maximum			15000	8000	8000	6000	10000
Rated Max. torque	S1Continuous	Nm		4.8	7.0	14.0	23.6	35.0
	S2 or S3			7.0	23.6	23.6	35.0	47.7
Power factor				0.68	0.74	0.75	0.68	0.75
Rated voltage of motor input *3		Vac		144-217	114-217	105-218	137-220	133-224
Winding connection				Δ	Δ	Δ	Δ	Δ
Number of poles				4				
Resistance of winding *10		m Ω±5%		436	427	337	288	141
Insulation class				F	F	F	F	F
Temperature rise of winding		K		≦105	≦105	≦105	≦105	≦105
Required clearance		mm		3				
Thermal switch operation		±5℃		130	130	140	140	140
IC code				IC9U7A7				
Coolant	Temperature	℃		21	22	21	18	16
	Temperature rise	K		≦2	≦5	≦3	≦5	≦5
	Flowing rate	l/min		≧12.9	≧12.1	≧12.0	≧13.2	≧12.0
	Specific heat	J/g·K		1.87				
	Density	g/cm^3		0.78				
	Pressure *11	kPa		≦2940				
Capacity of cooler *12		W		≧1160	≧1160	≧1160	≧1160	≧1160
Built-in sensor *4				T012	T012	T011,T012	T011	T011, T012
High resolution magnetic pulse coder *5				T121	T121	T121,T122	T121	T121,T122
Weight	Stator	kg		6	9	11	13	21
	Rotor			3	4	5	7	9
Rotor inertia		kgm^2		0.0029	0.004	0.008	0.013	0.02
Allowable overload *6		kW		2.6	4.4	4.4	6.6	9.0
Spindle amplifier module (SPM-)				2.2	5.5	5.5	11	11
Date for choice of PSM *7		kW		1.5/2.7	1.1/4.8	2.2/5.5	3.7/7.6	5.5/12.0
Parameter spec. (A06B-6078-) *9				L150	L143	L140	L151	L141

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 220-230VAC±5%.
  Within ±10%, normal operation can be done, but the ratings are not guaranteed.
- 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℃, 1000m or less above sea level, 1G or less vibration acceleration, non-condensation.

α B112L-5.5 1233-B410#1xxx		α B112L-18.5 1233-B411#1xxx		α B112LL-5.5 1234-B410#1xxx		Model name Type No. *8			Item
Low	High	Low	High	Low	High				
5.5 (39)	5.5 (50)	15 (85)	18.5 (111)	5.5 (52)	5.5 (62)	kW (A)	S1 Continuous (Max. current)		Rated output *1
7.5 30min. (50)	7.5 30min. (61)	18.5 15min. (100)	22 15min. (123)	7.5 30min. (60)	7.5 30min. (76)		S2 Short time Rated minutes (Max. current)		
7.5 (61)				7.5 (67)			S3 40% (Max. current)		
		18.5 (133)		7.5 (81)			S3 25% (Max. current)		
680	1600	1500	5000	450	1000	min^{-1}	Base		Rated speed *2
1600	12000	2500	10000	1000	10000		Power constant		
1600	12000	3500	14000	1000	12000		Maximum		
77.2		95.4		116.7		Nm	S1 Continuous		Rated max. torque
135.1		166.5		204.6			S2 or S3		
0.77		0.68		0.74		Power factor			
160-219		139-208		96-220		Vac	Rated voltage of motor input *3		
Y	Y	Y	Y	Y	Y	Winding connection			
4						Number of poles			
336	154	106	47	287	146	m Ω ±5%	Resistance of winding *10		
H		H		H		Insulation class			
≦125		≦125		≦125		K	Temperature rise of winding		
3						mm	Required clearance		
155		180		155		±5℃	Thermal switch operation		
IC9U7A7						IC code			
21	20	15	15	14	21	℃	Temperature		Coolant
≦10	≦6	≦10	≦10	≦14	≦12	K	Temperature rise		
≧14.4		≧15.3		≧14.3		l/min	Flowing rate		
1.87		1.78				J/g·K	Specific heat		
0.78		0.87				g/cm^3	Density		
≦2940						kPa	Pressure *11		
≧2910		≧4900		≧4900		W	Capacity of cooler *12		
T011,T012		T011,T014		T011		Built-in sensor *4			
				T121		High resolution magnetic pulse coder*5			
26		26		31		kg	Stator		Weight
15		15		18			Rotor		
0.028		0.028		0.034		kgm^2	Rotor inertia		
9.0		22.2	26.4	9.0		kW	Allowable overload *6		
15		30		22		Spindle Amplifier Module (SPM-)			
5.5/13.2		18.5/29.4		5.5/11		kW	Data for choice of PSM *7		
L510		L511		L512		Parameter spec. (A06B-6078-) *9			

*1 Check the rated output after assemble in a spindle. 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 A860-0392-Txxx. For velocity and position feedback. Install to a rotating axis. Refer to 3.3 SENSOR.
*5 A860-0382-Txxx. For velocity and position feedback. Install to a rotating axis. Refer to 3.3 SENSOR.
*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 Refer to SPECIFICATION NUMBER in APPENDIX to get information of "xxx" in type number.
*9 Refer to the manual, the latest edition of Parameter Manual (B-65160E) for details.
*10 Refer to Ⅱ.INSTRUCTION when checking the resistance.
*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.

$$Q(W)=\text{Flowing rate}(\ell/\text{min})\times\text{Specific heat}(J/gK)\times\text{Density}(g/cm^3)\times\text{Temperature rise of coolant}(K)\times 1000\div 60$$

Item			Model Name / Type No. *8	α B112LL-18.5 1234-B411#Txxx		α B132L-5.5 1241-B410#1xxx		α B132L-22 1241-B610#1xxx	
				Low	High	Low	High	Low	High
*1 Rated output	S1 Continuous (Max. current)	kW (A)		15 (89)	18.5 (119)	5.5 (46)	5.5 (48)	15 (105)	22 (123)
	S2 Short time Rated minutes (Max. current)			18.5 15min. (106)	22 15min. (134)	7.5 30min. (61)	7.5 30min. (57)	18.5 30min. (124)	25 30min. (134)
	S3 40% (Max. current)								
	S3 25% (Max. current)			18.5 (140)					
*2 Rated speed	Base	min^{-1}		1200	3500	330	1500	750	5500
	Power constant			2000	12000	1500	10000	1800	12000
	Maximum			4000	12000	1500	12000	3000	12000
Rated max. torque	S1 Continuous	Nm		119.0		159.2		190.9	
	S2 or S3			204.2		217.0		235.5	
Power factor				0.72		0.75		0.75	
Rated voltage of motor input *3		Vac		135 - 220		106 - 221		131 - 216	
Winding connection				Y	Y	Y	Y	Y	Δ
Number of poles				4					
Resistance of winding *10		mΩ ±5%		121	52	246	119	79.5	17
Insulation class				H		F		H	
Temperature rise of winding		K		≦125		≦105		≦125	
Required clearance		mm		3					
Thermal switch operation		±5℃		180		140		155	
IC code				IC9U7A7					
Coolant	Temperature	℃		14	18	24	27	12	13
	Temperature rise	K		≦16	≦17	≦8	≦7	≦16	≦15
	Flowing rate	l/min		≧14.9		≧11.8		≧13.5	
	Specific heat	J/g·K		1.78					
	Density	g/cm^3		0.87					
	Pressure	kPa		≦2940					
Capacity of cooler *12		W		≧4900		≧2560		≧4900	
Built-in sensor *4				T011		T011, T014		T011	
High resolution magnetic pulse coder*5						T123			
Weight	Stator	kg		31		61		55	
	Rotor			18		17		17	
Rotor inertia		kgm^2		0.034		0.048		0.048	
Allowable overload *6		kW		22.2	26.4	9.0		26.4	30
Spindle Amplifier Module (SPM-)				30		15		30	
Data for choice of PSM *7		kW		18.5/34.1		5.5/15		22/33.3	
Parameter spec. (A06B-6078-) *9				L513		L514		L520	

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 220-230VAC±5%.
  Within ±10%, normal operation can be done, but the ratings are not guaranteed.
- 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℃, 1000m or less above sea level, 1G or less vibration acceleration, non-condensation.

α B160S-5.5 1251-B412#1xxx	α B160M-5.5 1252-B412#1xxx		α B160M-11 1252-B712#1xxx		Model name Type No. *8		Item
	Low	High	Low	High			
5.5 (64)	5.5 (36)	5.5 (36)	5.5 (51)	11 (72)	kW (A)	S1 Continuous (Max. current)	*1 Rated output
	7.5 20min. (46)	7.5 30min. (45)				S2 Short time Rated minutes (Max. current)	
7.5 (88)				18.5 (102)		S3 40% (Max. current)	
			7.5(S3 15%) (85)	18.5 (108)		S3 25% (Max. current)	
600	450	1000	300	850	min^{-1}	Base	*2 Rated speed
6000	1000	7000	850	3250		Power constant	
6000	1000	7000	850	6000		Maximum	
87.5	116.7		175.1		Nm	S1 Continuous	Rated max. torque
135.1	159.2		325.6			S2 or S3	
0.82	0.74		0.85		Power factor		
81 - 213	134 - 207		117 - 212		Vac	Rated voltage of motor input *3	
Δ	Y	Δ	Y	Δ	Winding connection		
4					Number of poles		
155	467	156	440	150	m Ω ±5%	Resistance of winding *10	
F	F		H		Insulation class		
≦105	≦105		≦125		K	Temperature rise of winding	
3					mm	Required clearance	
140	140		155		±5℃	Thermal switch operation	
IC9U7A7					IC code		
16	25	21	14	16	℃	Temperature	Coolant
≦6	≦6	≦4	≦12	≦10	K	Temperature rise	
≧12.6	≧14.5		≧11.8		l/min	Flowing rate	
1.87	1.78				J/g·K	Specific heat	
0.78	0.87				g/cm^3	Density	
≦2940					kPa	Pressure *11	
≧2900	≧2560		≧4900		W	Capacity of cooler *12	
T018	T011		T011, T018		Built-in sensor *4		
					High resolution magnetic pulse coder *5		
27	38		38		kg	Stator	Weight
16	16		22			Rotor	
0.060	0.085		0.086		kgm^2	Rotor inertia	
9.0	9.0		9.0	22.2	kW	Allowable overload *6	
22	15		30		Spindle Amplifier Module (SPM-)		
5.5/21	5.5/14.1		11/28.6		kW	Date for choice of PSM *7	
L152	L509		L534		Parameter spec. (A06B-6078-) *9		

*1 Check the rated output after assemble in a spindle. 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 A860-0392-Txxx. For velocity and position feedback. Install to a rotating axis. Refer to 3.3 SENSOR.
*5 A860-0382-Txxx. For velocity and position feedback. Install to a rotating axis. Refer to 3.3 SENSOR.
*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 Refer to SPECIFICATION NUMBER in APPENDIX to get information of "xxx" in type number.
*9 Refer to the manual, the latest edition of Parameter Manual (B-65160E) for details.
*10 Refer to Ⅱ.INSTRUCTION when checking the resistance.
*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.

$$Q(W)=\text{Flowing rate}(\ell/\text{min})\times\text{Specific heat}(J/gK)\times\text{Density}(g/cm^3)\times\text{Temperature rise of coolant}(K)\times 1000\div 60$$

Item			Model name / Type No. *8	α B160L-7.5 1255-B411#Txxx		α B160LL-25 1256-B411#1xxx		α B180M-11 1261-B410#1xxx	
				Low	High	Low	High	Low	High
*1 Rated output	S1 Continuous (Max. current)	kW (A)		7.5 (59)	7.5 (64)	15 (82)	25 (120)	11 (52)	11 (78)
	S2 Short time Rated minutes (Max. current)			11 30min. (67)	11 30min. (81)	22 10min. (109)	30 30min. (132)	15 20min. (67)	15 30min. (99)
	S3 40% (Max. current)			11 (80)				15 (74)	
	S3 25% (Max. current)					22 (127)		15 (93)	
*2 Rated speed	Base	min^{-1}		450	800	600	2500	450	800
	Power constant			800	10000	1500	10000	800	6000
	Maximum			800	12000	3000	13000	800	6000
Rated max. torque	S1 Continuous	Nm		199.0		238.7		233	
	S2 or S3			291.8		420.1		477	
Power factor				0.74		0.84		0.82	
Rated voltage of motor input *3		Vac		106 - 222		157 - 223		115 - 222	
Winding connection				Y	Δ	Y	Y	Y	Y
Number of poles				4					
Resistance of winding *10		mΩ±5%		251	84	189	86	267	123
Insulation class				F		H		F	
Temperature rise of winding		K		≦105		≦125		≦105	
Required clearance		mm		3					
Thermal switch operation		±5℃		140		155		140	
IC code				IC9U7A7					
Coolant	Temperature	℃		18	15	24	19	17	14
	Temperature rise	K		≦14	≦6	≦17	≦17	≦10	≦9
	Flowing rate	l/min		≧10.8		≧10.1		≧13.8	
	Specific heat	J/g·K		1.78		1.87		1.78	
	Density	g/cm^3		0.87		0.78		0.87	
	Pressure *11	kPa		≦2940					
Capacity of cooler *12		W		≧4900		≧3740		≧4900	
Built-in sensor *4				T011, T014		T011, T014		T011, T013	
High resolution magnetic pulse coder*5								T123	
Weight	Stator	kg		52		63		65	
	Rotor			32		37		38	
Rotor inertia		kgm^2		0.129		0.152		0.190	
Allowable overload *6		kW		13.2		26.4	36	18	
Spindle Amplifier Module (SPM-)				22		30		30	
Data for choice of PSM *7		kW		7.5/16.4		25/39.4		11/25.6	
Parameter spec. (A06B-6078-) *9				L515		L516		L517	

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 220-230VAC±5%.
  Within ±10%, normal operation can be done, but the ratings are not guaranteed.
- 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℃, 1000m or less above sea level, 1G or less vibration acceleration, non-condensation.

α B180L-22 1262-B410#1xxx		α B180LL-22 1263-B411#1xxx		α B225M-15 1273-B411#Txxx		Model name / Type No. *8		Item
Low	High	Low	High	Low	High			
18.5 (83)	22 (97)	18.5 (112)	22 (121)	15 (125)	15 (138)	kW (A)	S1 Continuous (Max. current)	*1 Rated output
22 30, 15min. (96, 129)	30 30min. (125)	22 30min. (131)	25 30min. (131)	22 30min. (173)	22 30min. (185)		S2 Short time Rated minutes (Max. current)	
							S3 40% (Max. current)	
							S3 25% (Max. current)	
500	1500	350	1300	290	650	min^{-1}	Base	*2 Rated speed
800	2500	1200	8000	650	2500		Power constant	
1500	6000	1500	8000	650	4500		Maximum	
353		504		493		Nm	S1 Continuous	Rated max. torque
600		600		724			S2 or S3	
0.83		0.80		0.64		Power factor		
157 - 218		146 - 215		118 - 222		Vac	Rated voltage of motor input *3	
Y	Y	Y	Y	Y	Y	Winding connection		
4						Number of poles		
137	70	114	48	74	39	m Ω ±5%	Resistance of winding *10	
H		H		H		Insulation class		
≦125		≦125		≦125		K	Temperature rise of winding	
3						mm	Required clearance	
155		155		155		±5℃	Thermal switch operation	
IC9U7A7						IC code		
19	16	13	14	24	20	℃	Temperature	Coolant
≦16	≦12	≦19	≦16	≦18	≦11	K	Temperature rise	
≧9.7		≧12.0		≧12.2		l/min	Flowing rate	
1.87		1.78				J/g·K	Specific heat	
0.78		0.87				g/cm^3	Density	
≦2940						kPa	Pressure *11	
≧3740		≧4900		≧7700		W	Capacity of cooler *12	
T011, T013		T011		T013		Built-in sensor *4		
		T122				High resolution magnetic pulse coder*5		
91		111		115		kg	Stator	Weight
40		61		57			Rotor	
0.260		0.307		0.444		kgm^2	Rotor inertia	
26.4	36	26.4	30	26.4		kW	Allowable overload *6	
30		30		45		Spindle Amplifier Module (SPM-)		
22/34.8		22/35.1		15/33.7		kW	Data for choice of PSM *7	
L525		L518		L536		Parameter spec. (A06B-6078-) *9		

*1 Check the rated output after assemble in a spindle. 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 A860-0392-Txxx. For velocity and position feedback. Install to a rotating axis. Refer to 3.3 SENSOR.
*5 A860-0382-Txxx. For velocity and position feedback. Install to a rotating axis. Refer to 3.3 SENSOR.
*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 Refer to SPECIFICATION NUMBER in APPENDIX to get information of "xxx" in type number.
*9 Refer to the manual, the latest edition of Parameter Manual (B-65160E) for details.
*10 Refer to Ⅱ.INSTRUCTION when checking the resistance.
*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.

$$Q(W)=\text{Flowing rate}(\ell/\text{min})\times\text{Specific heat}(J/gK)\times\text{Density}(g/cm^3)\times\text{Temperature rise of coolant}(K)\times 1000\div 60$$

1.2 HIGH-SPEED TYPE

Item			Model Name / Type No. *8	α B80S-5.5 /40000 (Under development) *Reactor	α B100S-11 /30000 1228-B414#3xxx *Reactor	α B100S-11 /20000 1229-B902#1xxx	α B100L-11/25000 1222-B415#1xxx	
							Low	High
*1 Rated output	S1 Continuous (Max. current)	kW (A)		5.5	11 (92)	11 (69)	11 (54)	11 (65)
	S2 Short time Rated minutes (Max. current)			7.5 10min.	15 15min. (110)	15 30min. (83)	15 15min. (68)	15 15min. (81)
	S3 40% (Max. current)							
	S3 25% (Max. current)							
*2 Rated speed	Base	min^{-1}		40000	10000	7500	5500	9000
	Power constant			-	30000	12000	9000	25000
	Maximum			40000	30000	20000	9000	25000
Rated max. torque	S1 Continuous	Nm		1.31	10.5	14.0	19.1	
	S2 or S3			1.79	14.3	19.1	26.1	
Power factor						0.70	0.82	
Rated voltage of motor input *3		Vac				156 - 210	140 - 205	
Winding connection				Δ	Δ	Δ	Y	Δ
Number of poles				2	2	4	2	
Resistance of winding *10		m Ω ±5%			32.4	48.3	103.6	34.4
Insulation class				F	F	F	H	
Temperature rise of winding		K		≦105	≦105	≦105	≦125	
Required clearance		mm		3				
Thermal switch operation		±5℃		140	140	140	155	
IC code				IC9U7A7				
Coolant	Temperature	℃			20	20	23	22
	Temperature rise	K			≦10	≦5.6	≦5.7	≦6.1
	Flowing rate	l/min			≧14.0	≧14.5	≧8.8	
	Specific heat	J/g·K		1.78		1.87	1.78	
	Density	g/cm^3		0.87		0.78	0.87	
	Pressure	kPa		≦2940				
Capacity of cooler *12		W			≧3500	≧2900	≧4900	
Built-in sensor *4				T082	T082	T012, T081	T082	
High resolution magnetic pulse coder*5								
Weight	Stator	kg		15	15	11	20	
	Rotor			2	5	4	6	
Rotor inertia		kgm^2		0.004	0.008	0.008	0.014	
Allowable overload *6		kW		9.0	18.0	18.0	18.0	
Spindle Amplifier Module (SPM-)				22	26	22	30	
Data for choice of PSM *7		kW		5.5/9	11/22	11/19.5	11/22	
Parameter spec. (A06B-6078-) *9					L166	L174	L549	

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 220-230VAC±5%. Within ±10%, normal operation can be done, but the ratings are not guaranteed.
- 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℃, 1000m or less above sea level, 1G or less vibration acceleration, non-condensation.
- Reactor is required between the motor and the amplifier for the models marked "*Reactor".

α B112M-15/20000 1232-B415#1xxx		α B112L-18.5/20000 1233-B411#Txxx		α B112L-18.5/24000 1233-B814#1xxx (under modification)		Model name / Type No. *8		Item
Low	High	Low	High	Low	High			
10 (83)	15 (98)	15 (80)	18.5 (106)	15 (83)	18.5 (95)	kW (A)	S1 Continuous (Max. current)	*1 Rated output
15 10min. (112)	18.5 30min. (111)	18.5 15min. (94)	22 15min. (138)	18.5 15min. (96)	22 15min. (104)		S2 Short time Rated minutes (Max. current)	
							S3 40% (Max. current)	
		18.5 (109)		18.5 (111)			S3 25% (Max. current)	
1500	10000	1800	8000	1800	9000	min^{-1}	Base	*2 Rated speed
4500	20000	2500	10000	2500	15000		Power constant	
4500	20000	4000	20000	4000	24000		Maximum	
63.7		79.6		79.5		Nm	S1 Continuous	Rated max. torque
95.5		98.2		117.8			S2 or S3	
0.73		0.71		0.67		Power factor		
77 - 195		153 - 212		168 - 206		Vac	Rated voltage of motor input *3	
Y	Y	Y	Y	Y	Y	Winding connection		
4						Number of poles		
93	41	57	26	109	47	m Ω ±5%	Resistance of winding *10	
F		H		H		Insulation class		
≦105		≦125		≦125		K	Temperature rise of winding	
3						mm	Required clearance	
140		180		180		±5℃	Thermal switch operation	
IC9U7A7						IC code		
13	14	16	16	17	20	℃	Temperature	Coolant
≦9.1	≦9.9	≦10.3	≦9.3	≦11.2	≦8.6	K	Temperature rise	
≧14.0		≧14.8		≧15.2		l/min	Flowing rate	
1.78		1.87				J/g·K	Specific heat	
0.87		0.78				g/cm^3	Density	
≦2940						kPa	Pressure *11	
≧4900		≧4900		≧4900		W	Capacity of cooler *12	
T081		T081		T082		Built-in sensor *4		
						High resolution magnetic pulse coder*5		
22		26		26		kg	Stator	Weight
8		10		10			Rotor	
0.020		0.028		0.028		kgm^2	Rotor inertia	
18	22.2	22.2	26.4	22.2	26.4	kW	Allowable overload *6	
30		30		30		Spindle Amplifier Module (SPM-)		
15/24		18.5/32.7		18.5/34		kW	Data for choice of PSM *7	
L522		L546		L541		Parameter spec. (A06B-6078-) *9		

*1 Check the rated output after assemble in a spindle. 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 A860-0392-Txxx. For velocity and position feedback. Install to a rotating axis. Refer to 3.3 SENSOR.
*5 A860-0382-Txxx. For velocity and position feedback. Install to a rotating axis. Refer to 3.3 SENSOR.
*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 Refer to SPECIFICATION NUMBER in APPENDIX to get information of "xxx" in type number.
*9 Refer to the manual, the latest edition of Parameter Manual (B-65160E) for details.
*10 Refer to Ⅱ.INSTRUCTION when checking the resistance.
*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.

$$Q(W)=\text{Flowing rate}(\ell/\text{min})\times\text{Specific heat}(J/gK)\times\text{Density}(g/cm^3)\times\text{Temperature rise of coolant}(K)\times 1000\div 60$$

Item			Model name / Type No. *8	α B160LL-22/15000 1256-B611#1xxx	
				Low	High
*1 Rated output	S1 Continuous (Max. current)	kW (A)		15 (101)	22 (118)
	S2 Short time Rated minutes (Max. current)			22 10min. (133)	25 30min. (125)
	S3 40% (Max. current)				
	S3 25% (Max. current)				
*2 Rated speed	Base	min^{-1}		600	8000
	Power constant			2000	15000
	Maximum			3000	15000
Rated max. torque	S1 Continuous	Nm		238	
	S2 or S3			350	
Power factor				0.76	
Rated voltage of motor input *3		Vac		134 - 209	
Winding connection				Y	Δ
Number of poles				4	
Resistance of winding *10		mΩ±5%		82.6	44.6
Insulation class				H	
Temperature rise of winding		K		≦125	
Required clearance		mm		3	
Thermal switch operation		±5℃		180±5	
IC code				IC9U7A7	
Coolant	Temperature	℃		15	15
	Temperature rise	K		≦14.6	≦12.8
	Flowing rate	l/min		≧14.1	
	Specific heat	J/g·K		1.87	
	Density	g/cm^3		0.78	
	Pressure *11	kPa		≦2940	
Capacity of cooler *12		W		≧4200	
Built-in sensor *4				T081	
High resolution magnetic pulse coder*5					
Weight	Stator	kg		63	
	Rotor			37	
Rotor inertia		kgm^2		0.152	
Allowable overload *6		kW		26.4	30
Spindle Amplifier Module (SPM-)				30	
Data for choice of PSM *7		kW		22/34.7	
Parameter spec. (A06B-6078-) *9				L528	

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 220-230VAC±5%.
Within ±10%, normal operation can be done, but the ratings are not guaranteed.

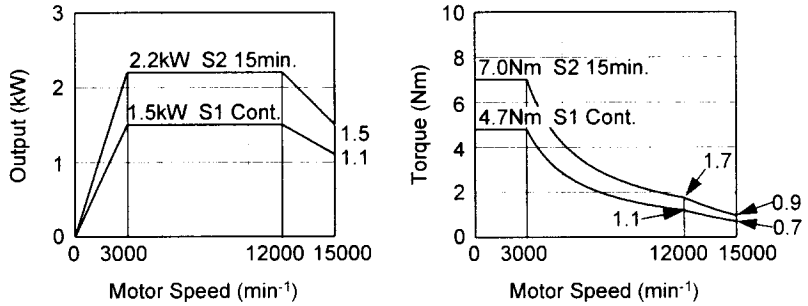
■IEC34 and VDE0110 etc. should be applied to conform to CE marking when installing the motor in a spindle.
Refer to the standards for details.

■Use motors under following condition.
Room temperature form 0 to 40℃, 1000m or less above sea level, 1G or less vibration acceleration, non-condensation.

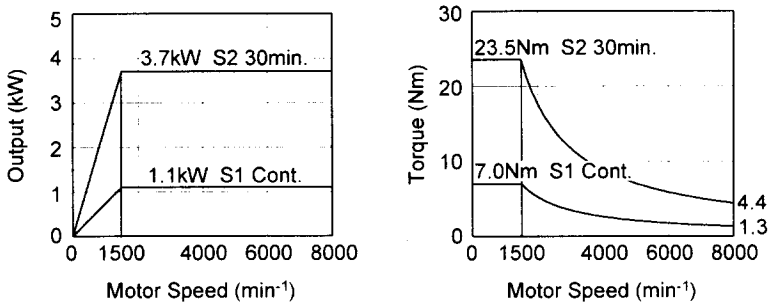
2 POWER CURVES

2.1 STANDARD TYPE

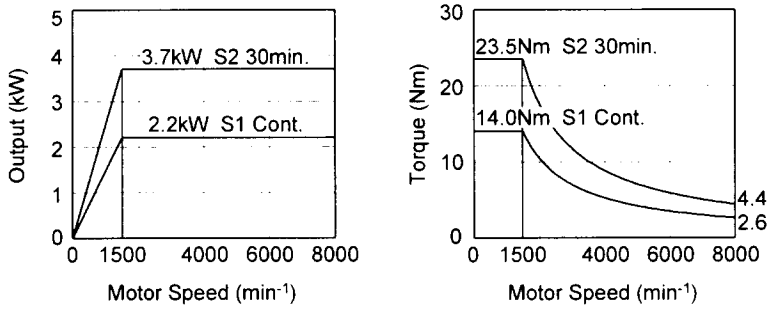
α B80M-1.5 (A06B-1211-B113#1xxx)



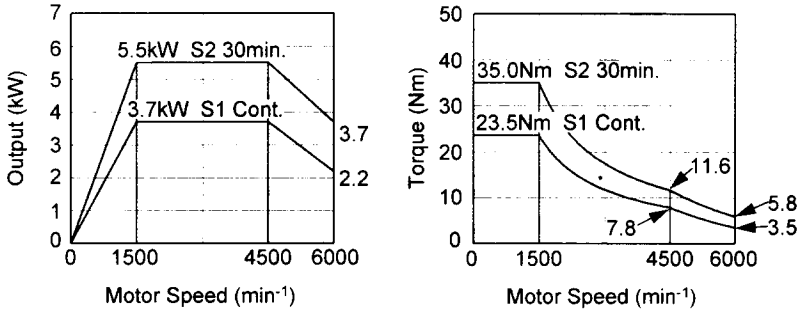
α B80L-1.1 (A06B-1212-B413#1xxx)



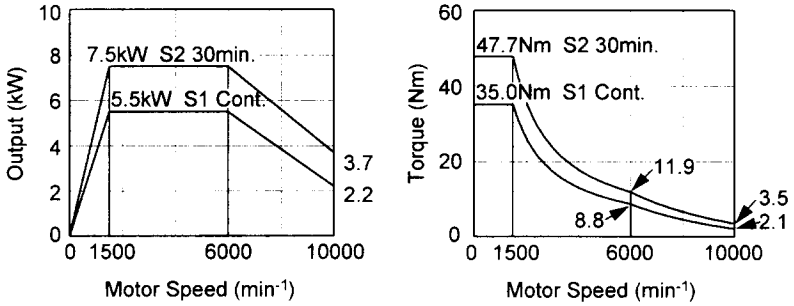
α B100S-2.2 (A06B-1221-B413#1xxx)



α B112S-3.7 (A06B-1231-B413#1xxx)

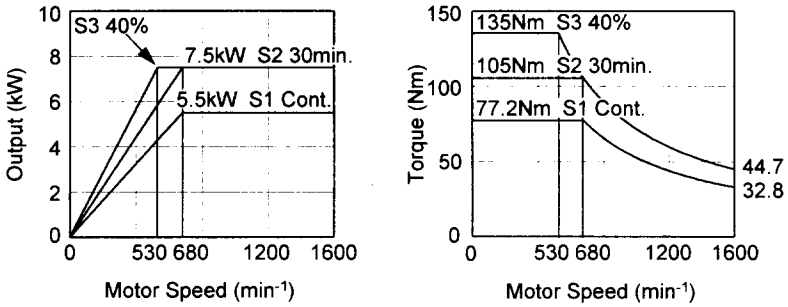


α B112M-5.5 (A06B-1232-B412#1xxx)

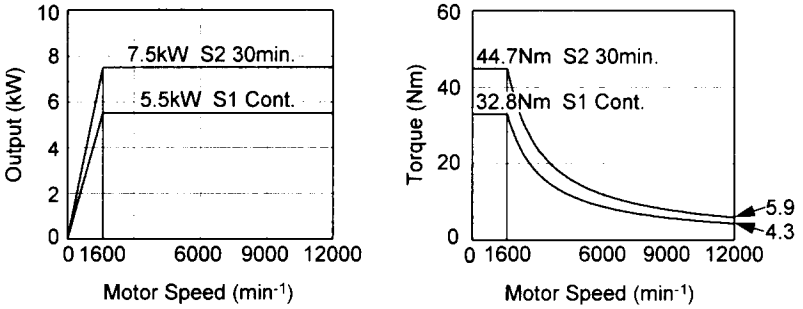


α B112L-5.5 (A06B-1233-B410#1xxx)

■Low winding

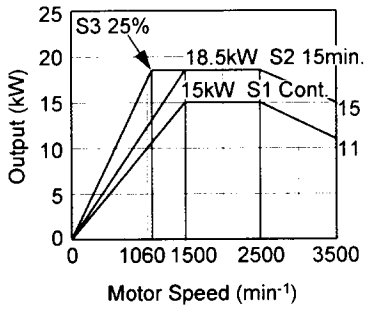


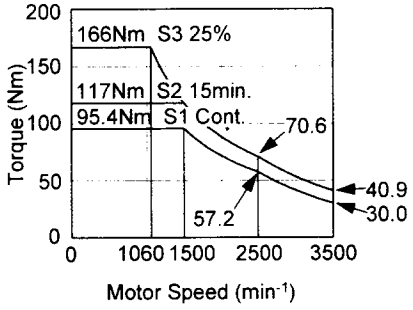
■High winding



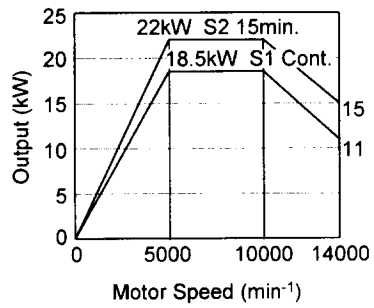
α B112L-18.5 (A06B-1233-B411#1xxx)

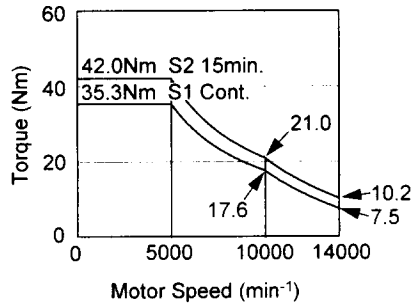
■Low winding





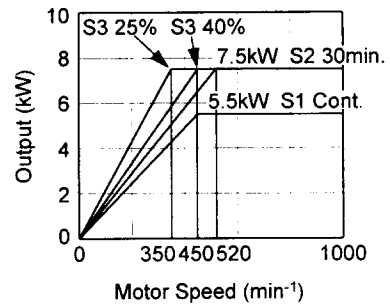
■High winding

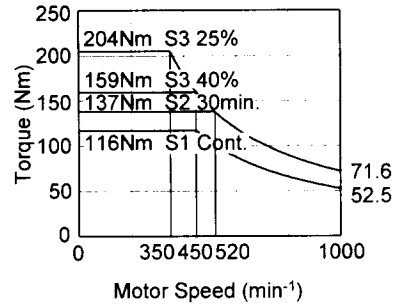




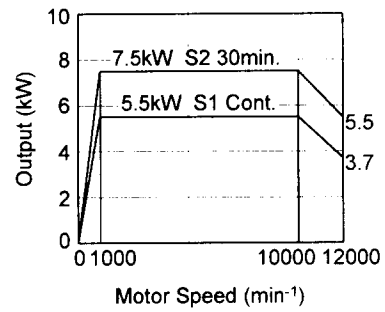
α B112LL-5.5 (A06B-1234-B410#1xxx)

