GE Fanuc Automation

Computer Numerical Control Products

AC Spindle Motor Series
(Serial Interface)

Descriptions Manual
(Volume 1 of 4)

GFZ–65042E/05

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Warnings, Cautions, and Notes as Used in this Publication

Warning

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

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

Caution

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

Note

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

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CONSTITUTION OF THIS MANUAL

This manual (B-65042E) is composed of the following 4 volumes.

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I. AC SPINDLE MOTOR S series

GENERAL/ FEATURES/ SPECIFICATIONS/ OUTPUT AND TORQUE CHARACTERISTICS/
CONFIGURATION AND ORDER DRAWING NUMBER/ CONNECTIONS/
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III. AC SPINDLE MOTOR VH series (LIQUID-COOLED)

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FEATURES/ SPECIFICATIONS/ CHARACTERISTIC/ EXTERNAL DIMENSIONS/
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Ⅷ. AC SPINDLE SERVO UNIT HV series

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PREFACE

The models covered by this manual, and their abbreviations are:

Series name	Model name
FANUC AC SPINDLE MOTOR S series	0.5S, 1S, 1.5S, 2S, 3S, 6S, 8S, 12S, 15S, 18S, 22S, 30S, 40S
FANUC AC SPINDLE MOTOR Power up series	8P, 10P, 12P, 15P, 16P, 18P, 22P, 30P, 40P, 50P, 60P
FANUC AC SPINDLE MOTOR High-speed series	6VH, 8VH, 12VH
FANUC AC SPINDLE MOTOR 380/415V series	30HV, 40HV, 60HV
FANUC AC SPINDLE MOTOR LTQUID-COOLED series	· Non hollow shaft/without speed range switching type L6/12000, L12/6000, L15/6000, L18/6000, L22/6000
	· Hollow shaft/with speed range switching type L12/10000, L15/10000, L22/10000, L26/10000, L40/8000, L50/8000
FANUC AC SPINDLE MOTOR IP65 series	1S, 1.5S, 2S, 3S

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XII. BUILT-IN SENSOR SIGNAL CONVERSION CIRCUIT

XIII. HIGH RESOLUTION MAGNETIC PULSE CODER

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APPENDIX

I. FANUC AC SPINDLE MOTOR series

1. FEATURES

The FANUC AC Spindle Motor series, which is a spindle motor series for CNC machine tools, has been used in many machine tool applications and provides the following outstanding features based on technology FANUC has accumulated over the years:

(1) From among a wide variety of motor series, the user can choose the motor ideal for his or her specific requirements. Also, the motors of each series are compatible; that is, they can be freely interchanged.

(2) By employing a unique stator cooling system that directly air-cools the electromagnetic steel sheet (for the S, P, and HV series), the series has easily achieved high power output and high-speed revolution in a compact enclosure.

(3) The series has achieved a vibration within V5 (V10 for some models) at high-speed revolution by accurate rotor balance adjustment.

(4) By reducing the rotor inertia, a shorter acceleration/deceleration time has been achieved.

(5) The user can easily select the air flow direction (either front or rear) of the fan motor to minimize the thermal deformation of the machine.

(6) Motors are available which have a built-in position coder required for synchronizing spindle feed with motion along the Z-axis and for rigid tapping. In addition, some motors have a built-in, high-resolution magnetic pulse coder to allow spindle synchronization control and C-axis contouring.

2. CONFIGURATION OF THE FANUC AC SPINDLE MOTOR series

The FANUC AC Spindle Motor series consists of the series listed below with their features.

(1) S series: This series is the standard series. It has been used in the field successfully for a long time.

(2) P series: This series has a wide constant output range of 1:8. As a result, some of the mechanisms, such as the gear change mechanism, has been eliminated. This has greatly simplified the mechanical structure.

(3) VH series: This series has achieved high-speed revolution by using oil-mist lubrication for the bearings. This series also minimizes the temperature rise by using liquid cooling.

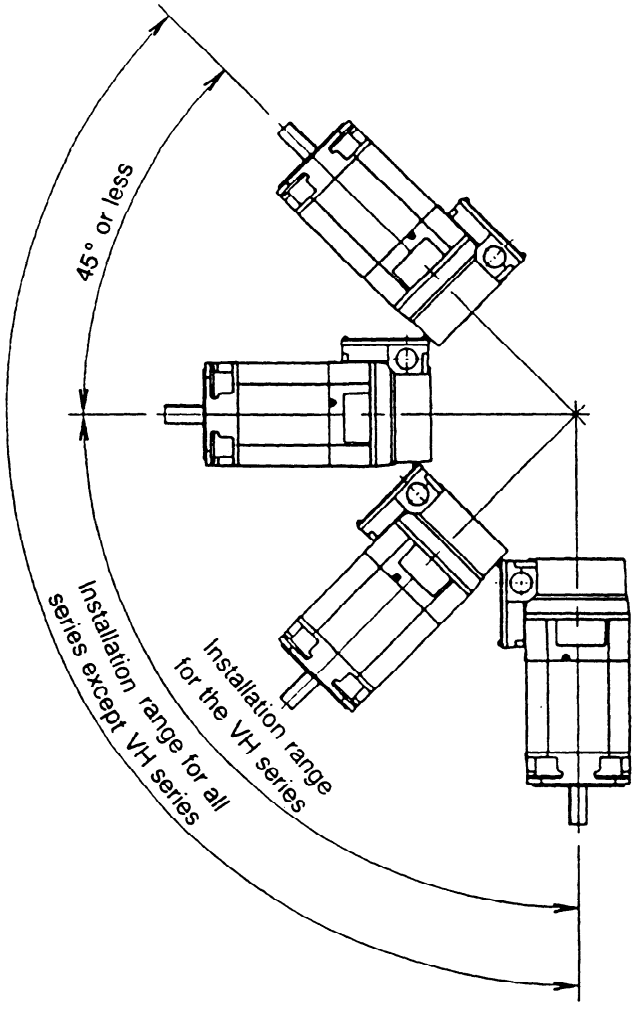
(4) HV series: This series can be connected with a 380/415 VAC power supply directly without using a power transformer.

(5) LIQUID-COOLED series: This series uses liquid cooling to minimize the temperature rise, and has achieved a low-speed large torque with speed range switching. In addition, some models are directly linked with the spindle, and have a shaft with a through-hole to enable the flow of coolant.

(6) IP65 series: This series has a protection structure grade of IP65. A motor of this series is therefore ideal as the motor for the second spindle or as a motor for tool rotation exposed to spattered coolant.

3. NOTES ON INSTALLATION

(1) Install all motors except the oriented in the range from VH series motors so that the output shaft of each motor is 45° above the horizontal to 90° below the horizontal (figure below). Install the VH series so that the output shaft is oriented in the range from the horizontal to 90° below the horizontal, and so the oil-mist drain hole faces downward (see below). When installing a motor in an orientation outside the installation ranges mentioned above, contact your FANUC sales office serving your locality.



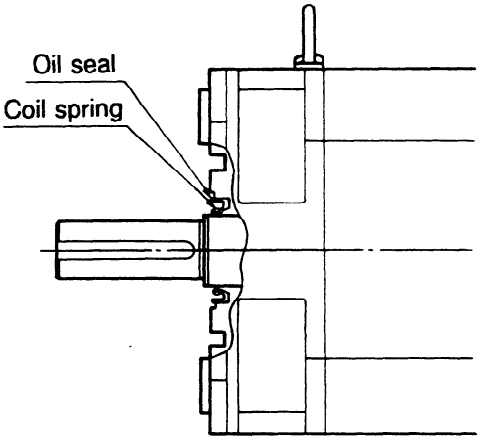
(2) Use the eyebolt of the motor to lift only a single motor, (gear and pulley may be attached).

(3) To maintain the long-term reliability of each motor component, ensure that the acceleration/deceleration of vibration at the motor installation location is 5 G (49 m/s^2) or less. This requirement must also be satisfied in cutting.

(4) Place a cover over an air-cooled motor to prevent the motor from being exposed to coolant. Consider the use of the IP65 series when exposure to coolant is unavoidable.

(5) When using a motor that has an oil seal attached to the output shaft, ensure that the surface of the lubricant is below the lip of the oil seal.

(6) When the oil seal is not exposed to lubricant, remove the coil spring of the oil seal to decrease the friction between the lip and shaft. This operation does not adversely affect the dust-proofness of the motor.



Oil seal section

(7) The seal for the output shaft of a flange mounting type motor designed for high-speed use is a simplified labyrinth seal. Be careful not to expose the flange surface to lubricant.

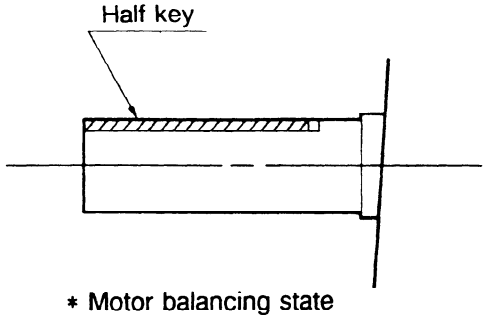
(8) Set the radial load specified for each series.

(9) Dynamic balance

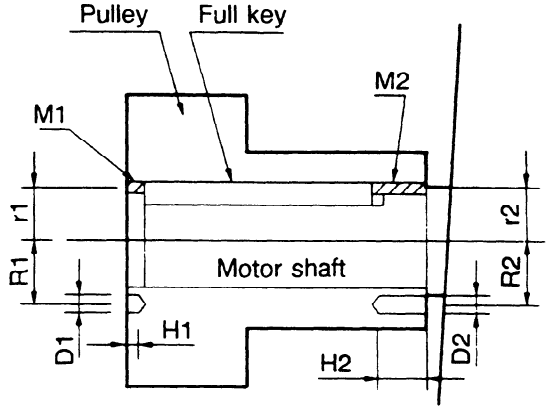
The rotor of each motor is balanced with a balancing machine in the state in which the half key whose thickness is one-half the key size indicated in the outside dimensions is mounted onto the shaft.

The AC spindle motors rotate at very high speeds. Consequently, even a slight unbalance can cause a large vibration. Pay particular attention to the dynamic balance of the gear and pulley attached to the motor shaft, and other high-speed rotation axes.

For a high-speed application, use a motor with no key attached.



* Motor balancing state



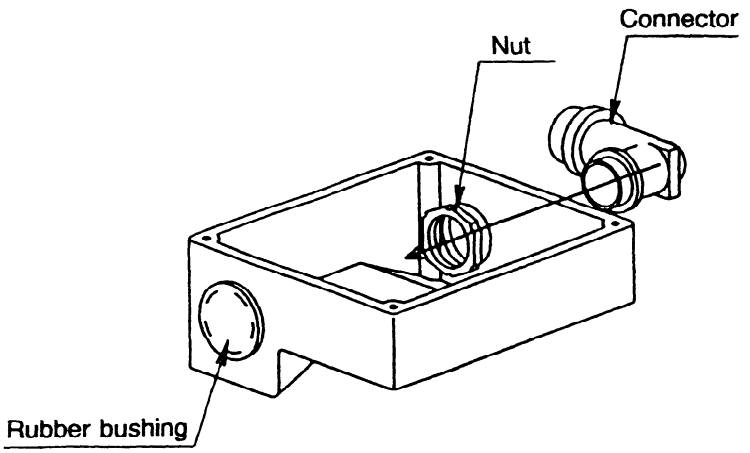
$\pi(D1/2)^2 H1 \cdot \rho \times R1 = M1 \times r1$ ρ ; Density

$\pi(D2/2)^2 H2 \cdot \rho \times R2 = M2 \times r2$

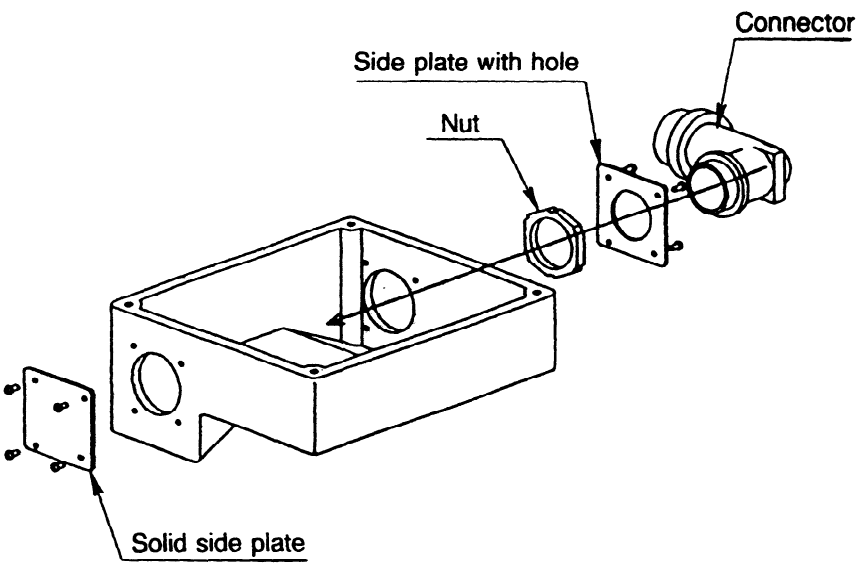
* Adjusting the motor balance

(10) Terminal box

(a) Run the cable through the conduit, then insert the connector into a hole of the terminal box and secure the connector by tightening the nut. Insert a rubber bushing, provided as an accessory, to plug the unused hole. (This applies only to models 1S to 15S, 1S/15000 to 15S/8000, 8P to 50P, and 8P/8000 to 40P/6000.)



(b) Run the cable through the conduit, assemble the connector to a side plate with a hole by tightening the nut, then attach the side plate to the terminal box. Mount a solid side plate to plug the unused hole. (This applies to the models other than those listed in (a) above.)



4. NOTES ON OPERATION

(1) Sound and vibration

Check that there is no abnormal sound or vibration.

(2) Cooling

(a) When using an air-cooled motor, provide a clearance of 50 mm or more between the finger guard of the fan motor and the machine, and periodically clean dust from the air inlet and outlet to allow sufficient air flow.

Check also that the air flow direction is correct.

(b) For a liquid-cooled motor, the user is to prepare coolant and equipment specified for each series.

(3) Breaking in a motor

For the S, P, and HV series, ball bearings lubricated with grease are used. To increase the operating lifetime of a motor of these series, break in the motor. As a guideline, increase the speed of the motor from 1000 min^{-1} to its maximum speed in 1000 min^{-1} increments, and operate the motor at each speed for about 5 minutes.

I. AC SPINDLE MOTOR S series

1. GENERAL

The FANUC AC SPINDLE MOTOR S series have been specially developed as highly reliable and high-performance variable-speed AC spindle motors for the most advanced CNC machine tools. By using the new stator cooling system which directly cools the electromagnetic steel sheet, the compact FANUC AC spindle motor allows high power output and high-speed revolution.

2. FEATURES

Based on the long-time field experience as the spindle motors for CNC machine tools and accumulated technologies, the FANUC AC spindle motor S series have a variety of excellent features as shown below.

(1) The motor is compact, light-weight and furnished with digital control for much higher performance.

(2) The rotor inertia of the AC spindle motor is made smaller to shorten the acceleration / deceleration speed. Further, optimum control enables highly efficient cutting.

(3) The motor incorporating the position coder required for synchronous feed of the spindle and Z axis and machining rigid tapping can be used.

(4) Improvement in machining of the motor housing enhances the accuracy of the mounting part. And improvement of the cooling fan motor and that of the sealing structure of the housing enhance the reliability and environment-proof characteristics.

3. SPECIFICATIONS

(1) AC spindle motor

Series		S Series												
Item \ Model		0.5S	1S	1.5S	2S	3S	6S	8S	12S	15S	18S	22S	30S	40S
Output	Continuous Rated kW (*1) (HP)	0.65 (0.87)	1.5 (2.0)	1.1 (1.5)	2.2 (3.0)	3.7 (5.0)	5.5 (7.4)	7.5 (10)	11 (14.7)	15 (20.1)	18.5 (24.8)	22 (29.5)	30 (40.2)	37 (49.6)
	30min Rated (*1) kW (10, 15min Rated)(*3) (HP)	1.1 (1.5)	2.2 (3.0)	3.7 (5.0)	3.7 (5.0)	5.5 (7.4)	7.5 (10)	11 (14.7)	15 (20.1)	18.5 (24.8)	22 (29.5)	26 (34.9)	37 (49.6)	45 (60.3)
	50% ED Rated (*1, *2)kW [30% ED Rated] (*4) (HP)	1.1 (1.5)	2.2 (3.0)	3.7 (5.0)	3.7 (5.0)	5.5 (7.4)	7.5 (10)	11 (14.7)	15 (20.1)	18.5 (24.8)	22 (29.5)	26 (34.9)	37 (49.6)	45 (60.3)
Rotation Speed	Base Speed min^{-1}	3000	3000	1500	1500	1500	1500	1500	1500	1500	1500	1500	1150	1150
	Maximum Speed min^{-1}	8000	8000	8000	8000	6000	6000	4500 / 6000	4500 / 6000	4500 / 6000	4500 / 6000	4500 / 6000	4500	4500
Output Torque N · m (kg · cm)		2.07 (21)	4.77 (49)	7.00 (71.4)	14.0 (143)	23.5 (240)	35.0 (357)	47.7 (487)	70 (714)	95.4 (974)	117.7 (1201)	140 (1428)	249 (2540)	307 (3133)
GD^2 kg · m^2		0.0019	0.012	0.017	0.031	0.059	0.086	0.11	0.36	0.36	0.51	0.51	1.18	1.18
Rotor Inertia N · m · s^2 (kg · cm · s^2)		0.0005 (0.0048)	0.003 (0.03)	0.004 (0.04)	0.008 (0.08)	0.015 (0.15)	0.022 (0.22)	0.027 (0.28)	0.091 (0.93)	0.091 (0.93)	0.126 (1.29)	0.126 (1.29)	0.29 (3.0)	0.29 (3.0)
Weight kg		7	18	24	27	46	60	80	110	110	143	143	250	250
Vibration		V5												
Noise		75 dB (A) less												
Cooling System		TENV(*6)	Totally enclosed fan cooled											
Installation		←	The output shaft must be oriented in the range from 45° above the horizontal to 90° below the horizontal.											
Cooling Fan (W)		None	17		20		56		68				84	
Allowable Overload Capacity (1 min) (*7)		←	120% of 30 minute-rating											
Insulation		Class F												
Ambient Temperature		0 - 40°C												
Painting Color		←	Munsell system N2.5											
Accessories		←	Pulse generator and thermostart											
Number of pulses for Built-in Sensor (optional) P/rev		512(*5)	512				1024							
Bearing Lubrication		←	Grease											
Applicable Spindle Amplifier		1S		2S		3S	6S/ Small type 6S	8S	12S	15S/ Small type 15S	18S	22S	30S	40S

(*1) The rated output is guaranteed at the rated input voltage (200V/220V/230VAC). If the input voltage fluctuates, it is possible that the rated output cannot be obtained even when such fluctuations are within the allowable fluctuation range.

(*2) The cycle time is 10 minutes, 50% ED: ON 5 min, OFF 5 min.
The cycle time is 10 minutes, 30% ED: ON 3 min, OFF 7 min.

(*3) The output for 0.5S, 1S, and 2S is 15-min rated. That for 1.5S is 10-min rated.

(*4) 30% ED for models 0.5S and 1.5S

(*5) It is necessary to change the jumper in the signal conversion circuit.

(*6) Cooling without enclosure

(*7) This is not a guaranteed value but a guideline for the maximum motor output at a rated power supply voltage.
120% of 15-min rating for 0.5S, 1S, and 2S; 120% of 10-min rating for 1.5S.

(2) AC spindle motor (high speed type)

Series		S Series / High-speed Model										
Item \ Model		1S / 15000	2S / 15000	3S / 12000	6S / 12000	8S / 8000	12S / 8000	15S / 8000	18S / 8000	22S / 8000	30S / 6000	40S / 6000
Output	Continuous Rated (*1) kW (HP)	1.5 (2.0)	2.2 (3.0)	3.7 (5.0)	5.5 (7.4)	7.5 (10)	11 (14.7)	15 (20.1)	18.5 (24.8)	22 (29.5)	30 (40.2)	37 (49.6)
	30min Rated (*1) (15min Rated)(*3) kW (HP)	2.2 (3.0)	3.7 (5.0)	5.5 (7.4)	7.5 (10)	11 (14.7)	15 (20.1)	18.5 (24.8)	22 (29.5)	26 (34.9)	37 (49.6)	45 (60.3)
	50% ED Rated output(*1, *2) kW (HP)	2.2 (3.0)	3.7 (5.0)	5.5 (7.4)	7.5 (10)	11 (14.7)	15 (20.1)	18.5 (24.8)	22 (29.5)	26 (34.9)	37 (49.6)	45 (60.3)
Rotation Speed	Base Speed min^{-1}	3000	3000	1500	1500	1500	1500	1500	1500	1500	1150	1150
	Maximum Speed min^{-1}	15000	15000	12000	12000	8000	8000	8000	8000	8000	6000	6000
Output Torque N · m (kg · cm)		4.77 (49)	7 (71.4)	23.5 (240)	35.0 (357)	47.7 (487)	70 (714)	95.4 (974)	117.7 (1201)	140 (1428)	249 (2540)	307 (3133)
GD^2 $kg \cdot m^2$		0.012	0.031	0.059	0.086	0.11	0.36	0.36	0.51	0.51	1.18	1.18
Rotor Inertia $N \cdot m \cdot s^2$ ($kg \cdot cm \cdot s^2$)		0.003 (0.03)	0.008 (0.08)	0.015 (0.15)	0.022 (0.22)	0.027 (0.28)	0.091 (0.93)	0.091 (0.93)	0.126 (1.29)	0.126 (1.29)	0.29 (3.0)	0.29 (3.0)
Weight kg		18	27	46	60	80	110	110	143	143	250	250
Vibration		V5										
Noise		75 dB										
Cooling System		Totally enclosed fan cooled										
Installation		The output shaft must be oriented in the range from 45° above the horizontal to 90° below the horizontal.										
Cooling Fan (W)		17	20		56		68				84	
Allowable Overload Capacity (1 min) (*4)		120% of 30 minute-rating										
Insulation		Class F										
Ambient Temperature		0 - 40°C										
Painting Color		Munsell system N2.5										
Accessories		Pulse generator and thermostart										
Number of pulses for Built-in Sensor (optional) P/rev		512				1024						
Bearing Lubrication		Grease										
Applicable Spindle Amplifier		1S	3S	6S/ Small type 6S	8S	8S	12S	15S/ Small type 15S	18S	22S	30S	40S

(*1) The rated output is guaranteed at the rated input voltage (200V/220V/230VAC). If the input voltage fluctuates, it is possible that the rated output cannot be obtained even when such fluctuations are within the allowable fluctuation range.

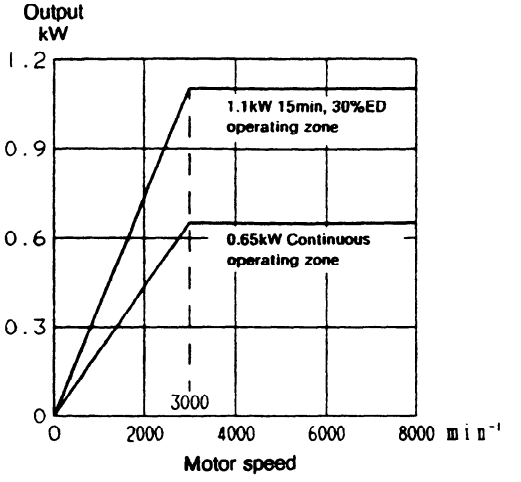
(*2) The cycle time is 10 minutes, 50% ED: ON 5 min, OFF 5 min.

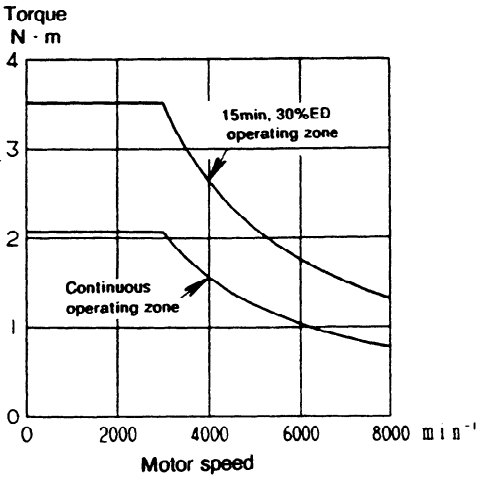
(*3) The output for 1S/15000 and 2S/15000 is 15-min rated.

(*4) This is not a guaranteed value but a guideline for the maximum motor output at a rated power supply voltage.
120% of 15-min rating for 1S/15000 and 2S/15000.

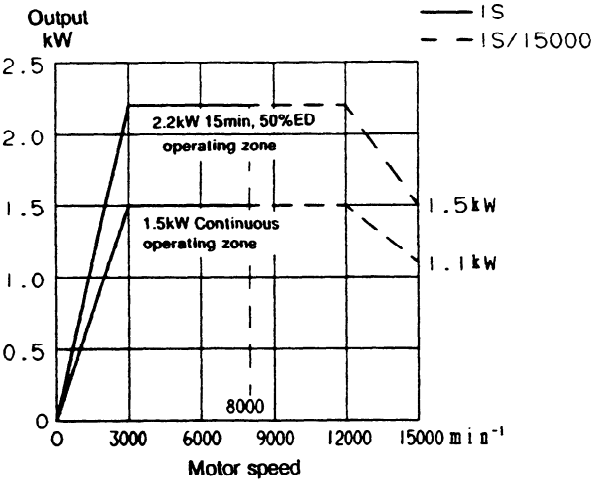
4. OUTPUT/TORQUE CHARACTERISTICS

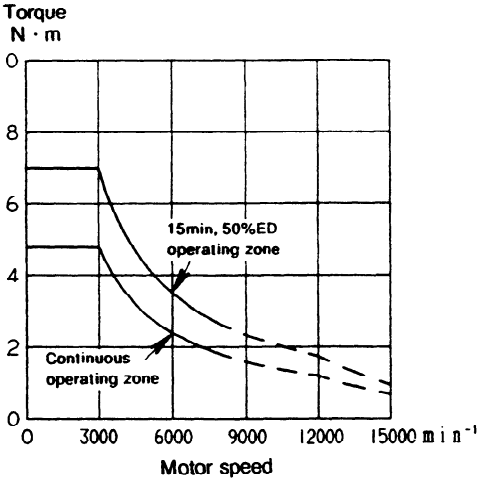
(1) Model 0.5S



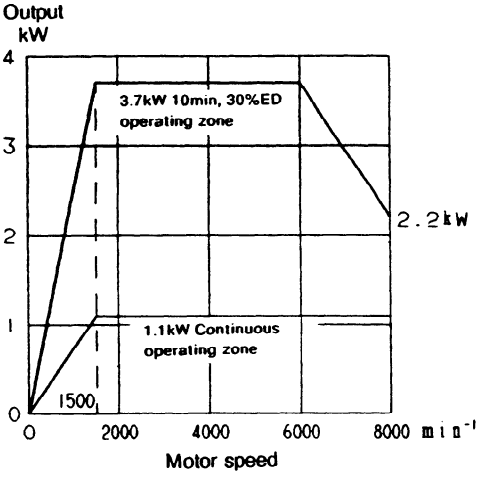


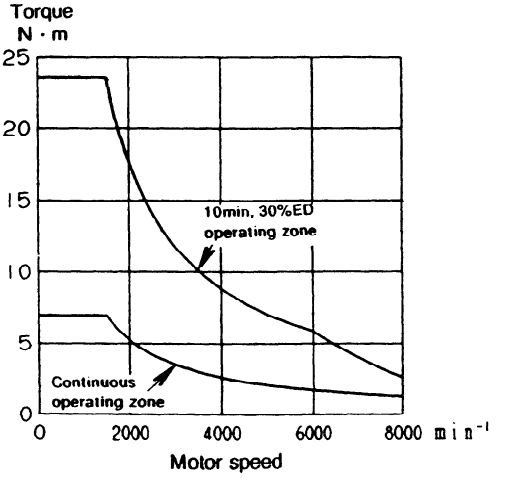
(2) Model 1S, 1S/15000



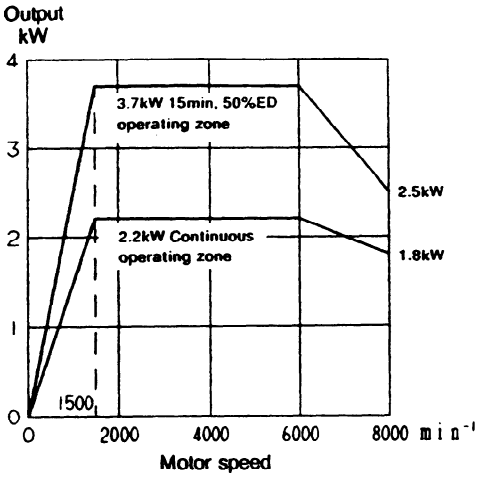


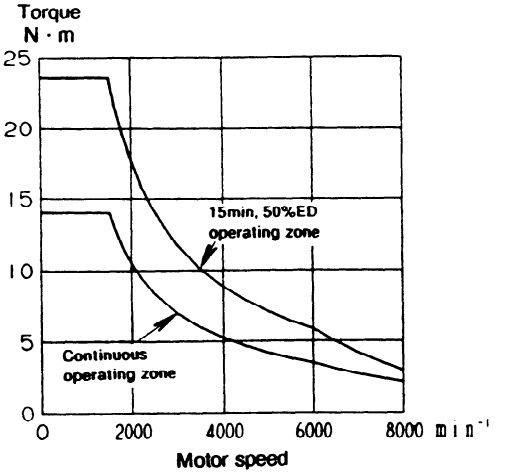
(3) Model 1.5S



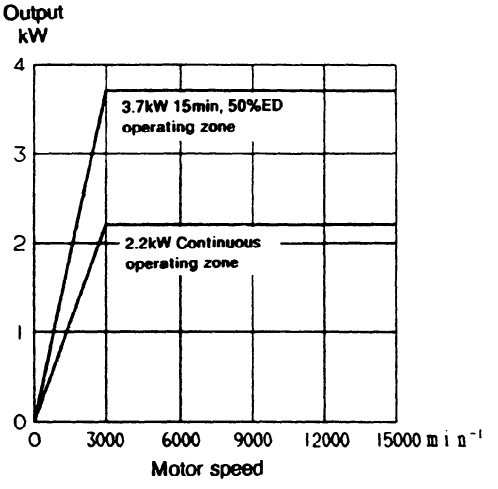


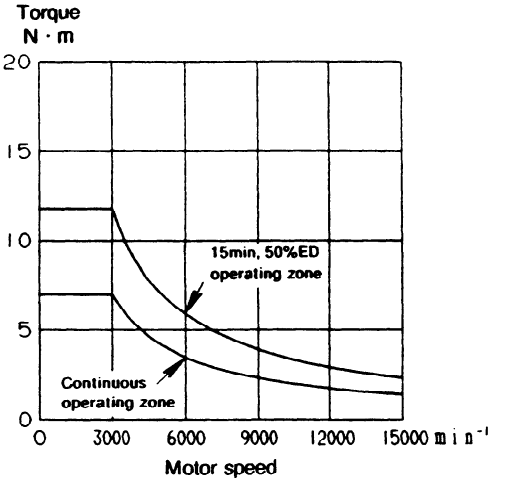
(4) Model 2S



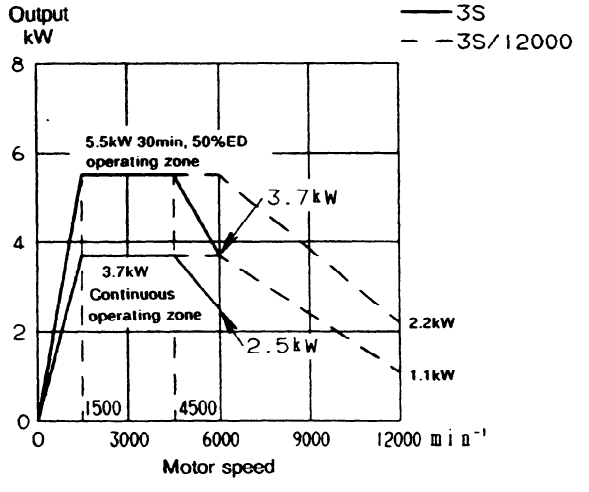


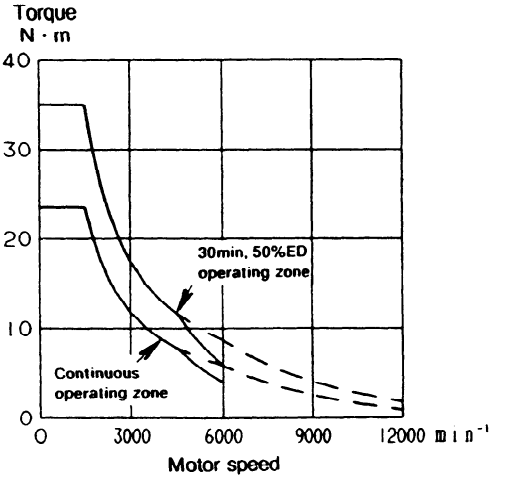
(5) Model 2S/15000



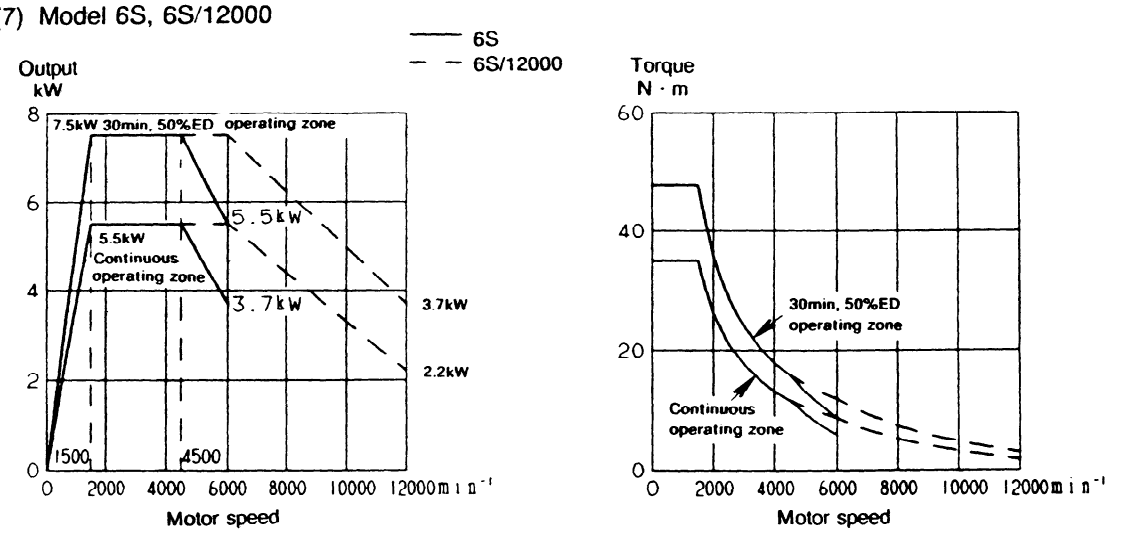


(6) Model 3S, 3S/12000

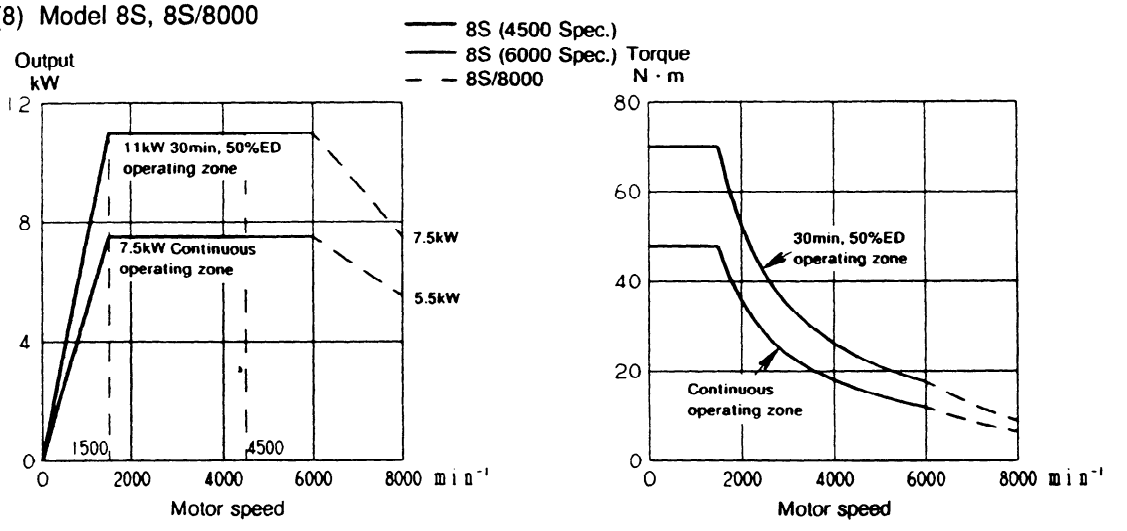




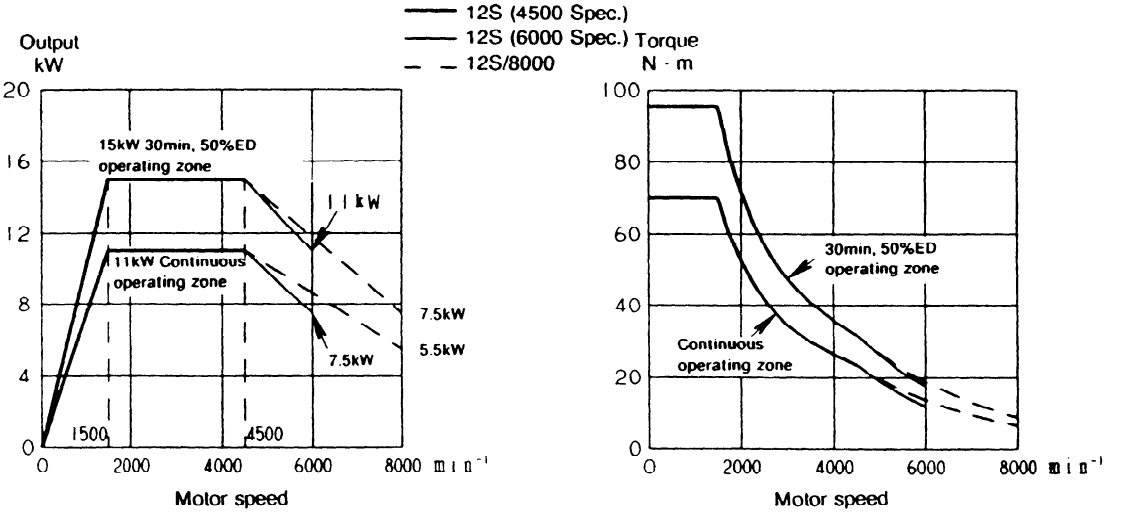
(7) Model 6S, 6S/12000



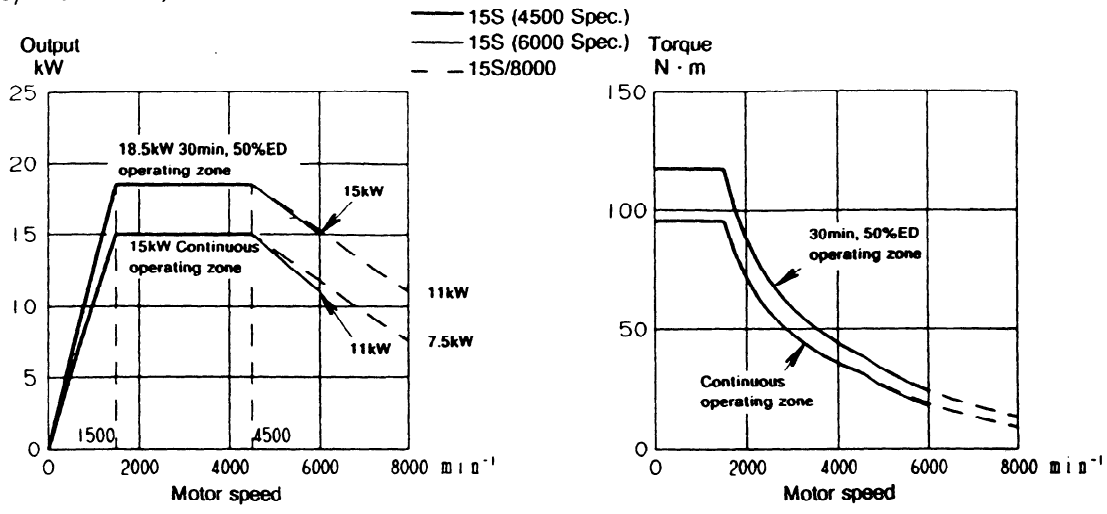
(8) Model 8S, 8S/8000



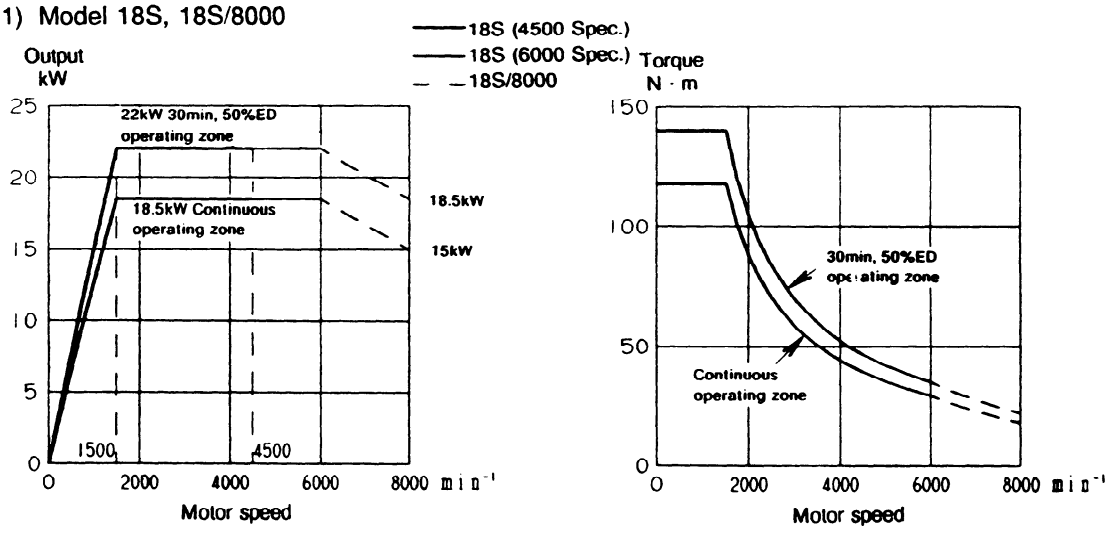
(9) Model 12S, 12S/8000



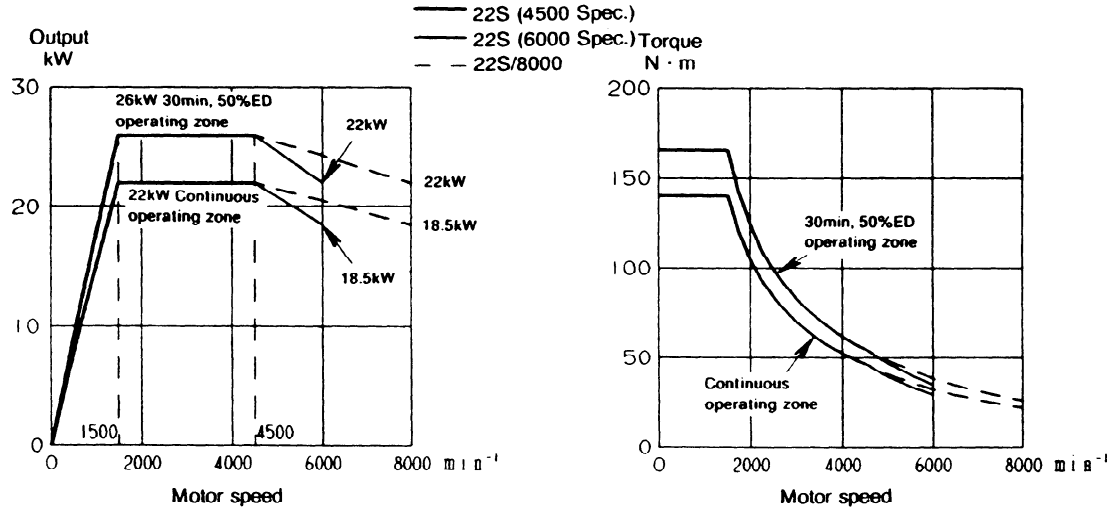
(10) Model 15S, 15S/8000



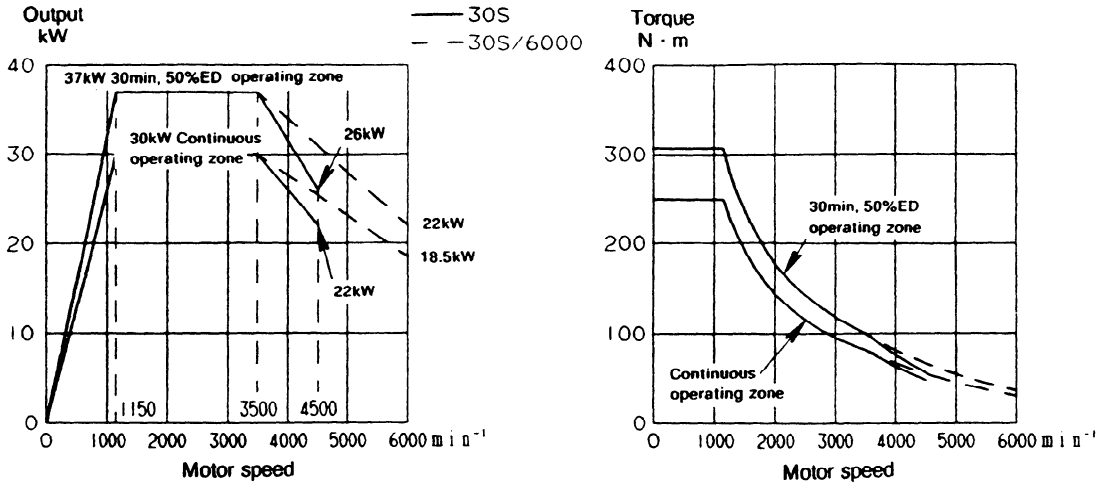
(11) Model 18S, 18S/8000



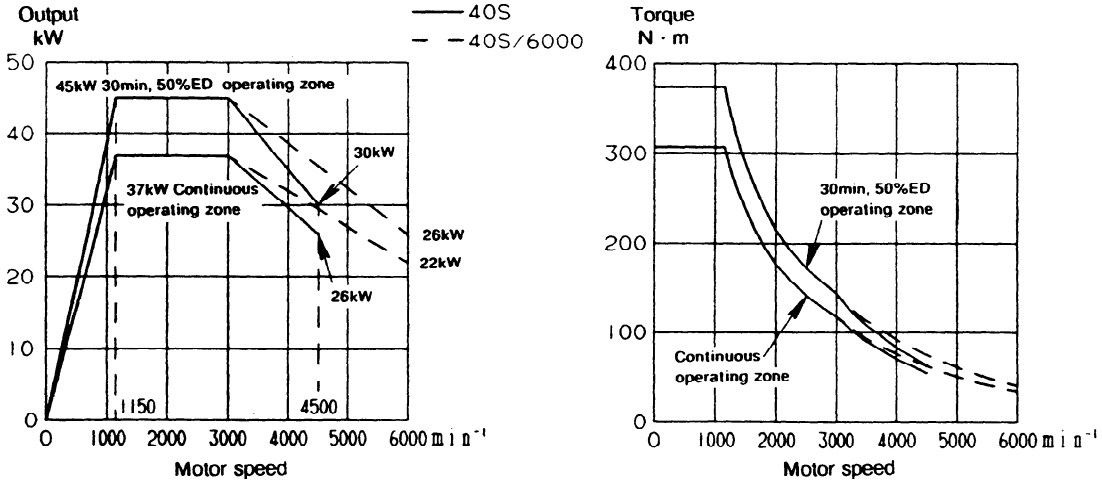
(12) Model 22S, 22S/8000



(13) Model 30S, 30S/6000



(14) Model 40S, 40S/6000



5. CONFIGURATION AND ORDER DRAWING NUMBER

5.1 Configuration

The AC spindle motor comprises the motor and accessories.

(1) AC spindle motor (basic)

(2) Key (accessory)

(3) Signal connector (housing, contactor) (accessory)
The accessories are stored in the terminal box.
The specifications of the connection cables between the motor and the AC spindle servo unit are described in the Appendix 1 of this manual. The cables should be prepared by the MTB.

5.2 Order Drawing Number

(1) S series

Name		Drawing number	Remarks
Model 0.5S	With a flange for mounting	A06B-0766-B300	8000 min^{-1}, no key
	With a mounting base	A06B-0766-B400	8000 min^{-1}, no key
Model 1S	Flange mounting	A06B-0750-B100	8000 min^{-1}, has key, exhaust rear
		A06B-0750-B101	8000 min^{-1}, has key, exhaust front
		A06B-0750-B300	8000 min^{-1}, no key, exhaust rear
		A06B-0750-B301	8000 min^{-1}, no key, exhaust front
	Foot mounting	A06B-0750-B200	8000 min^{-1}, has key, exhaust rear
		A06B-0750-B201	8000 min^{-1}, has key, exhaust front
		A06B-0750-B400	8000 min^{-1}, no key, exhaust rear
		A06B-0750-B401	8000 min^{-1}, no key, exhaust front

(Note 1) The end of the specification number for the flange mounting model with a built-in sensor is B□9□.
(Example: The built-in sensor type for B100 is B190.)
(Note 2) The 6000 min^{-1} specification for models 8S to 22S is specified with B□□□#0100.
(Note 3) The last four characters of the codes of models 2S to 40S with built-in high-resolution magnetic pulse coders are B□3□. For example, a model with a built-in high-resolution magnetic pulse coder which corresponds to a model having a code number of □□□□-□□□□-B100 has a code number of □□□□-□□□□-B130.

