MID SERIES 1/8HP to 3HP (0.1kW to 2.2kW)

AC Induction Gearmotor

Detailed Instruction Manual

<Please read this manual before using the product. >

Brother International Corporation

Introduction

Thank you very much for purchasing our product.

Safety Precautions

- Be sure to carefully read the contents described in this Instruction Manual and to master how to use the product correctly before using it.
- Extents of hazard/damage expected to occur in the case of inept handling are classified and indicated into ranks of “Danger”, “Warning” and “Caution” in this Instruction Manual. The definitions and indications are as follows:

Description of the symbol

Danger	Cases where it is expected that a degree of danger is extremely high such that improper handling possibly causes a dangerous situation to occur, which may lead to death or serious injury.
Warning	Cases where improper handling possibly causes a dangerous situation to occur, which may lead to death or serious injury.
Caution	Cases where improper handling possibly causes a dangerous situation to occur, from which a minor or medium degree of injury may be incurred.

Even items described in “CAUTION” may lead to a serious accident depending on the situation.
Be sure to observe every instruction which deals with important contents.

The types of precautions to be observed are explained with classification, per the symbols below.

	Indicates "What You Must Pay Attention To."		Indicates "What You Must Not Do."
	Indicates "Burn Hazard."		Indicates "Do Not Disassemble."
	Indicates "Electric Shock Hazard."		Indicates "What You Must Do."
	Indicates "Fire hazard."		Indicates "Ground Connection."

Danger	
General	
	Use an explosion-proof motor that complies with operation under the explosive atmosphere. Failure to follow this precaution may result in explosions, ignition of fire, fire, electric shocks, injuries, and/or damage to the application.
	If the product is used in an application such as a personnel transport device, make sure to install a protective device for safety purposes. Failure to implement safety measures may result in personal injury, death, and/or damage to the application.
	If the product is used in an elevator, install a safety device on the application to prevent it from falling. Failure to implement safety measures may result in personal injury, death, and/or damage to the application due to the falling of the elevator.
	Never perform operations with wet hands. Failure to follow this precaution may result in electric shock.
Wiring	
	Do not change the wiring while the product is energized. Be sure to turn off the power before work. Failure to follow this precaution may result in electric shock.
	Make sure to ground the grounding terminal. Otherwise, it may result in electric shock.
Operation	
	Do not come close or touch the rotating parts (output shafts, etc.) while the product is in operation. Failure to follow this precaution may result in injury due to entanglement to the product.

⚠ Warning

General	
	The operators in charge of transportation, installation, wiring, operation, handling, maintenance, and inspection should have enough knowledge and technical skill related to the product. Failure to follow this precaution may result in explosion, ignition of fire, fire, electric shock, injury, and/or damage to the application.
	Do not repair, disassemble, or remodel the product. Failure to observe this precaution may result in injury, fire, electric shock, and/or burns.
	Be sure not to get water or oil/grease into the brake unit. Failure to follow this precaution may result in falling or out-of-control accident due to the decreased brake torque.
Operation	
	When the operation has stopped due to the occurance of error or activated safeguards, do not re-start the operation until the causes of error are determined and countermeasures are taken. Failure to follow this precaution may result in damage to the application, injury, fire, electric shock, and/or burns.
	When performing a product test, fix the product in place and disconnect it from the application. Failure to observe this precaution may result in injury.

⚠ Caution

General	
	Operate the product under the conditions specified in this instruction manual. Failure to follow this precaution may result in damage to the equipment or injury.
	Do not expose the product to strong impacts/shocks. Failure to observe this precaution may result in failure of the product and/or injury.
	Do not use the gearmotor under conditions other than specified on the nameplate or the product specification. Failure to follow this precaution may result in electric shock, injury, fire, and/or damage to the application.
	Do not use damaged products. Failure to follow this precaution may result in injury, fire, and/or damage to the application.
	Do not remove the nameplate.
	Products modified by a customer will not be covered by our warranty.
	Do not insert fingers or objects in the open parts of the product. Failure to follow this precaution may result in electric shock, injury, fire, and/or damage to the application.
Transport	
	The product must be transported correctly in accordance with its weight.
	Do not overload/over stack the products. Failure to follow this precaution may result in injury and/or equipment failure.
Installation	
	When handling the gearmotor, be careful with the sharp edges/points of the application. Failure to follow this precaution may result in injury.
	Fix the gearmotor firmly in place. Failure to follow this precaution may result in damage to the equipment or injury.
	Do not put any combustible material near the product. Failure to follow this precaution may result in fire.
	Do not put any object that may prevent air from being circulated around the product. Failure to follow this precaution can cause abnormal overheating of the product. It may result in fire or burns.
	Do not stand on or place any heavy object on the product. Failure to follow this precaution may result in injury.
	Install an oil pan for food machinery and other applications in which leakage cannot be present and may occur in the event of a failure, service life, etc. Otherwise, products may become defective due to oil leakage.

⚠ Caution

Wiring	
	Be careful not to cause damage to the cable nor pull it strongly. Failure to follow this precaution may result in injury, fire, and/or electric shock.
	Make sure that the gearmotor is correctly wired. Failure to follow this precaution may result in injury due to damaged equipment.
Operation	
	Do not touch the gearmotor when the power is on or immediately after turning off the power, as their surfaces may be hot for a while. Failure to follow this precaution may cause burns.
	Immediately stop the operation if there is any abnormality. Failure to follow this precaution may result in electric shock, injury, and/or fire.
	Do not touch the rotating part of the gearmotor. Failure to follow this precaution may result in injury.

Important

When disposing of the product, dispose of it as a general industrial waste. Please follow local laws and regulations if any apply and take care of the waste accordingly.

Notice

We shall assume no responsibility or liability for any troubles caused by use that violates the warnings and cautions in this manual.

The contents of this manual are subject to change without notice.

We have made every possible effort to make the contents of this manual easy to understand. If there is anything that is unclear or hard to understand, please feel free to contact us.

Table of Contents

1 Inspection upon Unpacking

Caution	
⚠ ❗	Check whether the product received is consistent with your order. Injury, damage to the application, etc. may occur if the wrong product is installed.
⚠ ❗	Check the top and bottom of the package before opening it. Failure to follow this precaution may result in injury.

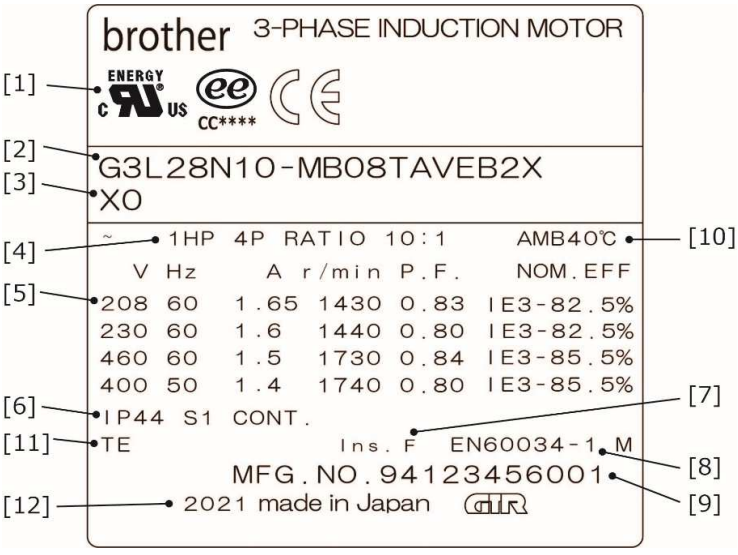
1-1 Checking Package Contents

Check for the following items when unpacking the package.
Contact the dealer from where you purchased the product or your nearest service office if you have any questions or if there are any defects.

- Is the information on the nameplate consistent with your order?
  (Gearmotor Model, Reduction Ratio, Motor Power, Voltage, Frequency, etc.)
- Were any parts damaged during transportation?
- Are there any loose screws, bolts, or nuts?
- If a terminal box is attached, is there a nut and a short board for connecting the included terminal block?
  The short board is only included for products where both low voltage (200V class) and high voltage (400V class) connections can be used.
- In the case of a brakemotor, is there a rectifier included in the package?
  In the case of a terminal box with a built-in rectifier(option), check if the rectifier is built into the terminal box.
- In the case of a clutch-brake gearmotors, is there one rectifier and two surge suppressors included in the package?

1-2 Details of Nameplate

The following is a typical nameplate.



No.	Description
[1]	Standards Conformance
[2]	Product Name
[3]	Option Code
[4]	Motor Power/Number of Poles/ Reduction Ratio
[5]	Motor Characteristics
[6]	IP Rating
[7]	Insulation Class
[8]	Standards Number
[9]	Manufacturing Number(MFG No.)
[10]	Ambient Temperature
[11]	Motor Structure
[12]	Year of Manufacture

- Please refer to the next page for product naming convention.
- Option codes may not be listed dependinng on the spec of the motor.
- When placing an inquiry, please provide the product name/option code, reduction ratio and MFG. No.

1-3 Gearmotor Model

Descriptions of the nomenclature for gearmotor model are as follows. Check if the model is consistent with your order.
The gearhead model and motor model are described separately.

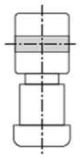
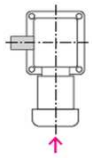
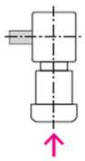
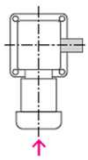
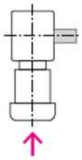
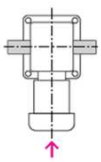
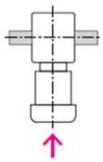
Gearhead Model

Gearhead Model					
[1]	[2]	[3] *4	[4]	[5] *5	
Series	Mounting	Frame No.	Shaft Arrangement	Reduction Ratio	-
G3	L	28	N	10	-

[1] Series		[2] Mounting	
G3	Inline Shaft	L	Foot Mount
		F	Flange Mount
		K	Small Flange Mount *1
H2	Right Angle Shaft	L	Foot Mount
		F	Flange Mount *2
F	Flange Mount Right Angle	S	Hollow Bore
		F	Solid Shaft *3
F3	Right Angle	S	Hollow Bore
		F	Solid Shaft

[5] Reduction Ratio *5	
5 to 15X	1/5 to 1/1500

[3] Frame No. *4	
□□	Output shaft diameter

[4] Shaft Arrangement				
Material		Output shaft direction of right angle shaft type		
S43C	SUS420J2	Output Shaft Direction	H2	F/F3
N	S	-	-	
L	H	The output shaft protrudes from the left when looking from the input shaft side(↑)		
R	M	The output shaft protrudes from the right when looking from the input shaft side(↑)		
T	B	The output shaft protrudes from both sides when looking from the input shaft side(↑)		

*1 Up to and including Frame No. 32 for [2] Mounting K: Small flange support of [1] Series G3 : Parallel shaft.
*2 Only Frame No. 22 for [2] Mounting F: Flange support of [1] Series H2 : Right angle shaft.
*3 Up to Motor Power: 1HP for [2] Mounting F: Solid shaft of [1] Series F : Right angle shaft.
*4 The [3] Frame Number depends on the lineup of each series.
*5 [5] Reduction ratios are 12X for 1200 and 15X for 1500 as they are displayed with up to three digits.

Motor Model

Motor Model							Brake Specs	Option	
[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]	[15]*4
Motor Type	Efficiency/ Insulation	Motor Power	No. of Phases	Supply Voltage	Standards	Terminal Box	Brake	Special Option	Option Code
M	B	08	T	A	V	E	B2	X	X0

[6] Motor Type	
M	Standard
W	Washdown(IP65)
E	Clutch Brake

[14] Special Option	
Brank	Standard Specifications
X	Designates a special option

[7] Efficiency / Insulation		[8] Motor Power	
B	IE2 / Class F	02	1/4HP (0.2kW)
		04	1/2HP (0.4kW)
	IE1 / Class F	05	3/4HP (0.55kW)
	IE3 / Class F	08	1HP (0.75kW)
		15	2HP (1.5kW)
		22	3HP (2.2kW)
M	IE1 / Class F	01	1/8HP (0.1kW)
	IE2 / Class F	02	1/4HP (0.2kW)
		04	1/2HP (0.4kW)
D	IE3 / Class F	08	1HP (0.75kW)
		15	2HP (1.5kW)
		22	3HP (2.2kW)

N	No Brake
B2	200V Brake
B4	400V Brake
J2	Manual Release 200V Brake
J4	Manual Release 400V brake
V2	Washdown 200V Brake
V4	Washdown 400V Brake

[12] Terminal Box	
T	T-type terminal box (Steel plate)
E	E-type terminal box (Aluminum)
N	Without terminal box (Flying Leads)

[9] No. of Phases	
T	3-phase

[10] Voltage		[11] Standards							
			Safety Standards			High-Efficiency Certification*3			
Symbol	Voltage (V) / Frequency (Hz)	Symbol	UL	CE *2	CCC *1 *2	United States	Canada	China	Korea
A	208,230,460,400/60,60,60,50	N	○	○	○	○	○	○	
		V	○	○		○	○		
		J							
E	415,440,480/50,50,60	N	○	○	○	○	○	○	
		V	○	○		○	○		
		J							
M	575/60	A	○			○	○		
		J							
N	200,200,220/50,60,60	N	○	○	○	○		○	○
		V	○	○		○			
		J							
W	380,400,400,440/50,50,60,60	N	○	○	○	○		○	○
		V	○	○		○			
		J							
K	220,380/60,60	N	○	○	○	○		○	○
		V	○	○		○			
		J							
C	220,230,380/50,50,50	N	○	○	○	○		○	
		V	○	○		○			
		J							

*1 CCC is not supported for motor powers 2HP(1.5 kW) & 3HP(2.2 kW) of [11] Standards.

*2 3/4HP (0.55kW) is not supported.

*3 High-efficiency Certification in [11] Standards are required for motor powers of 1HP(0.75 kW) or higher.

*4 [15] Option code is added to specify the appropriate option. The main options are as follows.
Wiring instructions for terminal boxes with built-in rectifier, terminal box mounting orientation, change of lead wire outlet hole direction, encoder, fan installation, etc.
For more details regarding options, please refer to the catalog or contact us.
(Contact details can be found on the last page of this instruction manual.)

2 Transportation

Danger
Do not enter underneath the product when it is lifted for transportation. Otherwise, accidents caused by dropping may occur.

Caution
Dropping and falling of the product during transportation is dangerous. Please pay sufficient attention to prevent this. For a gearmotor with a hook, be sure to check that the hook is not loose before using it. However, do not lift the application with the hook of the attached gearmotor. Otherwise, hook damage, injury due to dropping/falling and application damage may occur.
Check the weight of the gearmotor with the nameplate, packaging box, appearance diagram, catalog, etc. Do not lift a gearmotor whose mass is more than the rated load of the ceiling/application hook. Otherwise, bolt damage, injury due to dropping/falling and application damage may occur.
If the package is made of wood, it is unstable to lift the package from the bottom when a lift is used. It is recommended to use a belt to hold the package when lifting.
Do not hold/carry the gearmotor by grabbing on terminal box. Otherwise, injury and application damage may occur.

3 Installation

Pay attention to the following points as installation quality affects the lifespan of the gearmotor.

Caution
Do not place flammable items around the gearmotor. Otherwise, a fire may occur.
Do not place obstacles that disturb ventilation around the gearmotor. Cooling for the gearmotor may be disturbed and burn/fire may occur due to abnormal overheating.
Do not step on/hang from the gearmotor and terminal box. Otherwise, an injury may occur.
Do not touch gearmotor keyways with a bare hand. Otherwise, an injury may occur.
Install an oil pan for food machinery and other applications in which leakage cannot be present and may occur in the event of a failure, service life, etc. Otherwise, products may become defective due to oil leakage.
Wear debris of the brake, iron powder (metal pieces), etc. may be scattered after continuous use. Mount a preventive device for food machinery and other applications in which contamination may be a problem. Otherwise, the product, etc. may be defective.
The guidance value of vibration from the mounting surface of the gearmotor or applied externally is 0.5 G or less.
Pay attention to the transportation atmosphere because dew condensation occurs easily on sea transportation. Dew condensation may occur inside of the box if the ambient temperature rapidly changes in a high temperature/humidity atmosphere.
Pay attention to freezing under temperatures of 0°C or lower as freezing may cause a short circuit between terminals. Otherwise, an electric shock may occur.

3-1 Location

Motor Type	Standard Specification	Water-resistant Specification
Ingress Protection Rating	Differs depending on the model	IP65
Ambient Temperature	-10°C to 40°C (14°F to 104°F)	-10°C to 40°C (14°F to 104°F)
Ambient Humidity	85% max.(without any dew condensation)	100% max.(without any dew condensation)
Altitude	1,000 m (3,280 feet) max.	1,000 m (3,280 feet) max.
Atmosphere	A well ventilated place free from corrosive gas, explosive gas, vapor and/or chemicals. Not to be exposed to rain and direct sunlight. The brake should not be exposed to water, powders, grease, and/or oil mists. Models with protection rating of IPX0 should not be exposed to water directly.	A place free from corrosive gas, explosive gas and/or vapor. Not to be exposed to strong rain, wind and direct sunlight. Not suitable for use under water, under environments with exposure to high pressure water splashes, and under exposure to cleansing chemicals.

3-2 Orientation

- No restriction on installation orientation. (Since it uses a grease lubrication system)
- Make sure no foreign substances enter the opening part of the clutch brake.

3-3 Procedure

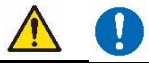
[1] Foot Mount, Flange Mount
Secure the gearmotor with four bolts on a vibration-free and flat machine-processed surface (0.3 mm or less of flatness).

[2] Shaft Mount (torque arm)
The drive shaft must be able to carry the weight of the reducer.
Note) Force other than the rotational reaction force should not be applied to the torque arm.

3-3-1 Tightening Torque for Installation Bolts (Reference value)

Mounting hole (mm)	Bolt size	Tightening torque		
		(N•m)	(kgf•m)	(lbf・in)
5.5	M5	2.9	0.3	26
6.5	M6	4.9	0.5	43
8.5	M8	13	1.3	115
9	M8	13	1.3	115
11	M10	25	2.6	221
13	M12	44	4.5	390
15	M14	69	7	611
18	M16	108	11	956
22	M20	294	30	2602

4 Connecting with Other Equipment

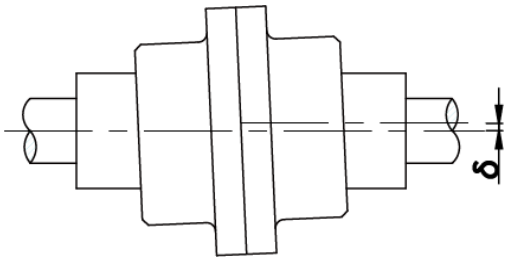
Caution	
	Pay attention to the centering, belt tensioning, pulley alignment, etc. when the gearmotor is connected to the load. In the case of a direct connection, make sure the connection is precise. When using a belt, make sure to adjust the belt tension correctly. Be sure to tighten the bolts for the pulley and couplings before operation. Otherwise, injury and application damage may occur due to the scattering of broken pieces.
	Apply a cover, etc. so that rotation parts are not exposed. Otherwise, injury may occur.