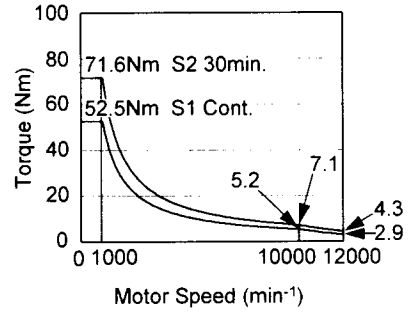
■Low winding





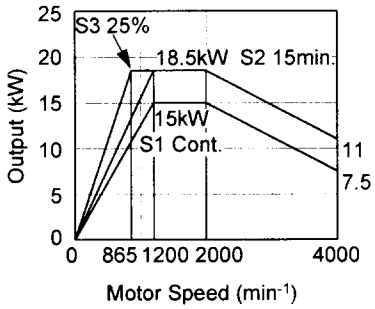
■High winding

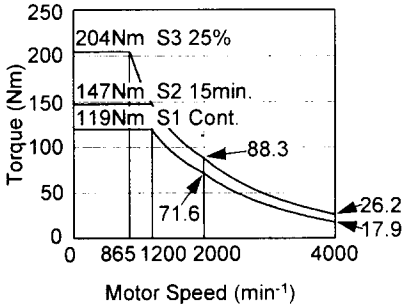




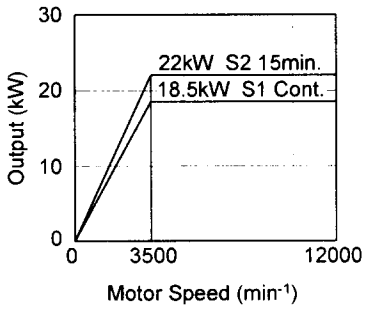
α B112LL-18.5 (A06B-1234-B411#Txxx)

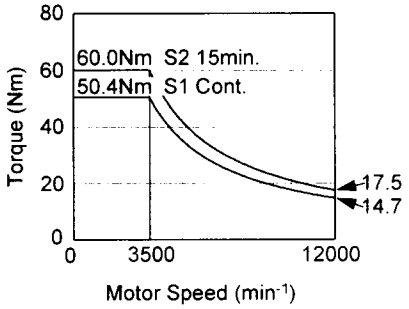
■Low winding





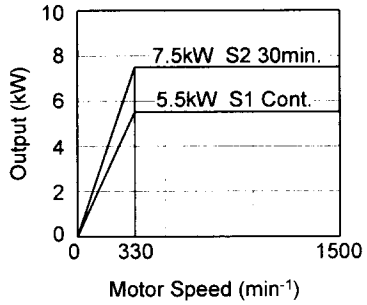
■High winding

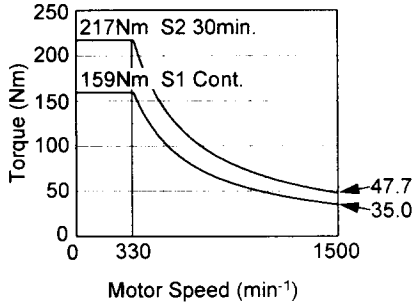




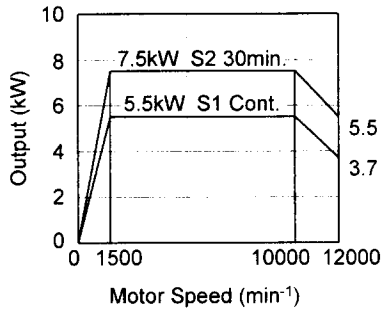
α B132L-5.5 (A06B-1241-B410#1xxx)

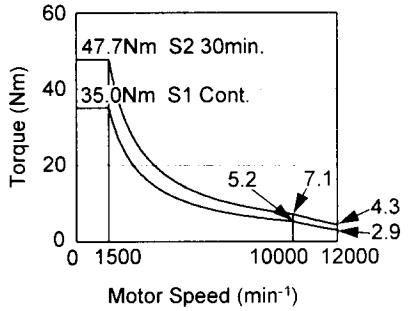
■Low winding





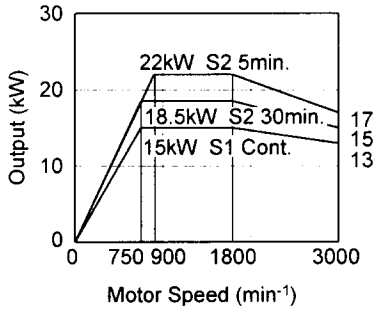
■High winding

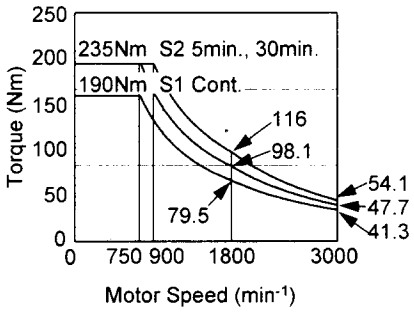




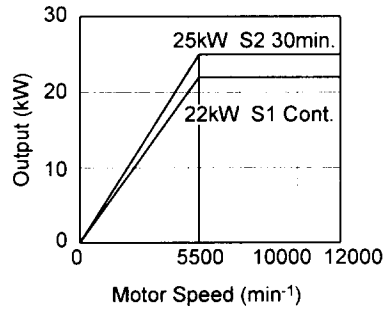
α B132L-22 (A06B-1241-B610#1xxx)

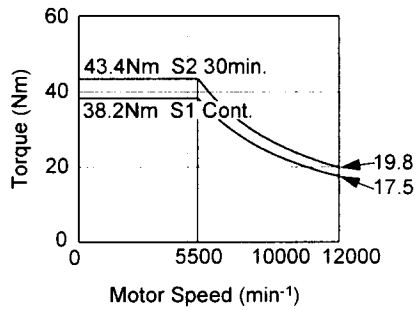
■Low winding



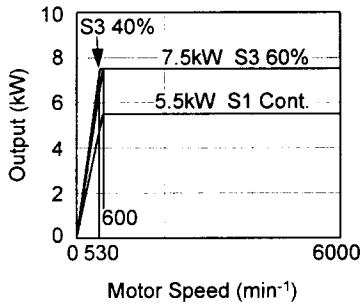


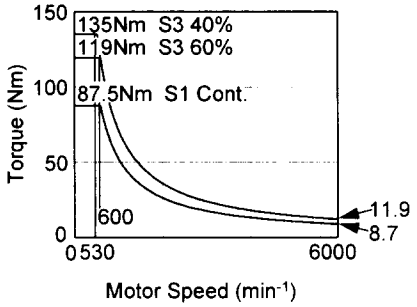
■High winding





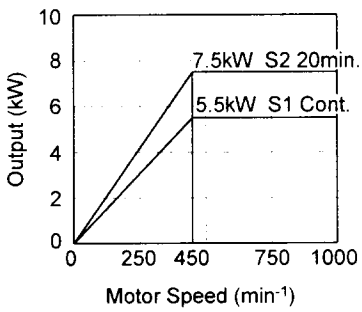
α B160S-5.5 (A06B-1251-B412#1xxx)

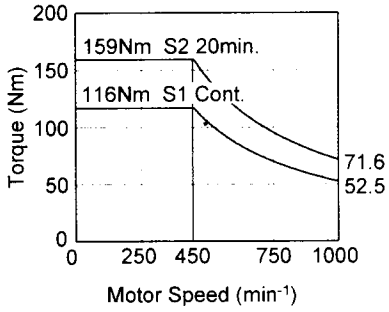




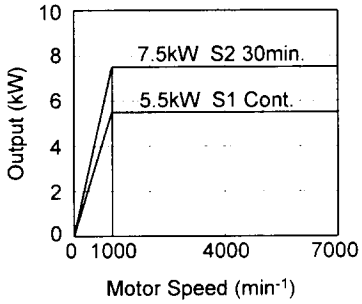
α B160M-5.5 (A06B-1252-B412#1xxx)

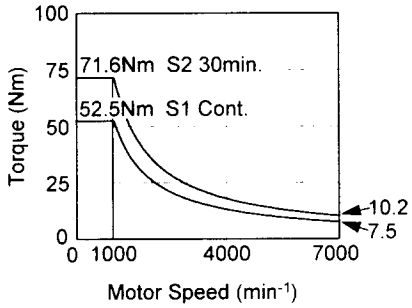
■Low winding





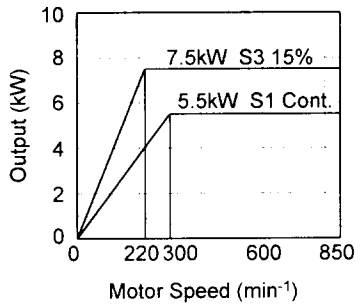
■High winding

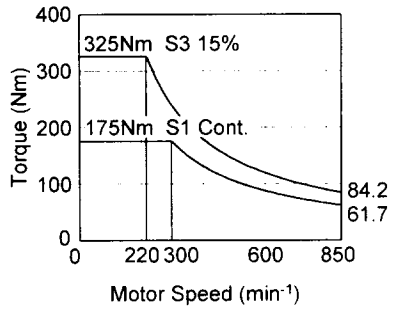




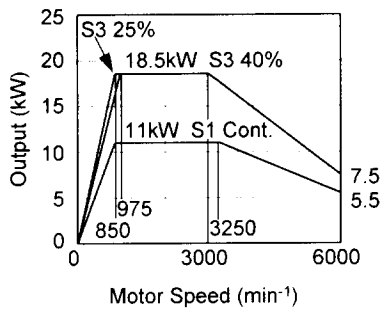
α B160M-11 (A06B-1252-B712#1xxx)

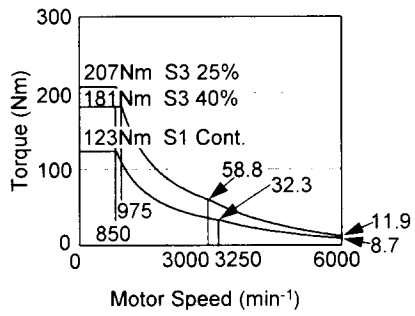
■Low winding





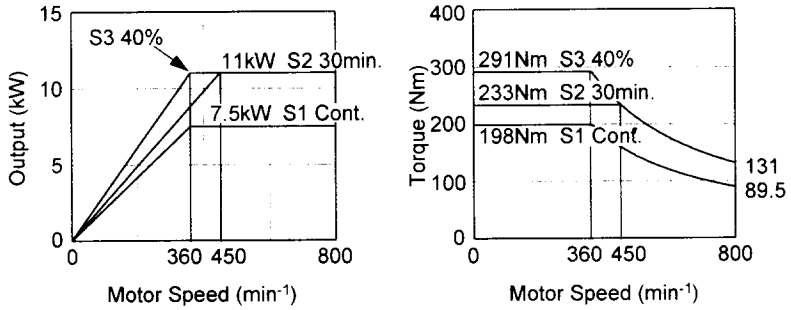
■High winding



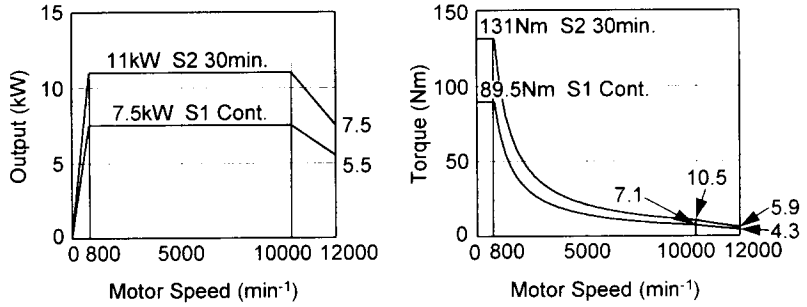


α B160L-7.5 (A06B-1255-B411#Txxx)

■Low winding

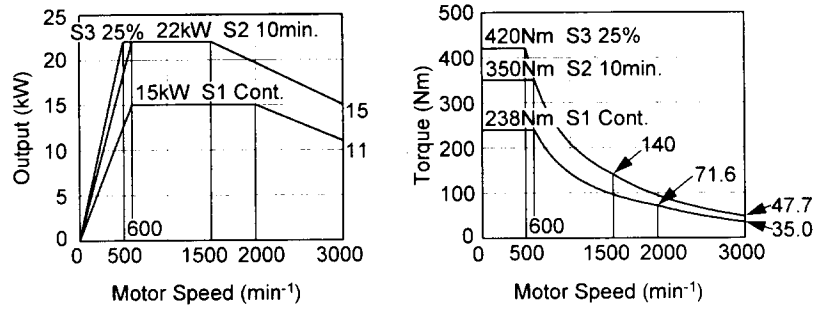


■High winding

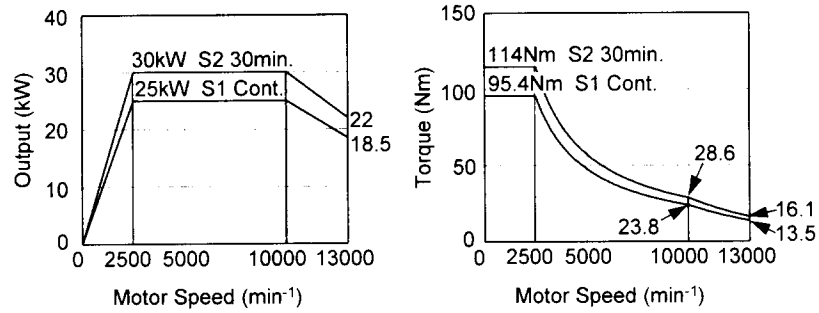


α B160LL-25 (A06B-1256-B411#1xxx)

■Low winding

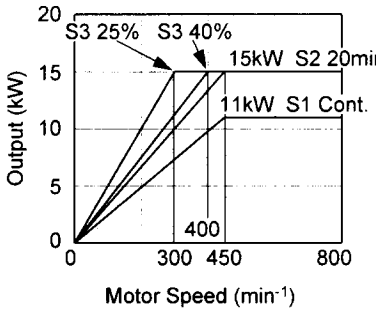


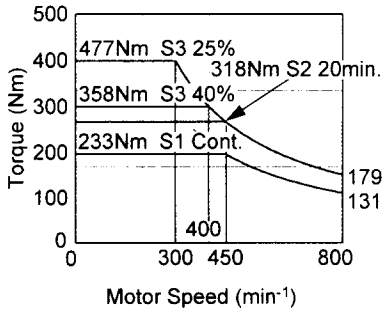
■High winding



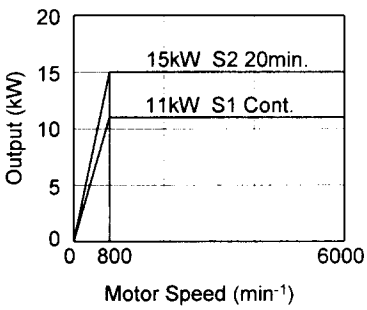
α B180M-11 (A06B-1261-B410#1xxx)

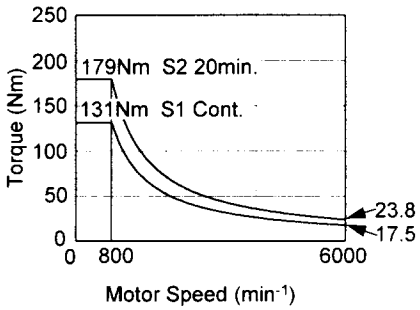
■Low winding





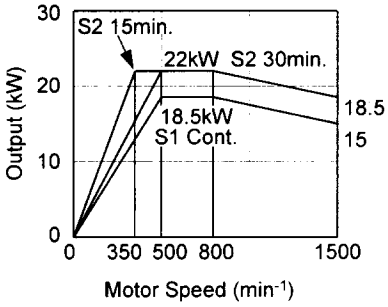
■High winding

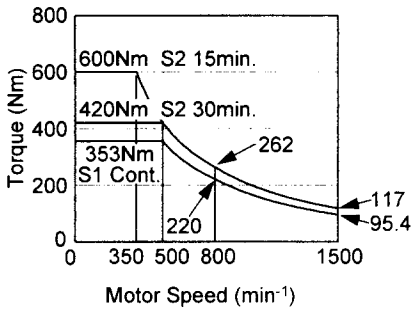




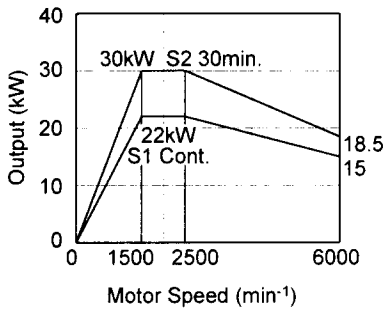
α B180L-22 (A06B-1262-B410#1xxx)

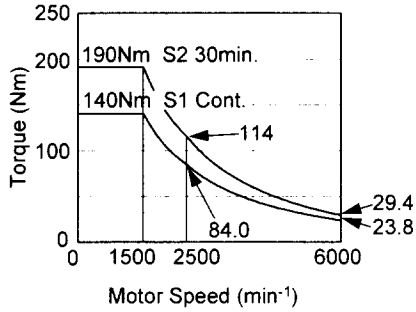
■Low winding





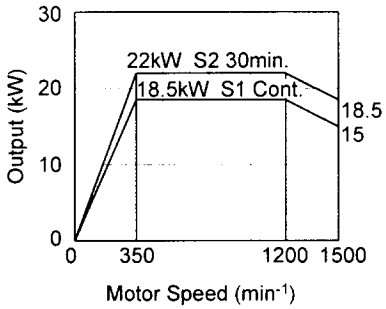
■High winding

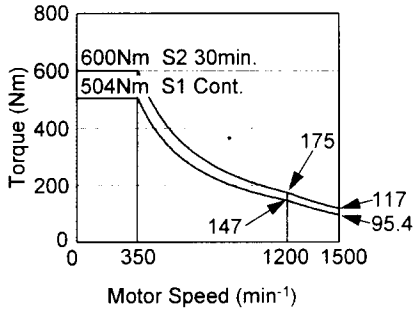




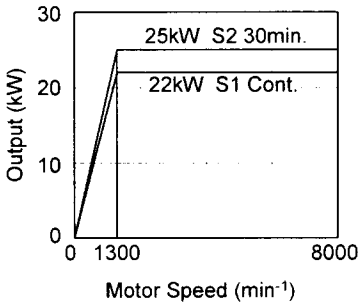
α B180LL-22 (A06B-1263-B411#1xxx)

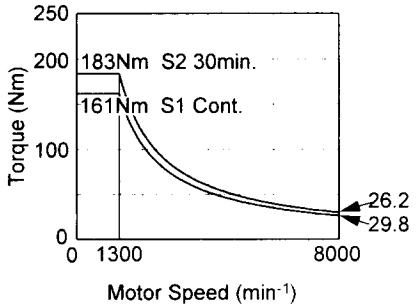
■Low winding





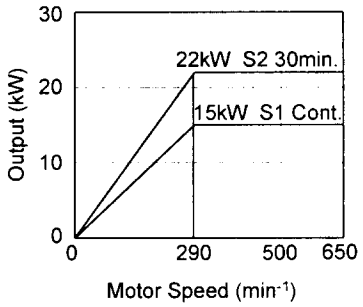
■High winding

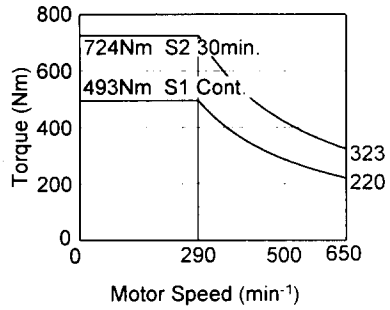




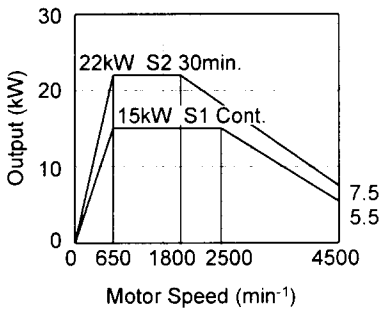
α B225M-15 (A06B-1273-B411#Txxx)

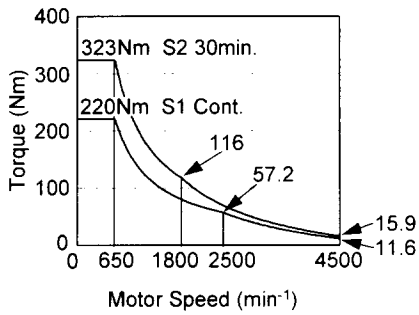
■Low winding





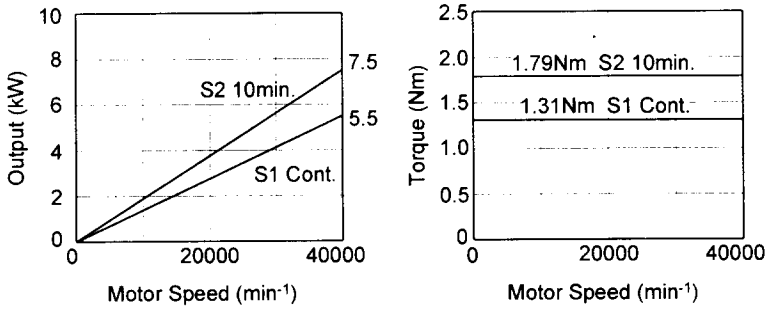
■High winding



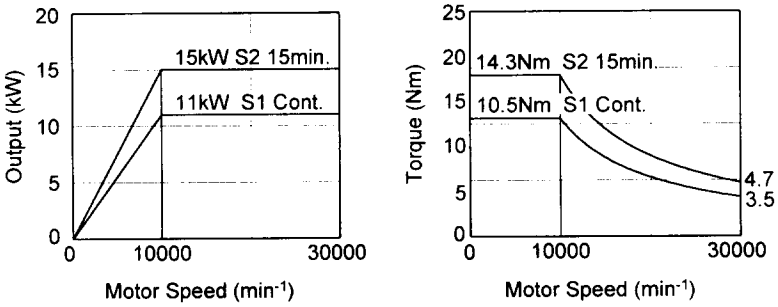


2.2 HIGH-SPEED TYPE

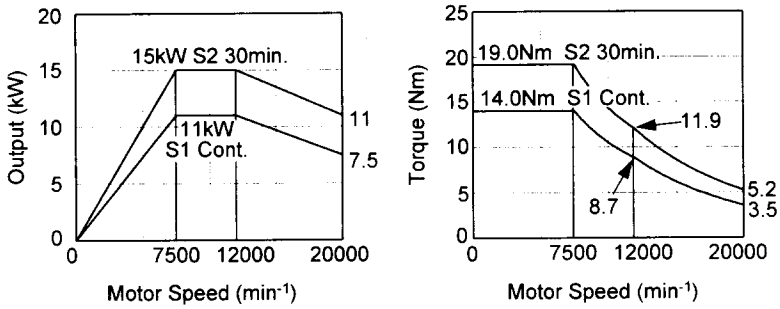
α B80S-5.5/40000 (Under development)



α B100S-11/30000 (A06B-1228-B414#3xxx)

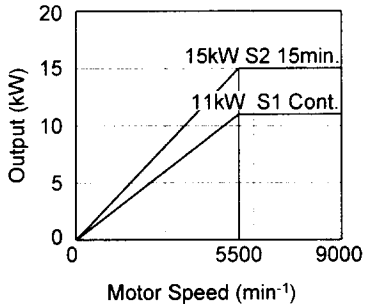


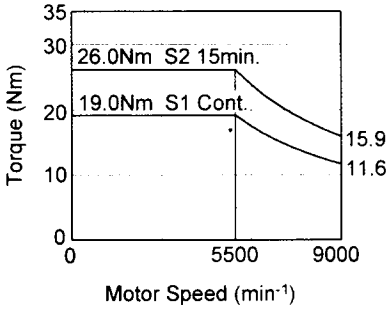
α B100S-11/20000 (A06B-1229-B902#1xxx)



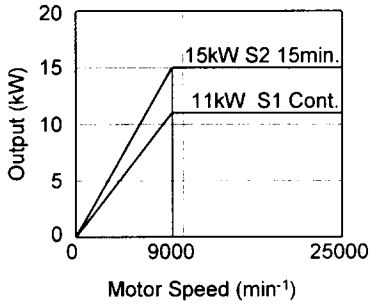
α B100L-11/25000 (A06B-1222-B415#1xxx)

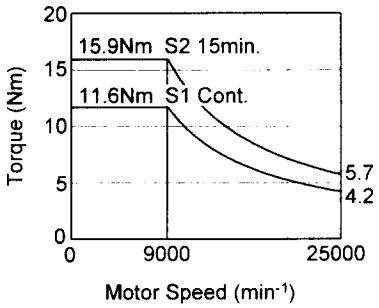
■Low winding





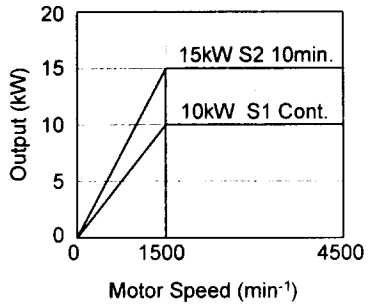
■High winding

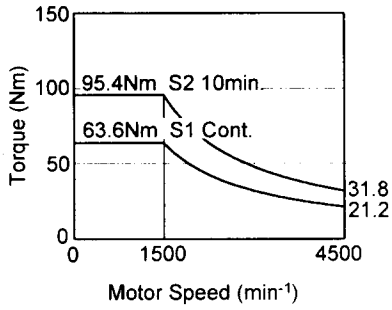




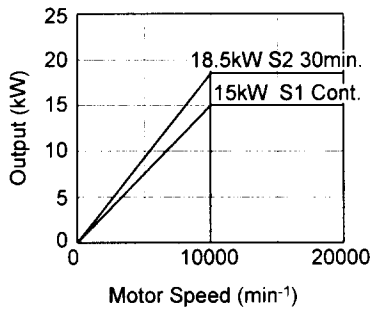
α B112M-15/20000 (A06B-1232-B415#1xxx)

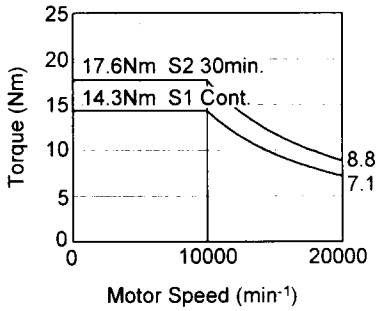
■Low winding





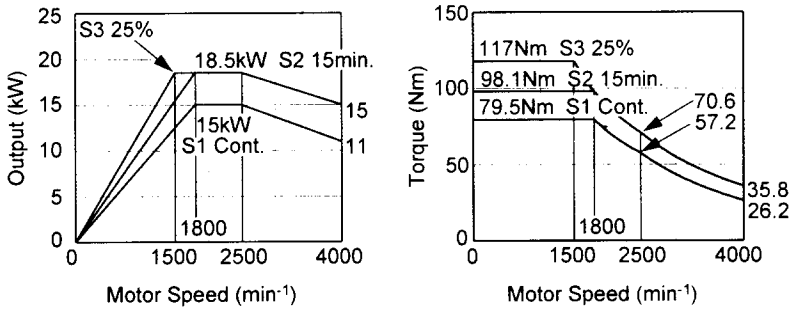
■High winding



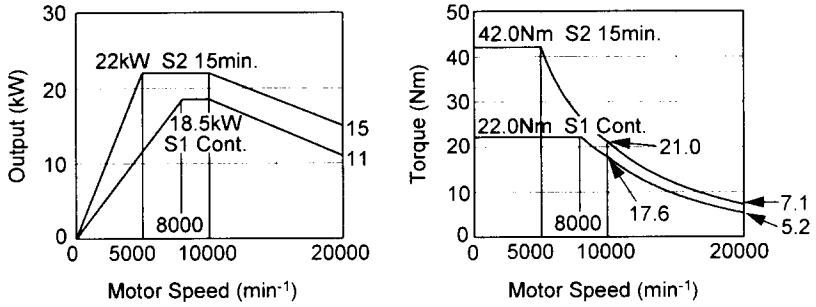


α B112L-18.5/20000 (A06B-1233-B411#Txxx)

■Low winding

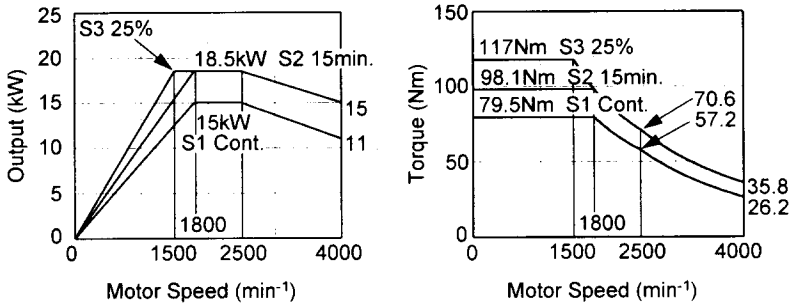


■High winding

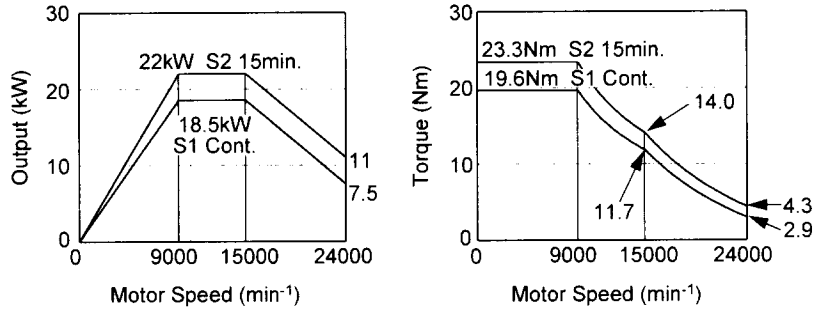


α B112L-18.5/24000 (A06B-1233-B814#1xxx : under modification)

■Low winding

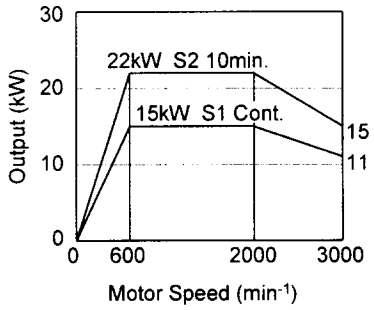


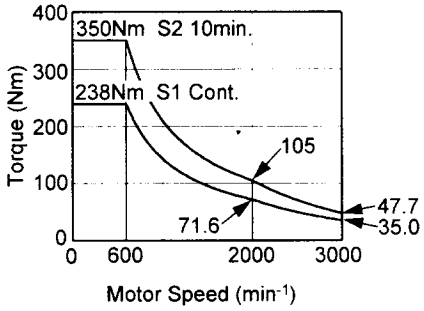
■High winding



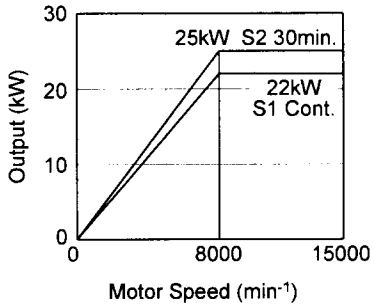
α B160LL-22/15000 (A06B-1256-B611#1xxx)

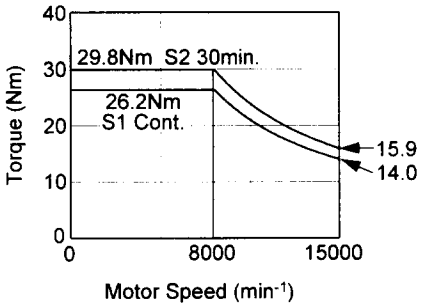
■Low winding





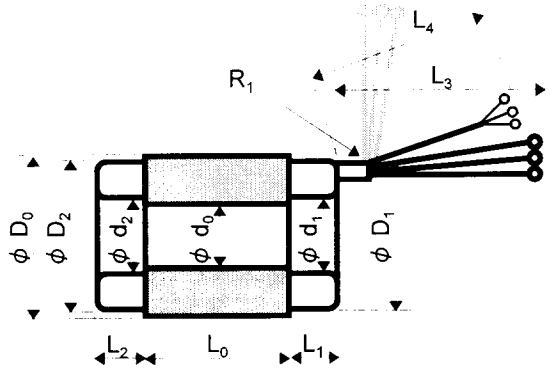
■High winding



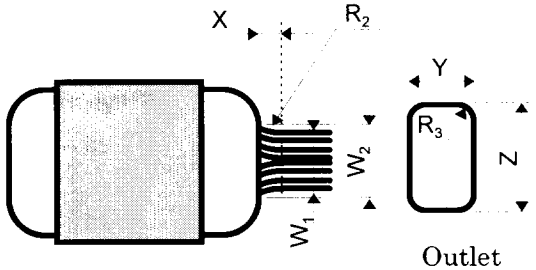


3 DIMENSIONS

3.1 STATOR



Side view(cut away)