(Continued from the previous page)

Name		Drawing number	Remarks
Model 1.5S	Flange mounting	A06B-0751-B100	8000 min^{-1}, has key, exhaust rear
		A06B-0751-B101	8000 min^{-1}, has key, exhaust front
		A06B-0751-B300	8000 min^{-1}, no key, exhaust rear
		A06B-0751-B301	8000 min^{-1}, no key, exhaust front
	Foot mounting	A06B-0751-B200	8000 min^{-1}, has key, exhaust rear
		A06B-0751-B201	8000 min^{-1}, has key, exhaust front
		A06B-0751-B400	8000 min^{-1}, no key, exhaust rear
		A06B-0751-B401	8000 min^{-1}, no key, exhaust front
Model 2S	Flange mounting	A06B-0752-B100	8000 min^{-1}, has key, exhaust rear
		A06B-0752-B101	8000 min^{-1}, has key, exhaust front
		A06B-0752-B300	8000 min^{-1}, no key, exhaust rear
		A06B-0752-B301	8000 min^{-1}, no key, exhaust front
	Foot mounting	A06B-0752-B200	8000 min^{-1}, has key, exhaust rear
		A06B-0752-B201	8000 min^{-1}, has key, exhaust front
		A06B-0752-B400	8000 min^{-1}, no key, exhaust rear
		A06B-0752-B401	8000 min^{-1}, no key, exhaust front
Model 3S	Flange mounting	A06B-0753-B100	6000 min^{-1}, has key, exhaust rear
		A06B-0753-B101	6000 min^{-1}, has key, exhaust front
		A06B-0753-B300	6000 min^{-1}, no key, exhaust rear
		A06B-0753-B301	6000 min^{-1}, no key, exhaust front
	Foot mounting	A06B-0753-B200	6000 min^{-1}, has key, exhaust rear
		A06B-0753-B201	6000 min^{-1}, has key, exhaust front
		A06B-0753-B400	6000 min^{-1}, no key, exhaust rear
		A06B-0753-B401	6000 min^{-1}, no key, exhaust front
Model 6S	Flange mounting	A06B-0754-B100	6000 min^{-1}, has key, exhaust rear
		A06B-0754-B101	6000 min^{-1}, has key, exhaust front
		A06B-0754-B300	6000 min^{-1}, no key, exhaust rear
		A06B-0754-B301	6000 min^{-1}, no key, exhaust front
	Foot mounting	A06B-0754-B200	6000 min^{-1}, has key, exhaust rear
		A06B-0754-B201	6000 min^{-1}, has key, exhaust front
		A06B-0754-B400	6000 min^{-1}, no key, exhaust rear
		A06B-0754-B401	6000 min^{-1}, no key, exhaust front
Model 8S	Flange mounting	A06B-0755-B100	4500 min^{-1}, has key, exhaust rear
		A06B-0755-B101	4500 min^{-1}, has key, exhaust front
		A06B-0755-B300	4500 min^{-1}, no key, exhaust rear
		A06B-0755-B301	4500 min^{-1}, no key, exhaust front
	Foot mounting	A06B-0755-B200	4500 min^{-1}, has key, exhaust rear
		A06B-0755-B201	4500 min^{-1}, has key, exhaust front
		A06B-0755-B400	4500 min^{-1}, no key, exhaust rear
		A06B-0755-B401	4500 min^{-1}, no key, exhaust front

(Continued from the previous page)

Name		Drawing number	Remarks
Model 12S	Flange mounting	A06B-0756-B100	4500 min^{-1}, has key, exhaust rear
		A06B-0756-B101	4500 min^{-1}, has key, exhaust front
		A06B-0756-B300	4500 min^{-1}, no key, exhaust rear
		A06B-0756-B301	4500 min^{-1}, no key, exhaust front
	Foot mounting	A06B-0756-B200	4500 min^{-1}, has key, exhaust rear
		A06B-0756-B201	4500 min^{-1}, has key, exhaust front
		A06B-0756-B400	4500 min^{-1}, no key, exhaust rear
		A06B-0756-B401	4500 min^{-1}, no key, exhaust front
Model 15S	Flange mounting	A06B-0757-B100	4500 min^{-1}, has key, exhaust rear
		A06B-0757-B101	4500 min^{-1}, has key, exhaust front
		A06B-0757-B300	4500 min^{-1}, no key, exhaust rear
		A06B-0757-B301	4500 min^{-1}, no key, exhaust front
	Foot mounting	A06B-0757-B200	4500 min^{-1}, has key, exhaust rear
		A06B-0757-B201	4500 min^{-1}, has key, exhaust front
		A06B-0757-B400	4500 min^{-1}, no key, exhaust rear
		A06B-0757-B401	4500 min^{-1}, no key, exhaust front
Model 18S	Flange mounting	A06B-0758-B100	4500 min^{-1}, has key, exhaust rear
		A06B-0758-B101	4500 min^{-1}, has key, exhaust front
		A06B-0758-B300	4500 min^{-1}, no key, exhaust rear
		A06B-0758-B301	4500 min^{-1}, no key, exhaust front
	Foot mounting	A06B-0758-B200	4500 min^{-1}, has key, exhaust rear
		A06B-0758-B201	4500 min^{-1}, has key, exhaust front
		A06B-0758-B400	4500 min^{-1}, no key, exhaust rear
		A06B-0758-B401	4500 min^{-1}, no key, exhaust front
Model 22S	Flange mounting	A06B-0759-B100	4500 min^{-1}, has key, exhaust rear
		A06B-0759-B101	4500 min^{-1}, has key, exhaust front
		A06B-0759-B300	4500 min^{-1}, no key, exhaust rear
		A06B-0759-B301	4500 min^{-1}, no key, exhaust front
	Foot mounting	A06B-0759-B200	4500 min^{-1}, has key, exhaust rear
		A06B-0759-B201	4500 min^{-1}, has key, exhaust front
		A06B-0759-B400	4500 min^{-1}, no key, exhaust rear
		A06B-0759-B401	4500 min^{-1}, no key, exhaust front
Model 30S	Flange mounting	A06B-0760-B100	4500 min^{-1}, has key, exhaust rear
		A06B-0760-B101	4500 min^{-1}, has key, exhaust front
		A06B-0760-B300	4500 min^{-1}, no key, exhaust rear
		A06B-0760-B301	4500 min^{-1}, no key, exhaust front
	Foot mounting	A06B-0760-B200	4500 min^{-1}, has key, exhaust rear
		A06B-0760-B201	4500 min^{-1}, has key, exhaust front
		A06B-0760-B400	4500 min^{-1}, no key, exhaust rear
		A06B-0760-B401	4500 min^{-1}, no key, exhaust front

(Continued from the previous page)

Name		Drawing number	Remarks
Model 40S	Flange mounting	A06B-0761-B100	4500 min^{-1}, has key, exhaust rear
		A06B-0761-B101	4500 min^{-1}, has key, exhaust front
		A06B-0761-B300	4500 min^{-1}, no key, exhaust rear
		A06B-0761-B301	4500 min^{-1}, no key, exhaust front
	Foot mounting	A06B-0761-B200	4500 min^{-1}, has key, exhaust rear
		A06B-0761-B201	4500 min^{-1}, has key, exhaust front
		A06B-0761-B400	4500 min^{-1}, no key, exhaust rear
		A06B-0761-B401	4500 min^{-1}, no key, exhaust front

(2) S series high-speed model

Name		Drawing number	Remarks
Model 1S/15000	Flange mounting	A06B-0750-B104	15000 min^{-1}, has key, exhaust rear
		A06B-0750-B105	15000 min^{-1}, has key, exhaust front
		A06B-0750-B304	15000 min^{-1}, no key, exhaust rear
		A06B-0750-B305	15000 min^{-1}, no key, exhaust front
Model 2S/15000	Flange mounting	A06B-0752-B104	15000 min^{-1}, has key, exhaust rear
		A06B-0752-B105	15000 min^{-1}, has key, exhaust front
		A06B-0752-B304	15000 min^{-1}, no key, exhaust rear
		A06B-0752-B305	15000 min^{-1}, no key, exhaust front
Model 3S/12000	Flange mounting	A06B-0753-B104	12000 min^{-1}, has key, exhaust rear
		A06B-0753-B105	12000 min^{-1}, has key, exhaust front
		A06B-0753-B304	12000 min^{-1}, no key, exhaust rear
		A06B-0753-B305	12000 min^{-1}, no key, exhaust front
Model 6S/12000	Flange mounting	A06B-0754-B104	12000 min^{-1}, has key, exhaust rear
		A06B-0754-B105	12000 min^{-1}, has key, exhaust front
		A06B-0754-B304	12000 min^{-1}, no key, exhaust rear
		A06B-0754-B305	12000 min^{-1}, no key, exhaust front
Model 8S/8000	Flange mounting	A06B-0755-B104	8000 min^{-1}, has key, exhaust rear
		A06B-0755-B105	8000 min^{-1}, has key, exhaust front
		A06B-0755-B304	8000 min^{-1}, no key, exhaust rear
		A06B-0755-B305	8000 min^{-1}, no key, exhaust front
Model 12S/8000	Flange mounting	A06B-0756-B104	8000 min^{-1}, has key, exhaust rear
		A06B-0756-B105	8000 min^{-1}, has key, exhaust front
		A06B-0756-B304	8000 min^{-1}, no key, exhaust rear
		A06B-0756-B305	8000 min^{-1}, no key, exhaust front

(Note 1) The end of the specification number for the flange mounting model with a built-in sensor is B□9□.
(Example: The built-in sensor type for B104 is B194.)
(Note 2) As the output shaft seal for S series hi-speed models is a simple labyrinth type, take care so that the surface of the flange may not be splashed directly with lubricating oil or the like.
(Note 3) For the high-speed models, the no-key type is recommended.

(Continued from the previous page)

Name		Drawing number	Remarks
Model 15S/8000	Flange mounting	A06B-0757-B104	8000 min^{-1}, has key, exhaust rear
		A06B-0757-B105	8000 min^{-1}, has key, exhaust front
		A06B-0757-B304	8000 min^{-1}, no key, exhaust rear
		A06B-0757-B305	8000 min^{-1}, no key, exhaust front
Model 18S/8000	Flange mounting	A06B-0758-B104	8000 min^{-1}, has key, exhaust rear
		A06B-0758-B105	8000 min^{-1}, has key, exhaust front
		A06B-0758-B304	8000 min^{-1}, no key, exhaust rear
		A06B-0758-B305	8000 min^{-1}, no key, exhaust front
Model 22S/8000	Flange mounting	A06B-0759-B104	8000 min^{-1}, has key, exhaust rear
		A06B-0759-B105	8000 min^{-1}, has key, exhaust front
		A06B-0759-B304	8000 min^{-1}, no key, exhaust rear
		A06B-0759-B305	8000 min^{-1}, no key, exhaust front
Model 30S/6000	Flange mounting	A06B-0760-B104	6000 min^{-1}, has key, exhaust rear
		A06B-0760-B105	6000 min^{-1}, has key, exhaust front
		A06B-0760-B304	6000 min^{-1}, no key, exhaust rear
		A06B-0760-B305	6000 min^{-1}, no key, exhaust front
	Foot mounting	A06B-0760-B204	6000 min^{-1}, has key, exhaust rear
		A06B-0760-B205	6000 min^{-1}, has key, exhaust front
		A06B-0760-B404	6000 min^{-1}, no key, exhaust rear
		A06B-0760-B405	6000 min^{-1}, no key, exhaust front
Model 40S/6000	Flange mounting	A06B-0761-B104	6000 min^{-1}, has key, exhaust rear
		A06B-0761-B105	6000 min^{-1}, has key, exhaust front
		A06B-0761-B304	6000 min^{-1}, no key, exhaust rear
		A06B-0761-B305	6000 min^{-1}, no key, exhaust front
	Foot mounting	A06B-0761-B204	6000 min^{-1}, has key, exhaust rear
		A06B-0761-B205	6000 min^{-1}, has key, exhaust front
		A06B-0761-B404	6000 min^{-1}, no key, exhaust rear
		A06B-0761-B405	6000 min^{-1}, no key, exhaust front

(3) Assembly of a terminal box and fan

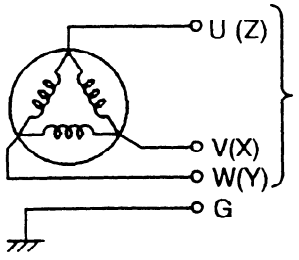
Model	Drawing number for assembling a terminal box	Drawing number for assembling a fan	Remarks
1S, 1.5S	A290-0753-T410	A290-0750-T500 A290-0750-T501	Exhaust rear Exhaust front
2S, 3S		A290-0753-T510 A290-0753-T511	Exhaust rear Exhaust front
6S, 8S	A290-0754-T400	A290-0754-T500 A290-0754-T501	Exhaust rear Exhaust front
12S, 15S		A290-0756-T500 A290-0756-T501	Exhaust rear Exhaust front
18S, 22S	A290-1018-T400	A290-0756-T500 A290-0756-T501	Exhaust rear Exhaust front
30S, 40S	A290-1040-T420	A290-0731-T510 A290-0731-T511	Exhaust rear Exhaust front

(Note) This applies also to the high-speed models.

6. CONNECTIONS

6.1 Model 0.5S

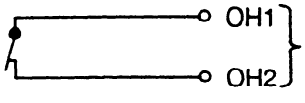
This model is connected to a power line and pulse generator using shielded cables with a connector.



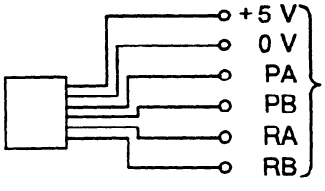
Connection to the power line
The following connector manufactured by AMP is attached to the cable.
Mounting screws are type M3.
Connector: A63L-0001-0428/C
Contact: A63L-0001-0456/AS

Pin assignment in the connector

		G	W	V	U
6	5	4	3	2	1



AMP crimping tool (for cables)	
Crimping tool	914596-2
Extractor	614677-1



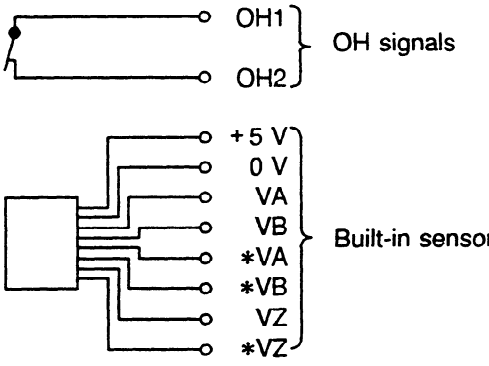
Connection to the pulse generator
The following connector manufactured by Hirose Electric Co., Ltd. is attached to the cable.
Mounting screws are type M4.
Connector: A63L-0001-0434#BB25SNO
(Hirose code: HDBB-25S)
Connector cover: A63L-0001-0442
(Hirose code: HDBW-25-CW)

Pin assignment in the connector

14	15	16	17	18	19	20	21	22	23	24	25
		0V				RA			+5V		

1	2	3	4	5	6	7	8	9	10	11	12	13
		OH2		PA			RB	PB				OH1

When a built-in sensor is provided



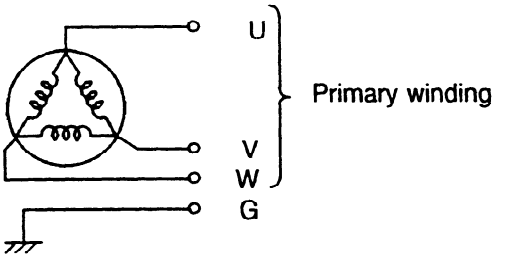
Pin assignment in the connector

14	15	16	17	18	19	20	21	22	23	24	25
		0V				*VZ					+5V

1	2	3	4	5	6	7	8	9	10	11	12	13
OH1		0V		VZ	*VB	VB	*VA	VA		OH2	+5V	

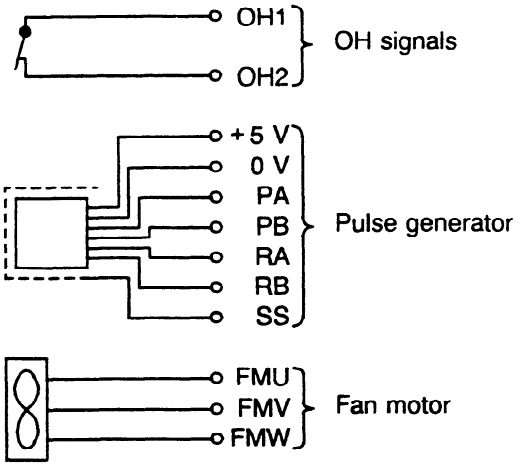
6.2 Models 1S - 40S

These models are connected to OH signals and a pulse generator with AMP connectors. The other signals are connected to the terminal block. Connector housings and contactors are attached to each motor.



Type of screws used in the terminal block

Terminal name / Motor model	U, V, W, G	FMU - FMW
1S - 15S	M5	M4
18S, 22S	M8	M4
30S, 40S	M10	M3.5



Pin assignment in the connector

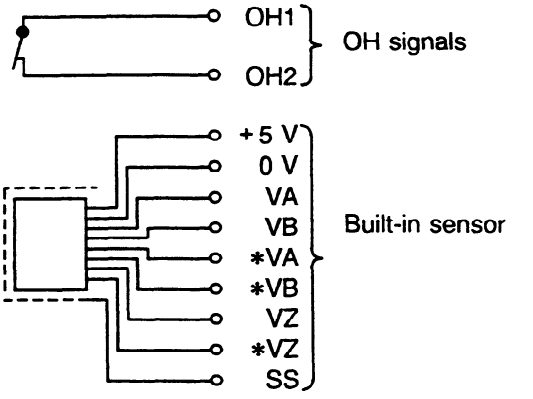
③ Blue PB	② Black PA	① Red +5V
⑥ White RB	⑤ Green RA	④ Yellow OV
⑨ OH2	⑧ SS	⑦ OH1

Connector: Universal maintenance-lock type manufactured by AMP

	Motor	Cable
Housing	350782-1	350720-1
Contactor	350706-7	350689-6

FANUC purchase code
A63L-0001-0219/09-C00 : 350782-1
A63L-0001-0220/SP706-7 : 350706-7
A63L-0001-0219/09-P00 : 350720-1
A63L-0001-0220/UN689-6 : 350689-6

When a built-in sensor is provided



Pin assignment in the connector

③ Blue *VA	② Black VA	① Red +5V
⑥ White-orange *VB	⑤ Green VB	④ White-yellow OV
⑨	⑧ White-brown *VZ	⑦ Gray VZ
⑫ OH2	⑪ Blue-transparent SS	⑩ OH1

Connector: Universal maintenance-lock type manufactured by AMP

	Motor	Cable
Housing	350783-1	350735-1
Contactor	350706-7	350689-6

FANUC purchase code
A63L-0001-0219/12-C00 : 350783-1
A63L-0001-0220/SP706-7 : 350706-7
A63L-0001-0219/12-P00 : 350735-1
A63L-0001-0220/UN689-6 : 350689-6

7. ALLOWABLE RADIAL LOAD

Use the motor output shaft below the allowable radial loads shown in the table below.

Model	Allowable radial load at output shaft end
0.5S	30 kg
1S	40 kg
1.5S	90 kg
2S	90 kg
3S	150 kg
6S	200 kg
8S	300 kg
12S, 15S	300 kg
18S, 22S	450 kg
30S, 40S	550 kg
1S/15000	40 kg
2S/15000	50 kg
3S/12000	100 kg
6S/12000	150 kg
8S/8000	200 kg
12S/8000, 15S/8000	250 kg
18S/8000, 22S/8000	300 kg
30S/6000, 40S/6000	550 kg

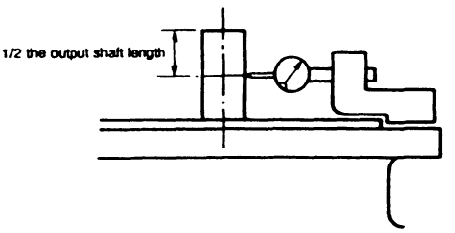
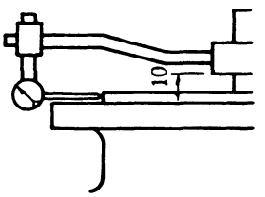
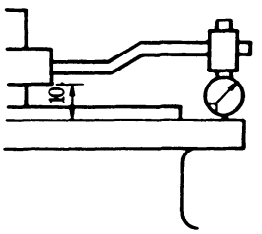
(Note 1) When using a belt, adjust the tension so the allowable loads indicated above are not exceeded. If an excessive load is applied, consider the use of a support bearing on the machine side to maintain the long-term reliability of the motor.

(Note 2) When the belt tension is maximized at a point outside the output shaft end, the allowable loads are less than those at the output shaft end.

(Note 3) If a thrust load is applied when a helical gear is used, the shaft moves in the direction of the thrust. So, as a general rule, never apply a thrust load.

8. ASSEMBLING ACCURACY (T.I.R: Total Indicator Reading)

Conforming to JEM1401

Item \ Model	22S or lower	30S,40S	Measuring method
Vibration at the end of the output shaft	20μm or less		
Vibration of the faucet joint for mounting the flange against the core of the shaft	40μm or less	60μm or less	
Vibration of the flange mounting surface against the core of the shaft	80μm or less	100μm or less	

9. EXTERNAL DIMENSIONS

9.1 AC Spindle Motor Model 0.5S

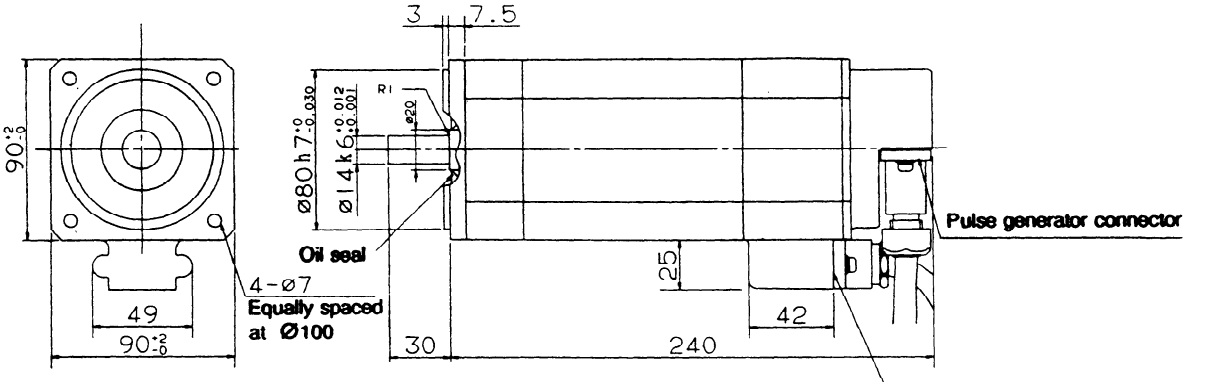
(a) Flange mounting type

Pin assignment of the power line connector manufactured by AMP

		G	W	V	U
6	5	4	3	2	1

Pin assignment of the pulse generator connector manufactured by Hirose

		OH2		PA			RB	PB				OH1
1	2	3	4	5	6	7	8	9	10	11	12	13
		0V				RA			+5V			
14	15	16	17	18	19	20	21	22	23	24	25	



(Note 1) Place the motor so that the output axis is on the horizontal plane or so that it is oriented vertically downward.

(Note 2) Use hexagon-socket-head M6 bolts to mount the motor.

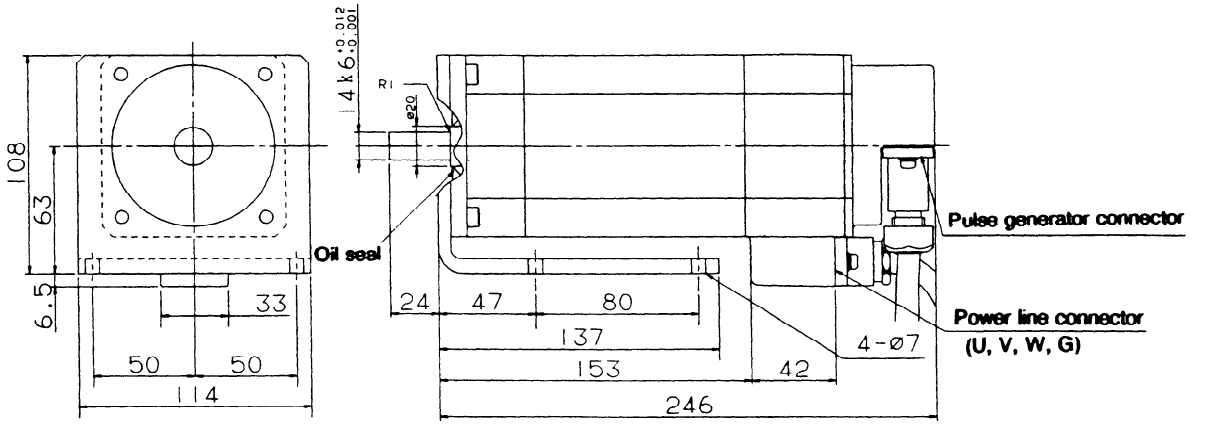
(b) Foot mounting type

Pin assignment of the power line connector manufactured by AMP

		G	W	V	U
6	5	4	3	2	1

Pin assignment of the pulse generator connector manufactured by Hirose

		OH2		PA			RB	PB				OH1
1	2	3	4	5	6	7	8	9	10	11	12	13
		0V				RA			+5V			
14	15	16	17	18	19	20	21	22	23	24	25	

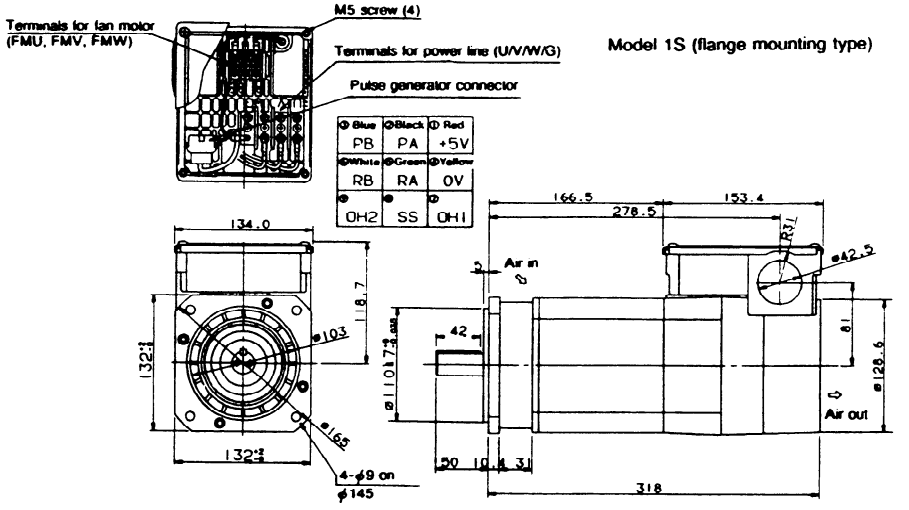


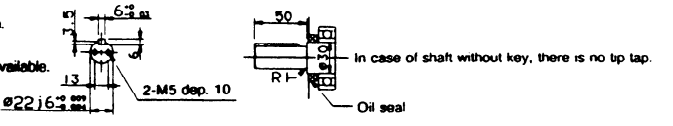
(Note 1) Place the motor so that the output axis is on the horizontal plane or so that it is oriented vertically downward.

(Note 2) Use hexagon-socket-head M6 bolts to mount the motor.

9.2 AC Spindle Motor Model 1S

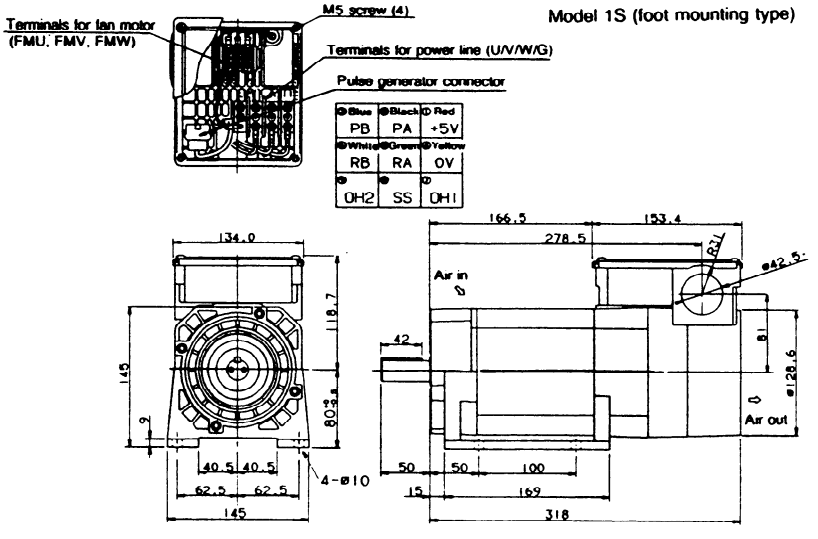
(a) Flange mounting type

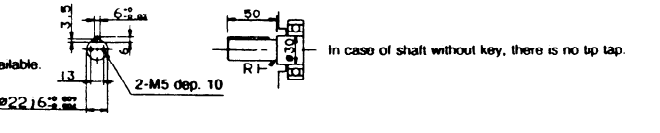




(Note) 1. The output shaft should be horizontal or vertical downward in use.
2. Use hexagon bolts M8, length 20 mm or less as mounting bolts.
3. The motor in which cooling air flow direction is reversed is also available.

(b) Foot mounting type

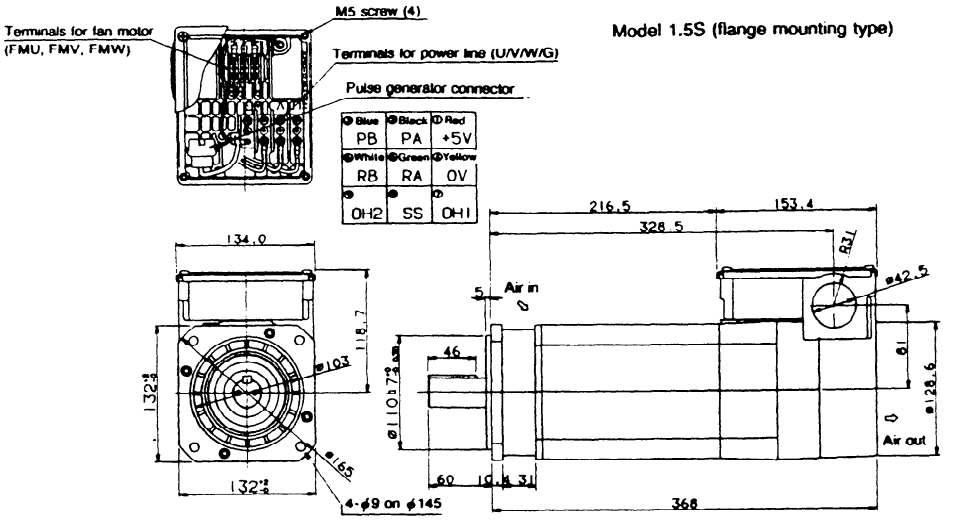




(Note) 1. The output shaft should be horizontal or vertical downward in use.
2. Use hexagon bolts M8, length 20 mm or less as mounting bolts.
3. The motor in which cooling air flow direction is reversed is also available.

9.3 AC Spindle Motor Model 1.5S

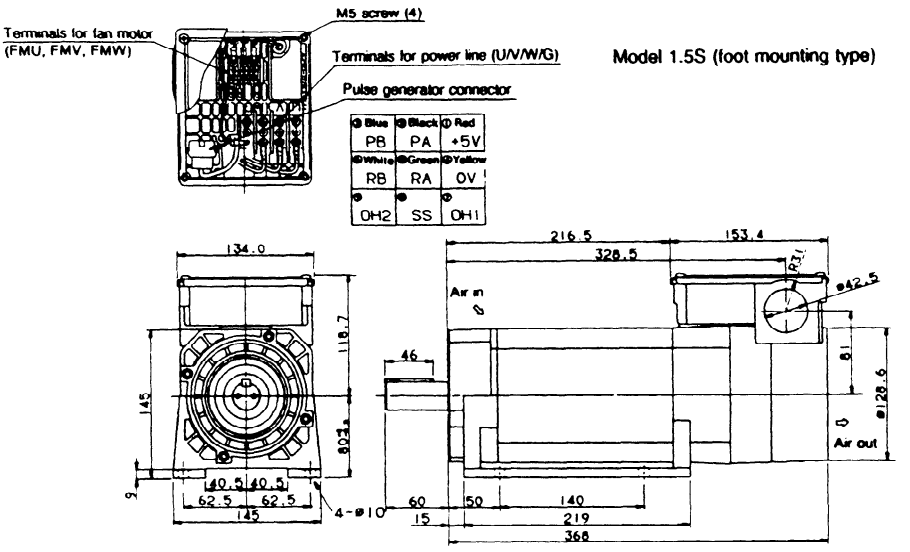
(a) Flange mounting type



(Note) 1. The output shaft should be honzontal or vertical downward in use.
2. Use hexagon bolts M8, length 20 mm or less as mounting bolts.
3. The motor in which cooling air flow direction is reversed is also available.

In case of shaft without key, there is no tp tap.

(b) Foot mounting type

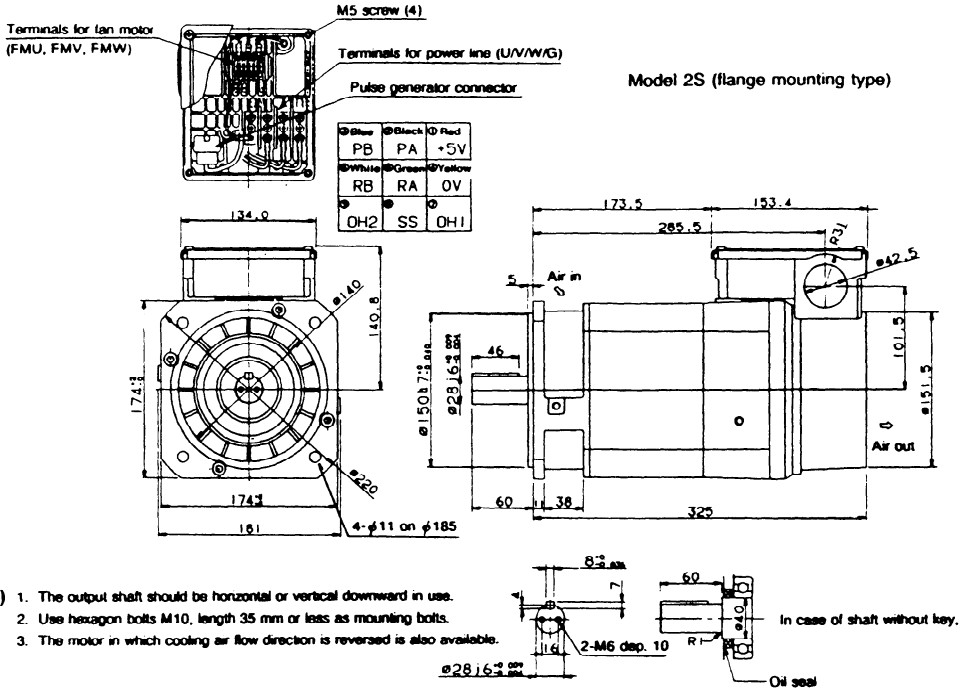


(Note) 1. The output shaft should be honzontal or vertical downward in use.
2. Use hexagon bolts M8, length 20 mm or less as mounting bolts.
3. The motor in which cooling air flow direction is reversed is also available.

In case of shaft without key, there is no tp tap.

9.4 AC Spindle Motor Model 2S

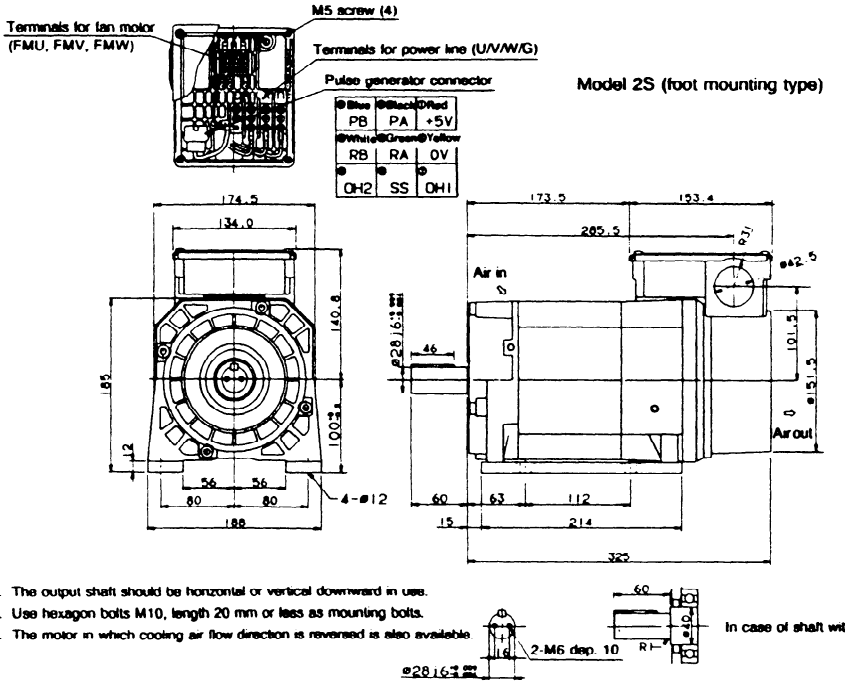
(a) Flange mounting type



(Note) 1. The output shaft should be horizontal or vertical downward in use.
2. Use hexagon bolts M10, length 35 mm or less as mounting bolts.
3. The motor in which cooling air flow direction is reversed is also available.

In case of shaft without key, there is no tip tap.

(b) Foot mounting type

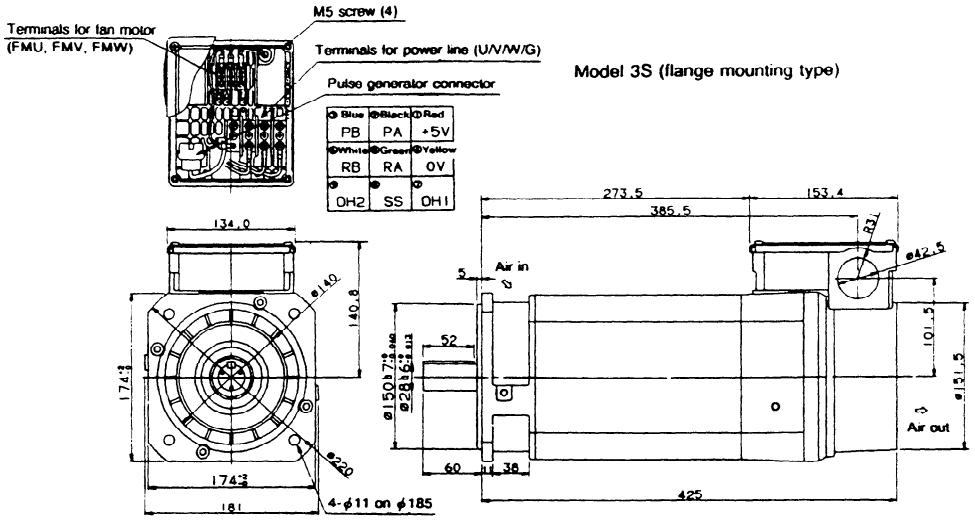


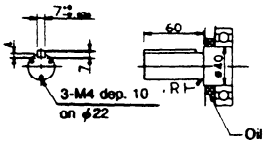
(Note) 1. The output shaft should be horizontal or vertical downward in use.
2. Use hexagon bolts M10, length 20 mm or less as mounting bolts.
3. The motor in which cooling air flow direction is reversed is also available.

In case of shaft without key, there is no tip tap.

9.5 AC Spindle Motor Model 3S

(a) Flange mounting type

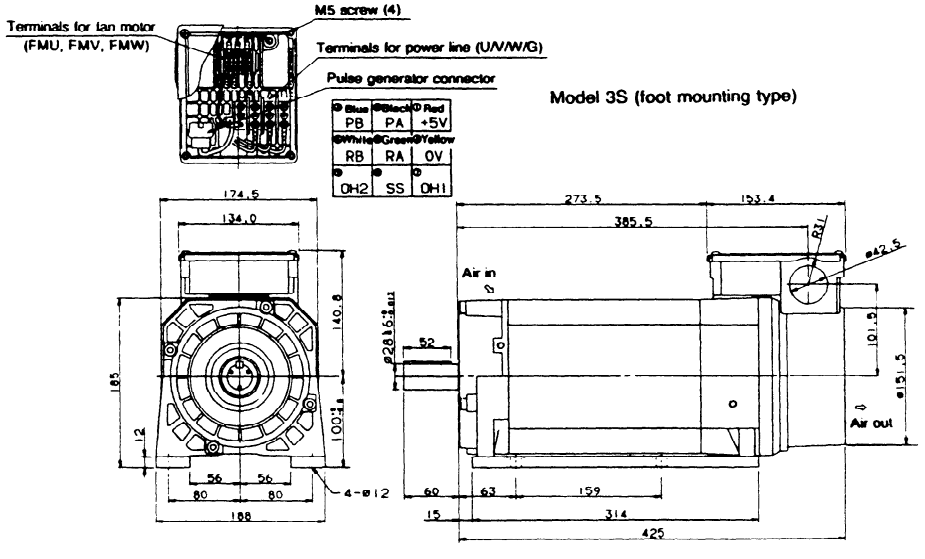


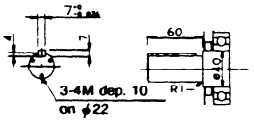


(Note) 1. The output shaft should be horizontal or vertical downward in use.
2. Use hexagon bolts M10, length 35 mm or less as mounting bolts.
3. The motor in which cooling air flow direction is reversed is also available.

In case of shaft without key, there is no tip tap.

(b) Foot mounting type



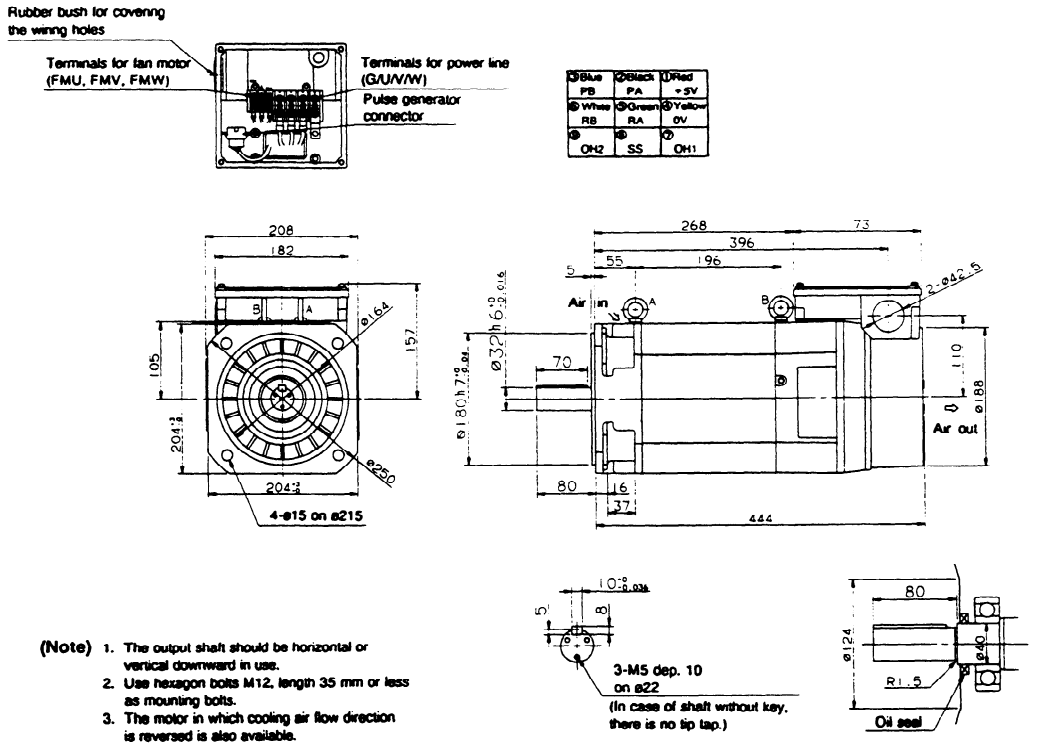


(Note) 1. The output shaft should be horizontal or vertical downward in use.
2. Use hexagon bolts M10, length 20 mm or less as mounting bolts.
3. The motor in which cooling air flow direction is reversed is also available.

In case of shaft without key, there is no tip tap.

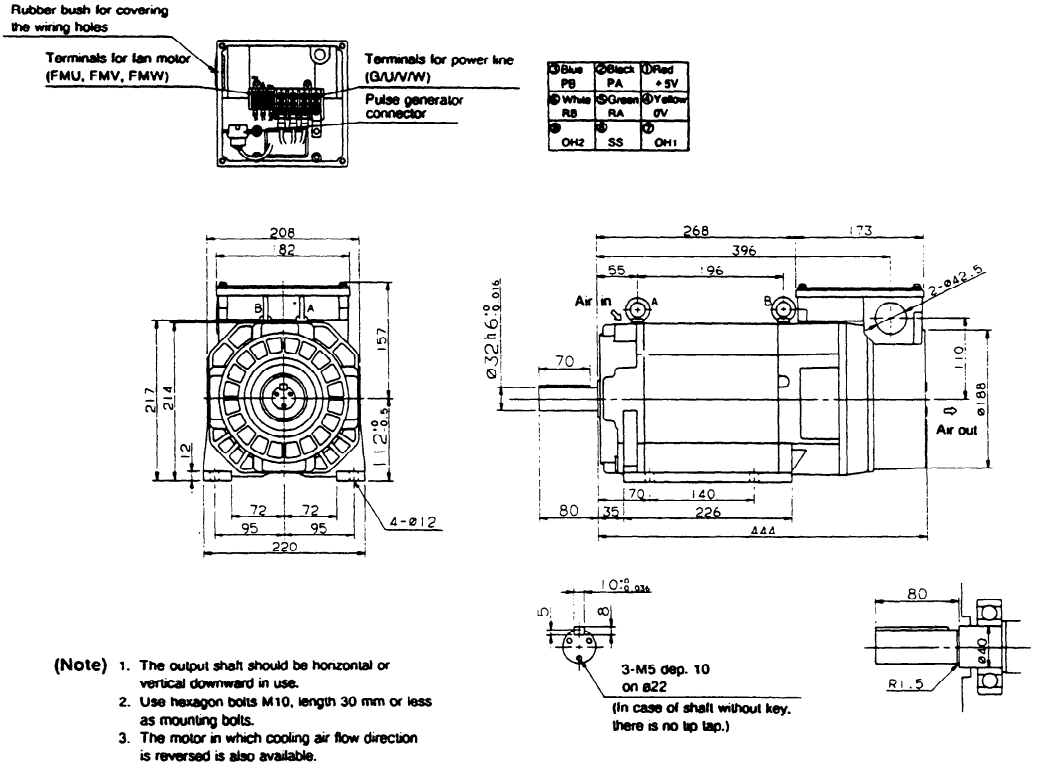
9.6 AC Spindle Motor Model 6S

(a) Flange mounting type



(Note) 1. The output shaft should be horizontal or vertical downward in use.
2. Use hexagon bolts M12, length 35 mm or less as mounting bolts.
3. The motor in which cooling air flow direction is reversed is also available.

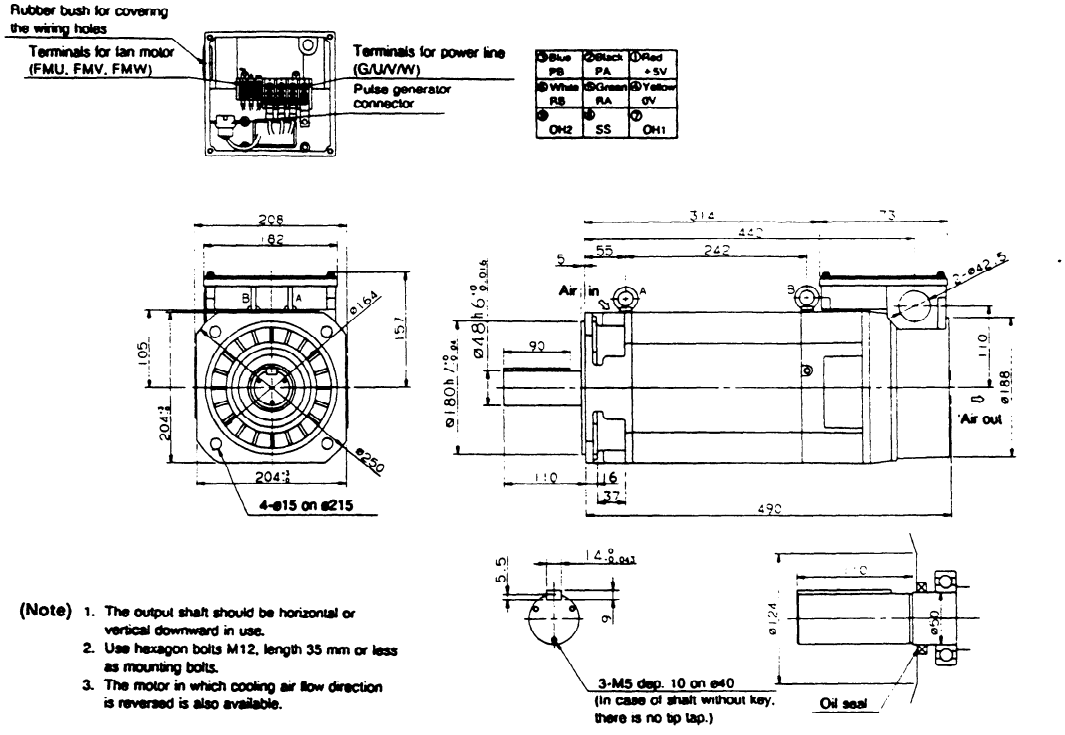
(b) Foot mounting type



(Note) 1. The output shaft should be horizontal or vertical downward in use.
2. Use hexagon bolts M10, length 30 mm or less as mounting bolts.
3. The motor in which cooling air flow direction is reversed is also available.

9.7 AC Spindle Motor Model 8S

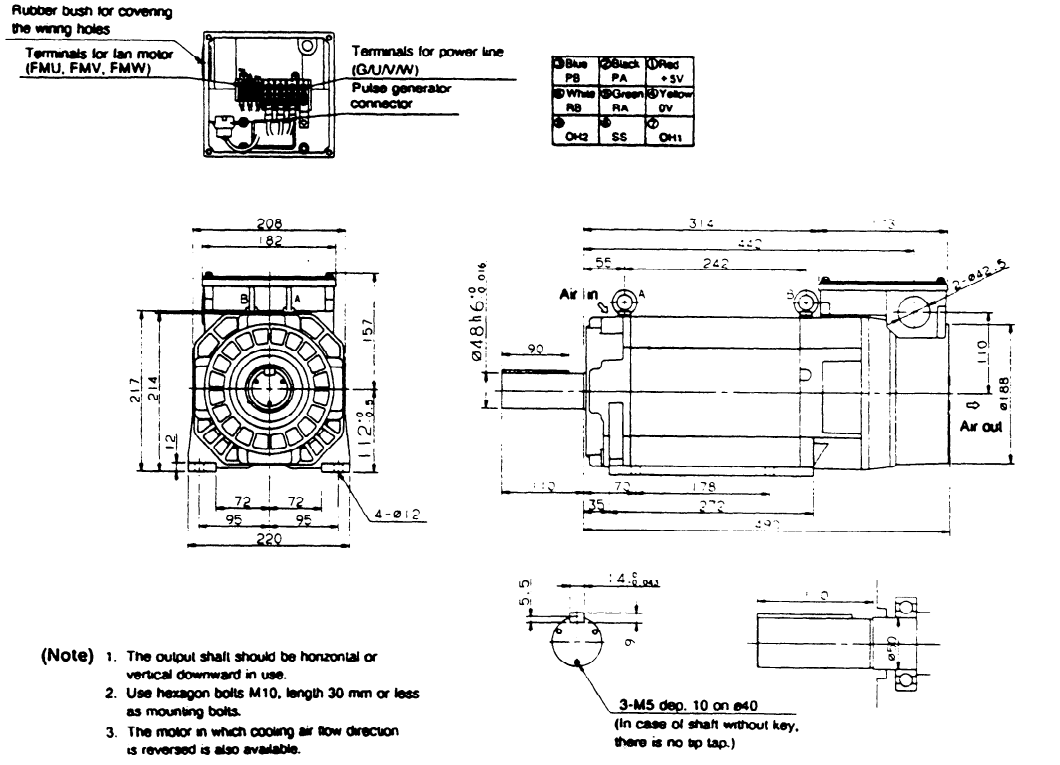
(a) Flange mounting type



⑤Blue PB	②Black PA	①Red +5V
⑩White RB	⑧Green RA	⑦Yellow 0V
⑫ OH2	⑥ SS	⑪ OH1

(Note) 1. The output shaft should be horizontal or vertical downward in use.
2. Use hexagon bolts M12, length 35 mm or less as mounting bolts.
3. The motor in which cooling air flow direction is reversed is also available.

(b) Foot mounting type

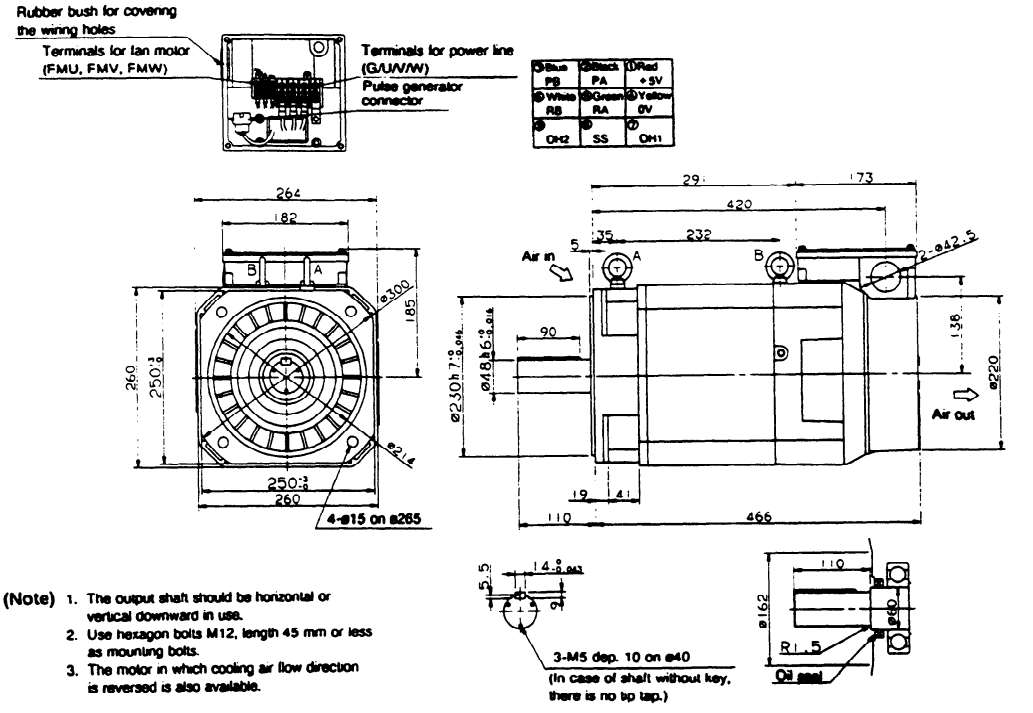


⑤Blue PB	②Black PA	①Red +5V
⑩White RB	⑧Green RA	⑦Yellow 0V
⑫ OH2	⑥ SS	⑪ OH1

(Note) 1. The output shaft should be horizontal or vertical downward in use.
2. Use hexagon bolts M10, length 30 mm or less as mounting bolts.
3. The motor in which cooling air flow direction is reversed is also available.