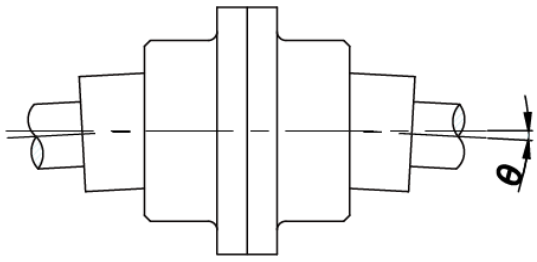
Be sure to use the specified key to affix the connection device (a coupling/sprocket/pulley/gear, etc.) to the reducer shaft with an H7 tolerance fit.

4-1 When directly connected

The shaft center of the application and the shaft center of the reducer must be aligned axially.

Coupling Example



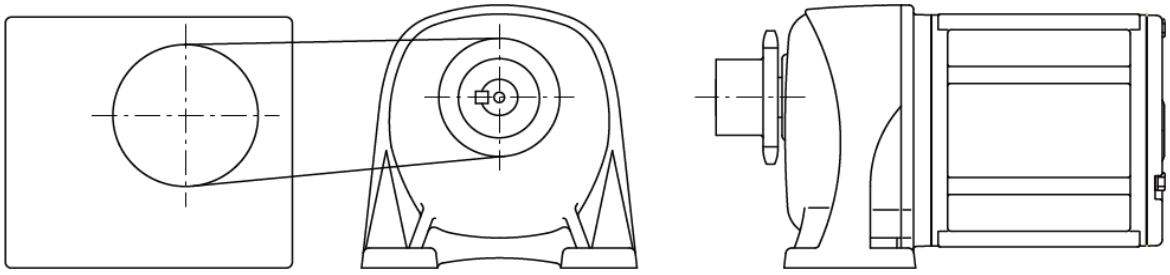


- The displacement amount of δ and θ should be minimized.
- The δ and θ differ according to the type of coupling. Therefore, they should be within the allowable value defined by the manufacturer.
  Reference: In the case of chain coupling, δ should be within 2% of the roller chain pitch and θ should be within 1°

4-2 Attaching Chains, V-belts, Gears, etc.

- The shaft center of the application and the shaft center of the reducer must be parallel to each other.
- Chain, V-belt tension and gear engagement must be at a right angle to the output shaft.
- V-belt tension : If it is too tight, the bearing may become damaged.
  Chain tension : The tension of chains must be adjusted appropirately. Having it too tight may result in damages to the bearing. On the other hand, having it too loose will cause shock on the apparatus durings startups, and may cause damages to the motor / equipment.

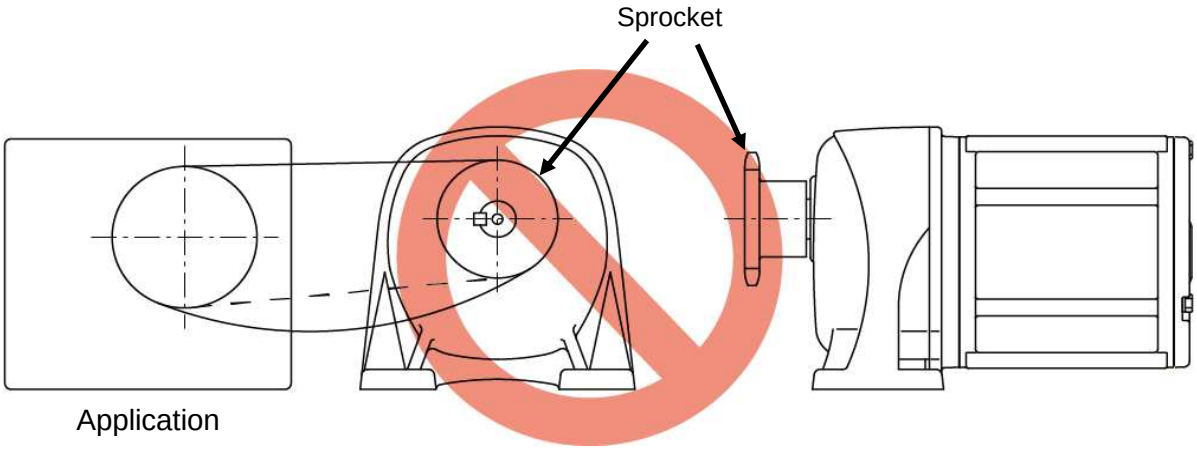
Correct



Application

● The tension of the V-belt and chain are properly set.
The pulley and sprocket are properly positioned.

Incorrect



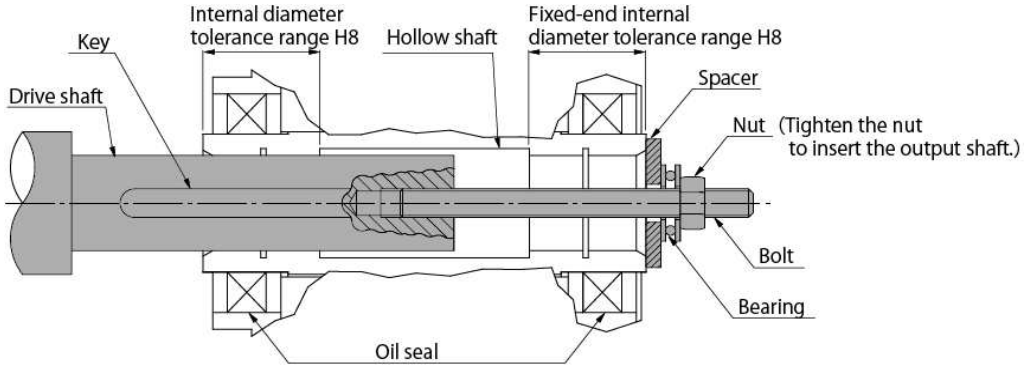
Application

● The chain is too loose.
● The sprocket is positioned in the reverse direction causing the load point to move to the shaft edge.

4-3 Installing/Removing the FS/F3S Type Hollow Bore

4-3-1 Installing the hollow bore of the reducer to the drive shaft

- Coat the drive shaft surface and interior surface of the hollow bore with a lubricant (molybdenum disulfide) suitable to the atmosphere in which they will be used and connect the reducer to the drive shaft.
- When used with uniform loads, a drive shaft tolerance of h7 is recommended. Additionally, when dealing with impact loads or large radial loads, make sure they fit each other tightly. The tolerance of the interior surface of hollow bore is designed to be H8.
- If the shafts are a tight fit, use a plastic hammer on the end of the hollow bore to insert it. When doing so, be sure not to hit the casing. If you make a jig like the one in the diagram below, drive shaft insertion will be easier.
- For the length of the turn-stop key for the drive shaft, tolerance range H8 for the internal diameter on the fixed side is recommended.
- It is recommended that axial runout for the shaft be 0.05 mm or less at the shaft end. If major wobbling occurs during operation, it may have a negative effect on the reducer.



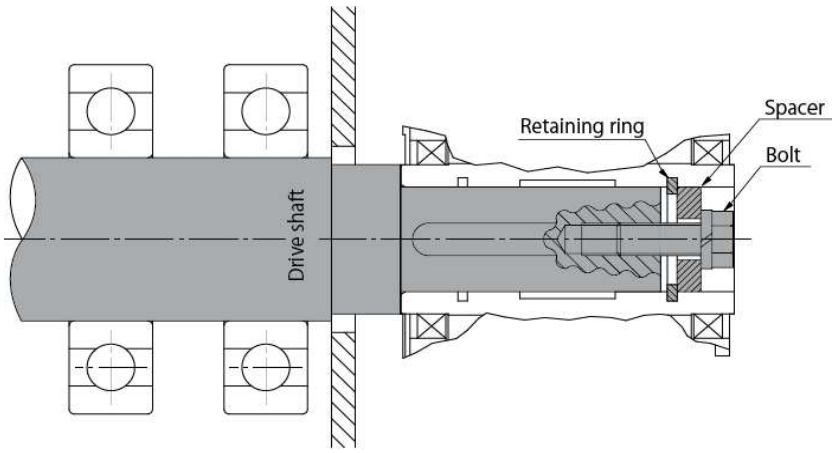
Customers need to provide their own spacer, nuts, bolts, keys and shaft bearings.

4-3-2 Connecting the reducer to the drive shaft

When there are steps on the drive shaft

Attachment Using a Spacer and Retaining Ring

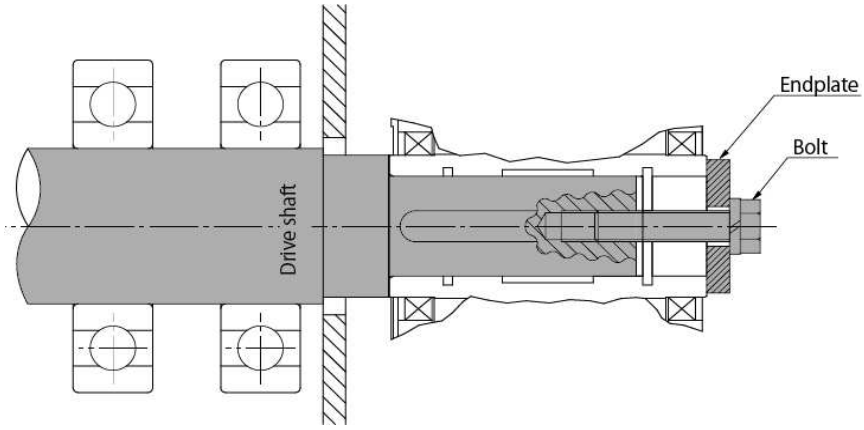
Note) Be careful when tightening the bolt, as tightening it too much can distort the shape of the retaining ring.



Customers need to provide their own spacer, bolts, and retaining rings.

Attachment Using an Endplate

Note) Please note that for the connection method below, mounting of a resin cover for the F Series is not possible due to the bolt interference.
In addition, please apply a protective cover when possible so that there is no injury due to objects getting caught in the output shaft.

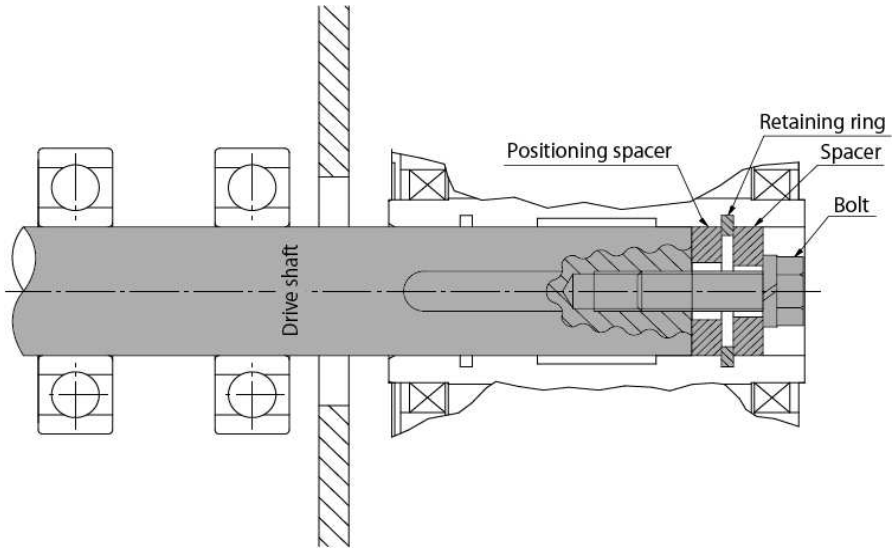


Customers need to provide their own endplates and bolts.

When the drive shaft has no steps

Attachment Using a Spacer and Retaining Ring

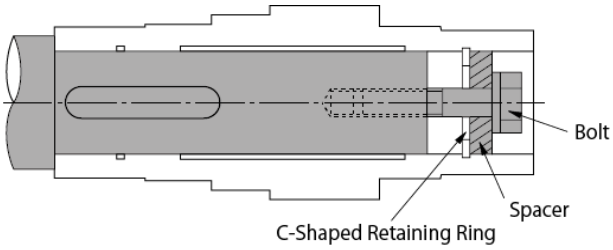
Note) Make sure there is a gap between the outer diameter of the spacer and the internal diameter of the hollow bore. If the fit is too tight and the outer diameter of the spacer is inaccurate, axial runout of the drive shaft and hollow bore can result.
The positioning spacer is used to position the reducer. It is not required if you know the length of the drive shaft in advance. In addition, attaching the positioning spacer allows for smooth removal from the hollow bore. (Refer to " 4-3-5 Removal from the Hollow Bore")



Customers need to provide their own spacer, positioning spacers, bolts, and retaining rings.

4-3-3 Recommended Sizes for the Fixing Elements of the Drive Shaft

When attaching the hollow bore in general use, refer to the dimensions shown below as a guideline when designing.



Recommended Sizes for the Fixing Elements of the Drive Shaft

・metric (mm)

Hollow bore hole diameter	Bolt size	Spacer dimensions			Groove diameter for C-shaped Retaining Ring
		Outer diameter	Internal diameter	Width	
ϕ20	M6	ϕ19.5	ϕ7	3	21.0
ϕ25	M6	ϕ24.5	ϕ7	4	26.2
ϕ30	M8	ϕ29.5	ϕ9	5	31.4
ϕ35	M10	ϕ34.5	ϕ11	5	37.0
ϕ45	M10	ϕ44.5	ϕ11	5	47.5
ϕ50	M12	ϕ49.5	ϕ13	6	53.0
ϕ55	M12	ϕ54.5	ϕ13	6	58.0

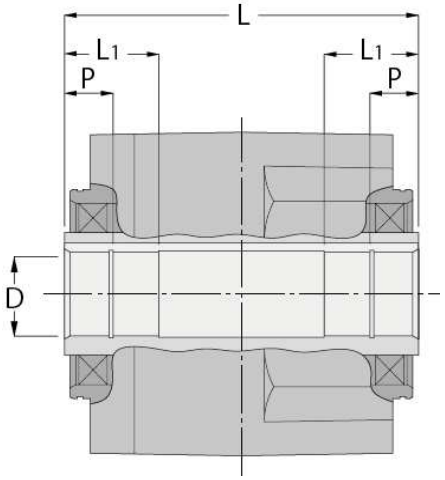
・yard-pound (in)

Hollow bore hole diameter	Bolt size	Spacer dimensions			Groove diameter for C-shaped Retaining Ring
		Outer diameter	Internal diameter	Width	
0.7500 (3/4)	1/4-20	ϕ0.73	ϕ0.28	0.125	0.796
1.0000 (1)	1/4-20	ϕ0.98	ϕ0.28	0.125	1.066
1.2500 (1 1/4)	5/16-18	ϕ1.23	ϕ0.35	0.188	1.330
1.4375 (1 7/16)	3/8-16	ϕ1.42	ϕ0.43	0.188	1.528
1.6875 (1 11/16)	3/8-16	ϕ1.67	ϕ0.43	0.188	1.792
1.9375 (1 15/16)	7/16-14	ϕ1.92	ϕ0.51	0.250	2.056
1.9375 (1 15/16)	7/16-14	ϕ1.92	ϕ0.51	0.250	2.056

4-3-4 Drive Shaft Length / Drive Shaft Key Length

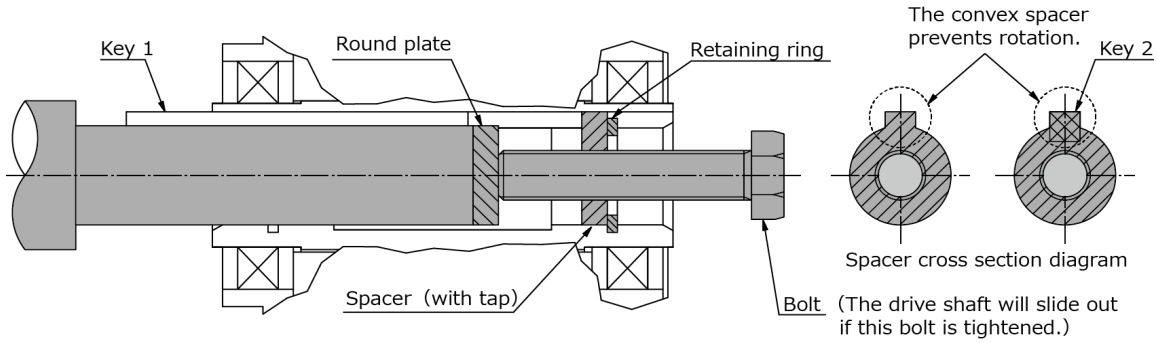
- Make sure the drive shaft reaches both ends of L1
  However, take note of how much room is necessary for spacers in the section titled
  “ 4-3-5 Removal from the Hollow Bore”.

- The length of the key should be at least 1.5 times the diameter of the hollow bore.
  Additionally, the key should be inserted in such a position that at least half its length is in L1.



4-3-5 Shaft removal from the Hollow Bore

Make sure there is enough room at the end of the hollow bore to use the jig shown below.
If you make and use a jig like the one below, drive shaft removal will be easier.



Customers need to provide their own spacers, round plates, bolts and retaining ring keys.

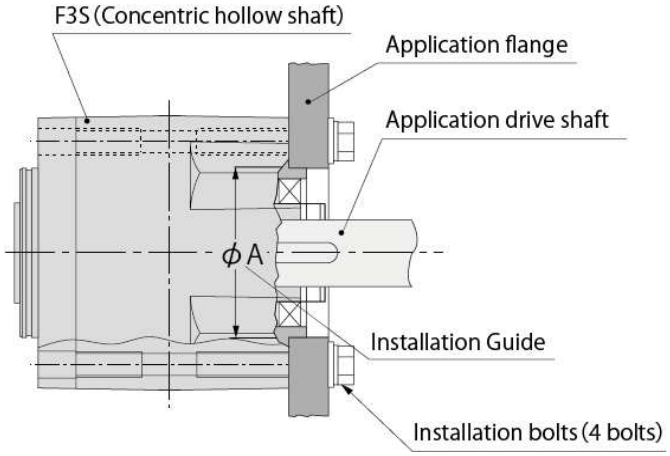
4-4 Installing a Flange/Torque Arm

Advantages and disadvantages of flange and torque arm installation

	Advantages	Disadvantages
Flange Installation	• Can be installed directly on the application. • Saves space.	• Centering with the application is required. • Requires four(4) tapped holes for mounting to the application.(F series)
Torque Arm Installation	• Makes centering with the application easy. • Fastening to the application only requires one detent.	• Requires a torque arm. • Requires space for installing a torque arm.