Upper view

Outlet

Unit : mm

	Model name	Type No.(A06B-)	φ D_0	φ D_1	φ D_2	φ d_0	φ d_1	φ d_2	L_0	L_1	L_2	L_3	L_4
Standard type	α B80M-1.5	1211-B113#1xxx	120±0.01	112^{+0}	112^{+0}	(75)	76^{-0}	76^{-0}	120	40^{+0}	35^{+0}	1000	1000
	α B80L-1.1	1212-B413#1xxx	120±0.01	112^{+0}	112^{+0}	(75)	76^{-0}	76^{-0}	170	40^{+0}	35^{+0}	2000	2000
	α B100S-2.2	1221-B413#1xxx	156±0.01	142^{+0}	142^{+0}	(100)	101^{-0}	101^{-0}	110	49^{+0}	43^{+0}	2000	2000
	α B112S-3.7	1231-B413#1xxx	180±0.01	169^{+0}	169^{+0}	(115)	118^{-0}	118^{-0}	115	57^{+0}	52^{+0}	2000	2000
	α B112M-5.5	1232-B412#1xxx	180±0.01	167^{+0}	167^{+0}	(115)	118^{-0}	118^{-0}	180	52^{+0}	45^{+0}	2000	2000
	α B112L-5.5	1233-B410#1xxx	180±0.01	174^{+0}	174^{+0}	(115)	118^{-0}	118^{-0}	226	52^{+0}	47^{+0}	2000	2000
	α B112L-18.5	1233-B411#1xxx	180±0.01	174^{+0}	174^{+0}	(115)	118^{-0}	118^{-0}	226	55^{+0}	45^{+0}	2000	2000
	α B112LL-5.5	1234-B410#1xxx	180±0.01	174^{+0}	174^{+0}	(115)	118^{-0}	118^{-0}	280	62^{+0}	57^{+0}	2000	2000
	α B112LL-18.5	1234-B411#Txxx	180±0.01	174^{+0}	174^{+0}	(115)	118^{-0}	118^{-0}	280	62^{+0}	57^{+0}	2000	2000
	α B132L-5.5	1241-B410#1xxx	249±0.02	222^{+0}	222^{+0}	(132)	138^{-0}	138^{-0}	226	64^{+0}	57^{+0}	2000	2000
	α B132L-22	1241-B610#1xxx	240±0.02	230^{+0}	222^{+0}	(132)	138^{-0}	138^{-0}	226	74^{+0}	62^{+0}	2000	2000
	α B160S-5.5	1251-B412#1xxx	240±0.02	216^{+0}	216^{+0}	(160)	163^{-0}	163^{-0}	127	69^{+0}	58^{+0}	2000	2000
	α B160M-5.5	1252-B412#1xxx	240±0.02	227^{+0}	227^{+0}	(160)	162^{-0}	162^{-0}	182	70^{+0}	62^{+0}	2000	2000
	α B160M-11	1252-B712#1xxx	240±0.02	227^{+0}	227^{+0}	(160)	162^{-0}	162^{-0}	182	70^{+0}	62^{+0}	2000	2000
	α B160L-7.5	1255-B411#Txxx	240±0.02	227^{+0}	227^{+0}	(160)	164^{-0}	164^{-0}	272	70^{+0}	62^{+0}	2000	2000
	α B160LL-25	1256-B411#1xxx	240±0.02	227^{+0}	227^{+0}	(160)	162^{-0}	162^{-0}	332	80^{+0}	62^{+0}	2000	2000
	α B180M-11	1261-B410#1xxx	292±0.03	281^{+0}	280^{+0}	(190)	199^{-0}	199^{-0}	212	91^{+0}	80^{+0}	2000	2000
	α B180L-22	1262-B410#1xxx	292±0.03	281^{+0}	281^{+0}	(190)	197^{-0}	197^{-0}	302	91^{+0}	80^{+0}	2000	2000
	α B180LL-22	1263-B411#1xxx	292±0.03	281^{+0}	281^{+0}	(190)	197^{-0}	197^{-0}	362	91^{+0}	80^{+0}	2000	2000
	α B225M-15	1273-B411#Txxx	305±0.03	295^{+0}	295^{+0}	(210)	214^{-0}	214^{-0}	282	91^{+0}	80^{+0}	2000	2000
High speed type	α B80S-5.5/40000	(Under development)	150±0.01	146^{+0}	144^{+0}	(90)	92^{-0}	92^{-0}	85	48^{+0}	35^{+0}	2000	2000
	α B100S-11/30000	1228-B414#3xxx	180±0.01	174^{+0}	176^{+0}	(100)	103^{-0}	103^{-0}	110	62^{+0}	47^{+0}	2000	2000
	α B100S-11/20000	1229-B902#1xxx	156±0.01	144^{+0}	144^{+0}	(100)	101^{-0}	101^{-0}	110	46^{+0}	44^{+0}	1300	1300
	α B100L-11/25000	1222-B415#1xxx	156±0.01	148^{+0}	152^{+0}	(100)	101^{-0}	101^{-0}	210	62^{+0}	47^{+0}	2000	2000
	α B112M-15/20000	1232-B415#1xxx	180±0.01	174^{+0}	168^{+0}	(115)	118^{-0}	118^{-0}	180	60^{+0}	52^{+0}	2000	2000
	α B112L-18.5/20000	1233-B411#Txxx	180±0.01	174^{+0}	174^{+0}	(115)	118^{-0}	118^{-0}	226	55^{+0}	45^{+0}	2000	2000
	α B112L-18.5/24000	1233-B814#1xxx	180±0.01	174^{+0}	174^{+0}	(115)	118^{-0}	118^{-0}	226	66^{+0}	47^{+0}	2000	2000
	α B160LL-22/15000	1256-B611#1xxx	240±0.02	227^{+0}	227^{+0}	(160)	162^{-0}	162^{-0}	332	80^{+0}	62^{+0}	2000	2000

Unit : mm

	Model name	Type No.(A06B-)	W_1	W_2	R_1	R_2	R_3	X	Y	Z
Standard type	α B80M-1.5	1211-B113#1xxx	20	30	10 - 15	10 - 15	3 - 5	3 or more	20 or more	40 or more
	α B80L-1.1	1212-B413#1xxx	20	30	10 - 15	10 - 15	3 - 5	3 or more	20 or more	40 or more
	α B100S-2.2	1221-B413#1xxx	40	50	10 - 15	20 - 25	3 - 5	3 or more	20 or more	60 or more
	α B112S-3.7	1231-B413#1xxx	40	50	10 - 15	10 - 15	3 - 5	3 or more	20 or more	60 or more
	α B112M-5.5	1232-B412#1xxx	50	60	20 - 25	25 - 30	3 - 5	3 or more	20 or more	50 or more
	α B112L-5.5	1233-B410#1xxx	60	70	25 - 30	25 - 30	3 - 5	3 or more	25 or more	80 or more
	α B112L-18.5	1233-B411#1xxx	70	80	30 - 35	30 - 35	3 - 5	3 or more	30 or more	90 or more
	α B112LL-5.5	1234-B410#1xxx	70	80	30 - 35	30 - 35	3 - 5	3 or more	30 or more	90 or more
	α B112LL-18.5	1234-B411#Txxx	70	80	30 - 35	30 - 35	3 - 5	3 or more	30 or more	90 or more
	α B132L-5.5	1241-B410#1xxx	60	70	25 - 30	25 - 30	3 - 5	3 or more	25 or more	80 or more
	α B132L-22	1241-B610#1xxx	80	90	35 - 40	35 - 40	3 - 5	3 or more	40 or more	100 or more
	α B160S-5.5	1251-B412#1xxx	50	60	20 - 25	25 - 30	3 - 5	3 or more	20 or more	70 or more
	α B160M-5.5	1252-B412#1xxx	50	60	20 - 25	25 - 30	3 - 5	3 or more	20 or more	70 or more
	α B160M-11	1252-B712#1xxx	50	60	30 - 35	30 - 35	3 - 5	3 or more	30 or more	90 or more
	α B160L-7.5	1255-B411#Txxx	70	80	30 - 35	30 - 35	3 - 5	3 or more	30 or more	90 or more
	α B160LL-25	1256-B411#1xxx	70	80	30 - 35	30 - 35	3 - 5	3 or more	30 or more	90 or more
	α B180M-11	1261-B410#1xxx	70	80	30 - 35	30 - 35	3 - 5	3 or more	30 or more	90 or more
	α B180L-22	1262-B410#1xxx	80	90	35 - 40	35 - 40	3 - 5	3 or more	40 or more	100 or more
	α B180LL-22	1263-B411#1xxx	80	90	35 - 40	35 - 40	3 - 5	3 or more	40 or more	100 or more
	α B225M-15	1273-B411#Txxx	80	90	35 - 40	35 - 40	3 - 5	3 or more	40 or more	100 or more
High speed type	α B80S-5.5/40000	(Under development)	60	70	25 - 30	25 - 30	3 - 5	3 or more	25 or more	80 or more
	α B100S-11/30000	1228-B414#3xxx	60	70	25 - 30	25 - 30	3 - 5	3 or more	25 or more	80 or more
	α B100S-11/20000	1229-B902#1xxx	30	40	25 - 30	25 - 30	3 - 5	3 or more	25 or more	50 or more
	α B100L-11/25000	1222-B415#1xxx	70	80	30 - 35	30 - 35	3 - 5	3 or more	35 or more	90 or more
	α B112M-15/20000	1232-B415#1xxx	70	80	30 - 35	30 - 35	3 - 5	3 or more	30 or more	90 or more
	α B112L-18.5/20000	1233-B411#Txxx	70	80	30 - 35	30 - 35	3 - 5	3 or more	30 or more	90 or more
	α B112L-18.5/24000	1233-B814#1xxx	80	90	35 - 40	35 - 40	3 - 5	3 or more	40 or more	100 or more
	α B160LL-22/15000	1256-B611#1xxx	80	90	35 - 40	35 - 40	3 - 5	3 or more	40 or more	100 or more

NOTE

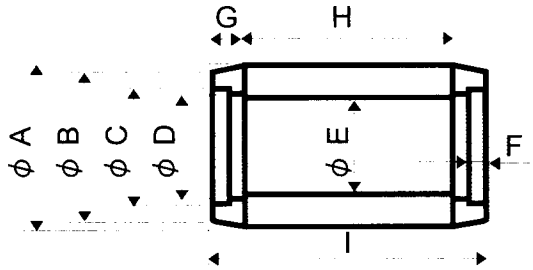
- R_1 is the minimum bending radius of power leads.
- Y, Z, and R_3 indicate a recommended outlet size at position X.
- If power leads or thermal leads is too long, it may be cut to a usable length.
- A tolerance of D_0 represents a machining dimension. The core is laminated, and a distortion of about 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.

	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	α B80M-1.5	1211-B113#1xxx	2	3	2.8	None	Connection A
	α B80L-1.1	1212-B413#1xxx	2	3	2.8	M5	Connection A
	α B100S-2.2	1221-B413#1xxx	3.5	6	3.5	M4	Connection B
	α B112S-3.7	1231-B413#1xxx	3.5	6	3.5	M6	Connection B
	α B112M-5.5	1232-B412#1xxx	5.5	3	4.4	M6	Connection A
	α B112L-5.5	1233-B410#1xxx	8	6	5.1	M6	Connection C
	α B112L-18.5	1233-B411#1xxx	14	6	6.5	M8	Connection C
	α B112LL-5.5	1234-B410#1xxx	14	6	6.5	M8	Connection C
	α B112LL-18.5	1234-B411#Txxx	14	6	6.5	M8	Connection C
	α B132L-5.5	1241-B410#1xxx	8	6	5.1	M6	Connection C
	α B132L-22	1241-B610#1xxx	$14mm^2 \times 6$, $8mm^2 \times 3$		6.5, 5.1	M8	Connection E
	α B160S-5.5	1251-B412#1xxx	5.5	6	4.4	M6	Connection B
	α B160M-5.5	1252-B412#1xxx	5.5	6	4.4	M6	Connection D
	α B160M-11	1252-B712#1xxx	14	6	6.5	M6	Connection D
	α B160L-7.5	1255-B411#Txxx	14	6	6.5	M6	Connection D
	α B160LL-25	1256-B411#1xxx	14	6	6.5	M8	Connection C
	α B180M-11	1261-B410#1xxx	14	6	6.5	M8	Connection C
	α B180L-22	1262-B410#1xxx	22	6	8.6	M8	Connection C
	α B180LL-22	1263-B411#1xxx	22	6	8.6	M8	Connection C
	α B225M-15	1273-B411#Txxx	22	6	8.6	M8	Connection C
High speed type	α B80S-5.5/40000	(Under development)	8	6	5.1	M8	Connection B
	α B100S-11/20000	1229-B902#1xxx	$8\ mm^2 \times 2$ para.	3	Max.12	M8	Connection A
	α B100S-11/30000	1228-B414#3xxx	8	6	5.1	M8	Connection B
	α B100L-11/25000	1222-B415#1xxx	14	6	6.5	M8	Connection D
	α B112M-15/20000	1232-B415#1xxx	14	6	6.5	M8	Connection C
	α B112L-18.5/20000	1233-B411#Txxx	14	6	6.5	M8	Connection C
	α B112L-18.5/24000	1233-B814#1xxx	14	12	6.5	M8	-
	α B160LL-22/15000	1256-B611#1xxx	$14mm^2 \times 2$ para. $\times 3$, $14mm^2 \times 6$		Max.15	M8	Connection E

NOTE

- The outer diameter of the thermal lead is ϕ 5.2±0.3mm. This cable consists of two wires (20AWG) and one shield net-wire.
- 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 "2.2 POWER LEADS CONNECTIONS" in "Ⅱ.INSTRUCTION" for details of power leads connection.

3.2 ROTOR

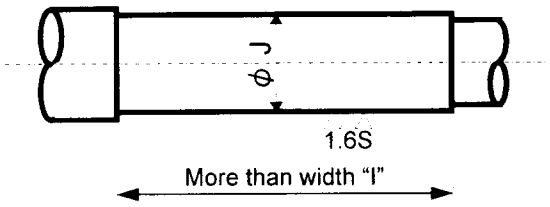


Unit : mm

	Model name	Type No.(A06B-)	φ A	φ B	φ C	φ D	φ E	F	G	H	I
Standard type	α B80M-1.5	1211-B113#1xxx	74.15 $^{+0.2}_{0}$ (73.90±0.01)	72	44	42 (Ef $^{+0.4}_{+0.2}$)	41 (Ef±0.01)	3	9	118	136
	α B80L-1.1	1212-B413#1xxx	74.15±0.1 (73.90±0.01)	72	44	42 (Ef $^{+0.4}_{+0.2}$)	41 (Ef±0.01)	3	9	168	186
	α B100S-2.2	1221-B413#1xxx	99.2 $^{+0.2}_{0}$ (99.00±0.01)	96	62	58 (Ef $^{+0.4}_{+0.2}$)	58.0 (Ef±0.01)	8	13	108	134
	α B112S-3.7	1231-B413#1xxx	114.5 $^{+0.2}_{0}$ (114.20±0.01)	111	76.5	74.4 (Ef $^{+0.4}_{+0.2}$)	74.0 (Ef±0.01)	5	15	113	143
	α B112M-5.5	1232-B412#1xxx	114.5 $^{+0.2}_{0}$ (114.20±0.02)	111	76	74.4 (Ef $^{+0.4}_{+0.2}$)	74.0 (Ef±0.01)	5	15	178	208
	α B112L-5.5	1233-B410#1xxx	114.3 $^{+0.2}_{0}$ (114.00±0.02)	111	76	74.4 (Ef $^{+0.4}_{+0.2}$)	74.0 (Ef±0.01)	5	15	224	254
	α B112L-18.5	1233-B411#1xxx	114.3 $^{+0.2}_{0}$ (114.00±0.02)	111	76	74.4 (Ef $^{+0.4}_{+0.2}$)	74.0 (Ef±0.01)	5	15	224	254
	α B112LL-5.5	1234-B410#1xxx	114.3 $^{+0.2}_{0}$ (114.00±0.02)	111	76	74.4 (Ef $^{+0.4}_{+0.2}$)	74.0 (Ef±0.01)	5	15	278	308
	α B112LL-18.5	1234-B411#Txxx	114.3 $^{+0.2}_{0}$ (114.00±0.02)	111	76	74.4 (Ef $^{+0.4}_{+0.2}$)	74.0 (Ef±0.01)	5	15	278	308
	α B132L-5.5	1241-B410#1xxx	131.3 $^{+0.2}_{0}$ (131.00±0.02)	128	75	74.4 (Ef $^{+0.4}_{+0.2}$)	74.0 (Ef±0.01)	5	15	224	254
	α B132L-22	1241-B610#1xxx	131.3 $^{+0.2}_{0}$ (131.00±0.02)	128	75	74.4 (Ef $^{+0.4}_{+0.2}$)	74.0 (Ef±0.01)	5	15	224	254
	α B160S-5.5	1251-B412#1xxx	159.2 $^{+0.2}_{0}$ (158.51±0.01)	155	104	102 (Ef $^{+0.4}_{+0.2}$)	101 (Ef±0.01)	7	18	125	161
	α B160M-5. 5	1252-B412#1xxx	159.2 $^{+0.2}_{0}$ (158.91±0.02)	155	104	102 (Ef $^{+0.4}_{+0.2}$)	101 (Ef±0.01)	7	18	180	216
	α B160M-11	1252-B712#1xxx	159.2 $^{+0.2}_{0}$ (158.91±0.02)	155	104	102 (Ef $^{+0.4}_{+0.2}$)	101 (Ef±0.01)	7	18	180	216
	α B160L-7.5	1255-B411#Txxx	158.9 $^{+0.2}_{0}$ (158.40±0.02)	155	104	102 (Ef $^{+0.4}_{+0.2}$)	101 (Ef±0.01)	7	18	270	306
	α B160LL-25	1256-B411#1xxx	158.5 $^{+0.2}_{0}$ (158.11±0.02)	155	-	101 (Ef $^{+0.4}_{+0.2}$)	101 (Ef±0.01)	-	18	330	366
	α B180M-11	1261-B410#1xxx	188.7 $^{+0.2}_{0}$ (188.32±0.02)	187	127	125 (Ef $^{+0.4}_{+0.2}$)	124 (Ef±0.01)	5	18	210	246
	α B180L-22	1262-B410#1xxx	188.8 $^{+0.2}_{0}$ (188.48±0.02)	185	127	125 (Ef $^{+0.4}_{+0.2}$)	124 (Ef±0.01)	5	18	300	336
	α B180LL-22	1263-B411#1xxx	189.2 $^{+0.2}_{0}$ (188.48±0.02)	187	127	125 (Ef $^{+0.4}_{+0.2}$)	124 (Ef±0.01)	5	18	360	396
	α B225M-15	1273-B411#Txxx	209.1 $^{+0.2}_{0}$ (208.80±0.02)	204	150	146.5 (Ef $^{+0.4}_{+0.2}$)	146 (Ef±0.01)	10	21	280	322
High-speed type	α B80S-5.5/40000	(Under development)	89±0.1 (88.80±0.01)	-	-	-	60±0.1 (Ef±0.005)	-	11.5	83	106
	α B100S-11/30000	1228-B414#3xxx	99.3 $^{+0.2}_{0}$ (98.6±0.01, width H)	98.4	-	(Ef $^{+0.065}_{+0.075}$) (Both side 3.5)	61.5 (Ef±0.005)	-	12.5	108	133
	α B100S-11/20000	1229-B902#1xxx	99.3 $^{+0.2}_{0}$ (98.60±0.01)	96	-	70.0 (Ef±0.01)	70.0 (Ef±0.01)	-	12.5	108	133
	α B100L-11/25000	1222-B415#1xxx	99.0 $^{+0.2}_{0}$ (98.20±0.01)	-	-	-	69.97 (Ef±0.01)	-	12.5	208	233
	α B112M-15/20000	1232-B415#1xxx	113.7 $^{+0.2}_{0}$ (113.40±0.01)	110	-	74.0 (Ef±0.01)	74.0 (Ef±0.01)	-	14.5	178	207
	α B112L-18.5/20000	1233-B411#Txxx	113.7 $^{+0.2}_{0}$ (113.40±0.02)	111	76.5	74.4 (Ef±0.01)	74.0 (Ef±0.01)	5	14.5	224	253
	α B112L-18.5/24000	1233-B814#1xxx	113.7 $^{+0.2}_{0}$ (113.40±0.03)	-	-	-	76.9 (Ef±0.01)	-	14.5	224	253
	α B160LL-22/15000	1256-B611#1xxx	158.5 $^{+0.2}_{0}$ (158.11±0.02)	158	-	101.4 (Ef±0.01)	101.4 (Ef±0.01)	-	17.5	330	365

NOTE Refer to the next page for Ef.

Reference size of spindle shaft



Unit : mm

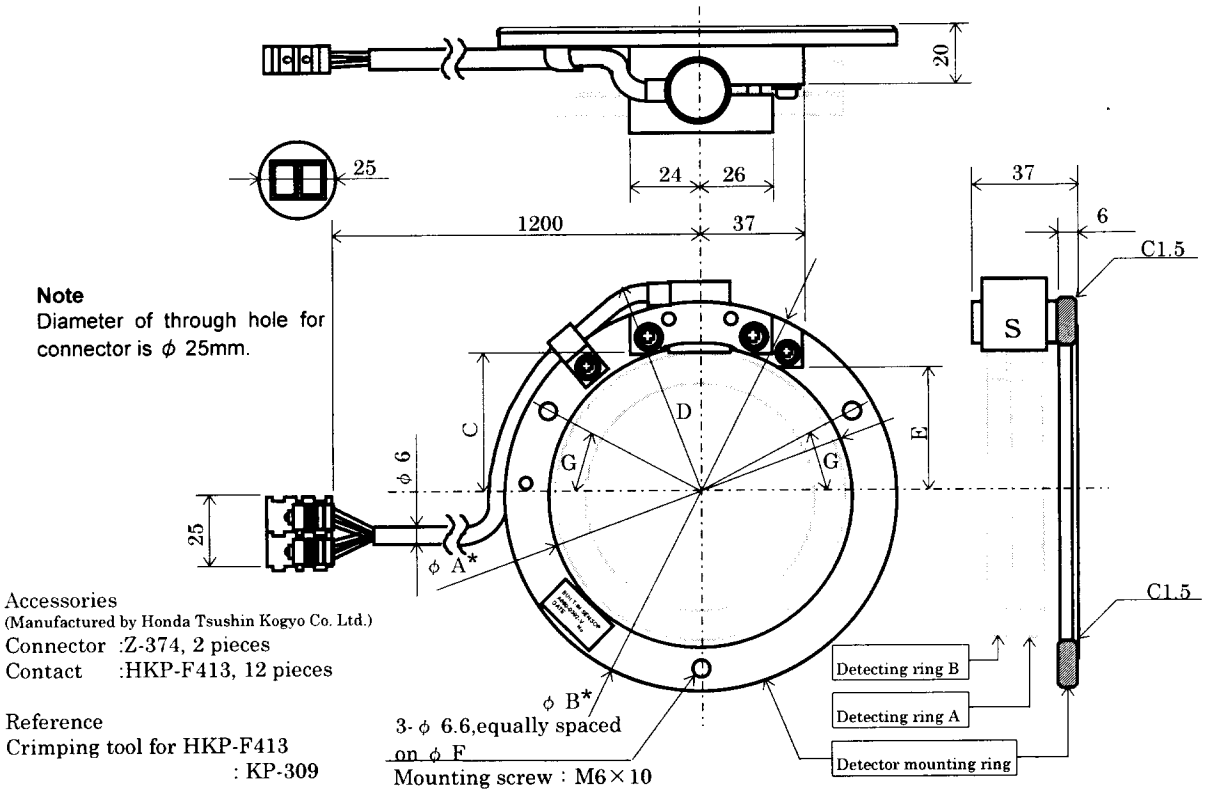
	Model name	Type No.(A06B-)	ϕ J	Ef	Interference for shrinking
Standard type	α B80M-1.5	1211-B113#1xxx	Ef $^{+0.055}_{+0.035}$	41.4≦Ef≦42.0	25 - 65 μ m
	α B80L-1.1	1212-B413#1xxx	Ef $^{+0.055}_{+0.035}$	41.4≦Ef≦42.0	25 - 65 μ m
	α B100S-2.2	1221-B413#1xxx	Ef $^{+0.060}_{+0.040}$	58.4≦Ef≦59.0	30 - 70 μ m
	α B112S-3.7	1231-B413#1xxx	Ef $^{+0.060}_{+0.040}$	74.4≦Ef≦77.0	30 - 70 μ m
	α B112M-5.5	1232-B412#1xxx	Ef $^{+0.060}_{+0.040}$	74.4≦Ef≦77.0	30 - 70 μ m
	α B112L-5.5	1233-B410#1xxx	Ef $^{+0.060}_{+0.040}$	74.4≦Ef≦77.0	30 - 70 μ m
	α B112L-18.5	1233-B411#1xxx	Ef $^{+0.060}_{+0.040}$	74.4≦Ef≦77.0	30 - 70 μ m
	α B112LL-5.5	1234-B410#1xxx	Ef $^{+0.060}_{+0.040}$	74.4≦Ef≦77.0	30 - 70 μ m
	α B112LL-18.5	1234-B411#Txxx	Ef $^{+0.060}_{+0.040}$	74.4≦Ef≦77.0	30 - 70 μ m
	α B132L-5.5	1241-B410#1xxx	Ef $^{+0.060}_{+0.040}$	74.4≦Ef≦77.0	30 - 70 μ m
	α B132L-22	1241-B610#1xxx	Ef $^{+0.070}_{+0.050}$	74.4≦Ef≦84.0	40 - 80 μ m
	α B160S-5.5	1251-B412#1xxx	Ef $^{+0.080}_{+0.070}$	101.4≦Ef≦102.0	30 - 85 μ m
	α B160M-5.5	1252-B412#1xxx	Ef $^{+0.070}_{+0.050}$	101.4≦Ef≦102.0	40 - 80 μ m
	α B160M-11	1252-B712#1xxx	Ef $^{+0.070}_{+0.050}$	101.4≦Ef≦102.0	40 - 80 μ m
	α B160L-7.5	1255-B411#Txxx	Ef $^{+0.070}_{+0.050}$	101.4≦Ef≦102.0	40 - 80 μ m
	α B160LL-25	1256-B411#1xxx	Ef $^{+0.090}_{+0.070}$	101.4≦Ef≦103.0	60 - 100 μ m
	α B180M-11	1261-B410#1xxx	Ef $^{+0.070}_{+0.050}$	124.4≦Ef≦125.0	40 - 80 μ m
	α B180L-22	1262-B410#1xxx	Ef $^{+0.070}_{+0.050}$	125.5≦Ef≦126.1	40 - 80 μ m
	α B180LL-22	1263-B411#1xxx	Ef $^{+0.070}_{+0.050}$	124.4≦Ef≦125.0	40 - 80 μ m
	α B225M-15	1273-B411#Txxx	Ef $^{+0.030}_{+0.020}$	146.4≦Ef≦147.0	30 - 60 μ m
High-speed type	α B80S-5.5/40000	(Under development)	Ef $^{+0.110}_{+0.105}$	Ef = 60.2	100 - 115 μ m
	α B100S-11/30000	1228-B414#3xxx	Ef $^{+0.115}_{+0.110}$	61.6≦Ef≦62.0	105 - 120 μ m
	α B100S-11/20000	1229-B902#1xxx	Ef $^{+0.050}_{+0.040}$	70.4≦Ef≦70.5	35 - 55 μ m
	α B100L-11/25000	1222-B415#1xxx	Ef $^{+0.100}_{+0.090}$	70.0≦Ef≦70.5	80 - 110 μ m
	α B112M-15/20000	1232-B415#1xxx	Ef $^{+0.080}_{+0.070}$	74.4≦Ef≦77.0	70 - 100 μ m
	α B112L-18.5/20000	1233-B411#Txxx	Ef $^{+0.090}_{+0.080}$	74.4≦Ef≦77.0	70 - 100 μ m
	α B112L-18.5/24000	1233-B814#1xxx	Ef $^{+0.110}_{+0.100}$	77.0≦Ef≦77.2	90 - 120 μ m
	α B160LL-22/15000	1256-B611#1xxx	Ef $^{+0.100}_{+0.090}$	101.4≦Ef≦103.0	70 - 110 μ m

NOTE

- The values in parentheses are the dimension for final finishing. Finish into these dimensions.
- Select a value of Ef within the allowable range of Ef.
- Machine ϕ C and ϕ E into the same size of ϕ E as you possible. And shrink fit the parts of ϕ C and ϕ E to the shaft as same as the part of ϕ E.
- When cutting fluid is used for machining, remove moisture completely from the core after machining by heating the rotor.
- Machine on the parts designated by FANUC. Incorrect machining will affect the motor life. Read "Ⅱ.INSTRUCTION" before machining.

3.3 SENSOR

3.3.1 Built-in Sensor (with Mounting Ring)



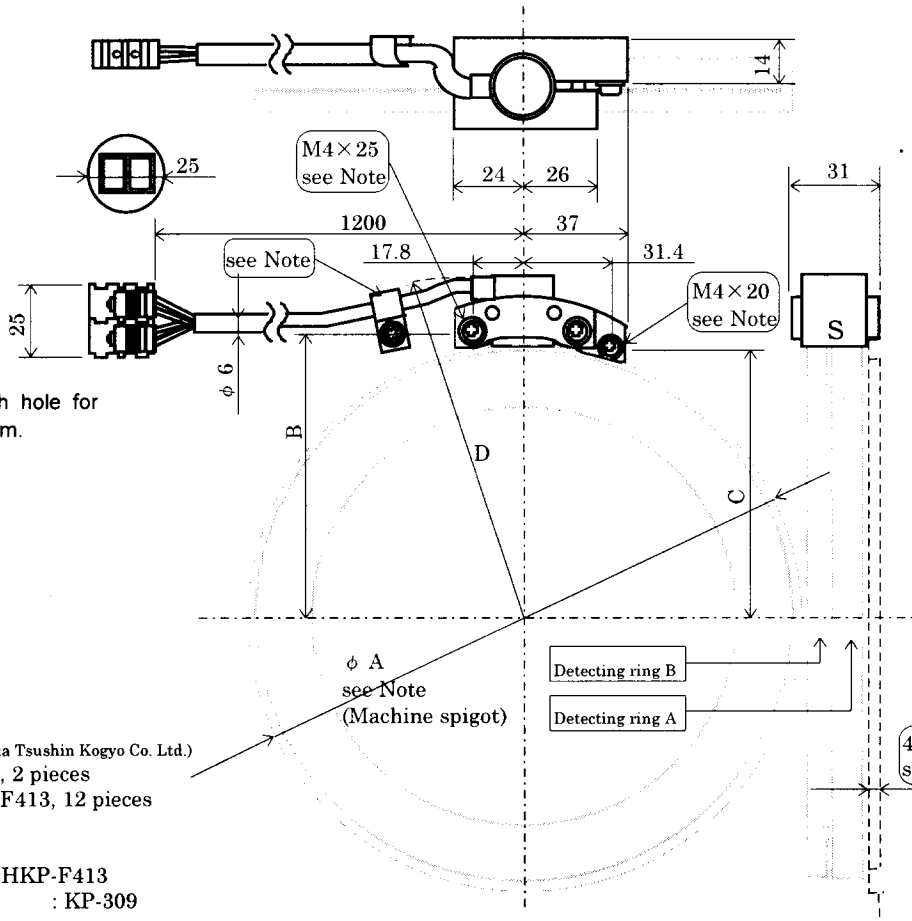
Sensor type No.	Detecting ring	Resolution Div./Rev.	ϕ A *	ϕ B *	C	D	E	ϕ F	G
A860-0392-T011	Ring 1	4096	$108^{+0.040}_{+0.020}$	$140h6^{+0.0}_{-0.025}$	51	R80	46	124	30°
A860-0392-T014	Ring 4								
A860-0392-T081	Ring 6								
A860-0392-T012	Ring 2	2048	$56H6^{+0.019}_{-0.0}$	$100h6^{+0.0}_{-0.022}$	25	R57	20	78	10°
A860-0392-T082	Ring 7								

Refer to the following section "Detecting ring" for details of detecting rings.

NOTE

- Use this sensor under 80℃.
- Handle these precision parts with special care. In particular, never apply external force to part S.
- The detector 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 detector so that it is aligned with the inner or outer diameter of the guide. Otherwise, the detector may produce incorrect output.
- The gap between detector and detecting ring is preadjusted. Therefore, never remove the detecting element from the detector mounting ring.
- Check the feedback signal after mounting the sensor. If the incorrect feedback signal is output, it is necessary to adjust. Adjustment procedure is shown in "4.1.4 Feedback Signal Adjustment" in part Ⅱ.
- Connect the shield wire.
- For easy maintenance, consider a replaceable structure.
- Use the detecting ring indicated in the table. Do not break the combination of detector and detecting ring.
- Mating connectors are provided with the detector.

Built-in Sensor (without Mounting Ring)



Note
Diameter of through hole for connector is φ 25mm.