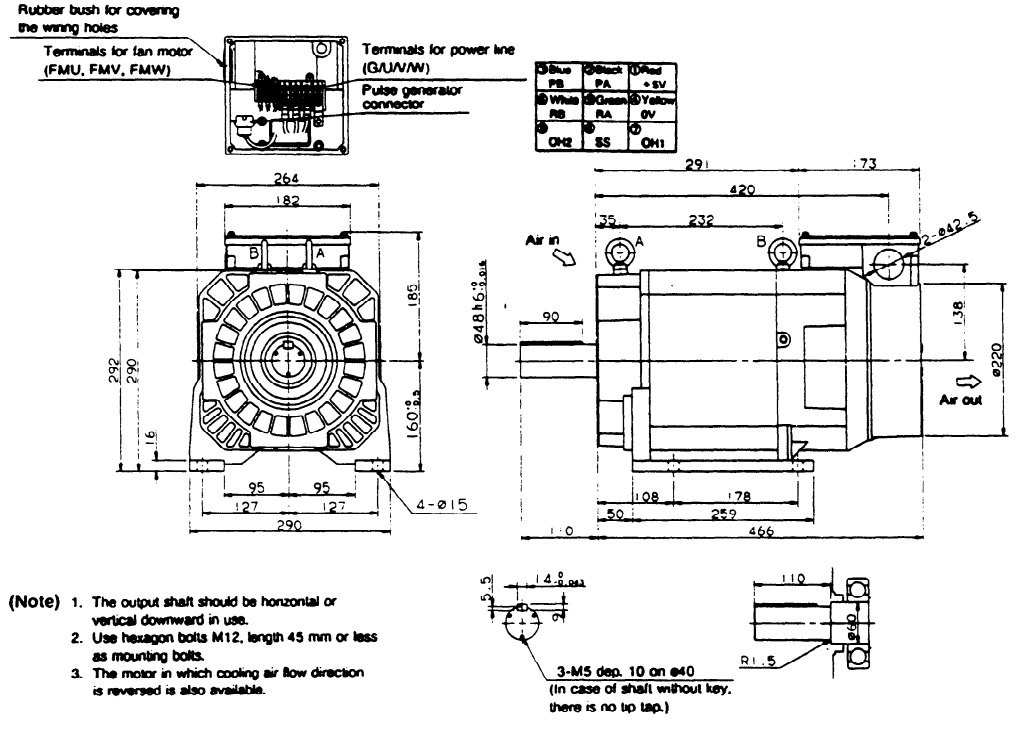
9.8 AC Spindle Motor Models 12S, 15S

(a) Flange mounting type



(Note) 1. The output shaft should be horizontal or vertical downward in use.
2. Use hexagon bolts M12, length 45 mm or less as mounting bolts.
3. The motor in which cooling air flow direction is reversed is also available.

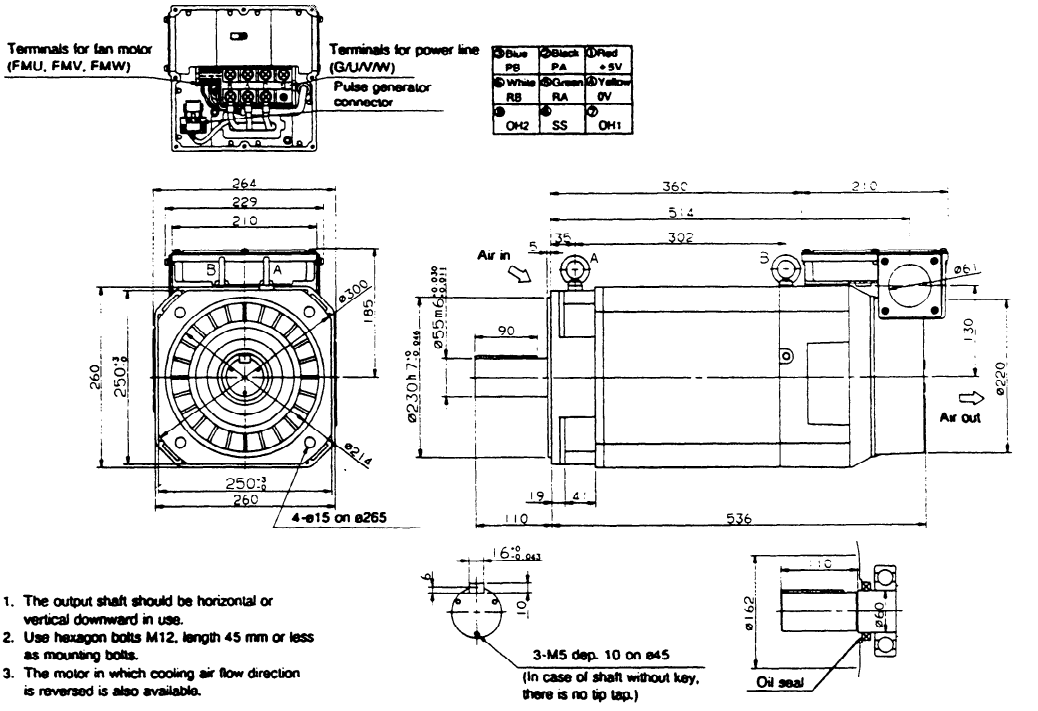
(b) Foot mounting type



(Note) 1. The output shaft should be horizontal or vertical downward in use.
2. Use hexagon bolts M12, length 45 mm or less as mounting bolts.
3. The motor in which cooling air flow direction is reversed is also available.

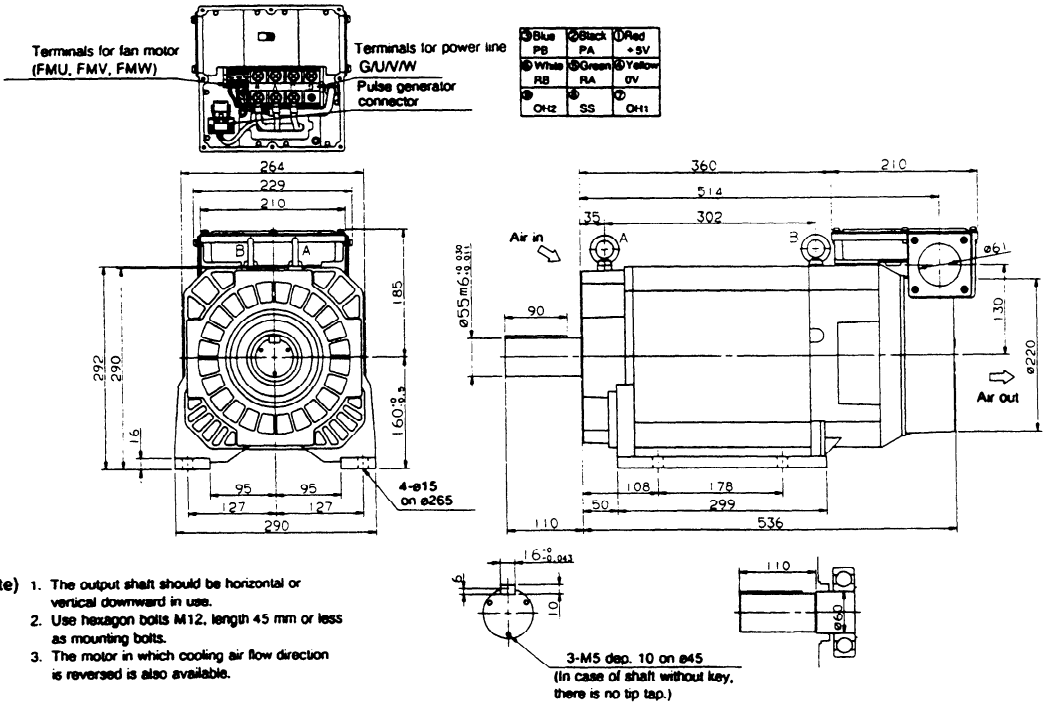
9.9 AC Spindle Motor Models 18S, 22S

(a) Flange mounting type



(Note) 1. The output shaft should be horizontal or vertical downward in use.
2. Use hexagon bolts M12, length 45 mm or less as mounting bolts.
3. The motor in which cooling air flow direction is reversed is also available.

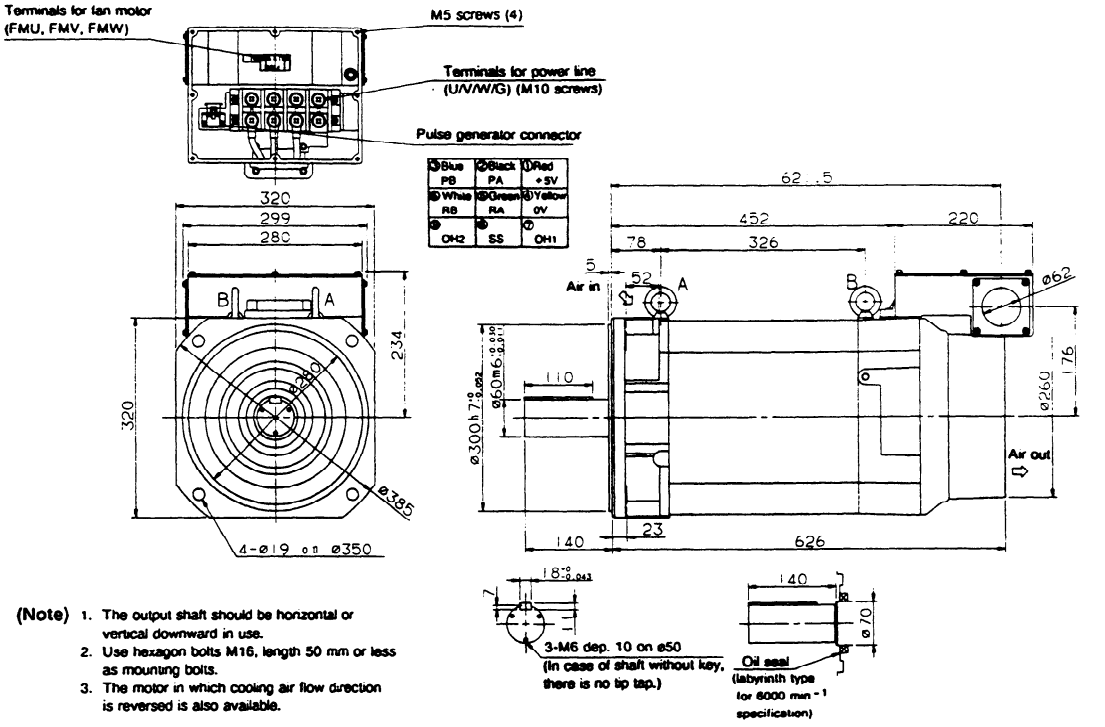
(b) Foot mounting type



(Note) 1. The output shaft should be horizontal or vertical downward in use.
2. Use hexagon bolts M12, length 45 mm or less as mounting bolts.
3. The motor in which cooling air flow direction is reversed is also available.

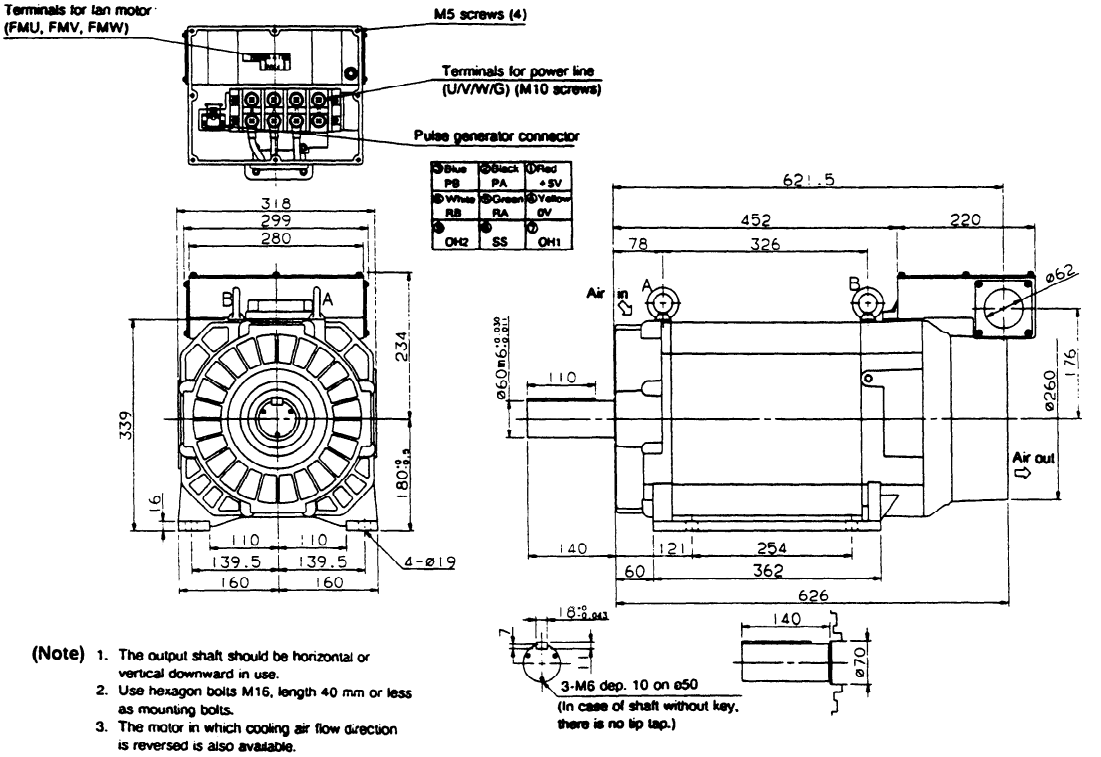
9.10 AC Spindle Motor Models 30S, 40S (30S/6000, 40S/6000)

(a) Flange mounting type



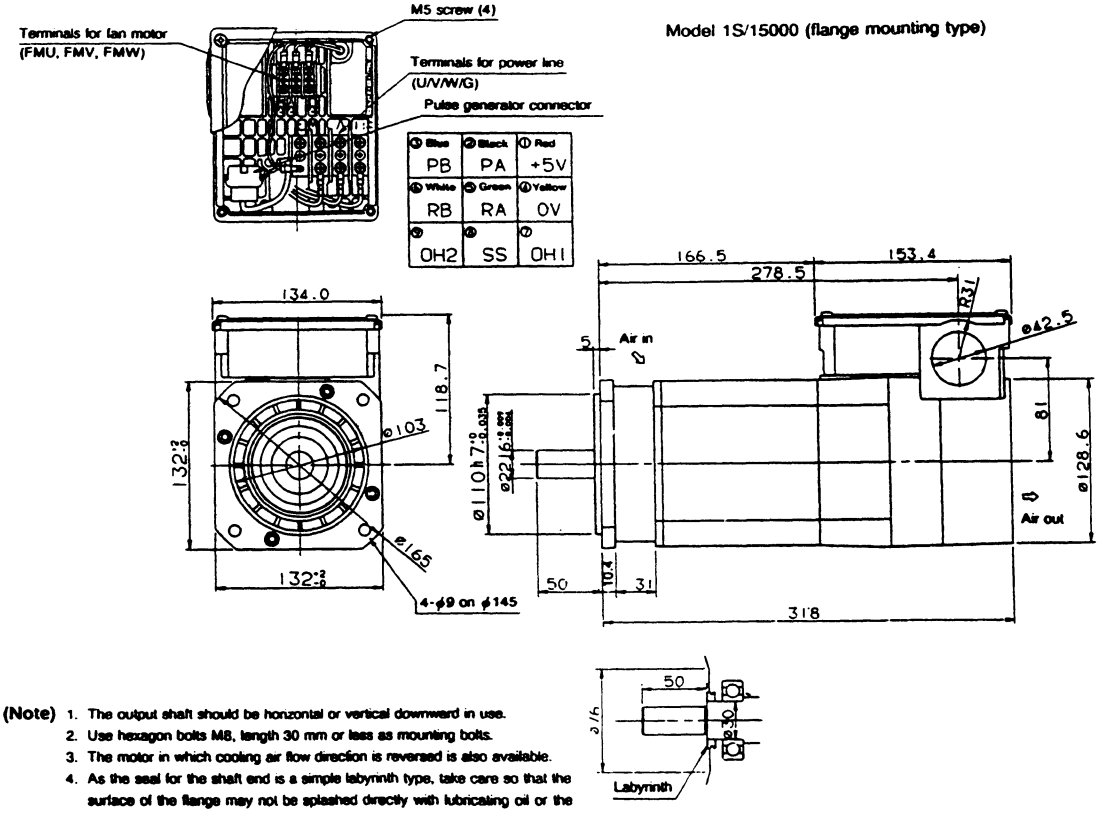
(Note) 1. The output shaft should be horizontal or vertical downward in use.
2. Use hexagon bolts M16, length 50 mm or less as mounting bolts.
3. The motor in which cooling air flow direction is reversed is also available.

(b) Foot mounting type



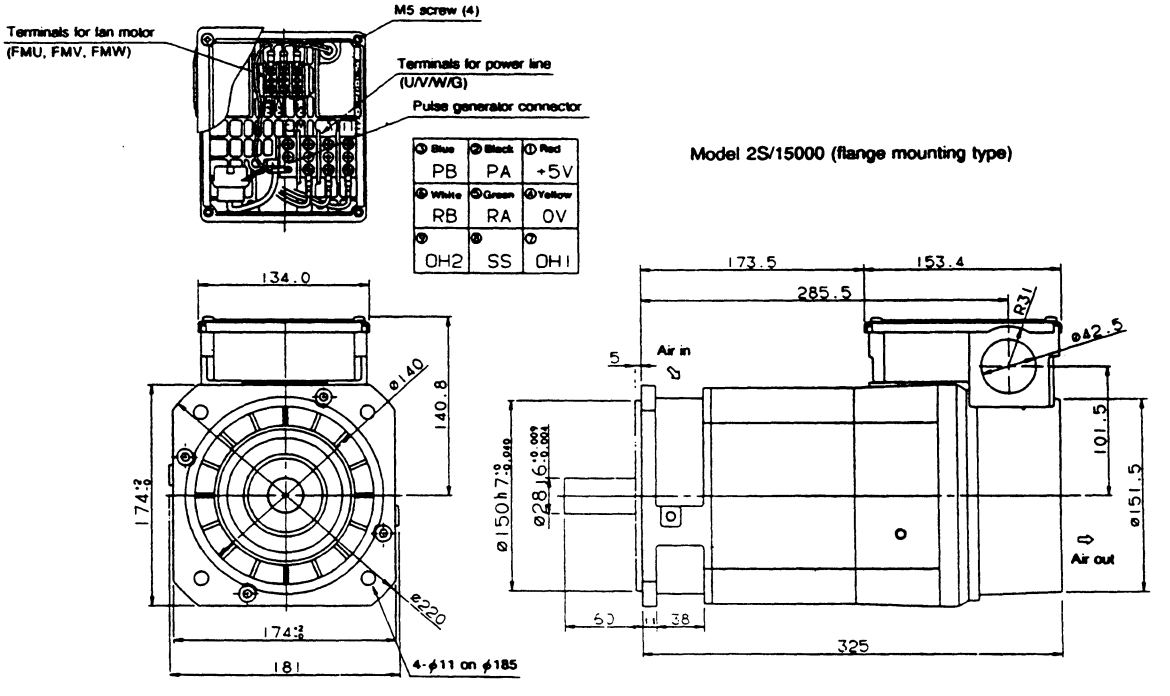
(Note) 1. The output shaft should be horizontal or vertical downward in use.
2. Use hexagon bolts M16, length 40 mm or less as mounting bolts.
3. The motor in which cooling air flow direction is reversed is also available.

9.11 AC Spindle Motor Model 1S/15000



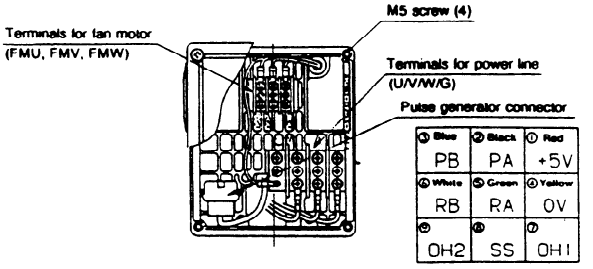
(Note) 1. The output shaft should be horizontal or vertical downward in use.
2. Use hexagon bolts M8, length 30 mm or less as mounting bolts.
3. The motor in which cooling air flow direction is reversed is also available.
4. As the seal for the shaft end is a simple labyrinth type, take care so that the surface of the flange may not be splashed directly with lubricating oil or the like.

9.12 AC Spindle Motor Model 2S/15000



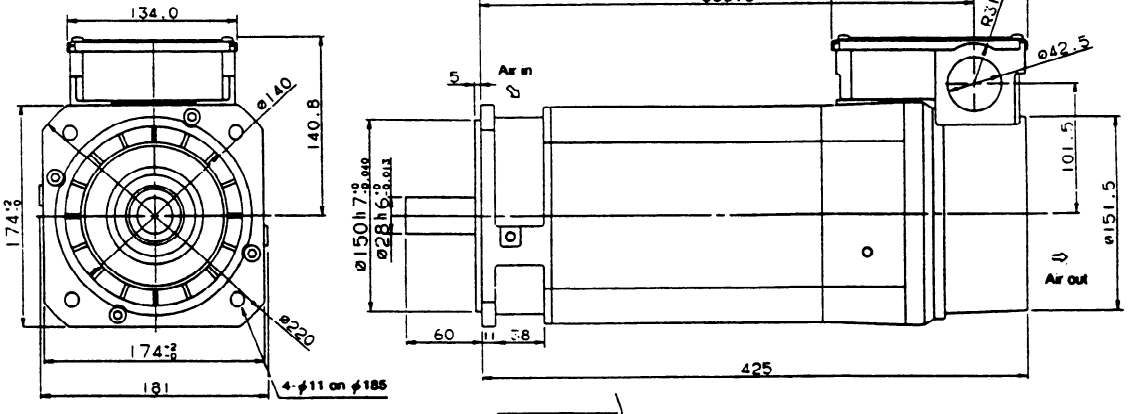
(Note) 1. The output shaft should be horizontal or vertical downward in use.
2. Use hexagon bolts M10, length 35 mm or less as mounting bolts.
3. The motor in which cooling air flow direction is reversed is also available.
4. As the seal for the shaft end is a simple labyrinth type, take care so that the surface of the flange may not be splashed directly with lubricating oil or the like.

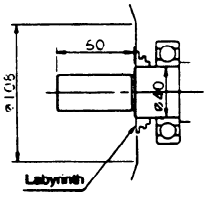
9.13 AC Spindle Motor Model 3S/12000



③ Blue	② Black	① Red
PB	PA	+5V
⑥ White	⑤ Green	④ Yellow
RB	RA	0V
⑨	⑧	⑦
OH2	SS	OH1

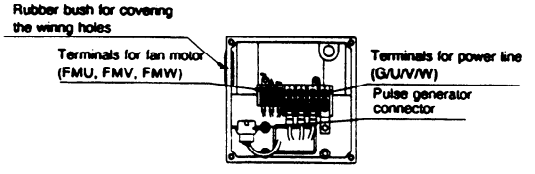
Model 3S/12000 (flange mounting type)



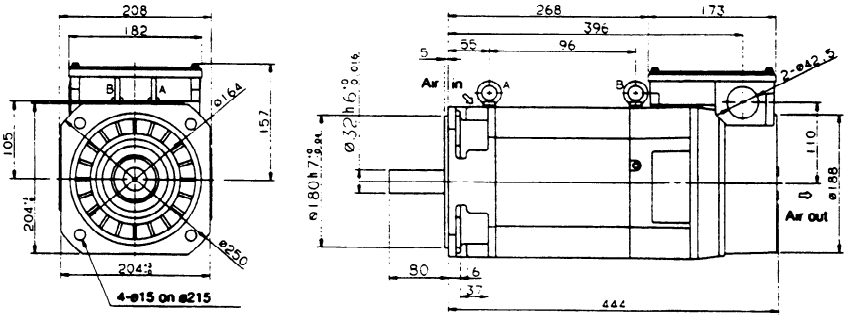


(Note)
1. The output shaft should be horizontal or vertical downward in use.
2. Use hexagon bolts M10, length 35 mm or less as mounting bolts.
3. The motor in which cooling air flow direction is reversed is also available.
4. As the seal for the shaft end is a simple labyrinth type, take care so that the surface of the flange may not be splashed directly with lubricating oil or the like.

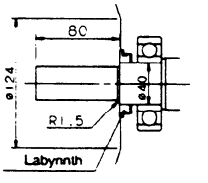
9.14 AC Spindle Motor Model 6S/12000



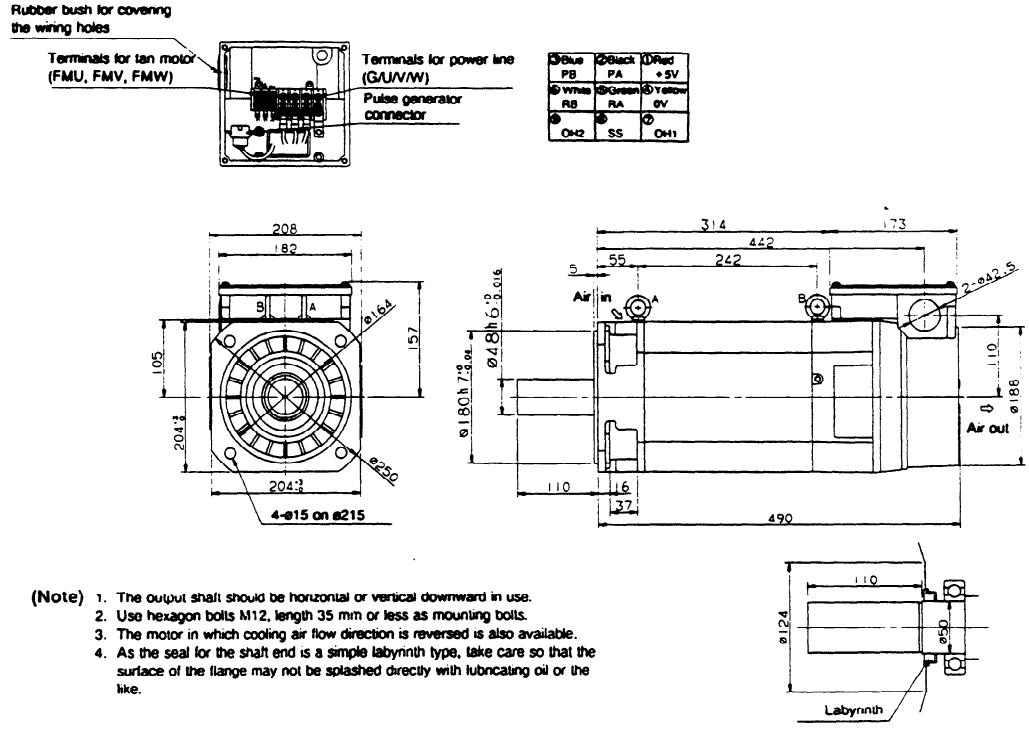
③ Blue	② Black	① Red
PB	PA	+5V
⑥ White	⑤ Green	④ Yellow
RB	RA	0V
⑨	⑧	⑦
OH2	SS	OH1



(Note)
1. The output shaft should be horizontal or vertical downward in use.
2. Use hexagon bolts M12, length 35 mm or less as mounting bolts.
3. The motor in which cooling air flow direction is reversed is also available.
4. As the seal for the shaft end is a simple labyrinth type, take care so that the surface of the flange may not be splashed directly with lubricating oil or the like.

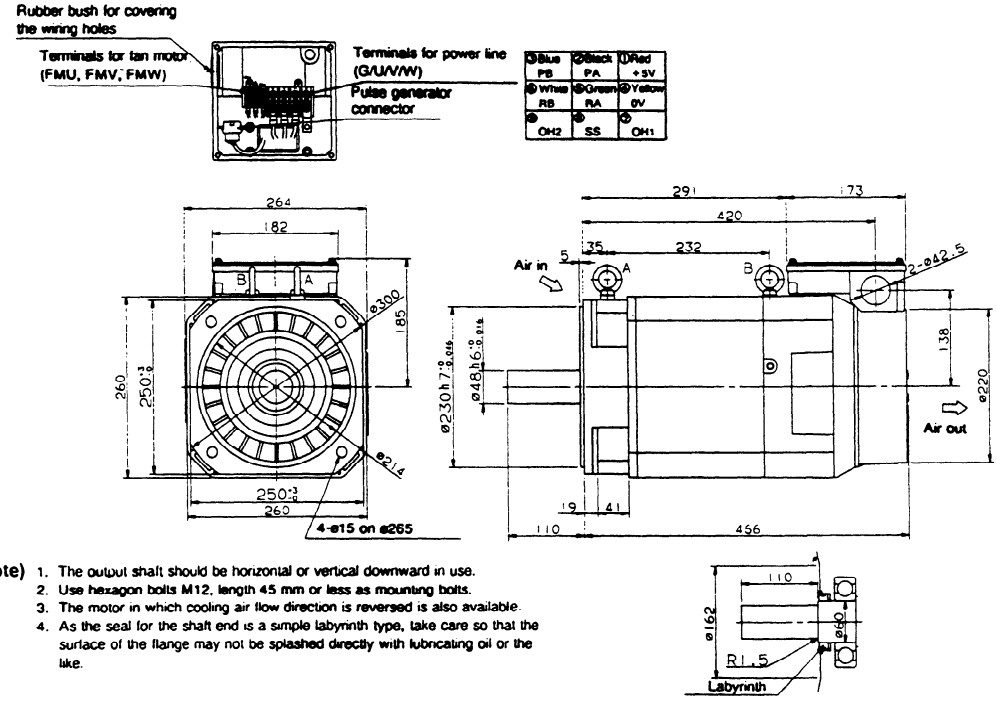


9.15 AC Spindle Motor Model 8S/8000



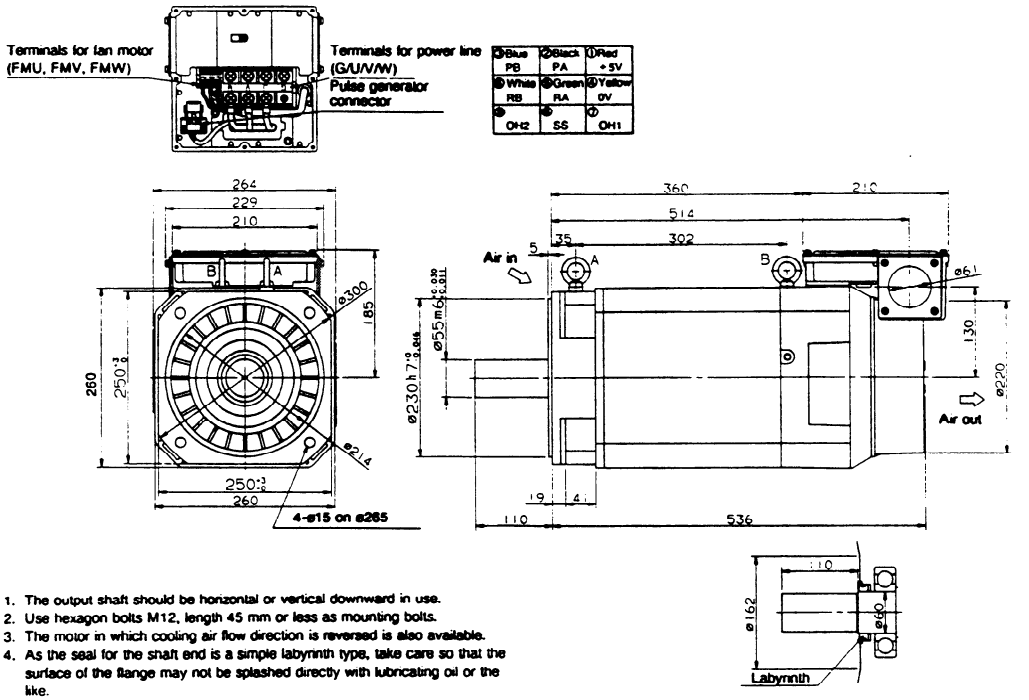
(Note) 1. The output shaft should be horizontal or vertical downward in use.
2. Use hexagon bolts M12, length 35 mm or less as mounting bolts.
3. The motor in which cooling air flow direction is reversed is also available.
4. As the seal for the shaft end is a simple labyrinth type, take care so that the surface of the flange may not be splashed directly with lubricating oil or the like.

9.16 AC Spindle Motor Models 12S/8000, 15S/8000



(Note) 1. The output shaft should be horizontal or vertical downward in use.
2. Use hexagon bolts M12, length 45 mm or less as mounting bolts.
3. The motor in which cooling air flow direction is reversed is also available.
4. As the seal for the shaft end is a simple labyrinth type, take care so that the surface of the flange may not be splashed directly with lubricating oil or the like.

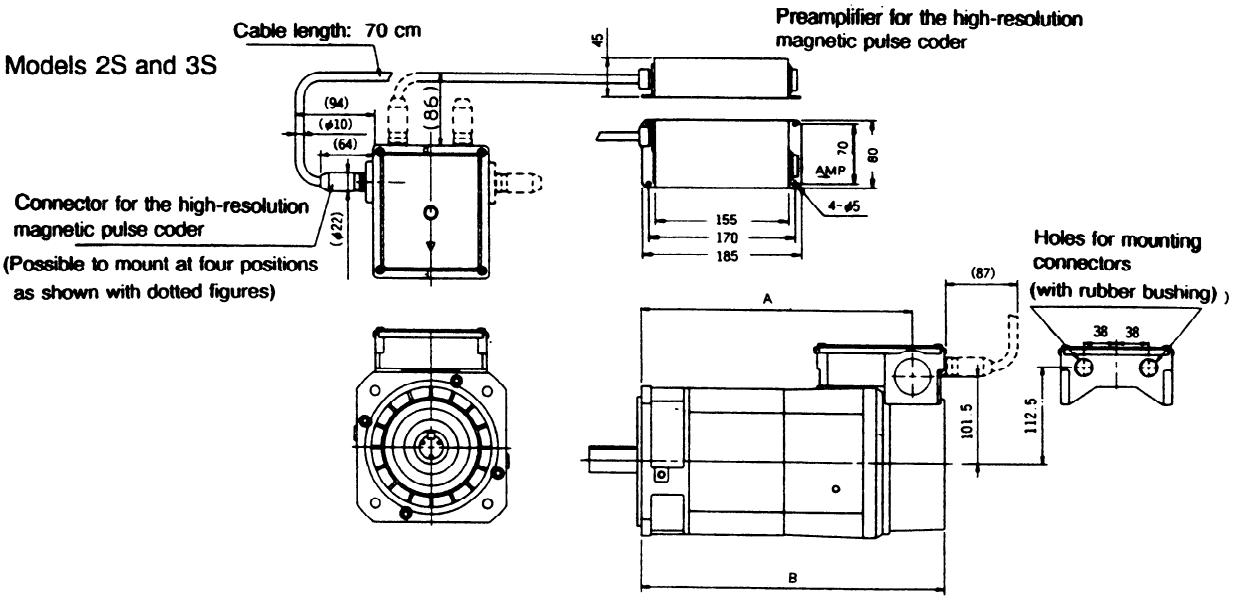
9.17 AC Spindle Motor Models 18S/8000, 22S/8000



(Note) 1. The output shaft should be horizontal or vertical downward in use.
2. Use hexagon bolts M12, length 45 mm or less as mounting bolts.
3. The motor in which cooling air flow direction is reversed is also available.
4. As the seal for the shaft end is a simple labyrinth type, take care so that the surface of the flange may not be splashed directly with lubricating oil or the like.

9.18 AC Spindle Motors with a Built-in High-resolution Magnetic Pulse Coder

Models 2S and 3S

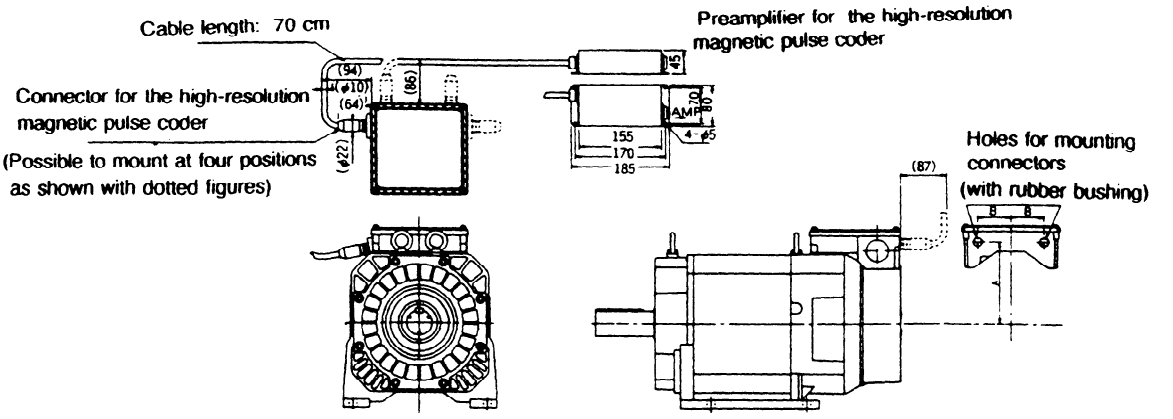


Model	Dimension A	Dimension B
2S	310.5	350
3S	410.5	450

(Note 1) For dimensions not specified in this figure, refer to the outline drawings of motors.

(Note 2) A motor without a key is only available for the flange type.

Models 6S to 40S



Model	Dimension A	Dimension B
6S, 8S	123	60
12S, 15S	151	60
18S, 22S	146	55
30S, 40S	195	90

(Note 1) For dimensions not specified in this figure, refer to the outline drawings of motors.

(Note 2) Flange type motors and motors without keys are also available.

II. AC SPINDLE MOTOR P series

1. GENERAL

The AC spindle motor series is suitable for structural rationalization by eliminating the machine spindle gear box.

2. FEATURES

(1) As the rated output range is wide at 1:8, a gear box structure for speed change is not required, thereby allowing the structure of the machine to be simplified.
Accordingly, vibration and noise caused by the gear box structure is also eliminated.

(2) Improvement in efficiency of construction equipment
In the conventional motor, it was necessary to stop the sipindle when switching the gear to change the speed. However, the power-up series AC spindle motor reduces unnecessary use of time, other than that needed for machining, to a minimum by eliminating gear switching.

(3) Despite a compact configuration, a large low-speed torque can be obtained.

(4) Similar to the standard series, the method of fan exhaust can be selected from either a exhaust front type or exhaust rear type, thus preventing heat deformation of the machine.

3. SPECIFICATIONS

(1) Without speed range switching model

Series			P series (without speed range switching model)								
Item		Model (*1)	8P	10P	12P	15P	18P	22P	30P	40P	50P
			8P/8000	10P/8000	12P/8000	15P/8000	18P/8000	22P/8000	30P/6000	40P/6000	
Output	Continuous rating (*2)	kW (HP)	3.7 (5.0)	7.5 (10)	5.5 (7.4)	7.5 (10)	9 (12)	11 (14.7)	15 (20.1)	18.5 (24.8)	22 (29.5)
	30-min. rating (*2, *4)	kW (HP)	5.5 (7.4)	11 (14.7)	7.5 (10)	9 (12)	11 (14.7)	15 (20.1)	18.5 (24.8)	22 (29.5)	30 (40.2)
	50% ED (*2, *3, *4)	kW (HP)	5.5 (7.4)	11 (14.7)	7.5 (10)	9 (12)	11 (14.7)	15 (20.1)	18.5 (24.8)	22 (29.5)	30 (40.2)
Rotation speed	Basal speed	min^{-1}	750	1300	750	750	750	750	575	575	575
	Max. speed (*5)	min^{-1}	6000	6000	6000	6000	6000	6000	4500	4500	4500
			8000	8000	8000	8000	8000	8000	6000	6000	
Output torque (Continuous rated torque within a specified range)		N · m (kg · cm)	47.1 (480)	55.1 (562)	70 (714)	95.5 (974)	114.6 (1169)	140 (1428)	249 (2540)	307 (3133)	365 (3726)
GD^2		$kg \cdot m^2$	0.11	0.15	0.36	0.36	0.51	0.51	1.18	1.18	1.96
Rotor inertia		$N \cdot m \cdot s^2$ ($kg \cdot cm \cdot s^2$)	0.027 (0.28)	0.037 (0.38)	0.091 (0.93)	0.091 (0.93)	0.126 (1.29)	0.126 (1.29)	0.29 (3.0)	0.29 (3.0)	0.49 (5.0)
Weight		$kg \cdot m^2$	80	103	110	110	143	143	250	250	460
Vibration			V5								V10
Noise		dB (A)	75								80
Cooling system			Totally enclosed external fan type								
Cooling fan		W	56		68				84		90
Mounting			The output shaft must be oriented in the range from 45° above the horizontal to 90° below the horizontal.								
Overload tolerance (1min.) (*6)			120 % of 30-min. rating								
Insulation			F type								
Ambient temperature		°C	0 - 40								
Painting color			Munsell N2. 5								
Spare parts			Pulse generator, Thermostat								
No. of pulses for built-in sensor (Option)		p/rev	1024								—
Bearing lubrication			Grease								
Applicable spindle amplifier (*7, *8)			6S	12S	6S	8S	12S	15S/ Small type 15S	18S	22S	26S
30-min. rated capacity		kVA	9	22	12	15	17	22	26	32	44

(*1) The high-speed models whose names are suffixed with /8000 and /6000 have bearings designed for high-speed use.

(*2) The rated outputs are guaranteed when a rated power supply voltage (200/220/230 VAC) is applied. However, even when an applied power supply voltage fluctuates within the allowable fluctuation range, the rated output may not be obtained.

(*3) With a cycle time of 10 minutes and 50% ED, the ON period is 5 minutes, and the OFF period is 5 minutes.

(*4) Guaranteed when the thermal restrictions and cooling conditions (forced air-cooling from the outside) separately specified for the servo unit are satisfied.

(*5) The values in the lower row are for the high-speed models whose names are suffixed with /8000 and /6000.

(*6) This is not a guaranteed value but a guideline for the maximum motor output at a rated power supply voltage.

(*7) The AC spindle servo unit requires forced air-cooling.

(*8) For the specifications including the order drawing numbers, outline drawings, connection diagrams of the AC spindle servo unit, see Part Ⅶ.

(2) With speed range switching model

Series			P series (with speed range swiching model)	
Item \ Model (*1)			16P 16P/8000	60P
*2 Low-speed winding	Output	Continuous rating (*3) kW (HP)	11 (14.7)	22 (29.5)
		30-min. rating (*3) (*5) kW (HP)	15 (20.1)	30 (40.2)
		50% ED (*3, *4, *5) kW (HP)	15 (20.1)	30 (40.2)
	Rotation speed	Basal speed min^{-1}	750	400
		Max. speed min^{-1}	2500	1500
	Output torque (Continuous rated torque within a specified range) N · m (kg · cm)		140 (1428)	525 (5356)
*2 High-speed winding	Output	Continuous rating (*3) kW (HP)	15 (20.1)	22 (29.5)
		30-min. rating (*3) (*5) kW (HP)	18.5 (24.8)	30 (40.2)
		50% ED (*3, *4, *5) kW (HP)	18.5 (24.8)	30 (40.2)
	Rotation speed	Basal speed min^{-1}	1500	750
		Max. speed (*6) min^{-1}	6000 8000	4500
	Output torque (Continuous rated torque within a specified range) N · m (kg · cm)		95.5 (974)	280 (2856)
GD^2 kg · m^2			0.42	1.96
Rotor inertia N · m · s^2 (kg · cm · s^2)			0.106 (1.08)	0.49 (5.0)
Weight kg			125	468
Vibration			V5	V10
Noise dB (A)			75	80
Cooling system			Totally enclosed external fan type	
Cooling fan W			68	90
Mounting			The output shaft must be oriented in the range from 45° above the horizontal to 90° below the horizontal.	
Overload tolerance (1min.) (*7)			120 % of 30-min. rating	

Series	P series (with speed range swiching model)	
Item \ Model (*1)	16P 1GP/8000	60P
Insulation	F type	
Ambient temperature °C	0 - 40	
Painting color	Munsell N2. 5	
Spare parts	Pulse generator, Thermostat	
No. of pulses for built-in sensor (Option) p/rev	1024	——
Bearing lubrication	Grease	
Applicable spindle amplifier (Serial interface) (*8, *9)	Small type 15S	26S
30-min. rated capacity kVA	26	44

(*1) The bearing used with model 16P is different from that used with model 16P/8000.

(*2) The optional speed range switching function (λ - Δ switching) is required. For information about switching speed, see the output characteristics curves.

(*3) The rated outputs are guaranteed when a rated power supply voltage (200/220/230 VAC) is applied. However, even when an applied power supply voltage fluctuates within the allowable fluctuation range, the rated output may not be obtained.

(*4) With a cycle time of 10 minutes and 50% ED, the ON period is 5 minutes, and the OFF period is 5 minutes.

(*5) Guaranteed when the thermal restrictions and cooling conditions (forced air-cooling from the outside) separately specified for the servo unit are satisfied.

(*6) The value in the lower row is for 16P/8000.

(*7) This is not a guaranteed value but a guideline for the maximum motor output at a rated power supply voltage.

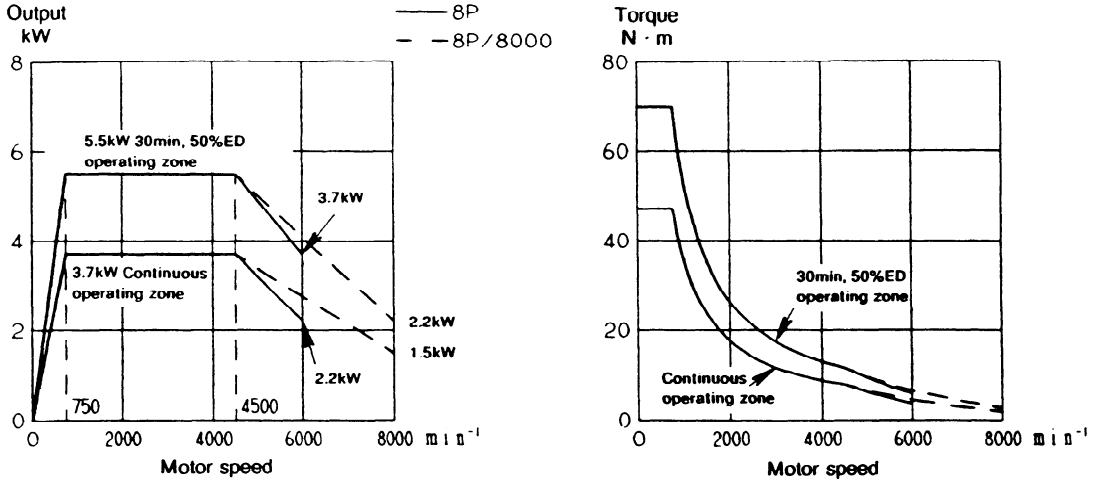
(*8) The AC spindle servo unit requires forced air-cooling.

(*9) For the specifications including the order drawing numbers, outline drawings, connection diagrams of the AC spindle servo unit, see Part Ⅶ.