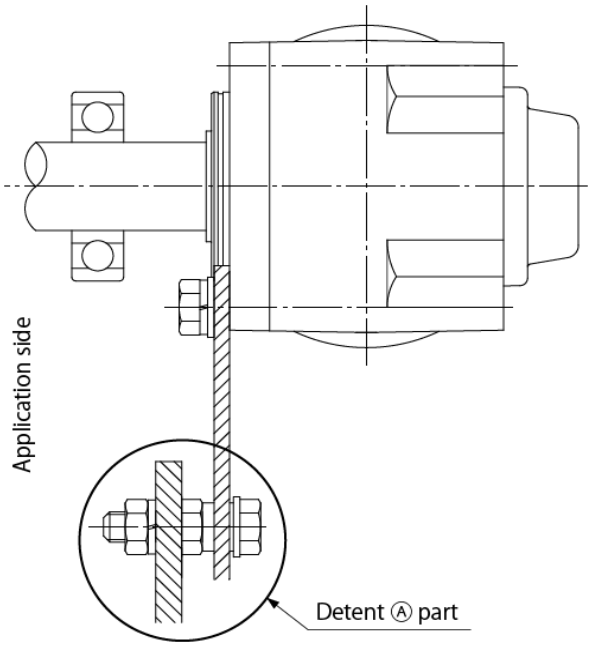
4-4-1 Installing a flange

When the hollow bore is installed directly to the flange of an application, it can cause motor burn-out or bearing damage if it is off-center, so be sure to center it properly.
There is an installation guide, as shown in the diagram below. The dimension tolerance for ϕA on the installation guide is h7 in the case of F3S. The installation bolts are installed as shown in the diagram to the right.
Four bolts should be used.



4-4-2 Fastening the Reducer to the Torque Arm

- Install the torque arm detent to the application side.
- Because the torque arm sustains a reactive force from rotation, consideration needs to be given to impact loads particularly during startup and braking. Bolts and plates that are sufficiently strong must be used. It is best to use our optional torque arm.
- To install the torque arm and reducer, fasten them using spring washers and flat washers with the installation bolts.



Bolt Size and Tightening Torque (Reference value)

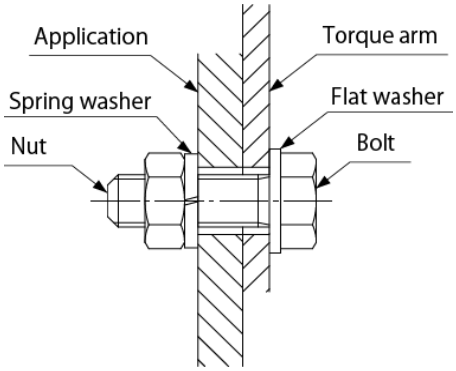
Bolt size	Tightening torque		
	(N•m)	(kgf•m)	(lbf・in)
M8	13	1.3	115
M10	25	2.6	221
M12	44	4.5	390
M14	69	7	611
M16	108	11	956

How to install the Torque Arm Detent Ⓐ

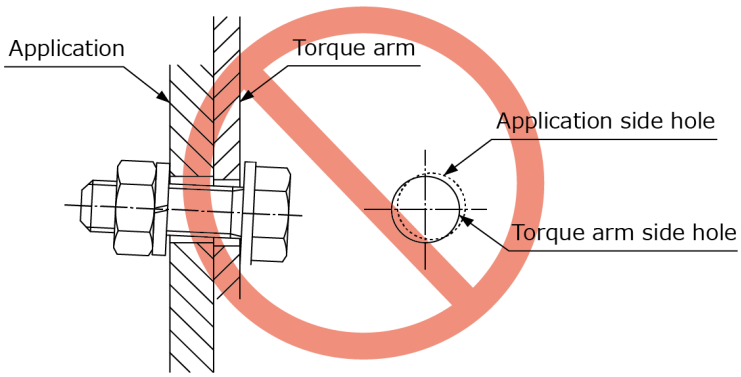
For normal/reverse rotation operation and intermittent unidirectional operation

Fasten the torque arm detent securely. When doing this, center the detent hole with that of the application to make sure that no radial load (suspension load) is applied against the drive shaft and hollow bore of the reducer. (Refer to the diagram below.)

Good example

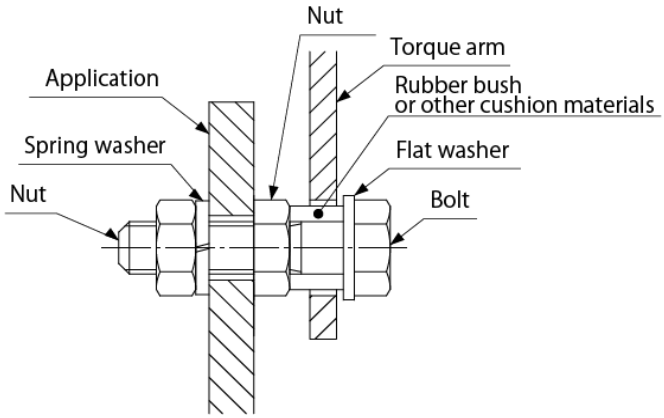


Bad example



Unnecessary force applied to the drive shaft and hollow shaft can result in defects.

Note) If the mounting is loose, impact may be applied to the torque arm with each startup and defects such as loosened bolts may occur.
If a firm mount is not possible, a rubber bushing or other cushion material should be inserted between the torque arm and the bolt as a protective measure.
Stronger bolts can also be used to minimize looseness.
Bolts with sufficient strength should be used.

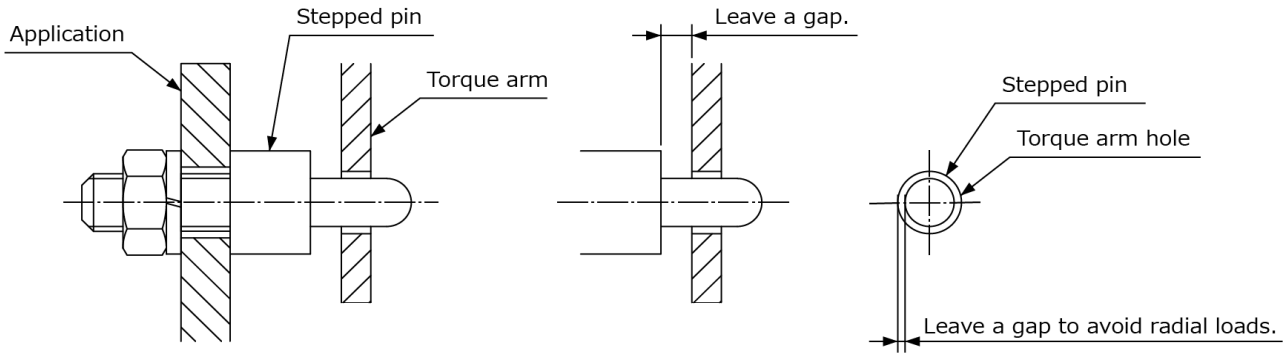


Continuous unidirectional operation

For continuous unidirectional operation which has infrequent start-up torque applied, the torque arm can be used without a detent. However, it is still necessary to fasten the drive shaft to the hollow bore.

(Refer to ”4-3. Installing/Removing FS/F3S Type Hollow Bore”.)
In this case, it is necessary to provide sufficient clearance in both radial and thrust directions for alignment between the application and the detent. (Refer to the diagram below.)

Example of Stepped Pin Usage



5 Rotational Direction

Caution

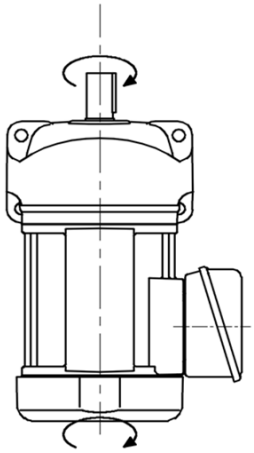
Check the direction of rotation before the gearmotor is connected to the application. A difference in rotational direction may cause injury and/or damage to the application.

The relationship between the input shaft (motor) and the output shaft rotational direction of this product are as follows.

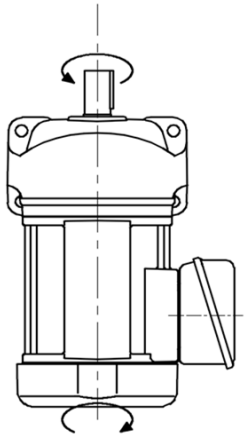
The following given rotational directions are when the gearmotors are wired according to the section "6 Wiring".

G3 Series

Motor Power	Reduction Ratio
1/8HP (0.1 kW)	1/5 to 1/50 and 1/300 to 1/1200
1/4HP to 3HP (0.2kW to 2.2 kW)	1/5 to 1/30 and 1/300 to 1/1200

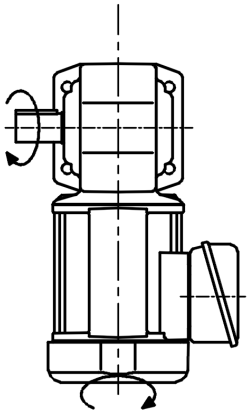


Motor Power	Reduction Ratio
1/8HP (0.1 kW)	1/60 to 1/200
1/4HP to 3HP (0.2kW to 2.2 kW)	1/40 to 1/200

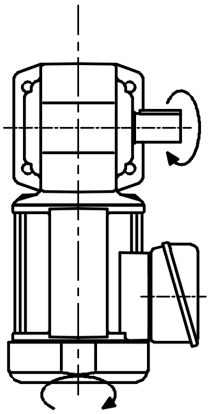


H2 Series

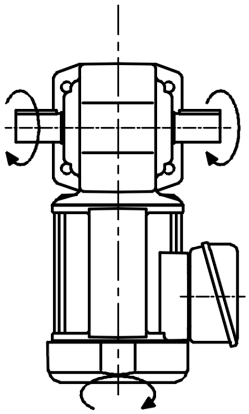
Motor Power	Reduction Ratio
1/8HP and 1/4HP (0.1kW and 0.2kW)	1/5 to 1/60 and 1/600 to 1/1500
1/2HP to 1HP (0.4kW to 0.75kW)	1/5 to 1/60 and 1/300 to 1/1500
2HP and 3HP (1.5kW and 2.2kW)	1/5 to 1/30



L Shaft

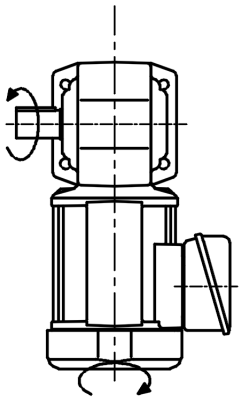


R Shaft

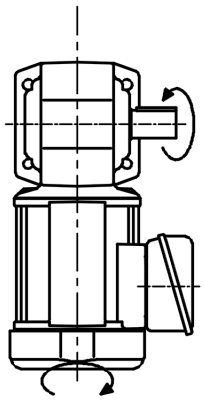


T Shaft

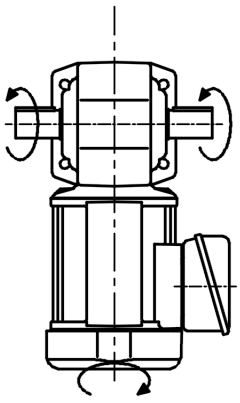
Motor Power	Reduction Ratio
1/8HP and 1/4HP (0.1kW and 0.2kW)	1/80 to 1/450
1/2HP to 1HP (0.4kW to 0.75kW)	1/80 to 1/240
2HP and 3HP (1.5kW and 2.2kW)	1/40 to 1/240



L Shaft



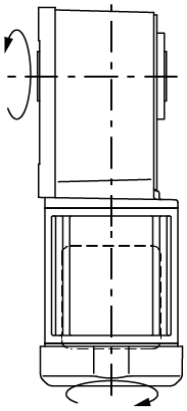
R Shaft



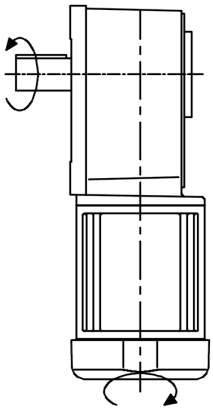
T Shaft

F Series

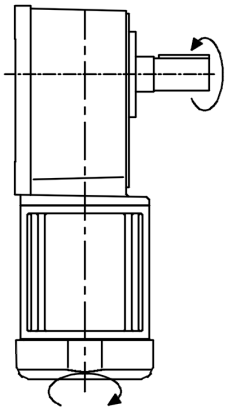
Motor Power	Reduction Ratio
1/8HP to 1HP (0.1kW to 0.75kW)	1/5 to 1/60 and 1/300 to 1/1500
2HP and 3HP (1.5kW and 2.2kW)	1/5 to 1/30



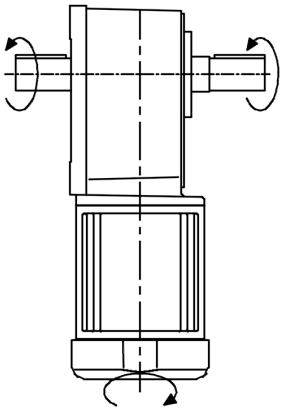
Hollow Bore



L Shaft

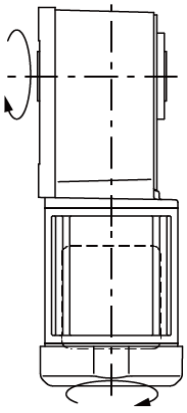


R Shaft

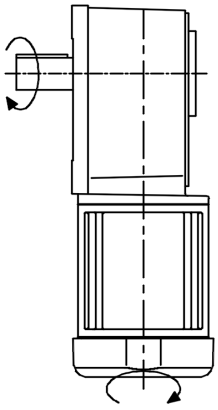


T Shaft

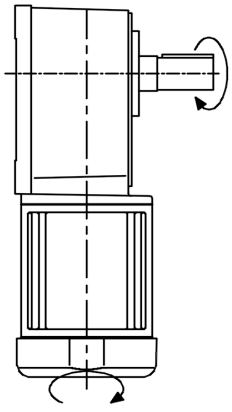
Motor Power	Reduction Ratio
1/8HP to 1HP (0.1kW to 0.75kW)	1/80 to 1/240
2HP and 3HP (1.5kW and 2.2kW)	1/40 to 1/240



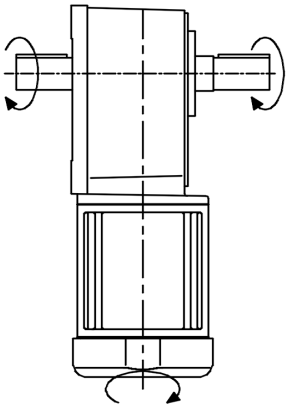
Hollow Bore



L Shaft



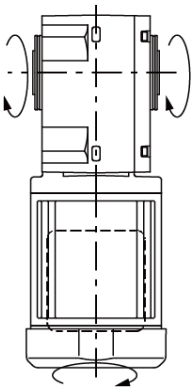
R Shaft



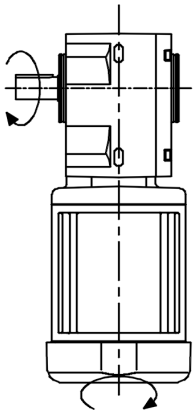
T Shaft

F3 Series

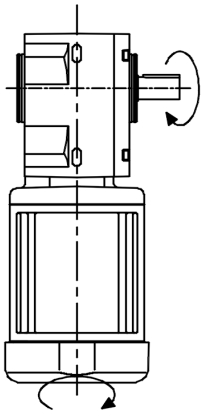
Motor Power	Reduction Ratio
1/8HP (0.1kW)	1/5 to 1/60 and 1/300 to 1/1500
1/4HP (0.2kW)	1/5 to 1/60 and 1/300 to 1/1200
1/2HP (0.4kW)	1/5 to 1/60 and 1/300 to 1/600
3/4HP and 1HP (0.55kW and 0.75kW)	1/5 to 1/60 and 1/300
2HP and 3HP (1.5kW and 2.2kW)	1/5 to 1/60



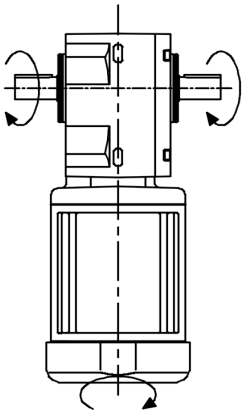
Hollow Bore



L Shaft

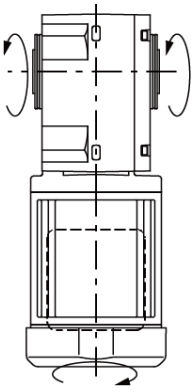


R Shaft

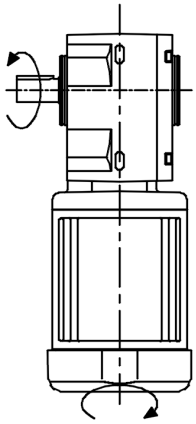


T Shaft

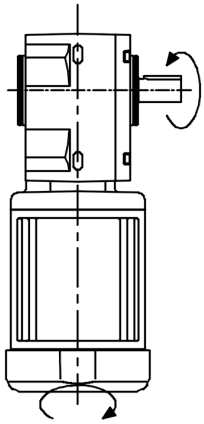
Motor Power	Reduction Ratio
1/8HP to 2HP (0.1kW to 1.5kW)	1/80 to 1/240
3HP (2.2kW)	1/80 to 1/120



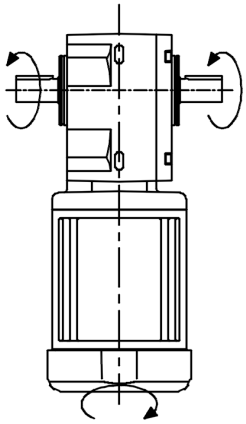
Hollow Bore



L Shaft



R Shaft



T Shaft

6 Wiring

Danger	
	Connect the power cable according to the wiring diagram within the terminal box or the instruction manual. Otherwise, an electric shock and/or fire may occur. (For a gearmotor without a terminal box, please be sure that the electrical connection components of the gearmotor are properly insulated.)
	Do not forcibly bend, pull or pinch the power cable and motor lead wires. Otherwise, an electric shock may occur.
	Be sure to ground the grounding terminal. Otherwise, an electric shock may occur.
	Be sure to use the supply voltage described on the nameplate. Otherwise, motor burn damage and fire may occur.

Caution	
	Do not touch the terminals when measuring the insulation resistance. Otherwise, an electric shock may occur.
	When wiring, follow your facility's electrical codes and extension regulations in order to prevent burns, electric shock, injury, and fire.
	The user must install an overload protector according to applicable electrical codes. It is recommended to install other protective devices (ground leakage breaker, etc.), in addition to an overload protector, in order to prevent burns, electric shock, injury, and fire.
	When running the gearmotor off the application, please remove the temporarily attached key from the output shaft. Not doing so may result in injury.
	Check the direction of rotation before the gearmotor is connected to the application. Running an application in the wrong direction may cause injury and/or damage to the application.
	When using Inverter/VFD on a 400V class motor, consult with Inverter/VFD manufacturer concerning the micro surge voltage. Failure to follow this precaution may result in damage and fire due to insulation breakdown.
	The voltage drop from the wiring should be 2% or lower. If the wiring distance is too long, the voltage drop will be larger and the gearmotor may not start.
	When reversing the rotation, be sure to stop the motor completely before starting the reverse rotation. Otherwise, the application may be damaged.
	For a gearmotor with brake, do not energize the brake coil continuously while the motor is stationary. Otherwise, coil burn damage and/or fire may occur due to reduced ventilation.
	For a gearmotor with clutch/brake, do not energize the clutch brake coil continuously while the motor is stationary. Otherwise, coil burn damage and/or fire may occur due to reduced ventilation.
	If a gearmotor with brake is utilized for lifting applications, please be sure to utilize the DC switch connection. Failing to do so may result in a drop-accident.