Accessories
(Manufactured by Honda Tsushin Kogyo Co. Ltd.)
Connector :Z-374, 2 pieces
Contact :HKP-F413, 12 pieces

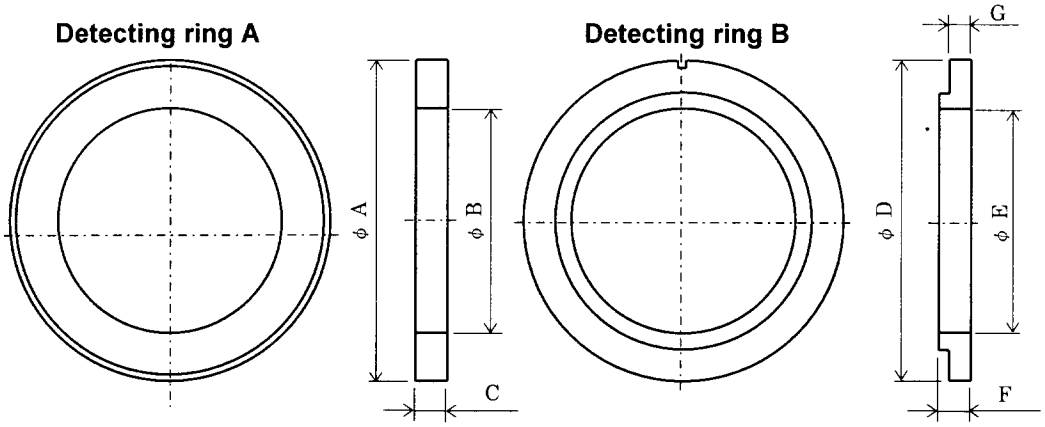
Reference
Crimping tool for HKP-F413
: KP-309

Sensor type No.	Detecting ring	Resolution Div./Rev	φ A	B	C	D
A860-0392-T013	Ring 3	4096	$210^{+0.0}_{-0.030}$	110.8	104.8	R140
A860-0392-T018	Ring 5	4096	$158^{+0.0}_{-0.025}$	84.3	78.3	R110

Refer to the following section "Detecting ring" for details of detecting rings.

NOTE
- Use this sensor under 80℃.
- Handle these precision parts with special care. In particular, never apply external force to part S.
- The detector consists of electric circuit. Therefore, keep away from dust, oil, and any other harmful things.
- The detector must be installed by butting the sensor holder against the machine mounting surface(φ A). And the height of the machine side rabbet must not exceed 4.5mm. Otherwise, the detector may produce incorrect output.
- Use mounting screws of M4×20mm and M4×25mm.
- The gap between detector and detecting ring is preadjusted. Therefore, never remove the detecting element from the detector mounting ring.
- Clamp the cable at a proper position.
- Check the feedback signal after mounting the sensor. If the incorrect feedback signal is output, it is necessary to adjust. Adjustment procedure is shown in "4.1.4 Feedback Signal Adjustment" in part Ⅱ.
- Connect the shield wire.
- For easy maintenance, consider a replaceable structure.
- Use the detecting ring indicated in the table. Do not break the combination of detector and detecting ring.
- Mating connectors are provided with the detector.

Detecting ring



Dimensions

	Detecting ring A			Detecting ring B			
	φ A	φ B	C	φ D	φ E	F	G
Ring 1, 6	$103.2^{+0.0}_{-0.020}$	$82^{+0.0}_{-0.018}$	10±0.1	$103.2^{+0.0}_{-0.020}$	$82^{+0.0}_{-0.018}$	8.6±0.1	6.7
Ring 2, 7	$52^{+0.0}_{-0.020}$	$40^{+0.016}_{-0.0}$	10±0.1	$52^{+0.0}_{-0.020}$	$40^{+0.016}_{-0.0}$	8.6±0.1	6.7
Ring 3	$205.6^{+0.0}_{-0.020}$	$160^{+0.020}_{-0.0}$	10±0.1	$205.6^{+0.0}_{-0.020}$	$160^{+0.020}_{-0.0}$	8.6±0.1	6.7
Ring 4	$103.2^{+0.0}_{-0.020}$	$88^{+0.0}_{-0.018}$	10±0.1	$103.2^{+0.0}_{-0.020}$	$88^{+0.0}_{-0.018}$	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

Refer to the precede section "Built-in sensor" for details of detector and mounting ring.

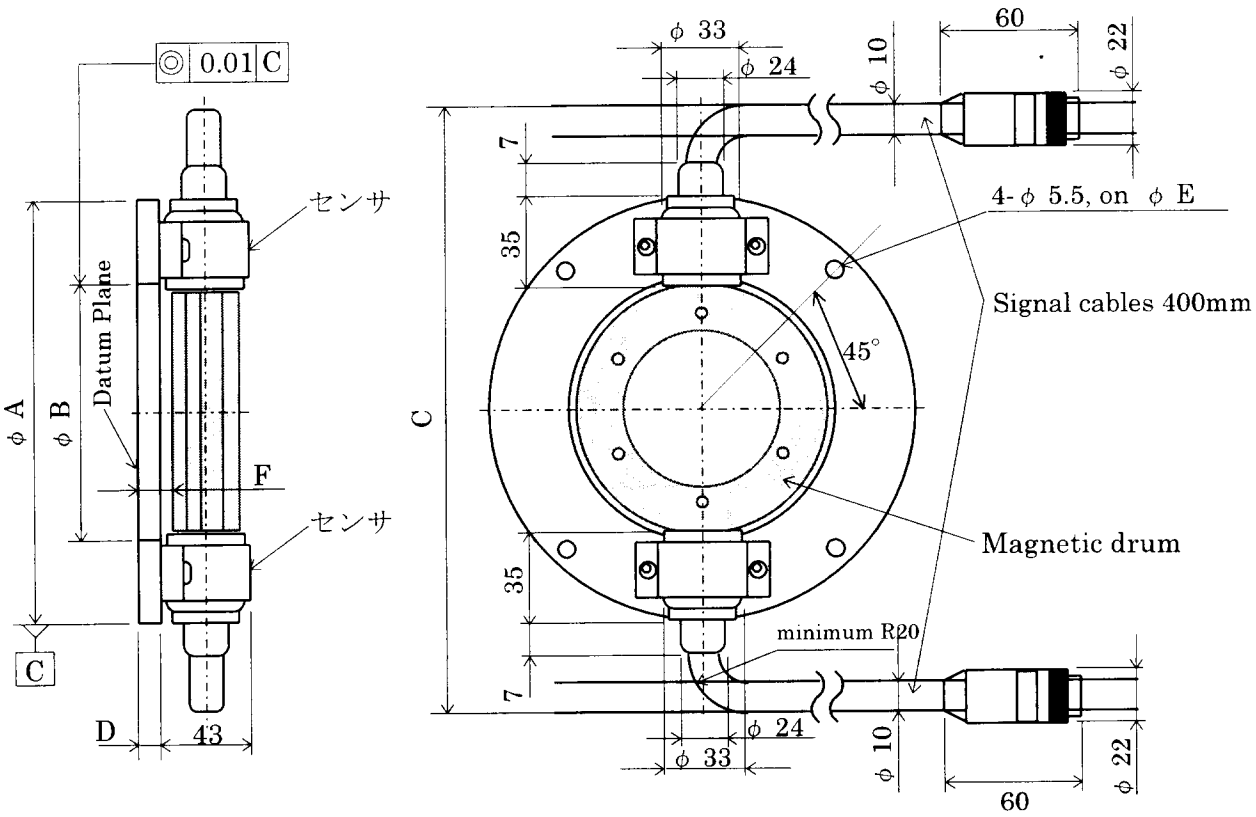
NOTE
- Press fit the rings on a sleeve, then install the sleeve on the spindle shaft. Be sure to insert detecting ring A and B completely.
- Used ring can be recycled only one time.
- The circumference has special teeth. Therefore carefully protect against deformation and chipping due to external force.
- Check the feedback signal after mounting the sensor. Adjustment procedure is shown in "4.1.4 Feedback Signal Adjustment" in part Ⅱ.

Allowable maximum speed

	Ring 1	Ring 2	Ring 3	Ring 4	Ring 5	Ring 6	Ring 7
Sensor type No.	T011	T012	T013	T014	T018	T081	T082
Number of teeth	256	128	512	256	384	256	128
Max. speed(min^{-1})	15,000	20,000	6,000	15,000	8,000	20,000	50,000

NOTE
Interference for shrink fitting of the rings is changed according to the maximum speed of spindle. Refer to "4.1.2 Interference" in part Ⅱ.

3.3.2 High Resolution Magnetic Pulse Coder

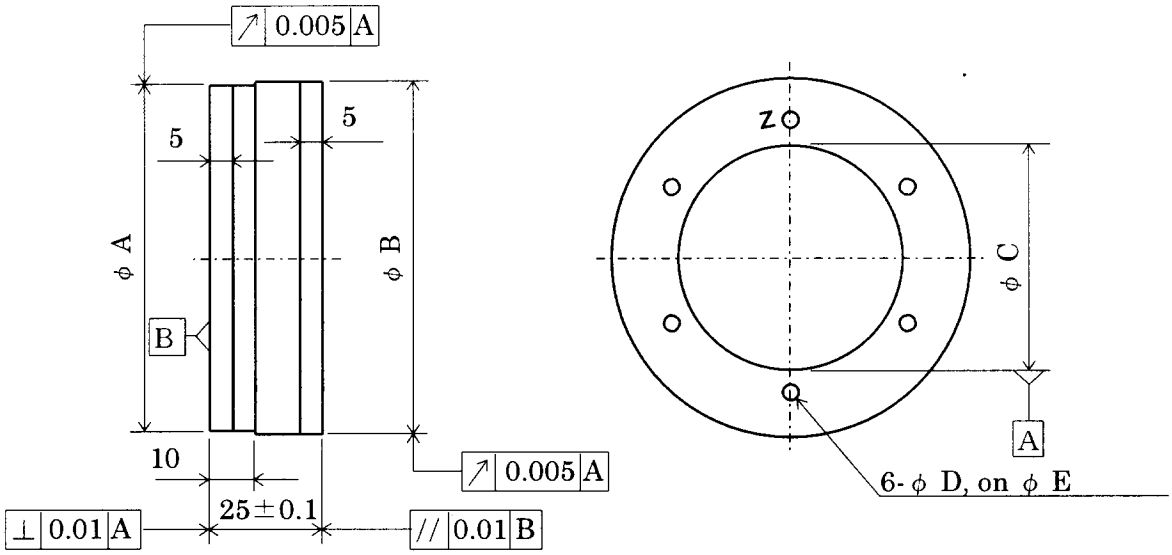


Sensor type No.	Magnetic drum	Resolution Div./Rev.	φ A	φ B	C	D	φ E	F
A860-0382-T121	Drum 1	360,000	$140^{+0.0}_{-0.015}$	$70^{+0.015}_{-0.0}$	191	6	130	15±0.2
A860-0382-T122	Drum 2	360,000	$170^{+0.0}_{-0.015}$	$110^{+0.015}_{-0.0}$	224	10	160	19±0.2
A860-0382-T123	Drum 3	360,000	$200^{+0.0}_{-0.015}$	$140^{+0.015}_{-0.0}$	256	10	190	19±0.2
A860-0382-T124	Drum 4	360,000	$270^{+0.0}_{-0.015}$	$210^{+0.015}_{-0.0}$	321	10	260	19±0.2

Refer to the next page for details of magnetic drums.

NOTE
- Use this sensor under 50℃.
- Preamplifier is attached to this sensor.
- Detectors, drum and preamplifier have been adjusted before shipping and given the same serial number. Therefore do not break the combination of this number. And do not remove the detector from the mounting ring.
- This sensor includes many magnetic parts and elements. Keep away from any other magnetic items. Over 20 Gauss magnetic field affect the sensor.
- Check the feedback signals after mounting the sensor. Adjustment procedure is shown in "4.2.4 Feedback Signal Adjustment" in part Ⅱ.

Magnetic Drum



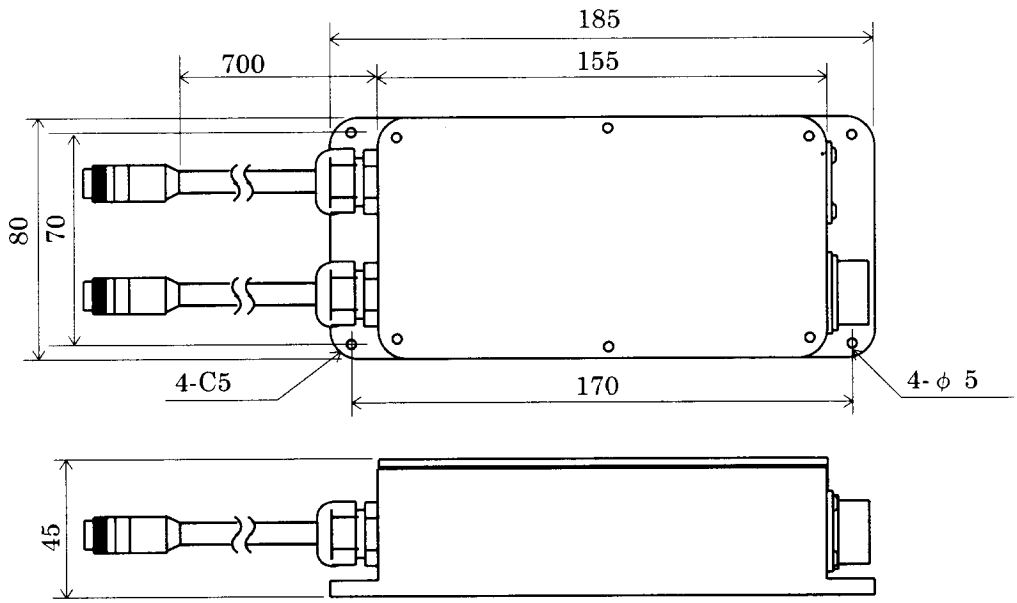
Sensor type No.	Magnetic drum	φ A	φ B	φ C	φ D	φ E
A860-0382-T121	Drum 1	64.05±0.01	$65^{+0.0}_{-0.015}$	$50^{+0.0}_{-0.011}$	—	—
A860-0382-T122	Drum 2	96.55±0.01	$97.5^{+0.0}_{-0.015}$	$70^{+0.015}_{-0.0}$	5.5	80
A860-0382-T123	Drum 3	129.05±0.01	$130^{+0.0}_{-0.015}$	$105^{+0.015}_{-0.0}$	5.5	115
A860-0382-T124	Drum 4	194.05±0.01	$195^{+0.0}_{-0.015}$	$160^{+0.015}_{-0.0}$	6.5	175

Refer to the previous page for details of detector.

Allowable maximum speed

Sensor type No.	T121	T122	T123	T124
Drum	Drum 1	Drum 2	Drum 3	Drum 4
Max. speed(min^{-1})	15,000	13,000	10,000	6,500
Material of drum	SUS303			

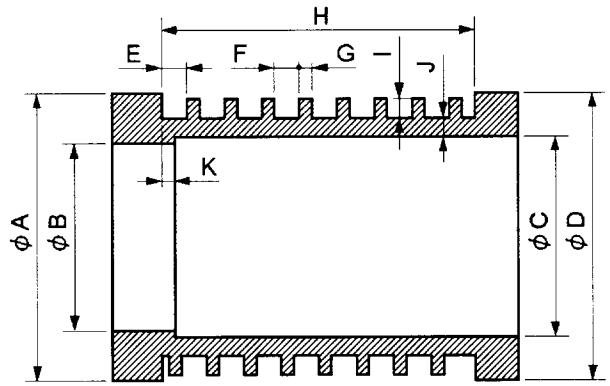
Preamplifier



NOTE

- Use this preamplifier under 50℃.
- This preamplifier is necessary to use the high resolution magnetic pulse coder.
- Detectors, drum and preamplifier have been adjusted before shipping and given the same serial number. Therefore do not break the combination of this number. And do not remove the detector from the mounting ring.
- Vibration affecting the preamplifier must not exceed 1G.
- This preamplifier box has anti-drop performance expected to meet IP55. But it is bad for the circuit in the box, if the box gets wet continuously by oil or water. Therefore take care to keep away from oil and water.
- Check the feedback signals after mounting the sensor. Adjustment procedure is shown in "4.2.4 Feedback Signal Adjustment" in part Ⅱ.

3.4 COOLING JACKET (REFERENCE)



Unit : mm

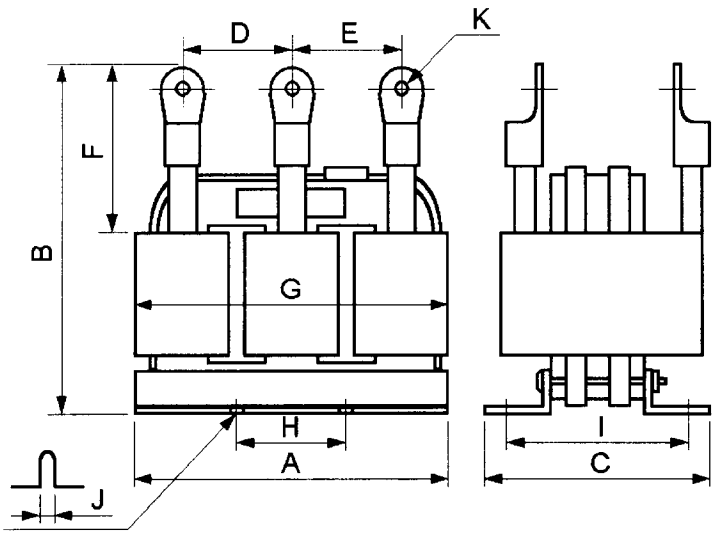
	Model name	Type No.(A06B-)	φ A	φ B	φ C	φ D	E	F	G	H	I	J	K
Standard type	α B80M-1.5	1211-B113#1xxx	144	119	120	145	10	21.5	3.5	121.5	6	5.5	1
	α B80L-1.1	1212-B413#1xxx	144	119	120	145	10	21.5	3.5	1713.5	6	5.5	1
	α B100S-2.2	1221-B413#1xxx	177	155	156	180	10	20	5	102	5	10.5	-4
	α B112S-3.7	1231-B413#1xxx	203	179	180	205	17	10	3	128	6	5.5	-11.5
	α B112M-5.5	1232-B412#1xxx	203	179	180	205	10	25	3	193	6	5.5	4
	α B112L-5.5	1233-B410#1xxx	205	179	180	202	40	20	5	235	6	5	2
	α B112L-18.5	1233-B411#1xxx	205	179	180	202	40	20	5	235	6	5	2
	α B112LL-5.5	1234-B410#1xxx	205	179	180	205	34	20	4	332	5	7.5	36
	α B112LL-18.5	1234-B411#Txxx	205	179	180	205	34	20	4	332	5	7.5	36
	α B132L-5.5	1241-B410#1xxx	273	245	249	273	20	7.5	4	192.5	3	10	5
	α B132L-22	1241-B610#1xxx	273	245	249	273	20	7.5	4	192.5	3	10	5
	α B160S-5.5	1251-B412#1xxx	278	239	240	280	15.5	8.5	3	160	10	9	16.5
	α B160M-5.5	1252-B412#1xxx	265	236	240	270	29.5	14	4	194	5	7.5	7
	α B160M-11	1252-B712#1xxx	265	236	240	270	29.5	14	4	194	5	7.5	7
	α B160L-7.5	1255-B411#Txxx	260	235	240	270	29.5	14	4	287	5	7.5	-21
	α B160LL-25	1256-B411#1xxx	290	236	240	290	30	11	4	350	5	20	18
	α B180M-11	1261-B410#1xxx	315	286	292	350	21	14	4	139	5	9	24
	α B180L-22	1262-B410#1xxx	333	288	292	329	26	11.5	3	343	10	11	20.5
	α B180LL-22	1263-B411#1xxx	336	288	292	336	16	11	4	361	5	17	-11
	α B225M-15	1273-B411#Txxx	335	301	305	338	22	14	4	324.5	5	11	5
High-speed type	α B80S-5.5/40000	(Under development)	180	148	150	182	22	22	2	142	7.5	6.5	20
	α B100S-11/30000	1228-B414#3xxx	218	179	180	220	12	19	3	137	4	14	2
	α B100S-11/20000	1229-B902#1xxx	177	155	156	180	10	20	5	102	5	10.5	-4
	α B100L-11/25000	1222-B415#1xxx	177	154	156	180	20	20	5	207.5	7.8	4	-3
	α B112M-15/20000	1232-B415#1xxx	203	179	180	205	10	25	3	193	6	5.5	4
	α B112L-18.5/20000	1233-B411#Txxx	205	179	180	202	40	20	5	235	6	5	2
	α B112L-18.5/24000	1233-B814#1xxx	205	179	180	202	40	20	5	235	6	5	2
	α B160LL-22/15000	1256-B611#1xxx	290	236	240	290	30	11	4	350	5	20	18

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 "2.1 HEAT SHRINK FITTING" in part II 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 α B80S-5.5/40000 and for α B100S-11/30000.



Dimensions Unit : mm

Motor model	Reactor type No.	A	B	C	D	E	F	G	H	I	J	K
α B80S-5.5/40000	A81L-0001-0141	188	200	115	65±5	65±5	81	195	70	95	7.2	φ 6.4
α B100S-11/30000	A81L-0001-0142	280	295	210	90±5	90±5	105	270	90	185	10	φ 8.4

Specifications

Motor model	Reactor type No.	Inductance(mH)	Phase	Rated current (A)	Insulation class	Temp. rise (℃)	Weight (Kg)
α B80S-5.5/40000	A81L-0001-0141	0.1	3	130 cont.	H	125 or less	9
α B100S-11/30000	A81L-0001-0142	0.08	3	180 cont.	H	125 or less	30

NOTE
- If the reactor is not used, it affect the motor life.
- Consider the setting place of the reactor. There is a possibility of high temperature rise up to about 100℃.
- Protect the reactor from oil, water and conductive dust.
- This is a sample drawing. Actual figure may be different from the drawing above.

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

Liquid cooling

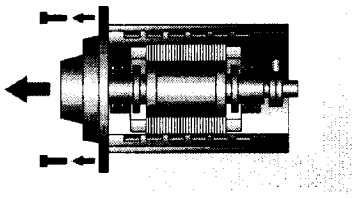
FANUC's built-in spindle motors are developed based on liquid cooling. You will not obtain the rated output by air cooling. Use liquid cooling system so that the rated output can be obtained.
Recommended coolant : ISO VG2 (e.g. Idemitsu Super Multi 2)

Thermal switch

Do not cool the thermal switch locally. Over heat of motor may not be detected.

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. Refer to following "1.2 PROTECTION CLASS".

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. Refer to " I .SPECIFICATIONS" to know the connection type (from A to E).

- Connection A
  Measure the resistance between U-V, V-W, and W-U.
- Connection B
  Measure the resistance between U-X, V-Y, and W-Z.
- Connection C
  Measure the resistance between U1-V1, U2-V2, V1-W1, V2-W2, W1-U1, and W2-U2.
- Connection D
  Measure the resistance between U-X, V-Y, and W-Z.
- Connection E
  Measure the resistance between U-X, V-Y, W-Z, U-X2, V-Y2, and W-Z2.

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 100M Ω Good
- 10 - 100M Ω Deterioration has begun. It does not affect normal use. But check the insulation on regular intervals.
- 1 - 10M Ω Special care is required. Check the insulation on regular intervals.
- Under 1M Ω Damaged. Change the motor to the new one.

CAUTION
Measure the insulation in the minimum time. Continuous charge will affect the insulation.

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.)

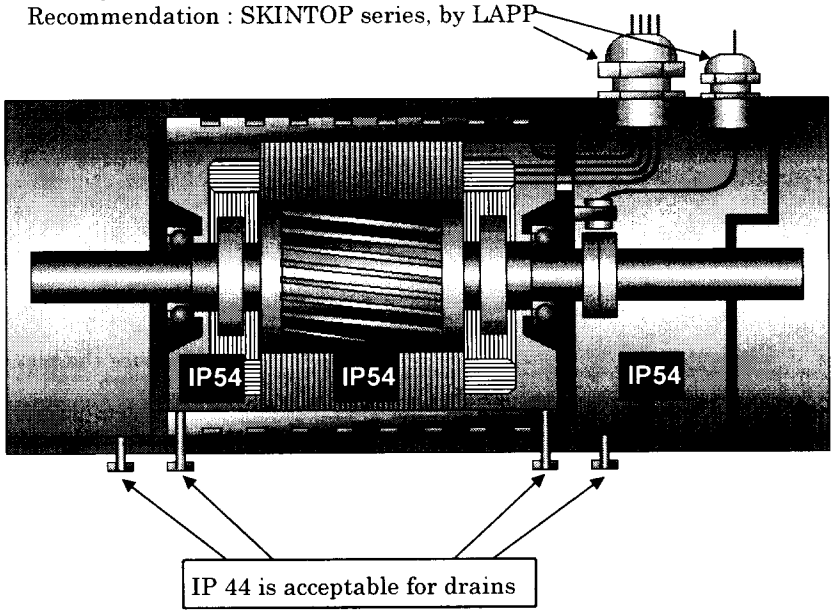
When appropriate protection is not maintained, contamination like oil, water ,cutting dust and so on have to be removed through drains. Some structure of the spindle has to be prepared so that the contamination cannot reach the motor and sensor.

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

Cable gland
Recommendation : SKINTOP series, by LAPP



IP 44 is acceptable for drains

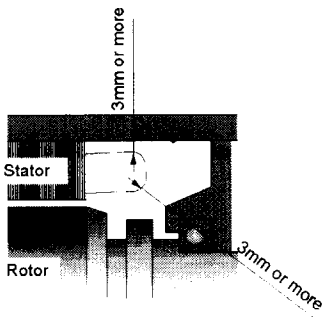
Example of IP44 drain:
6 - 10mm of drain hole diameter,
with net of 1mm or less meshes.

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

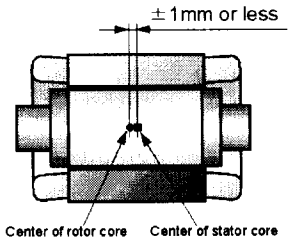
Creepage distance depends on materials used for insulation. In the case of general plastic material under IP54 condision, it has to be 2.5mm or more. Refer to VDE0110 for details.

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

1.4 DEVIATION

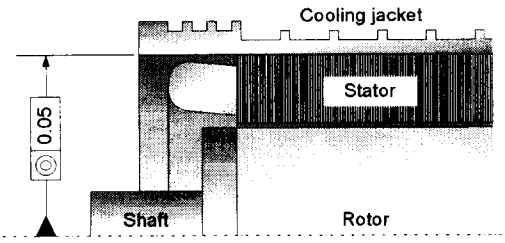
Deviation of stator and rotor

Deviation between center of stator core and center of rotor core must be 1mm or less. 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

2.1 HEAT SHRINK FITTING

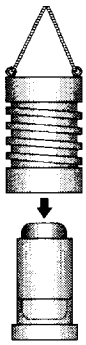
■Stator outer diameter is machined within the proper tolerance. But it sometimes has distortion of 0.1mm after winding procedure. Even if there is the distortion of 0.1mm in the stator outer diameter, it is an allowable distortion for heat shrink with a cooling jacket. But the jacket will deform when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

■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)
α B112LL or smaller	0.01 - 0.02
α B160L or smaller	0.01 - 0.03
α B160LL or larger	0.02 - 0.05

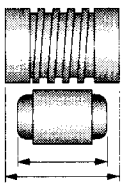
NOTE
Shrinkage margin shown above must be applied to the diameter of the stator. And these data are for the iron jacket. In case of other material is used, shrinkage margin must change according to the material characteristics.

■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.

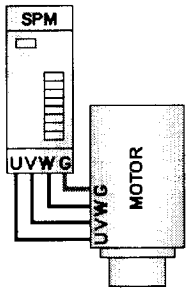
■It is the best for the winding if the cooling jacket covers all of it.



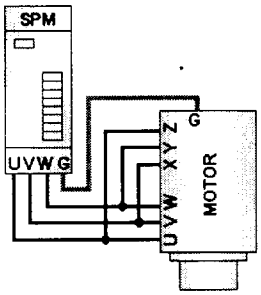
WARNING
When installing the stator, the jacket becomes very hot. Also the jacket or stator is very heavy. Therefore be careful not to get hurt or burnt.

2.2 POWER LEADS CONNECTION

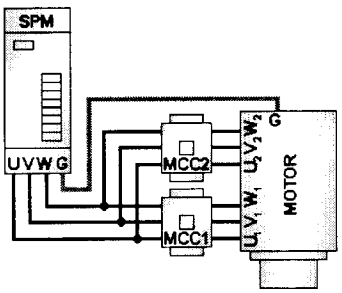
■Connection A



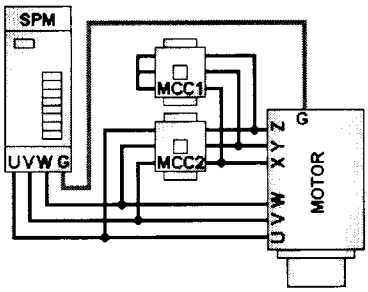
■Connection B



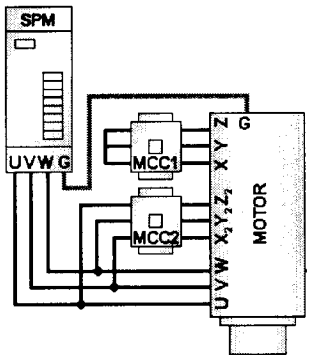
■Connection C



■Connection D



■Connection E



■Switching of MCC

for low speed winding :

MCC1=ON

MCC2=OFF

for high speed winding :

MCC1=OFF

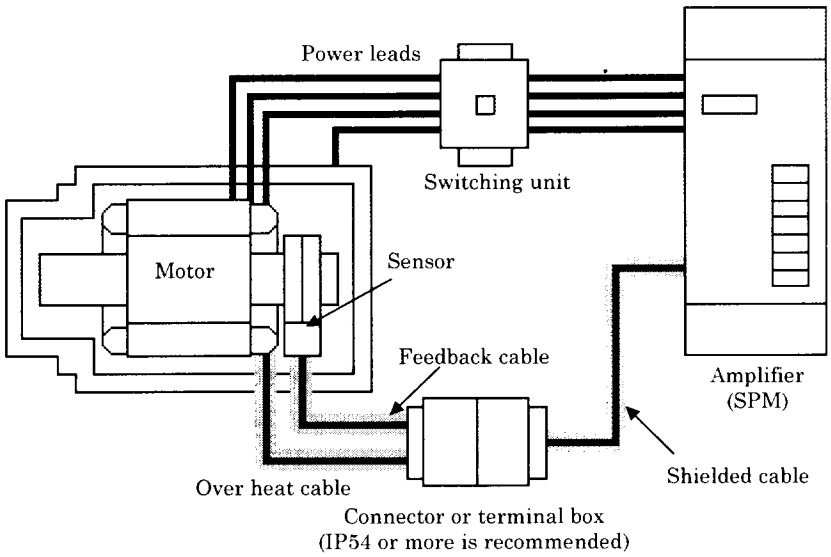
MCC2=ON

NOTE

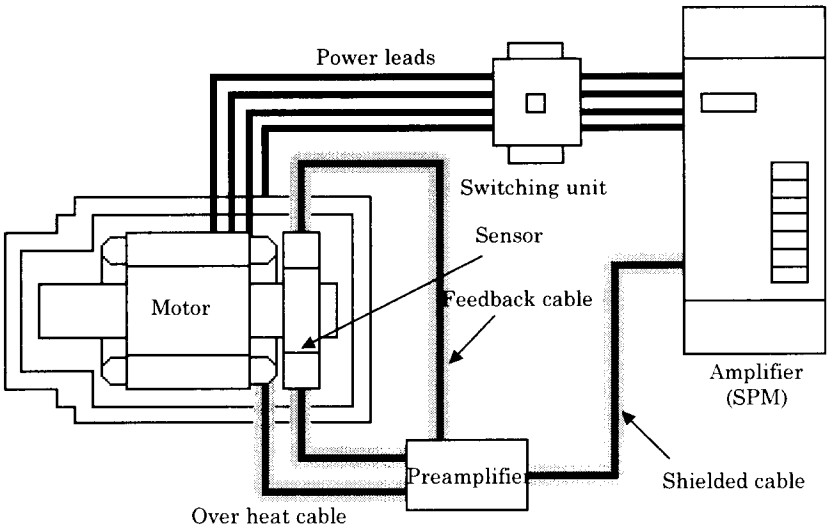
- MCC(Switching unit) is not attached to the built-in motor. Refer to "4.SWITCHING UNIT" in APPENDIX.
- Refer to "1.SPECIFICATIONS" in part I for the connection of each model.
- Use yellow-green stripe cable for the ground wire.
- Use O-type crimp terminal and spring washer so that the terminal does not loosen.
- Connect only one cable with one terminal except when the terminal is designed so that it may connect two or more cables.
- Refer to the Descriptions (B-65162E) of FANUC CONTROL MOTOR AMPLIFIER α series to get more information about the connection of the motor and amplifier.