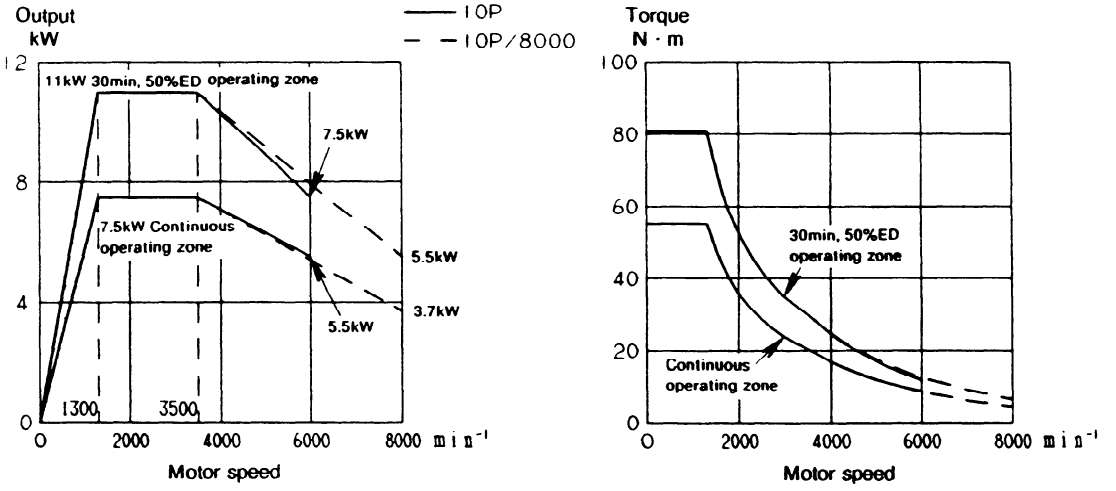
4. OUTPUT/TORQUE CHARACTERISTICS

4.1 Without Speed Range Swithing Type

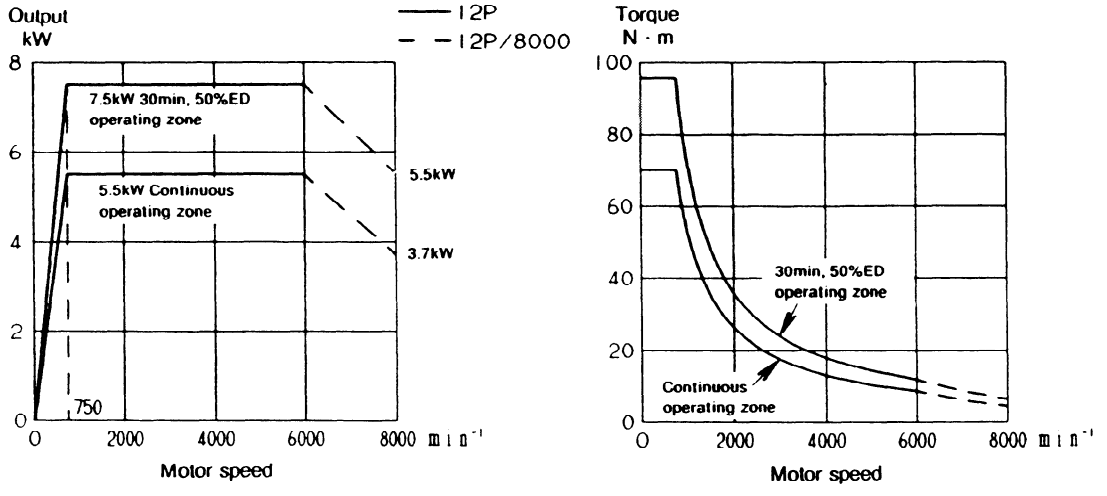
(1) Model 8P, 8P/8000



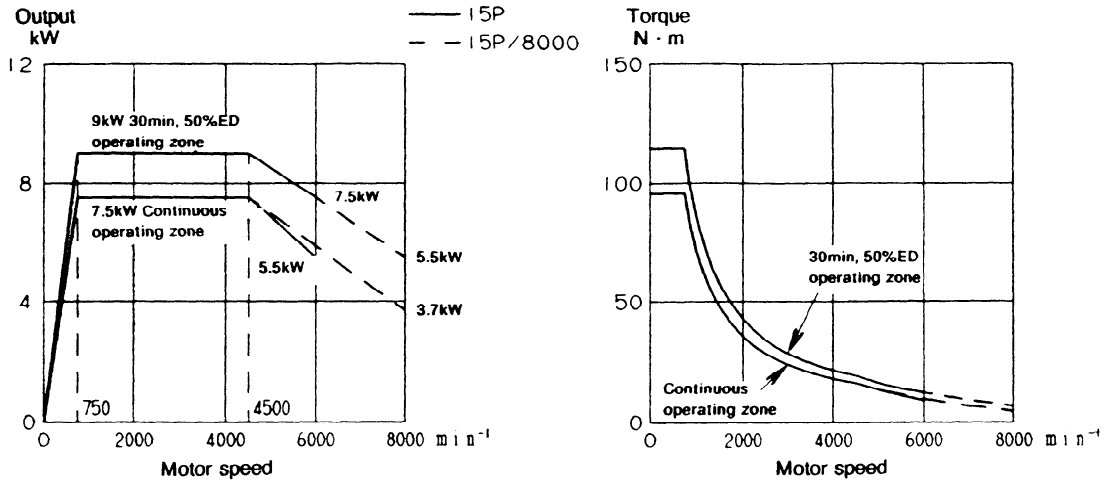
(2) Model 10P, 10P/8000



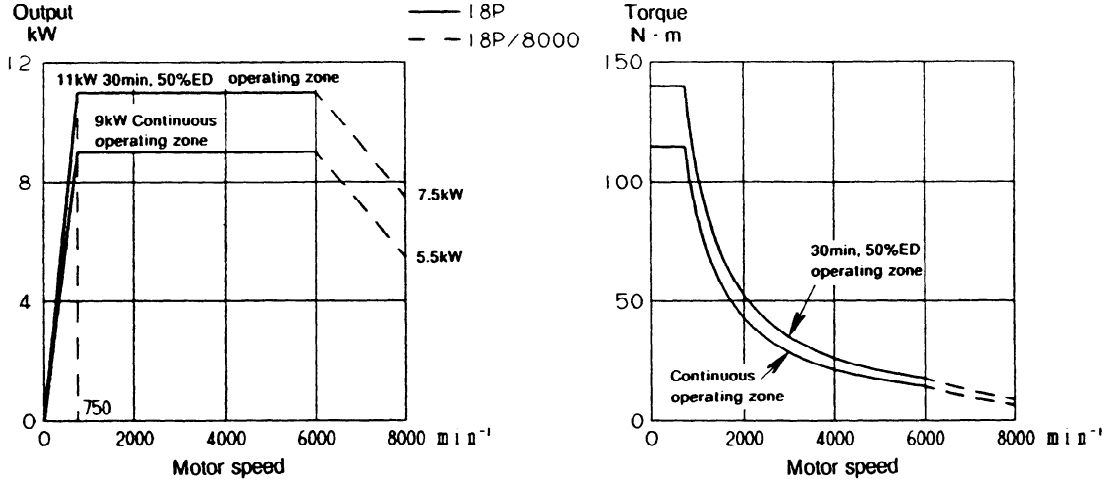
(3) Model 12P, 12P/8000



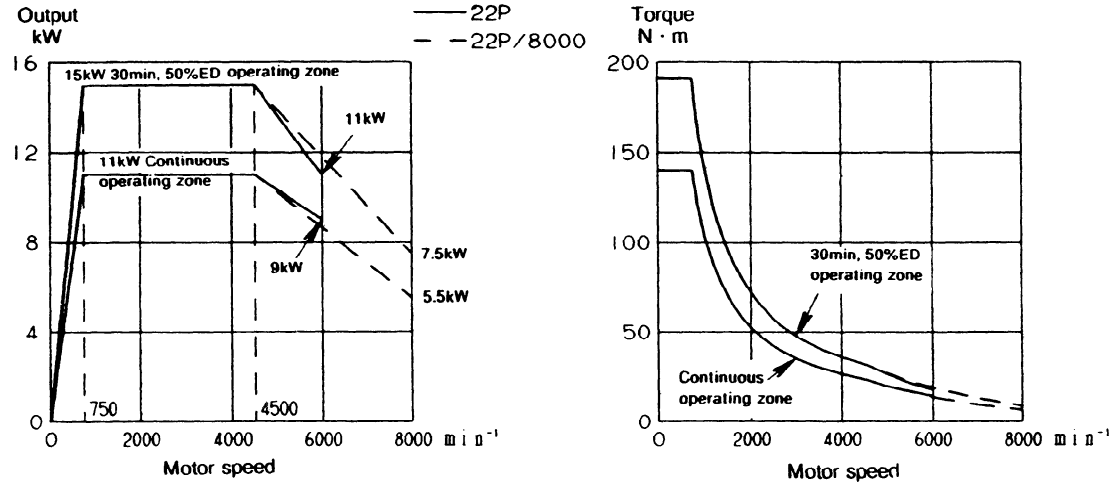
(4) Model 15P, 15P/8000



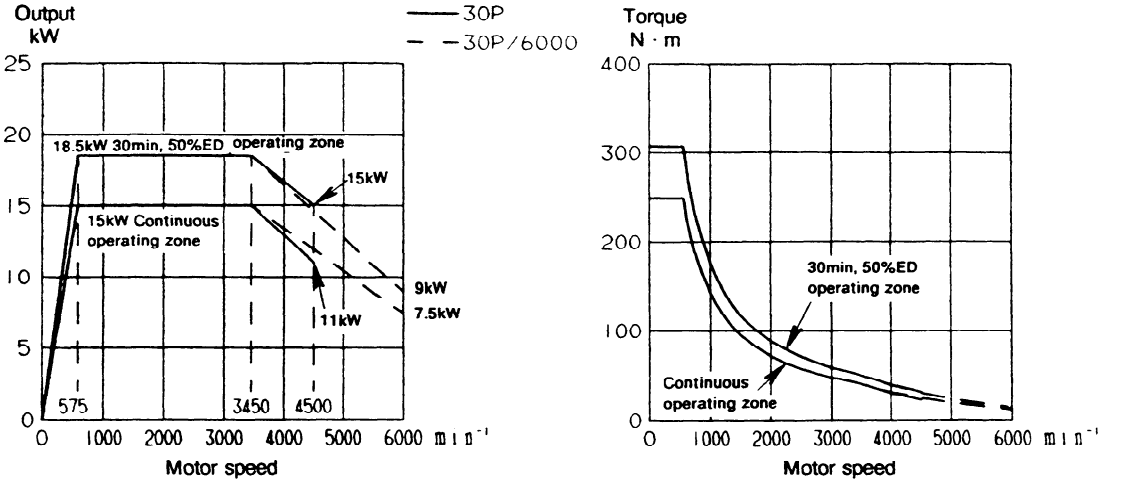
(5) Model 18P, 18P/8000



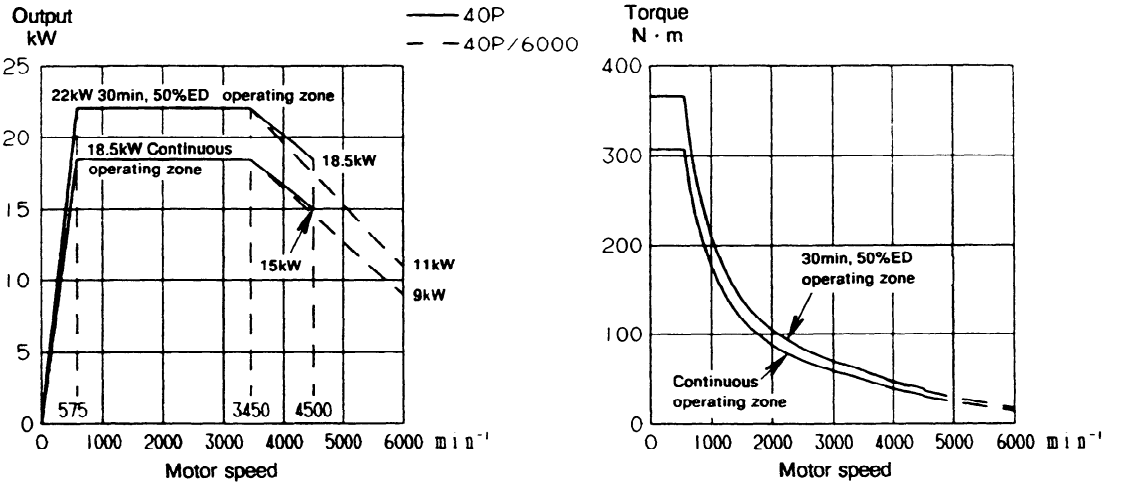
(6) Model 22P, 22P/8000



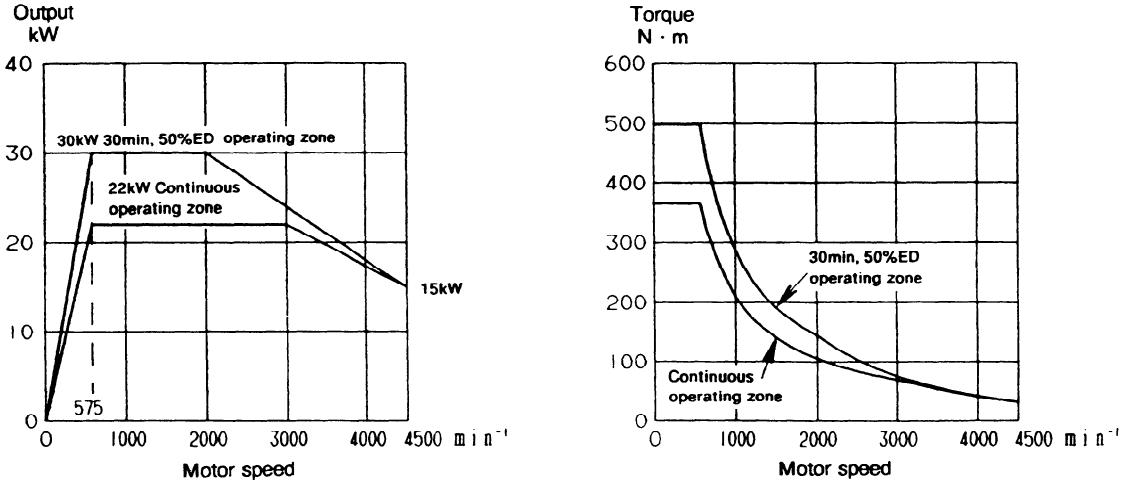
(7) Model 30P, 30P/6000



(8) Model 40P, 40P/6000

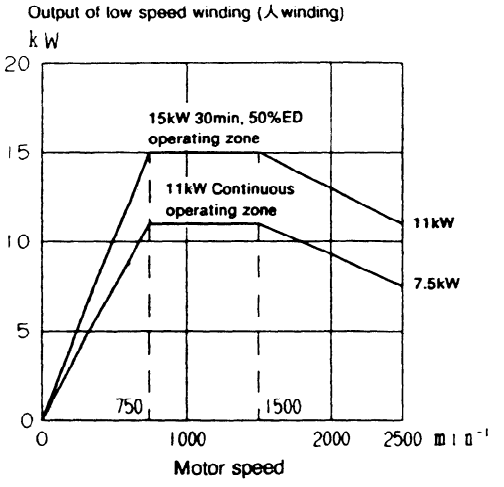


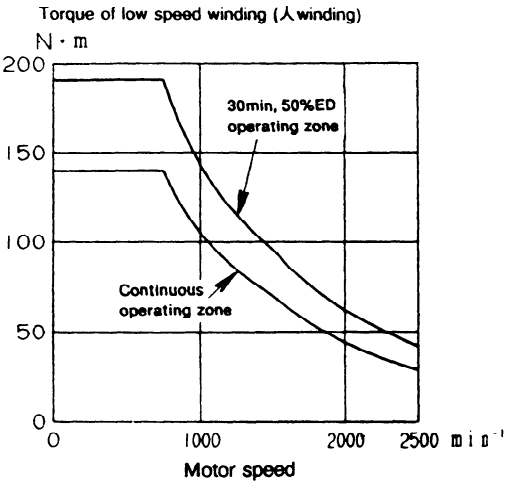
(9) Model 50P



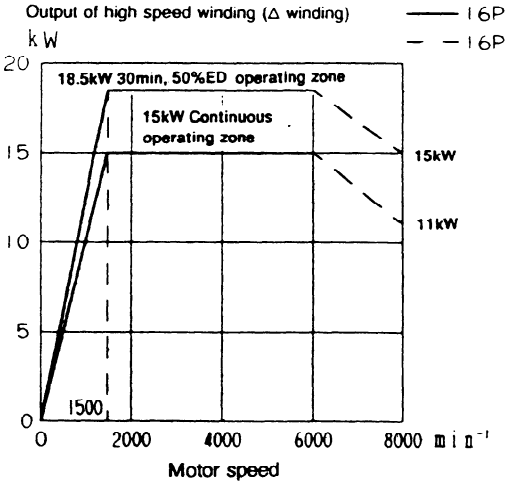
4.2 With Speed Range Swithing Type

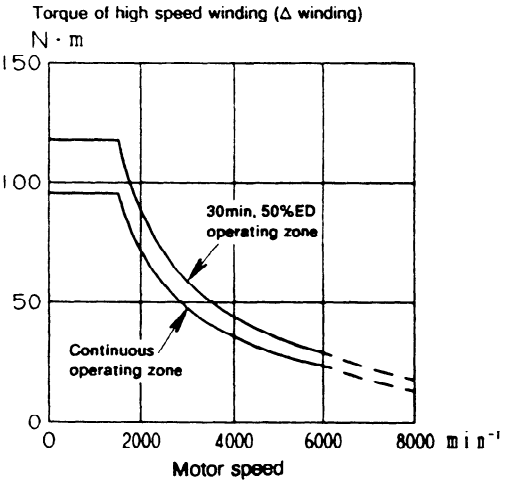
(1) Model 16P, 16P/8000





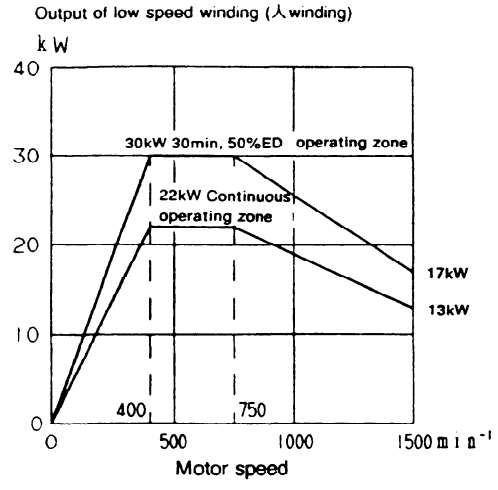
Switching speed: 1220min⁻¹

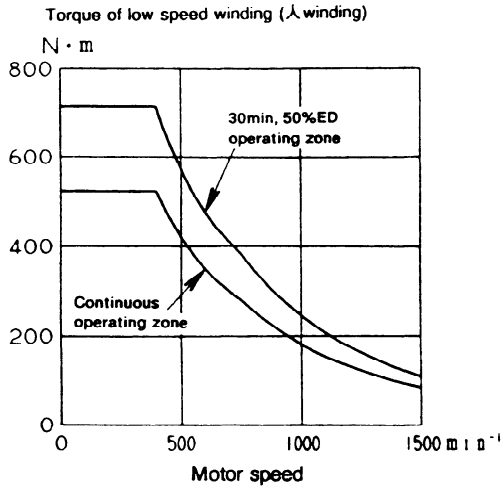




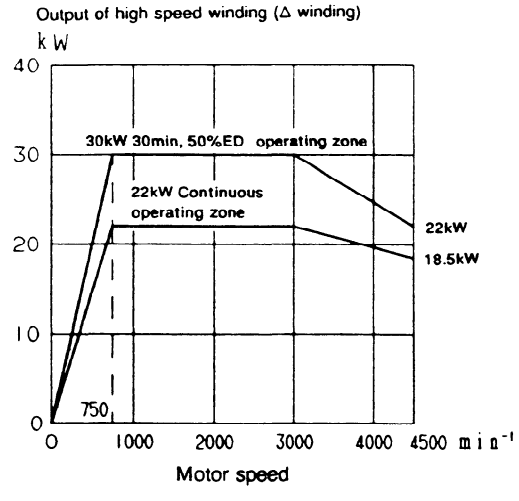
(Note) For a model, an optional speed range switching (人- Δ) is required.
For detail, refer to the speed range switching control.

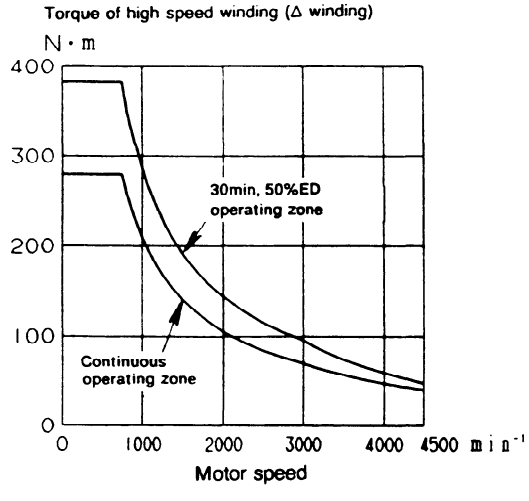
(2) Model 60P





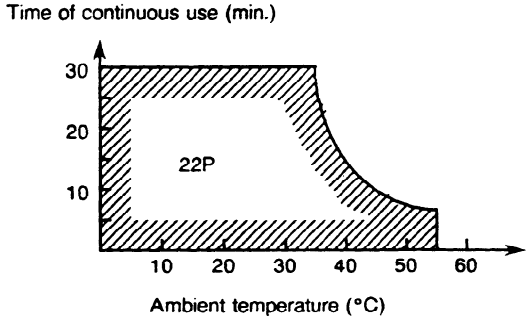
Switching speed: 750min⁻¹



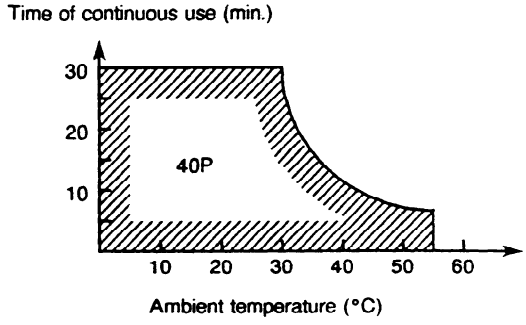


(Note) For a model, an optional speed range switching (人- Δ) is required.
For detail, refer to the speed range switching control.

(Note 1) When the ambient temperature of the spindle amplifier for Model 22P (Small type Model 15S) and for Model 40P (Model 22S) are high, the time of continuous use at the motor's 30-min. rated output is shown in the figure below in terms of spindle amplifier thermal limitation.



Spindle amplifier for Model 22P (small type Model 15S)



Spindle amplifier for Model 40P (Model 22S)

(Note 2) See Chapter 7 of Part III for cooling spindle amplifier model 22S used for motor models 40P.

5. ORDER DRAWING NUMBER

(1) P series/without speed range switching

(a) Standard-speed model

Name		Order drawing number	Remarks
Model 8P	Flange mounting	A06B-0725-B102	6000 min^{-1}, has key, exhaust rear
		A06B-0725-B103	6000 min^{-1}, has key, exhaust front
		A06B-0725-B302	6000 min^{-1}, no key, exhaust rear
		A06B-0725-B303	6000 min^{-1}, no key, exhaust front
	Foot mounting	A06B-0725-B202	6000 min^{-1}, has key, exhaust rear
		A06B-0725-B203	6000 min^{-1}, has key, exhaust front
		A06B-0725-B402	6000 min^{-1}, no key, exhaust rear
		A06B-0725-B403	6000 min^{-1}, no key, exhaust front
Model 10P	Flange mounting	A06B-0717-B102	6000 min^{-1}, has key, exhaust rear
		A06B-0717-B103	6000 min^{-1}, has key, exhaust front
		A06B-0717-B302	6000 min^{-1}, no key, exhaust rear
		A06B-0717-B303	6000 min^{-1}, no key, exhaust front
	Foot mounting	A06B-0717-B202	6000 min^{-1}, has key, exhaust rear
		A06B-0717-B203	6000 min^{-1}, has key, exhaust front
		A06B-0717-B402	6000 min^{-1}, no key, exhaust rear
		A06B-0717-B403	6000 min^{-1}, no key, exhaust front
Model 12P	Flange mounting	A06B-0726-B102	6000 min^{-1}, has key, exhaust rear
		A06B-0726-B103	6000 min^{-1}, has key, exhaust front
		A06B-0726-B302	6000 min^{-1}, no key, exhaust rear
		A06B-0726-B303	6000 min^{-1}, no key, exhaust front
	Foot mounting	A06B-0726-B202	6000 min^{-1}, has key, exhaust rear
		A06B-0726-B203	6000 min^{-1}, has key, exhaust front
		A06B-0726-B402	6000 min^{-1}, no key, exhaust rear
		A06B-0726-B403	6000 min^{-1}, no key, exhaust front
Model 15P	Flange mounting	A06B-0727-B102	6000 min^{-1}, has key, exhaust rear
		A06B-0727-B103	6000 min^{-1}, has key, exhaust front
		A06B-0727-B302	6000 min^{-1}, no key, exhaust rear
		A06B-0727-B303	6000 min^{-1}, no key, exhaust front
	Foot mounting	A06B-0727-B202	6000 min^{-1}, has key, exhaust rear
		A06B-0727-B203	6000 min^{-1}, has key, exhaust front
		A06B-0727-B402	6000 min^{-1}, no key, exhaust rear
		A06B-0727-B403	6000 min^{-1}, no key, exhaust front

(Note 1) The end of the order drawing number for the flange mounting model with a built-in sensor is B□9□. (Example: The built-in sensor type for B102 is B192.)

(Note 2) The last four characters of the codes of models with built-in high-resolution magnetic pulse coders are BX3X. For example, a model with a built-in high-resolution magnetic pulse coder which corresponds to a model having a code number of XXXX-XXXX-B102 has a code number of XXXX-XXXX-B132.

(Continued from the previous page)

Name		Order drawing number	Remarks
Model 18P	Flange mounting	A06B-0728-B102	6000 min^{-1}, has key, exhaust rear
		A06B-0728-B103	6000 min^{-1}, has key, exhaust front
		A06B-0728-B302	6000 min^{-1}, no key, exhaust rear
		A06B-0728-B303	6000 min^{-1}, no key, exhaust front
	Foot mounting	A06B-0728-B202	6000 min^{-1}, has key, exhaust rear
		A06B-0728-B203	6000 min^{-1}, has key, exhaust front
		A06B-0728-B402	6000 min^{-1}, no key, exhaust rear
		A06B-0728-B403	6000 min^{-1}, no key, exhaust front
Model 22P	Flange mounting	A06B-0729-B102	6000 min^{-1}, has key, exhaust rear
		A06B-0729-B103	6000 min^{-1}, has key, exhaust front
		A06B-0729-B302	6000 min^{-1}, no key, exhaust rear
		A06B-0729-B303	6000 min^{-1}, no key, exhaust front
	Foot mounting	A06B-0729-B202	6000 min^{-1}, has key, exhaust rear
		A06B-0729-B203	6000 min^{-1}, has key, exhaust front
		A06B-0729-B402	6000 min^{-1}, no key, exhaust rear
		A06B-0729-B403	6000 min^{-1}, no key, exhaust front
Model 30P	Flange mounting	A06B-0730-B100	4500 min^{-1}, has key, exhaust rear
		A06B-0730-B101	4500 min^{-1}, has key, exhaust front
		A06B-0730-B300	4500 min^{-1}, no key, exhaust rear
		A06B-0730-B301	4500 min^{-1}, no key, exhaust front
	Foot mounting	A06B-0730-B200	4500 min^{-1}, has key, exhaust rear
		A06B-0730-B201	4500 min^{-1}, has key, exhaust front
		A06B-0730-B400	4500 min^{-1}, no key, exhaust rear
		A06B-0730-B401	4500 min^{-1}, no key, exhaust front
Model 40P	Flange mounting	A06B-0731-B100	4500 min^{-1}, has key, exhaust rear
		A06B-0731-B101	4500 min^{-1}, has key, exhaust front
		A06B-0731-B300	4500 min^{-1}, no key, exhaust rear
		A06B-0731-B301	4500 min^{-1}, no key, exhaust front
	Foot mounting	A06B-0731-B200	4500 min^{-1}, has key, exhaust rear
		A06B-0731-B201	4500 min^{-1}, has key, exhaust front
		A06B-0731-B400	4500 min^{-1}, no key, exhaust rear
		A06B-0731-B401	4500 min^{-1}, no key, exhaust front
Model 50P	Flange mounting	A06B-0732-B100	4500 min^{-1}, has key, exhaust rear
		A06B-0732-B101	4500 min^{-1}, has key, exhaust front
		A06B-0732-B300	4500 min^{-1}, no key, exhaust rear
		A06B-0732-B301	4500 min^{-1}, no key, exhaust front
	Foot mounting	A06B-0732-B200	4500 min^{-1}, has key, exhaust rear
		A06B-0732-B201	4500 min^{-1}, has key, exhaust front
		A06B-0732-B400	4500 min^{-1}, no key, exhaust rear
		A06B-0732-B401	4500 min^{-1}, no key, exhaust front

(b) High-speed models

Name		Order drawing number	Remarks
Model 8P/8000	Flange type	A06B-0725-B104	8000 min^{-1}, has key, exhaust in rear
		A06B-0725-B105	8000 min^{-1}, has key, exhaust in front
		A06B-0725-B304	8000 min^{-1}, no key, exhaust in rear
		A06B-0725-B305	8000 min^{-1}, no key, exhaust in front
	Foot mounting	A06B-0725-B204	8000 min^{-1}, has key, exhaust in rear
		A06B-0725-B205	8000 min^{-1}, has key, exhaust in front
		A06B-0725-B404	8000 min^{-1}, no key, exhaust in rear
		A06B-0725-B405	8000 min^{-1}, no key, exhaust in front
Model 10P/8000	Flange mounting	A06B-0717-B104	8000 min^{-1}, has key, exhaust in rear
		A06B-0717-B105	8000 min^{-1}, has key, exhaust in front
		A06B-0717-B304	8000 min^{-1}, no key, exhaust in rear
		A06B-0717-B305	8000 min^{-1}, no key, exhaust in front
	Foot mounting	A06B-0717-B204	8000 min^{-1}, has key, exhaust in rear
		A06B-0717-B205	8000 min^{-1}, has key, exhaust in front
		A06B-0717-B404	8000 min^{-1}, no key, exhaust in rear
		A06B-0717-B405	8000 min^{-1}, no key, exhaust in front
Model 12P/8000	Flange type	A06B-0726-B104	8000 min^{-1}, has key, exhaust in rear
		A06B-0726-B105	8000 min^{-1}, has key, exhaust in front
		A06B-0726-B304	8000 min^{-1}, no key, exhaust in rear
		A06B-0726-B305	8000 min^{-1}, no key, exhaust in front
	Foot mounting	A06B-0726-B204	8000 min^{-1}, has key, exhaust in rear
		A06B-0726-B205	8000 min^{-1}, has key, exhaust in front
		A06B-0726-B404	8000 min^{-1}, no key, exhaust in rear
		A06B-0726-B405	8000 min^{-1}, no key, exhaust in front
Model 15P/8000	Flange type	A06B-0727-B104	8000 min^{-1}, has key, exhaust in rear
		A06B-0727-B105	8000 min^{-1}, has key, exhaust in front
		A06B-0727-B304	8000 min^{-1}, no key, exhaust in rear
		A06B-0727-B305	8000 min^{-1}, no key, exhaust in front
	Foot mounting	A06B-0727-B204	8000 min^{-1}, has key, exhaust in rear
		A06B-0727-B205	8000 min^{-1}, has key, exhaust in front
		A06B-0727-B404	8000 min^{-1}, no key, exhaust in rear
		A06B-0727-B405	8000 min^{-1}, no key, exhaust in front

(Note 1) The order drawing number of a flange mounting model with a built-in sensor ends with B□9□. (Example: When a built-in sensor is incorporated into the model (A06B-0717-B104), its ordering drawing number is A06B-0717-B194.)

(Note 2) The seal for the output shaft of a high-speed model (with 8000 min^{-1} specified) is a simplified labyrinth seal. Be careful not to expose the flange surface to lubricant.

(Note 3) For the high-speed models, the no-key type is recommended.

(Continued from the previous page)

Name		Order drawing number	Remarks
Model 18P/8000	Flange mounting	A06B-0728-B104	8000 min^{-1}, has key, exhaust rear
		A06B-0728-B105	8000 min^{-1}, has key, exhaust front
		A06B-0728-B304	8000 min^{-1}, no key, exhaust rear
		A06B-0728-B305	8000 min^{-1}, no key, exhaust front
	Foot mounting	A06B-0728-B204	8000 min^{-1}, has key, exhaust rear
		A06B-0728-B204	8000 min^{-1}, has key, exhaust front
		A06B-0728-B405	8000 min^{-1}, no key, exhaust rear
		A06B-0728-B405	8000 min^{-1}, no key, exhaust front
Model 22P/8000	Flange mounting	A06B-0729-B104	8000 min^{-1}, has key, exhaust rear
		A06B-0729-B105	8000 min^{-1}, has key, exhaust front
		A06B-0729-B304	8000 min^{-1}, no key, exhaust rear
		A06B-0729-B305	8000 min^{-1}, no key, exhaust front
	Foot mounting	A06B-0729-B204	8000 min^{-1}, has key, exhaust rear
		A06B-0729-B205	8000 min^{-1}, has key, exhaust front
		A06B-0729-B404	8000 min^{-1}, no key, exhaust rear
		A06B-0729-B405	8000 min^{-1}, no key, exhaust front
Model 30P/6000	Flange mounting	A06B-0730-B104	6000 min^{-1}, has key, exhaust rear
		A06B-0730-B105	6000 min^{-1}, has key, exhaust front
		A06B-0730-B304	6000 min^{-1}, no key, exhaust rear
		A06B-0730-B305	6000 min^{-1}, no key, exhaust front
	Foot mounting	A06B-0730-B204	6000 min^{-1}, has key, exhaust rear
		A06B-0730-B205	6000 min^{-1}, has key, exhaust front
		A06B-0730-B404	6000 min^{-1}, no key, exhaust rear
		A06B-0730-B405	6000 min^{-1}, no key, exhaust front
Model 40P/6000	Flange mounting	A06B-0731-B104	6000 min^{-1}, has key, exhaust rear
		A06B-0731-B105	6000 min^{-1}, has key, exhaust front
		A06B-0731-B304	6000 min^{-1}, no key, exhaust rear
		A06B-0731-B305	6000 min^{-1}, key, exhaust front
	Foot mounting	A06B-0731-B204	6000 min^{-1}, has key, exhaust rear
		A06B-0731-B205	6000 min^{-1}, has key, exhaust front
		A06B-0731-B404	6000 min^{-1}, no key, exhaust rear
		A06B-0731-B405	6000 min^{-1}, no key, exhaust front

(2) P series/with speed range switching

(a) Standard-speed model

Name		Order drawing number	Remarks
Model 16P	Flange mounting	A06B-0714-B106	6000 min^{-1}, has key, exhaust in rear
		A06B-0714-B107	6000 min^{-1}, has key, exhaust in front
		A06B-0714-B306	6000 min^{-1}, no key, exhaust in rear
		A06B-0714-B307	6000 min^{-1}, no key, exhaust in front
	Foot mounting	A06B-0714-B206	6000 min^{-1}, has key, exhaust in rear
		A06B-0714-B207	6000 min^{-1}, has key, exhaust in front
		A06B-0714-B406	6000 min^{-1}, no key, exhaust in rear
		A06B-0714-B407	6000 min^{-1}, no key, exhaust in front
Model 60P	Flange mounting	A06B-0733-B106	4500 min^{-1}, has key, exhaust in rear
		A06B-0733-B107	4500 min^{-1}, has key, exhaust in front
		A06B-0733-B306	4500 min^{-1}, no key, exhaust in rear
		A06B-0733-B307	4500 min^{-1}, no key, exhaust in front
	Foot mounting	A06B-0733-B206	4500 min^{-1}, has key, exhaust in rear
		A06B-0733-B207	4500 min^{-1}, has key, exhaust in front
		A06B-0733-B406	4500 min^{-1}, no key, exhaust in rear
		A06B-0733-B407	4500 min^{-1}, no key, exhaust in front

(Note 1) The order drawing number of a flange mounting model with a built-in sensor ends with B□9□. (Example: When a built-in sensor is incorporated into the model (A06B-0733-B106), its ordering drawing number is A06B-0733-B196.)

(Note 2) The order drawing number of a model with a built-in high-resolution magnetic pulse coder ends with B□3□. (Example: When a built-in high-resolution magnetic pulse coder is in corporated into the model (A06B-0733-B106), its ordering drawing number is A06B-0733-B136.)

(b) High-speed model

Name		Order drawing number	Remarks
Model 16P/8000	Flange mounting	A06B-0714-B108	8000 min^{-1}, has key, exhaust in rear
		A06B-0714-B109	8000 min^{-1}, has key, exhaust in front
		A06B-0714-B308	8000 min^{-1}, no key, exhaust in rear
		A06B-0714-B309	8000 min^{-1}, no key, exhaust in front
	Foot mounting	A06B-0714-B208	8000 min^{-1}, has key, exhaust in rear
		A06B-0714-B209	8000 min^{-1}, has key, exhaust in front
		A06B-0714-B408	8000 min^{-1}, no key, exhaust in rear
		A06B-0714-B409	8000 min^{-1}, no key, exhaust in front

(Note 1) The order drawing number of a flange mounting model with a built-in sensor ends with B□9□. (Example: When a built-in sensor is incorporated into the model (A06B-0714-B108), its ordering drawing number is A06B-0714-B198.)

(Note 2) The seal for the output shaft of a high-speed model (with 8000 min^{-1} specified) is a simplified labyrinth seal. Be careful not to expose the flange surface to lubricant.

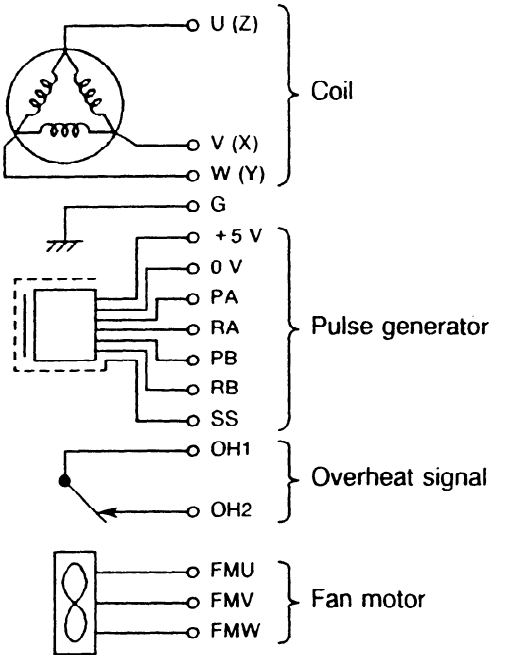
(Note 3) For the high-speed models, the no-key type is recommended.

Model	Drawing number for assembling a terminal box	Drawing number for assembling a fan	Remarks
8P, 10P	A290-0754-T400	A290-0754-T500	Exhaust rear
		A290-0754-T501	Exhaust front
12P, 15P 18P, 22P		A290-0756-T500	Exhaust rear
		A290-0756-T501	Exhaust front
16P	A290-0731-T471	A290-0756-T500	Exhaust rear
		A290-0756-T501	Exhaust front
30P, 40P	A290-0731-T451	A290-0731-T500	Exhaust rear
		A290-0731-T511	Exhaust front
50P		A290-1040-T500	Exhaust rear
		A290-1040-T501	Exhaust front
60P	A290-0733-T420	A290-1040-T500	Exhaust rear
		A290-1040-T501	Exhaust front

(Note) This applies also to the high-speed models.

6. CONNECTIONS

Models 8P - 60P



Connector connections

③ Blue PB	② Black PA	① Red +5 V
⑥ White RB	⑤ Green RA	④ Yellow 0 V
⑦ OH2	⑧ SS	⑨ OH1

Connector specifications

AMP unipulser model/maten-lock connector

	Motor side	Cable side
Housing	350782-1	350720-1
Contact	350706-7	350689-6

The pulse generator and overheat signals are connected to the AMP connector. The others are connected to the terminal block.

Terminal block screw dimensions

Terminal name / Model	G, U, V, W (X, Y, Z)	FMU - FMW
8P - 22P	M5	M4
30P - 50P	M8	M4
60P	M10	M3.5

7. ALLOWABLE RADIAL LOAD

Use the motor output shaft below the allowable radial loads shown in the table below.

Model	Allowable radial loads
8P	300 kg
12P, 15P, 16P	300 kg
18P, 22P	450 kg
30P, 40P	550 kg
50P	1100 kg
60P	2000 kg (Note)
8P/8000 10P/8000	200 kg
12P/8000 15P/8000 16P/8000	250 kg
18P/8000 22P/8000	300 kg
30P/6000 40P/6000	550 kg

(Note 1) The allowable radial load for 60P is calculated assuming that the load is supported at the center of the output shaft. The allowable radial loads for the other models assume that the load is supported at the output shaft end.

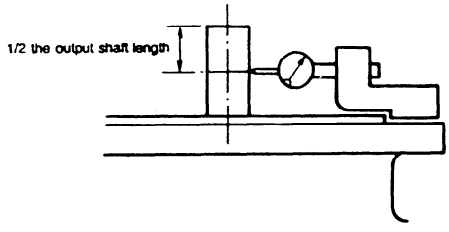
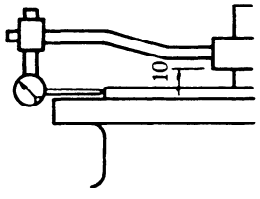
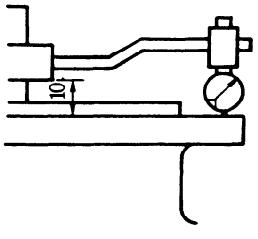
(Note 2) When using a belt, adjust the tension so allowable loads indicated above are not exceeded. If an excessive load is applied, consider the use of a support bearing on the machine side to maintain the long-term reliability of the motor.

(Note 3) When the belt tension is maximized at a point outside the output shaft end, the allowable loads are less than those at the output shaft end.

(Note 4) If a thrust load is applied when a helical gear is used, the shaft moves in the direction of the thrust. So, as a general rule, never apply a thrust load.

8. ASSEMBLING ACCURACY (T.I.R: Total Indicator Reading)

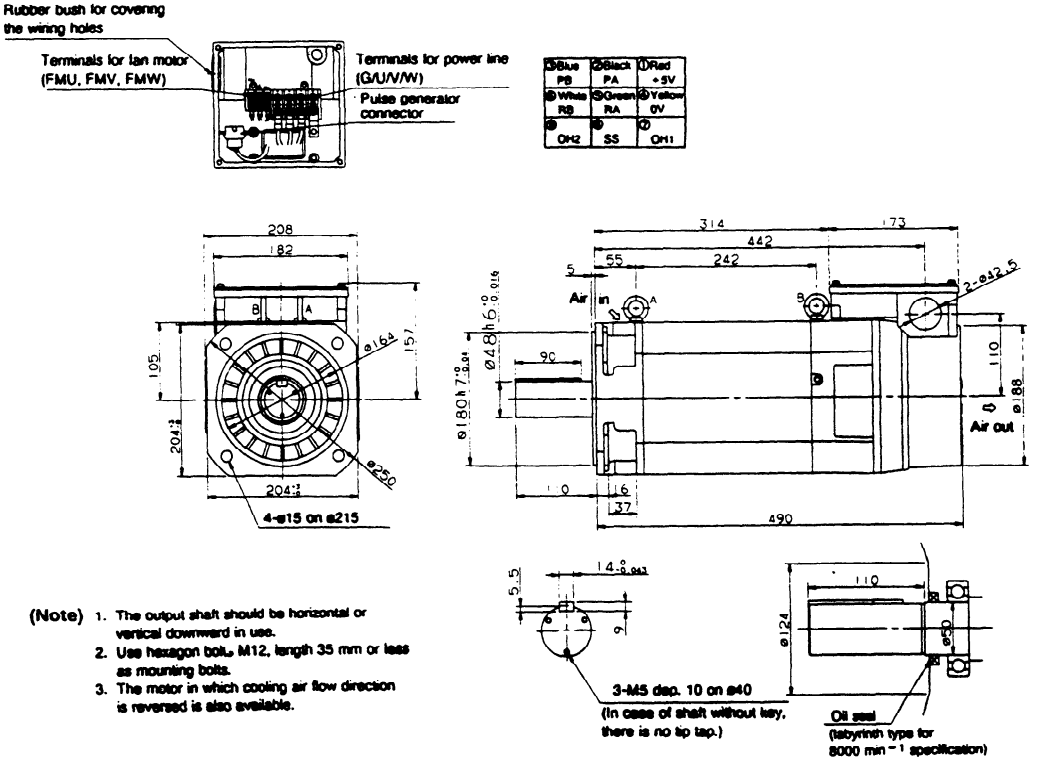
Conforming to JEM1401

Item \ Model	22P or lower	30P or more	Measuring method
Vibration at the end of the output shaft	20μm or less		
Vibration of the faucet joint for mounting the flange against the core of the shaft	40μm or less	60μm or less	
Vibration of the flange mounting surface against the core of the shaft	80μm or less	100μm or less	

9. EXTERNAL DIMENSIONS

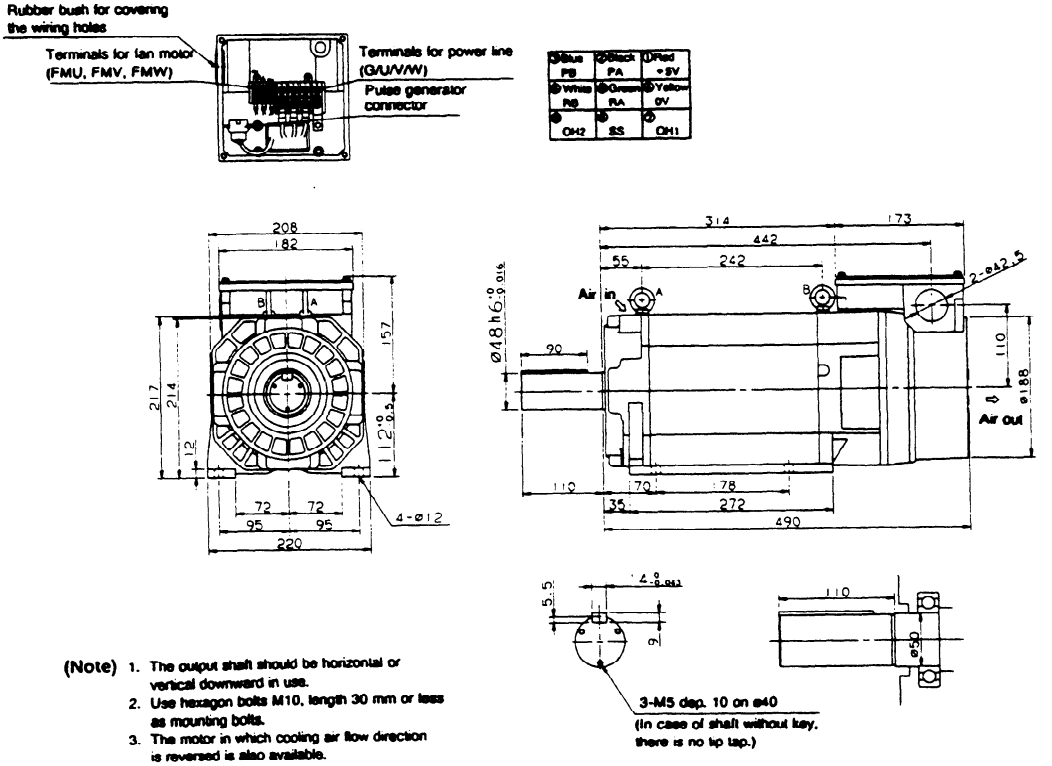
9.1 AC Spindle Motor Model 8P, 8P/8000

(a) Flange mounting type



(Note) 1. The output shaft should be horizontal or vertical downward in use.
2. Use hexagon bolts M12, length 35 mm or less as mounting bolts.
3. The motor in which cooling air flow direction is reversed is also available.

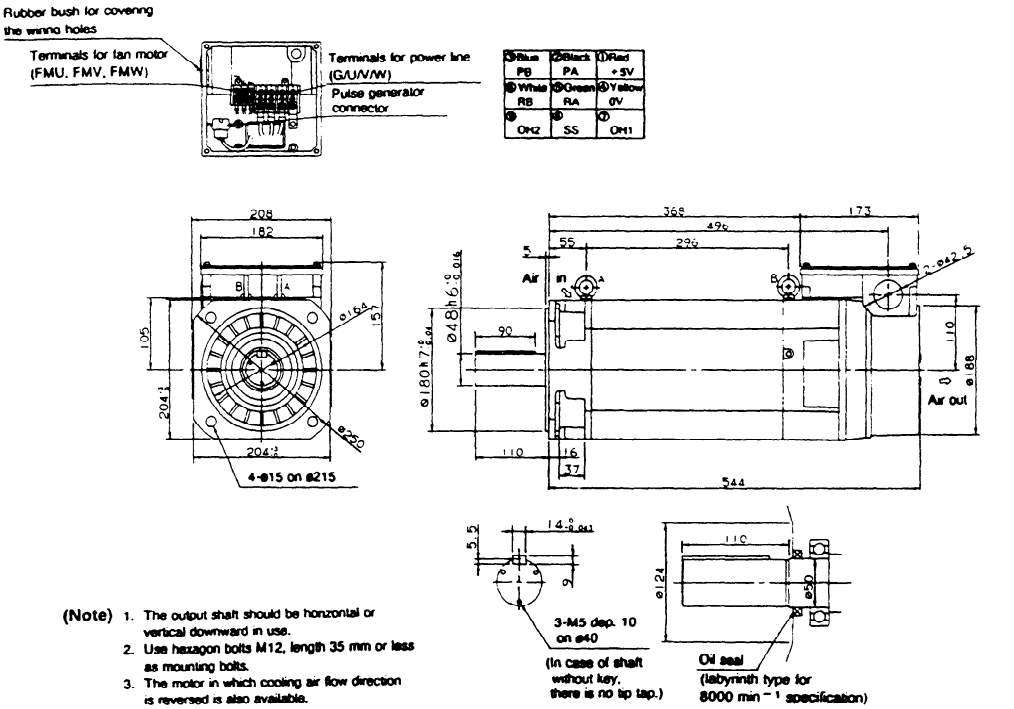
(b) Foot mounting type



(Note) 1. The output shaft should be horizontal or vertical downward in use.
2. Use hexagon bolts M10, length 30 mm or less as mounting bolts.
3. The motor in which cooling air flow direction is reversed is also available.

9.2 AC Spindle Motor Model 10P, 10P/8000

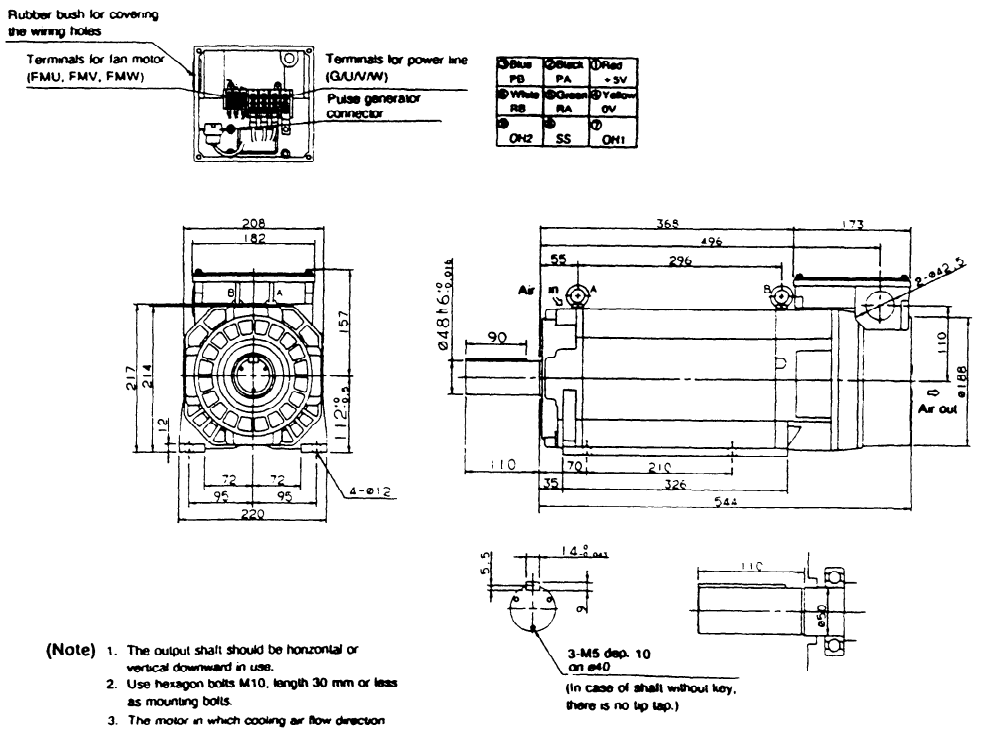
(a) Flange mounting type



③Blue	②Black	①Red
PB	PA	+5V
⑥White	⑤Green	④Yellow
RB	RA	0V
⑨	⑧	⑦
OH2	SS	OH1

(Note) 1. The output shaft should be horizontal or vertical downward in use.
2. Use hexagon bolts M12, length 35 mm or less as mounting bolts.
3. The motor in which cooling air flow direction is reversed is also available.

(b) Foot mounting type

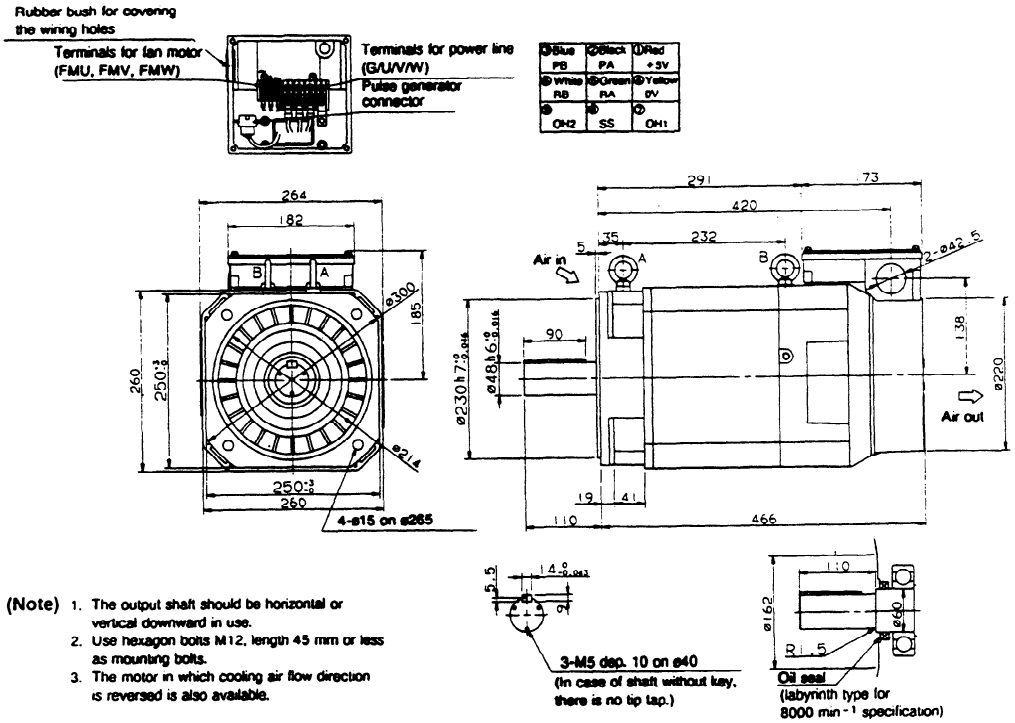


③Blue	②Black	①Red
PB	PA	+5V
⑥White	⑤Green	④Yellow
RB	RA	0V
⑨	⑧	⑦
OH2	SS	OH1

(Note) 1. The output shaft should be horizontal or vertical downward in use.
2. Use hexagon bolts M10, length 30 mm or less as mounting bolts.
3. The motor in which cooling air flow direction is reversed is also available.

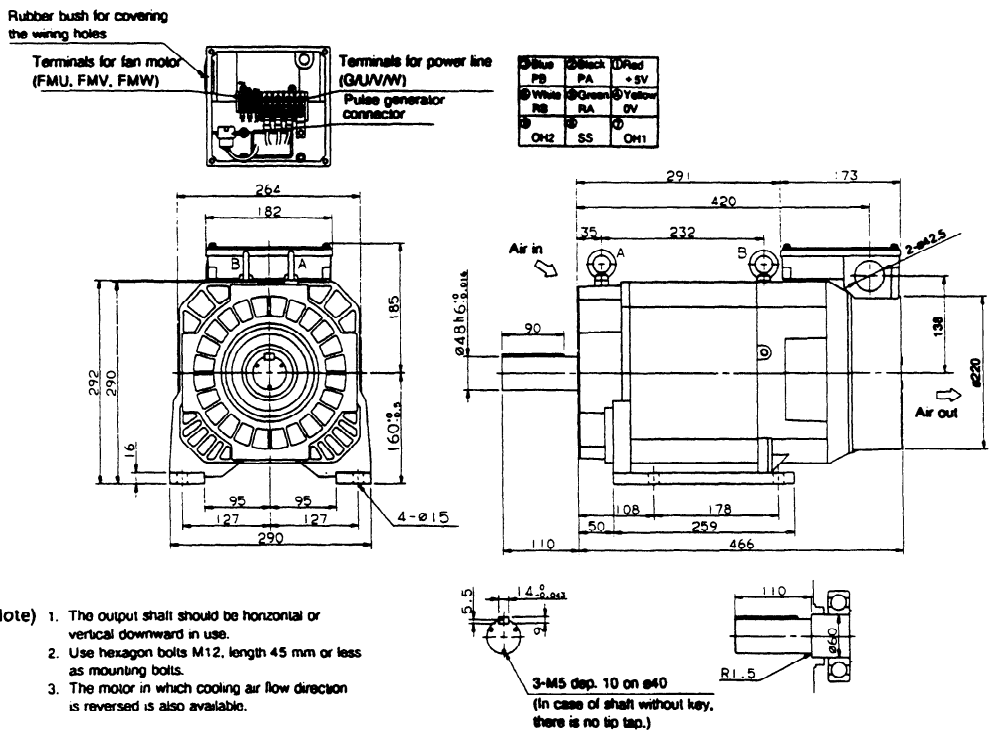
9.3 AC Spindle Motor Models 12P, 15P, 12P/8000, 15P/8000

(a) Flange mounting type



(Note) 1. The output shaft should be horizontal or vertical downward in use.
2. Use hexagon bolts M12, length 45 mm or less as mounting bolts.
3. The motor in which cooling air flow direction is reversed is also available.

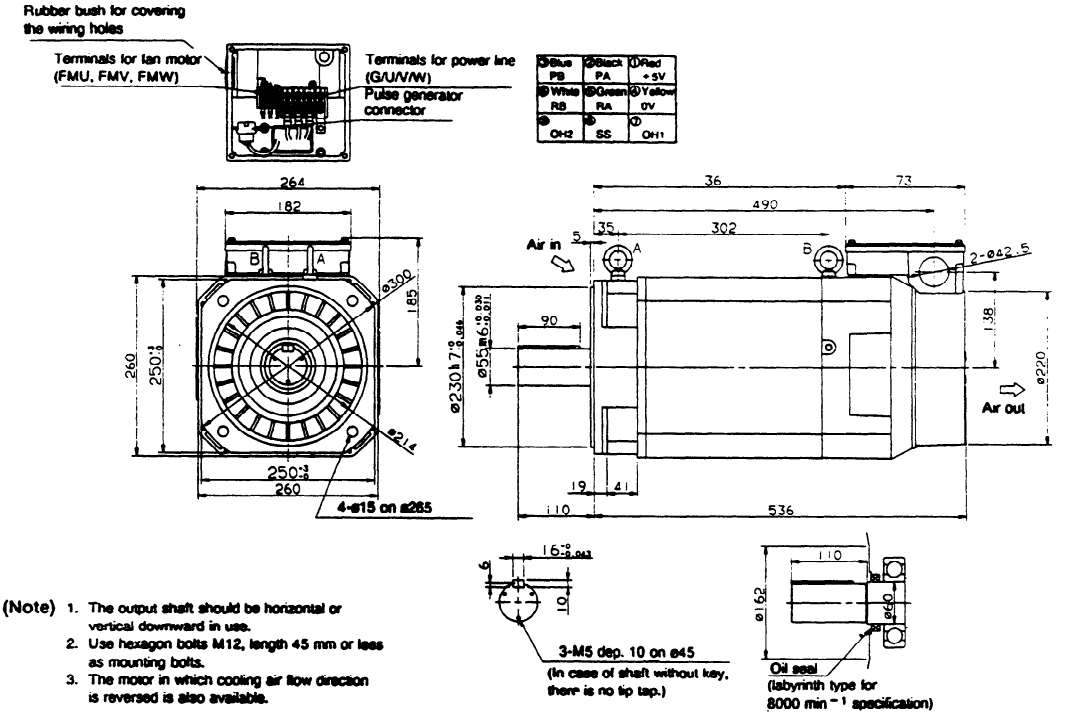
(b) Foot mounting type



(Note) 1. The output shaft should be horizontal or vertical downward in use.
2. Use hexagon bolts M12, length 45 mm or less as mounting bolts.
3. The motor in which cooling air flow direction is reversed is also available.