6-1 Gearmotor Wiring <Common Items>

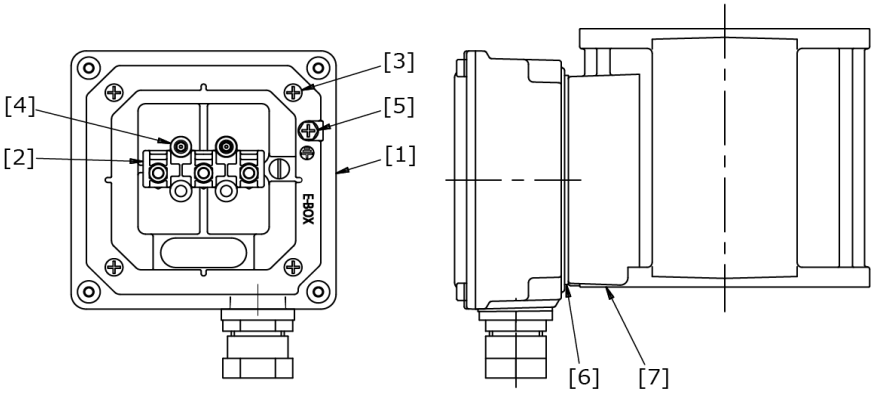
6-1-1 Precautions for Terminal Box/Terminal Block

- Use the nuts and a short board included for terminal block connection.
  (Short boards are not included for motors with three lead wires since it is unnecessary.)
- The tightening torque for the ground terminal is 1.2 to 1.5 N･m (10.6 to 13.3 lbf･in).
- Be sure to assemble and fasten the terminal box lid with the fixing screws after wiring.
- The tightening torque for the lid on the T type terminal box is 0.4 to 0.8 N･m (3.5 to 7.1 lbf･in).
- Refer to "6-1-2 How to Change Terminal Box Mounting Direction" if the direction of the terminal box outlet hole must be changed.
- An electric shock and application damage may occur if the motor is used with a damaged gasket. Please contact your nearest service office if the terminal box's rubber gasket is cut or damaged. (Refer to the final page of this instruction manual for details.)
- A rubber grommet with a membrane is attached to the opening part of the T type terminal box to protect the cable or the lead wire. Cut open the surface when performing wire connection.
- A rubber gasket for insulation and water-proofing is attached to the lid of E type terminal boxes.
  Please do not remove the rubber gasket. Otherwise, a short circuit and electric shock may occur.
  If by any chance the rubber gasket comes off, be sure to put it back on the lid.
- The tightening torque for the lid on the E type terminal box is 1.2 to 1.5 N･m (10.6 to 13.3 lbf･in).

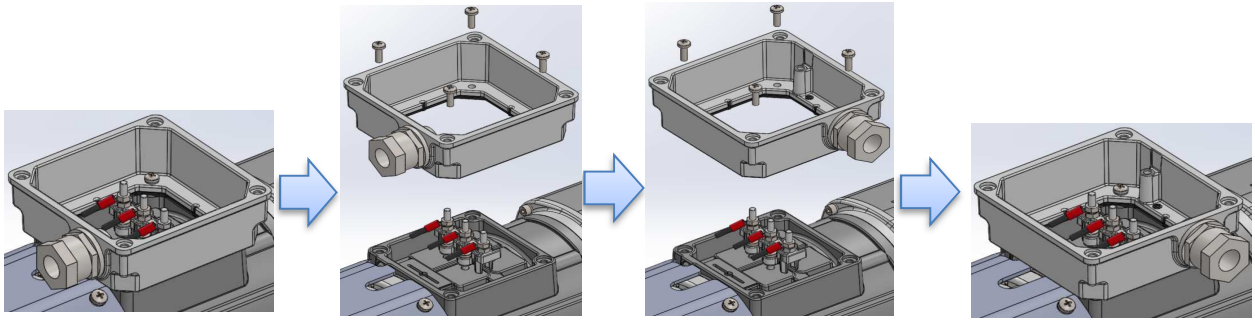
6-1-2 How to Change The Terminal Box Mounting Direction

Change the terminal box mounting direction as follows if the direction of the terminal box outlet hole must be changed.

* Note that malfunctions due to this procedure being performed incorrectly are not covered by our warranty.



[1]	Terminal box
[2]	Terminal block
[3]	Box mounting screw
[4]	Terminal block mounting screw
[5]	Ground terminal
[6]	Rubber gasket
[7]	Motor



1. Loosen the four [3] Box mounting screws and remove the terminal box.
   * The [6] Rubber gasket is attached to the bottom part of the terminal box. Be careful not to remove the rubber gasket.
2. Mount the terminal box in your desired direction and tighten the mounting screws.
   The tightening torque for the mounting screws is 1.2 to 1.5 N･m (10.6 to 13.3 lbf･in).
   Mount the box carefully so that the lead wires for the motor and brake are not pinched between the motor and the box.

Note) Do not change the mounting direction of the [2] Terminal block.
Defects caused by a customer changing the terminal block mounting direction are not covered by the warranty.

6-1-3 Precautions when Wiring a Brakemotor

- The brake voltage is 90V DC for the 200V class brake and 180V DC for the 400V class brake.
  The brake lead wires are blue for the 200V class brake and yellow for the 400V class brake.
- Please note that in case of products (voltage codes K & C) where voltage of both 200V class and 400V class are displayed on the motor nameplate, the voltage that can be used will vary depending on the brake voltage type.
  * 200V Class Brakes (Blue lead wires) cannot be used with 400V power.
  * 400V Class Brakes (Yellow lead wires) cannot be used with 200V power.
- Utilize “DC Switching” if the motor is used for lifting applications.
- Connect a surge suppressor (optional accessory) between the contacts for a DC Switching connection.
  Please contact your local service office for details on the surge suppressor. (Optional Accessory).
- Use switches of 110V DC <220V DC> with a contact point rating of 13 DC to block the inductive load of the DC coil when using DC Switching. Please contact your local service office for further details.
  * "A Contact point rating of 13 DC" is a classification under JIS C 8201-5-1 (Low voltage switching device and control device) for coil load applications.
  * The value within < > is for motors with a 400V brake.
- The rectifier has a diode built in, which may become unusable if a short circuit occurs due to improper connections, etc.
- The input voltage to the rectifier must be within the range specified below.
  Please be aware that repeated operation beyond this range may cause a malfunction.

Voltage	Rectifier	Allowable input power voltage
200V Class	A200-D90-UL	AC200V to 230V±10%
400V Class	A400-D180	AC380V to 480V±10%

6-1-4 Brake Lag Time : ta

Time (seconds) between switching off power to the brake coil and brake engagement.(Differs from the braking time.)

Standard (Brake model: B2, B4, J2, and J4)

Motor Power	DC Switching	AC Switching (A)	AC Switching (B)
1/8HP to 1HP (0.1kW to 0.75kW)	0.005 to 0.020	0.05 to 0.15	0.15 to 0.25
2HP and 3HP (1.5kW and 2.2kW)	0.015 to 0.030	0.15 to 0.30	0.5 to 0.6

Washdown IP65 (Brake model: V2, and V4)

Motor Power	DC Switching	AC Switching (A)	AC Switching (B)
1/8HP to 1HP (0.1kW to 0.75kW)	0.005 to 0.015	0.03 to 0.13	0.1 to 0.3

6-1-5 Precautions when Wiring a Gearmotor with a Clutch Brake

- DC 90V is required to operate the clutch brake. Please install the included rectifier (A200-D90) and surge suppressor (OP-ERZV10D471) according to the wiring diagram.
- For the protection of the rectifier, please install a fuse (1A capacity) either on the input or output side of the circuit.
- The rectifier has a diode built in, which may become unusable if a short circuit occurs due to improper connections, etc.
- Please use a contactor with a capacity of DC110V, and with a utilization category of DC-13 to block the inductive load (DC coil) on the relay for the clutch brake.
  * "A Contact point rating of 13 DC" is a classification under JIS C 8201-5-1 (Low voltage switching device and control device) for coil load applications.
- The input voltage to the rectifier must be within the range specified below.
  Please be aware that repeated operation beyond this range may cause a malfunction.

Rectifier	Allowable input power voltage
A200-D90	AC200V to 220V±10%

6-2 Gearmotor Wiring <Direct Power Input Operation>

- Refer to the "6-2-1 3-phase Motor Connection Table (Direct Power Input Operation)" to perform wiring for your gearmotor.
- For the motor's direction of rotation in the "6-2-2 3-phase Motor Connection List (Direct Power Input Operation)" connections, "Forward" is defined as clockwise rotation seen from the back-side of the motor.
  The rotational direction of the output shaft depends on the reduction ratio of the gearhead. Check the reduction ratio before connection. (Refer to "5 Rotational Direction")
- Securely ground the ground terminal to avoid risks of an electric shock.
  The ground terminal is located on the motor frame for motors w/o terminal box, or in the terminal box for motors with a terminal box.

6-2-1 3-phase Motor Connection Table (Direct Power Input Operation)

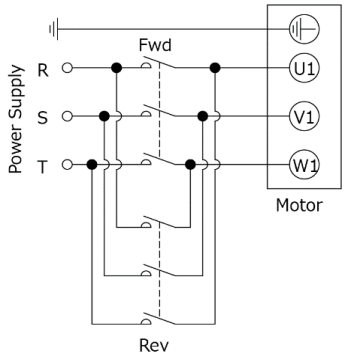
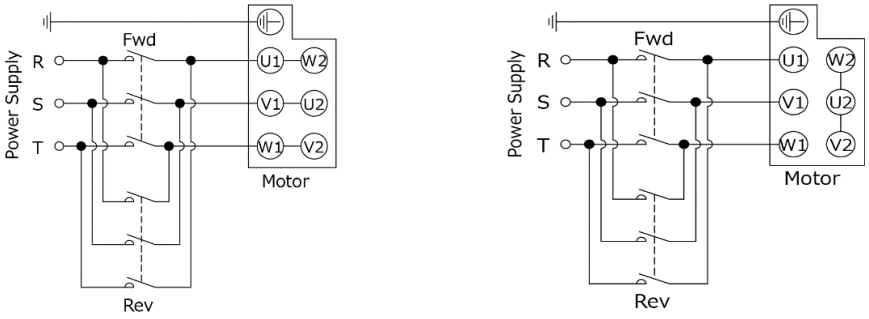
* The figure number in ( ) is an optional specification for the built-in rectifier.

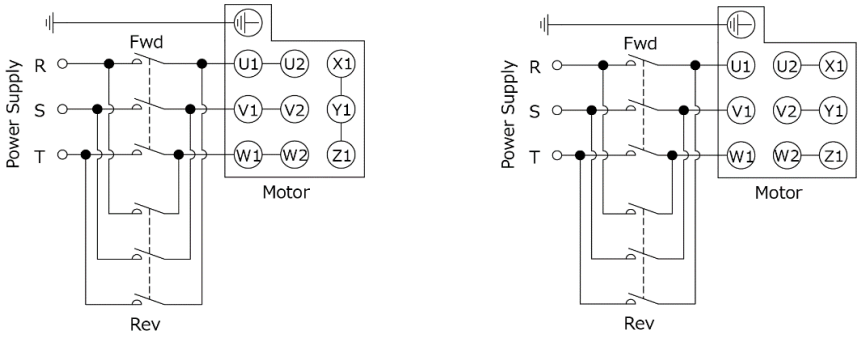
Voltage		Motor		Wiring diagram number				
Model No.	Voltage(V) / Frequency(Hz)	Number of Lead wires	Terminal Box	No Brake	Brake			Clutch Brake
					AC Switching (B)	AC Switching (A)	DC Switching	
A	208/60 230/60	9	w/ Box	Fig.-[3]	Fig.-[20] (Fig.-[AB])	Fig.-[21] (Fig.-[AA])	Fig.-[22] (Fig.-[DC])	–
	460/60 400/50				Fig.-[23] (Fig.-[AB])	Fig.-[24] (Fig.-[AA])	Fig.-[25] (Fig.-[DC])	–
E	415/50 440/50 480/60	3	w/ Box	Fig.-[1]	Fig.-[9] (Fig.-[AB])	Fig.-[10] (Fig.-[AA])	Fig.-[11] (Fig.-[DC])	–
M	575/60	3	w/ Box	Fig.-[1]	–	Fig.-[12]	Fig.-[13]	–
N	200/50 200/60 220/60	3	w/ Box	Fig.-[1]	Fig.-[6] (Fig.-[AB])	Fig.-[7] (Fig.-[AA])	Fig.-[8] (Fig.-[DC])	Fig.-[26]
			w/o Box (Flying Leads)	Fig.-[4]	Fig.-[14]	Fig.-[15]	Fig.-[16]	Fig.-[27]
W	380/50 400/50 400/60 440/60	3 / 9*1	w/ Box	Fig.-[1]	Fig.-[9] (Fig.-[AB])	Fig.-[10] (Fig.-[AA])	Fig.-[11] (Fig.-[DC])	Fig.-[28]
			w/o Box (Flying Leads)	Fig.-[5]	Fig.-[17]	Fig.-[18]	Fig.-[19]	–
K	220/60	6	w/ Box	Fig.-[2]	Fig.-[6] (Fig.-[AB])	Fig.-[7] (Fig.-[AA])	Fig.-[8] (Fig.-[DC])	–
	380/60				Fig.-[9] (Fig.-[AB])	Fig.-[10] (Fig.-[AA])	Fig.-[11] (Fig.-[DC])	–
C	220/50 230/50	6	w/ Box	Fig.-[2]	Fig.-[6] (Fig.-[AB])	Fig.-[7] (Fig.-[AA])	Fig.-[8] (Fig.-[DC])	–
	380/50				Fig.-[9] (Fig.-[AB])	Fig.-[10] (Fig.-[AA])	Fig.-[11] (Fig.-[DC])	–

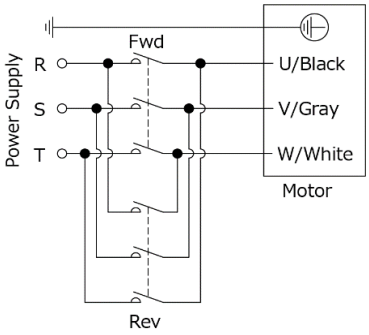
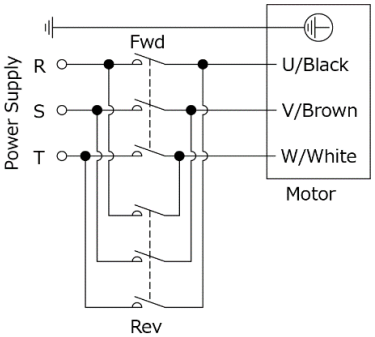
*1 400V class motor with clutch brake has 9 lead wires.

6-2-2 3-phase Motor Connection List (Direct Power Input Operation)

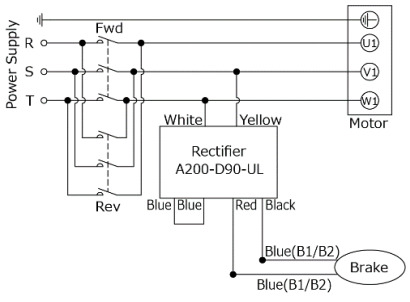
* 200V Class：200V to 230V, 400V Class：380V to 480V

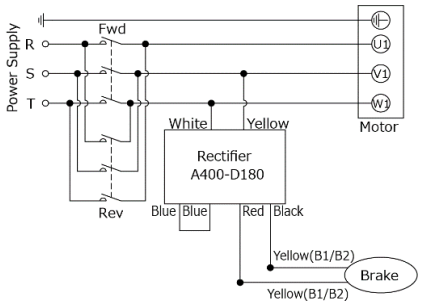
<table>
<tr><th>Number of Motor lead wires</th><th>Terminal box</th><th>Brake connection</th><th>Wiring diagram (Direct power input operation)</th></tr>
<tr><td>3</td><td>w/ Box</td><td>—</td><td>Fig. - [1] Common for 200V Class / 400V Class / 575 V
 
</td></tr>
<tr><td>6</td><td>w/ Box</td><td>—</td><td>Fig. - [2] Low Voltage (200V Class) High Voltage (400V Class)
 

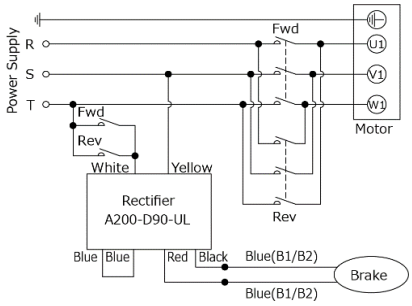
* Use the included short board to switch between 200V/400V power.</td></tr>
<tr><td>9</td><td>w/ Box</td><td>—</td><td>Fig. - [3] Low Voltage (200V Class) High Voltage (400V Class)
 

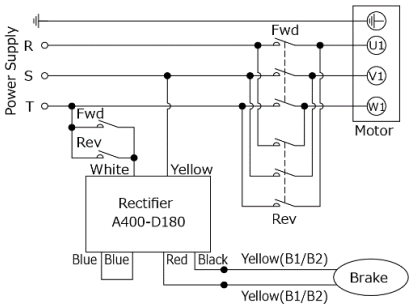
* Use the included short board to switch between 200V/400V power.</td></tr>
<tr><td>3</td><td>w/o Box</td><td>—</td><td>Fig. - [4] 200V Class
 
</td><td>Fig. - [5] 400V Class
 
</td></tr>
</table>

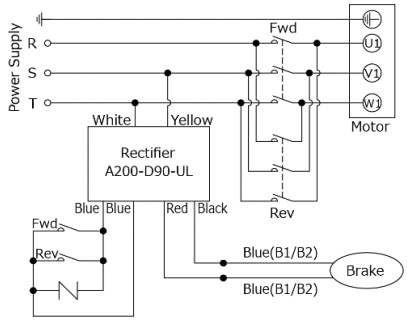
* 200V Class：200V to 230V, 400V Class：380V to 480V

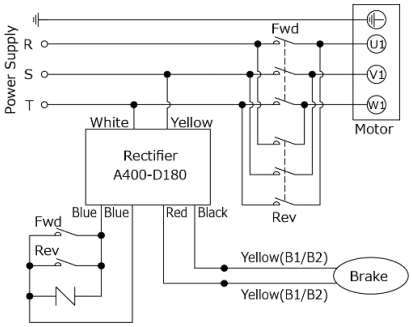
<table>
<tr><th>Number of Motor lead wires</th><th>Terminal box</th><th>Brake connection</th><th>Wiring diagram (Direct power input operation)</th></tr>
<tr><td rowspan="2">3 / 6</td><td rowspan="2">w/ Box</td><td rowspan="2">AC Switching (B)</td><td>Fig. - [6]
Motor：200V Class
Brake：200V Class
 