2.3 CABLE CONNECTION (OUTLINE)

Built-in sensor



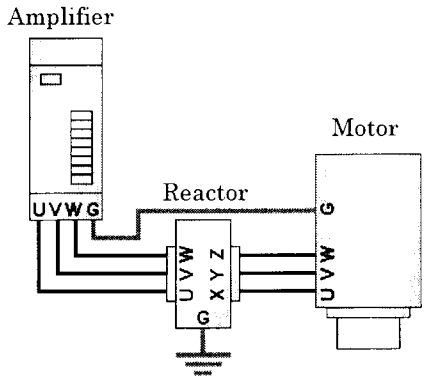
High resolution magnetic pulse coder



NOTE
These diagrams are just for reference. Refer to "4.SENSOR", Descriptions (B-65162E) of FANUC CONTROL MOTOR AMPLIFIER α series, and Maintenance Manual (B-65165E) of FANUC CONTROL MOTOR AMPLIFIER α series for details.

2.3.1 Reactor Connection

Reactor must be connected between motor and amplifier for α B80S-5.5/40000 and for α B100S-11/30000.



CAUTION
- If the reactor is not used when it is necessary, it affect the motor life. Be sure to use the reactor when it is indicated.
- Consider the setting place of the reactor. There is a possibility of high temperature rise up to about 100℃.

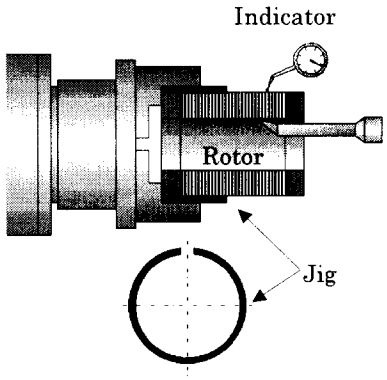
NOTE
- This diagram is just for reference. Refer to "2.2 POWER LEADS CONNECTION" for details of each model.

3 ROTOR

3.1 MACHINING AND FINISHING

Method

When machining the inner diameter of the rotor, chuck the outer diameter of the core, as shown at right. 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.



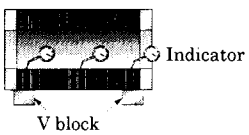
Precision

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

Inner diameter

Circularity	20 μ m or better
Camber	30 μ m or better

Camber measuring (reference)



Outer diameter (Machine after shrinking with shaft.)

Roughness	12S or better
Circularity	40 μ m or better
Concentricity between rotor outer diameter and shaft center	25 μ m or better

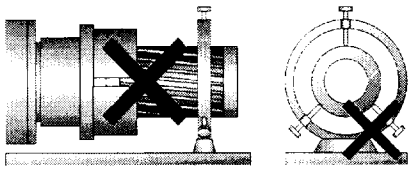
Cutting condition (Reference)

	Roughing		Finishing	
Motor type	Standard type	High speed type	Standard type	High speed type
Cutting speed(m/min.)	15.6	44.0	25.6	44.0
Feed speed(mm/rev.)	0.2	0.15	0.2	0.15
Depth of cut(mm)	1.5	0.5	0.1 - 0.2	0.1

CAUTION
The rotor is made from less than 1mm thickness of silicon steel. Therefore, when incorrect method is used, the rotor deforms easily.

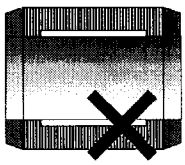
Steady rest

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.



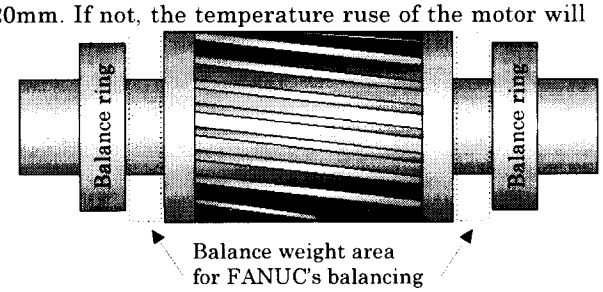
Clearance

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 BALANCE

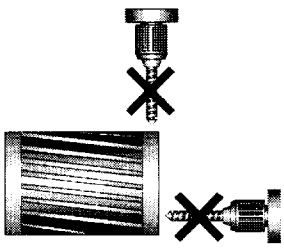
■After the rotor is mounted on a shaft, balance the entire spindle by separately installing balance rings. It is recommended to use a Non-magnetic material like stainless steel for the ring. If a magnetic material is used for the ring, keep enough distance from the rotor to the ring, for example, more than 20mm. If not, the temperature ruse of the motor will increase. The outer diameter of the ring should not exceed the outer diameter of the rotor.



■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.



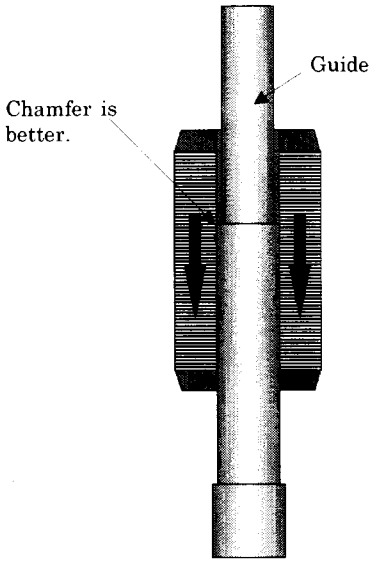
3.3 HEAT SHRINK FITTING

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

■When mounting the rotor, the rotor has to be heated in an electric oven to a maximum temperature of 200℃. 180℃ is preferable. When heated to 200℃, 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 shaft (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



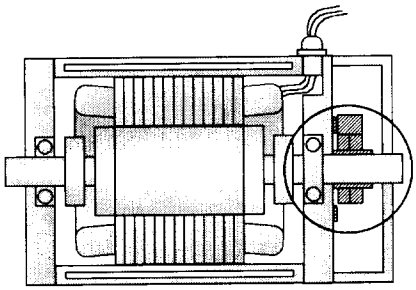
WARNING
When shrinking the rotor, it is very hot and heavy. Therefore, be careful not to get hurt or burnt.

4 SENSOR

4.1 BUILT-IN SENSOR

4.1.1 Mounting

The built-in sensor has to be installed on the rotating axis at the side of power leads, and the ring A must face the motor. If the sensor is installed incorrectly, the motor cannot be controlled normally.



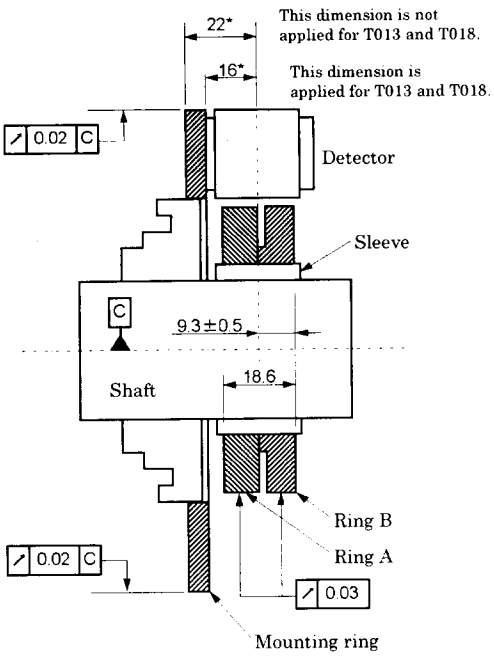
Install ring A and B as follows.

■Press fit the ring A and B on the sleeve, then install the sleeve on the spindle shaft.

■ Install the detector and detecting rings so that the distance between half of the detecting ring width (18.6mm/2) and the center of the detector is within ±0.5mm.

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

■The runout of the mounting ring and the center of shaft must be within ±0.02mm.



4.1.2 Interference

Detecting rings are expanded by centrifugal force when the spindle rotates. The interference for the detecting rings to the spindle or sleeve must be greater than expansion at the maximum spindle speed. The following table lists recommended interferences. Use the recommended interference corresponding to the specified maximum speed for each model.

Unit : μ m

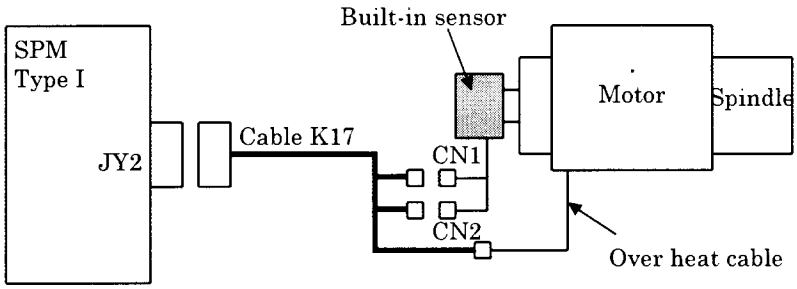
Max. speed (min^{-1})	T011 Ring 1	T012 Ring 2	T013 Ring 3	T014 Ring 4	T018 Ring 5	T081 Ring 6	T082 Ring 7
3000	ϕ 7-ϕ 35	ϕ 6-ϕ 32	ϕ 11-ϕ 41	ϕ 7-ϕ 35	ϕ 8-ϕ 43	ϕ 7-ϕ 35	ϕ 6-ϕ 32
3500	↓	↓	ϕ 13-ϕ 43	↓	ϕ 9-ϕ 44	↓	↓
4500	↓	↓	ϕ 19-ϕ 49	↓	ϕ 11-ϕ 46	↓	↓
6000	ϕ 9-ϕ 37	↓	ϕ 29-ϕ 59	ϕ 9-ϕ 37	ϕ 15-ϕ 50	ϕ 9-ϕ 37	↓
8000	ϕ 11-ϕ 39	↓		ϕ 11-ϕ 39	ϕ 24-ϕ 59	ϕ 11-ϕ 39	↓
10000	ϕ 14-ϕ 42	↓		ϕ 15-ϕ 43		ϕ 14-ϕ 42	↓
12000	ϕ 18-ϕ 46	ϕ 7-ϕ 33		ϕ 19-ϕ 47		ϕ 18-ϕ 46	ϕ 7-ϕ 33
15000	ϕ 26-ϕ 54	ϕ 8-ϕ 34		ϕ 28-ϕ 56		ϕ 26-ϕ 54	ϕ 8-ϕ 34
20000		ϕ 10-ϕ 36				ϕ 41-ϕ 69	ϕ 10-ϕ 36
25000							ϕ 12-ϕ 38
30000							ϕ 15-ϕ 41
40000							ϕ 23-ϕ 49
50000							ϕ 33-ϕ 59

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 SENSOR" in part I for details of allowable maximum speed of rings.

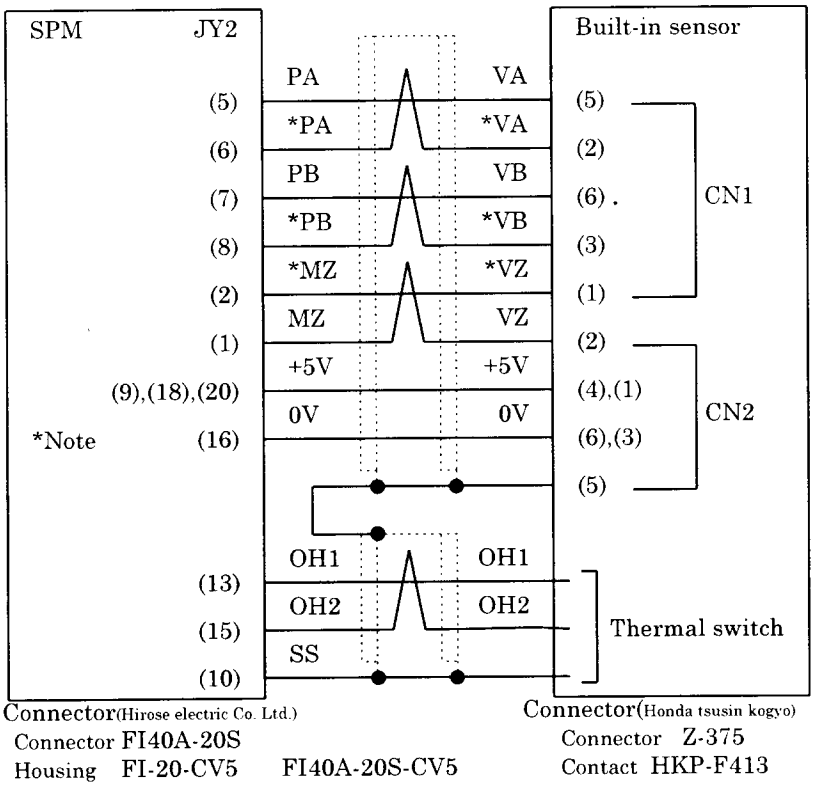
4.1.3 Built-in Sensor Connection

Connection diagram



NOTE
- Prepare the cable K17 by yourself.
- Over heat cable is connected to the motor.
- Refer to the next page for details of the cable.
- 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.
- Refer to "4.3 SIGNAL CABLE LENGTH" for details of cable length.
- Refer to the Descriptions (B-65162E) of FANUC CONTROL MOTOR AMPLIFIER α series for more detail information.

Connection (Details)



Recommended cable : A66L-0001-0368 (Refer to the next page)
0.18mm² Twisted pair 4 pairs (except +5V,0V)
0.5mm² 2 wires (+5V,0V)

CAUTION
Use No. (16) as long as you possible. (12) or (14) also can be used, but if you connect to JY3 mistakenly, it damages the sensor element.

Pin assignment

Connector JY2

9	+5V	10	SS	19		20	+5V
7	PB	8	*PB	17		18	+5V
5	PA	6	*PA	15	OH2	16	0V
3		4		13	OH1	14	(0V)
1	MZ	2	*MZ	11		12	(0V)

Connector CN1

1	*MZ	4	
2	*PA	5	PA
3	*PB	6	PB

Connector CN2

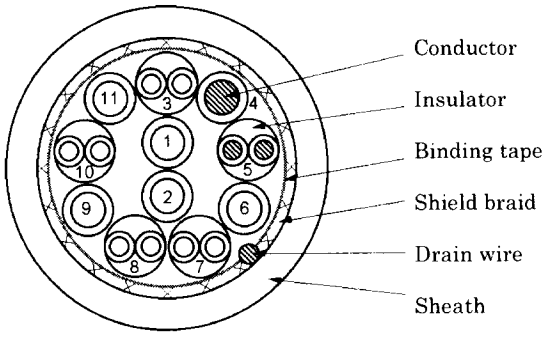
1	+5V	4	+5V
2	MZ	5	SS
3	0V	6	0V

Cable K17 for built-in sensor connection (Reference)

Cable for built-in sensor interface connection.
Contact the manufacturer as required.

Composite 16-core cable

Item			Unit	Specifications	
Product No.				A66L-0001-0368 (FNC-021)	
Manufacturer				Shinko Electric Industries Co., Ltd.	
Rating				80℃, 60V	
Material	Conductor			Stranded wire of tinned annealed copper (JIS C 3152)	
	Insulator			Heat resistant polyvinyl chloride	
	Shield braid			Tinned annealed copper wire	
	Sheath			Heat resistant, Oil resistant, Flame retardant polyvinyl chloride (S-3)	
Number of pairs			Pairs	6	10 (5 pairs)
Conductor	Nominal cross sectional area		mm^2	0.5	0.18
	Structure		Conductors/mm	20/0.18	7/0.18
	Outer dia.		mm	0.9	0.54
Insulator	Thickness		mm	0.25 (Average : 90% or more)	0.2 (Average:90% or more)
	Outer dia.		mm	1.5	0.94
Twisted pair	Outer dia.		mm	-	1.88 (Pitch : 20mm or less)
Lay	Outer dia.		mm	6.5	
Tape wound wire	Outer dia.		mm	6.6	
Drain wire	Structure		Conductors/mm	12/0.18	
Shield	Element wire dia.		mm	0.12 (Braid density : 70%)	
Sheath	Color			Black	
	Thickness		mm	1.0 (Average : 90% or more)	
	Outer dia.		mm	9.2±0.3	
Electrical performance	Resistance of conductor	$0.18mm^2$	W/km	113 or less (20℃ JIS C 3005 6)	
		$0.5mm^2$		39.4 or less (20℃ JIS C 3005 6)	
	Dielectric strength		V/min	AC500(JIS C 3005 8 (2))	
	Insulation resistance		MW-km	15 or more (20℃ JIS C 3005 9.1)	



Pair No.	1	2	3	4	5	6	7	8	9	10	11
Color	Red	Red	White/ Yellow	Black	White/ Green	Black	White/ Black	White/O range	Black	White/ Gray	Red
Size(mm^2)	0.5	0.5	0.18	0.5	0.18	0.5	0.18	0.18	0.5	0.18	0.5

4.1.4 Feedback Signal Adjustment

Check the feedback signal after installing the sensor. Pins for checking are on the check board. The check board is not attached to the amplifier or to the motor. Refer to the Maintenance Manual (B-65165) of FANUC CONTROL MOTOR α series for details of the check board.

if incorrect value is measured, adjust the gap between rings and detector so that the target value is satisfied both clockwise and counterclockwise.

CAUTION
Do not contact the rings with the detector 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.

Main spindle

Speed feedback	Position feedback	One rotation signal	Connect to
PA1, PB1	PA1, PB1	PS1	JY2

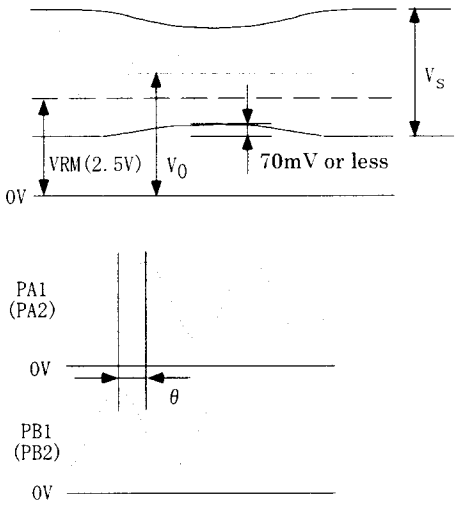
Sub spindle (in case of using sub spindle/spindle switching control)

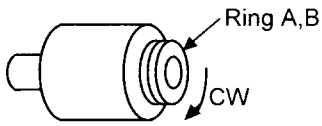
Speed feedback	Position feedback	One rotation signal	Connect to
PA2, PB2	PA2, PB2	PS2	JY6

Speed and position feedback signal

Measuring condition :

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

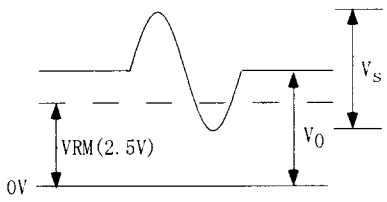


Point to be checked	Target value	Remarks
Amplitude of Vs	0.66 - 0.93V	
Offset of V_0	2.5V±272mV	Use digital voltmeter and DC range.
Phase difference θ	90±3°	View from the sensor side. 

One rotation signal

Measuring condition :

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

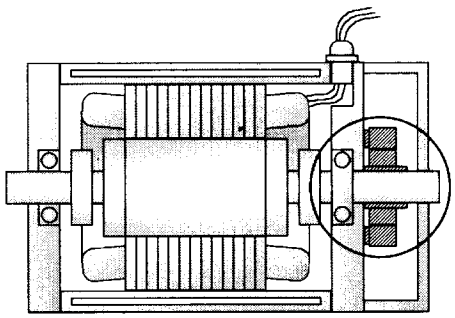


Point to be checked	Target value	Remarks
Amplitude of Vs	1.08V or more	
Offset of V_0	2.5V±500mV	Use digital voltmeter and DC range.

4.2 HIGH RESOLUTION MAGNETIC PULSE CODER

4.2.1 Mounting

The high resolution magnetic pulse coder has to be installed on the rotating axis at the side of power leads. If the sensor is installed incorrectly, the motor cannot be controlled normally.



Magnetic drum

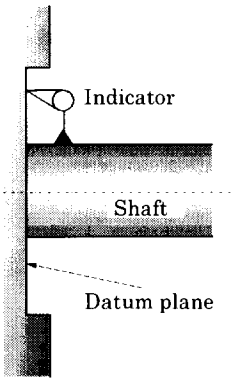
Detector	A860-0382-T121	A860-0382-T122 A860-0382-T123 A860-0382-T124
Method of mounting	Shrink-fit the drum or expansion-fit the sleeve. The drum can be heated up to 100°C. Refer to "4.2.2 Interference".	Mount the drum using the six holes(ϕ 5.5) on it. Mount the drum loosely as it is centered later.
Mounting direction	Mount the drum so that the datum plane faces to the nose of the spindle. The datum plane of the drum is the surface on which Z is not marked.	

NOTE
- To minimize leakage flux from the motor, use a magnetic material for the housing of the motor. And the thickness of the housing must be 15mm or more.
- Mount the drum on the sleeve and then install the sleeve to the spindle shaft. The stopper to screw the magnetic drum must be mounted on the motor side. If it is not possible, use a non-magnetic material for the sleeve.
- When a magnetic material is used near the rear of the magnetic drum, separate it 30mm or more.

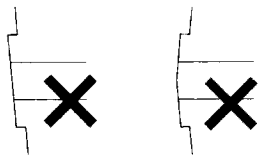
Runout of datum plane

Adjust the right angle of datum plane to machine within values shown below.

Type No.	Max. runout(μ m)
A860-0382-T121	20
A860-0382-T122	25
A860-0382-T123	30
A860-0382-T124	40



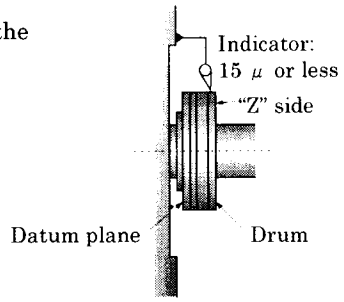
Incline, tapered or deformed surface for mounting is not acceptable. If it is, the sensor cannot output the correct signal.



Incline Tapered or deformed

Runout of outer surface of drum

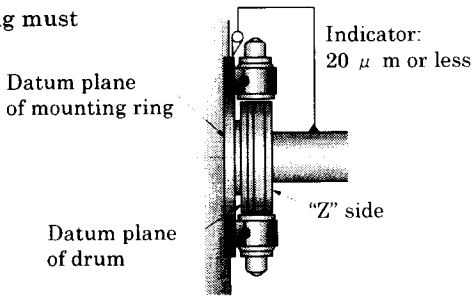
The runout of the outer surface of the magnetic drum must be 15 μ m or less



CAUTION
Use indicator tip on the surface within 5mm from the "Z" printed side. If the tip contact other surface of the drum, magnetic data on the drum will be erased,

Runout of mounting ring

The runout of the sensor mounting ring must be 20 μ m or less.



4.2.2 Interference (for A860-0382-T121)

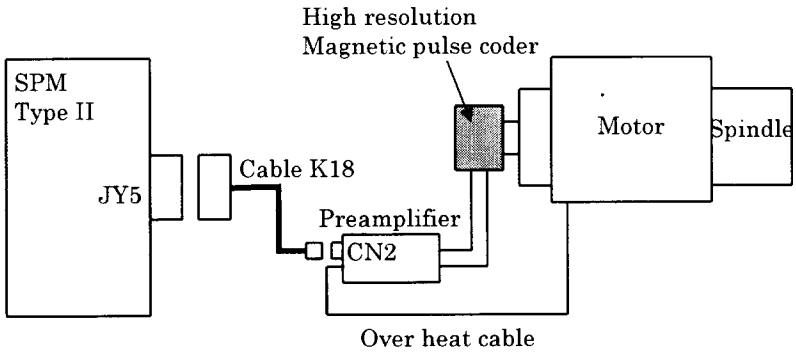
Fit the drum of A860-0382-T121 by shrink fitting. Use proper interference shown below according to the maximum rotation speed.

Maximum speed(min^{-1})	Interference(μ m)
6000	ϕ 26 - ϕ 47
8000	ϕ 27 - ϕ 48
1000	ϕ 27 - ϕ 48
12000	ϕ 28 - ϕ 49
15000	ϕ 30 - ϕ 51

CAUTION
- If the incorrect interference is chosen, the drum will loosen by centrifugal force or deform.
- Allowable temperature of the drum is 100℃. Do not heat the drum more than 100℃.

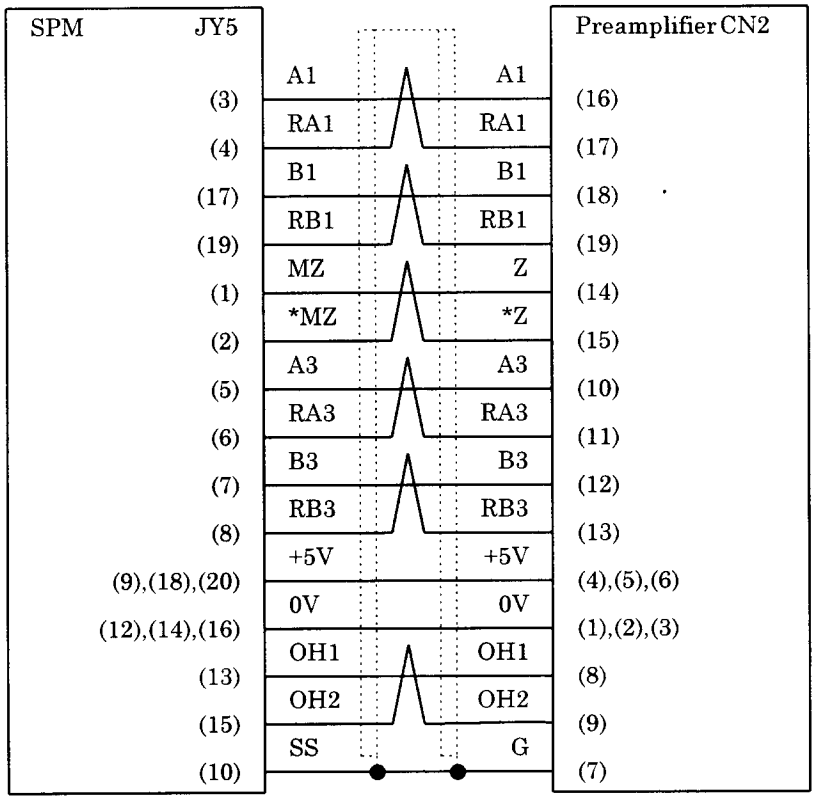
4.2.3 High Resolution Magnetic Pulse Coder Connection

Connection diagram



NOTE
- Prepare the cable K18 by yourself.
- Over heat cable is connected to the motor. Refer to following "Over heat cable connection" for details of over heat cable connection.
- Cables and connectors between the sensor and the preamplifier are attached.
- Refer to the next page for details of the cable.
- Refer to "4.3 SIGNAL CABLE LENGTH" for details of cable length.
- Refer to the Descriptions (B-65162E) of FANUC CONTROL MOTOR AMPLIFIER α series for more detail information.

Connection (Details)



Connector(Hirose electric Co., Ltd.)
Connector FI40A-20S
Housing FI-20-CV5

FI40A-20S-CV5

Connector(Hirose electric Co., Ltd.)
HR22-12WTPA-20S
(Soldered type)

Recommend cable : A66L-0001-0367 (Refer to the next page)
0.18mm² Twisted pair 6 pairs(except +5V,0V)
0.18mm² 6 wires (+5V×3, 0V×3)

Connector shown below can be used instead of HR22-12WTPA-20S.

Pins	HR22-SC-122 (20pins per connector are necessary)
Connector housing	HR22-12WTPA-20SC
Crimping tool	HR22-TA-2428HC(HIROSE)

Pin assignment

Connector JY5

		10	SS			20	+5V
9	+5V	8	RB3	19	RB1	18	+5V
7	B3	6	RA3	17	B1	16	0V
5	A3	4	RA1	15	OH2	14	0V
3	A1	2	*Z	13	OH1	12	0V
1	Z			11			

Connector CN2

1	0V	2	0V	3	0V	4	+5V
5	+5V	6	+5V	7	G	8	OH1
9	OH2	10	A3	11	RA3	12	B3
13	RB3	14	Z	15	*Z	16	A1
17	RA1	18	B1	19	RB1	20	

Over heat cable connection

① Remove the blind plate on the hole for a cable gland from the preamplifier box. Attach the cable gland on the plate for fix. Prepare the cable gland by yourself.

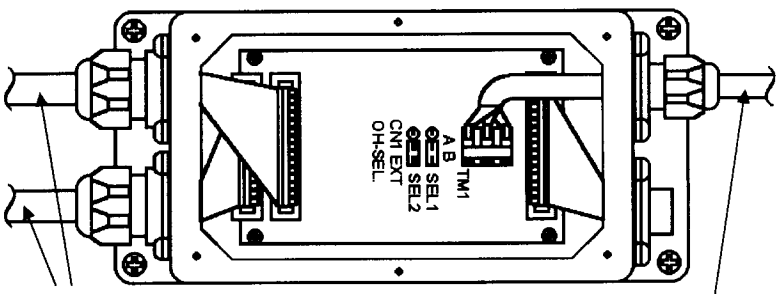
Outer diameter of cable : ϕ 5.2±0.3
Diameter of hole for cable gland fixation : ϕ 13mm
Recommended cable gland : Skintop ST-7 by LAPP

② Pull the over heat cable into the box and connect to the terminal TM1. Torque for the screw tightening must be 3kgfcm. And then cramp the cable by cable gland.

Terminal	Connection
OH1, OH2	Connect the over heat cable (non-polarity)
G(SHLD)	Connect the shield wire of the over heat cable

③ Set the pins SEL1, SEL2 to "B". (Default "A")

These pins are in the preamplifier as follows.



Signal cables from the sensor

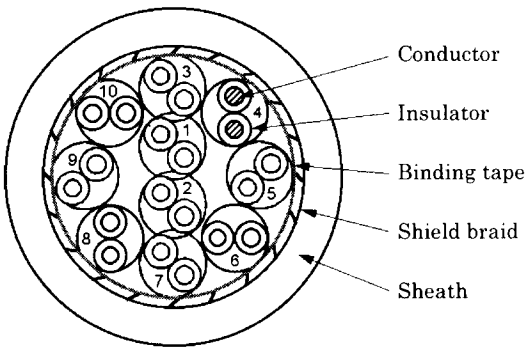
Over heat cable

Cable K18 for high resolution magnetic pulse coder (Reference)

Cable for high resolution magnetic pulse coder interface connection.
Contact the manufacturer as required.

10-pair cable

Item		Unit	Specifications
Product No.			A66L-0001-0367 (FNC-019)
Manufacturer			Shinko Electric Industries Co., Ltd.
Ratings			80℃,60V
Material	Conductor		Stranded wire of tinned annealed copper (JIS C 3152)
	Insulator		Heat resistant polyvinyl chloride
	Shield braid		Tinned annealed copper wire
	Sheath		Heat resistant, oil resistant, flame retardant polyvinyl chloride (S-3)
Number of pairs		Pairs	10
Conductor	Nominal cross-sectional area	mm^2	0.18
	Structure	Conductors/mm	7/0.18
	Outer dia.	mm	0.54
Insulator	Thickness	mm	0.25 (Ave. : 90% or more)
	Outer dia.	mm	1.04
Twisted pair	Outer dia.	mm	2.08 (Pitch : 25mm or less)
Lay	Outer dia.	mm	6.5
Tape wound wire	Outer dia.	mm	6.6
Shield	Element wire dia.	mm	0.12 (Braid density : 75% or more)
Sheath	Color		Black
	Thickness	mm	1.0 (Ave. : 90% or more)
	Outer dia.	mm	9.2±0.3
Electrical Perfor-mance	Resistance of conductor	W/km	110 or less (20℃ JIS C 3005 6)
	Dielectric strength	V/min	AC500 (JIS C 3005 8 (2))
	Insulation resistance	MW-km	15 or more (20℃ JIS C 3005 9.1)



Pair No.	1	2	3	4	5	6	7	8	9	10
Color	Black/ Orange	Black/ Gray	White/ Yellow	White/ Green	White/ Brown	White/ Orange	White/ Gray	Black/ Yellow	Black/ Green	Black/ Brown

4.2.4 Feedback Signal Adjustment

Check the feedback signal after installing the sensor. Pins for checking are on the check board and in the preamplifier. The check board is not attached to the amplifier or to the motor. Refer to the Maintenance Manual (B-65165E) of FANUC CONTROL MOTOR α series for details of the check board.

NOTE
- Check the feedback signal after setting the parameters concerning the sensor. The feedback signal is output correctly after CNC loads the parameters.
- Check the feedback signal before installing the draw-bar and the break.
- Preamplifier has been adjusted before shipping. But if incorrect value is measured, adjust the signal according to following procedures.

Pins for checking

Use pins shown below for the feedback signal checking.

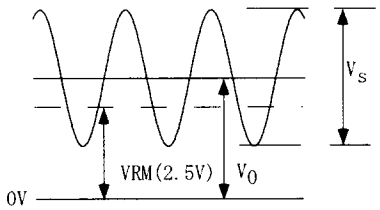
Motor speed feedback	Motor position feedback	One rotation signal	for Cs contouring control		Connect to
			Speed feedback	Position feedback	
PA2, PB2	PA2, PB2	Z	PA3, PB3	PA3, PB3	JY5

*Pin Z is in the preamplifier.

Speed and position feedback signal for motor

Measuring condition :

Rotation : Clockwise, Counterclockwise
Speed : 500min^{-1} or less
Pins : PA2, PB2



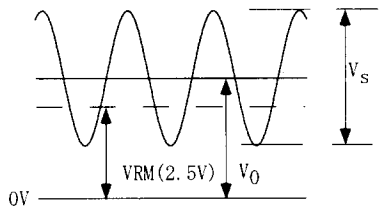
If the different value from the target shown below is measured, adjust the volume in the preamplifier so that the value satisfied the target value.