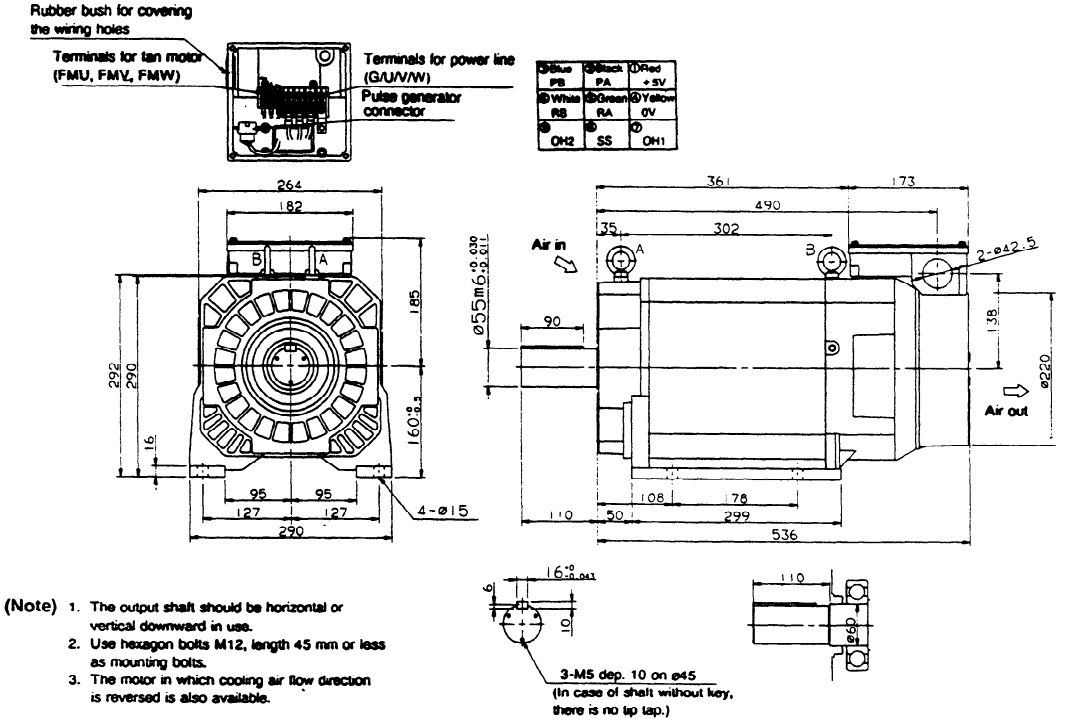
9.4 AC Spindle Motor Models 18P, 22P, 22P/8000

(a) Flange mounting type



(Note) 1. The output shaft should be horizontal or vertical downward in use.
2. Use hexagon bolts M12, length 45 mm or less as mounting bolts.
3. The motor in which cooling air flow direction is reversed is also available.

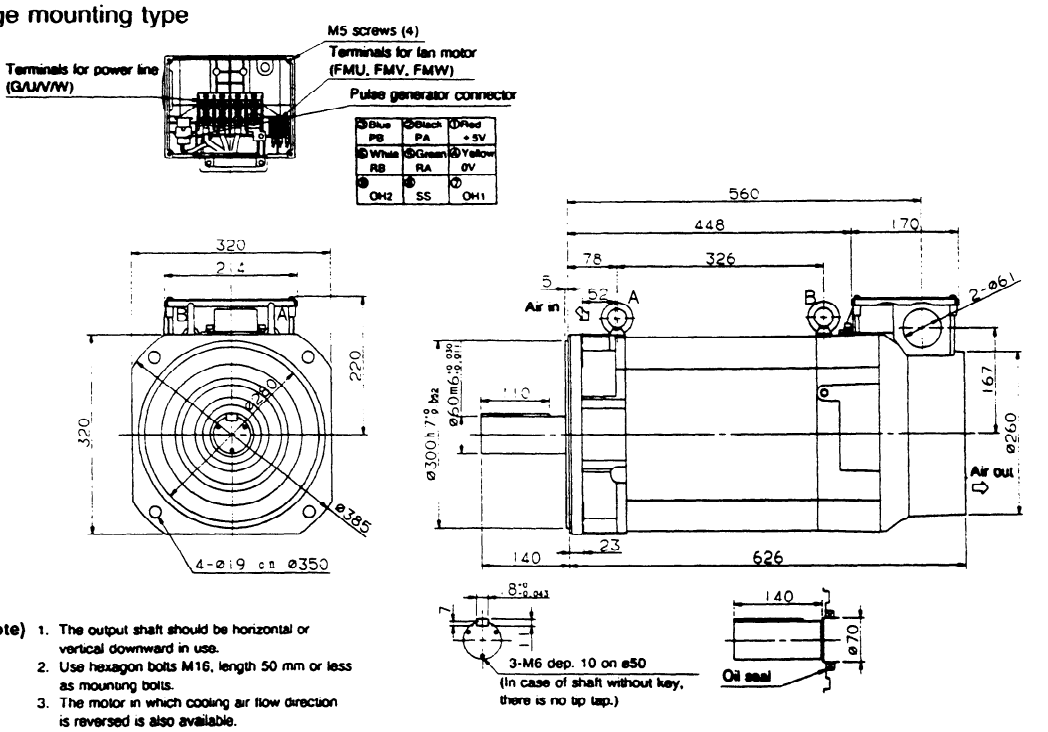
(b) Foot mounting type



(Note) 1. The output shaft should be horizontal or vertical downward in use.
2. Use hexagon bolts M12, length 45 mm or less as mounting bolts.
3. The motor in which cooling air flow direction is reversed is also available.

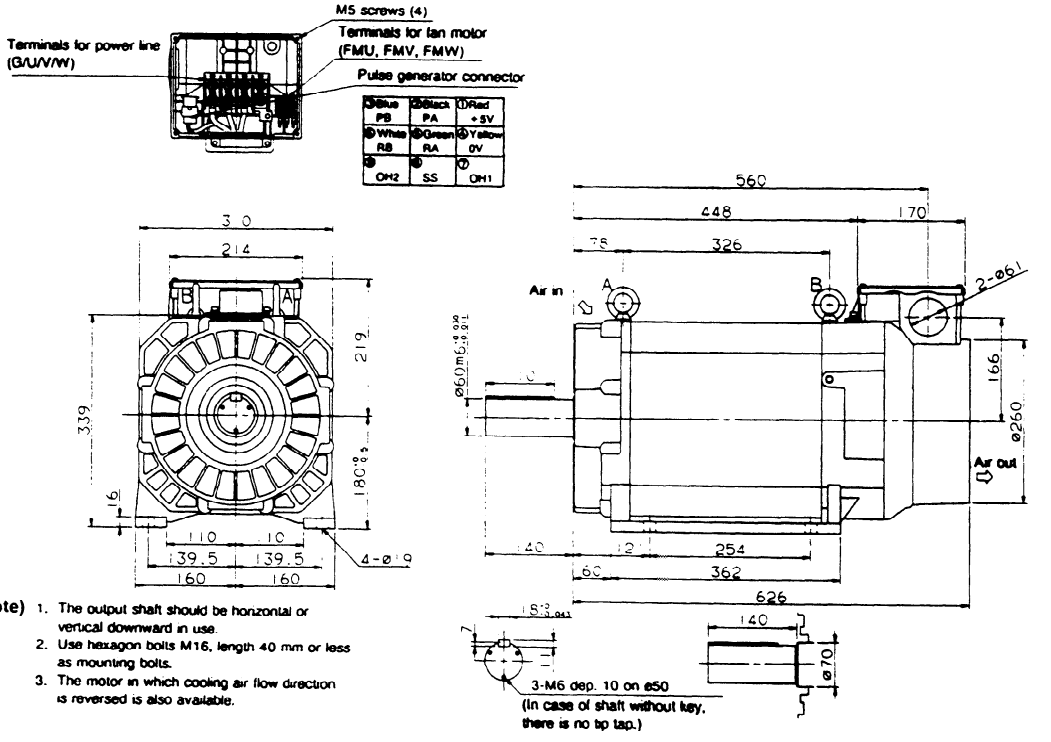
9.5 AC Spindle Motor Models 30P, 40P, 30P/6000, 40P/6000

(a) Flange mounting type



(Note) 1. The output shaft should be horizontal or vertical downward in use.
2. Use hexagon bolts M16, length 50 mm or less as mounting bolts.
3. The motor in which cooling air flow direction is reversed is also available.

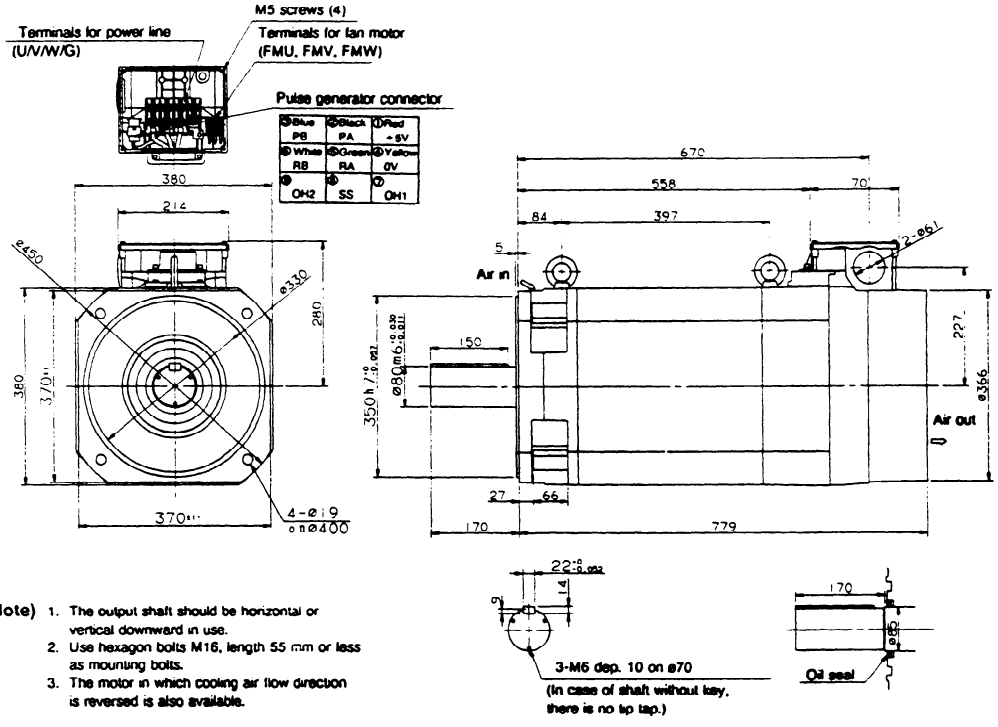
(b) Foot mounting type



(Note) 1. The output shaft should be horizontal or vertical downward in use.
2. Use hexagon bolts M16, length 40 mm or less as mounting bolts.
3. The motor in which cooling air flow direction is reversed is also available.

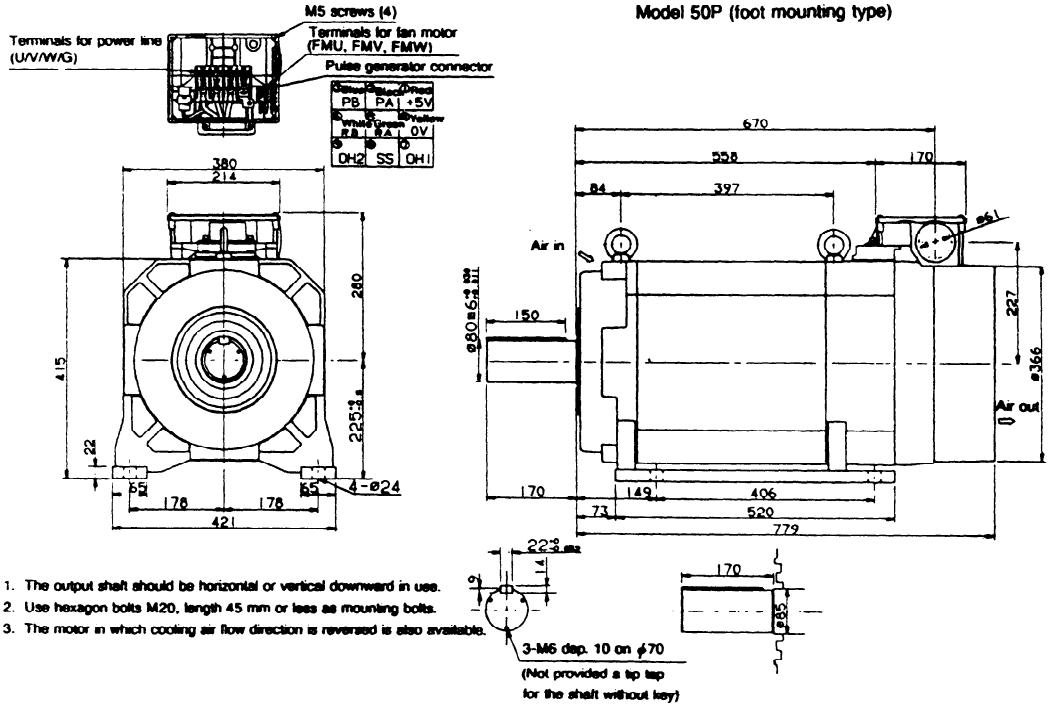
9.6 AC Spindle Motor Model 50P

(a) Flange mounting type



(Note) 1. The output shaft should be horizontal or vertical downward in use.
2. Use hexagon bolts M16, length 55 mm or less as mounting bolts.
3. The motor in which cooling air flow direction is reversed is also available.

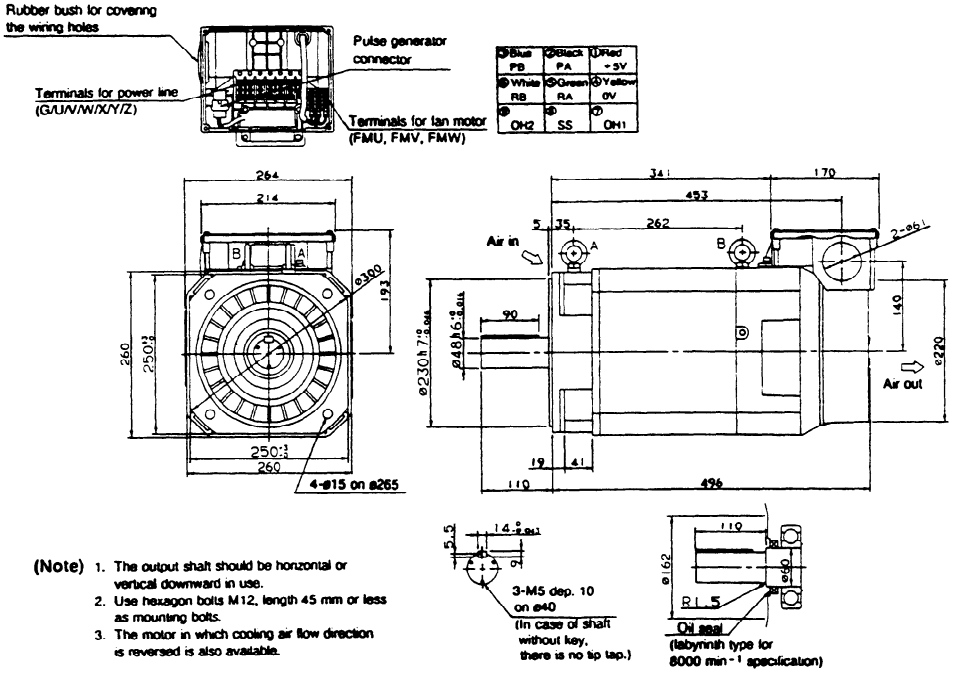
(b) Foot mounting type



(Note) 1. The output shaft should be horizontal or vertical downward in use.
2. Use hexagon bolts M20, length 45 mm or less as mounting bolts.
3. The motor in which cooling air flow direction is reversed is also available.

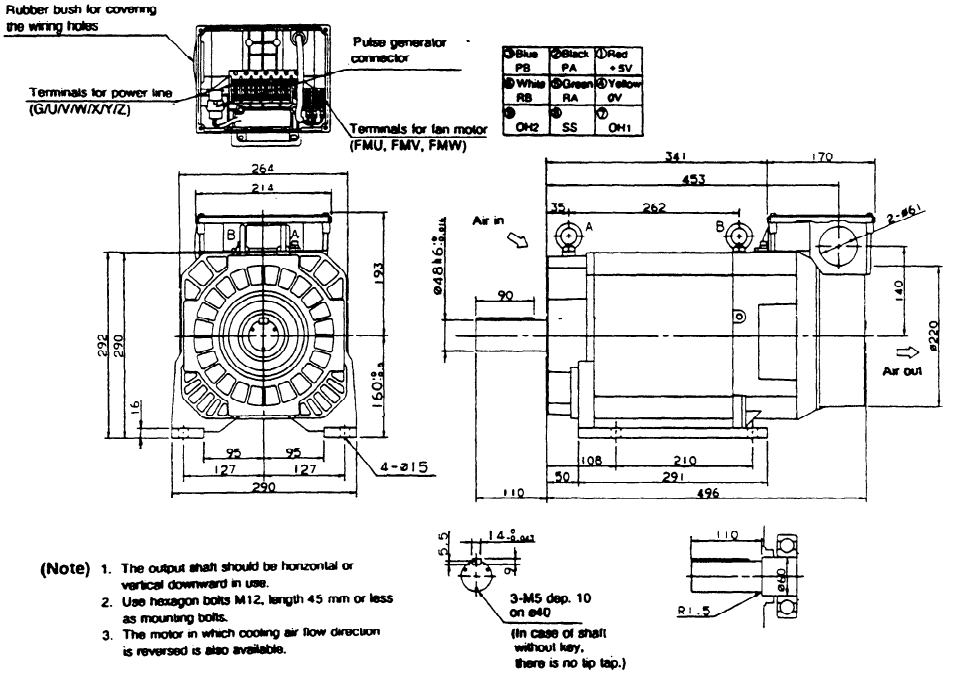
9.7 AC Spindle Motor Model 16P, 16P/8000

(a) Flange mounting type



(Note) 1. The output shaft should be horizontal or vertical downward in use.
2. Use hexagon bolts M12, length 45 mm or less as mounting bolts.
3. The motor in which cooling air flow direction is reversed is also available.

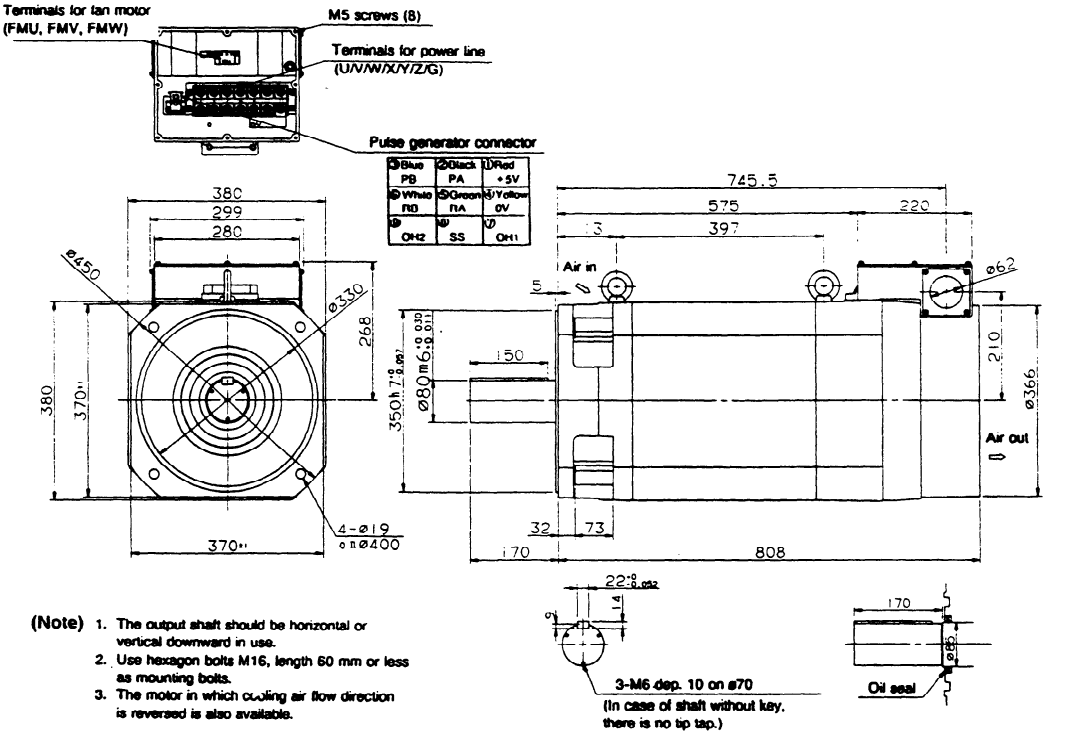
(b) Foot mounting type



(Note) 1. The output shaft should be horizontal or vertical downward in use.
2. Use hexagon bolts M12, length 45 mm or less as mounting bolts.
3. The motor in which cooling air flow direction is reversed is also available.

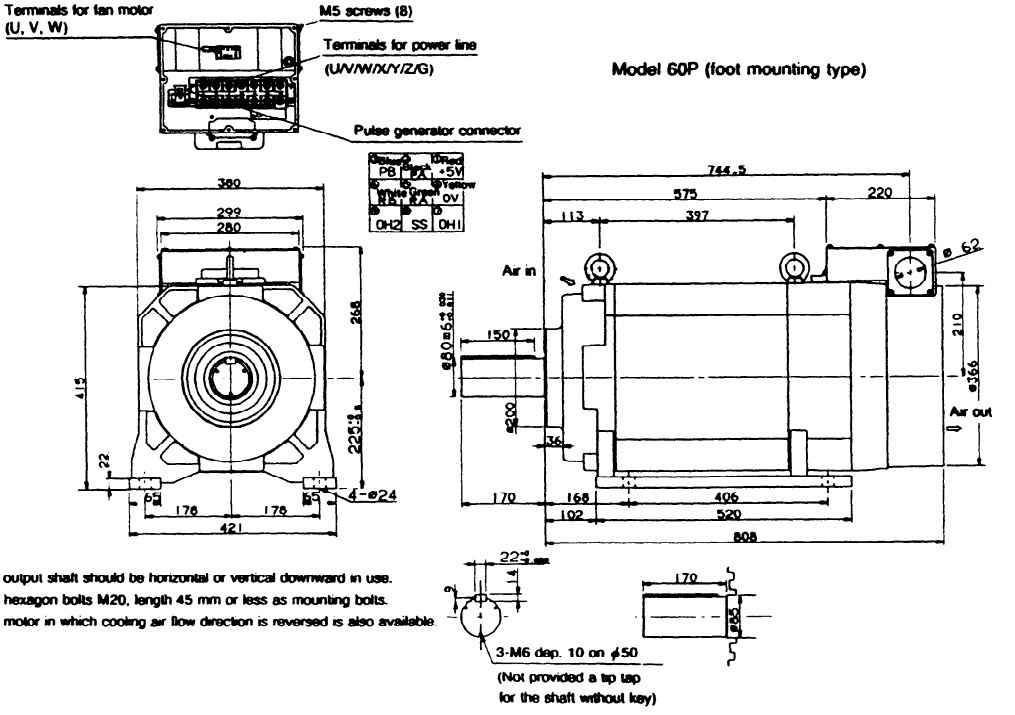
9.8 AC Spindle Motor Model 60P

(a) Flange mounting type



(Note) 1. The output shaft should be horizontal or vertical downward in use.
2. Use hexagon bolts M16, length 60 mm or less as mounting bolts.
3. The motor in which cooling air flow direction is reversed is also available.

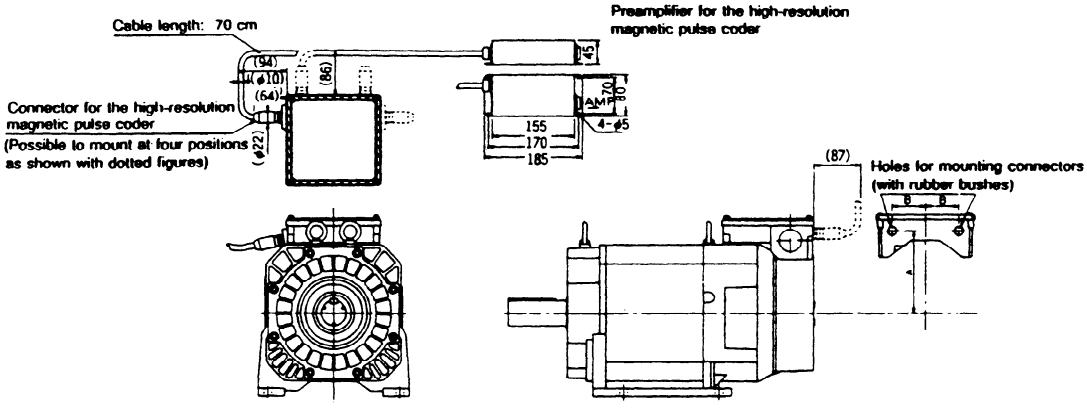
(b) Foot mounting type



(Note) 1. The output shaft should be horizontal or vertical downward in use.
2. Use hexagon bolts M20, length 45 mm or less as mounting bolts.
3. The motor in which cooling air flow direction is reversed is also available.

9.9 AC Spindle Motors with a Built-in High-resolution Magnetic Pulse Coder

Models 8P - 60P



Model	Dimension A	Dimension B
8P, 10P	123	60
12P, 15P, 18P, 22P	151	60
16P	153	72
30P, 40P	180	72
50P	240	72
60P	230	90

(Note 1) For dimensions not specified in this figure, refer to the outline drawings of motors.
(Note 2) Flange type motors and motors without a key are also available.

III. AC SPINDLE MOTOR VH series (LIQUID-COOLED)

1. GENERAL

This part describes the AC Spindle Motor VH series (Model 6VH/8VH/12VH). For the topics other than those described below, see Part I.

The AC Spindle Motor VH series employs oil-air lubrication, thus allowing high-speed rotation not achievable with grease lubrication. In addition, oil-cooling is employed for a minimum rise in temperature.

2. FEATURES

(1) With bearings using oil-air lubrication, a maximum motor speed of 20,000 min^{-1} is achieved for 6VH/8VH, and a maximum motor speed of 15,000 min^{-1} is achieved for 12VH.

(2) By employing an oil-cooling system based on a proprietary cooling tube structure (patent pending), a minimum rise in temperature is achieved.

(3) The dimensions of the VH series are the same as those of the S series. So the VH series can be installed without any structural modification of machine tools.

(4) With a precise rotor balance adjustment, a vibration not exceeding V5 can be achieved even at high-speed operation.

3. SPECIFICATIONS

Item \ Model			6VH	8VH	12VH
Output	Continuous rating(*1)	kw	5.5	7.5	11
	30-min rating(*1)	kw	7.5	11	15
	50%ED(*1,*2)	kw	7.5	11	15
Rotation speed	Base speed	(min⁻¹)	5, 000	5, 000	2, 500
	Maximum speed	(min⁻¹)	20, 000	20, 000	15, 000
Output torque (Continuous rated torque with a specified range)		N · m	10.5	14.3	42.0
		(kg · cm)	(107)	(14.3)	(428)
GD^2		$N \cdot m^2$	0.84	1.08	3.53
		$(kg \cdot m^2)$	(0.086)	(0.11)	(0.36)
Rotor inertia		$N \cdot m \cdot sec^2$	0.022	0.027	0.091
		$(kg \cdot cm \cdot sec^2)$	(0.22)	(0.28)	(0.93)
Weight		kg	60	80	110
Vibration			V5		
Noise			75 dB or less		
Cooling system			Oil cooling		
Cooler capacity(*6)		W (kcal/h)	1163-1745 (1000-1500 kcal/h) or more		
Cooling oil flow rate(*3,*4)		l/min	5 to 10		
Mounting direction			The output shaft must be horizontal (with the oil air drain placed at the bottom) or vertically downward.		
Allowable overload capacity (1 min)			120% of 30-min rating		
Insulation			Class F		
Ambient temperature			0°C to 40°C		
Painting color			Munsell system N2.5		
Accessories			Pulse generator and thermostat		
Number of pulses for built-in sensor (optional)		p/rev	512		
Bearing lubrication			Oil air		
Allowable radial load		N (kg)	0 (Make a direct connection to the motor.)		
Applicable amplifier (serial interface)			8S	12S	15S

(*1) The rated output is guaranteed at the rated power supply voltage (200/220/230 VAC). If the input power supply voltage fluctuates even within the allowable fluctuation range, the rated output may not be obtained.

(*2) The cycle time is 10 minutes, 50%ED: ON 5 minutes, OFF 5 minutes.

(*3) The maximum cooling oil pressure is 4.9×10^5 Pa (5 kgf/cm^2).

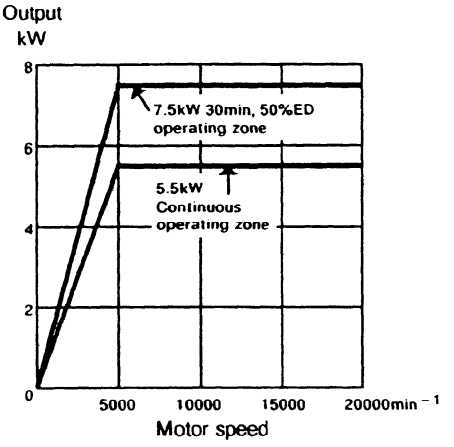
(*4) Use cooling oil with a viscosity not exceeding 1.0×10^{-5} m^2/sec (10 cSt).

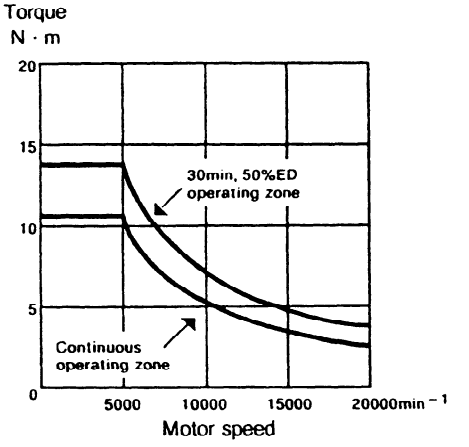
(*5) The structure protection grade is IP54.

(*6) Motor temperature increase depends on the cooler capacity.

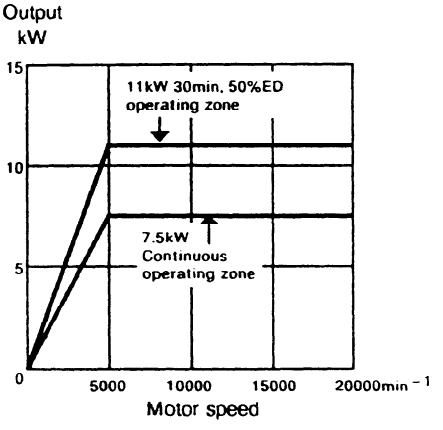
4. OUTPUT/TORQUE CHARACTERISTICS

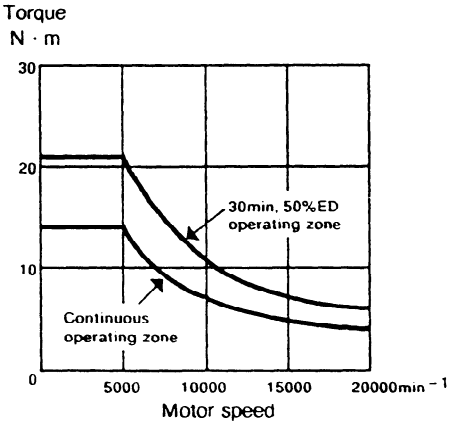
(1) Model 6VH



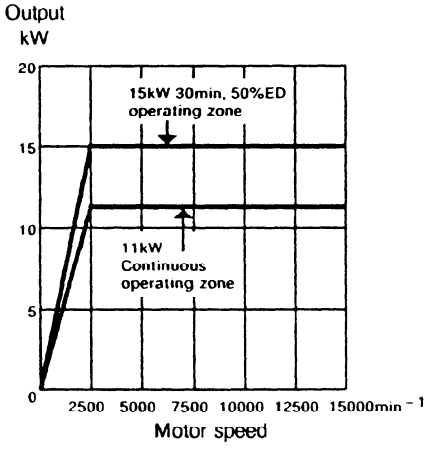


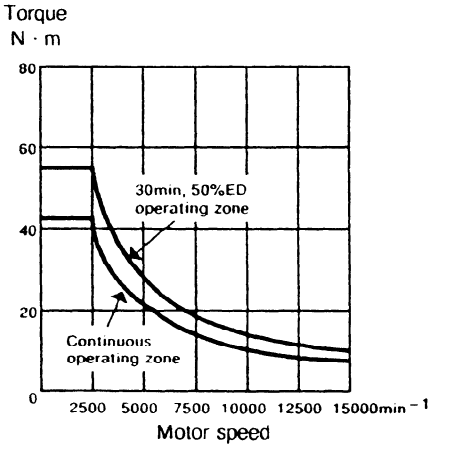
(2) Model 8VH





(3) Model 12VH





5. ORDER SPECIFICATIONS

Name		Specification number	Remarks
Model 6VH	Flange mounting	A06B-1056-B308	20,000 min^{-1}, no key
		A06B-1056-B398	20,000 min^{-1}, no key, with built-in sensor (512 p/rev)
Model 8VH	Flange mounting	A06B-1058-B308	20,000 min^{-1}, no key
		A06B-1058-B398	20,000 min^{-1}, no key, with built-in sensor (512 p/rev)
Model 12VH	Flange mounting	A06B-1062-B308	15,000 min^{-1}, no key
		A06B-1062-B398	15,000 min^{-1}, no key, with built-in sensor (512 p/rev)

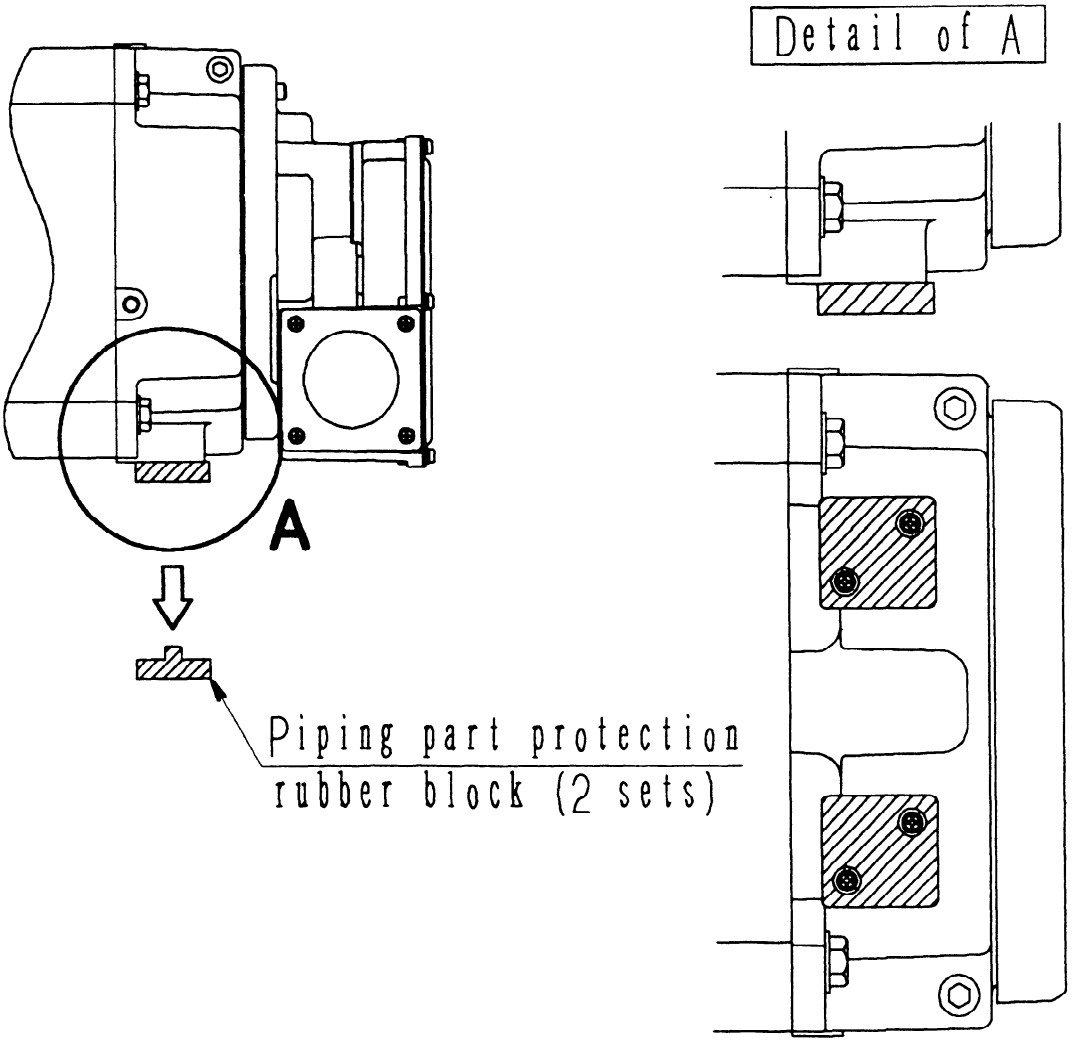
(Note) For a model with a built-in sensor, an optional signal conversion circuit is required.
For order specification of AC spindle servo unit S series (Serial interface) and each optional circuit, see chapter V and after.

6. CAUTIONS IN USE

6.1 Piping of Cooling Oil

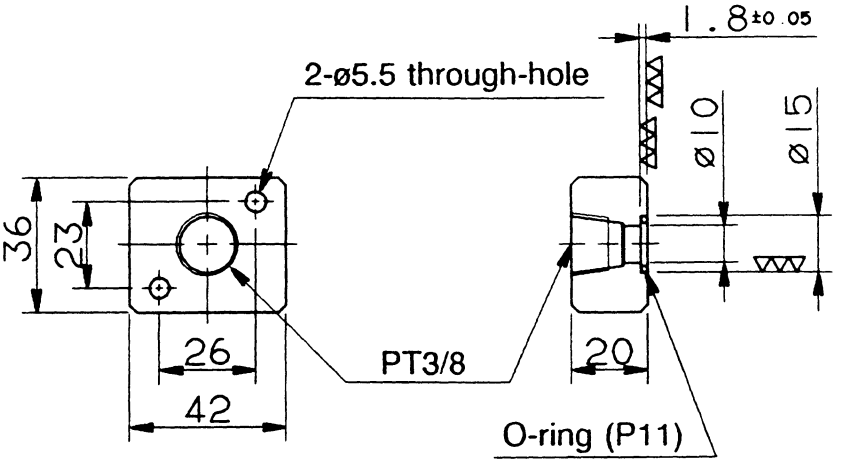
These motors require to be cooled by the cooling oil.

6.1.1 Factory-set piping

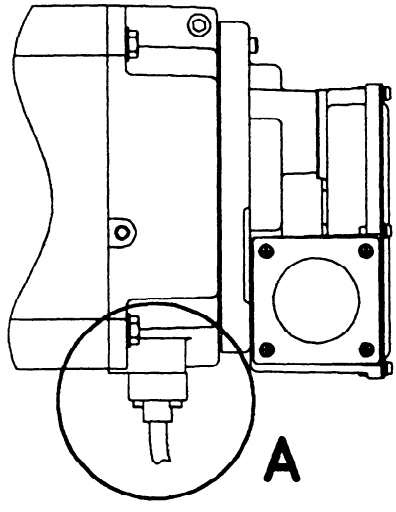


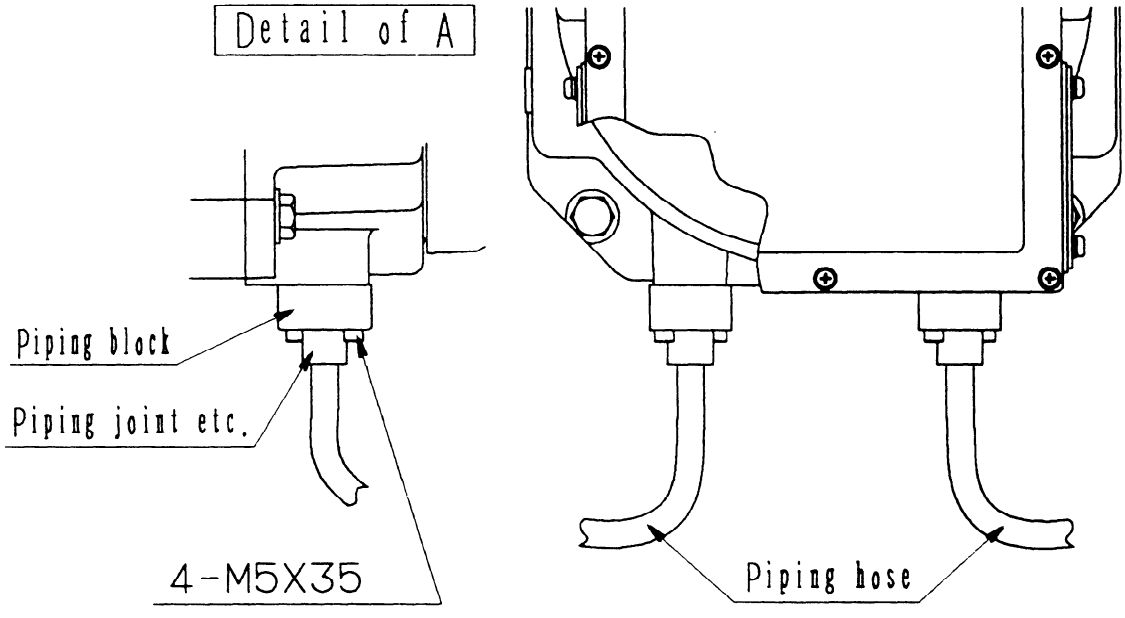
The rubber block is attached for the piping part protection. When you use the motor, please manufacture the piping block with the customer. (Refer to 6.1.2.)

6.1.2 Piping block (for reference)



6.1.3 Piping (for reference)





6.2 Motor Cooling Conditions

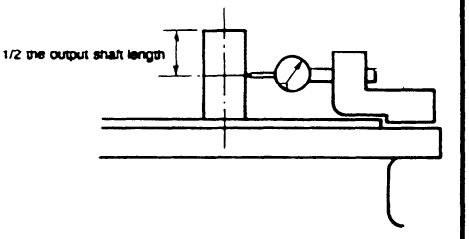
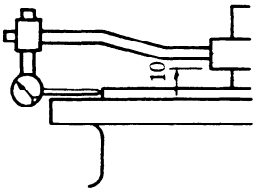
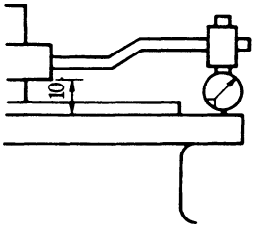
Item	Setting
Cooler capacity	1163-1745 W (1000-1500 kcal/h)
Type of cooling oil	Turbine oil or spindle oil with viscosity not exceeding 1.0×10^{-5} m^2/sec (10 cSt)
Maximum pressure	490 kPa (5.0 kgf/cm^2) or less
Flow rate	5-10 l /min
Oil temperature	30°C (no condensation)

6.3 Oil-Air Lubrication Conditions

Item	Setting
Oil supply amount	0.03 cc at intervals of 16 minutes
Type of oil	Turbine oil or spindle oil with viscosity 3.2×10^{-5} m^2/sec (32 cSt)
Air supply amount	20 NL/min/bearing (dry air)
Air pressure	340-440 kPa (3.5-4.5 kgf/cm^2)
Drain piping	Internal diameter of 6 mm or more, piping length not exceeding 300 mm

7. ASSEMBLING ACCURACY (T.I.R: Total Indicator Reading)

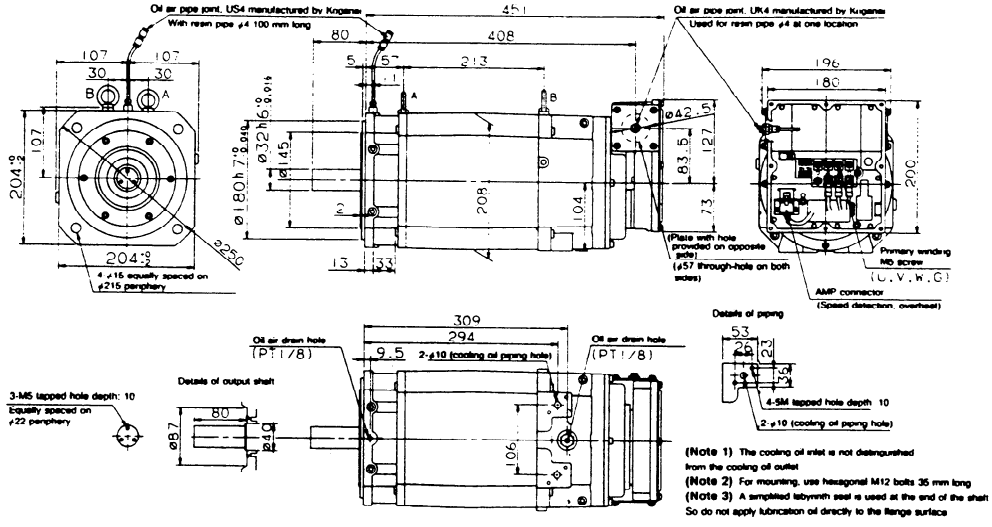
Conforming to JEM1401

Item \ Model	6VH, 8VH, 12VH	Measuring method
Vibration at the end of the output shaft	20μm or less	
Vibration of the faucet joint for mounting the flange against the core of the shaft	40μm or less	
Vibration of the flange mounting surface against the core of the shaft	80μm or less	

8. EXTERNAL DIMENSIONS

8.1 AC Spindle Motor Model 6VH

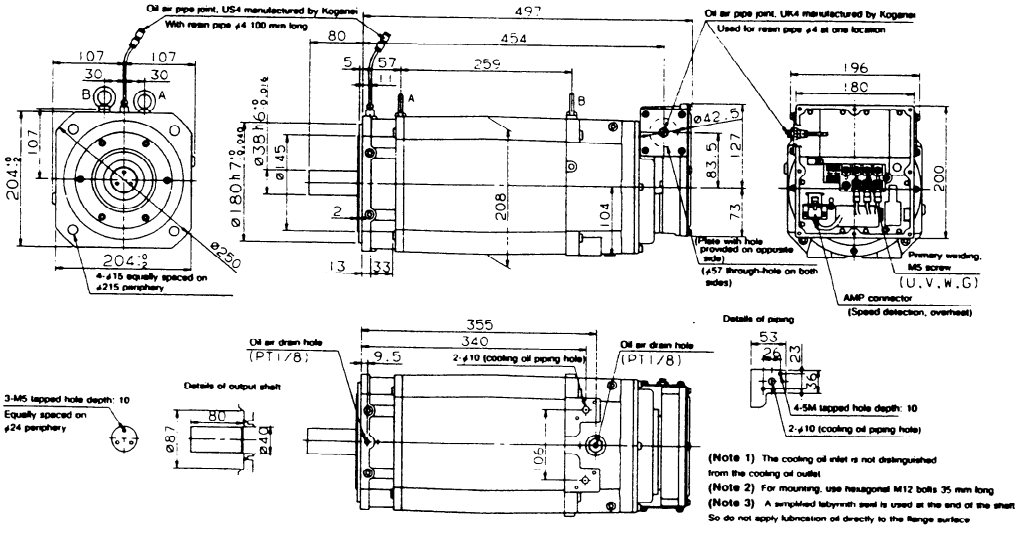
Model 6VH (liquid-cooled)



(Note 1) The cooling oil inlet is not distinguished from the cooling oil outlet
(Note 2) For mounting, use hexagonal M12 bolts 35 mm long
(Note 3) A simplified labyrinth seal is used at the end of the shaft So do not apply lubrication oil directly to the flange surface

8.2 AC Spindle Motor Model 8VH

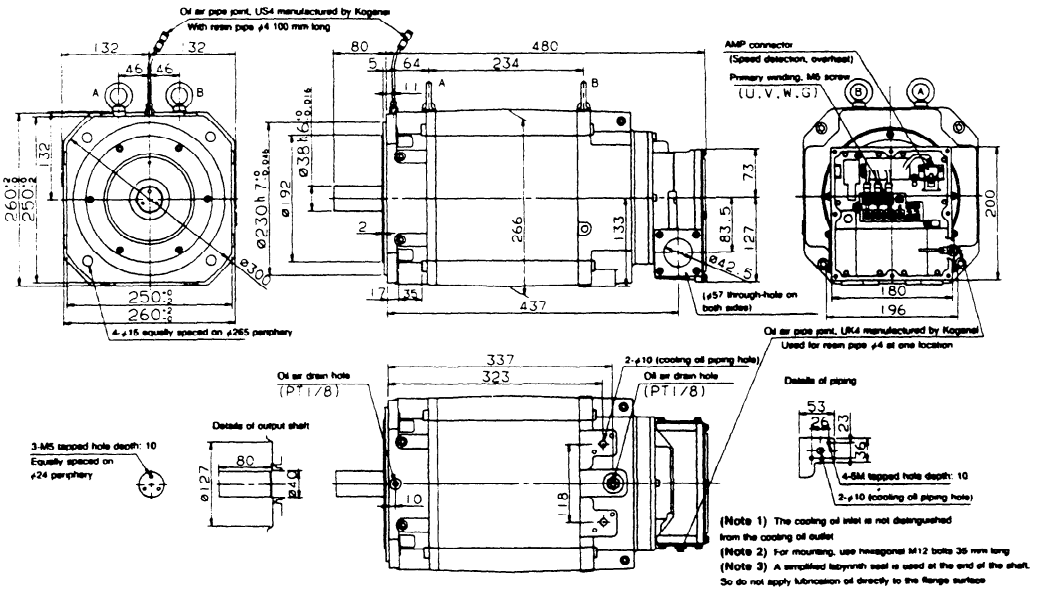
Model 8VH (liquid-cooled)



(Note 1) The cooling oil inlet is not distinguished from the cooling oil outlet
(Note 2) For mounting, use hexagonal M12 bolts 35 mm long
(Note 3) A simplified labyrinth seal is used at the end of the shaft So do not apply lubrication oil directly to the flange surface

8.3 AC Spindle Motor Model 12VH

Model 12VH (liquid-cooled)



IV. AC SPINDLE MOTOR HV series (380/415 VAC INPUT)

1. GENERAL

This part describes the AC Spindle Motor HV series (Model 30HV/40HV/60HV). For the topics other than those described below, see Part I .

The AC spindle motor HV series does not require a power transformer to be connected to a 380/415 VAC input power supply. The AC spindle motor HV series can be directly connected to a 380/415 VAC power supply.

2. FEATURES

(1) With the state-of-the-art power electronics technology, a 380/415 VAC power supply can be connected not via a power transformer but directly to the AC spindle servo unit fordriving.

(2) The dimensions of the HV series are the same as those of the S series. So the HV series can be installed without any structural modification of machine tools.

(3) Models 30HV and 40HV are installed on a commercially available directly-connected gear box. So an output shaft of footed-flange type is available; the output shaft and flange dimensions conform to the DIN standard.

3. SPECIFICATIONS

Item \ Model			30HV	40HV	60HV
Output	Continuous rating(*1)	kw (HP)	30 (40.2)	37 (49.6)	60 (80.4)
	30-min rating(*1)	kw (HP)	37 (49.6)	45 (60.3)	75 (100.5)
	50%ED(*1,*2)	kw (HP)	37 (49.6)	45 (60.3)	75 (100.5)
Rotation speed	Base speed	(min^{-1})	1,150	1,150	1,150
	Maximum speed	(min^{-1})	4,500	4,500	4,500
Output torque (Continuous rated torque with a specified range)		N · m (kg · cm)	249 (2540)	307 (3130)	498 (5081)
GD^2		($kg \cdot m^2$)	1.18	1.18	2.48
Rotor inertia		N · m · sec^2 ($kg \cdot cm \cdot sec^2$)	0.29 (3.0)	0.29 (3.0)	0.62 (6.34)
Weight		kg	250	250	468
Vibration			V5		V10
Noise			75dB(A)		80dB(A)
Cooling system			Totally enclosed fan cooled		
Cooler fan capacity		W	84		90
Mounting			The output shaft must be horizontal or vertically downward. (*3)		
Allowable overload capacity (1 min)			120%		
Insulation			Class F		
Ambient temperature			0°C to 40°C		
Painting color			Munsell system N2.5		
Accessories			Pulse generator and thermostat		
Number of pulses for built-in sensor (optional)		pulse/rev	1024		——
Applicable amplifier (serial interface)			30HV	40HV	60HV

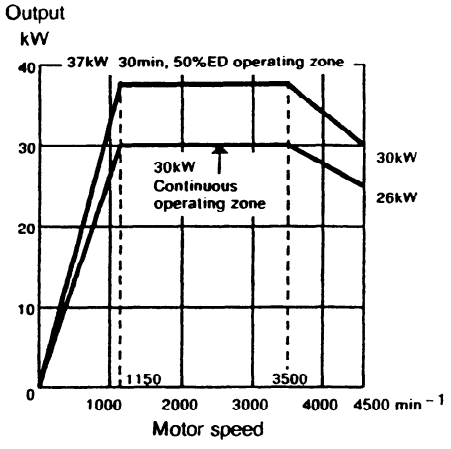
(*1) The rated output is guaranteed at the rated power supply voltage (200/220/230 VAC). If the input power supply voltage fluctuates even within the allowable fluctuation range, the rated output may not be obtained.