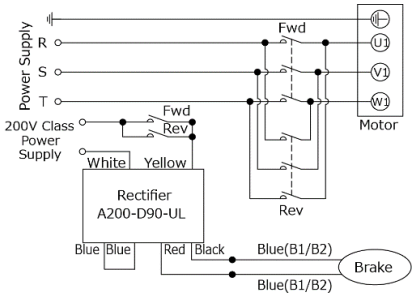
* Please short the A200-D90-UL rectifier's blue-blue wires.
* B1･B2 terminals are located in the terminal box.</td><td>Fig. - [9]
Motor：400V Class
Brake：400V Class
 

* Please short the A400-D180 rectifier's blue-blue wires.
* B1･B2 terminals are located in the terminal box.</td></tr>
<tr><td rowspan="2">3 / 6</td><td rowspan="2">w/ Box</td><td rowspan="2">AC Switching (A)</td><td>Fig. - [7]
Motor：200V Class
Brake：200V Class
 

* Please short the A200-D90-UL rectifier's blue-blue wires.
* B1･B2 terminals are located in the terminal box.</td><td>Fig. - [10]
Motor：400V Class
Brake：400V Class
 

* Please short the A400-D180 rectifier's blue-blue wires.
* B1･B2 terminals are located in the terminal box.</td></tr>
<tr><td>3 / 6</td><td>w/ Box</td><td>DC Switching</td><td>Fig. - [8]
Motor：200V Class
Brake：200V Class
 

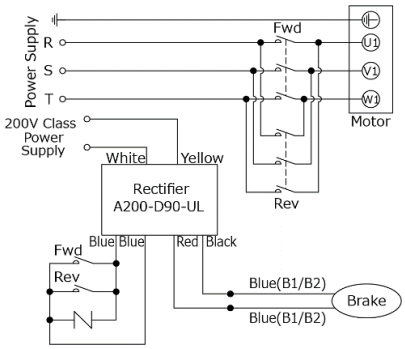
* B1･B2 terminals are located in the terminal box.</td><td>Fig. - [11]
Motor：400V Class
Brake：400V Class
 

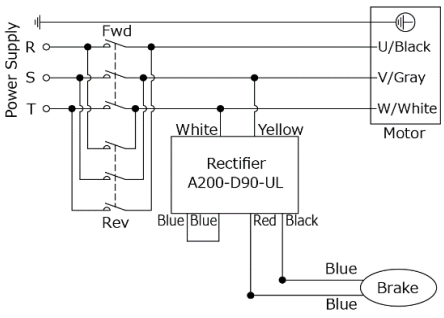
* B1･B2 terminals are located in the terminal box.</td></tr>
<tr><td>3</td><td>w/ Box</td><td>AC Switching (A)</td><td></td><td>Fig. - [12]
Motor：575V
Brake：200V Class
 

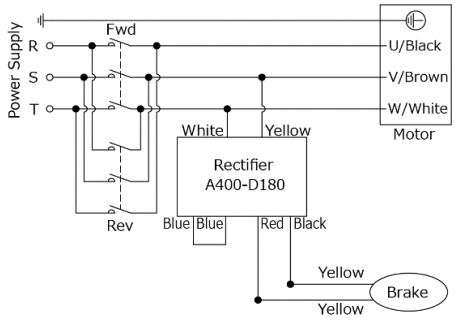
* Please short the A200-D90-UL rectifier's blue-blue wires.
* B1･B2 terminals are located in the terminal box.</td></tr>
</table>

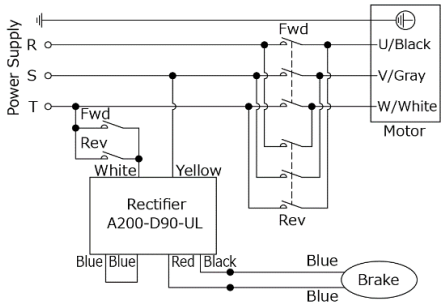
: Surge suppressor (option)

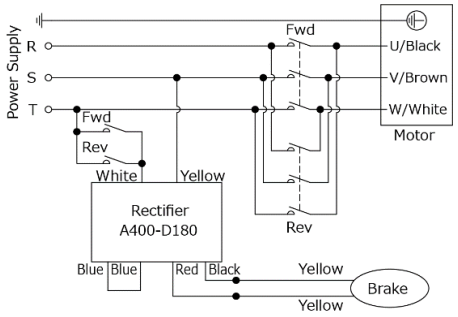
* 200V Class：200V to 230V, 400V Class：380V to 480V

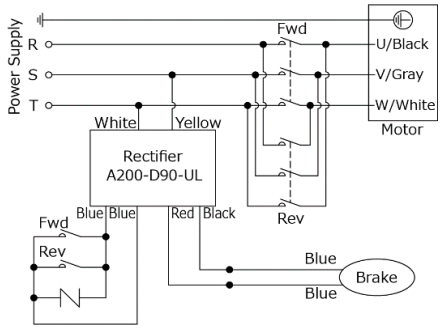
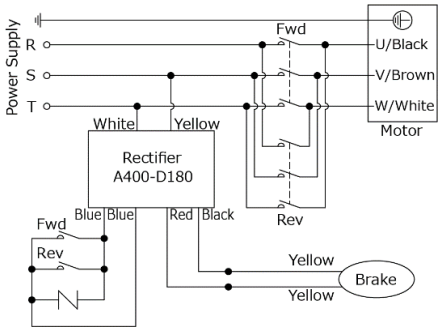
<table>
<tr><th>Number of Motor lead wires</th><th>Terminal box</th><th>Brake connection</th><th colspan="2">Wiring diagram (Direct power input operation)</th></tr>
<tr><td>3</td><td>w/ Box</td><td>DC Switching</td><td></td><td>Fig. - [13]
Motor：575V
Brake：200V Class
 

* B1･B2 terminals are located in the terminal box.</td></tr>
<tr><td>3</td><td>w/o Box</td><td>AC Switching (B)</td><td>Fig. - [14]
Motor：200V Class
Brake：200V Class
 

* Please short the A200-D90-UL rectifier's blue-blue wires.</td><td>Fig. - [17]
Motor：400V Class
Brake：400V Class
 

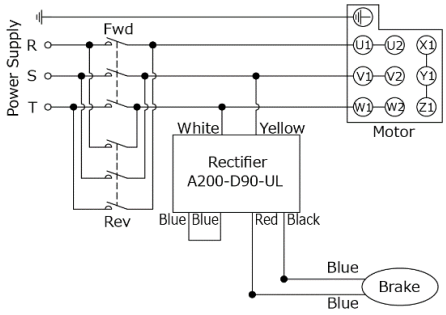
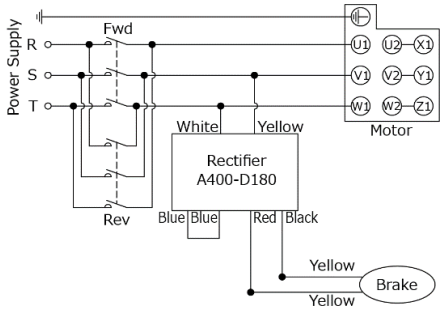
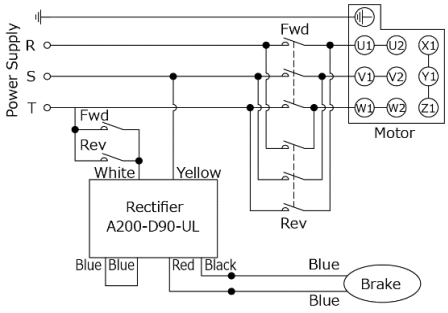
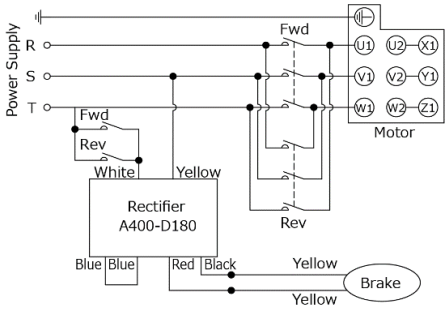
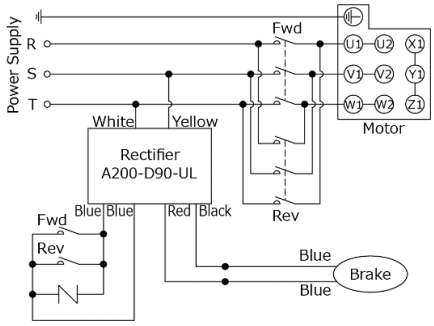
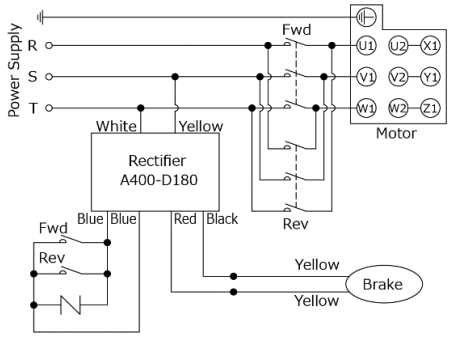
* Please short the A400-D180 rectifier's blue-blue wires.</td></tr>
<tr><td>3</td><td>w/o Box</td><td>AC Switching (A)</td><td>Fig. - [15]
Motor：200V Class
Brake：200V Class
 

* Please short the A200-D90-UL rectifier's blue-blue wires.</td><td>Fig. - [18]
Motor：400V Class
Brake：400V Class
 

* Please short the A400-D180 rectifier's blue-blue wires.</td></tr>
<tr><td>3</td><td>w/o Box</td><td>DC Switching</td><td>Fig. - [16]
Motor：200V Class
Brake：200V Class
 
</td><td>Fig. - [19]
Motor：400V Class
Brake：400V Class
 
</td></tr>
</table>

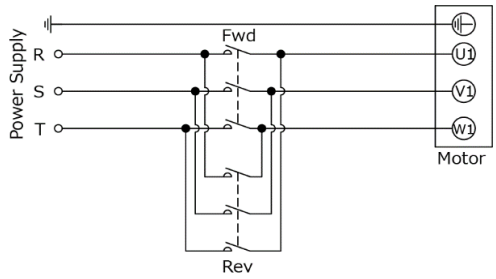
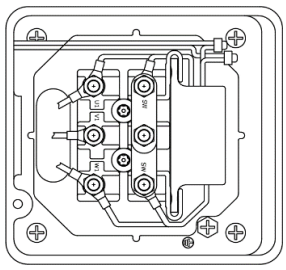
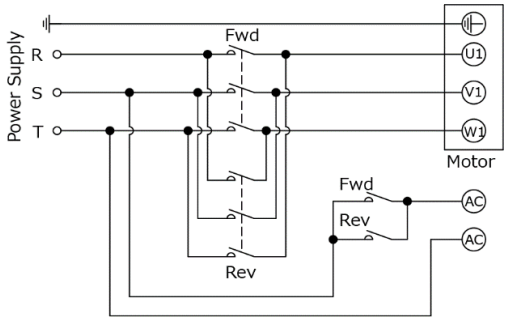
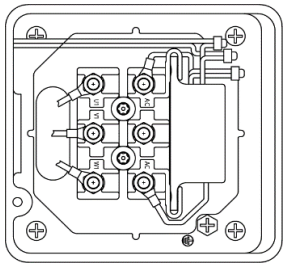
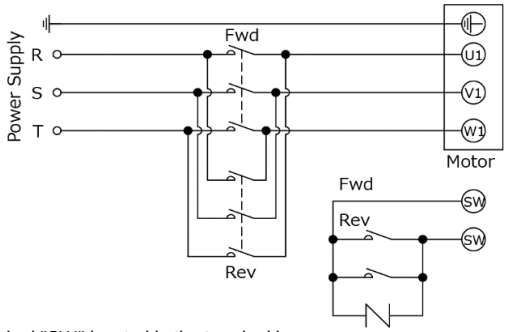
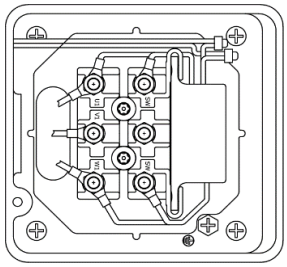
: Surge suppressor (option)

* 200V Class：200V to 230V, 400V Class：380V to 480V

Number of Motor lead wires	Terminal box	Brake connection	Wiring diagram (Direct power input operation)	
9	w/ Box	AC Switching (B)	Fig. - [20] Motor：200V Class Brake：200V Class  * Please short the A200-D90-UL rectifier's blue-blue wires. * Brake lead wire(blue) is located inside the terminal box.	Fig. - [23] Motor：400V Class Brake：400V Class  * Please short the A400-D180 rectifier's blue-blue wires. * Brake lead wire(yellow) is located inside the terminal box.
9	w/ Box	AC Switching (A)	Fig. - [21] Motor：200V Class Brake：200V Class  * Please short the A200-D90-UL rectifier's blue-blue wires. * Brake lead wire(blue) is located inside the terminal box.	Fig. - [24] Motor：400V Class Brake：400V Class  * Please short the A400-D180 rectifier's blue-blue wires. * Brake lead wire(yellow) is located inside the terminal box.
9	w/ Box	DC Switching	Fig. - [22] Motor：200V Class Brake：200V Class  * Brake lead wire(blue) is located inside the terminal box.	Fig. - [25] Motor：400V Class Brake：400V Class  * Brake lead wire(yellow) is located inside the terminal box.

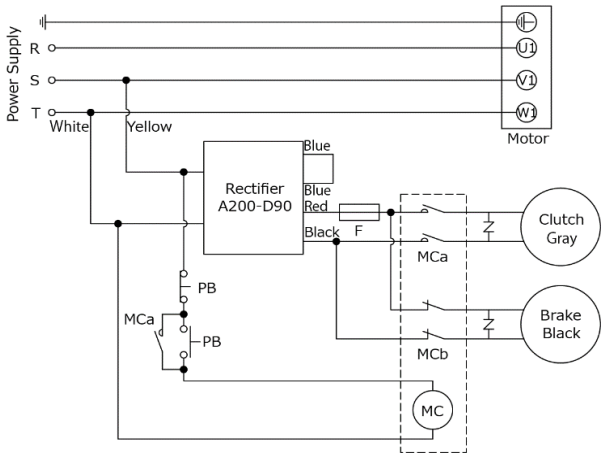
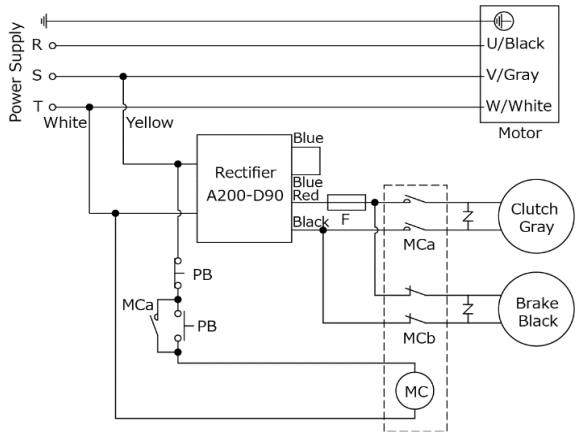
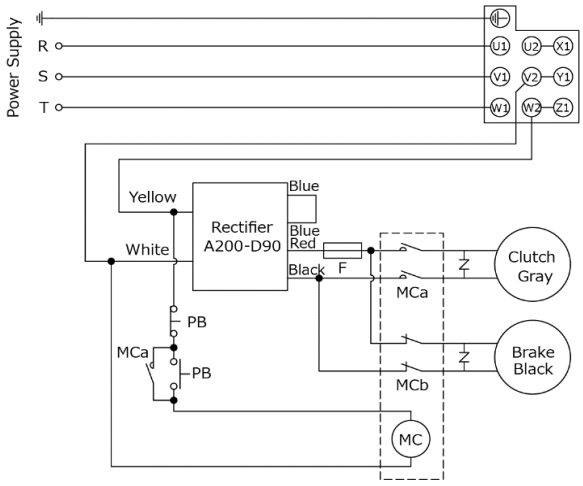
: Surge suppressor (option)

* 200V Class：200V to 230V, 400V Class：380V to 480V

Number of Motor lead wires	Terminal box	Brake connection	Wiring diagram (Direct power input operation)
3 / 6 / 9	w/ Box	AC Switching (B)	Fig. - [AB] Common for 200V Class / 400V Class  <Appearance>  * The voltage supplied to the brake shall be the same as the supply voltage of the motor. * The rectifier type would be "A200-D90-UL" for 200V type, and "A400-D180" for 400V type.
3 / 6 / 9	w/ Box	AC Switching (A)	Fig. - [AA] Common for 200V Class / 400V Class  <Appearance>  * Terminal "AC" located in the terminal box. * The rectifier type would be "A200-D90-UL" for 200V type, and "A400-D180" for 400V type.
3 / 6 / 9	w/ Box	DC Switching	Fig. - [DC] Common for 200V Class / 400V Class  <Appearance>  * Terminal "SW" located in the terminal box. * The voltage supplied to the brake shall be the same as the supply voltage of the motor. * The rectifier type would be "A200-D90-UL" for 200V type, and "A400-D180" for 400V type.

: Surge suppressor (option)

* 200V Class：200V to 230V, 400V Class：380V to 480V

Number of Motor lead wires	Terminal box	Brake connection	Wiring diagram (Direct power input operation)
3	w/ Box	—	Fig. - [26] Motor：200V Class Clutch Brake：200V Class  * Please short the A200-D90 rectifier's blue-blue wires.
3	w/o Box	—	Fig. - [27] Motor：200V Class Clutch Brake：200V Class  * Please short the A200-D90 rectifier's blue-blue wires.
9	w/ Box	—	Fig. - [28] Motor：400V Class Clutch Brake：200V Class  * Please short the A200-D90 rectifier's blue-blue wires.

MC：Relay Coil
Mca：Magnetic Contactor, Contact a
MCb：Magnetic Contactor, Contact b
PB：Push Button Switch
—|\|— ：Surge suppressor (accessory)
F：Fuse

6-3 Gearmotor wiring <Inverter/VFD Operation>

- Refer to the "6-3-2 3-phase Motor Connection Table (Inverter/VFD Operation)" to perform wiring for your gearmotor.
- The rotational direction of the output shaft depends on the reduction ratio of the gearhead. Check the reduction ratio before connection. (Refer to "5 Rotational Direction")
- Securely ground the ground terminal to avoid risks of an electric shock.
  The ground terminal is located on the motor frame for motors w/o terminal box, or in the terminal box for motors with a terminal box.

6-3-1 Precautions for Inverter/VFD Operation

- For general usage, please use the gearmotor within the range of 5Hz to 120Hz.
  * 5 to 60 Hz for gearmotors with a clutch brake.
- Vibration/noise is increased when operating at above 60Hz. In addition, the higher shaft speed may shorten the life-span of the oil seal.
- Note that a temperature increase may occur with low speed operation due to the reduced cooling effect of the motor fan.
- The torque characteristics of the motor largely varies with the type of the Inverter/VFD used and the control method.
- In the case of a brakemotor or a gearmotor with a clutch brake, it is recommended to bypass the Inverter/VFD when wiring the brake or clutch brake, as voltage fluctuation may cause braking or clutching malfunction. (Supply from the primary side of the Inverter/VFD)
- When using Inverter/VFD on a 400V class motor, consult with Inverter/VFD manufacturer concerning the micro surge voltage.