Point to be checked	Target value	Volume for adjustment (Name of volume is underlined)
Amplitude of Vs	0.86 - 1.20V	PA2 : A3G PB2 : B3G
Offset of V_0	2.5V±24mV	Use digital volt-meter and DC range. PA2 : A3O PB2 : B3O

Speed and position feedback signal for Cs contouring control

Measuring condition :

Rotation : Clockwise, Counterclockwise
Speed : 500min^{-1} or less
Pins : PA3, PB3



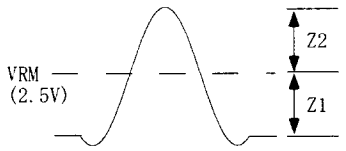
If the different value from the target shown below is measured, adjust the volume in the preamplifier so that the value satisfied the target value.

Point to be checked	Target value	Volume for adjustment (Name of volume is underlined)
Amplitude of Vs	1.20 - 1.51V	PA3 : A1G PB3 : B1G
Offset of V_0	2.5V±15mV	Use digital volt-meter and DC range. PA3 : A1O PB3 : B1O

One rotation signal

Measuring condition :

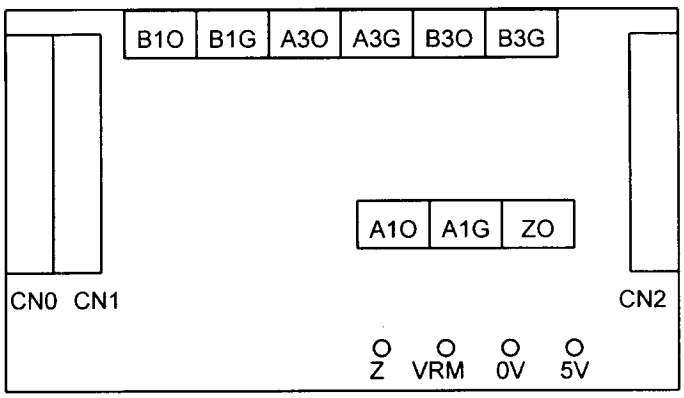
Rotation : Clockwise, Counterclockwise
Speed : 500min^{-1} or less
Pin : Z



If the different value from the target shown below is measured, adjust the volume in the preamplifier so that the value satisfied the target value.

Point to be checked	Target value	Volume for adjustment (Name of volume is underlined)
Z1, Z2	Z1≒Z2 Z1≧60mV Z2≧60mV	Z : ZO

Volume and pin assignment



Circuit board in the preamplifier

4.3 SIGNAL CABLE LENGTH (ALLOWANCE)

Calculate the allowable signal cable length between the sensor and the amplifier according to the formula below.

$$L \leqq \Delta V \times m \div I \div R \div 2$$

L : Cable length [m]
m : Number of wires connected to power supply and 0V
Δ V : Allowable voltage drop (See table)
I : Power supply current of sensor [A] (See table)
R : Resistance of wire [Ω/m]

In the case of using recommended cable :
A66L-0001-0367 $0.18mm^2 = 0.11[\Omega/m]$
A66L-0001-0368 $0.5mm^2 = 0.0394[\Omega/m]$

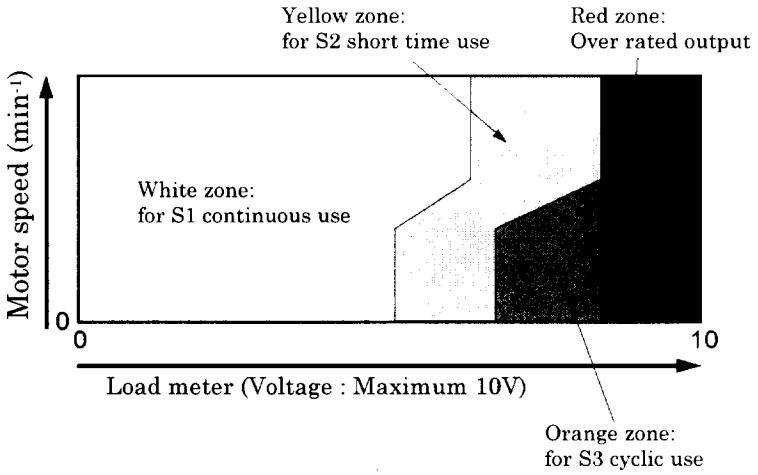
Sensor	Power supply current [A]	Allowable voltage drop [V]
Built-in sensor	0.05	0.2
High resolution magnetic pulse coder	0.15	0.2

NOTE
■ The calculated cable length includes the cable length attached to the sensor. Therefore cable length of K17 and K18 are shorter than the length calculated here. Deduct the cable length attached to the sensor.
■ To minimize the noise affection, shorten the cable length as far as possible.

5 LOAD METER (DYNAMOMETER)

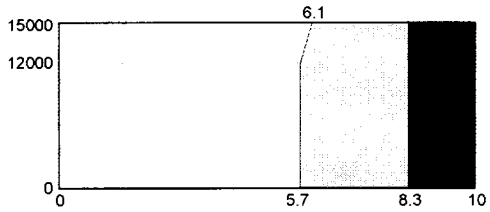
A load meter (dynamometer) indicates the load factor. The load factor is the ratio of average output to the maximum output of the spindle motor when the spindle of the machine tool operates with no load and during cutting. Maximum output is equal to 10V. The voltage is output to pin No.16 of JY1 connector in spindle amplifier module(SPM). Refer to the Descriptions (B-65162E) of FANUC CONTROL MOTOR AMPLIFIER α series for details of connector and pin assignment.

■Explanation

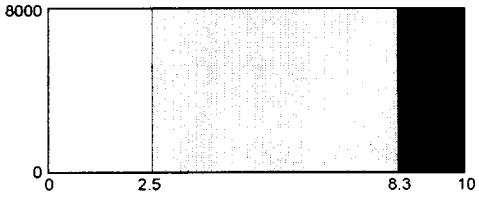


5.1 STANDARD TYPE

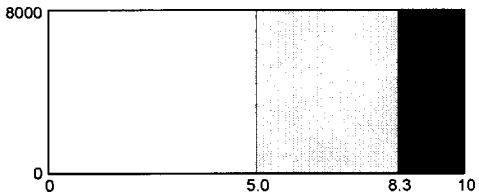
α B80M-1.5 (A06B-1211-B113#1xxx)



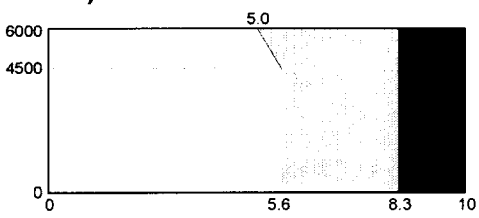
α B80L-1.1 (A06B-1212-B413#1xxx)



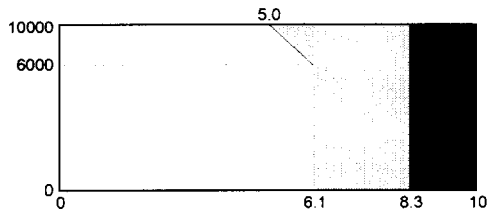
α B100S-2.2 (A06B-1221-B413#1xxx)



α B112S-3.7 (A06B-1231-B413#1xxx)

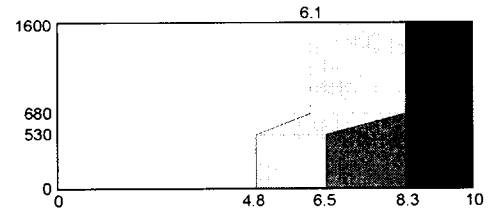


α B112M-5.5 (A06B-1232-B412#1xxx)

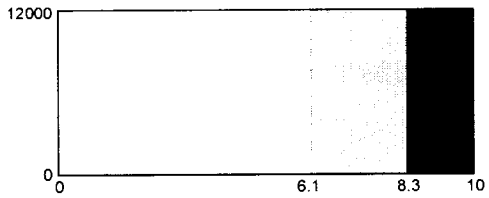


α B112L-5.5 (A06B-1233-B410#1xxx)

■Low speed winding

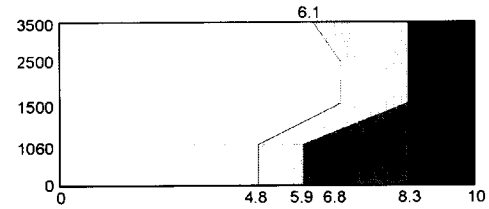


■High speed winding

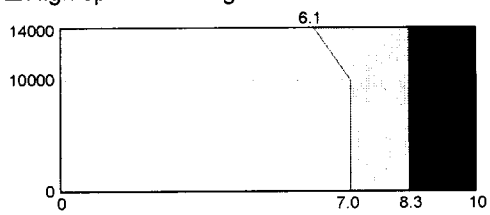


α B112L-18.5 (A06B-1233-B411#1xxx)

■Low speed winding

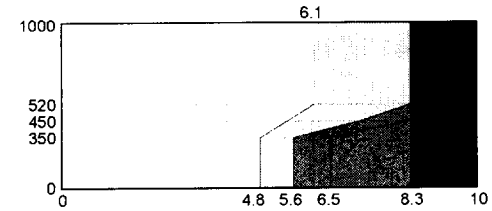


■High speed winding

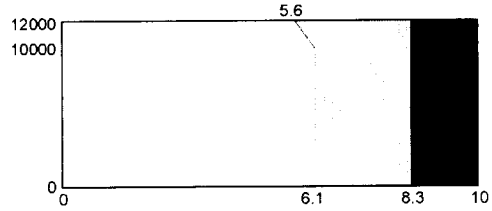


α B112LL-5.5 (A06B-1234-B410#1xxx)

■Low speed winding

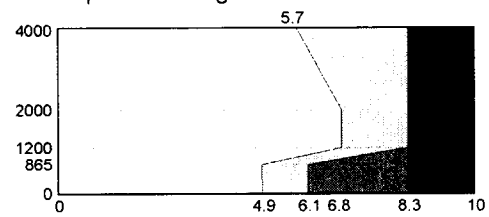


■High speed winding

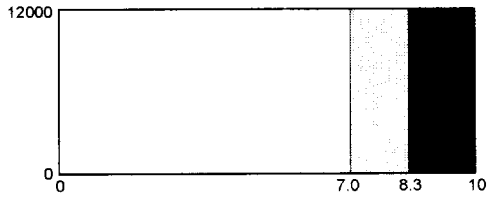


α B112LL-18.5 (A06B-1234-B411#Txxx)

■Low speed winding

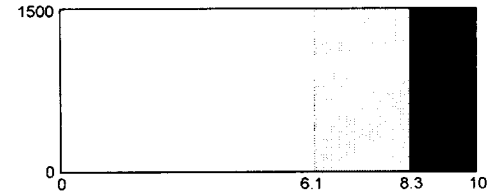


■High speed winding

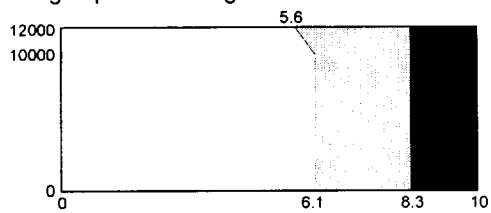


α B132L-5.5 (A06B-1241-B410#1xxx)

■Low speed winding

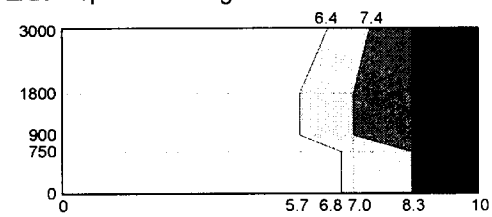


■High speed winding

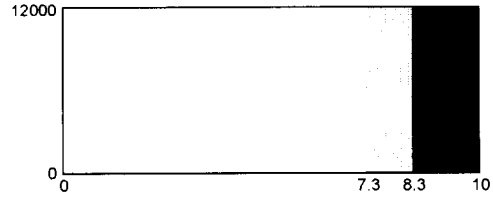


α B132L-22 (A06B-1241-B610#1xxx)

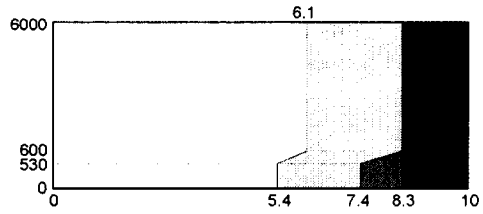
■Low speed winding



■High speed winding

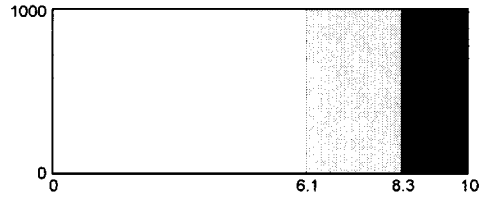


α B160S-5.5 (A06B-1251-B412#1xxx)

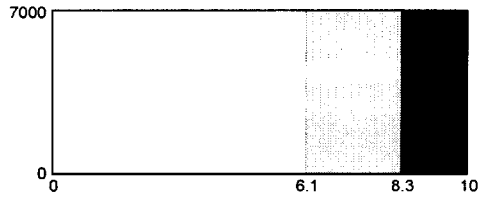


α B160M-5.5 (A06B-1252-B412#1xxx)

■Low speed winding

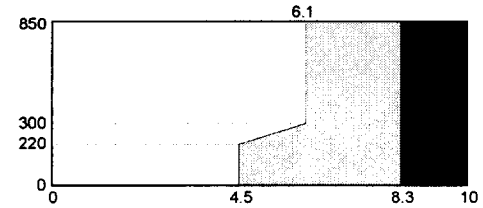


■High speed winding

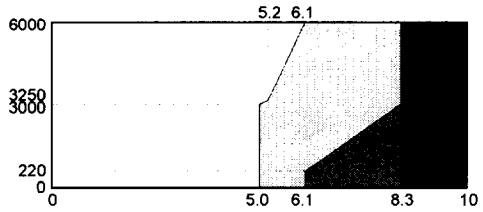


α B160M-11 (A06B-1252-B712#1xxx)

■Low speed winding

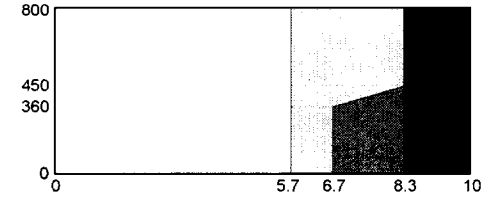


■High speed winding

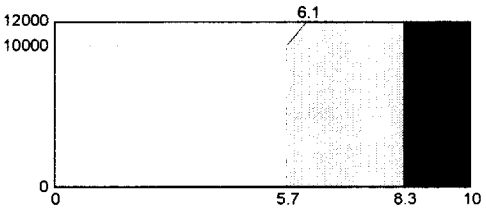


α B160L-7.5 (A06B-1255-B411#Txxx)

■Low speed winding

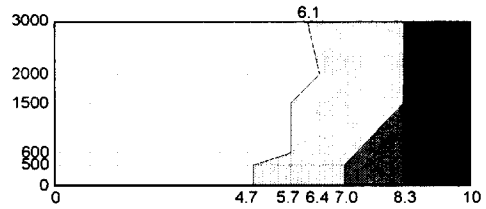


■High speed winding

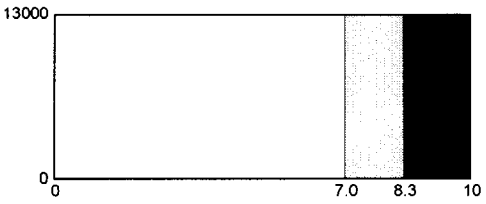


α B160LL-25 (A06B-1256-B411#1xxx)

■Low speed winding

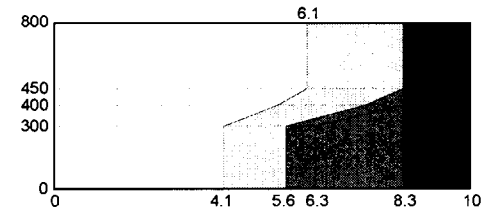


■High speed winding

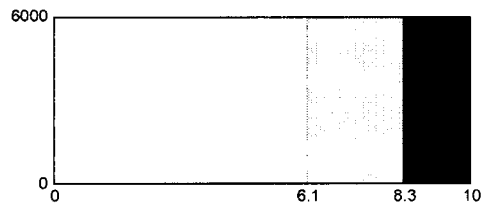


α B180M-11 (A06B-1261-B410#1xxx)

■Low speed winding

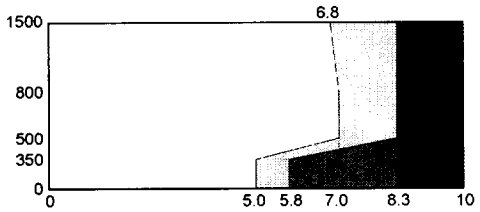


■High speed winding

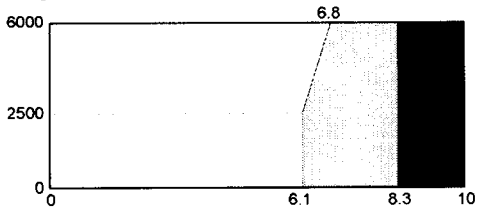


α B180L-22 (A06B-1262-B410#1xxx)

■Low speed winding

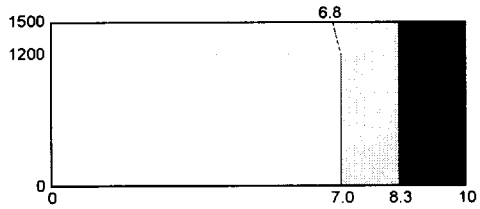


■High speed winding

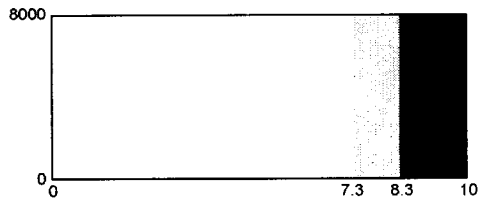


α B180LL-22 (A06B-1263-B411#1xxx)

■Low speed winding

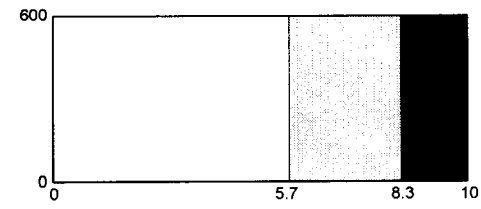


■High speed winding

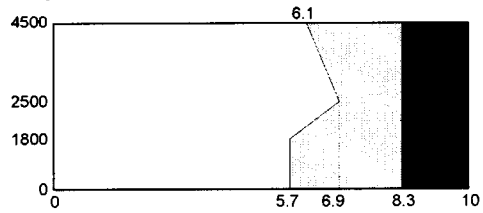


α B225M-15 (A06B-1273-B411#Txxx)

■Low speed winding

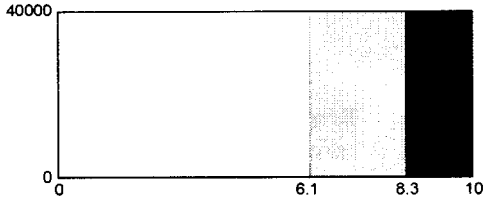


■High speed winding

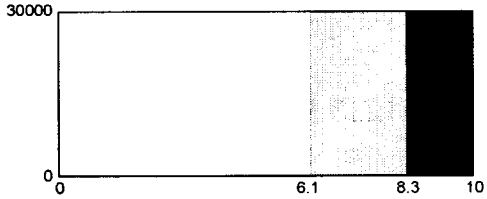


5.2 HIGH-SPEED TYPE

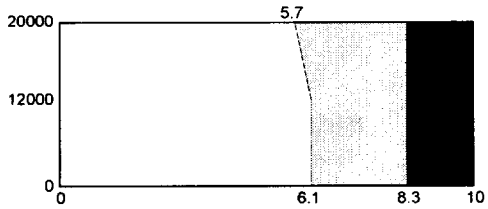
α B80S-5.5/40000 (Under development)



α B100S-11/30000 (A06B-1228-B414#3xxx)

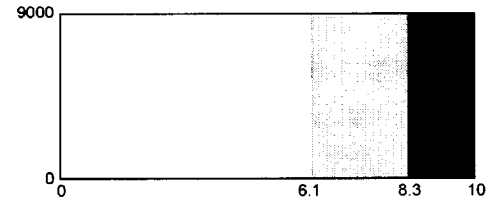


α B100S-11/20000 (A06B-1229-B902#1xxx)

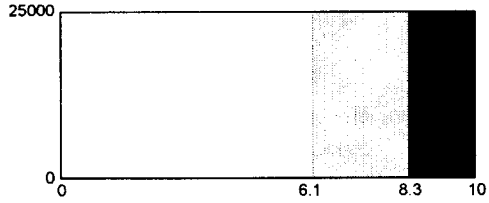


α B100L-11/25000 (A06B-1222-B415#1xxx)

■Low speed winding

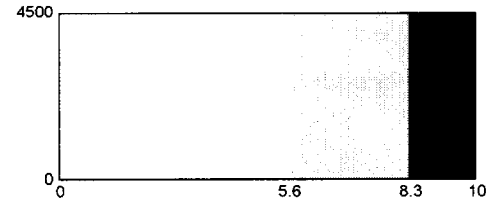


■High speed winding

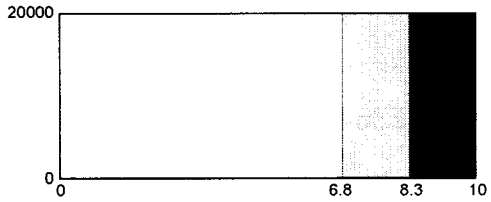


α B112M-15/20000 (A06B-1232-B415#1xxx)

■Low speed winding

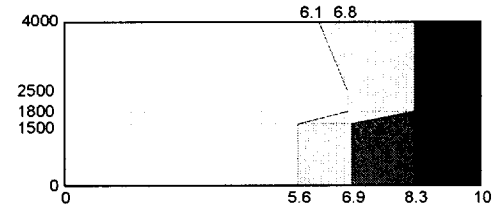


■High speed winding

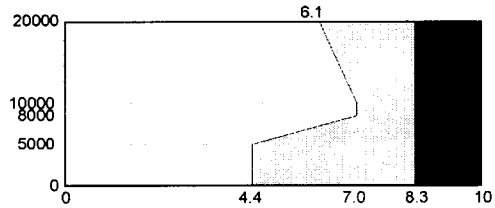


α B112L-18.5/20000 (A06B-1233-B411#Txxx)

■Low speed winding

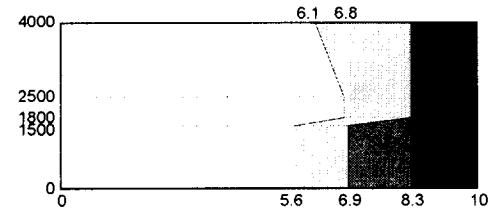


■High speed winding

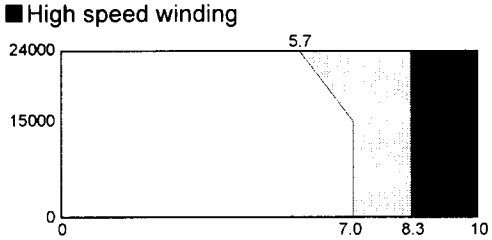


α B112L-18.5/24000 (A06B-1233-B411#Vxxx)

■Low speed winding

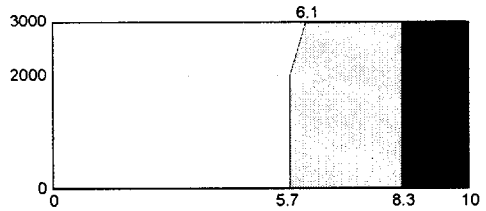


■High speed winding

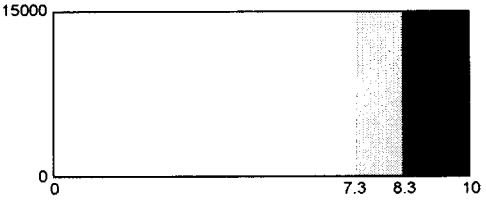


α B160LL-22/15000 (A06B-1256-B611#1xxx)

■Low speed winding



■High speed winding



APPENDIX

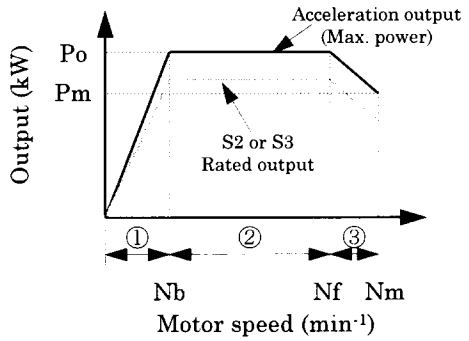
CONSTRUCTION OF APPENDIX

Appendix includes many reference data and information.

A 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]
Po, Pm	:Output [kW]
Nb, Nf, Nm	:Motor speed [min^{-1}]

① Acceleration time (t_1)in the constant torque region (0→Nb)

$$t_1=0.01097\times(J_L+J_m)\times Nb^2\div Po\div 1000 \text{ [sec]}$$

② Acceleration time (t_2) in the constant output region (Nb→Nf)

$$t_2=0.01097\times(J_L+J_m)\times(Nf^2-Nb^2)\div 2Po\div 1000 \text{ [sec]}$$

③ Acceleration time (t_3) in the output reduction region (Nf→Nm)

$$t_3=0.01097\times(J_L+J_m)\times(Nm-Nf)\ \div(Pm-Po)\div 1000$$
$$\times\{(Nm-Nf)-(Po\times Nm-Pm\times Nf)\div(Pm-Po)\times\ln(Pm\div Po)\} \text{ [sec]}$$

Total acceleration time (t) from 0 to Nm $t=t_1+t_2+t_3$ [sec]

B 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 .

Removed calories Q(W)=Coolant temperature rise(K) × Flow rate(ℓ/min.)
× Specific heat(J/gK) × Density(g/cm^3) × 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.

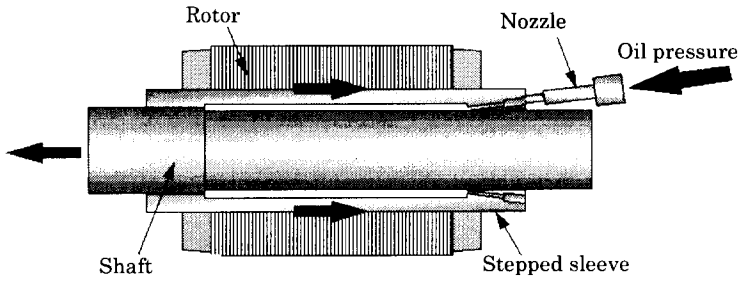
Coolant temperature setting

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.

C ROTOR SLEEVE (REFERENCE)

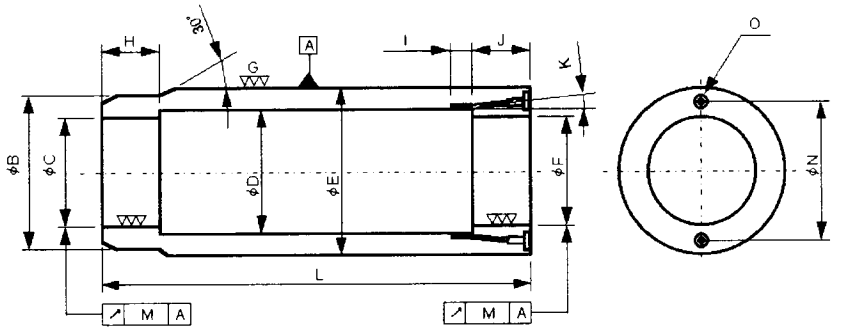
Rotor sleeve (Stepped sleeve)

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
- Shrink fit the stepped sleeve to the rotor, and then shrink fit the sleeve to the shaft. These reference data cannot be applied for other shrinking method. (It is not examined in FANUC.)
- The stepped sleeve cannot be separated from the rotor. You can separated the shaft from the rotor sleeve.
- 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	φ C	φ D	φ F	H	I	J	K(deg)	L
Standard type	α B80M-1.5	1211-B113#1xxx									
	α B80L-1.1	1212-B413#1xxx									
	α B100S-2.2	1221-B413#1xxx	57	44.9	46	44.7	18	-	18	8	134
	α B112S-3.7	1231-B413#1xxx	73.5	59.1	61	58.9	20	6.6 or less	20	6	143
	α B112M-5.5	1232-B412#1xxx	73.5	59.1	61	58.9	20	6.6 or less	20	6	208
	α B112L-5.5	1233-B410#1xxx	73.5	59.1	61	58.9	20	6.6 or less	20	6	266
	α B112L-18.5	1233-B411#1xxx	73.5	59.1	61	58.9	20	6.6 or less	20	6	266
	α B112LL-5.5	1234-B410#1xxx	73.5	59.1	61	58.9	20	6.6 or less	20	6	320
	α B112LL-18.5	1234-B411#Txxx	73.5	59.1	61	58.9	20	6.6 or less	20	6	320
	α B132L-5.5	1241-B410#1xxx	73.5	59.1	61	58.9	20	6.6 or less	20	6	266
	α B132L-22	1241-B610#1xxx	73.5	59.1	61	58.9	20	6.6 or less	20	6	266
	α B160S-5.5	1251-B412#1xxx									
	α B160M-5.5	1252-B412#1xxx	100.5	85.2	86.5	85.0	25	6.6 or less	26	8	228
	α B160M-11	1252-B712#1xxx	100.5	85.2	86.5	85.0	25	6.6 or less	26	8	228
	α B160L-7.5	1255-B411#Txxx	100.5	83.6	85.0	83.3	27	-	27	8	318
	α B160LL-25	1256-B411#1xxx	101.5	77.1	79.0	76.9	30	6.6 or less	30	6	377
	α B180M-11	1261-B410#1xxx	123.5	93.8	95.0	93.3	27	-	27	8	253
	α B180L-22	1262-B410#1xxx									
	α B180LL-22	1263-B411#1xxx									
	α B225M-15	1273-B411#Txxx	145.0	119.3	121.0	119.0	36	-	37	8	345
High speed type	α B80S-5.5/40000	(Under development)									
	α B100S-11/30000	1228-B414#3xxx									
	α B100S-11/20000	1229-B902#1xxx									
	α B100L-11/25000	1222-B415#1xxx									
	α B112M-15/20000	1232-B415#1xxx	73.5	59.1	61	58.9	20	6.6 or less	20	6	208
	α B112L-18.5/20000	1233-B411#Txxx	73.5	59.1	61	58.9	20	6.6 or less	20	6	266
	α B112L-18.5/24000	1233-B814#1xxx	73.5	59.1	61	58.9	20	6.6 or less	20	6	266
	α B160LL-22/15000	1256-B611#1xxx	101.5	77.1	79.0	76.9	30	6.6 or less	30	6	377

NOTE

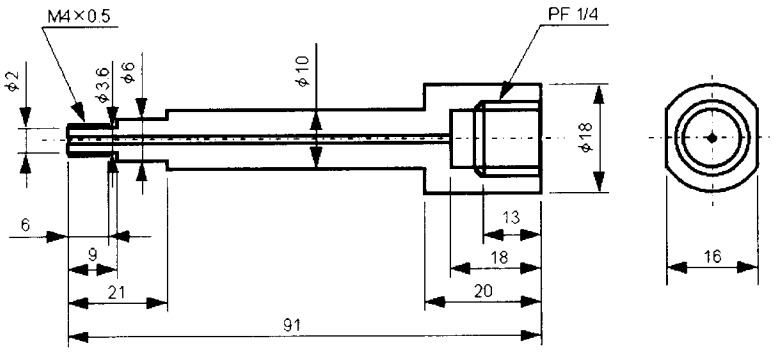
- All data shown above are just for reference.
- Material is HRC25-28, and heat treatment (refining) is recommended. Use magnetic material for the sleeve.
- φ E and interference between the sleeve and the rotor must be as same as the data of "φ E", "φ J" and "Interference" shown in the section "3.2 ROTOR" in part I .
- There is a possibility that the rotor cannot be separated from the shaft, if H and J are largely different form this table.
- Calculate φ C, φ F 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 φ E. and the inner surface of the rotor. It causes the deformation of the rotor.
- Consider the oil pressure, from 30MPa to 80MPa.