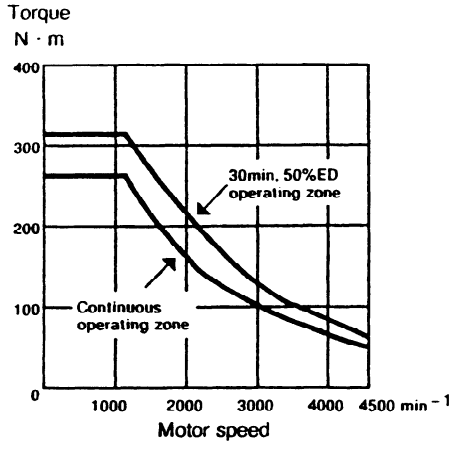
(*2) The cycle time is 10 minutes, 50%ED: ON 5 minutes, OFF 5 minutes.

(*3) It is possible to install upward within 45°.

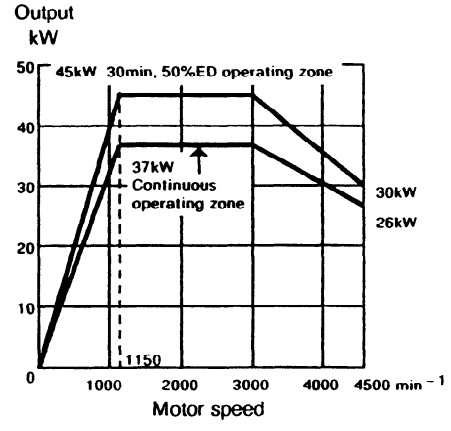
4. OUTPUT/TORQUE CHARACTERISTICS

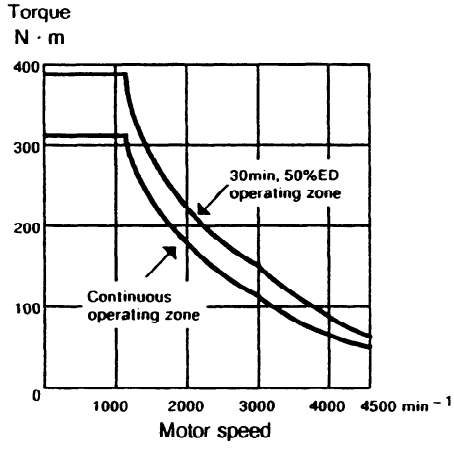
(1) Model 30HV



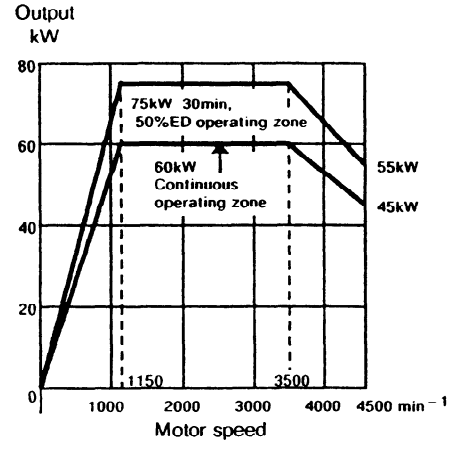


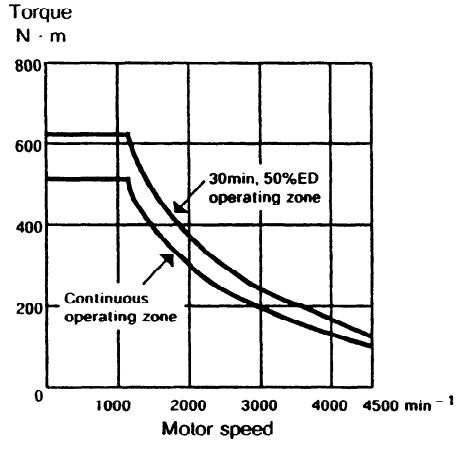
(2) Model 40HV





(3) Model 60HV





5. CONFIGURATION AND ORDER SPECIFICATIONS

5.1 Configuration

The AC spindle motor HV series consists of the following motor and accessories:

(1) AC spindle motor (basic)
(2) Key (accessory)
(3) Signal connector (housing, contact) (accessory)

The accessories are contained in the terminal box.
For the specifications of the cables used for connection between the motor and spindle servo unit, see APPENDIX 1 CABLE SPECIFICATIONS.
Prepare then by the machine tool fuilder.

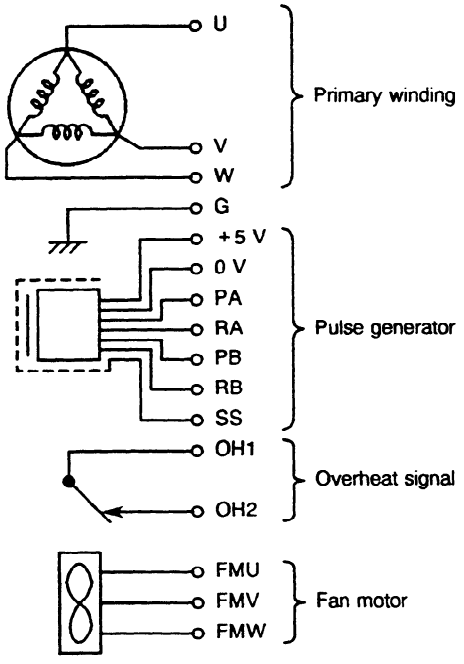
5.2 Order Specifications

Name	Mounting	Specification number	Remarks
Model 30HV	Flange mounting	A06B-0780-B100	4500 min^{-1}, has key, exhaust rear
		A06B-0780-B101	4500 min^{-1}, has key, exhaust front
		A06B-0780-B300	4500 min^{-1}, no key, exhaust rear
		A06B-0780-B301	4500 min^{-1}, no key, exhaust front
	Foot mounting	A06B-0780-B200	4500 min^{-1}, has key, exhaust rear
		A06B-0780-B201	4500 min^{-1}, has key, exhaust front
		A06B-0780-B400	4500 min^{-1}, no key, exhaust rear
		A06B-0780-B401	4500 min^{-1}, no key, exhaust front
	Footed-flange	A06B-0780-B908	4500 min^{-1}, has key, exhaust rear. Output shaft conforming to DIN standard (ϕ55m6)
Model 40HV	Flange mounting	A06B-0781-B100	4500 min^{-1}, has key, exhaust rear
		A06B-0781-B101	4500 min^{-1}, has key, exhaust front
		A06B-0781-B300	4500 min^{-1}, no key, exhaust rear
		A06B-0781-B301	4500 min^{-1}, no key, exhaust front
	Foot mounting	A06B-0781-B200	4500 min^{-1}, has key, exhaust rear
		A06B-0781-B201	4500 min^{-1}, has key, exhaust front
		A06B-0781-B400	4500 min^{-1}, no key, exhaust rear
		A06B-0781-B401	4500 min^{-1}, no key, exhaust front
	Footed-flange	A06B-0781-B908	4500 min^{-1}, has key, exhaust rear. Output shaft conforming to DIN standard (ϕ55m6)
Model 60HV	Flange mounting	A06B-0783-B100	4500 min^{-1}, has key, exhaust rear
		A06B-0783-B101	4500 min^{-1}, has key, exhaust front
		A06B-0783-B300	4500 min^{-1}, no key, exhaust rear
		A06B-0783-B301	4500 min^{-1}, no key, exhaust front
	Foot mounting	A06B-0783-B200	4500 min^{-1}, has key, exhaust rear
		A06B-0783-B201	4500 min^{-1}, has key, exhaust front
		A06B-0783-B400	4500 min^{-1}, no key, exhaust rear
		A06B-0783-B401	4500 min^{-1}, no key, exhaust front
	Footed-flange	A06B-0783-B907	4500 min^{-1}, has key, exhaust rear

(Note) The specification number for the flange mounting model with a built-in sensor ends with B□9□. (Example: The specification number for the built-in sensor type for B100 ends with B190.

6. CONNECTION

Models 30HV to 60HV



Connector connections

③ Blue PB	② Black PA	① Red +5 V
⑥ White RB	⑤Green RA	④Yellow 0 V
⑦ OH2	⑧ SS	⑨ OH1

Connector specifications
Universal maintenance-lock type connector
manufactured by AMP

	Motor side	Cable side
Housing	350782-1	350720-1
Contact	350706-7	350689-6

The pulse generator and overheat signals are connected to the AMP connector. The other signals are connected to the terminal block. The AMP connector and contact are provided with the motor.

Terminal block screw dimensions

Terminal name / Model	U, V, W, G	FMU to FMW
30HV to 60HV	M10	M3.5

7. ALLOWABLE RADIAL LOAD

Use the motor output shaft below the allowable radial loads shown in the table below.

Model	Mounting	Allowable radial loads	Output shaft
30HV, 40HV	Flange mounting, Foot mounting	450 kg	———
	Footed-flange	550 kg	DIN standard
60HV	Flange mounting, Foot mounting	2000 kg (Note)	———
	Footed-flange	1100 kg	———

(Note 1) The allowable radial load for the flange mounting and foot mounting types of 60HV is calculated assuming that the load is supported at the center of the output shaft. The allowable radial loads for the other models assume that the load is supported at the output shaft end.

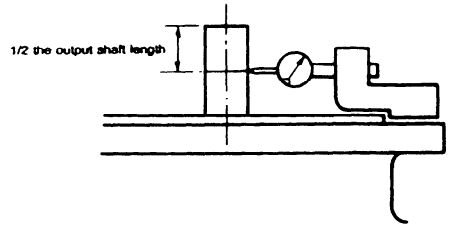
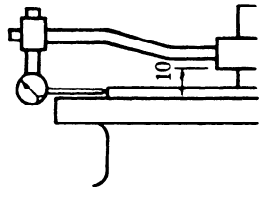
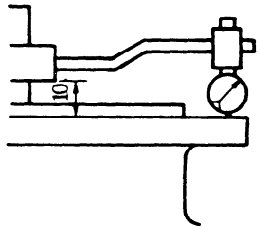
(Note 2) When using a belt, adjust the tension so allowable loads indicated above are not exceeded. If an excessive load is applied, consider the use of a support bearing on the machine side to maintain the long-term reliability of the motor.

(Note 3) When the belt tension is maximized at a point outside the output shaft end, the allowable loads are less than those at the output shaft end.

(Note 4) If a thrust load is applied when a helical gear is used, the shaft moves in the direction of the thrust. So, as a general rule, never apply a thrust load.

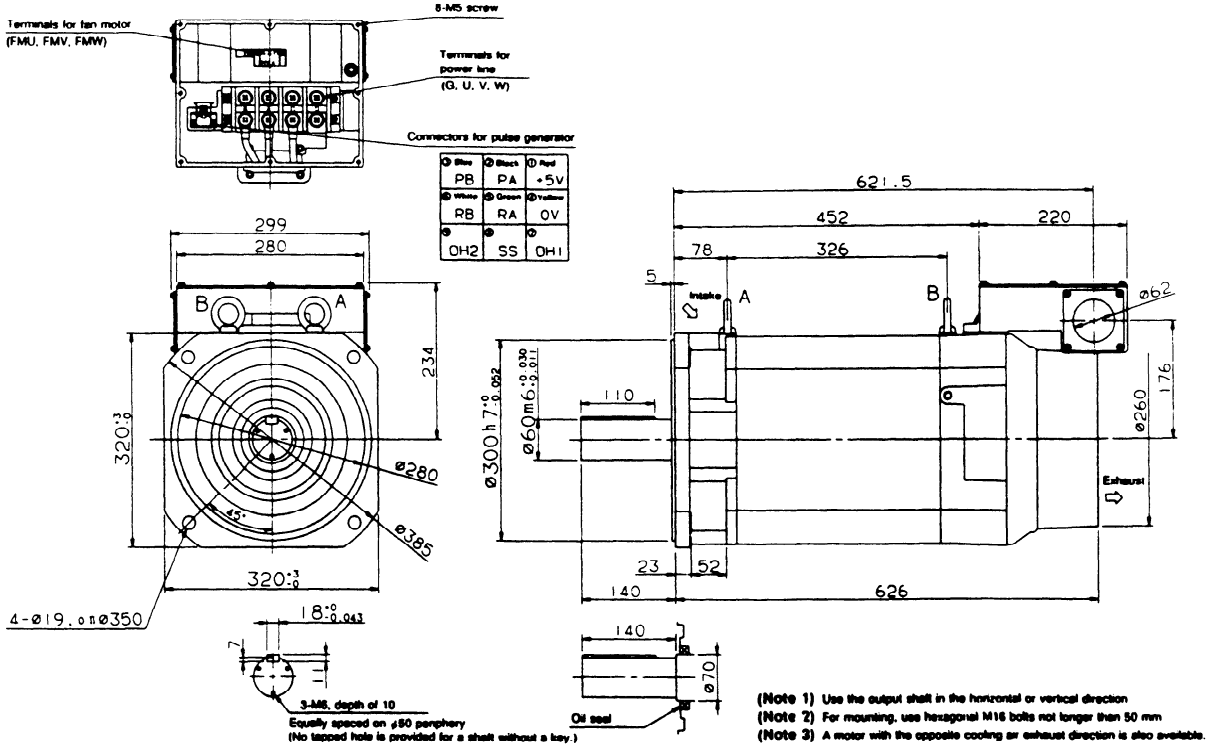
8. ASSEMBLING ACCURACY (T.I.R: Total Indicator Reading)

Conforming to JEM1401

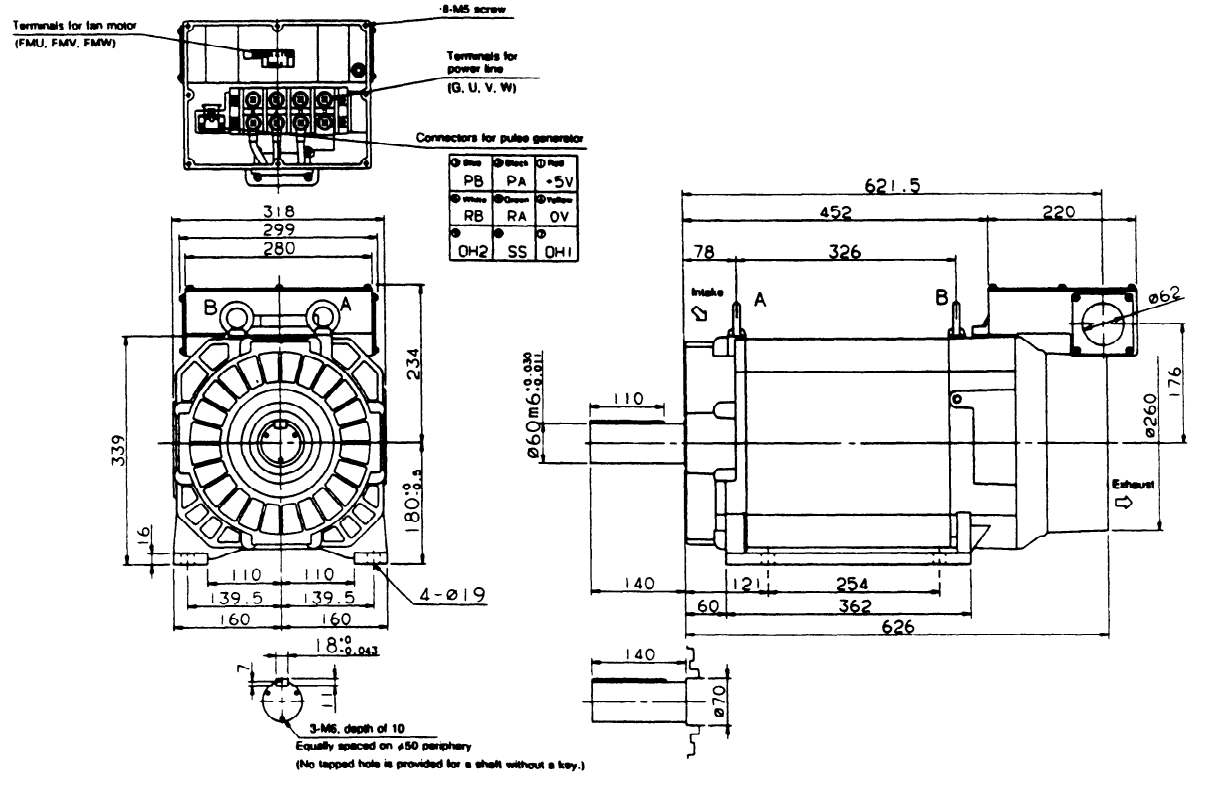
Item \ Model	30HV, 40HV, 60HV	Measuring method
Vibration at the end of the output shaft	20μm or less	
Vibration of the faucet joint for mounting the flange against the core of the shaft	60μm or less	
Vibration of the flange mounting surface against the core of the shaft	100μm or less	

9. EXTERNAL DIMENSIONS

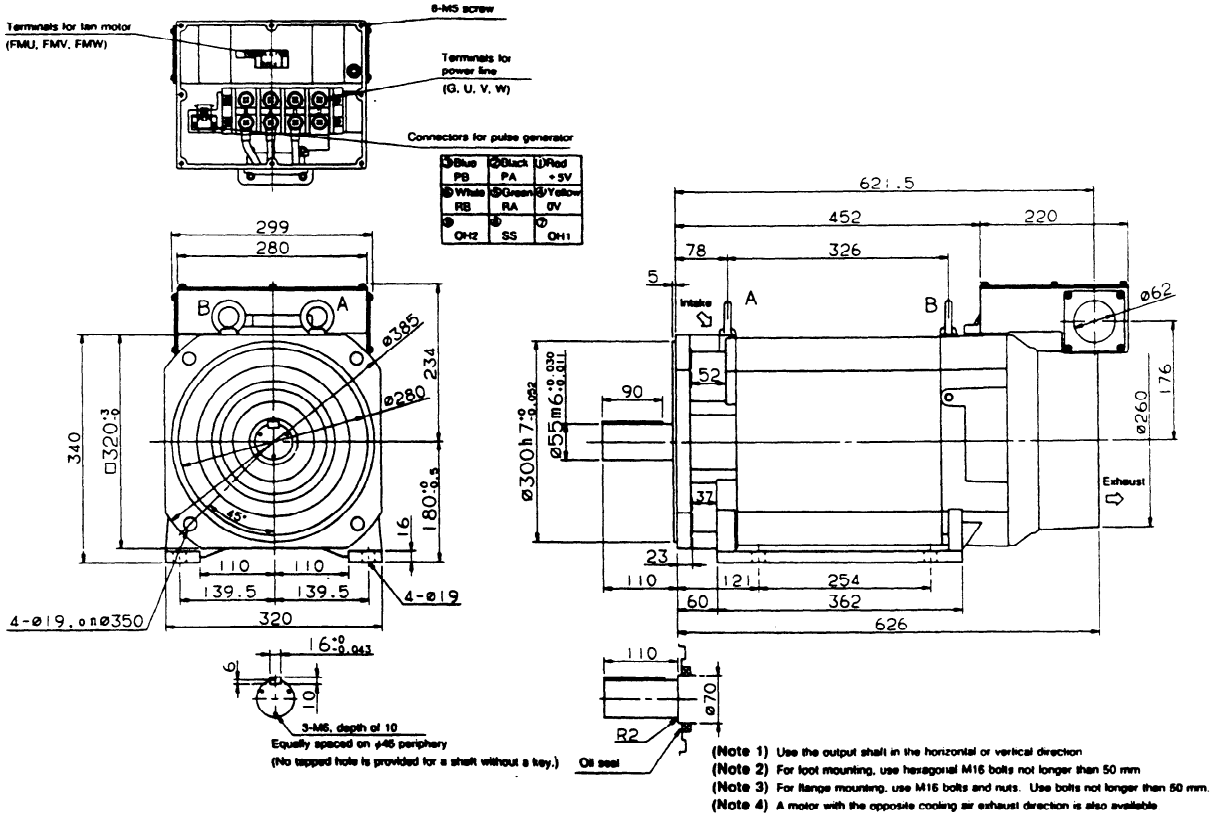
9.1 AC Spindle Motor Model 30HV/40HV (Flange Mounting)



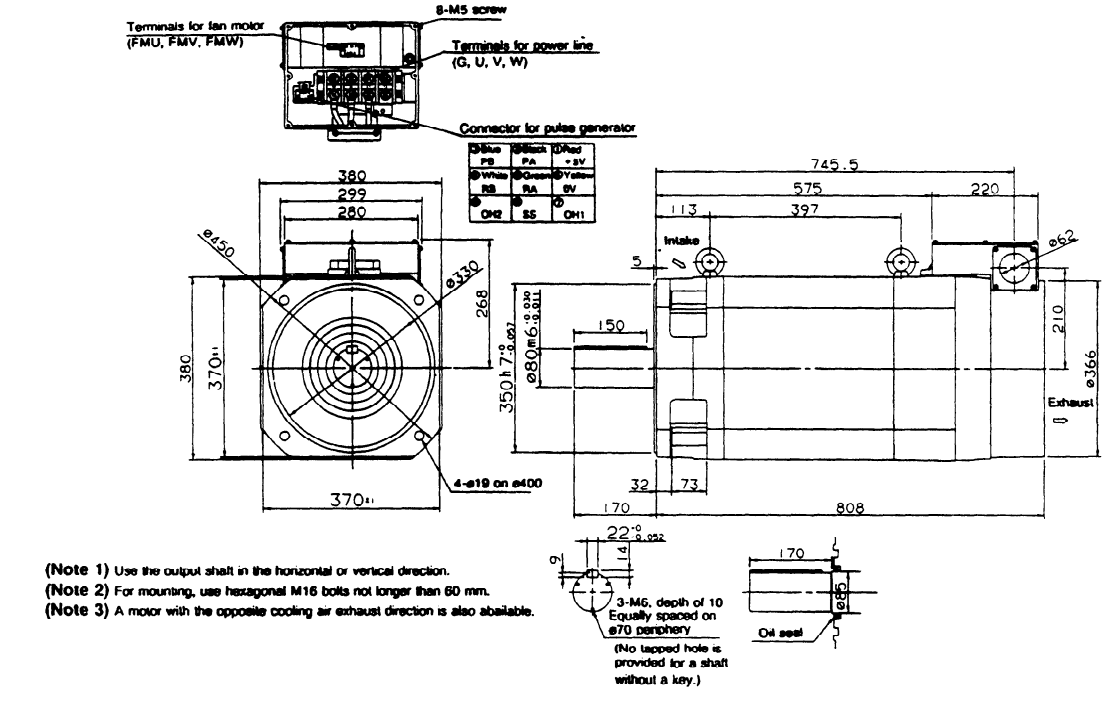
9.2 AC Spindle Motor Model 30HV/40HV (Foot Mounting)



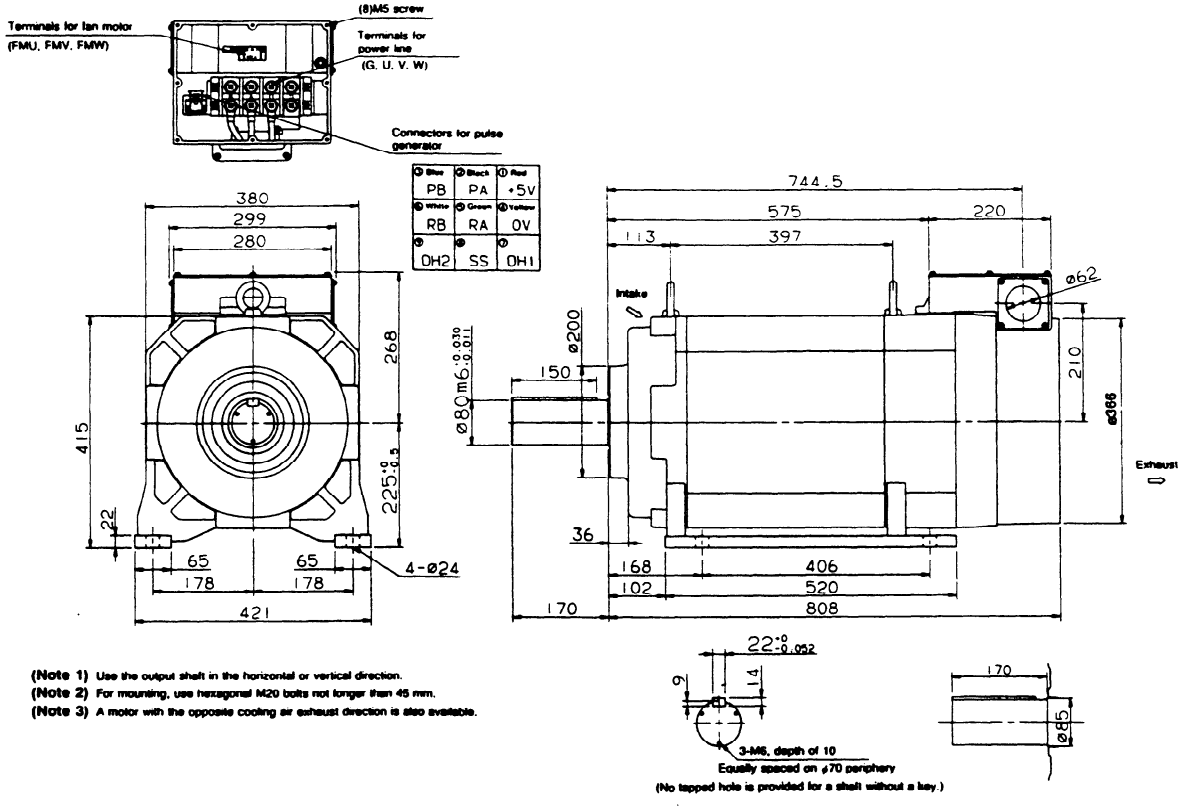
9.3 AC Spindle Motor Model 30HV/40HV (Footed-Flange/Output Shaft Conforming to DIN Standard)



9.4 AC Spindle Motor Model 60HV (Flange Mounting)

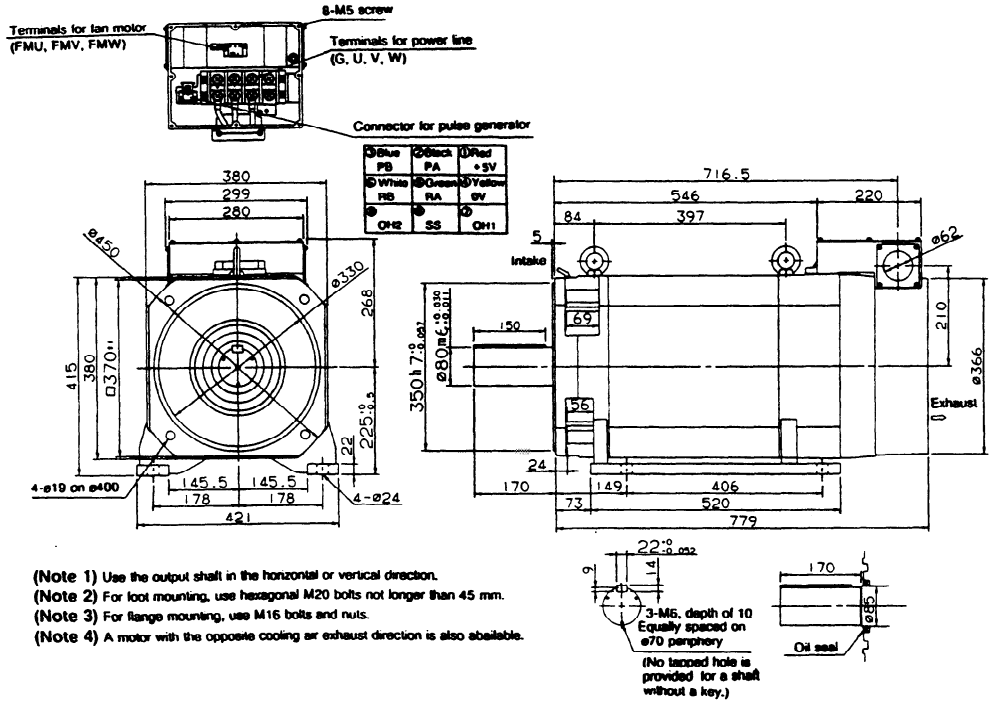


9.5 AC Spindle Motor Model 60HV



(Note 1) Use the output shaft in the horizontal or vertical direction.
(Note 2) For mounting, use hexagonal M20 bolts not longer than 45 mm.
(Note 3) A motor with the opposite cooling air exhaust direction is also available.

9.6 AC Spindle Motor Model 60HV (Foot Mounting)



(Note 1) Use the output shaft in the horizontal or vertical direction.
(Note 2) For foot mounting, use hexagonal M20 bolts not longer than 45 mm.
(Note 3) For flange mounting, use M16 bolts and nuts.
(Note 4) A motor with the opposite cooling air exhaust direction is also available.

V. LIQUID-COOLED AC SPINDLE MOTOR series

1. NON HOLLOW SHAFT/WITHOUT SPEED RANGE SWITCHING TYPE

1.1 Outline

Oil-cooled AC spindle motor (non hollow shaft/without speed range switching type) achieves a high-speed rotation, low temperature rise and low vibration.

Connecting directly with the spindle of the machining-center, it is possible to eliminate the gear and to get high accuracy.

1.2 Feature

(1) The front flange and the motor case are cooled by the specially cooling system (patent pending), and the heat conduction to the spindle head and the heat radiation to the machine side column shall be decreased.

(2) The vibration class is V3 (rotation component) by strict rotor balance.

1.3 Specifications

1.3.1 Non hollow shaft/without speed range switching type

Item \ Model	L6/12000	L12/6000	L15/6000	L18/6000	L22/6000
Continuous rated output (*1) kw	5.5	11	15	18.5	22
30 min., 50%ED rated output (*1) (*2) kw	7.5	15	18.5	22	26
Base speed min^{-1}	1500	1500	1500	1500	1500
Maximum speed min^{-1}	12000	6000	6000	6000	6000
30 min., 50%ED rated torque (*2) (*3) N-m (kgf-cm)	47.7 (486)	95.4 (973)	117.7 (1201)	140.0 (1428)	165.4 (1688)
GD^2 $kgf\text{-}m^2$	0.086	0.36	0.36	0.51	0.51
Rotor inertia $N\text{-}m\text{-}s^2$ ($kgf\text{-}cm\text{-}s^2$)	0.022 (0.22)	0.091 (0.93)	0.091 (0.93)	0.126 (0.29)	0.126 (1.29)
Weight kg	60	110	110	145	145
Vibration	V3 (rotation component)				
Noise dB (A)	75				
Cooling system	(*4) Oil cooled				
Installation	The output shaft be horizontal or vertically downward or less than 45° upward.				
Allowable overload capacity (*5) (1 min.)	120% for rated 30 min.				
Insulation	Class F				
Ambient temperature °C	0 to 40				
Painting color	Munsell system N2.5				
Accessories	Pulse-generator and thermostat				
Builtin sensor pulse p/rev	(option/512)	(option/1024)			
Bearing lubrication	Grease				
Allowable radial load kgf	200	300			
Amplifier model (serial interface)	8S	12S	15S	18S	22S

(*1) The rated output is guaranteed at the rated voltage. (AC200/220/230V)
If the input voltage fluctuates, it is possible that the rated output cannot be obtain even when such functions are within the allowable fluctuation range.

(*2) The cycle time is 10 minutes, 50%ED : ON 5.0 min., OFF 5.0 min.

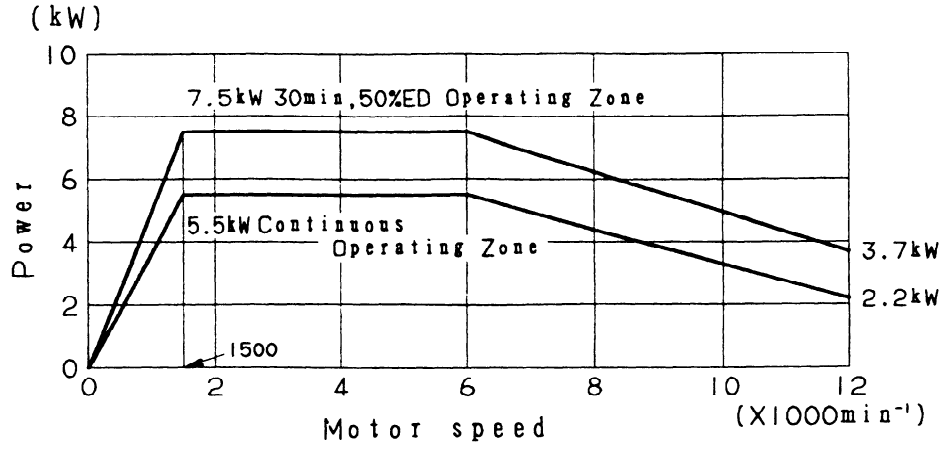
(*3) Short time rated torque at constant range.

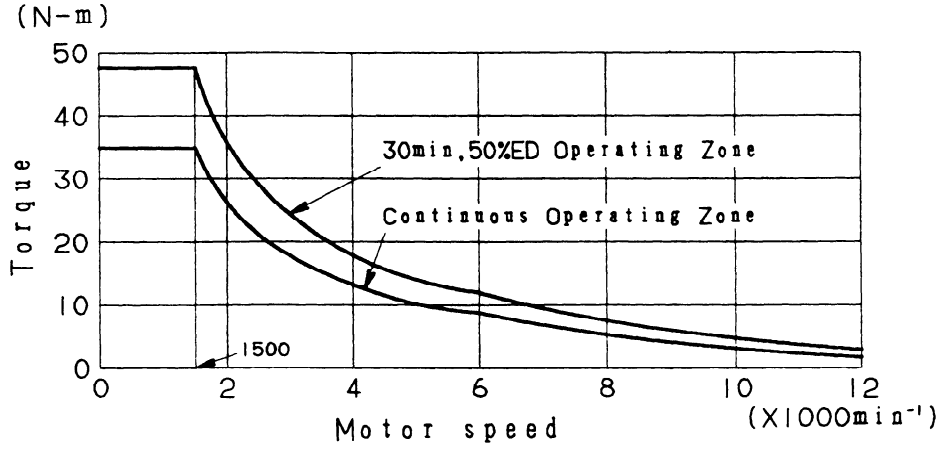
(*4) Please prepare the cooling unit and cooling oil which is recommend at 6.2.

(*5) The allowable over load capacity is a typical value of the motor maximum output at AC 200V and not a guaranteed value.

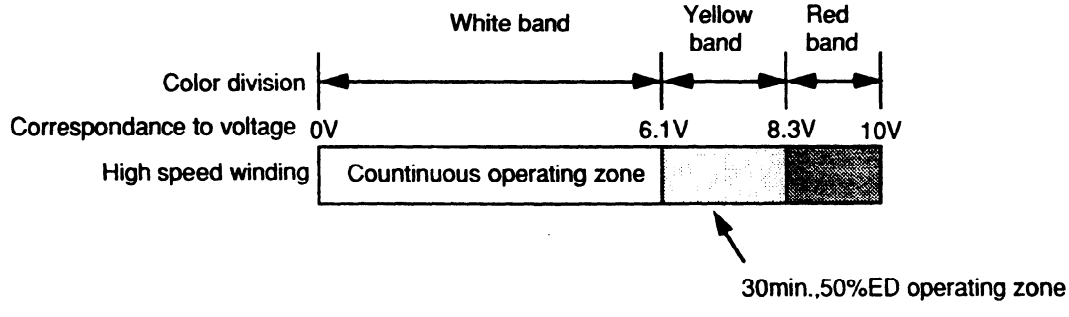
1.3.2 Outputs and torque characteristics

1.3.2.1 Model L6/12000 (without speed range switching type)

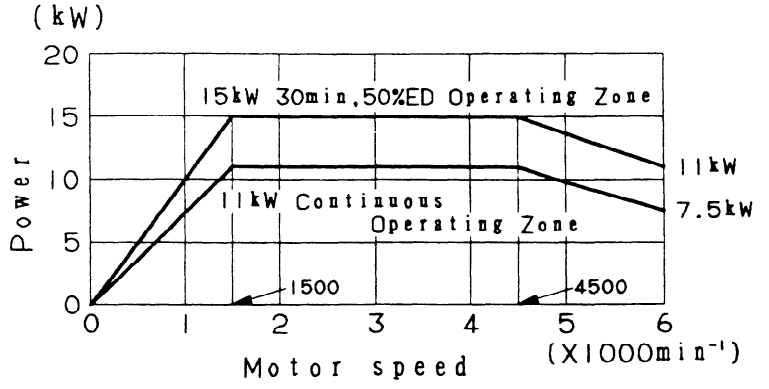


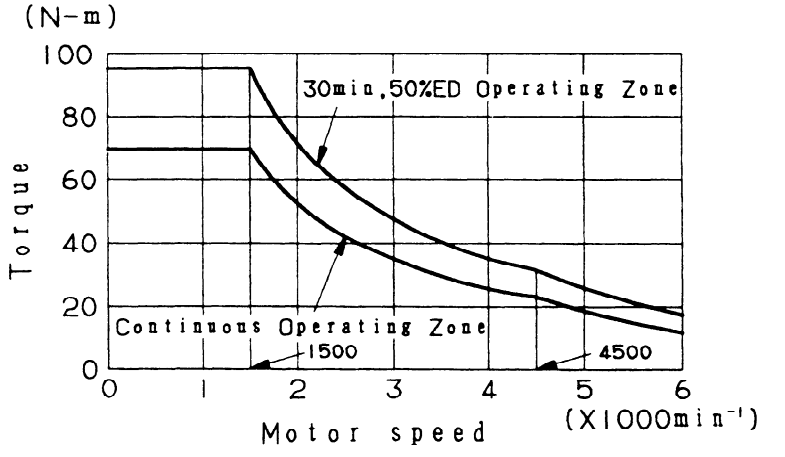


Load Meter Scale

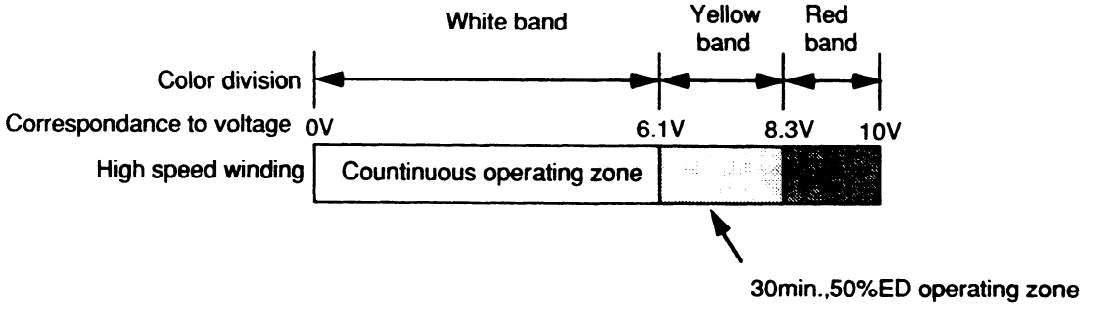


1.3.2.2 Model L12/6000 (without speed range switching type)

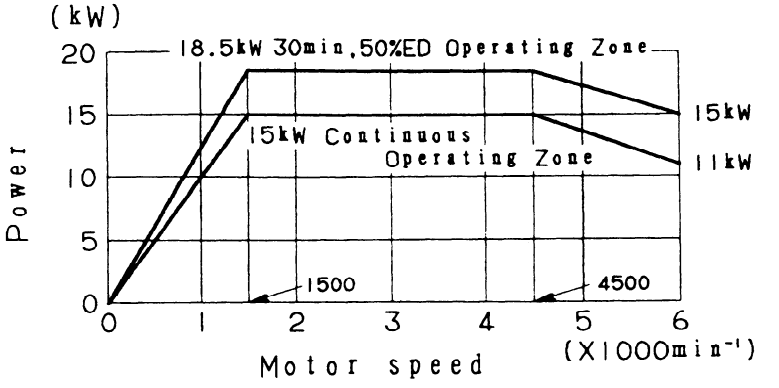


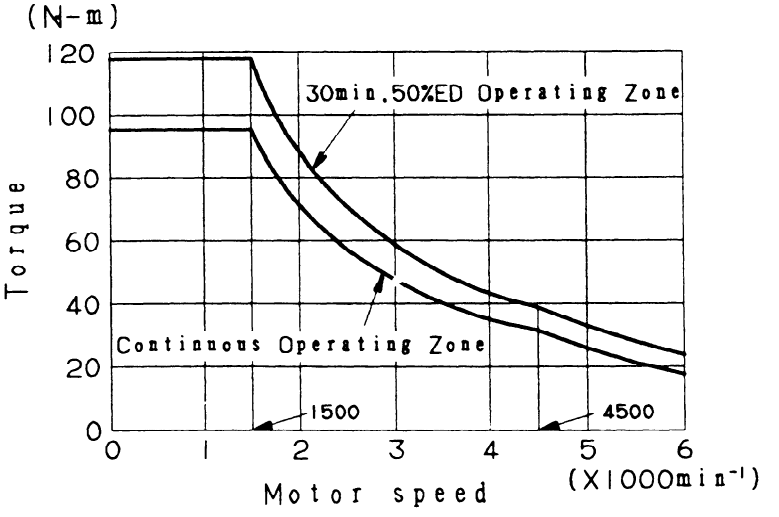


Load Meter Scale

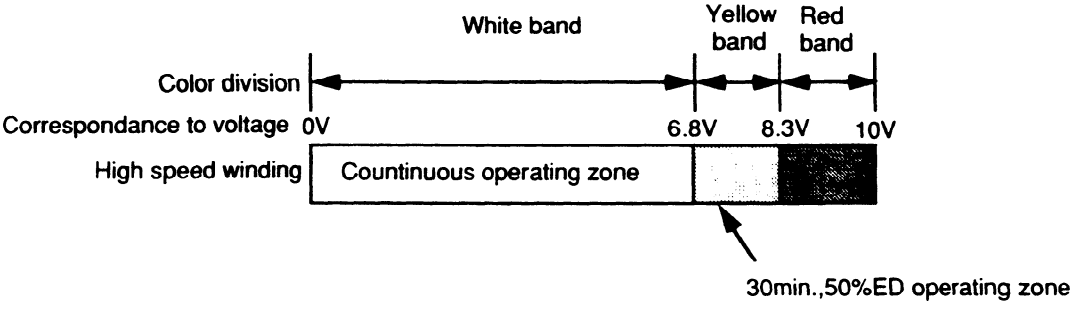


1.3.2.3 Model L15/6000 (without speed range switching type)

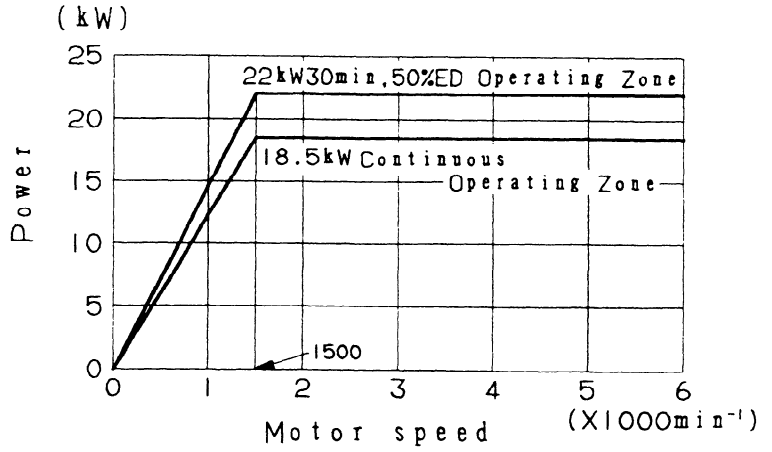


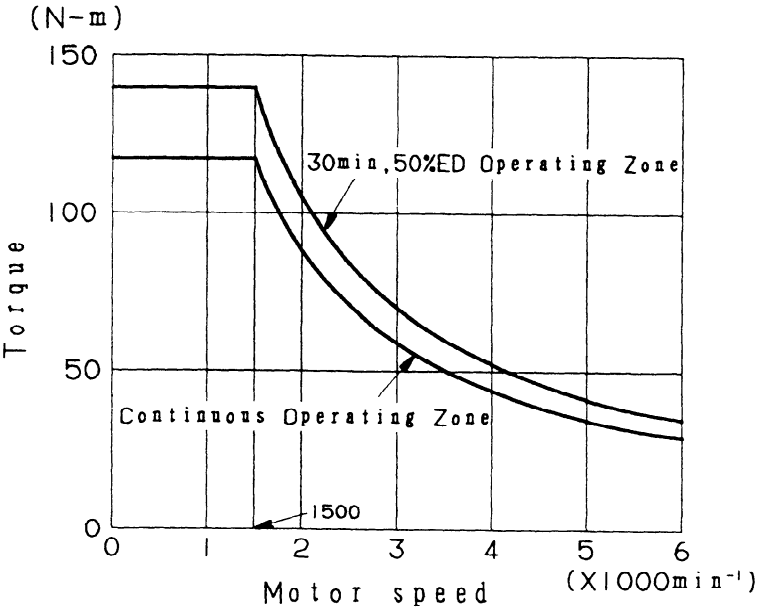


Load Meter Scale

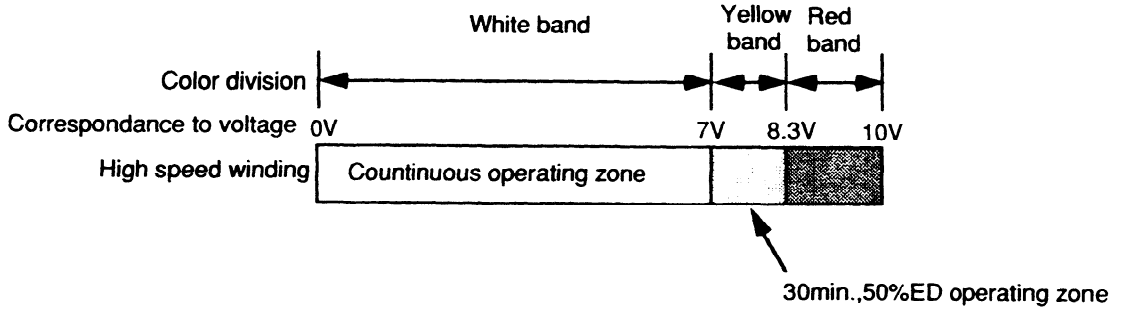


1.3.2.4 Model L18/6000 (without speed range switching type)

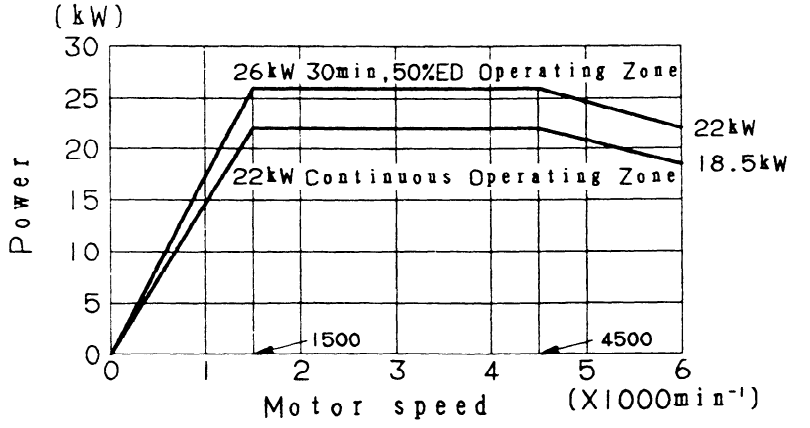


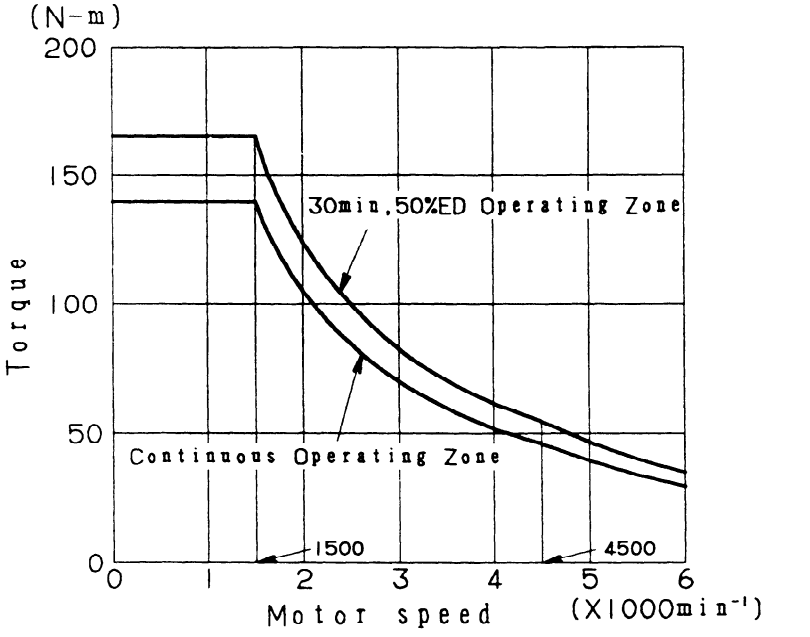


Load Meter Scale

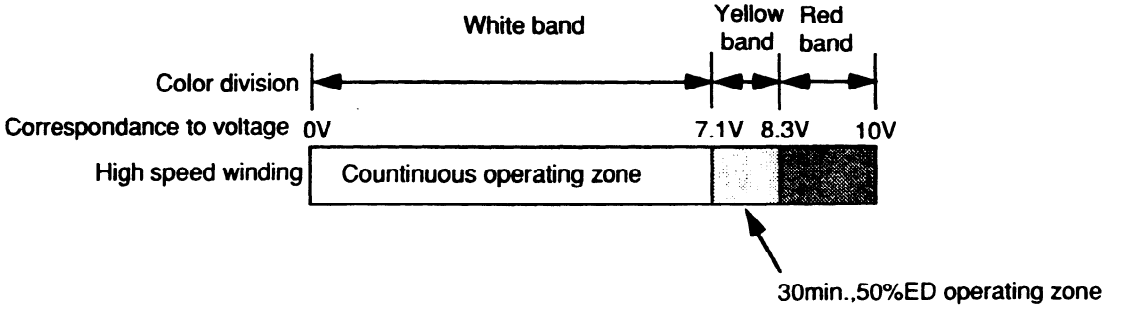


1.3.2.5 Model L22/6000 (without speed range switching type)





Load Meter Scale



1.4 Configuration and Order Drawing Number

1.4.1 Configuration

Oil-cooled AC spindle motor is composed of the following.

(1) Oil-cooled AC spindle motor

(2) Connector for pulse-generator (housing and contact)
The connector is stored as accessories in the terminal box.

1.4.2 Order drawing number

Name	Motor specification drawing number	Amplifier model (*1)	Note
Model L6/12000	A06B-1304-B301#0141	Model 8S	Non hollow shaft no key without speed range switching Flange mounting Oil seal (L6/12000 is labyrinth seal)
Model L12/6000	A06B-1306-B300#0142	Model 12S	
Model L15/6000	A06B-1307-B300#0142	Model 15S	
Model L18/6000	A06B-1308-B300#0142	Model 18S	
Model L22/6000	A06B-1309-B300#0142	Model 22S	

(*1) An applied amplifier is a serial interface series.
(*2) The end of specification number for Built-in sensor type is B□9□.

1.5 Connections

1.5.1 Power cable size

Please use equivalent goods in the table below for the crimp terminal and the power cable used between amplifier, magnetic-contactor and motor.

Model	Crimp terminal size		Applied cable size (mm2)		
	Motor side	Amplifier side	1) LMFC cable	2) BEAMEX-ER500	3) FLUONLEX
L6/12000	M5	M5	5.5	5.5	3.5
L12/6000			8.0	8.0	5.5
L15/6000		M8	14.0	14.0	8.0
L18/6000			22.0	14.0	8.0
L22/6000			22.0	14.0	8.0

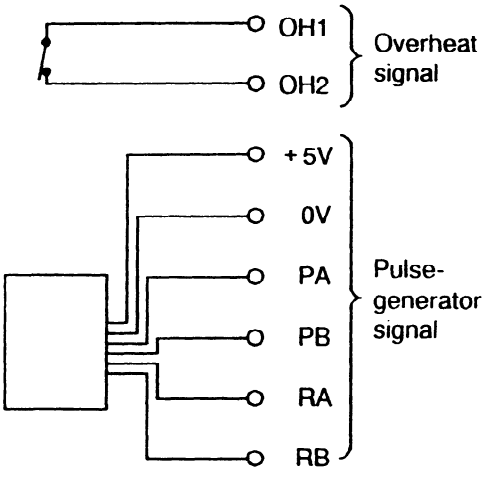
(Note 1) LMFC cable : Imcombustible poli-flex cable.
(Maximum temperature of conductor: 150°C)

(Note 2) BEAMEX-ER500 : FURUKAWA ELECTRIC CO. LTD. made
(Maximum temperature of conductor: 150°C)

(Note 3) FLUONLEX cable : HITACHI Cable Ltd. made
(Maximum temperature of conductor: 200 °C)

1.5.2 Connection of signal cable

Please connect the pulse-generator signal and overheat signal with the connector made of AMP (motor accessory).