6-3-2 3-phase Motor Connection Table (Inverter/VFD Operation)

*The figure number in ( ) is for the built-in rectifier option specifications.

Supply Voltage		Motor		Wiring diagram number				
Model No.	Voltage(V) / Frequency(Hz)	Number of Lead wires	Terminal Box	No Brake	Brake			Clutch Brake
					AC Switching (B)	AC Switching (A)	DC Switching	
A	208/60 230/60	9	w/ Box	Fig.-V[4]	—	Fig.-V[17] (Fig.-V[AA])	Fig.-V[18]	—
	460/60 400/50				—	Fig.-V[19] (Fig.-V[AA])	Fig.-V[20]	—
E	415/50 440/50 480/60	3	w/ Box	Fig.-V[2]	—	Fig.-V[9] (Fig.-V[AA])	Fig.-V[10]	—
M	575/60	3	w/ Box	Fig.-V[2]	—	Fig.-V[11]	Fig.-V[12]	—
N	200/50 200/60 220/60	3	w/ Box	Fig.-V[1]	—	Fig.-V[7] (Fig.-V[AA])	Fig.-V[8]	Fig.-[21]
			w/o Box (Flying Leads)	Fig.-V[5]	—	Fig.-V[13]	Fig.-V[14]	Fig.-[22]
W	380/50 400/50 400/60 440/60	3 / 9*1	w/ Box	Fig.-V[2]	—	Fig.-V[9] (Fig.-V[AA])	Fig.-V[10]	Fig.-[23]
			w/o Box (Flying Leads)	Fig.-V[6]	—	Fig.-V[15]	Fig.-V[16]	—
K	220/60	6	w/ Box	Fig.-V[3]	—	Fig.-V[7] (Fig.-V[AA])	Fig.-V[8]	—
	380/60				—	Fig.-V[9] (Fig.-V[AA])	Fig.-V[10]	—
C	220/50 230/50	6	w/ Box	Fig.-V[3]	—	Fig.-V[7] (Fig.-V[AA])	Fig.-V[8]	—
	380/50				—	Fig.-V[9] (Fig.-V[AA])	Fig.-V[10]	—

*1 400V class motor with a clutch brake has 9 lead wires.

6-3-3 3-phase Motor Connection List (Inverter/VFD Operation)

* 200V Class：200V to 230V, 400V Class：380V to 480V

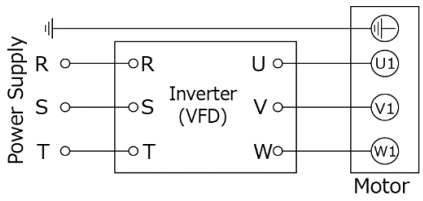
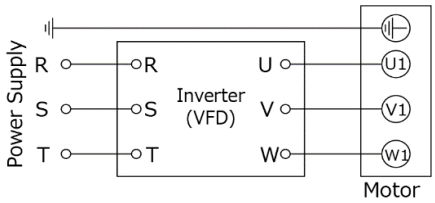
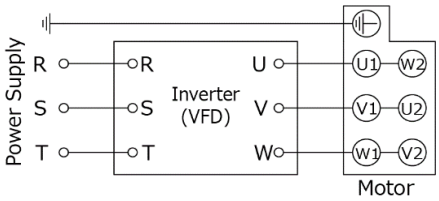
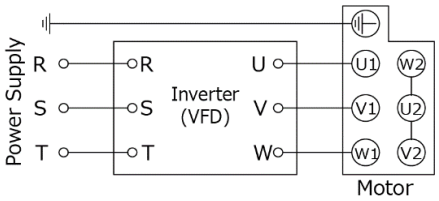
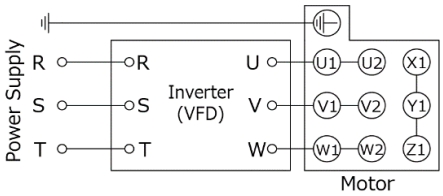
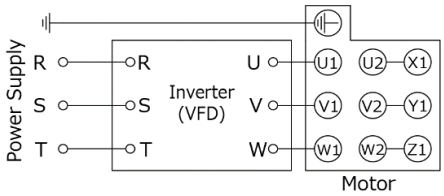
<table>
<tr><th>Number of Motor lead wires</th><th>Terminal box</th><th>Brake connection</th><th>Wiring diagram (Inverter/VFD operation)</th></tr>
<tr><td>3</td><td>w/ Box</td><td>—</td><td>Fig. - V[1] 200V Class
 

Fig. - V[2] 400V Class / 575V
 
</td></tr>
<tr><td>6</td><td>w/ Box</td><td>—</td><td>Fig. - V[3] Low Voltage (200V Class) High Voltage (400V Class)
 



* Use the included short board to switch between 200V/400V power.</td></tr>
<tr><td>9</td><td>w/ Box</td><td>—</td><td>Fig. - V[4] Low Voltage (200V Class) High Voltage (400V Class)
 



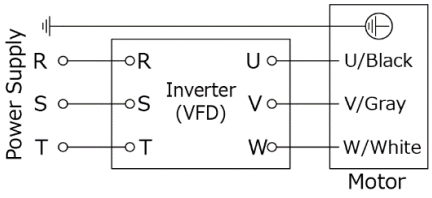
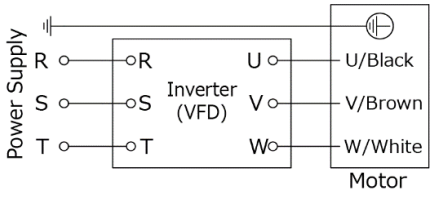
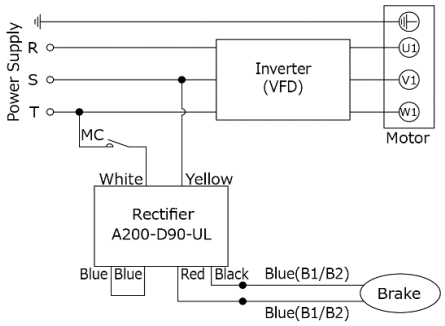
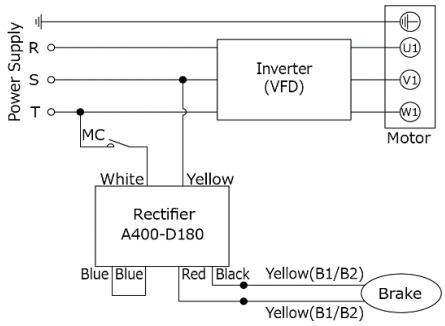
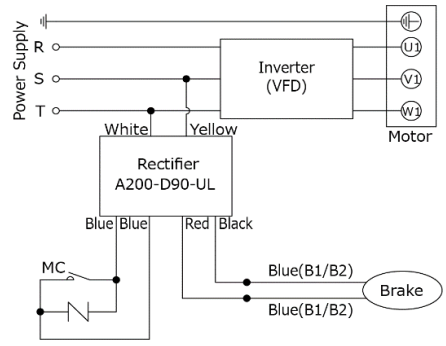
* Use the included short board to switch between 200V/400V power.</td></tr>
<tr><td>3</td><td>w/o Box</td><td>—</td><td>Fig. - V[5] 200V Class
 

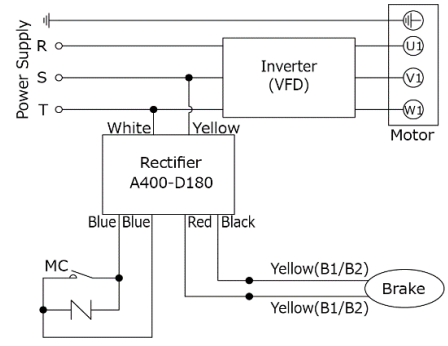
Fig. - V[6] 400V Class
 
</td></tr>
</table>

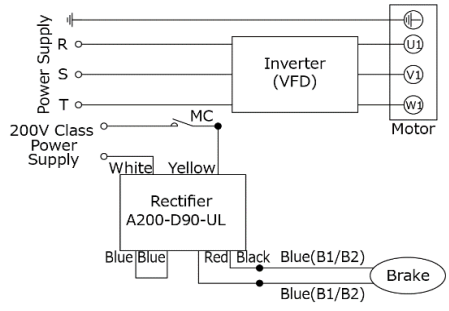
* 200V Class：200V to 230V, 400V Class：380V to 480V

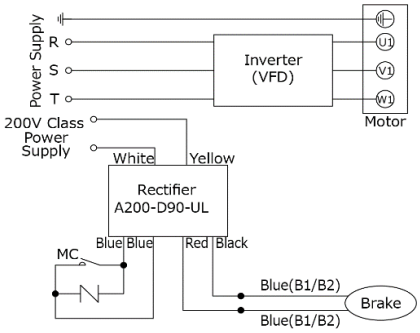
<table>
<tr><th>Number of Motor lead wires</th><th>Terminal box</th><th>Brake connection</th><th>Wiring diagram (Inverter/VFD operation)</th></tr>
<tr><td>3 / 6</td><td>w/ Box</td><td>AC Switching (A)</td><td>Fig. - V[7] Motor：200V Class Brake：200V Class
 

* Please short the A200-D90-UL rectifier's blue-blue wires.
* B1･B2 terminals are located in the terminal box.</td><td>Fig. - V[9] Motor：400V Class Brake：400V Class
 

* Please short the A400-D180 rectifier's blue-blue wires.
* B1･B2 terminals are located in the terminal box.</td></tr>
<tr><td>3 / 6</td><td>w/ Box</td><td>DC Switching</td><td>Fig. - V[8] Motor：200V Class Brake：200V Class
 

* B1･B2 terminals are located in the terminal box.</td><td>Fig. - V[10] Motor：400V Class Brake：400V Class
 

* B1･B2 terminals are located in the terminal box.</td></tr>
<tr><td>3 / 6</td><td>w/ Box</td><td>AC Switching (A)</td><td></td><td>Fig. - V[11] Motor：575V Brake：200V Class
 

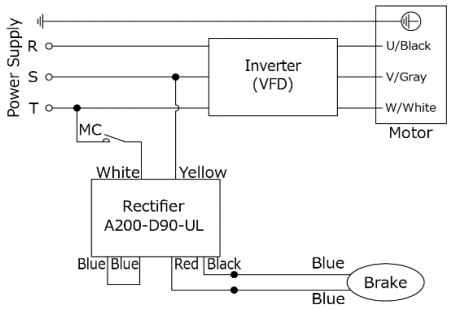
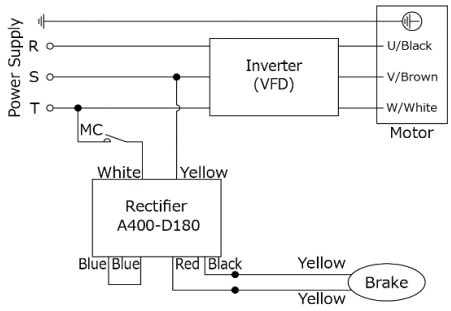
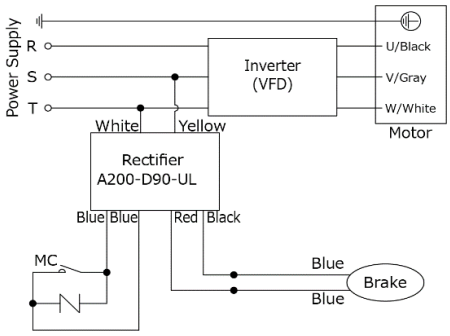
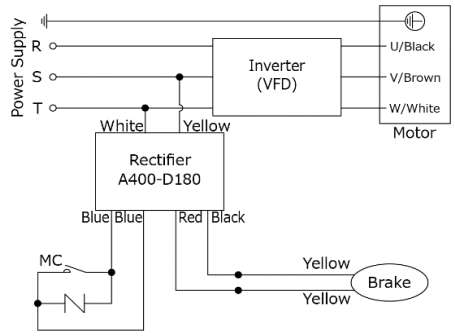
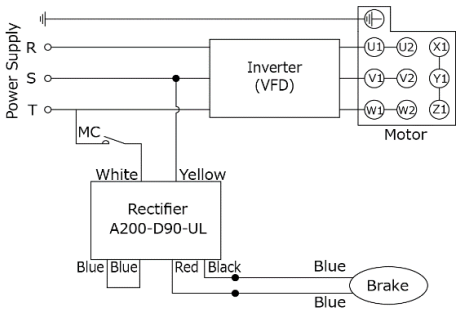
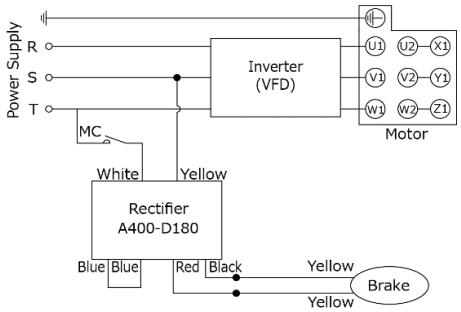
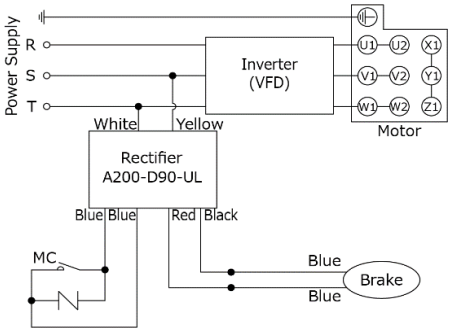
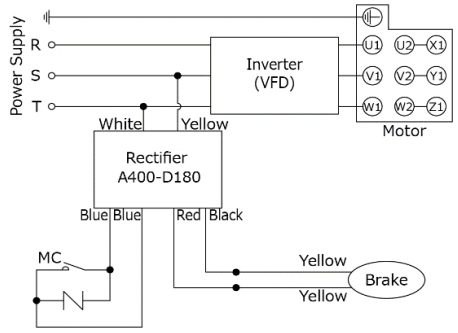
* Please short the A400-D180 rectifier's blue-blue wires.
* B1･B2 terminals are located in the terminal box.</td></tr>
<tr><td>3</td><td>w/ Box</td><td>DC Switching</td><td></td><td>Fig. - V[12] Motor：575V Brake：200V Class
 

* Please short the A200-D90-UL rectifier's blue-blue wires.
* B1･B2 terminals are located in the terminal box.</td></tr>
</table>

MC : Magnetic Contactor

 : Surge suppressor (option)

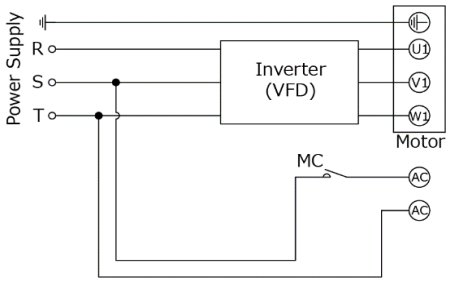
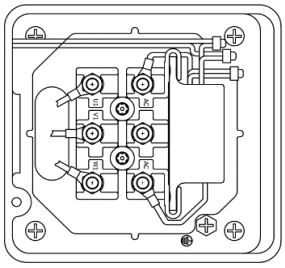
* 200V Class：200V to 230V, 400V Class：380V to 480V

Number of Motor lead wires	Terminal box	Brake connection	Wiring diagram (Inverter/VFD operation)	
3	w/o Box	AC Switching (A)	Fig. - V[13] Motor：200V Class Brake：200V Class  * Please short the A200-D90-UL rectifier's blue-blue wires.	Fig. - V[15] Motor：400V Class Brake：400V Class  * Please short the A400-D180 rectifier's blue-blue wires.
3	w/o Box	DC Switching	Fig. - V[14] Motor：200V Class Brake：200V Class  	Fig. - V[16] Motor：400V Class Brake：400V Class 
9	w/ Box	AC Switching (A)	Fig. - V[17] Motor：200V Class Brake：200V Class  * Please short the A200-D90-UL rectifier's blue-blue wires. * Brake lead wire(blue) is located inside the terminal box.	Fig. - V[19] Motor：400V Class Brake：400V Class  * Please short the A400-D180 rectifier's blue-blue wires. * Brake lead wire(yellow) is located inside the terminal box.
9	w/ Box	DC Switching	Fig. - V[18] Motor：200V Class Brake：200V Class  * Brake lead wire(blue) is located inside the terminal box.	Fig. - V[20] Motor：400V Class Brake：400V Class  * Brake lead wire(yellow) is located inside the terminal box.

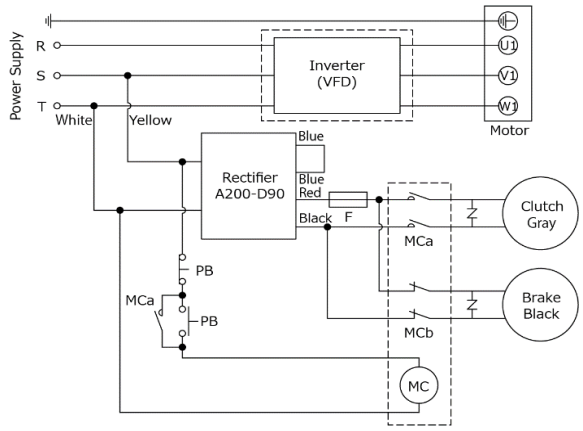
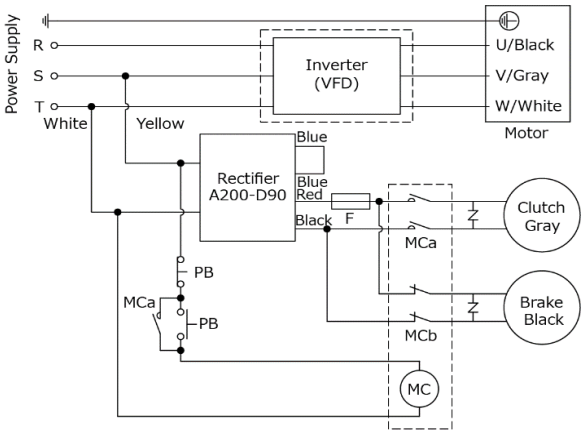
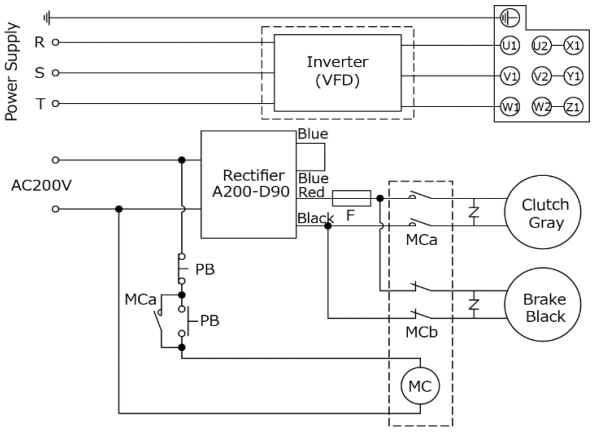
MC : Magnetic Contactor

: Surge suppressor (option)

* 200V Class：200V to 230V, 400V Class：380V to 480V

Number of Motor lead wires	Terminal box	Brake connection	Wiring diagram (Inverter/VFD operation)
3 / 6 / 9	w/ Box	AC Switching (A)	Fig. - V[AA] Common for 200V Class / 400V Class  <Appearance>  * Terminal "AC" located in the terminal box. * The rectifier type would be "A200-D90-UL" for 200V type, and "A400-D180" for 400V type.