単位：mm

	Model name	Type No. (A06B-)	M	φ N	O
Standard type	α B80M-1.5	1211-B113#1xxx			
	α B80L-1.1	1212-B413#1xxx			
	α B100S-2.2	1221-B413#1xxx	0.02 - 0.05	(53)	2-M4×0.5 Depth 8: φ 2; φ 6 Counterboring Depth 1
	α B112S-3.7	1231-B413#1xxx	0.02 - 0.05	(67)	2-M4×0.5 Depth 8: φ 2; φ 6 Counterboring Depth 1
	α B112M-5.5	1232-B412#1xxx	0.02 - 0.05	(67)	2-M4×0.5 Depth 8: φ 2; φ 6 Counterboring Depth 1
	α B112L-5.5	1233-B410#1xxx	0.02 - 0.05	(67)	2-M4×0.5 Depth 8: φ 2; φ 6 Counterboring Depth 1
	α B112L-18.5	1233-B411#1xxx	0.02 - 0.05	(67)	2-M4×0.5 Depth 8: φ 2; φ 6 Counterboring Depth 1
	α B112LL-5.5	1234-B410#1xxx	0.02 - 0.05	(67)	2-M4×0.5 Depth 8: φ 2; φ 6 Counterboring Depth 1
	α B112LL-18.5	1234-B411#Txxx	0.02 - 0.05	(67)	2-M4×0.5 Depth 8: φ 2; φ 6 Counterboring Depth 1
	α B132L-5.5	1241-B410#1xxx	0.02 - 0.05	(67)	2-M4×0.5 Depth 8: φ 2; φ 6 Counterboring Depth 1
	α B132L-22	1241-B610#1xxx	0.02 - 0.05	(67)	2-M4×0.5 Depth 8: φ 2; φ 6 Counterboring Depth 1
	α B160S-5.5	1251-B412#1xxx			
	α B160M-5.5	1252-B412#1xxx	0.02 - 0.05	(96)	2-M4×0.5 Depth 8: φ 2; φ 6 Counterboring Depth 1
	α B160M-11	1252-B712#1xxx	0.02 - 0.05	(96)	2-M4×0.5 Depth 8: φ 2; φ 6 Counterboring Depth 1
	α B160L-7.5	1255-B411#Txxx	0.02 - 0.05	(95)	2-M4×0.5 Depth 8: φ 2; φ 6 Counterboring Depth 1
	α B160LL-25	1256-B411#1xxx	0.02 - 0.05	(90)	2-M4×0.5 Depth 8: φ 2; φ 6 Counterboring Depth 1
	α B180M-11	1261-B410#1xxx	0.02 - 0.05	(110)	2-M4×0.5 Depth 8: φ 2; φ 6 Counterboring Depth 1
	α B180L-22	1262-B410#1xxx			
	α B180LL-22	1263-B411#1xxx			
	α B225M-15	1273-B411#Txxx	0.02 - 0.05	(134)	2-M4×0.5 Depth 8: φ 2; φ 6 Counterboring Depth 1
High speed type	α B80S-5.5/40000	(Under development)			
	α B100S-11/30000	1228-B414#3xxx			
	α B100S-11/20000	1229-B902#1xxx			
	α B100L-11/25000	1222-B415#1xxx			
	α B112M-15/20000	1232-B415#1xxx	0.02 - 0.05	(67)	2-M4×0.5 Depth 8: φ 2; φ 6 Counterboring Depth 1
	α B112L-18.5/20000	1233-B411#Txxx	0.02 - 0.05	(67)	2-M4×0.5 Depth 8: φ 2; φ 6 Counterboring Depth 1
	α B112L-18.5/24000	1233-B814#1xxx	0.02 - 0.05	(67)	2-M4×0.5 Depth 8: φ 2; φ 6 Counterboring Depth 1
	α B160LL-22/15000	1256-B611#1xxx	0.02 - 0.05	(90)	2-M4×0.5 Depth 8: φ 2; φ 6 Counterboring Depth 1

NOTE
- All data shown above are just for reference.
- φ N changes if the stopper is on the J side or if the L changes. Therefore change φ N according to your spindle design.
- Tap of O is for the nozzle shown below.
- Consider the oil pressure, from 30MPa to 80MPa.

Nozzle (Reference)



D SWITCHING UNIT

It is necessary to use the Switching Unit for the motor of speed range switching control. The switching unit is not attached to the motor. Therefore order according to the following order number, or prepare according to the specifications shown below.

Order number

Order number	Winding switching type	Applicable amplifier (SPM)
A06B-6059-K034	Y – Y	SPM-15 or smaller
A06B-6059-K035	Y – Δ	SPM-15 or smaller
A06B-6059-K036	Y – Y	SPM-30 or smaller
A06B-6059-K037	Y – Δ	SPM-30 or smaller

NOTE
Refer to the Descriptions (B-65162E) of FANUC CONTROL MOTOR AMPLIFIER α series for details.

Specifications of electromagnetic contactor

Select and design according to the followings when you prepare these parts by yourself.

	SC-3N, Fuji Electric		SC-6N, Fuji Electric	
Rated operating voltage	220V		220V	
Rated operating current	65A		125A	
Current capacity for the closed circuit and shut off	Closed circuit	780A	Closed circuit	1500A
	Shut off	650A	Shut off	1250A
Switching frequency	1200 times/hour or more			
Life	Mechanical	5 million times or more		
	Electrical	1 million times or more		
Rating of electromagnetic operation coil	200V/220V -15% to +10% 50/60Hz±1Hz			
Applicable amplifier(SPM)	SPM-15 or smaller		SPM-30 or smaller	

NOTE Contact the manufacturer for details.

Specifications of relay

	LY2-D, Omron
Rated voltage	24V±10%
Rated current	36.9mA

NOTE Contact the manufacturer for details.

E PARAMETERS

When setting automatically the parameters are set corresponding to the model code. When "None" is entered for the model codes corresponding to the models, the parameter data is mostly set automatically in agreement with the model codes. Change the sections that are different.

Applicable ROM version is which automatic setting data is prepared for displayed version and subsequence version.
If the applied ROM version is left blank, it indicates that the model code has yet to be released.

It is necessary to modify the parameters concerning the sensor according to which used in your system.

Refer to the Parameter Manual (B-65160E) of FANUC AC SPINDLE MOTOR α series for details.

E.1 STANDARD TYPE

Model code (Applicable ROM Version)			101 (9D00/G)	102 (9D00/G)	120 (9D00/O)
Model name			α B80M -1.5/15000 (L150) 1.5/2.2 kW	α B80L -1.1/8000 (L143) 1.1/3.7 kW	α B100S -2.2/8000 (L140) 2.2/3.7 kW
Parameter No.			3000/15000 min^{-1}	1500/8000 min^{-1}	1500/8000 min^{-1}
FS0	FS15	FS16			
6507	3007	4007	10000000	10000000	10000000
6508	3008	4008	00000000	00000000	00000000
6509	3009	4009	00000000	00000000	00000000
6511	3011	4011	00001001	00001001	00001010
6512	3012	4012	00000000	00000000	00000000
6513	3013	4013	00011010	00011010	00011010
6519	3019	4019	00001100	00001100	00001100
6520	3020	4020	15000*	8000	8000
6539	3039	4039	0	0	0
6540	3040	4040		3 *	7 *
6548	3048	4048		3 *	7 *
6580	3080	4080	60	60	70
6598	3098	4098			
6600	3100	4100	3000	1500	1500
6601	3101	4101	100	100	93
6602	3102	4102	3000	2000	2352
6603	3103	4103	3000	2000	2352
6604	3104	4104	1500	1500	1500
6605	3105	4105	1500	1500	1500
6606	3106	4106	1500	1500	1500
6607	3107	4107	1500	1500	1500
6608	3108	4108	500	500	300
6609	3109	4109	10	10	10
6610	3110	4110	629	377	585
6611	3111	4111	8	13	22
6612	3112	4112	652	652	783
6613	3113	4113	1550	1600	550
6614	3114	4114	10	10	10
6615	3115	4115	3	2	2
6616	3116	4116	100	100	115
6617	3117	4117	20	20	20
6618	3118	4118	10	10	10
6619	3119	4119	0	0	0
6620	3120	4120	40	40	35
6624	3124	4124	0	0	0
6627	3127	4127	176	403	202
6628	3128	4128	0	16000	8000
6629	3129	4129	0	0	0
6630	3130	4130	0	0	0
6933	3133	4169	0	0	0
Applicable amplifier			SPM-2.2	SPM-5.5	SPM-5.5

NOTE
■Asterisk marked parameters must be set after setting the parameters automatically.

Model code (Applicable ROM Version)				121 (9D00/O)	
Model name / Parameter No.			α B112S -3.7/6000 (L151) 3.7/5.5 kW 1500/6000	α B112M -5.5/10000 (L141) 5.5/7.5 kW 1500/10000	α B160S -5.5/6000 (L152) 5.5/7.5 kW 600/6000
FS0	FS15	FS16	min^{-1}	min^{-1}	min^{-1}
6507	3007	4007	10000000	10000000	10000000
6508	3008	4008	00000000	00000000	00000000
6509	3009	4009	00000000	00000000	00000000
6511	3011	4011	00001001	00001010	00001001
6512	3012	4012	00000000	00000000	00000000
6513	3013	4013	00011010	00011010	00100110
6519	3019	4019	00001100	00001100	00001100
6520	3020	4020	6000	10000	6000
6539	3039	4039	0	0	0
6580	3080	4080	65	35	70
6598	3098	4098			
6600	3100	4100	2000	1900	630
6601	3101	4101	100	100	100
6602	3102	4102	2000	1900	1700
6603	3103	4103	2000	1750	1700
6604	3104	4104	1300	1600	1000
6605	3105	4105	1300	1600	1000
6606	3106	4106	1500	1500	1500
6607	3107	4107	1500	1500	1500
6608	3108	4108	300	300	300
6609	3109	4109	10	10	10
6610	3110	4110	1369	838	1257
6611	3111	4111	38	29	49
6612	3112	4112	1000	500	500
6613	3113	4113	425	350	180
6614	3114	4114	20	0	30
6615	3115	4115	0	0	0
6616	3116	4116	110	100	100
6617	3117	4117	20	20	20
6618	3118	4118	20	20	20
6619	3119	4119	0	0	0
6620	3120	4120	35	35	35
6624	3124	4124	0	0	0
6627	3127	4127	178	163	164
6628	3128	4128	0	0	32000
6629	3129	4129	0	0	0
6630	3130	4130	0	0	0
6933	3133	4169	0	0	0
Applicable amplifier			SPM-11	SPM-11	SPM-22

NOTE
■Asterisk marked parameters must be set after setting the parameters automatically.

Model name			α B112L -5.5/12000 (L510)	Model code (Applicable ROM Version)			165 (9D00/O)
for low speed winding				for high speed winding			
Parameter No.			5.5/7.5 kW 680/1600	Parameter No.			5.5/7.5 kW 1600/12000
FS0	FS15	FS16	min^{-1}	FS0	FS15	FS16	min^{-1}
				6507	3007	4007	10000000
				6508	3008	4008	00000000
				6509	3009	4009	00000000
				6511	3011	4011	00001010
				6512	3012	4012	00000000
				6513	3013	4013	00011010
				6519	3019	4019	00001100
				6520	3020	4020	12000
				6523	3023	4023	133 *
6920	3300	4156	15	6539	3039	4039	0
6541	3041	4041	4 *				
6549	3049	4049	4 *				
6930	3310	4166	60 *	6580	3080	4080	80
				6598	3098	4098	10000 *
6902	3282	4138	1000	6600	3100	4100	1700
6903	3283	4139	100	6601	3101	4101	100
6904	3284	4140	1000	6602	3102	4102	2500
6905	3285	4141	1000	6603	3103	4103	2500
6906	3286	4142	1000	6604	3104	4104	1000
				6605	3105	4105	1000
6907	3287	4143	1500	6606	3106	4106	1500
				6607	3107	4107	1500
6908	3288	4144	300	6608	3108	4108	300
6909	3289	4145	10	6609	3109	4109	10
6910	3290	4146	1508	6610	3110	4110	707
6911	3291	4147	50	6611	3111	4111	22
6912	3292	4148	667	6612	3112	4112	2667
6913	3293	4149	350	6613	3113	4113	450
6914	3294	4150	10	6614	3114	4114	10
6915	3295	4151	5	6615	3115	4115	2
6916	3296	4152	100	6616	3116	4116	100
6917	3297	4153	20	6617	3117	4117	20
6918	3298	4154	10	6618	3118	4118	10
6929	3309	4165	0	6619	3119	4119	0
				6620	3120	4120	30
6919	3299	4155	0	6624	3124	4124	0
				6627	3127	4127	164
6922	3302	4158	0	6628	3128	4128	16000
6923	3303	4159	0	6629	3129	4129	0
6925	3305	4161	0	6630	3130	4130	0
				6933	3313	4169	240
Applicable amplifier			SPM-15				

NOTE

■Asterisk marked parameters must be set after setting the parameters automatically.

Model name			α B112L -18.5/14000 (L511)	Model code (Applicable ROM Version)			166 (9D00/O)
for low speed winding				for high speed winding			
Parameter No.			15/18.5 kW 1500/3500	Parameter No.			18.5/22 kW 5000/14000
FS0	FS15	FS16	min^{-1}	FS0	FS15	FS16	min^{-1} ·
				6507	3007	4007	10000000
				6508	3008	4008	00000000
				6509	3009	4009	00000000
				6511	3011	4011	00001010
				6512	3012	4012	00000000
				6513	3013	4013	00100110
				6519	3019	4019	00001100
				6520	3020	4020	14000
				6523	3023	4023	250 *
6920	3300	4156	0	6539	3039	4039	0
6541	3041	4041	3 *				
6549	3049	4049	3 *				
6930	3310	4166	80 *	6580	3080	4080	100
				6598	3098	4098	10000 *
6902	3282	4138	1800	6600	3100	4100	7000
6903	3283	4139	100	6601	3101	4101	100
6904	3284	4140	1800	6602	3102	4102	7000
6905	3285	4141	1800	6603	3103	4103	7000
6906	3286	4142	1500	6604	3104	4104	300
				6605	3105	4105	300
6907	3287	4143	1500	6606	3106	4106	1500
				6607	3107	4107	1500
6908	3288	4144	300	6608	3108	4108	300
6909	3289	4145	10	6609	3109	4109	10
6910	3290	4146	2011	6610	3110	4110	1206
6911	3291	4147	53	6611	3111	4111	30
6912	3292	4148	313	6612	3112	4112	1250
6913	3293	4149	550	6613	3113	4113	480
6914	3294	4150	10	6614	3114	4114	30
6915	3295	4151	10	6615	3115	4115	5
6916	3296	4152	120	6616	3116	4116	100
6917	3297	4153	20	6617	3117	4117	20
6918	3298	4154	20	6618	3118	4118	20
6929	3309	4165	0	6619	3119	4119	0
				6620	3120	4120	35
6919	3299	4155	0	6624	3124	4124	0
				6627	3127	4127	148
6922	3302	4158	0	6628	3128	4128	0
6923	3303	4159	0	6629	3129	4129	0
6925	3305	4161	0	6630	3130	4130	25
				6933	3313	4169	0
Applicable amplifier			SPM-30				

NOTE
■Asterisk marked parameters must be set after setting the parameters automatically.

Model name			α B112LL -5.5/12000 (L512)	Model code (Applicable ROM Version)			167 (9D00/O)
for low speed winding				for high speed winding			
Parameter No.			5.5/7.5 kW 450/1000 min^{-1}	Parameter No.			5.5/7.5 kW 1000/12000 min^{-1}
FS0	FS15	FS16		FS0	FS15	FS16	
				6507	3007	4007	10000000
				6508	3008	4008	00000000
				6509	3009	4009	00000000
				6511	3011	4011	00001010
				6512	3012	4012	00000000
				6513	3013	4013	00100110
				6519	3019	4019	00001100
				6520	3020	4020	12000
				6523	3023	4023	83 *
6920	3300	4156	0	6539	3039	4039	0
6541	3041	4041	3 *				
6549	3049	4049	3 *				
6930	3310	4166	70 *	6580	3080	4080	90
				6598	3098	4098	10000 *
6902	3282	4138	520	6600	3100	4100	1050
6903	3283	4139	100	6601	3101	4101	100
6904	3284	4140	900	6602	3102	4102	1900
6905	3285	4141	900	6603	3103	4103	1900
6906	3286	4142	2000	6604	3104	4104	1100
				6605	3105	4105	1100
6907	3287	4143	1500	6606	3106	4106	1500
				6607	3107	4107	1500
6908	3288	4144	500	6608	3108	4108	500
6909	3289	4145	10	6609	3109	4109	10
6910	3290	4146	1676	6610	3110	4110	838
6911	3291	4147	55	6611	3111	4111	21
6912	3292	4148	500	6612	3112	4112	500
6913	3293	4149	350	6613	3113	4113	500
6914	3294	4150	20	6614	3114	4114	20
6915	3295	4151	0	6615	3115	4115	5
6916	3296	4152	100	6616	3116	4116	100
6917	3297	4153	20	6617	3117	4117	20
6918	3298	4154	10	6618	3118	4118	10
6929	3309	4165	0	6619	3119	4119	0
				6620	3120	4120	50
6919	3299	4155	0	6624	3124	4124	0
				6627	3127	4127	164
6922	3302	4158	0	6628	3128	4128	15000
6923	3303	4159	0	6629	3129	4129	0
6925	3305	4161	0	6630	3130	4130	0
				6933	3313	4169	0
Applicable amplifier			SPM-22				

NOTE
■Asterisk marked parameters must be set after setting the parameters automatically.

Model name			α B112LL -18.5/12000 (L513)	Model code (Applicable ROM Version)			168 (9D00/O)
for low speed winding				for high speed winding			
Parameter No.			15/18.5 kW 1200/4000 min^{-1}	Parameter No.			18.5/22 kW 3500/12000 min^{-1}
FS0	FS15	FS16		FS0	FS15	FS16	
				6507	3007	4007	10000000
				6508	3008	4008	00000000
				6509	3009	4009	00000000
				6511	3011	4011	00001010
				6512	3012	4012	00000000
				6513	3013	4013	00100110
				6519	3019	4019	00001100
				6520	3020	4020	12000
				6523	3023	4023	217 *
6920	3300	4156	0	6539	3039	4039	0
6541	3041	4041	4 *				
6549	3049	4049	4 *				
6930	3310	4166	55 *	6580	3080	4080	60
				6598	3098	4098	10000 *
6902	3282	4138	1500	6600	3100	4100	3500
6903	3283	4139	100	6601	3101	4101	85
6904	3284	4140	1500	6602	3102	4102	4000
6905	3285	4141	1500	6603	3103	4103	4000
6906	3286	4142	800	6604	3104	4104	600
				6605	3105	4105	600
6907	3287	4143	1500	6606	3106	4106	1500
				6607	3107	4107	1500
6908	3288	4144	300	6608	3108	4108	300
6909	3289	4145	10	6609	3109	4109	10
6910	3290	4146	2011	6610	3110	4110	1006
6911	3291	4147	60	6611	3111	4111	29
6912	3292	4148	417	6612	3112	4112	833
6913	3293	4149	350	6613	3113	4113	500
6914	3294	4150	10	6614	3114	4114	20
6915	3295	4151	5	6615	3115	4115	0
6916	3296	4152	100	6616	3116	4116	110
6917	3297	4153	20	6617	3117	4117	20
6918	3298	4154	10	6618	3118	4118	20
6929	3309	4165	0	6619	3119	4119	0
				6620	3120	4120	35
6919	3299	4155	0	6624	3124	4124	0
				6627	3127	4127	148
6922	3302	4158	0	6628	3128	4128	12000
6923	3303	4159	0	6629	3129	4129	0
6925	3305	4161	0	6630	3130	4130	0
				6933	3313	4169	0
Applicable amplifier			SPM-30				

NOTE
■Asterisk marked parameters must be set after setting the parameters automatically.

Model name			α B132L -5.5/12000 (L514)	Model code (Applicable ROM Version)			169 (9D00/O)
for low speed winding				for high speed winding			
Parameter No.			5.5/7.5 kW 330/1500 min^{-1}	Parameter No.			5.5/7.5 kW 1500/12000 min^{-1}
FS0	FS15	FS16		FS0	FS15	FS16	
				6507	3007	4007	10000000
				6508	3008	4008	00000000
				6509	3009	4009	00000000
				6511	3011	4011	00001010
				6512	3012	4012	00000000
				6513	3013	4013	00011010
				6519	3019	4019	00001100
				6520	3020	4020	12000
				6523	3023	4023	125 *
6920	3300	4156	0	6539	3039	4039	0
6541	3041	4041	4 *				
6549	3049	4049	4 *				
6930	3310	4166	65 *	6580	3080	4080	75
				6598	3098	4098	10000 *
6902	3282	4138	380	6600	3100	4100	1650
6903	3283	4139	100	6601	3101	4101	100
6904	3284	4140	750	6602	3102	4102	2500
6905	3285	4141	750	6603	3103	4103	2500
6906	3286	4142	2000	6604	3104	4104	950
				6605	3105	4105	950
6907	3287	4143	1500	6606	3106	4106	100
				6607	3107	4107	100
6908	3288	4144	300	6608	3108	4108	300
6909	3289	4145	10	6609	3109	4109	10
6910	3290	4146	1886	6610	3110	4110	944
6911	3291	4147	63	6611	3111	4111	27
6912	3292	4148	333	6612	3112	4112	333
6913	3293	4149	160	6613	3113	4113	150
6914	3294	4150	15	6614	3114	4114	10
6915	3295	4151	5	6615	3115	4115	5
6916	3296	4152	100	6616	3116	4116	100
6917	3297	4153	20	6617	3117	4117	30
6918	3298	4154	0	6618	3118	4118	10
6929	3309	4165	0	6619	3119	4119	0
				6620	3120	4120	30
6919	3299	4155	0	6624	3124	4124	0
				6627	3127	4127	164
6922	3302	4158	3800	6628	3128	4128	9000
6923	3303	4159	0	6629	3129	4129	0
6925	3305	4161	0	6630	3130	4130	0
				6933	3313	4169	0
Applicable amplifier			SPM-15				

NOTE
■Asterisk marked parameters must be set after setting the parameters automatically.

Model name			α B132L -22/12000 (L520)	Model code (Applicable ROM Version)			
for low speed winding				for high speed winding			
Parameter No.			15/22 kW 750/3000	Parameter No.			22/25 kW 5500/12000
FS0	FS15	FS16	min^{-1}	FS0	FS15	FS16	min^{-1} ・
				6507	3007	4007	10000000
				6508	3008	4008	00000001
				6509	3009	4009	00000000
				6511	3011	4011	00001010
				6512	3012	4012	00000000
				6513	3013	4013	00100110
				6519	3019	4019	00001100
				6520	3020	4020	12000
				6523	3023	4023	250
6920	3300	4156	0	6539	3039	4039	0
6541	3041	4041	4				
6549	3049	4049	4				
6930	3310	4166	100	6580	3080	4080	53
				6598	3098	4098	10000
6902	3282	4138	1300	6600	3100	4100	6000
6903	3283	4139	100	6601	3101	4101	100
6904	3284	4140	1300	6602	3102	4102	6000
6905	3285	4141	1300	6603	3103	4103	6000
6906	3286	4142	1500	6604	3104	4104	400
				6605	3105	4105	400
6907	3287	4143	1500	6606	3106	4106	1500
				6607	3107	4107	1500
6908	3288	4144	300	6608	3108	4108	300
6909	3289	4145	10	6609	3109	4109	10
6910	3290	4146	3017	6610	3110	4110	928
6911	3291	4147	100	6611	3111	4111	31
6912	3292	4148	417	6612	3112	4112	2500
6913	3293	4149	110	6613	3113	4113	150
6914	3294	4150	0	6614	3114	4114	30
6915	3295	4151	5	6615	3115	4115	2
6916	3296	4152	100	6616	3116	4116	120
6917	3297	4153	20	6617	3117	4117	20
6918	3298	4154	10	6618	3118	4118	20
6929	3309	4165	0	6619	3119	4119	0
				6620	3120	4120	55
6919	3299	4155	0	6624	3124	4124	0
				6627	3127	4127	176
6922	3302	4158	0	6628	3128	4128	0
6923	3303	4159	0	6629	3129	4129	0
6925	3305	4161	0	6630	3130	4130	38
				6933	3313	4169	0
Applicable amplifier			SPM-30				

NOTE
■Asterisk marked parameters must be set after setting the parameters automatically.

Model name			α B160M -5.5/7000 (L509)	Model code (Applicable ROM Version)			164 (9D00/O)
for low speed winding				for high speed winding			
Parameter No.			5.5/7.5 kW 450/1000	Parameter No.			5.5/7.5 kW 1000/7000
FS0	FS15	FS16	min^{-1}	FS0	FS15	FS16	min^{-1}
				6507	3007	4007	10000000
				6508	3008	4008	00000000
				6509	3009	4009	00000000
				6511	3011	4011	00001010
				6512	3012	4012	00000000
				6513	3013	4013	00011010
				6519	3019	4019	00001100
				6520	3020	4020	7000
				6523	3023	4023	143 *
6920	3300	4156	0	6539	3039	4039	0
6930	3310	4166	66 *	6580	3080	4080	66
				6598	3098	4098	0
6902	3282	4138	520	6600	3100	4100	1080
6903	3283	4139	73	6601	3101	4101	66
6904	3284	4140	601	6602	3102	4102	1203
6905	3285	4141	601	6603	3103	4103	1203
6906	3286	4142	1500	6604	3104	4104	1400
				6605	3105	4105	1400
6907	3287	4143	1500	6606	3106	4106	1500
				6607	3107	4107	1500
6908	3288	4144	300	6608	3108	4108	300
6909	3289	4145	10	6609	3109	4109	10
6910	3290	4146	1331	6610	3110	4110	984
6911	3291	4147	44	6611	3111	4111	31
6912	3292	4148	333	6612	3112	4112	333
6913	3293	4149	160	6613	3113	4113	140
6914	3294	4150	10	6614	3114	4114	15
6915	3295	4151	0	6615	3115	4115	0
6916	3296	4152	100	6616	3116	4116	100
6917	3297	4153	20	6617	3117	4117	20
6918	3298	4154	20	6618	3118	4118	20
6929	3309	4165	0	6619	3119	4119	0
				6620	3120	4120	35
6919	3299	4155	0	6624	3124	4124	0
				6627	3127	4127	164
6922	3302	4158	0	6628	3128	4128	3000
6923	3303	4159	0	6629	3129	4129	0
6925	3305	4161	0	6630	3130	4130	0
				6933	3313	4169	0
Applicable amplifier			SPM-15				

NOTE
■Asterisk marked parameters must be set after setting the parameters automatically.

Model name			α B160M -11/6000 (L534)	Model code (Applicable ROM Version)			
for low speed winding				for high speed winding			
Parameter No.			5.5/7.5 kW 300/850	Parameter No.			11/18.5 kW 850/6000
FS0	FS15	FS16	min^{-1}	FS0	FS15	FS16	min^{-1}
				6507	3007	4007	10000000
				6508	3008	4008	00000000
				6509	3009	4009	00000000
				6511	3011	4011	00111010
				6512	3012	4012	00000000
				6513	3013	4013	00100110
				6519	3019	4019	00001100
				6520	3020	4020	6000
				6523	3023	4023	142
6920	3300	4156	0	6539	3039	4039	0
6541	3041	4041	6	6540	3040	4040	8
6549	3049	4049	6	6548	3048	4048	8
6930	3310	4166	40	6580	3080	4080	30
				6598	3098	4098	0
6902	3282	4138	300	6600	3100	4100	1300
6903	3283	4139	100	6601	3101	4101	100
6904	3284	4140	750	6602	3102	4102	1300
6905	3285	4141	750	6603	3103	4103	1300
6906	3286	4142	1000	6604	3104	4104	1000
				6605	3105	4105	1000
6907	3287	4143	1500	6606	3106	4106	1500
				6607	3107	4107	1500
6908	3288	4144	300	6608	3108	4108	300
6909	3289	4145	10	6609	3109	4109	10
6910	3290	4146	4309	6610	3110	4110	2414
6911	3291	4147	90	6611	3111	4111	75
6912	3292	4148	313	6612	3112	4112	313
6913	3293	4149	130	6613	3113	4113	180
6914	3294	4150	0	6614	3114	4114	0
6915	3295	4151	0	6615	3115	4115	0
6916	3296	4152	100	6616	3116	4116	100
6917	3297	4153	20	6617	3117	4117	20
6918	3298	4154	20	6618	3118	4118	20
6929	3309	4165	0	6619	3119	4119	0
				6620	3120	4120	50
6919	3299	4155	0	6624	3124	4124	0
				6627	3127	4127	202
6922	3302	4158	0	6628	3128	4128	0
6923	3303	4159	0	6629	3129	4129	0
6925	3305	4161	0	6630	3130	4130	0
				6933	3313	4169	0
Applicable amplifier			SPM-30				

NOTE
■Asterisk marked parameters must be set after setting the parameters automatically.

Model name			α B160L -7.5/12000 (L515)	Model code (Applicable ROM Version)			170 (9D00/O)
for low speed winding				for high speed winding			
Parameter No.			7.5/11 kW 450/800	Parameter No.			7.5/11 kW 800/12000
FS0	FS15	FS16	min^{-1}	FS0	FS15	FS16	min^{-1}
				6507	3007	4007	10000000
				6508	3008	4008	00000000
				6509	3009	4009	00000000
				6511	3011	4011	00001010
				6512	3012	4012	00000000
				6513	3013	4013	00100110
				6519	3019	4019	00001100
				6520	3020	4020	12000
				6523	3023	4023	67 *
6920	3300	4156	53	6539	3039	4039	0
6930	3310	4166	70 *	6580	3080	4080	70
				6598	3098	4098	10000 *
6902	3282	4138	450	6600	3100	4100	900
6903	3283	4139	100	6601	3101	4101	95
6904	3284	4140	600	6602	3102	4102	1700
6905	3285	4141	600	6603	3103	4103	1500
6906	3286	4142	2500	6604	3104	4104	1000
				6605	3105	4105	1000
6907	3287	4143	1500	6606	3106	4106	1500
				6607	3107	4107	1500
6908	3288	4144	300	6608	3108	4108	300
6909	3289	4145	10	6609	3109	4109	10
6910	3290	4146	1006	6610	3110	4110	1006
6911	3291	4147	32	6611	3111	4111	37
6912	3292	4148	500	6612	3112	4112	1000
6913	3293	4149	200	6613	3113	4113	180
6914	3294	4150	20	6614	3114	4114	0
6915	3295	4151	5	6615	3115	4115	5
6916	3296	4152	100	6616	3116	4116	100
6917	3297	4153	20	6617	3117	4117	20
6918	3298	4154	10	6618	3118	4118	10
6929	3309	4165	0	6619	3119	4119	0
				6620	3120	4120	50
6919	3299	4155	0	6624	3124	4124	0
				6627	3127	4127	176
6922	3302	4158	0	6628	3128	4128	20000
6923	3303	4159	0	6629	3129	4129	0
6925	3305	4161	53	6630	3130	4130	0
				6933	3313	4169	240
Applicable amplifier			SPM-22				

NOTE
■Asterisk marked parameters must be set after setting the parameters automatically.

Model name			α B160LL -25/13000 (L516)	Model code (Applicable ROM Version)			171 (9D00/O)
for low speed winding				for high speed winding			
Parameter No.			15/22 kW 600/3000 min^{-1}	Parameter No.			25/30 kW 2500/13000 min^{-1}
FS0	FS15	FS16		FS0	FS15	FS16	
				6507	3007	4007	10000000
				6508	3008	4008	00000011
				6509	3009	4009	00000000
				6511	3011	4011	00001010
				6512	3012	4012	00000000
				6513	3013	4013	00100110
				6519	3019	4019	00001100
				6520	3020	4020	13000
				6523	3023	4023	131 *
6920	3300	4156	0	6539	3039	4039	0
6541	3041	4041	7 *				
6549	3049	4049	7 *				
6930	3310	4166	85 *	6580	3080	4080	50
				6598	3098	4098	10000 *
6902	3282	4138	600	6600	3100	4100	2500
6903	3283	4139	100	6601	3101	4101	100
6904	3284	4140	600	6602	3102	4102	2500
6905	3285	4141	600	6603	3103	4103	2500
6906	3286	4142	1000	6604	3104	4104	1000
				6605	3105	4105	1000
6907	3287	4143	1500	6606	3106	4106	1500
				6607	3107	4107	1500
6908	3288	4144	300	6608	3108	4108	300
6909	3289	4145	10	6609	3109	4109	10
6910	3290	4146	1631	6610	3110	4110	1140
6911	3291	4147	50	6611	3111	4111	41
6912	3292	4148	417	6612	3112	4112	417
6913	3293	4149	180	6613	3113	4113	180
6914	3294	4150	0	6614	3114	4114	7
6915	3295	4151	5	6615	3115	4115	5
6916	3296	4152	100	6616	3116	4116	100
6917	3297	4153	20	6617	3117	4117	20
6918	3298	4154	50	6618	3118	4118	50
6929	3309	4165	0	6619	3119	4119	0
				6620	3120	4120	50
6919	3299	4155	0	6624	3124	4124	0
				6627	3127	4127	176
6922	3302	4158	0	6628	3128	4128	0
6923	3303	4159	0	6629	3129	4129	0
6925	3305	4161	0	6630	3130	4130	0
				6933	3313	4169	0
Applicable amplifier			SPM-30				

NOTE
■Asterisk marked parameters must be set after setting the parameters automatically.