Connector connections

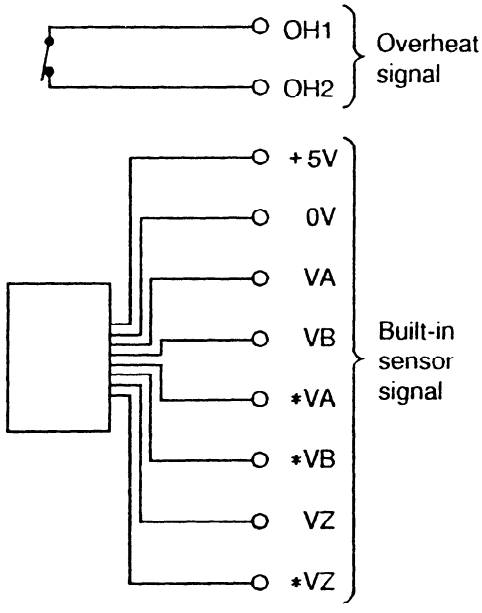
③ Blue PB	② Black PA	① Red +5V
⑥ White RB	⑤ Green RA	④ Yellow 0V
⑨ OH2	⑧ Blue /transparent SS	⑦ OH1

Connector specification: AMP universal
MATE-N-LOK connector

	Motor side	Cable side
Housing	350782-1	350720-1
Contact	350706-7	350689-6

	FANUC order specification
350782-1	A63L-0001-0219/09-C00
350706-7	A63L-0001-0220/SP706-7
350720-1	A63L-0001-0219/09-P00
350689-6	A63L-0001-0220/UN689-6

In case of built-in sensor type.



Connector connections

③ Blue *VA	② Black VA	① Red +5V
⑥ White /orange *VB	⑤ Green VB	④ White /yellow 0V
⑨	⑧ White /brown *VZ	⑦ Gray VZ
⑫ OH2	⑪ Blue /transparent SS	⑩ OH1

Connector specification: AMP universal
MATE-N-LOK connector

	Motor side	Cable side
Housing	350783-1	350735-1
Contact	350706-7	350689-6

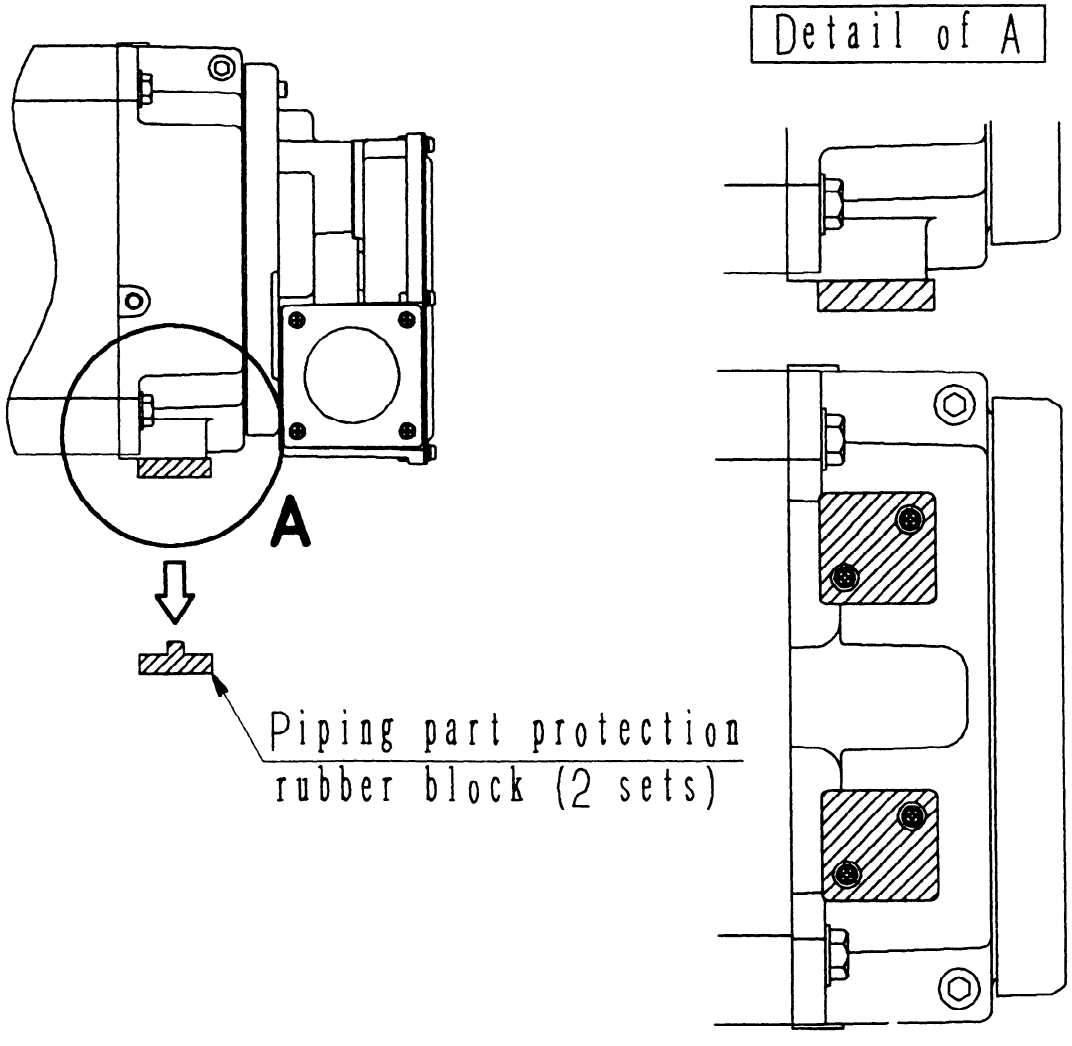
	FANUC order specification
350783-1	A63L-0001-0219/12-C00
350706-7	A63L-0001-0220/SP706-7
350735-1	A63L-0001-0219/12-P00
350689-6	A63L-0001-0220/UN689-6

1.6 Cautions in Use

1.6.1 Piping of cooling oil

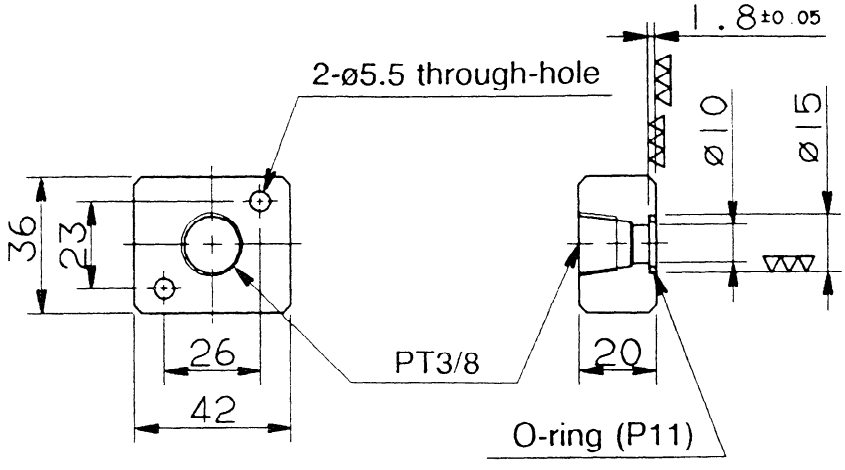
These motors require to be cooled by the cooling oil.

1.6.1.1 State in shipment

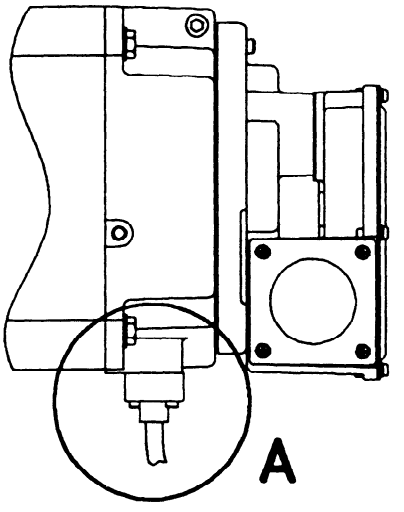


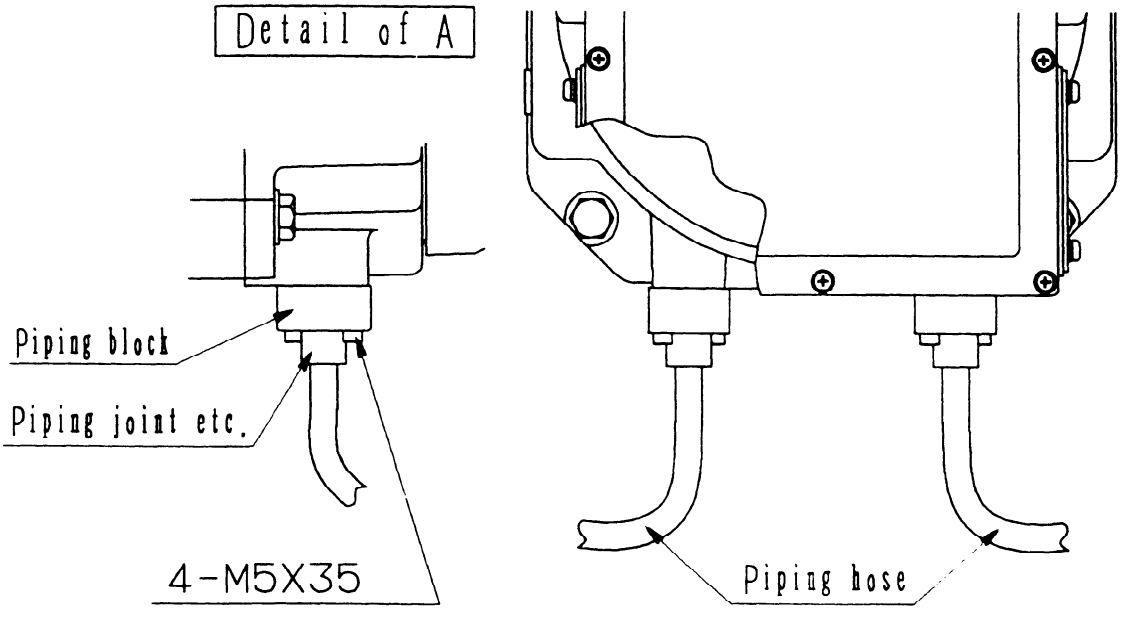
The rubber block is attached for the piping part protection. When you use the motor, please manufacture the piping block with the customer. (Refer to 1.6.1.2.)

1.6.1.2 Example of piping block



1.6.1.3 Piping example





1.6.2 Motor cooling condition

Model	L6/12000, L12/6000 L15/6000, L18/6000	L22/6000
Cooling machine capacity (*1)	More than 1163 W (more than 1000 kcal/h)	More than 1745 W (more than 1500 kcal/h)
Type of cooling oil	Turbine oil or spindle oil (Viscosity: less than $1.0 \times 10^{-5} m^2/sec.$ (10 cSt)	
The maximum inlet pressure	490 kPa (5.0 kgf/cm^2)	
Oil flow	5-10ℓ/min	
Cooling oil temperature (*2)	Within +10°C in room temperature at inlet	

(*1) It is at least necessary capacity for cooling machine to meet the output specification.
(*2) Please set temperature at cooler strictly, because when cooling oil temperature lowers less than room temperature at inlet, it might be dewy in motor.

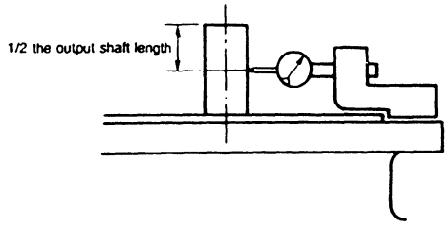
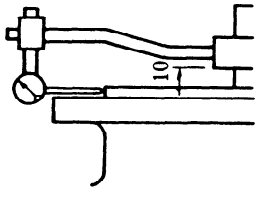
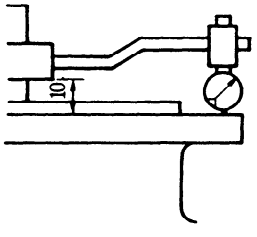
1.6.3 Allowable radial load

The allowable radial load at top of the shaft should be less than the values which are shown in the table below.

Model	Allowable radial load (kgf)
L6/12000	200
L12/6000	300
L15/6000	
L18/6000	
L22/8000	

(Note) If the radial load point is outside of shaft end, the allowable radial load is less than above value.

1.6.4 Assembly accuracy

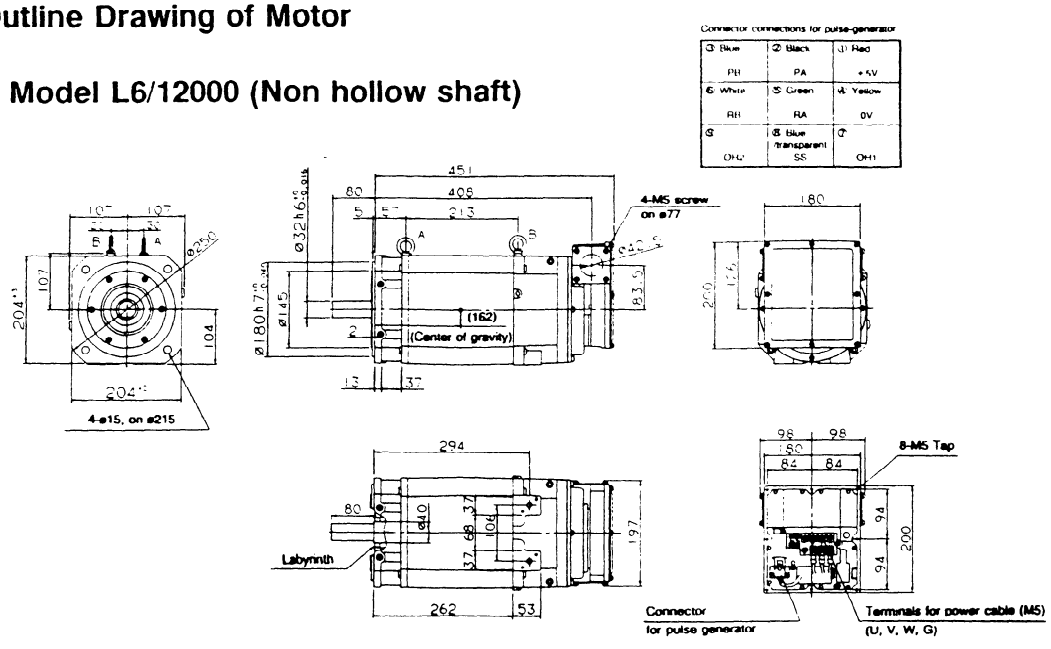
Item \ Model	L6/12000, L12/6000, L15/6000, L18/6000, L22/6000	Measuring method
Shaft Run-Out at the end of output shaft	10μm or less	
The faucet Run-Out against the output shaft	30μm or less	
The mounting surface Run-Out against the output shaft	40μm or less	

1.6.5 Utilization limitation of eye bolt

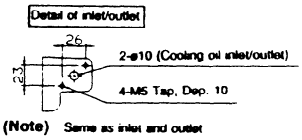
Please use the eye bolt of the motor only to hang the motor unit (It is acceptable with a coupling) due to the strength of the eye bolt.

1.7 Outline Drawing of Motor

1.7.1 Model L6/12000 (Non hollow shaft)

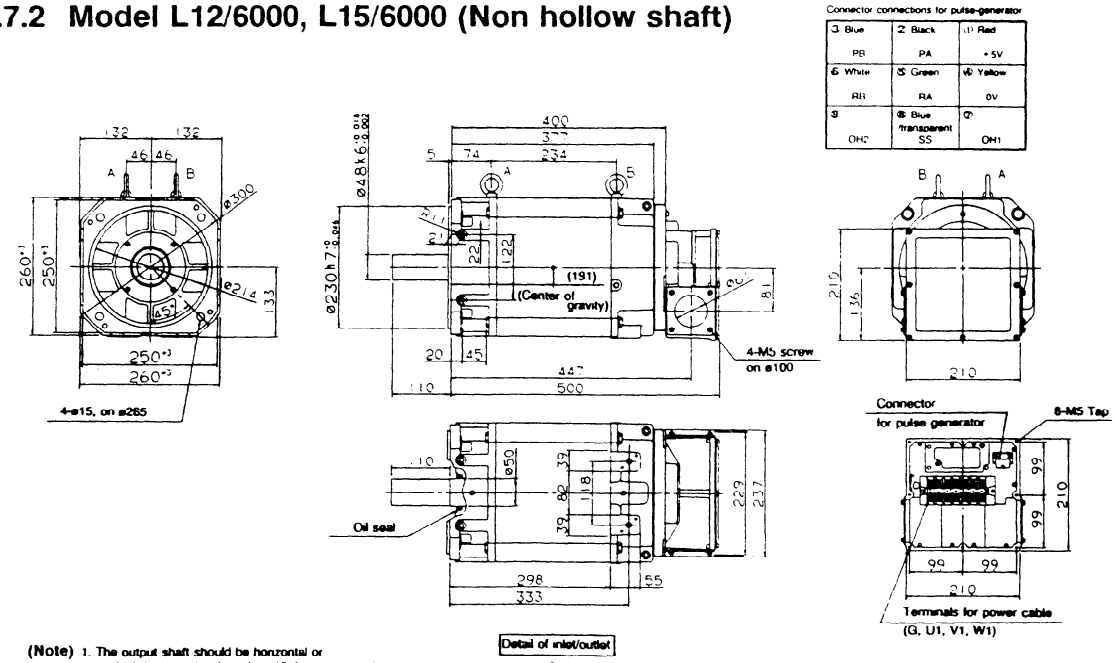


(Note) 1. The output shaft should be horizontal or vertical downward or less than 45 degree upward.
2. Use hexagon bolts M12, length 35 mm or less as mounting bolts.
3. As the seal for the shaft end is a simple labyrinth type, take care so that the flange surface may not be splashed directly with lubrication oil.

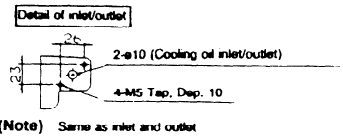


(Note) Same as inlet and outlet

1.7.2 Model L12/6000, L15/6000 (Non hollow shaft)

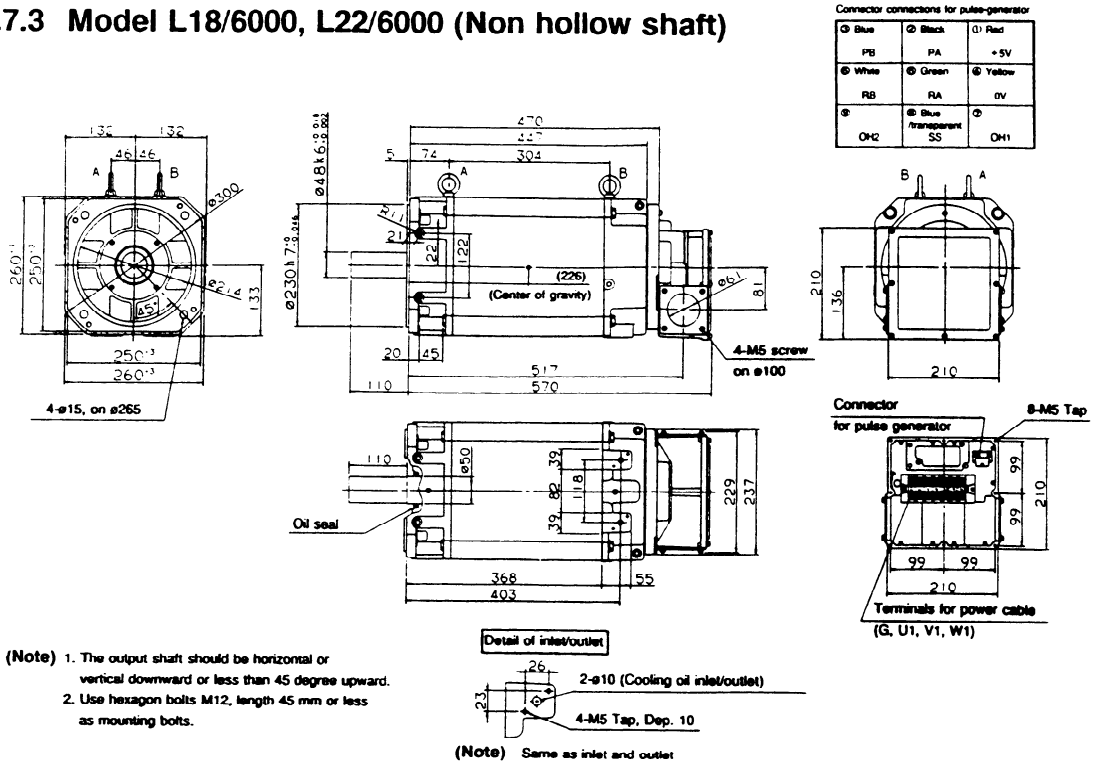


(Note) 1. The output shaft should be horizontal or vertical downward or less than 45 degree upward.
2. Use hexagon bolts M12, length 45 mm or less as mounting bolts.



(Note) Same as inlet and outlet

1.7.3 Model L18/6000, L22/6000 (Non hollow shaft)



(Note) 1. The output shaft should be horizontal or vertical downward or less than 45 degree upward.
2. Use hexagon bolts M12, length 45 mm or less as mounting bolts.

(Note) Same as inlet and outlet

2. HOLLOW SHAFT/WITH SPEED RANGE SWITCHING TYPE

2.1 Outline

Oil-cooled AC spindle motor (hollow shaft/with speed range switching type) achieves a large torque in low speed area (The speed range switching control is used), a high-speed rotation, low temperature rise and low vibration.

Connecting directly with the spindle of the machining-center, it is possible to eliminate the gear and to get high accuracy.

Spindle through coolant is available because the through hole is cut to the motor shaft.

2.2 Feature

(1) The front flange and the motor case are cooled by the specially cooling system (patent pending), and the heat conduction to the spindle head and the heat radiation to the machine side column shall be decreased.

(2) The highly efficient oil cooling system and speed range switching control enable to get big torque in low speed area.

(3) High-speed by the grease lubrication.

(4) The vibration class is V3 (rotation component) by strict rotor balance.

(5) The through hole for spindle through coolant is cut in the motor shaft.

(6) In case of connecting directly with spindle, you need not set the detector on the machine side because the incorporated built-in sensor can be used for the orientation and rigid-tap.

2.3 Specification

2.3.1 List of specification (Hollow shaft/with speed range switching type)

Item		Model	L12 /10000	L15 /10000	L22 /10000	L26 /10000	L40 /8000	L50 /8000
Low speed winding (*1)	Continuous rated output	(*2) kw	7.5	9	11	15	18.5	22
	40%ED rated output	(*2) (*3) kw	9	11	15	18.5	25	30
	Base speed	min^{-1}	500	500	500	500	450	300
	Maximum speed	min^{-1}	2000	2000	2000	2000	1500	1200
	40%ED torque	(*3) (*4) N-m (kg-cm)	172 (1753)	210 (2142)	286 (2921)	353 (3603)	530 (5410)	954 (9738)
High speed winding (*1)	Continuous rated output	(*2) kw	7.5	9	15	18.5	22	26
	30 min., 50%ED rated output	(*2) (*3) kw	9	11	18.5	22	30	30
	Base speed	min^{-1}	2000	2000	2000	2000	2000	1200
	Maximum speed	min^{-1}	10000	10000	10000	10000	8000	8000
	30 min., 50%ED rated torque	(*3) (*4) N-m (kg-cm)	42.9 (438)	52.5 (536)	88 (901)	105 (1071)	143 (1461)	239 (2435)
GD^2		$kg-m^2$	0.36	0.36	0.51	0.67	1.18	1.96
Rotor inertia		$N-m-s^2$ ($kg-cm-s^2$)	0.091 (0.93)	0.091 (0.93)	0.126 (1.29)	0.167 (1.70)	0.29 (3.0)	0.49 (5.0)
Weight		kg	110	110	145	180	255	390
Vibration			V3 (rotation component)					
Noise		dB (A)	75					
Cooling system			(*5) Oil cooled					
Installation			The output shaft be horizontal or vertically downward or less than 45° upward.					
Allowable overload capacity		(*7) (1 min.)	High speed winding : 120% for rated 40%ED Low speed winding : 120% for rated 30 min.					
Insulation			Class F					
Ambient temperature		°C	0 to 40					
Painting color			Munsell system N2.5					
Accessories			Built-in sensor and thermostat					
Builtin sensor pulse		p/rev	(*6) 1024					
Bearing lubrication			Grease					
Allowable radial load		kg	Direct connection					
Amplifier model (serial interface)			8S	12S	15S	22S	26S	30S

(*1) Optional speed range switching control (⅄— ⅄ switching) is necessary. Please refer to power curve about switching speed.

(*2) The rated output is guaranteed at the rated voltage. (AC200/220/230V)
If the input voltage fluctuates, it is possible that the rated output cannot be obtain even when such functions are within the allowable fluctuation range.

(*3) The cycle time is 10 minutes, 50%ED : ON 5.0 min., OFF 5.0 min.
40%ED : ON 4.0 min., OFF 6.0 min.

(*4) Short time rated torque at constant range.

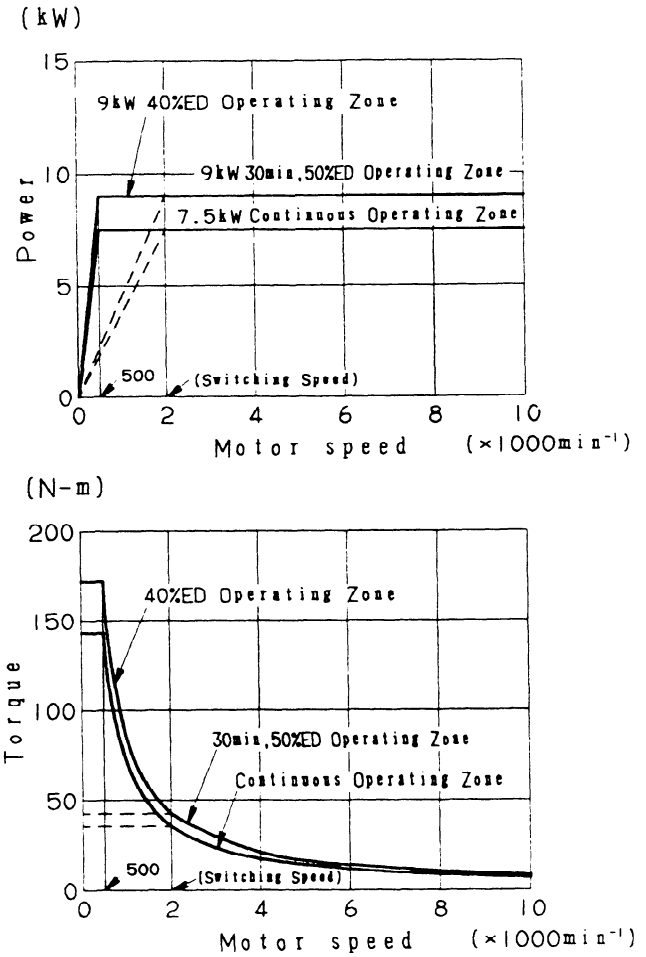
(*5) Please prepare the cooling unit and cooling oil which is recommend at 6.2.

(*6) Optional signal conversion circuit is necessary.

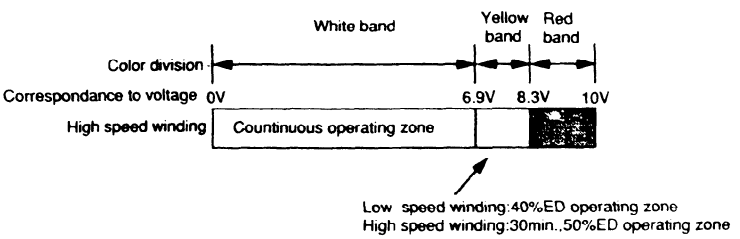
(*7) The allowable over load capacity is a typical value of the motor maximum output at AC 200V and not a guaranteed value.

2.3.2 Output and torque character

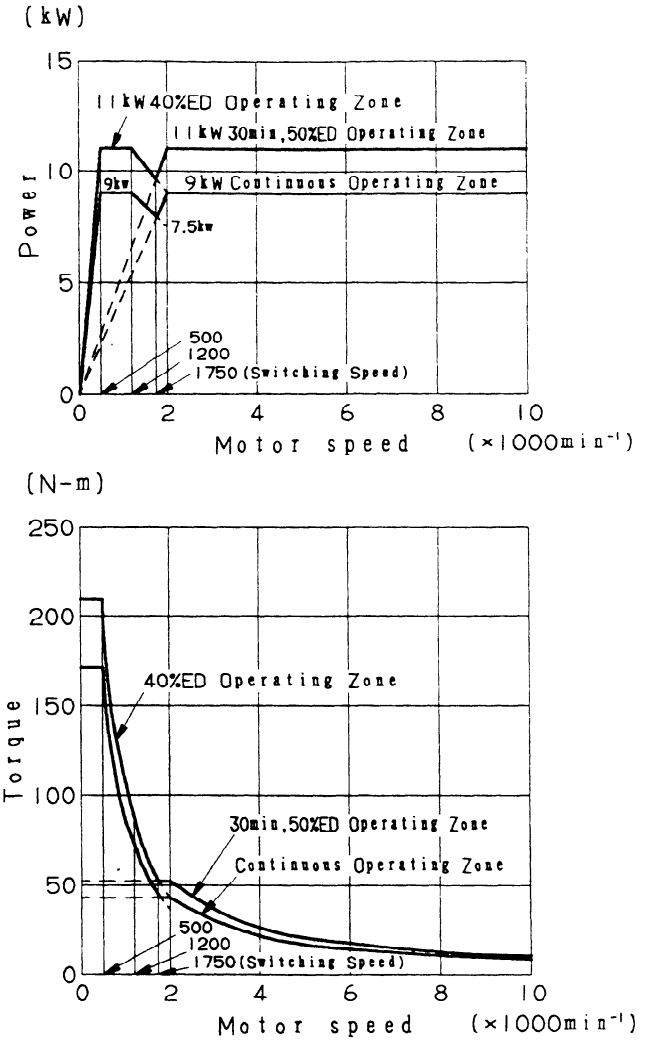
2.3.2.1 Model L12/10000 (with speed range switching type)



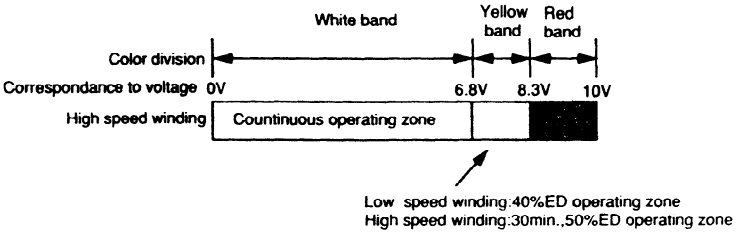
Load Meter Scale



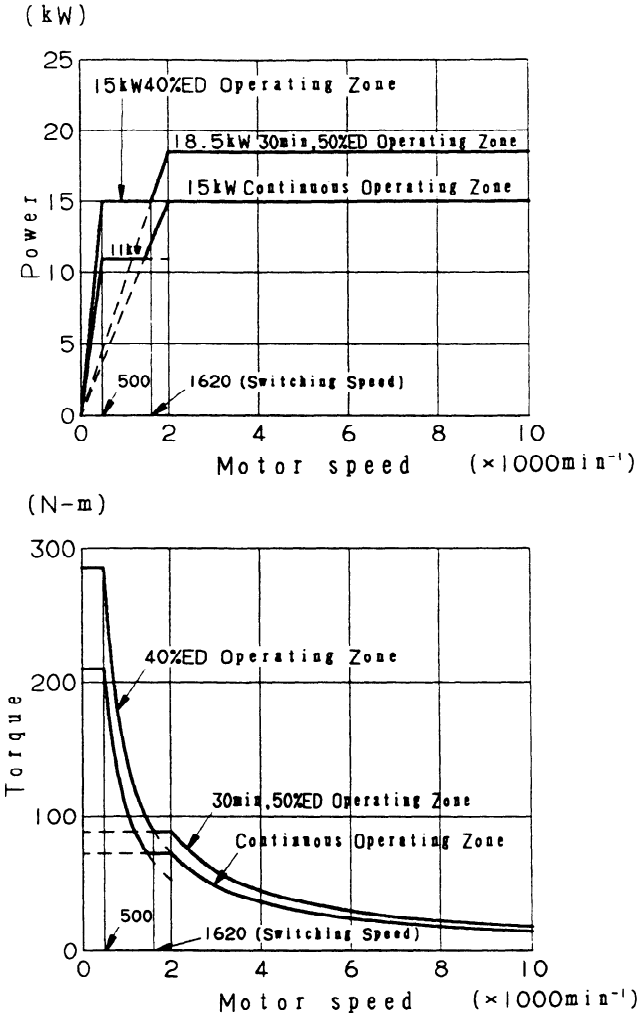
2.3.2.2 Model L15/10000 (with speed range switching type)



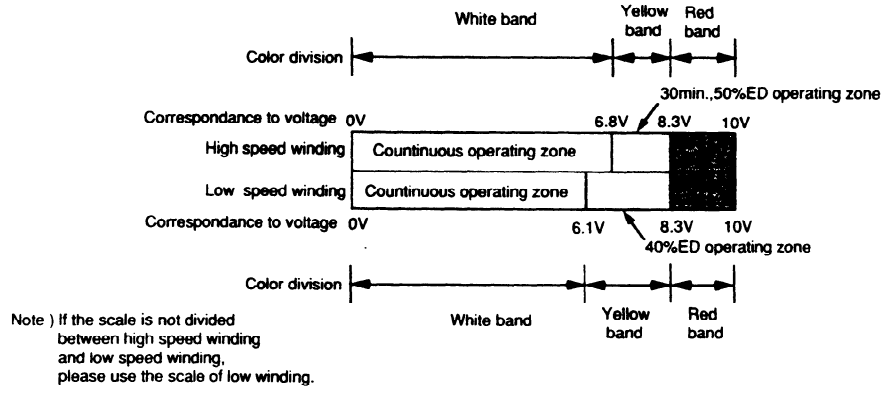
Load Meter Scale



2.3.2.3 Model L22/10000 (with speed range switching type)

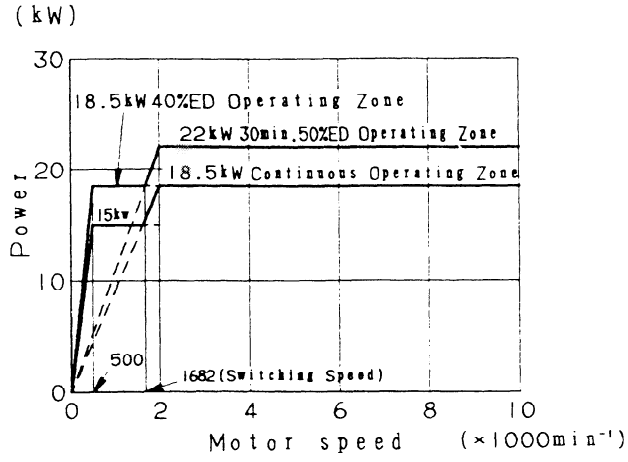


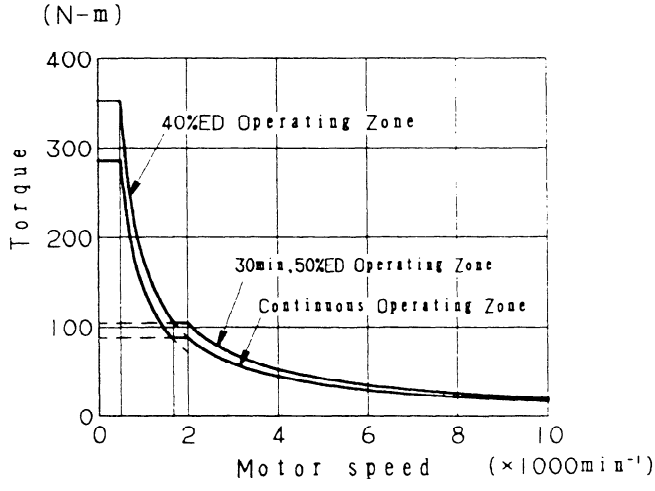
Load Meter Scale



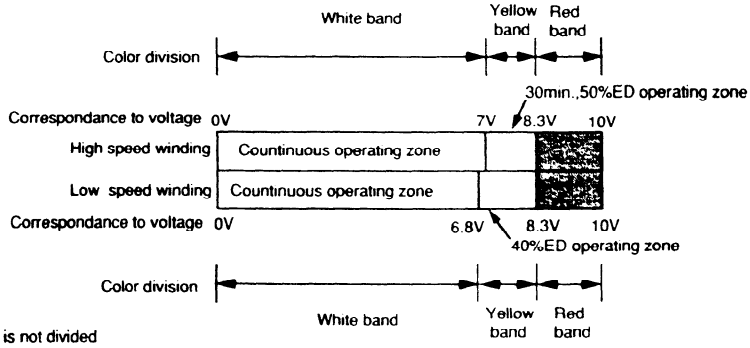
Note) If the scale is not divided between high speed winding and low speed winding, please use the scale of low winding.

2.3.2.4 Model L26/10000 (with speed range switching type)



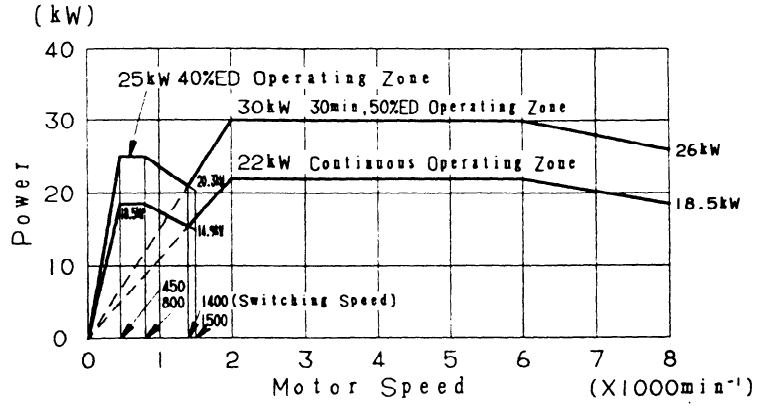


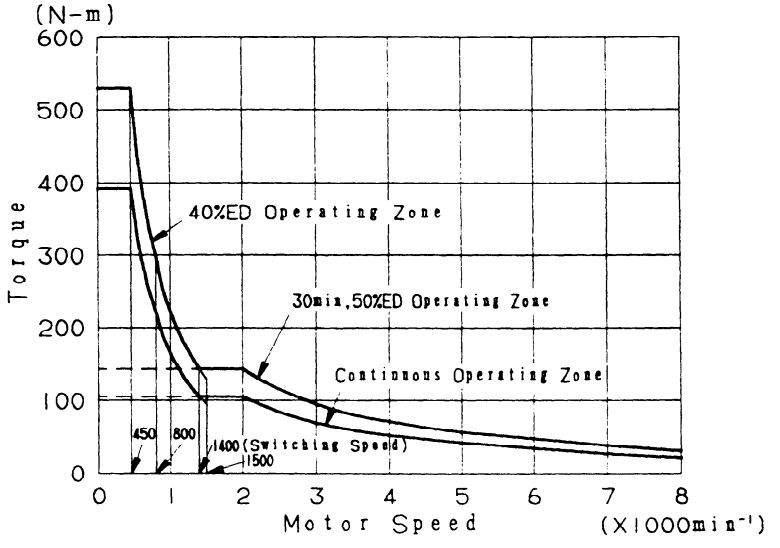
Load Meter Scale



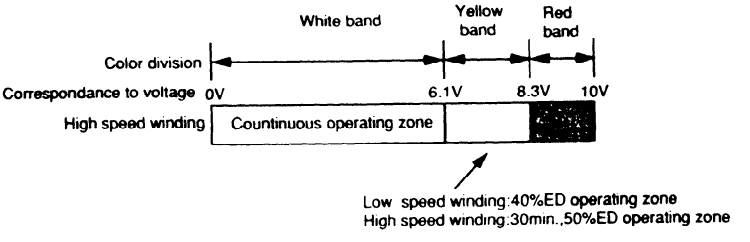
Note) If the scale is not divided between high speed winding and low speed winding, please use the scale of low winding

2.3.2.5 Model L40/8000 (with speed range switching type)

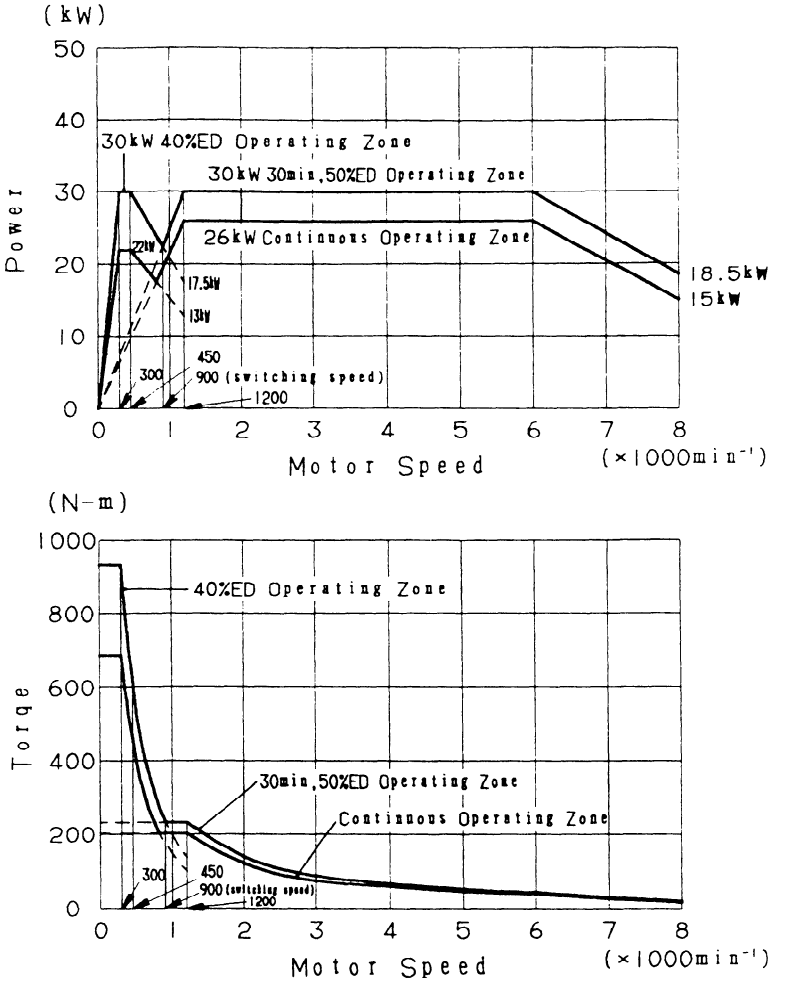




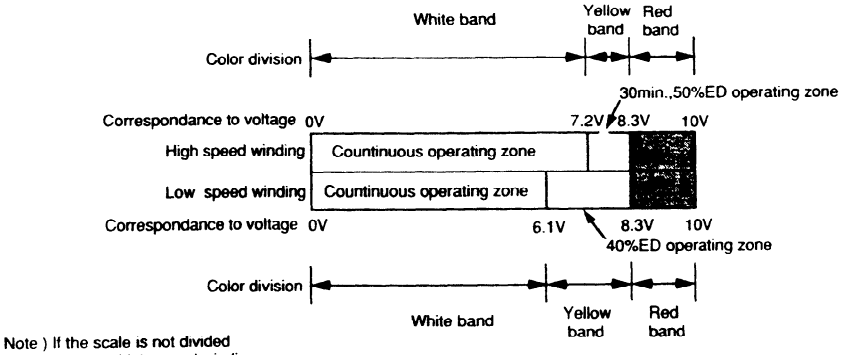
Load Meter Scale



2.3.2.6 Model L50/8000 (with speed range switching type)



Load Meter Scale



Note) If the scale is not divided between high speed winding and low speed winding, please use the scale of low winding.

2.4 Configuration and Order Specification Drawing Number

2.4.1 Configuration

Oil-cooled AC spindle motor is composed of the following.

(1) Oil-cooled AC spindle motor

(2) Connector for built-in sensor (housing and contact)
The connector is stored as accessories in the terminal box.

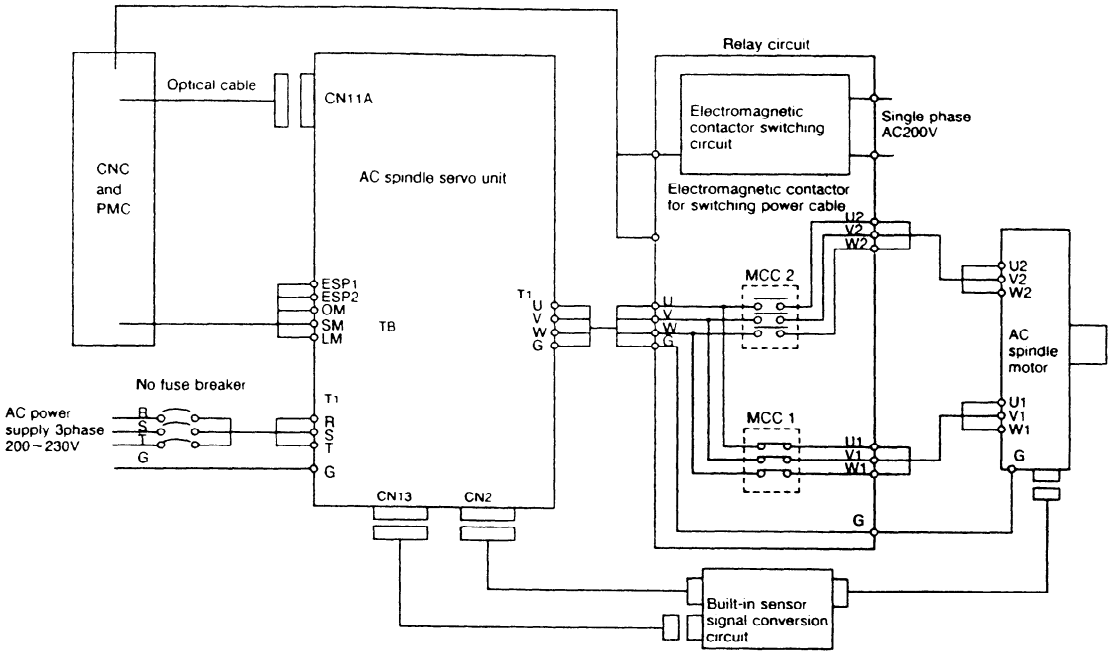
2.4.2 Order specification drawing number

Name	Motor specification drawing number	Amplifier model (*1)	Note
Model L12/10000	A06B-1326-B394#3041	Model 8S	Hollow shaft no key with speed range switching Flange mounting Built-in sensor type (*2) Labyrinth seal
Model L15/10000	A06B-1327-B394#3041	Model 12S	
Model L22/10000	A06B-1329-B394#3041	Model 15S	
Model L26/10000	A06B-1339-B394#3041	Model 22S	
Model L40/8000	A06B-1331-B394#3041	Model 26S	
Model L50/8000	A06B-1332-B394#3041	Model 30S	

(1*) An applied amplifier is a serial interface series.
(2*) The signal conversion circuit is necessary.

2.5 Connections

2.5.1 Connection diagram



(Note 1) Items such as units and cables other than the AC spindle servo unit, and AC spindle motor, which are surrounded by the unbroken line, must be provided by the machine tool builder.

(Note 2) The switching type of the power-line is 人 – 人 type.

(Note 3) The relation between the operation of the magnetic-contactor and the state of the winding is the following.

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

(Note 4) Please refer to Chapter XV. SPEED RANGE SWITCHING CONTROL for the switching sequence of a low speed winding/high speed winding.

2.5.2 Power cable size

Please use equivalent goods in the table below for the crimp terminal and the power cable used between amplifier, magnetic-contactor and motor.

Model	Crimp terminal size		Applied cable size (mm2)		
	Motor side	Amplifier side	1) LMFC cable	2) BEAMEX-ER500	3) FLUONLEX
L12/10000	M5	M5	5.5	5.5	3.5
L15/10000			8.0	8.0	5.5
L22/10000		M8	14.0	14.0	8.0
L26/10000			22.0	14.0	8.0
L40/8000	M8		22.0	22.0	14.0
L50/8000		M10	30.0	22.0	14.0

(Note 1) LMFC cable : Imcombustible poli-flex cable.
(Maximum temperature of conductor: 150°C)

(Note 2) BEAMEX-ER500 : FURUKAWA ELECTRIC CO. LTD. made
(Maximum temperature of conductor: 150°C)

(Note 3) FLUONLEX cable : HITACHI Cable Ltd. made(Maximum temperature of conductor: 200 °C)

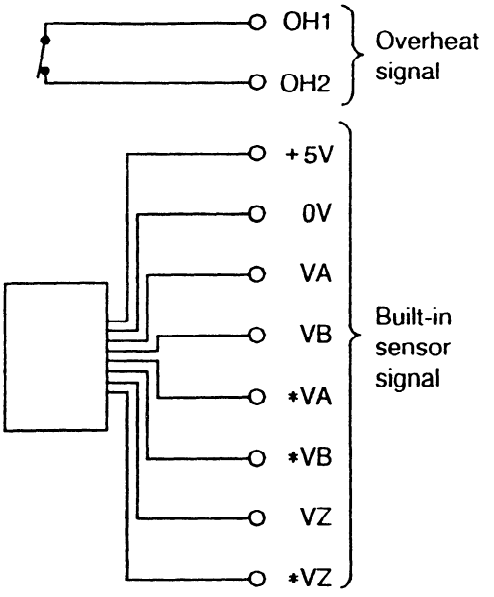
2.5.3 Magnetic-contactor for switching

Please use equivalent goods in the tabl below for magnetic-contactor (MCC1, MCC2) for the power cable switching of 5.1.

Motor model	L12 /10000	L15 /1000	L22 /10000	L26 /10000	L40 /8000	L50 /8000
Applied amplifier model	8S	12S	15S	22S	26S	30S
Magnetic-contactor model (made by Fuji Electric Co., Ltd.)	SC-2N	SC-2SN	SC-3N	SC-5N	SC-6N	SC-7N

2.5.4 Connection of signal cable

Please connect the built-in sensor signal and the overheat signal with the connector made of AMP (motor accessory).



Connector connections

③ Blue *VA	② Black VA	① Red +5V
⑥ White /orange *VB	⑤ Green VB	④ White /yellow 0V
⑨	⑧ White /brown *VZ	⑦ Gray VZ
⑫ OH2	⑪ Blue /transparent SS	⑩ OH1

Connector specification: AMP universal MATE-N-LOK connector

	Motor side	Cable side
Housing	350783-1	350735-1
Contact	350706-7	350689-6

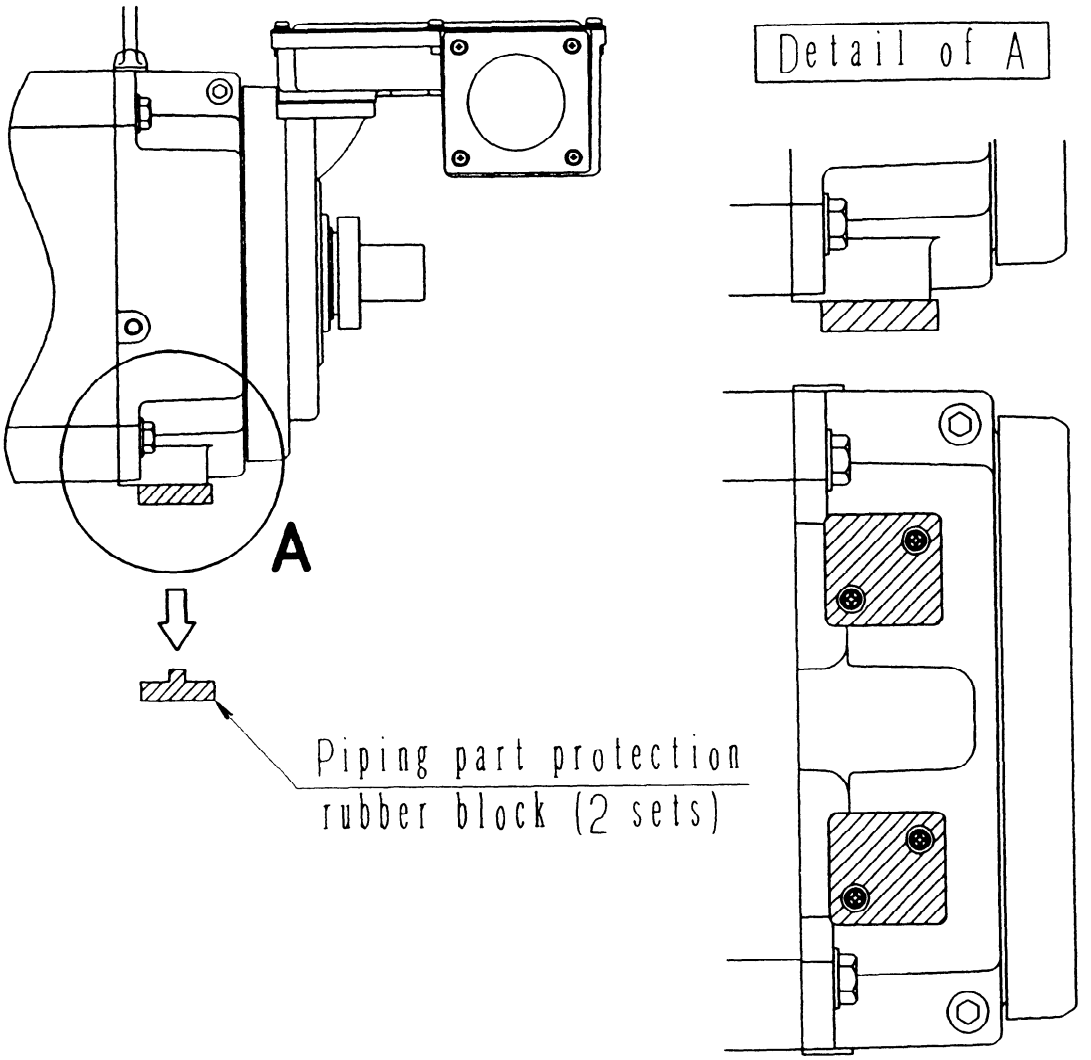
	FANUC order specification
350783-1	A63L-0001-0219/12-C00
350706-7	A63L-0001-0220/SP706-7
350735-1	A63L-0001-0219/12-P00
350689-6	A63L-0001-0220/UN689-6

2.6 Cautions in Use

2.6.1 Piping of cooling oil

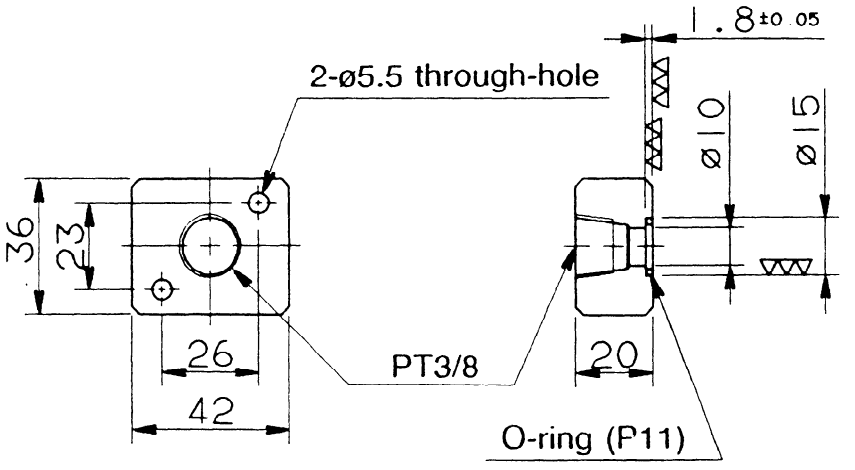
These motors require to be cooled by the cooling oil.