* 200V Class：200V to 230V, 400V Class：380V to 480V

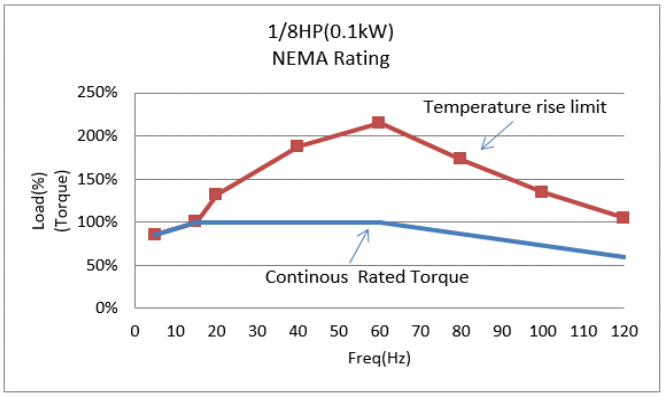
Number of Motor lead wires	Terminal box	Brake connection	Wiring diagram (Inverter/VFD operation)
3	w/ Box	—	Fig. - V[21] Motor：200V Class Clutch Brake：200V Class  * Please short the A200-D90 rectifier's blue-blue wires.
3	w/o Box	—	Fig. - V[22] Motor：200V Class Clutch Brake：200V Class  * Please short the A200-D90 rectifier's blue-blue wires.
9	w/ Box	—	Fig. - V[23] Motor：400V Class Clutch Brake：200V Class  * Please short the A200-D90 rectifier's blue-blue wires. * Prepare separate 200V power supply for the input lead wire(white/yellow) of the rectifier.

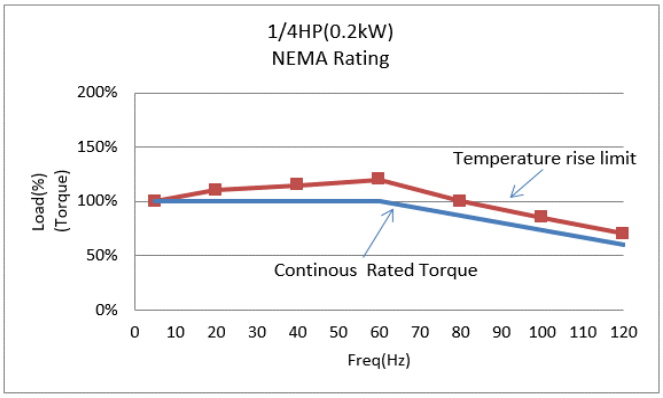
MC：Relay Coil
Mca：Magnetic Contactor, Contact a
MCb：Magnetic Contactor, Contact b
PB：Push Button Switch
—|\|— ：Surge suppressor (accessory)
F：Fuse

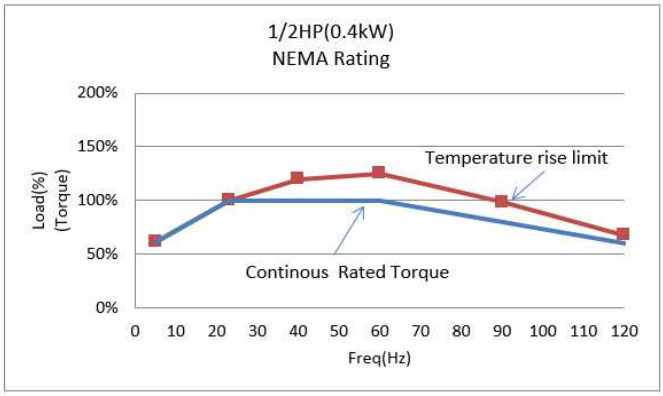
6-4 Data of Inverter/VFD Motor with Allen Bradley(Power Flex 4)

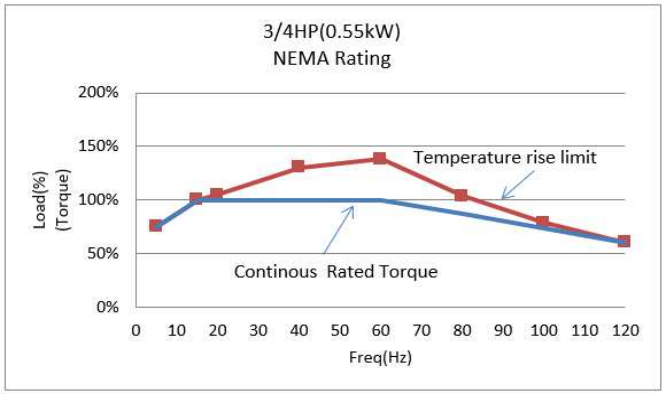
Below are performance curves when using an Allen Bradley Inverter/VFD (Power Flex 4) with our gearmotors. When the frequency reaches 60Hz, the load factor (%) is equal to the Output shaft torque 100% as defined in the catalogue.

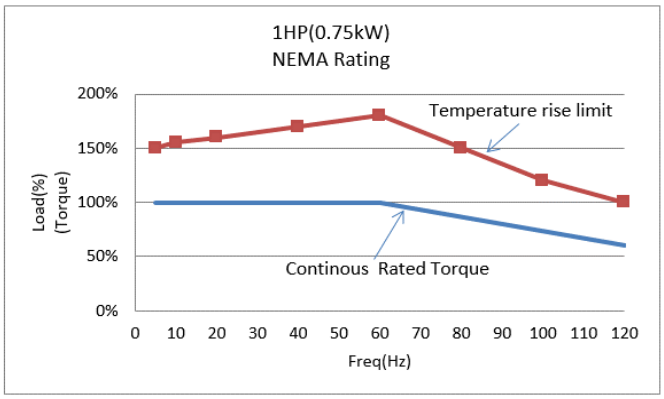
Based on the Inverter/VFD used, gearmotor characteristics can change. In case another Inverter/VFD that is not Allen Bradley (Power Flex 4) is used, please contact our customer care for more information.

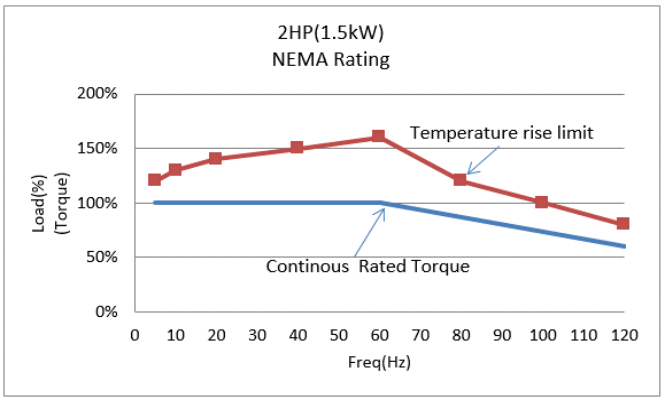


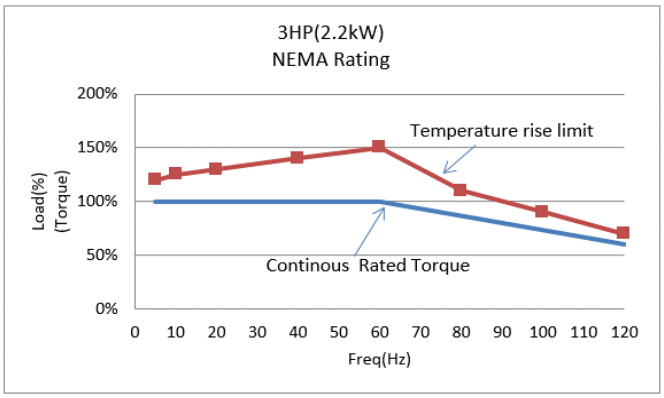






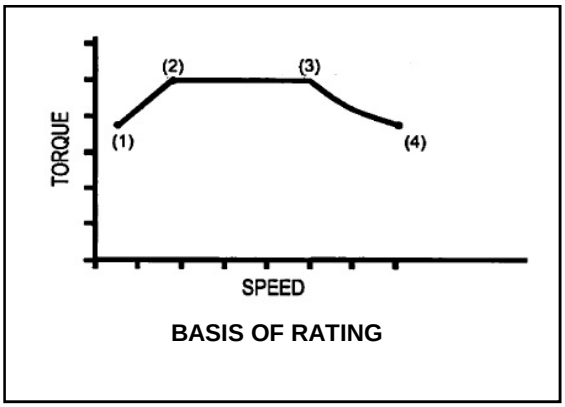






Remarks		Motor Power						
		1/8HP (0.1kW)	1/4HP (0.2kW)	1/2HP (0.4kW)	3/4HP* (0.55kW)	1HP (0.75kW)	2HP (1.5kW)	3HP (2.2kW)
(1)	Freq (Hz)	5	5	5	5	5	5	5
	Torque(%)	90	100	60	75	100	100	100
(2)	Freq (Hz)	15	5	25	15	5	5	5
	Torque(%)	100	100	100	100	100	100	100
(3)	Freq (Hz)	60	60	60	60	60	60	60
	Torque(%)	100	100	100	100	100	100	100
(4)	Freq (Hz)	120	120	120	120	120	120	120
	Torque(%)	60	60	60	60	60	60	60

* 3/4 HP(0.55kW) data is base on the use of 1 HP(0.75kW) Allen Bradley (Power Flex 4) Inverter/VFD.



BASIS OF RATING

NOTES

(1) = Torque at minimum speed based on temperature considerations and voltage boost.
(2) = Lowest speed of the constant torque range based on temperature considerations.
(3) = Base rating point at upper end of constant torque range.
(4) = Maximum operating speed based on constant horsepower and any limitation on rotational speed.

7 Operation

Danger
Do not operate the motor while the terminal box cover is removed. Mount the terminal box cover in the original position after work. Otherwise, an electric shock may occur.
Do not approach or touch rotating bodies (output shafts, etc.) while the product is running. Otherwise, entanglement and injury may occur.
Be sure to turn off the power switch when a power failure occurs. Otherwise, sudden power recovery may cause electric shock, injury and application damage.
Do not use a gearmotor with clutch brake for lifting(elevation) applications. Drop accidents may occur when power fails.

Caution
Do not touch the gearmotor which may be hot when energized or for a while after the power is shut off. If touched it may result in burns.
Immediately stop operation of the gearmotor if there is any abnormality. Otherwise, an electric shock, injury and/or fire may occur.
Do not use the motor under loads that exceed the ratings. Otherwise, injury and application damage may occur.
Do not perform impact stop to the motor. For this may cause damage to the gearmotor and the application.
Do not remove the fan of gearmotors without a brake and gearmotors with clutch brake with capacities of 1/2HP(0.4 kW) or more. Once removed, the fan cannnot be reinstalled properly, and the fan may not be secured on the motor. If it is removed, please contact the nearest service office.

7-1 Pre-Operation Checks

Please check below before turning on the power.

- Is the wiring correctly performed?
- Is the capacity of the fuse and thermal relay appropriate?
- Is the product correctly installed?
- Is the ground connection properly done?

7-2 Trial Operation Checks

Please check below before test runs.

- Switch the motor on for 1 to 2 seconds under no load to check the rotational direction before installing to the application.
  If the direction is wrong, refer to “ 6. Wiring.” and change the wiring.
- Connect to the application and operate at not load.
  If there is no abnormality, gradually increase the load up to full load.

7-3 Routine Operation Checks

Refer to the details of "9-2 Daily Inspection" and check the state of operation .

Note) Immediately stop the operation if there is any abnormality.
Otherwise, application damage, injury, fire, an electric shock and burn may occur.
Refer to “10 Troubleshooting” etc. for the diagnosis when an abnormality occurs and do not operate the motor until the causes of error are found and corrective actions are taken.

8 Standards

8-1 Gearmotor Safety Standards

Country Name	United States	Canada	Europe (EU)	China
Number of Phases	3-phase	3-phase	3-phase	3-phase
Standards	UL	CSA	EN	GB
Standards No.	UL1004-1	CSA C22.2 No.100	EN60034-1 EN60034-5	GB/T12350-2009
UL File No.	PRGY2. E172621	PRGY8. E172621		

8-2 Low Voltage 3-phase Induction Motor Efficiency Regulation Support Status

Country Name		United States	Canada	Europe (EU) *		China	Korea
Law		EISA	EEAct	COMMISSION REGULATION		电动机能效限定值及能效等级	Energy Consumption Efficiency Class Display System
Standards		NEMA MG1-12-12	CSA C390	IEC60034-30-1		GB18613-2020	KS C 4202
Support Details	Power Range	1HP(0.75kW) to 3HP(2.2 kW)	1HP(0.75kW) to 3HP(2.2 kW)	1/4HP (0.2kW) to 1/2HP (0.4kW)	1HP (0.75kW) to 3HP (2.2kW)	1HP(0.75kW) to 3HP(2.2 kW)	1HP(0.75kW) to 3HP(2.2 kW)
	Number of Poles	4	4	4	4	4	4
	Efficiency	IE3	IE3	IE2	IE3	Class 3	IE3

* 3/4HP (0.55kW) is not supported.

- Support details are applicable to gearmotor efficiency regulations.
- The contents "8 Standards" are subject to change without a prior notification in accordance with the change of standards, etc.
- Clutch brake gearmotors are not supported.

8-2-1 Efficiency Values for High-Efficiency Gearmotor for Europe

Rated efficiency value under 50Hz and under 75 % and 50 % rated load
*Please refer to the product name plate for the rated efficiency at 100% load.

(Efficiency : %)

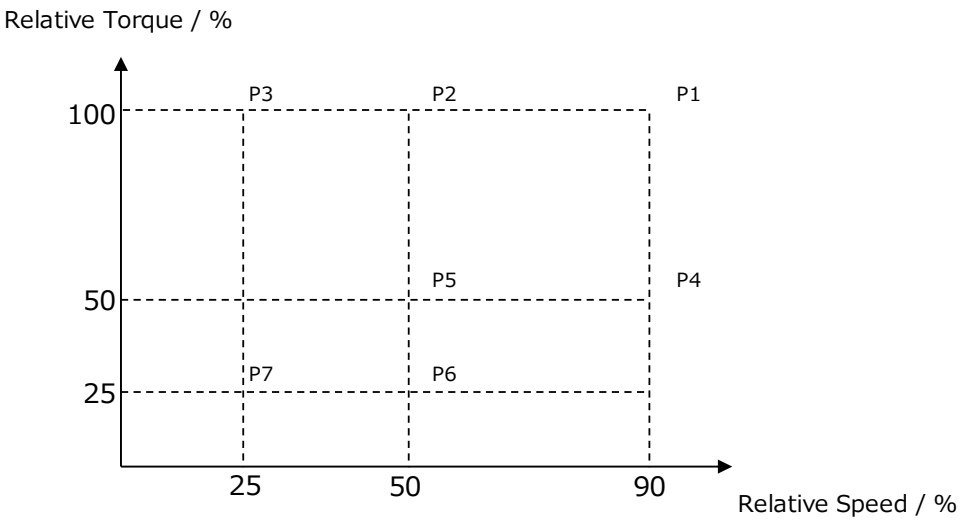
Efficiency Class	Motor power	Voltage codes	Voltage	Frequency	Load factor	
					50%	75%
IE2	0.2kW	N	200V	50Hz	64.1	68.2
		W	380V	50Hz	64.9	68.8
			400V	50Hz	63.7	68.2
		C	220V	50Hz	66.1	70.2
			230V	50Hz	64.5	69.4
			380V	50Hz	64.9	68.8
		A	400V	50Hz	64.1	68.7
		E	415V	50Hz	64.9	67.9
			440V	50Hz	63.3	67.3

(Efficiency : %)

Efficiency Class	Motor power	Voltage codes	Voltage	Frequency	Load factor	
					50%	75%
IE2	0.4kW	N	200V	50Hz	72.7	75.0
		W	380V	50Hz	74.3	75.4
			400V	50Hz	74.4	75.4
		C	220V	50Hz	73.6	74.9
			230V	50Hz	72.2	74.8
			380V	50Hz	74.3	75.4
		A	400V	50Hz	70.1	73.3
		E	415V	50Hz	72.6	74.5
			440V	50Hz	69.4	73.1
IE3	0.75kW	N	200V	50Hz	85.1	85.9
		W	380V	50Hz	85.9	86.1
			400V	50Hz	85.0	86.0
		C	220V	50Hz	84.6	85.3
			230V	50Hz	84.1	85.3
			380V	50Hz	85.9	86.1
		A	400V	50Hz	85.2	86.3
		E	415V	50Hz	83.3	85.0
			440V	50Hz	83.9	85.9
	1.5kW	N	200V	50Hz	87.1	88.0
		W	380V	50Hz	86.5	87.1
			400V	50Hz	85.6	86.9
		C	220V	50Hz	85.7	87.0
			230V	50Hz	85.1	86.8
			380V	50Hz	86.5	87.1
		A	400V	50Hz	86.5	87.8
		E	415V	50Hz	86.5	87.8
			440V	50Hz	84.3	86.6
	2.2kW	N	200V	50Hz	89.0	89.7
		W	380V	50Hz	89.6	89.9
			400V	50Hz	89.4	90.1
		C	220V	50Hz	87.9	89.1
			230V	50Hz	87.4	89.0
			380V	50Hz	89.6	89.9
		A	400V	50Hz	88.6	89.9
		E	415V	50Hz	87.0	88.9
			440V	50Hz	85.9	88.4