Model name			α B180M -11/6000 (L517)	Model code (Applicable ROM Version)			172 (9D00/O)
for low speed winding				for high speed winding			
Parameter No.			11/15 kW 450/800 min^{-1}	Parameter No.			11/15 kW 800/6000 min^{-1}
FS0	FS15	FS16		FS0	FS15	FS16	
				6507	3007	4007	10000000
				6508	3008	4008	00000000
				6509	3009	4009	00000000
				6511	3011	4011	00001010
				6512	3012	4012	00000000
				6513	3013	4013	00100110
				6519	3019	4019	00001100
				6520	3020	4020	6000
				6523	3023	4023	133 *
6920	3300	4156	0	6539	3039	4039	0
6930	3310	4166	45 *	6580	3080	4080	66
				6598	3098	4098	0
6902	3282	4138	562	6600	3100	4100	1000
6903	3283	4139	100	6601	3101	4101	100
6904	3284	4140	562	6602	3102	4102	1875
6905	3285	4141	562	6603	3103	4103	1700
6906	3286	4142	1200	6604	3104	4104	1200
				6605	3105	4105	1200
6907	3287	4143	1200	6606	3106	4106	1200
				6607	3107	4107	1200
6908	3288	4144	300	6608	3108	4108	300
6909	3289	4145	10	6609	3109	4109	10
6910	3290	4146	3771	6610	3110	4110	2624
6911	3291	4147	99	6611	3111	4111	69
6912	3292	4148	150	6612	3112	4112	313
6913	3293	4149	75	6613	3113	4113	75
6914	3294	4150	20	6614	3114	4114	0
6915	3295	4151	0	6615	3115	4115	0
6916	3296	4152	120	6616	3116	4116	130
6917	3297	4153	20	6617	3117	4117	20
6918	3298	4154	20	6618	3118	4118	20
6929	3309	4165	0	6619	3119	4119	0
				6620	3120	4120	35
6919	3299	4155	0	6624	3124	4124	0
				6627	3127	4127	164
6922	3302	4158	0	6628	3128	4128	0
6923	3303	4159	0	6629	3129	4129	0
6925	3305	4161	0	6630	3130	4130	0
				6933	3313	4169	0
Applicable amplifier			SPM-30				

NOTE
■Asterisk marked parameters must be set after setting the parameters automatically.

Model name			α B180L -22/6000 (L525)	Model code (Applicable ROM Version)			
for low speed winding				for high speed winding			
Parameter No.			18.5/22 kW 500/1500	Parameter No.			22/25 kW 1500/6000
FS0	FS15	FS16	min^{-1}	FS0	FS15	FS16	min^{-1}
				6507	3007	4007	10000000
				6508	3008	4008	00000001
				6509	3009	4009	00000000
				6511	3011	4011	00001010
				6512	3012	4012	00000000
				6513	3013	4013	00100110
				6519	3019	4019	00001100
				6520	3020	4020	6000
				6523	3023	4023	167
6920	3300	4156	0	6539	3039	4039	0
6541	3041	4041	8				
6549	3049	4049	8				
6930	3310	4166	27	6580	3080	4080	55
				6598	3098	4098	0
6902	3282	4138	530	6600	3100	4100	1750
6903	3283	4139	100	6601	3101	4101	100
6904	3284	4140	530	6602	3102	4102	1750
6905	3285	4141	530	6603	3103	4103	1750
6906	3286	4142	2500	6604	3104	4104	1100
				6605	3105	4105	1100
6907	3287	4143	1500	6606	3106	4106	1500
				6607	3107	4107	1500
6908	3288	4144	300	6608	3108	4108	300
6909	3289	4145	10	6609	3109	4109	10
6910	3290	4146	2413	6610	3110	4110	2155
6911	3291	4147	77	6611	3111	4111	72
6912	3292	4148	208	6612	3112	4112	667
6913	3293	4149	80	6613	3113	4113	70
6914	3294	4150	0	6614	3114	4114	10
6915	3295	4151	0	6615	3115	4115	0
6916	3296	4152	100	6616	3116	4116	120
6917	3297	4153	20	6617	3117	4117	20
6918	3298	4154	20	6618	3118	4118	20
6929	3309	4165	0	6619	3119	4119	0
				6620	3120	4120	50
6919	3299	4155	0	6624	3124	4124	0
				6627	3127	4127	164
6922	3302	4158	0	6628	3128	4128	0
6923	3303	4159	0	6629	3129	4129	0
6925	3305	4161	0	6630	3130	4130	0
				6933	3313	4169	0
Applicable amplifier			SPM-30				

NOTE
■Asterisk marked parameters must be set after setting the parameters automatically.

Model name			α B180LL -22/8000 (L518)	Model code (Applicable ROM Version)			173 (9D00/O)
for low speed winding				for high speed winding			
Parameter No.			18.5/22 kW 350/1500 min^{-1}	Parameter No.			22/25 kW 1300/8000 min^{-1}
FS0	FS15	FS16		FS0	FS15	FS16	
				6507	3007	4007	10000000
				6508	3008	4008	00000000
				6509	3009	4009	00000000
				6511	3011	4011	00001010
				6512	3012	4012	00000000
				6513	3013	4013	00100110
				6519	3019	4019	00001100
				6520	3020	4020	8000
				6523	3023	4023	150 *
6920	3300	4156	42	6539	3039	4039	0
6930	3310	4166	70 *	6580	3080	4080	65
				6598	3098	4098	0
6902	3282	4138	500	6600	3100	4100	1500
6903	3283	4139	100	6601	3101	4101	100
6904	3284	4140	500	6602	3102	4102	1500
6905	3285	4141	500	6603	3103	4103	1500
6906	3286	4142	1000	6604	3104	4104	1200
				6605	3105	4105	1200
6907	3287	4143	1500	6606	3106	4106	1500
				6607	3107	4107	1500
6908	3288	4144	300	6608	3108	4108	300
6909	3289	4145	10	6609	3109	4109	10
6910	3290	4146	1724	6610	3110	4110	862
6911	3291	4147	50	6611	3111	4111	21
6912	3292	4148	417	6612	3112	4112	417
6913	3293	4149	90	6613	3113	4113	100
6914	3294	4150	10	6614	3114	4114	10
6915	3295	4151	5	6615	3115	4115	5
6916	3296	4152	100	6616	3116	4116	100
6917	3297	4153	20	6617	3117	4117	20
6918	3298	4154	10	6618	3118	4118	10
6929	3309	4165	0	6619	3119	4119	0
				6620	3120	4120	50
6919	3299	4155	0	6624	3124	4124	0
				6627	3127	4127	136
6922	3302	4158	0	6628	3128	4128	0
6923	3303	4159	0	6629	3129	4129	0
6925	3305	4161	0	6630	3130	4130	0
				6933	3313	4169	1800
Applicable amplifier			SPM-30				

NOTE
■Asterisk marked parameters must be set after setting the parameters automatically.

Model name			α B225M -15/4500 (L536)	Model code (Applicable ROM Version)			
for low speed winding				for high speed winding			
Parameter No.			15/22 kW 290/650	Parameter No.			15/22 kW 650/4500
FS0	FS15	FS16	min^{-1}	FS0	FS15	FS16	min^{-1}
				6507	3007	4007	10000000
				6508	3008	4008	00000000
				6509	3009	4009	00000000
				6511	3011	4011	10000010
				6512	3012	4012	00000000
				6513	3013	4013	00111110
				6519	3019	4019	00001100
				6520	3020	4020	4500
				6523	3023	4023	144
6920	3300	4156	0	6539	3039	4039	0
6930	3310	4166	50	6580	3080	4080	50
				6598	3098	4098	0
6902	3282	4138	450	6600	3100	4100	1300
6903	3283	4139	100	6601	3101	4101	100
6904	3284	4140	450	6602	3102	4102	1300
6905	3285	4141	450	6603	3103	4103	1300
6906	3286	4142	2400	6604	3104	4104	1500
				6605	3105	4105	1500
6907	3287	4143	1500	6606	3106	4106	1500
				6607	3107	4107	1500
6908	3288	4144	300	6608	3108	4108	300
6909	3289	4145	10	6609	3109	4109	10
6910	3290	4146	1234	6610	3110	4110	1212
6911	3291	4147	39	6611	3111	4111	38
6912	3292	4148	370	6612	3112	4112	370
6913	3293	4149	400	6613	3113	4113	150
6914	3294	4150	10	6614	3114	4114	10
6915	3295	4151	5	6615	3115	4115	5
6916	3296	4152	100	6616	3116	4116	100
6917	3297	4153	20	6617	3117	4117	20
6918	3298	4154	10	6618	3118	4118	10
6929	3309	4165	0	6619	3119	4119	0
				6620	3120	4120	80
6919	3299	4155	0	6624	3124	4124	0
				6627	3127	4127	176
6922	3302	4158	0	6628	3128	4128	0
6923	3303	4159	0	6629	3129	4129	0
6925	3305	4161	0	6630	3130	4130	0
				6933	3313	4169	0
Applicable amplifier			SPM-45				

NOTE
■Asterisk marked parameters must be set after setting the parameters automatically.

E.2 HIGH-SPEED TYPE

Model code (Applicable ROM Version)			
Model name / Parameter No.			α B100S -11/20000 (L174) 11/15 kW 7500/20000
FS0	FS15	FS16	min^{-1}
6507	3007	4007	10000000
6508	3008	4008	00000000
6509	3009	4009	00000000
6511	3011	4011	00001010
6512	3012	4012	00000000
6513	3013	4013	00100110
6519	3019	4019	00001100
6520	3020	4020	20000
6539	3039	4039	0
6540	3040	4040	8
6548	3048	4048	8
6580	3080	4080	80
6598	3098	4098	10000
6600	3100	4100	11000
6601	3101	4101	100
6602	3102	4102	11000
6603	3103	4103	9000
6604	3104	4104	400
6605	3105	4105	400
6606	3106	4106	800
6607	3107	4107	800
6608	3108	4108	300
6609	3109	4109	10
6610	3110	4110	1077
6611	3111	4111	33
6612	3112	4112	1500
6613	3113	4113	580
6614	3114	4114	10
6615	3115	4115	5
6616	3116	4116	100
6617	3117	4117	20
6618	3118	4118	20
6619	3119	4119	0
6620	3120	4120	55
6624	3124	4124	50
6627	3127	4127	163
6628	3128	4128	0
6629	3129	4129	0
6630	3130	4130	45
6933	3313	4169	0
Applicable amplifier			SPM-22

NOTE
■Asterisk marked parameters must be set after setting the parameters automatically.

Model name			α B100L -11/25000 (L549)	Model code (Applicable ROM Version)			
for low speed winding				for high speed winding			
Parameter No.			11/15 kW 5500/9000	Parameter No.			11/15 kW 9000/25000
FS0	FS15	FS16	min^{-1}	FS0	FS15	FS16	min^{-1}
				6507	3007	4007	10000000
				6508	3008	4008	00000000
				6509	3009	4009	00000000
				6511	3011	4011	00000001
				6512	3012	4012	00000000
				6513	3013	4013	00100110
				6519	3019	4019	00001100
				6520	3020	4020	25000
				6523	3023	4023	360
6920	3300	4156	0	6539	3039	4039	0
6930	3310	4166	80	6580	3080	4080	80
				6598	3098	4098	20000
6902	3282	4138	5500	6600	3100	4100	11000
6903	3283	4139	100	6601	3101	4101	100
6904	3284	4140	5500	6602	3102	4102	11000
6905	3285	4141	5500	6603	3103	4103	11000
6906	3286	4142	700	6604	3104	4104	700
				6605	3105	4105	700
6907	3287	4143	1000	6606	3106	4106	1000
				6607	3107	4107	1000
6908	3288	4144	300	6608	3108	4108	300
6909	3289	4145	10	6609	3109	4109	10
6910	3290	4146	2514	6610	3110	4110	1775
6911	3291	4147	39	6611	3111	4111	26
6912	3292	4148	1000	6612	3112	4112	2000
6913	3293	4149	550	6613	3113	4113	450
6914	3294	4150	17	6614	3114	4114	10
6915	3295	4151	0	6615	3115	4115	0
6916	3296	4152	100	6616	3116	4116	100
6917	3297	4153	20	6617	3117	4117	20
6918	3298	4154	20	6618	3118	4118	20
6929	3309	4165	0	6619	3119	4119	0
				6620	3120	4120	50
6919	3299	4155	0	6624	3124	4124	0
				6627	3127	4127	164
6922	3302	4158	0	6628	3128	4128	0
6923	3303	4159	0	6629	3129	4129	0
6925	3305	4161	30	6630	3130	4130	0
				6933	3313	4169	0
Applicable amplifier			SPM-30				

NOTE
■Asterisk marked parameters must be set after setting the parameters automatically.

Model name			α B112M -15/20000 (L522)	Model code (Applicable ROM Version)			
for low speed winding				for high speed winding			
Parameter No.			10/15 kW 1500/4500 min^{-1}	Parameter No.			15/18.5 kW 10000/20000 min^{-1}
FS0	FS15	FS16		FS0	FS15	FS16	
				6507	3007	4007	10000000
				6508	3008	4008	00000000
				6509	3009	4009	00000000
				6511	3011	4011	00001010
				6512	3012	4012	00000010
				6513	3013	4013	10100110
				6519	3019	4019	00101100
				6520	3020	4020	20000
				6523	3023	4023	225
6920	3300	4156	0	6539	3039	4039	0
6541	3041	4041	4				
6549	3049	4049	4				
6930	3310	4166	100	6580	3080	4080	63
				6598	3098	4098	10000
6902	3282	4138	1950	6600	3100	4100	15000
6903	3283	4139	100	6601	3101	4101	100
6904	3284	4140	2187	6602	3102	4102	15000
6905	3285	4141	2187	6603	3103	4103	13000
6906	3286	4142	1000	6604	3104	4104	240
				6605	3105	4105	240
6907	3287	4143	1000	6606	3106	4106	600
				6607	3107	4107	600
6908	3288	4144	300	6608	3108	4108	300
6909	3289	4145	10	6609	3109	4109	10
6910	3290	4146	1206	6610	3110	4110	1725
6911	3291	4147	30	6611	3111	4111	45
6912	3292	4148	313	6612	3112	4112	2500
6913	3293	4149	650	6613	3113	4113	330
6914	3294	4150	0	6614	3114	4114	0
6915	3295	4151	0	6615	3115	4115	0
6916	3296	4152	100	6616	3116	4116	100
6917	3297	4153	20	6617	3117	4117	20
6918	3298	4154	20	6618	3118	4118	0
6929	3309	4165	0	6619	3119	4119	0
				6620	3120	4120	90
6919	3299	4155	0	6624	3124	4124	200
				6627	3127	4127	180
6922	3302	4158	9000	6628	3128	4128	0
6923	3303	4159	0	6629	3129	4129	0
6925	3305	4161	20	6630	3130	4130	100
				6933	3313	4169	0
Applicable amplifier			SPM-30				

NOTE
■Asterisk marked parameters must be set after setting the parameters automatically.

Model name			α B112L -18.5/20000 (L546)	Model code (Applicable ROM Version)			
for low speed winding				for high speed winding			
Parameter No.			15/18.5 kW 1800/4000	Parameter No.			18.5/22 kW 8000/20000
FS0	FS15	FS16	min^{-1}	FS0	FS15	FS16	min^{-1}
				6507	3007	4007	10000000
				6508	3008	4008	00000000
				6509	3009	4009	00000000
				6511	3011	4011	00011010
				6512	3012	4012	00000000
				6513	3013	4013	00100110
				6519	3019	4019	00101100
				6520	3020	4020	20000
				6523	3023	4023	200
6920	3300	4156	0	6539	3039	4039	0
6541	3041	4041	4				
6549	3049	4049	4				
6930	3310	4166	80	6580	3080	4080	100
				6598	3098	4098	10000
6902	3282	4138	2000	6600	3100	4100	7500
6903	3283	4139	100	6601	3101	4101	90
6904	3284	4140	2000	6602	3102	4102	7500
6905	3285	4141	2000	6603	3103	4103	7500
6906	3286	4142	1500	6604	3104	4104	350
				6605	3105	4105	350
6907	3287	4143	1500	6606	3106	4106	1500
				6607	3107	4107	1500
6908	3288	4144	500	6608	3108	4108	500
6909	3289	4145	10	6609	3109	4109	10
6910	3290	4146	1774	6610	3110	4110	1006
6911	3291	4147	41	6611	3111	4111	28
6912	3292	4148	417	6612	3112	4112	417
6913	3293	4149	450	6613	3113	4113	400
6914	3294	4150	0	6614	3114	4114	10
6915	3295	4151	5	6615	3115	4115	5
6916	3296	4152	100	6616	3116	4116	100
6917	3297	4153	20	6617	3117	4117	20
6918	3298	4154	20	6618	3118	4118	20
6929	3309	4165	0	6619	3119	4119	200
				6620	3120	4120	35
6919	3299	4155	0	6624	3124	4124	0
				6627	3127	4127	148
6922	3302	4158	0	6628	3128	4128	0
6923	3303	4159	0	6629	3129	4129	0
6925	3305	4161	0	6630	3130	4130	50
				6933	3313	4169	0
Applicable amplifier			SPM-30				

NOTE
■Asterisk marked parameters must be set after setting the parameters automatically.

Model name			α B112L -18.5/24000 (L541)	Model code (Applicable ROM Version)			
for low speed winding				for high speed winding			
Parameter No.			15/18.5 kW 1800/4000	Parameter No.			18.5/22 kW 9000/24000
FS0	FS15	FS16	min^{-1}	FS0	FS15	FS16	min^{-1}
				6507	3007	4007	10000000
				6508	3008	4008	00000000
				6509	3009	4009	00000000
				6511	3011	4011	00011010
				6512	3012	4012	00000010
				6513	3013	4013	10100110
				6519	3019	4019	00101100
				6520	3020	4020	24000
				6523	3023	4023	167
6920	3300	4156	0	6539	3039	4039	0
6541	3041	4041	4				
6549	3049	4049	4				
6930	3310	4166	100	6580	3080	4080	100
				6598	3098	4098	10000
6902	3282	4138	2000	6600	3100	4100	10000
6903	3283	4139	100	6601	3101	4101	65
6904	3284	4140	2000	6602	3102	4102	7500
6905	3285	4141	2000	6603	3103	4103	7500
6906	3286	4142	1500	6604	3104	4104	350
				6605	3105	4105	350
6907	3287	4143	1500	6606	3106	4106	1000
				6607	3107	4107	1000
6908	3288	4144	500	6608	3108	4108	500
6909	3289	4145	10	6609	3109	4109	10
6910	3290	4146	1774	6610	3110	4110	1078
6911	3291	4147	33	6611	3111	4111	31
6912	3292	4148	417	6612	3112	4112	417
6913	3293	4149	600	6613	3113	4113	420
6914	3294	4150	0	6614	3114	4114	10
6915	3295	4151	5	6615	3115	4115	5
6916	3296	4152	100	6616	3116	4116	100
6917	3297	4153	20	6617	3117	4117	20
6918	3298	4154	20	6618	3118	4118	20
6929	3309	4165	0	6619	3119	4119	200
				6620	3120	4120	55
6919	3299	4155	0	6624	3124	4124	0
				6627	3127	4127	148
6922	3302	4158	0	6628	3128	4128	13501
6923	3303	4159	0	6629	3129	4129	0
6925	3305	4161	40	6630	3130	4130	55
				6933	3313	4169	0
Applicable amplifier			SPM-30 (Remodeling A06B-6088-J417)				

NOTE
■Asterisk marked parameters must be set after setting the parameters automatically.

Model name			α B160LL -25/15000 (Under development)	Model code (Applicable ROM Version)			
for low speed winding				for high speed winding			
Parameter No.			15/22 kW 600/3000	Parameter No.			22/25 kW 8000/15000
FS0	FS15	FS16	min^{-1}	FS0	FS15	FS16	min^{-1} *
				6507	3007	4007	10000000
				6508	3008	4008	00000000
				6509	3009	4009	00000000
				6511	3011	4011	00001010
				6512	3012	4012	00000000
				6513	3013	4013	00100110
				6519	3019	4019	00001100
				6520	3020	4020	15000
				6523	3023	4023	200
6920	3300	4156	0	6539	3039	4039	0
6541	3041	4041	8				
6549	3049	4049	8				
6930	3310	4166	70	6580	3080	4080	90
				6598	3098	4098	10000
6902	3282	4138	800	6600	3100	4100	8000
6903	3283	4139	100	6601	3101	4101	100
6904	3284	4140	800	6602	3102	4102	8000
6905	3285	4141	800	6603	3103	4103	8000
6906	3286	4142	1500	6604	3104	4104	500
				6605	3105	4105	500
6907	3287	4143	1500	6606	3106	4106	1500
				6607	3107	4107	1500
6908	3288	4144	300	6608	3108	4108	300
6909	3289	4145	10	6609	3109	4109	10
6910	3290	4146	1258	6610	3110	4110	1207
6911	3291	4147	37	6611	3111	4111	35
6912	3292	4148	833	6612	3112	4112	3333
6913	3293	4149	220	6613	3113	4113	200
6914	3294	4150	10	6614	3114	4114	10
6915	3295	4151	5	6615	3115	4115	2
6916	3296	4152	100	6616	3116	4116	100
6917	3297	4153	20	6617	3117	4117	20
6918	3298	4154	20	6618	3118	4118	20
6929	3309	4165	0	6619	3119	4119	0
				6620	3120	4120	40
6919	3299	4155	0	6624	3124	4124	0
				6627	3127	4127	176
6922	3302	4158	0	6628	3128	4128	0
6923	3303	4159	0	6629	3129	4129	0
6925	3305	4161	0	6630	3130	4130	0
				6933	3313	4169	0
Applicable amplifier			SPM-30				

NOTE
■Asterisk marked parameters must be set after setting the parameters automatically.

F SPECIFICATION NUMBER

F.1 STANDARD TYPE

Model name	Specification number		Attached sensor		Applicable amplifier(SPM)
	FANUC name plate	GEFanuc name plate	Built-in sensor	High resolution magnetic pulse coder	
α B80M-1.5	A06B-1211-B113#Z112	A06B-1211-B113#1112	A860-0392-T012		A06B-6078-H202#H500
	A06B-1211-B113#Z11A	A06B-1211-B113#111A		A860-0382-T121	A06B-6078-H302#H500
α B80L-1.1	A06B-1212-B413#Z112	A06B-1212-B413#1112	A860-0392-T012		A06B-6078-H206#H500
	A06B-1212-B413#Z11A	A06B-1212-B413#111A		A860-0382-T121	A06B-6078-H306#H500
α B100S-2.2	A06B-1221-B413#Z111	A06B-1221-B413#1111	A860-0392-T011		A06B-6078-H206#H500
	A06B-1221-B413#Z112	A06B-1221-B413#1112	A860-0392-T012		A06B-6078-H206#H500
	A06B-1221-B413#Z11A	A06B-1221-B413#111A		A860-0382-T121	A06B-6078-H306#H500
	A06B-1221-B413#Z11B	A06B-1221-B413#111B		A860-0382-T122	A06B-6078-H306#H500
	A06B-1221-B413#Z11C	A06B-1221-B413#111C		A860-0382-T123	A06B-6078-H306#H500
α B112S-3.7	A06B-1231-B413#Z111	A06B-1231-B413#1111	A860-0392-T011		A06B-6078-H211#H500
	A06B-1231-B413#Z11A	A06B-1231-B413#111A		A860-0382-T121	A06B-6078-H311#H500
α B112M-5.5	A06B-1232-B412#Z111	A06B-1232-B412#1111	A860-0392-T011		A06B-6078-H211#H500
	A06B-1232-B412#Z112	A06B-1232-B412#1112	A860-0392-T012		A06B-6078-H211#H500
	A06B-1232-B412#Z11A	A06B-1232-B412#111A		A860-0382-T121	A06B-6078-H311#H500
	A06B-1232-B412#Z11B	A06B-1232-B412#111B		A860-0382-T122	A06B-6078-H311#H500
α B112L-5.5	A06B-1233-B410#Z111	A06B-1233-B410#1111	A860-0392-T011		A06B-6088-H215#H500
	A06B-1233-B410#Z112	A06B-1233-B410#1112	A860-0392-T012		A06B-6088-H215#H500
α B112L-18.5	A06B-1233-B411#Z111	A06B-1233-B411#1111	A860-0392-T011		A06B-6088-H230#H500
	A06B-1233-B411#Z114	A06B-1233-B411#1114	A860-0392-T014		A06B-6088-H230#H500
α B112LL-5.5	A06B-1234-B410#Z111	A06B-1234-B410#1111	A860-0392-T011		A06B-6088-H222#H500
	A06B-1234-B410#Z11A	A06B-1234-B410#111A		A860-0382-T121	A06B-6088-H322#H500
α B112LL-18.5	A06B-1234-B411#4111	A06B-1234-B411#T111	A860-0392-T011		A06B-6088-H230#H500
α B132L-5.5	A06B-1241-B410#Z111	A06B-1241-B410#1111	A860-0392-T011		A06B-6088-H215#H500
	A06B-1241-B410#Z114	A06B-1241-B410#1114	A860-0392-T014		A06B-6088-H215#H500
	A06B-1241-B410#Z11C	A06B-1241-B410#111C		A860-0382-T123	A06B-6088-H315#H500
α B132L-22	A06B-1241-B610#Z111	A06B-1241-B610#1111	A860-0392-T011		A06B-6088-H230#H500
α B160S-5.5	A06B-1251-B412#Z116	A06B-1251-B412#1116	A860-0392-T018		A06B-6088-H222#H500
	A06B-1251-B412#Z11C	A06B-1251-B412#111C		A860-0382-T123	A06B-6088-H322#H500
α B160M-5.5	A06B-1252-B412#Z111	A06B-1252-B412#1111	A860-0392-T011		A06B-6088-H215#H500
α B160M-11	A06B-1252-B712#Z111	A06B-1252-B712#1111	A860-0392-T011		A06B-6088-H230#H500
	A06B-1252-B712#Z116	A06B-1252-B712#1116	A860-0392-T018		A06B-6088-H230#H500
α B160L-7.5	A06B-1255-B411#4111	A06B-1255-B411#T111	A860-0392-T011		A06B-6088-H222#H500
	A06B-1255-B411#4114	A06B-1255-B411#T114	A860-0392-T014		A06B-6088-H222#H500
α B160LL-25	A06B-1256-B411#Z111	A06B-1256-B411#1111	A860-0392-T011		A06B-6088-H230#H500
	A06B-1256-B411#Z114	A06B-1256-B411#1114	A860-0392-T014		A06B-6088-H230#H500
α B180M-11	A06B-1261-B410#Z111	A06B-1261-B410#1111	A860-0392-T011		A06B-6088-H230#H500
	A06B-1261-B410#Z113	A06B-1261-B410#1113	A860-0392-T013		A06B-6088-H230#H500
	A06B-1261-B410#Z11C	A06B-1261-B410#111C		A860-0382-T123	A06B-6088-H330#H500
α B180L-22	A06B-1262-B410#Z111	A06B-1262-B410#1111	A860-0392-T011		A06B-6088-H230#H500
	A06B-1262-B410#Z113	A06B-1262-B410#1113	A860-0392-T013		A06B-6088-H230#H500
α B180LL-22	A06B-1263-B411#Z111	A06B-1263-B411#1111	A860-0392-T011		A06B-6088-H230#H500
	A06B-1263-B411#Z11B	A06B-1263-B411#111B		A860-0382-T122	A06B-6088-H330#H500
α B225M-15	A06B-1273-B411#4113	A06B-1273-B411#T113	A860-0392-T013		A06B-6088-H245#H500

NOTE

- The combination of sensor which is not described here is not prepared.
- The switching unit is needed for the models of speed range switching control. Refer to "4.SWITCHING UNIT" in APPENDIXfor details.
- Specifications of each model are shown in " I . SPECIFICATIONS".
- Contact our sales department for details as required.

F.2 HIGH-SPEED TYPE

Model name	Specification number		Attached built-in sensor	Applicable amplifier(SPM)	Applicable reactor
	FANUC name plate	GEFanuc name plate			
α B80S-5.5/40000	(Under development)	(Under development)	A860-0392-T082	A06B-6088-H222#H500	A81L-0001-0141
α B100S-11/30000	A06B-1228-B414#0908	A06B-1228-B411#3908	A860-0392-T082	A06B-6088-H226#H500	A81L-0001-0142
α B100S-11/20000	A06B-1229-B902#Z012	A06B-1229-B902#1012	A860-0392-T012	A06B-6088-H226#H500	-
	A06B-1229-B902#Z017	A06B-1229-B902#1017	A860-0392-T081	A06B-6088-H226#H500	
α B100L-11/25000	A06B-1222-B415#Z648	A06B-1222-B415#1648	A860-0392-T082	A06B-6088-H230#H500	-
α B112M-15/20000	A06B-1232-B415#Z617	A06B-1232-B415#1617	A860-0392-T081	A06B-6088-H230#H500	-
α B112L-18.5/20000	A06B-1233-B411#4617	A06B-1233-B411#T617	A860-0392-T081	A06B-6088-H230#H500	-
α B112L-18.5/24000	A06B-1233-B814#Z618	A06B-1233-B814#1618	A860-0392-T082	A06B-6088-H230#H500	-
α B160LL-22/15000	A06B-1256-B611#Z617	A06B-1256-B611#1617	A860-0392-T081	A06B-6088-H230#H500	-

NOTE

- The combination of sensor which is not described here is not prepared.
- The switching unit is needed for the models of speed range switching control. Refer to "4.SWITCHING UNIT" in APPNDIXfor details.
- Order the reactor for α B80S-5.5/40000 and α B100S-11/30000. Refer to "3.5 Reactor" in part I for details of the reactor.
- Specifications of each model are shown in " I . SPECIFICATIONS".
- Contact our sales department for details.
- α B112L-18.5/24000 is now on mdification. The specification may be changed.

7 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

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

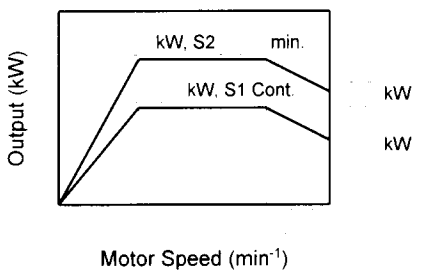
■Machine Type

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

■Specification

Power supply		V Hz
Stator	Outer Diameter Length	mm mm
Rotor	Inner Diameter Length	mm mm
Detector	Built-in sensor High resolution magnetic pulse coder Position coder	
Detecting ring	Outer diameter Inner diameter	mm mm
Detecting pulse		pulse/rev
Acceleration		sec
Rigid tapping	Available Unavailable Arrival speed Acceleration time	 min^{-1} sec
Speed range switching	Available Unavailable	

Output characteristics(Power curves)



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

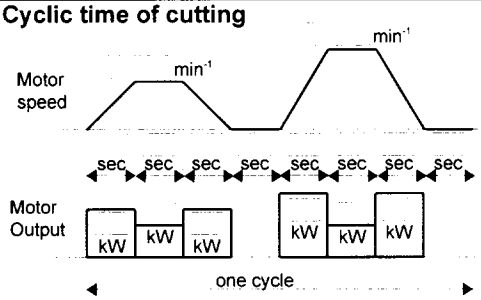
Please fill the cell with a drawing number of motor, if you would like to use a current model.

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



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. We will check whether it is good or not.
2. Motor will produce the rated power in the environment or condition shown below.
   - Less than 1000m oversea level.
   - Ambient temperature from 0 to 40 centigrade.
   - Non-condensation.
   - Liquid cooling system for motor.
   - IP54 or more protection class of spindle body.
   - Heat-shrink fitting rotor to shaft.

   If you use the motor in the different environment or condition, please inform to us the final condition after it is defined. We will check whether it is good or not.
3. Please fill up the sheet "Cutting Conditions In The Cs Contouring Control Mode" if you use Cs contouring control mode.
4. Refer to the next page for your convenience.

■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.

■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, Detector
Select from the ***manual B-65202EN*** or ***catalog*** of built-in 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, S6 and other ratings, please ***prepare another paper***.

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).

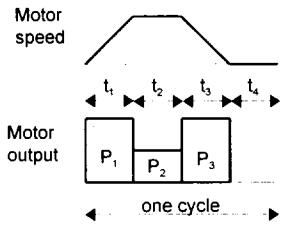
Spindle inertia
Actual value of spindle inertia. Use SI unit.

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 $P_{av}=\sqrt{\frac{(P_1^2t_1+P_2^2t_2+P_3^2t_3+\cdots)}{(t_1+t_2+t_3+t_4+\cdots)}}$

*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.

Cutting Conditions In The Cs Contouring Control Mode

Drawing No. of motor	A06B-
Drawing No. of amplifier	A06B-
Outer diameter of Cs drum	ϕ 65 ϕ 97.5 ϕ 130 ϕ 195
Differential	Available (Ratio) Unavailable
Spindle inertia	kgm^2
Workpiece material	Fe Al Others( )
Tool diameter	mm
Number of tool teeth	teeth
Tool speed at cutting	min^{-1}
Feed speed at cutting	mm／分 deg／分
Cutting depth	mm
Workpiece shape	

■Drawing No. of motor
Fill the cell if you would like to use ***a current model***.

■Drawing No. of amplifier
Amplifier used to drive a built-in motor.

■Outer diameter of Cs drum
Check the diameter that you would like to use. Please refer to the manual and the catalog of built-in motor for details of the size.

■Differential
Fill the cell if the machine has some differential.

■Spindle inertia
Actual value of spindle inertia. Use SI unit.

■Workpiece material
If you would like to use some special piece, write the name into ***Others***.

■Tool diameter, Number of tool teeth
Data of tool that you would like to use.

■Tool speed, Feed speed, Cutting depth
Cutting conditions in the Cs contouring control mode.

■Workpiece shape
Please show us ***the external dimensions***.

Index

Revision Record

FANUC BUILT-IN AC SPINDLE MOTOR α series DESCRIPTIONS (B-65202EN)

02	Mar., '97	Addition of new models. Addition of Feedback Signal Adjustment section to INSTRUCTION. Addition ROTOR SLEEVE section to APPENDIX. Correction of erros			
01	Feb., '95				
Edition	**Date**	**Contents**	**Edition**	**Date**	**Contents**

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