2.6.1.1 State in shipment

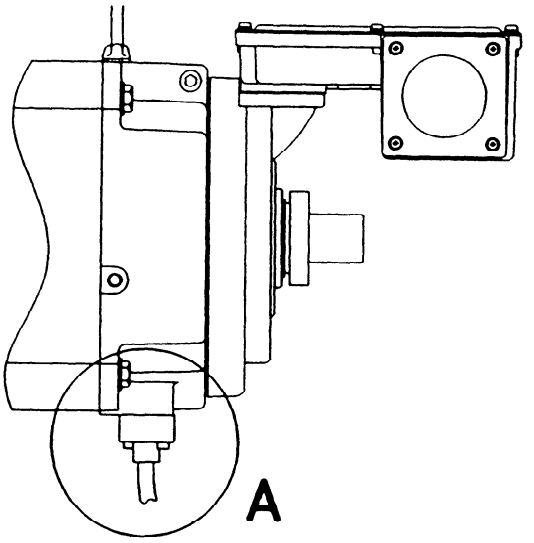


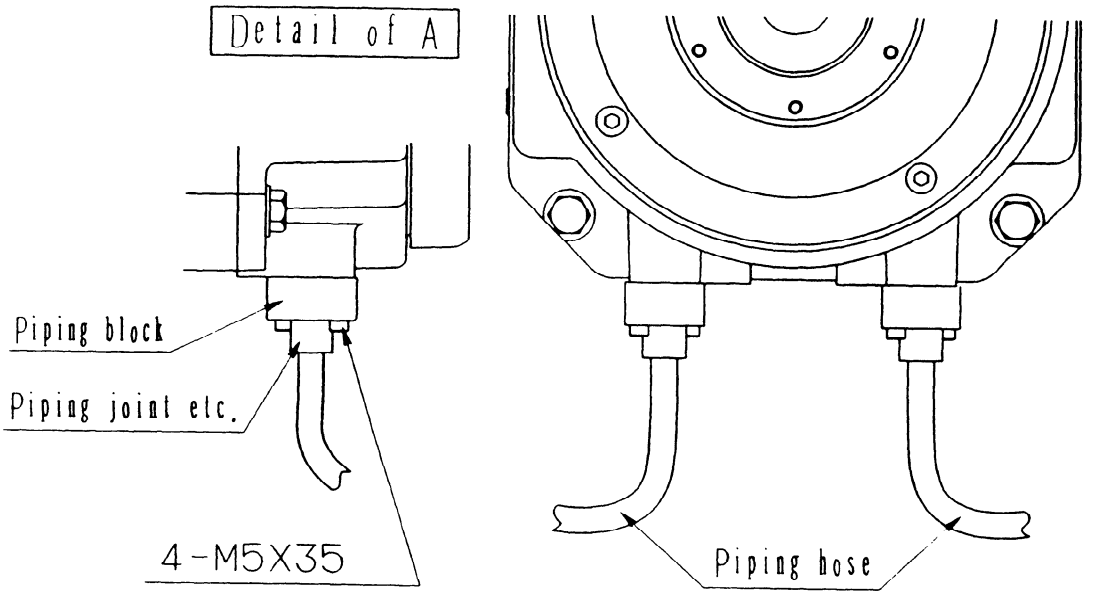
The rubber block is attached for the piping part protection. When you use the motor, please manufacture the piping block with the customer. (Refer to 2.6.1.2.)

2.6.1.2 Example of piping block



2.6.1.3 Piping example





2.6.2 Motor cooling condition

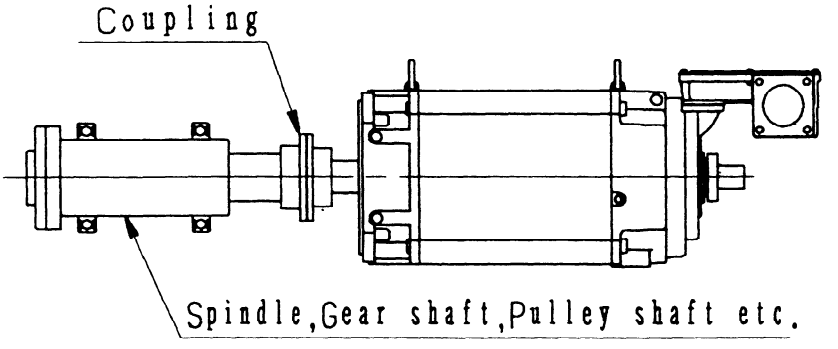
Model	L12/10000, L15/10000	L22/10000, L26/10000 L40/8000, L50/8000
Cooling machine capacity (*1)	More than 1745 W (more than 1500 kcal/h)	More than 2908 W (more than 2500 kcal/h)
Type of cooling oil	Turbine oil or spindle oil (Viscosity: less than $1.0 \times 10^{-5} m^2/sec.$ (10 cSt)	
The maximum inlet pressure	490 kPa (5.0 kgf/cm^2)	
Oil flow	5-10ℓ/min	
Cooling oil temperature (*2)	Within +10°C in room temperature at inlet	

(*1) It is at least necessary capacity for cooling machine to meet the output specification.
(*2) Please set temperature at cooler strictly, because when cooling oil temperature lowers less than room temperature at inlet, it might be dewy in motor.

2.6.3 Connection with machine

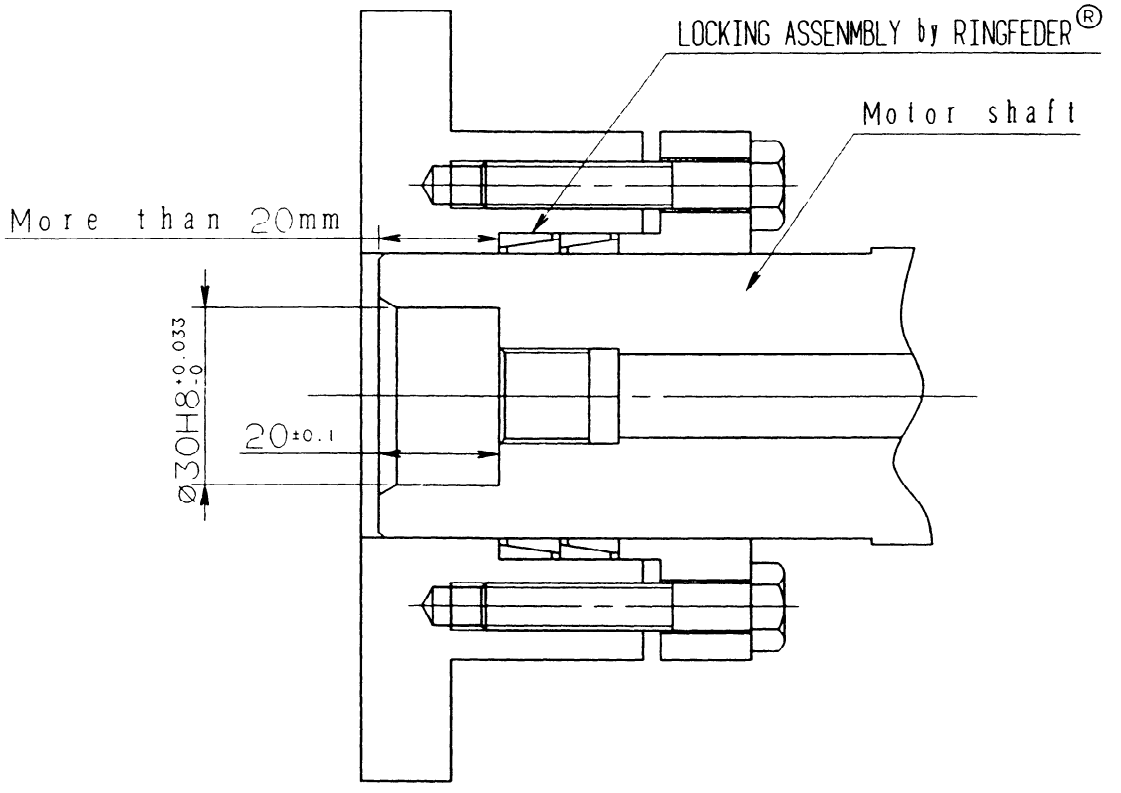
Please adopt the method of connection as a radial load and the thrust load do not load on the motor shaft because the bearing life is secured.

Connection example

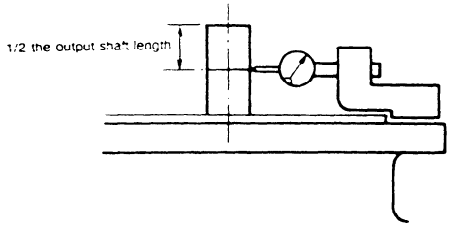
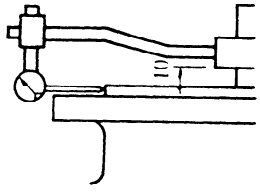
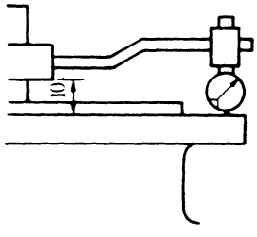


Please select SPANNRING*) that can transmit the torque of 3.6 multiple 40%ED ratings torques.
Please secure 20 millimenters or more from the motor shaft point for the position of SPANNRING as shown in the drawing below.

(*) LOCKING-ASSEMBLY by RINGFEDER®



2.6.4 Assembly accuracy

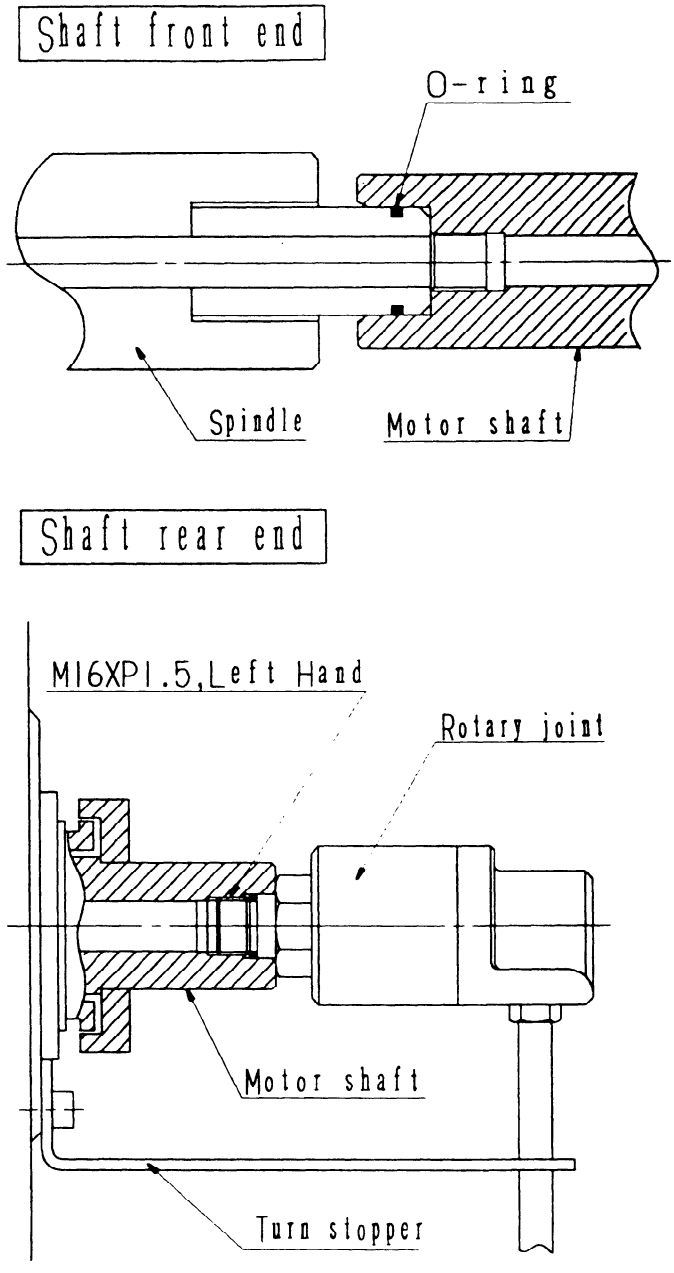
Item \ Model	L12/10000 L15/10000 L22/10000 L26/10000	L40/8000 L50/8000	Measuring method
Shaft Run-Out at the end of output shaft	10μm or less		
The faucet Run-Out against the output shaft	30μm or less	40μm or less	
The mounting surface Run-Out against the output shaft	40μm or less	50μm or less	

2.6.5 Utilization limitation of eye bolt

Please use the eye bolt of the motor only to hang the motor unit (It is acceptable with a coupling) due to the strength of the eye bolt.

2.6.6 Connection with through hole

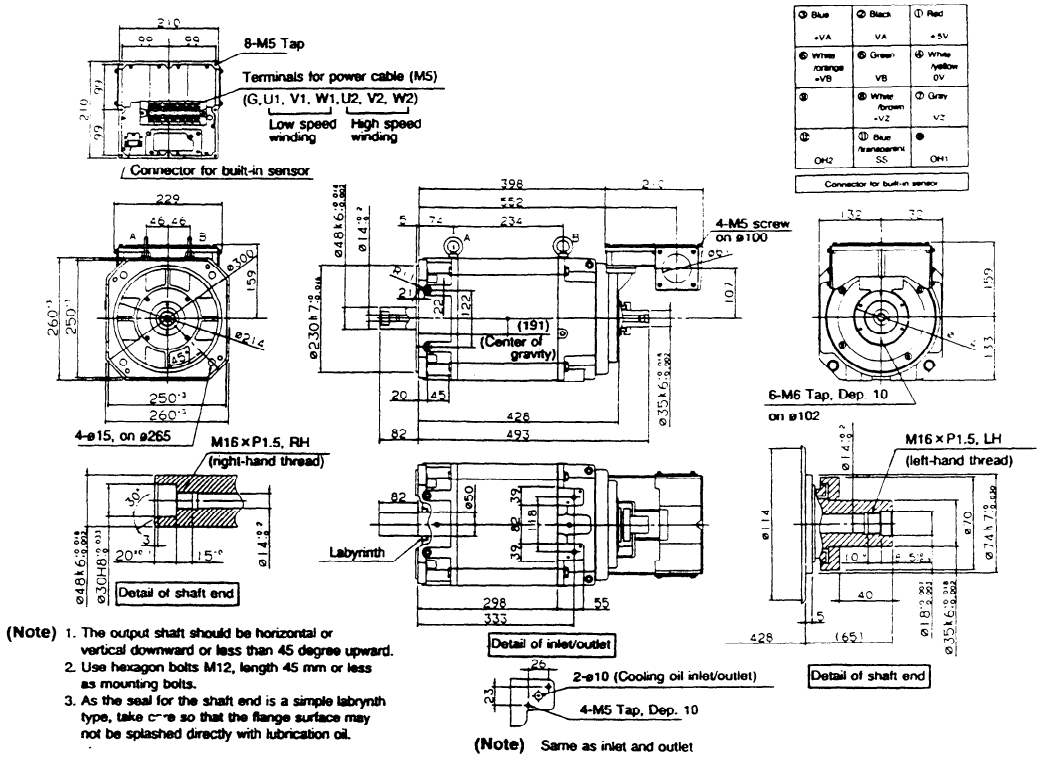
Please use the through hole only to flow spindle through coolant. Please separately consult with GE FANUC in case of other usages. The figure below shows the connection example.



Please refer to the specifications of each rotary joint conserning the method to stop turn of joint.

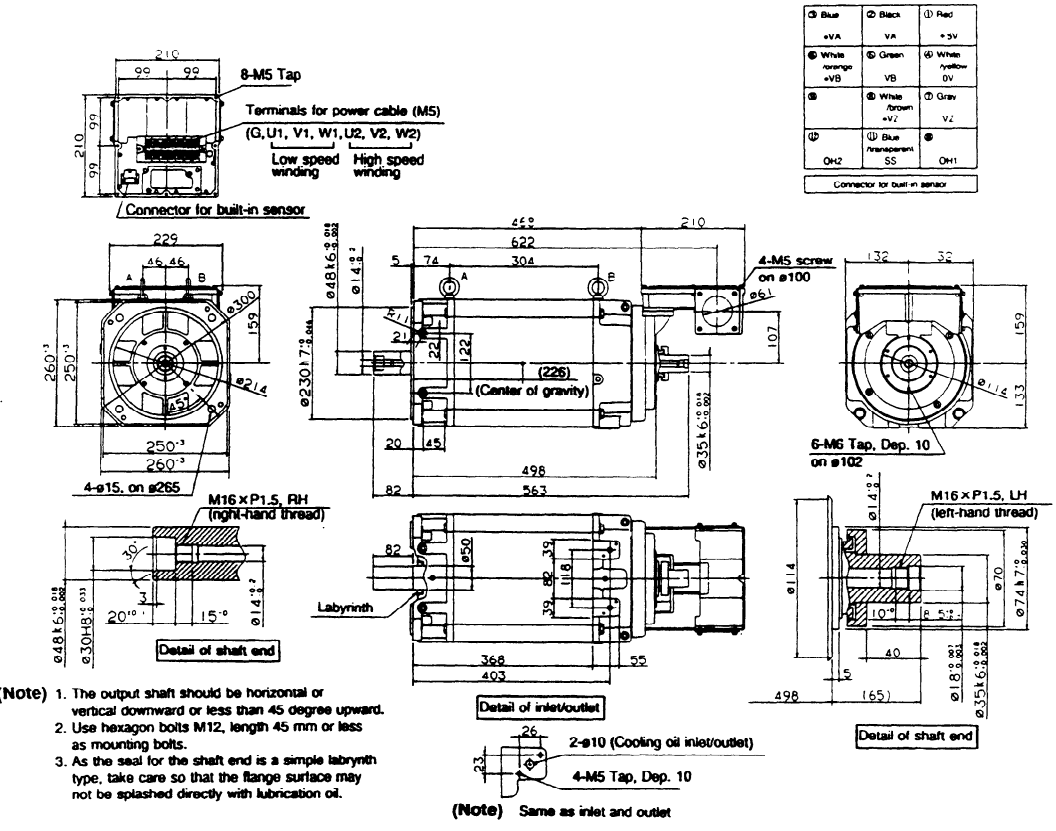
2.7 Outline Drawing of Motor

2.7.1 Model L12/10000, L15/10000 (Hollow shaft)



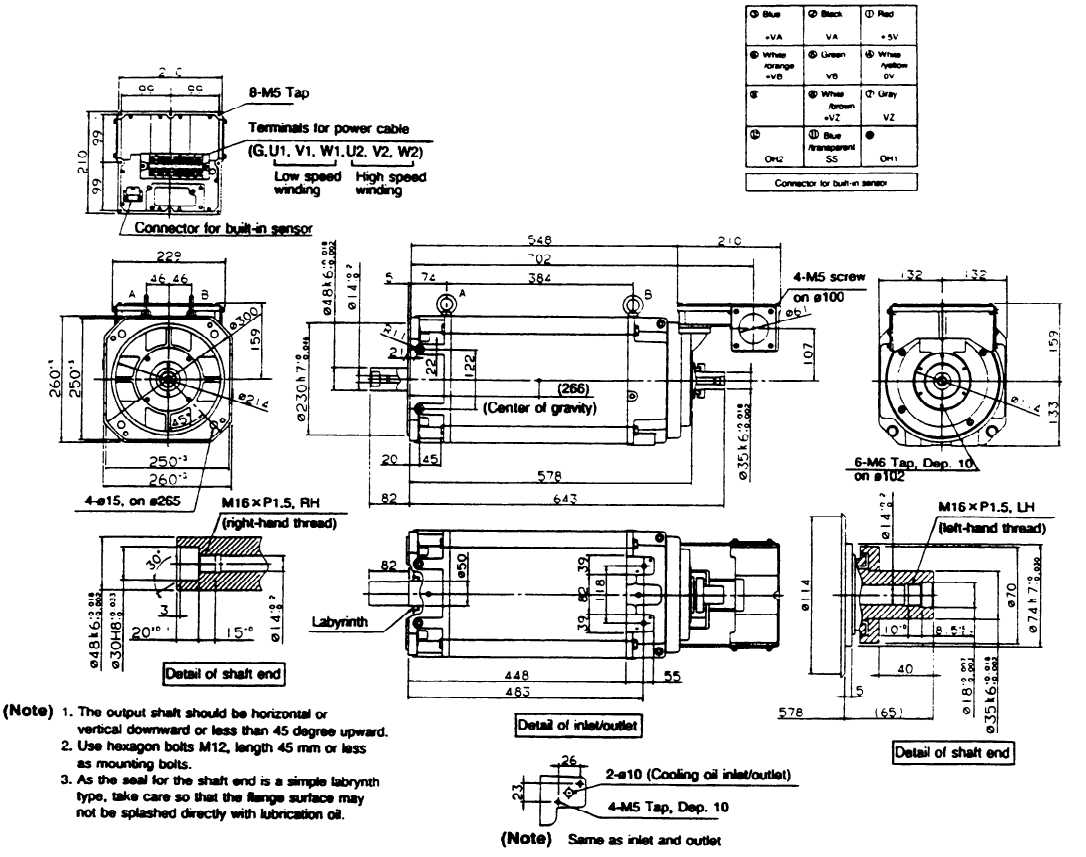
(Note) 1. The output shaft should be horizontal or vertical downward or less than 45 degree upward.
2. Use hexagon bolts M12, length 45 mm or less as mounting bolts.
3. As the seal for the shaft end is a simple labrynth type, take care so that the flange surface may not be splashed directly with lubrication oil.

2.7.2 Model L22/10000 (Hollow shaft)



(Note) 1. The output shaft should be horizontal or vertical downward or less than 45 degree upward.
2. Use hexagon bolts M12, length 45 mm or less as mounting bolts.
3. As the seal for the shaft end is a simple labrynth type, take care so that the flange surface may not be splashed directly with lubrication oil.

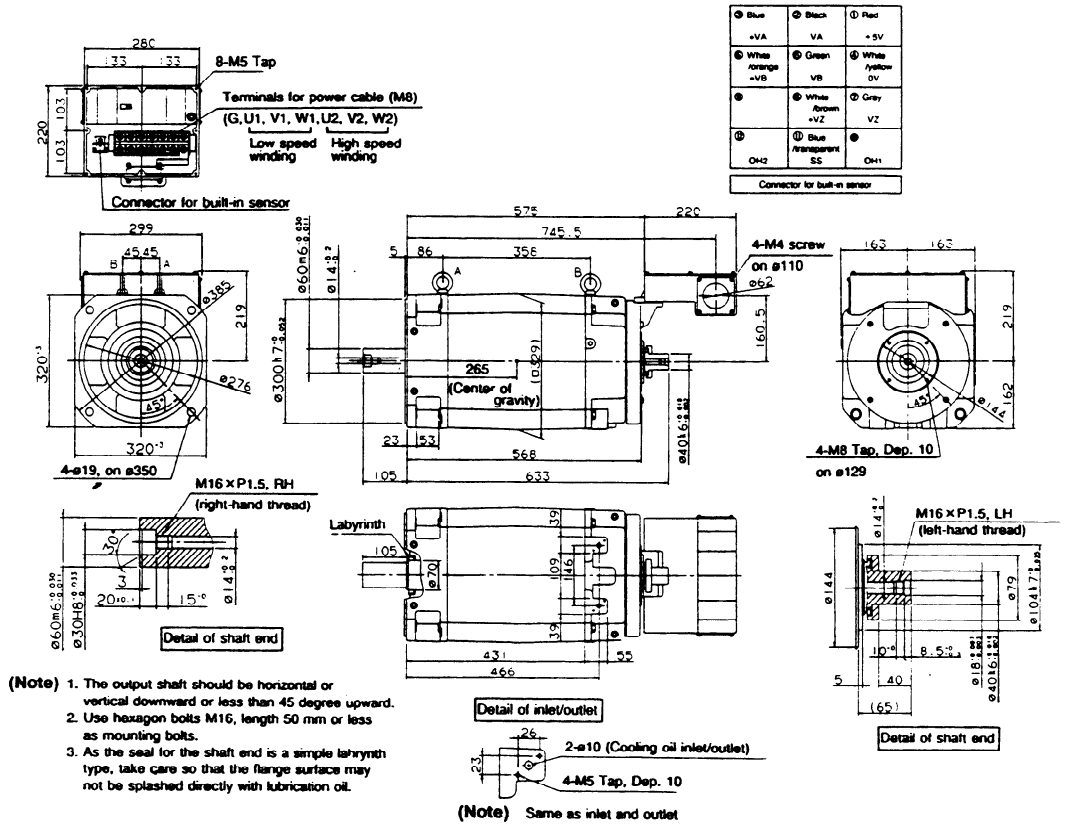
2.7.3 Model L26/10000 (Hollow shaft)



(Note) 1. The output shaft should be horizontal or vertical downward or less than 45 degree upward.
2. Use hexagon bolts M12, length 45 mm or less as mounting bolts.
3. As the seal for the shaft end is a simple labrynth type, take care so that the flange surface may not be splashed directly with lubrication oil.

(Note) Same as inlet and outlet

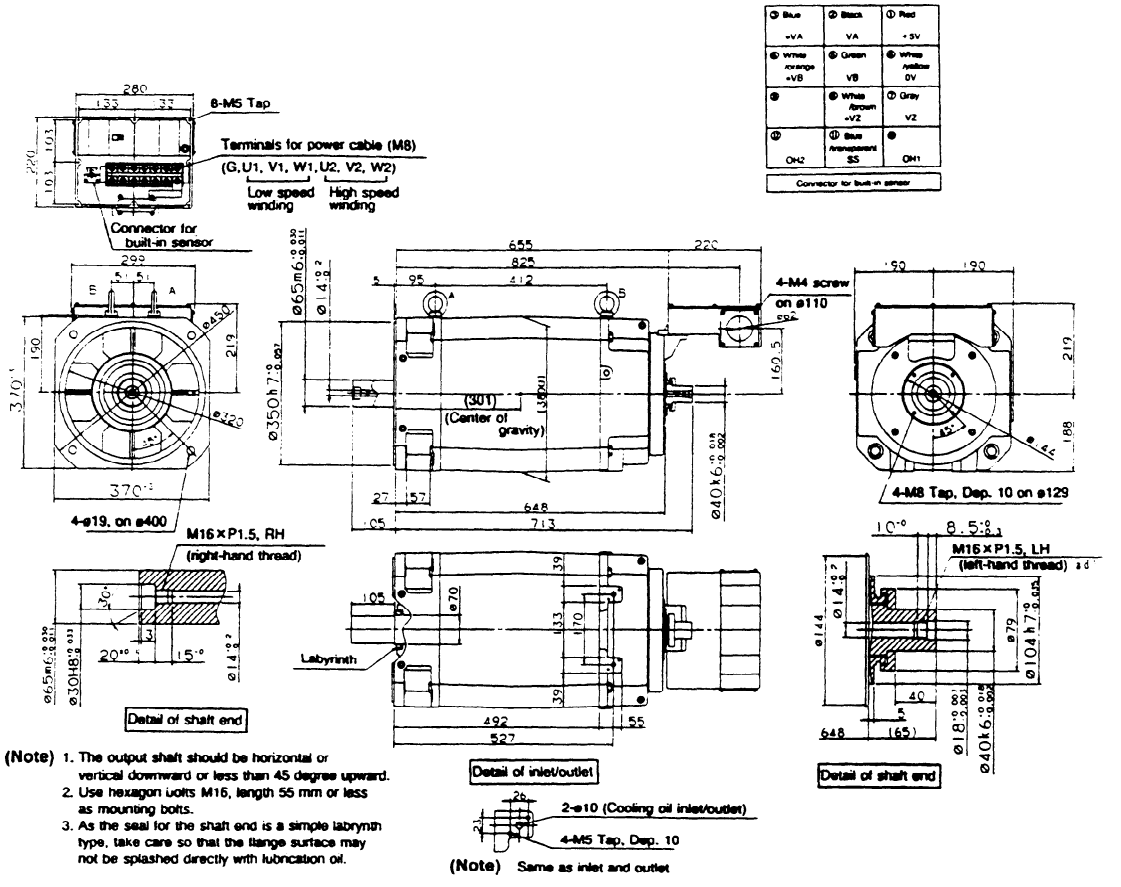
2.7.4 Model L40/8000 (Hollow shaft)



(Note) 1. The output shaft should be horizontal or vertical downward or less than 45 degree upward.
2. Use hexagon bolts M16, length 50 mm or less as mounting bolts.
3. As the seal for the shaft end is a simple labrynth type, take care so that the flange surface may not be splashed directly with lubrication oil.

(Note) Same as inlet and outlet

2.7.5 Model L50/8000 (Hollow shaft)



(Note) 1. The output shaft should be horizontal or vertical downward or less than 45 degree upward.
2. Use hexagon bolts M16, length 55 mm or less as mounting bolts.
3. As the seal for the shaft end is a simple labrynth type, take care so that the flange surface may not be splashed directly with lubrication oil.

(Note) Same as inlet and outlet

VI. IP65 series

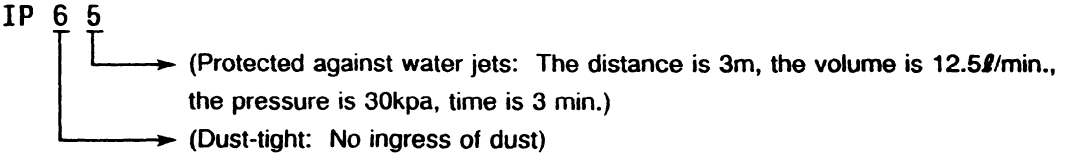
1. FEATURES

(1) This motor conforms to IP65 in IEC standard, and has perfect dustproof and waterproof for every direction.

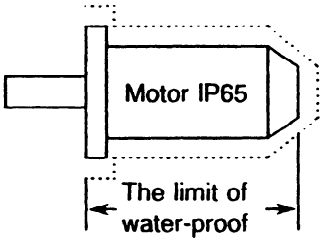
(2) This motor is most suited for a sub-spindle and a spindle motor for tool rotation.

(3) Model 1S to 3S are provided, and are available for continuous output torque 0.29 kgm to 1.43 kgm.

Meaning of IP65



The limit of water-proof



The limit of water-proof is that ----- shows the range in the fig.
The range is at the rear of the flange's face.

2. SPECIFICATIONS

2.1 AC Spindle Motor (IP65)

Item \ Model			1S	1.5S	2S	3S
Output	Continuous rated *1	kW	0.9	0.9	1.5	2.2
	15 min rated *1 *3	kW	2.2	3.7	3.7	5.5
	50% ED rated *2 *4	kW	2.2	3.7	3.7	5.5
Rotation speed	Base speed	min^{-1}	3000	1500	1500	1500
	Maximum speed	min^{-1}	8000	8000	8000	6000
Output torque (Continuous rated torque)		Nm (kg · m)	2.84 (0.29)	5.73 (0.58)	9.55 (0.97)	14.0 (1.43)
GD^2		$kg \cdot m^2$	0.012	0.017	0.031	0.059
Rotor inertia		$N \cdot m \cdot sec^2$ ($kg \cdot cm \cdot sec^2$)	0.003 (0.03)	0.004 (0.04)	0.0082 (0.08)	0.015 (0.15)
Weight		kg	18	24	27	46
Cooling system			TENV			
Installation			The output shaft should be horizontal or vertically downward			
Allowable overload capacity			120% of 15 minurate-rating for one minute			
Insulation			Class F			
Ambient temperature			0 to 40°C			
Vibration			V5			
Noise			75 dB (A)			
Painting color			Munsell system N2.5			
Number of pulses for built-in sensor (option)			512 p/rev			
Accessories			Pulse generator and thermostat			

(*1) If the input voltage fluctuates, it is possible that the rated output cannot be obtained even when such fluctuations are within the allowable fluctuation range.

(*2) The cycle time is 10 minutes. For 50% ED, 5 minutes for ON and 5 minutes for OFF.

(*3) For model 1.5S data is in 10-minute rated output. For model 3S data is in 30-minute rated output.

(*4) For model 1.5S: 30% ED, ON 3 min, OFF 7 min.

(*5) The indication of load meter of IP65 series is different form that of standard series.

2.2 AC Spindle Servo Unit (Serial Spindle)

Item \ Model	1S	1.5S	2S	3S
Applicable spindle amplifier	1S	2S	2S	3S
Power supply capacity at 15-minute rating *1	4	7	7	9
Power supply *2	200/220/230V +10%, −15% 50/60 Hz ± 1 Hz			
Main circuit system	Transister PWM invertor			
Feed back system	Speed feed back by pulse generator			
Braking system (Regenerative energy processing system)	Regenerative braking (Power regeneration)			
Speed control range	80 to 80000			60 to 6000
Speed variation	Less than 0.1% of maximum speed (load variation 10 to 100%)			
Ambient temperature	0 to 55°C			
Cooling system	External radiation type *3			
Weight kg	13			

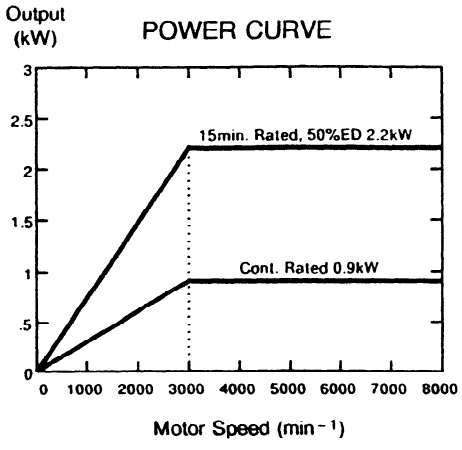
(*1) For model 1.5S data is in 10-minute rating. For model 3S data is in 30-minute rating.

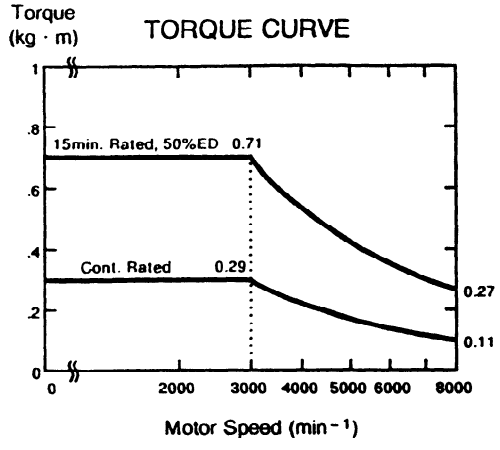
(*2) When a power supply voltage other than specification above is used, a transformer is required.

(*3) The cooling fan motor of the radiator is built in.

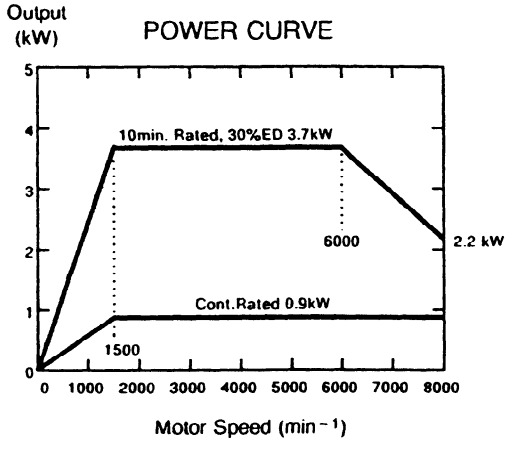
3. CHARACTERISTIC

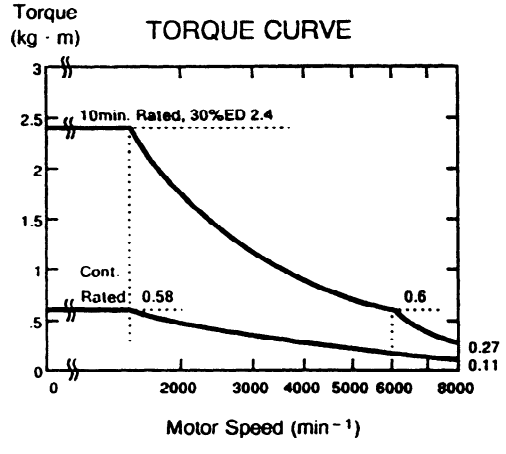
(1) Model 1S (IP65)



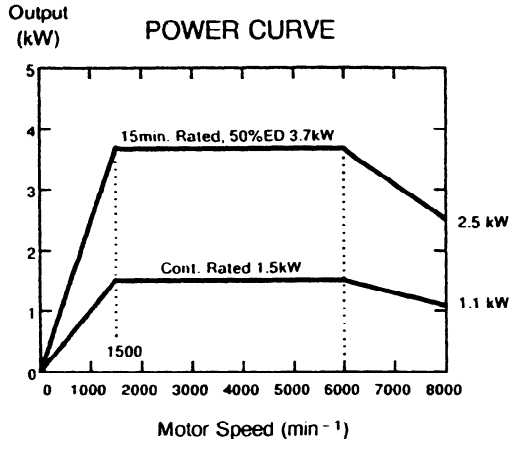


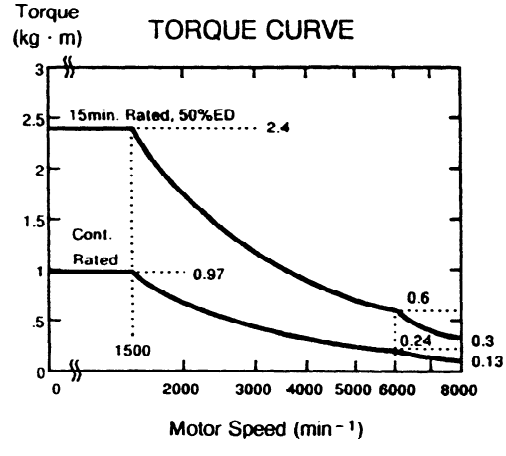
(2) Model 1.5S (IP65)



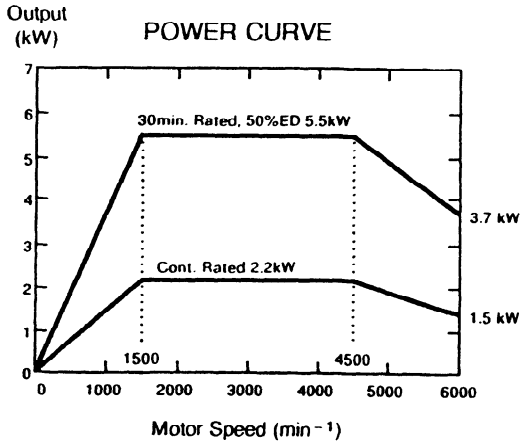


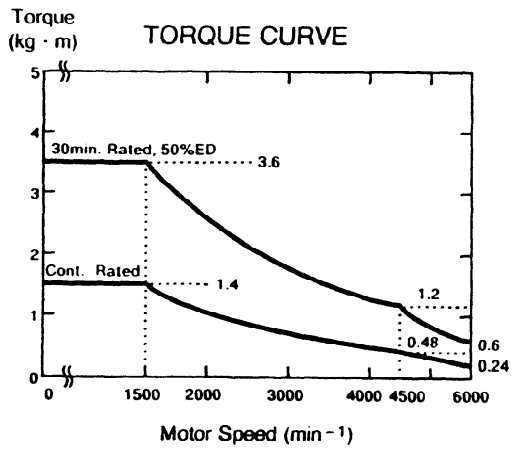
(3) Model 2S (IP65)





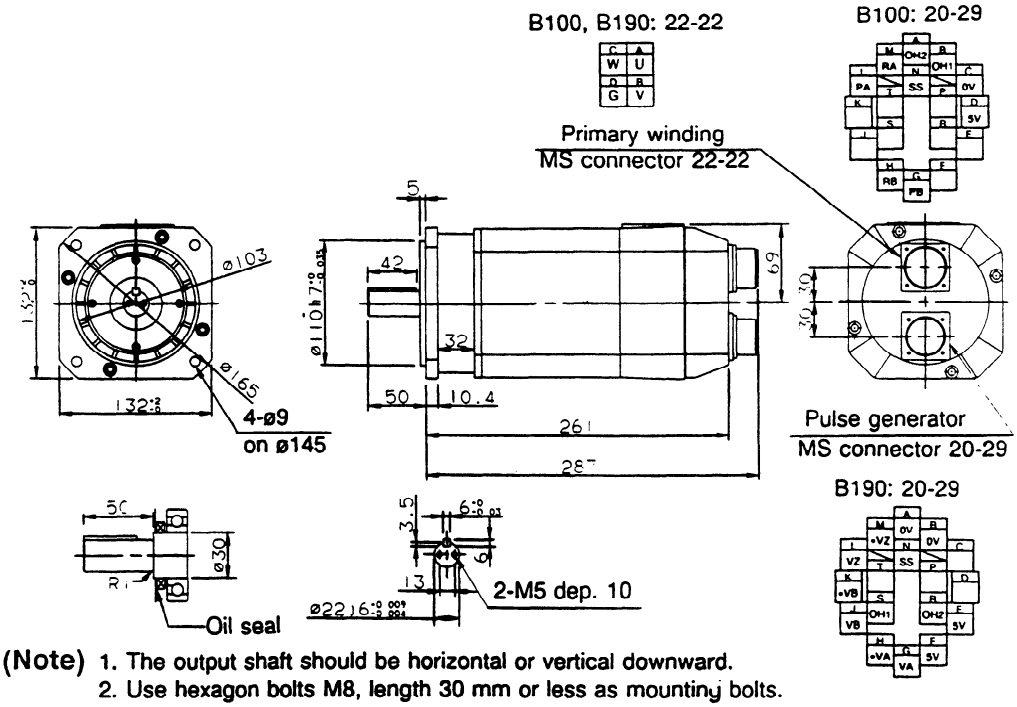
(4) Model 3S (IP65)





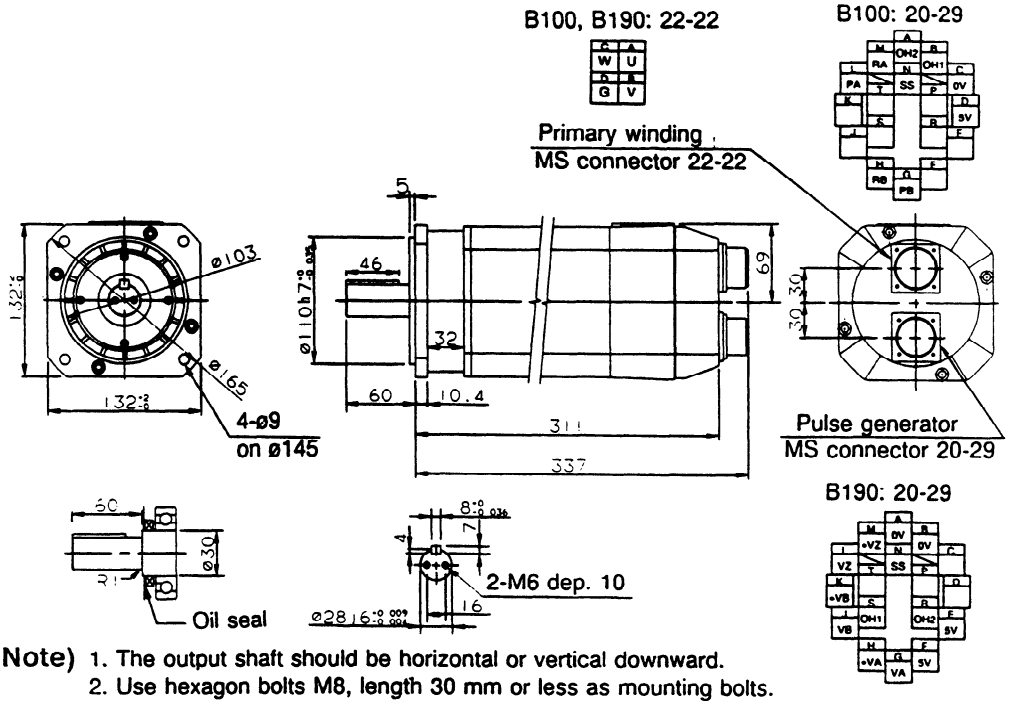
4. EXTERNAL DIMENSIONS

4.1 IP65 1S/8000 B100, B190



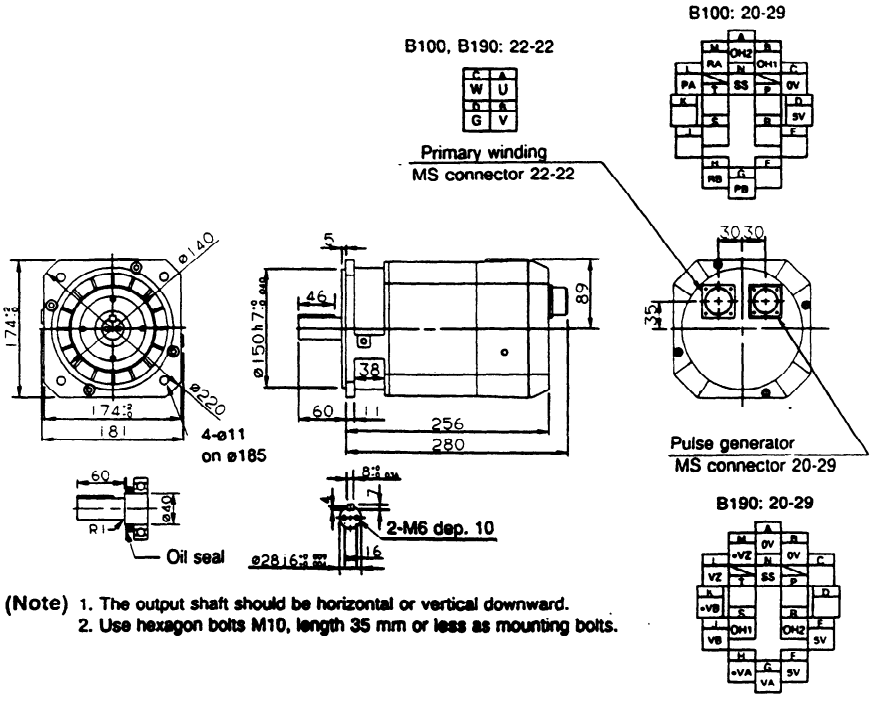
(Note) 1. The output shaft should be horizontal or vertical downward.
2. Use hexagon bolts M8, length 30 mm or less as mounting bolts.

4.2 IP65 1.5S/8000 B100, B190



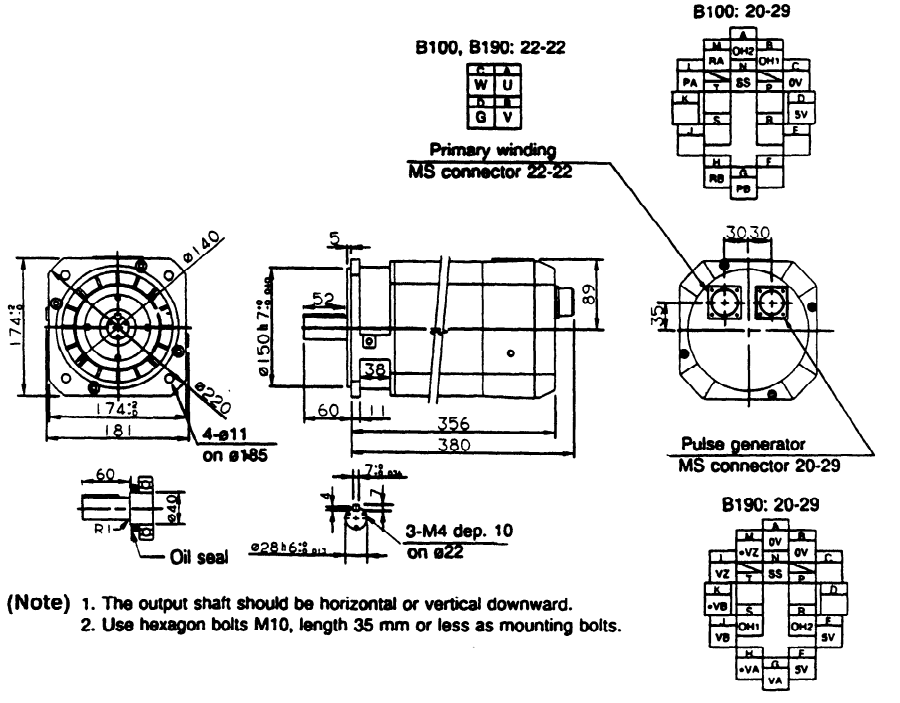
(Note) 1. The output shaft should be horizontal or vertical downward.
2. Use hexagon bolts M8, length 30 mm or less as mounting bolts.

4.3 IP65 2S/8000 B100, B190



(Note) 1. The output shaft should be horizontal or vertical downward.
2. Use hexagon bolts M10, length 35 mm or less as mounting bolts.

4.4 IP65 3S/6000 B100, B190

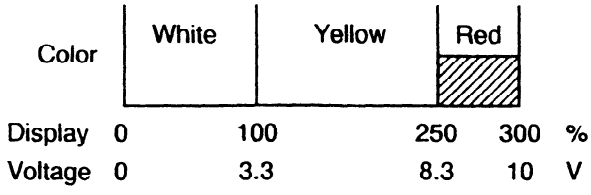


(Note) 1. The output shaft should be horizontal or vertical downward.
2. Use hexagon bolts M10, length 35 mm or less as mounting bolts.

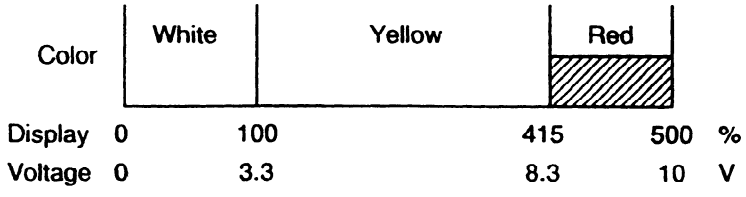
5. LOAD METER

The load meter for IP65 spindle motor is different from one for standard S series spindle motor. Please refer to the following load meter.

① The load meter for 1S, 2S, 3S



② The load meter for 1.5S



6. ORDER SPECIFICATION DWG NO.

Name		Motor spec. DWG No.	Amplifier spec. DWG No.	Remarks
Model 1S	Flange mounting	A06B-0790-B100	A06B-6064-H301	8000 min^{-1}, with key
		A06B-0790-B190	#H550	8000 min^{-1}, with key, with B.S
		A06B-0790-B300		8000 min^{-1}, without key
		A06B-0790-B390		8000 min^{-1}, without key, with B.S
Model 1.5S	Flange mounting	A06B-0791-B100	A06B-6064-H302	8000 min^{-1}, with key
		A06B-0791-B190	#H550	8000 min^{-1}, with key, with B.S
		A06B-0791-B300		8000 min^{-1}, without key
		A06B-0791-B390		8000 min^{-1}, without key, with B.S
Model 2S	Flange mounting	A06B-0792-B100	A06B-6064-H302	8000 min^{-1}, with key
		A06B-0792-B190	#H550	8000 min^{-1}, with key, with B.S
		A06B-0792-B300		8000 min^{-1}, without key
		A06B-0792-B390		8000 min^{-1}, without key, with B.S
Model 3S	Flange mounting	A06B-0793-B100	A06B-6064-H303	6000 min^{-1}, with key
		A06B-0793-B190	#H550	6000 min^{-1}, with key, with B.S
		A06B-0793-B300		6000 min^{-1}, without key
		A06B-0793-B390		6000 min^{-1}, without key, with B.S

(Note) B.S: Built-in Sensor

(*1) The motor with built-in sensor needs signal conversion circuit.
The specification of signal conversion circuit is following.
Separate type : A06B-6063-H731 (For IP65)
Load on type : A06B-6064-J706 (For IP65)