COMMISSION REGULATION (EU) 2019/1781

8-2-2 Power Losses for High-Efficiency Gearmotor for Europe



Motor Power	Symbol	Voltage	Power Losses [%]						
			P1	P2	P3	P4	P5	P6	P7
0.2 kW	N	200V50Hz	42.9%	39.3%	36.7%	23.7%	21.1%	16.2%	15.1%
		200V60Hz	36.3%	32.1%	29.4%	22.8%	19.6%	16.1%	14.7%
		220V60Hz	36.8%	32.8%	29.8%	23.3%	20.0%	16.5%	14.8%
	W	380V50Hz	41.9%	38.8%	36.9%	21.7%	19.0%	13.9%	11.6%
		400V50Hz	41.4%	38.7%	36.7%	22.0%	19.1%	13.8%	11.8%
		400V60Hz	34.9%	31.0%	28.5%	23.4%	19.8%	15.2%	12.1%
		440V60Hz	35.2%	31.5%	28.8%	21.4%	18.0%	14.0%	11.3%
	C	220V50Hz	43.9%	40.8%	38.0%	20.6%	18.5%	13.7%	12.4%
		230V50Hz	44.0%	41.0%	38.0%	20.7%	18.5%	13.5%	13.0%
		380V50Hz	40.8%	38.1%	37.0%	21.4%	18.9%	14.0%	11.8%
	K	220V60Hz	34.7%	31.3%	28.9%	18.6%	16.5%	15.1%	11.9%
		380V60Hz	34.0%	30.6%	28.6%	18.1%	17.3%	15.2%	10.6%
	A	208V60Hz	35.9%	31.6%	28.4%	21.8%	19.6%	16.1%	13.8%
		230V60Hz	36.8%	32.7%	28.9%	22.0%	20.2%	17.2%	14.0%
		460V60Hz	36.8%	32.5%	29.5%	23.6%	18.9%	17.3%	11.7%
		400V50Hz	41.6%	38.4%	36.4%	23.1%	19.6%	14.5%	11.7%
	E	415V50Hz	49.1%	46.6%	46.0%	23.3%	20.1%	13.6%	11.4%
		440V50Hz	48.9%	46.4%	46.3%	23.5%	20.0%	13.6%	11.6%
		480V60Hz	40.2%	36.1%	33.0%	22.7%	18.9%	14.5%	11.7%
0.4 kW	N	200V50Hz	33.1%	30.2%	26.9%	15.9%	13.9%	10.0%	8.7%
		200V60Hz	27.1%	23.4%	20.8%	15.4%	13.0%	10.1%	8.8%
		220V60Hz	27.2%	24.0%	21.1%	15.9%	13.4%	10.4%	8.9%
	W	380V50Hz	33.1%	30.2%	27.7%	16.1%	14.0%	10.2%	8.6%
		400V50Hz	33.1%	30.4%	27.7%	16.3%	14.2%	11.2%	8.6%
		400V60Hz	27.1%	23.6%	20.9%	15.5%	13.0%	10.1%	9.6%
		440V60Hz	27.6%	24.1%	21.2%	15.9%	13.4%	10.4%	9.5%
	C	220V50Hz	46.7%	46.0%	50.9%	17.4%	14.7%	8.7%	7.3%
		230V50Hz	45.7%	44.9%	48.1%	16.8%	14.2%	8.3%	6.6%
		380V50Hz	35.7%	32.0%	29.1%	17.7%	15.2%	12.2%	8.6%
	K	220V60Hz	34.4%	31.3%	29.8%	15.8%	12.9%	8.3%	6.9%
		380V60Hz	30.4%	25.4%	22.4%	16.9%	14.1%	11.1%	9.6%
	A	208V60Hz	30.2%	26.3%	23.5%	16.9%	13.5%	10.6%	7.3%
		230V60Hz	30.8%	26.8%	23.6%	17.5%	14.0%	11.3%	7.4%
		460V60Hz	30.8%	26.2%	22.3%	18.8%	15.1%	11.9%	9.5%
		400V50Hz	36.1%	32.3%	29.0%	18.4%	15.5%	12.1%	10.0%
	E	415V50Hz	36.5%	32.8%	29.3%	16.6%	14.1%	10.7%	8.4%
		440V50Hz	36.7%	32.8%	29.3%	16.9%	14.2%	10.8%	8.4%
		480V60Hz	29.9%	25.5%	21.7%	16.9%	13.4%	10.3%	9.5%

Motor Power	Symbol	Voltage	Power Losses [%]						
			P1	P2	P3	P4	P5	P6	P7
0.75 kW	N	200V50Hz	19.9%	17.2%	15.3%	9.2%	7.5%	5.4%	4.3%
		200V60Hz	16.9%	13.6%	11.7%	9.1%	7.0%	5.4%	4.7%
		220V60Hz	16.9%	13.9%	11.8%	9.3%	7.1%	5.5%	4.8%
	W	380V50Hz	21.5%	19.1%	17.6%	10.0%	8.2%	5.7%	4.2%
		400V50Hz	21.5%	19.6%	17.7%	10.0%	8.4%	5.8%	4.2%
		400V60Hz	18.1%	15.2%	13.3%	10.2%	7.9%	6.3%	3.9%
		440V60Hz	18.4%	15.5%	13.4%	10.5%	8.3%	6.4%	3.9%
	C	220V50Hz	24.5%	21.8%	19.7%	9.0%	7.3%	3.1%	3.1%
		230V50Hz	24.8%	21.9%	19.7%	9.2%	7.4%	3.2%	3.1%
		380V50Hz	21.3%	19.2%	17.5%	9.7%	8.1%	4.5%	3.1%
	K	220V60Hz	16.9%	14.1%	12.0%	9.3%	7.2%	5.5%	5.1%
		380V60Hz	17.5%	14.6%	12.5%	11.4%	8.8%	7.2%	5.3%
	A	208V60Hz	17.0%	14.0%	12.0%	9.6%	7.2%	5.7%	5.1%
		230V60Hz	17.3%	14.3%	12.1%	9.7%	7.5%	6.0%	5.2%
		460V60Hz	18.8%	16.0%	13.7%	10.7%	8.4%	6.5%	4.1%
		400V50Hz	21.5%	19.3%	17.5%	10.3%	8.2%	5.8%	4.1%
	E	415V50Hz	22.1%	19.7%	17.9%	10.2%	8.3%	5.7%	4.0%
		440V50Hz	22.5%	20.1%	18.0%	10.9%	8.6%	5.9%	4.1%
		480V60Hz	19.1%	16.1%	13.7%	11.0%	8.2%	6.1%	3.8%
1.5 kW	N	200V50Hz	19.5%	18.8%	18.9%	8.8%	7.7%	5.3%	3.9%
		200V60Hz	15.4%	14.1%	13.1%	8.2%	7.1%	5.3%	3.7%
		220V60Hz	15.6%	14.4%	13.2%	8.6%	7.3%	5.8%	3.8%
	W	380V50Hz	18.2%	17.2%	16.5%	8.3%	7.4%	5.2%	3.9%
		400V50Hz	18.5%	17.5%	16.6%	8.7%	7.6%	5.0%	4.0%
		400V60Hz	15.3%	13.7%	12.4%	8.6%	7.2%	5.4%	3.8%
		440V60Hz	15.3%	14.1%	12.5%	8.6%	7.5%	6.2%	3.9%
	C	220V50Hz	23.7%	24.7%	30.7%	8.5%	7.6%	4.4%	3.4%
		230V50Hz	24.2%	25.1%	31.2%	8.6%	7.7%	4.4%	3.4%
		380V50Hz	18.2%	17.5%	16.7%	8.4%	7.5%	4.7%	4.0%
	K	220V60Hz	15.7%	14.9%	13.8%	8.5%	7.5%	5.6%	3.9%
		380V60Hz	15.2%	13.4%	11.7%	10.0%	8.3%	6.8%	5.0%
	A	208V60Hz	16.6%	15.3%	14.1%	9.0%	7.9%	6.0%	3.7%
		230V60Hz	17.1%	15.7%	14.3%	9.6%	8.2%	6.2%	3.9%
		460V60Hz	16.3%	14.9%	13.2%	9.3%	7.8%	6.2%	3.7%
		400V50Hz	19.0%	17.9%	17.1%	8.8%	7.7%	5.2%	3.3%
	E	415V50Hz	20.9%	20.0%	19.9%	9.1%	7.8%	5.1%	3.8%
		440V50Hz	21.2%	20.2%	19.9%	9.3%	7.9%	5.2%	3.8%
		480V60Hz	17.0%	15.5%	14.1%	9.2%	7.6%	5.2%	3.9%
2.2 kW	N	200V50Hz	16.3%	14.9%	13.5%	7.2%	6.0%	4.0%	2.9%
		200V60Hz	13.2%	11.6%	10.0%	6.8%	5.5%	4.1%	2.7%
		220V60Hz	13.3%	11.7%	10.0%	7.2%	5.8%	4.3%	2.8%
	W	380V50Hz	14.5%	12.9%	11.4%	6.9%	5.7%	3.5%	2.8%
		400V50Hz	14.7%	12.9%	11.4%	7.1%	6.0%	3.7%	2.8%
		400V60Hz	12.5%	10.5%	8.9%	7.1%	5.8%	4.3%	3.1%
		440V60Hz	12.6%	10.6%	8.9%	7.3%	5.9%	4.6%	3.0%
	C	220V50Hz	19.8%	18.6%	18.1%	7.7%	6.5%	3.9%	2.8%
		230V50Hz	19.9%	18.6%	18.2%	7.8%	6.5%	4.1%	2.7%
		380V50Hz	14.9%	13.3%	11.8%	7.2%	6.0%	3.5%	3.3%
	K	220V60Hz	13.9%	12.1%	10.5%	7.4%	6.3%	4.1%	2.9%
		380V60Hz	12.5%	10.3%	8.7%	7.9%	6.4%	5.0%	3.3%
	A	208V60Hz	13.8%	11.9%	10.4%	8.1%	6.6%	5.1%	3.2%
		230V60Hz	14.4%	12.4%	10.3%	8.7%	6.8%	5.6%	3.5%
		460V60Hz	13.0%	11.1%	9.1%	7.7%	6.2%	5.0%	3.2%
		400V50Hz	14.5%	12.9%	11.1%	7.2%	6.0%	4.4%	3.0%
	E	415V50Hz	15.4%	13.5%	12.1%	7.2%	5.8%	4.3%	2.7%
		440V50Hz	15.7%	13.5%	12.1%	7.4%	6.1%	4.1%	3.1%
		480V60Hz	13.0%	11.5%	9.5%	7.6%	6.2%	4.3%	3.0%

COMMISSION REGULATION (EU) 2019/1781

8-3 By Country (Area)

8-3-1 United States

● Safety Standards <Target Standards and UL File>

Number of Phases	Target Standards	UL File No.	Motor Power	Support Details [voltage/standards]						
				AN	EN	MA	NN	WN	KN	CN
				AV	EV		NV	WV	KV	CV
3-phase	UL1004-1 (Standard for Rotating Electrical Machines – General Requirements)	PRGY2. E172621	1/8HP (0.1kW) to 3/4HP (0.55kW)							
			1HP (0.75kW) to 3HP (2.2kW)							

● High-efficiency Regulation

Number of Phases	Target Standards	UL File No.	Motor Power	Support Details [voltage/standards]						
				AN	EN	MA	NN	WN	KN	CN
				AV	EV		NV	WV	KV	CV
3-phase	NEMA MG1-12-12	ZWKG. E172621	1HP (0.75kW) to 3HP (2.2kW)							

8-3-2 Canada

● Safety Standards <Target Standards and UL File>

Number of Phases	Target Standards	UL File No.	Motor Power	Support Details [voltage/standards]						
				AN	EN	MA	NN	WN	KN	CN
				AV	EV		NV	WV	KV	CV
3-phase	C22.2 No.100 (Motors and Gearmotors)	PRGY8. E172621	1/8HP (0.1kW) to 3/4HP (0.55kW)							
			1HP (0.75kW) to 3HP (2.2kW)							

● High-efficiency Regulation

Number of Phases	Target Standards	UL File No.	Motor Power	Support Details [voltage/standards]						
				AN	EN	MA	NN	WN	KN	CN
				AV	EV		NV	WV	KV	CV
3-phase	CSA C390	ZYKH. E172621	1HP (0.75kW) to 3HP (2.2kW)							

8-3-3 Europe

● Safety Standards

Number of Phases	EU Directive	Target Standards	Motor Power	Support Details [voltage/standards]						
				AN	EN	MA	NN	WN	KN	CN
				AV	EV		NV	WV	KV	CV
3-phase	Low Voltage Directive 2014/35/EU	EN60034-1: Rotating Electrical Machine - Part 1: Rating and Characteristics EN60034-5: Rotating Electrical Machine - Part 5: Classification of Protection Ratings with Integrated Type Design for Rotating Electrical Machine (IP Code)	1/8HP (0.1kW) to 3HP (2.2kW) *	CE				CE		

* 3/4HP (0.55kW) is not supported.

● High-efficiency Regulation

Number of Phases	EU Directive	Target Standards	Motor Power	Support Details [voltage/standards]						
				AN	EN	MA	NN	WN	KN	CN
				AV	EV		NV	WV	KV	CV
3-phase	IEC 60034-30-1		1/4HP (0.2kW) to 3HP (2.2kW) *	CE				CE		

* 3/4HP (0.55kW) is not supported.

8-3-4 China

● Safety Standards

Number of Phases	Target Standards	Motor Power	Support Details [voltage/standards]						
			AN	EN	MA	NN	WN	KN	CN
3-phase	GB/T12350-2009 Small Power Motor Safety Requirements	1/8HP (0.1kW) to 1HP (0.75kW) *	CCC				CCC		

* 3/4HP (0.55kW) is not supported.

Note) Please be careful when using CCC specifications of 0.2 kW and 0.4 kW. They are certified as rated for a short time(S2 rated).

● High-efficiency Regulation

Number of Phases	Target Standards	Motor Power	Support Details [voltage/standards]						
			AN	EN	MA	NN	WN	KN	CN
3-phase	GB18613-2020 Minimum Allowable Values of Energy Efficiency and Values of Efficiency Grades for Motors	1HP (0.75kW) to 3HP (2.2kW)							

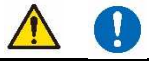
8-3-5 Korea

● High-efficiency Regulation

Number of Phases	Target Standards	Motor Power	Support Details [voltage/standards]						
			AN	EN	MA	NN	WN	KN	CN
3-phase	KS C 4202	1HP (0.75kW) to 3HP (2.2kW)							

9 Inspection and Adjustments

Danger	
	Do not touch rotating bodies (output shafts, etc.) when the gearmotor is being maintained/inspected while it is running. Otherwise, entanglement and injury accidents may occur.
	Do not remove the internal inspection cover while the gearmotor is running. Otherwise, high-temperature lubricant may disperse causing burns.
	Be sure to stop rotation of the application when checking the tooth surface condition of the stopped gear. Otherwise, entanglement to the gear engagement part and injury may occur.
	Be sure to stop rotation of the application and wait for the inside of the product to sufficiently cool down to inspect the inside of the product. Furthermore, please allocate a third party to constantly check for safety while the inspection is conducted by the inspector. In addition, the inspector must keep in mind that the inside of the product is lubricated and slippery, and safety measures should properly be implemented accordingly. Otherwise, accidents with injury may occur.
	Do not operate the product while the safety cover, etc. is removed during inspection. Otherwise, entanglement and injury may occur.
	Do not operate the product while the brake is manually released via the manual release lever. Otherwise, an out-of-control accident may occur.
	Never energize the gearmotor when the brake gap is being inspected/adjusted. Otherwise, an electric shock, injury and application damage may occur.
	Do not operate the product with the fan cover (brake cover) removed after the brake gap inspection/adjustment. Otherwise, entanglement and injury may occur.
	Turn the power ON and OFF to check the brake operation before operating the motor after the inspection/adjustment of brake gap. Otherwise, an out-of-control accident may occur.
	If the motor is used for lifting, do not release the brake while a load is lifted. Otherwise, a drop accident may occur.

Caution	
	Do not touch the terminal when the insulation resistance is measured. Otherwise, an electric shock may occur.
	Do not touch the gearmotor surface with your bare hand. The surface may become very hot, which may cause burns.
	Execute a diagnosis based on the instruction manual in case of abnormalities. Never operate a motor until you properly identify and resolve any abnormalities.
	Be sure that repair/disassembly/assembly is done by an authorized expert. Otherwise, an electric shock, injury, fire, etc. may occur.

9-1 Grease/Oil Seal/O-Ring

- These gearmotors utilize grease for lubrication on G3, H2, F and F3 Series, with a specified amount of grease pre-sealed in each unit before shipping. The motors can be used without further lubrication.
- Although replacement and replenishment are not required in most cases, if necessary, you may replace the grease at around the 10,000 hour mark to potentially increase the life-span of your motor. However, please note that grease replacement must be performed at our factory and is considered a repair order.
- Though the oil seals and O-rings should prevent grease leakage from the motor, we highly recommend that you use protection such as oil-pans to prevent potential accidents. (Leakage tends to occur at the end of a motor's life, or in instances of break-downs.)
- Oil seals may need to replaced before the 10,000 hour mark depending on the environment and usage. Please note that oil seals must be replaced at our factory and are considered repair orders.

Note) If you need parts replaced (grease / oil seal / O-ring, etc) for maintenance/inspection purposes, please contact your nearest service office (described on the final page of the instruction manual). Please note that defects caused by the replacement of parts by a customer are not covered by our warranty.

9-2 Daily Inspection

To be performed every 2 to 3 days.

Inspection item	Method	Inspection details
Load Current	Ammeter	Within the rated current described on the nameplate
Noise	Auditory Observation	No abnormal sound (Rattling sound, periodic sound) *Apply a listening rod to the bearing part to check abnormal sound.
Vibration	By touch	No abnormal vibration of the gear case and motor frame
Surface Temperature	Thermometer	No rapid increase or decrease of normal temperature.
Grease Leakage	Visual Observation	No leakage from the joint part of the case, oil seal, bracket, etc.

9-3 Regular Inspection

Based on 8 hours/day operation.

Inspection item	Inspection frequency	Inspection details
Mounting Bolt	Every 6 months	Check the looseness with a spanner. Tighten it if it is loose.
Chain and V-belt	Every 6 months	Check the tension. Adjust if too loose or too tight.
Motor Insulation Resistance	Every 6 months	Measure with an insulation resistance tester. Resistance must be 1 MΩ or higher under 500V.
Gap Amount (Brake)	Annually or every 1 to 1.5 million times of brake usage	Check that the gap is within the appropriate gap range. For inspection and adjustment methods, refer to "9-3-3 How to Inspect the Brake Gap" "9-3-4 How to Adjust the Brake Gap".

* Refer to “10 Troubleshooting” and execute measures/treatments if errors are recognized with the inspection.

9-3-1 Brake Specifications

Standard (Brake model : B2, B4, J2, J4)

[metric]

Motor Power [kW]	Brake supply AC voltage [V]	Brake supply DC voltage [V]	Braking torque [N・m]	Gap [mm]			Recommended tightening torque [N・m]	Screw size
				Initial	Limitation	Adjustable		
0.1	200 (400)	90 (180)	0.98	0.05 to 0.25	0.4	0.3	2.1 to 2.3	M4
0.2			1.96	0.05 to 0.25	0.4	0.3	2.1 to 2.3	M4
0.4			3.92	0.05 to 0.25	0.4	0.35	2.1 to 2.3	M4
0.75			7.35	0.05 to 0.25	0.45	0.4	2.1 to 2.3	M4
1.5			14.7	0.05 to 0.25	0.55	0.5	6.9 to 7.6	M6
2.2			21.6	0.05 to 0.35	0.55	0.5	6.9 to 7.6	M6

[yard - pound]

Motor Power [HP]	Brake supply AC voltage [V]	Brake supply DC voltage [V]	Braking torque [lbf・in]	Gap [inch]			Recommended tightening torque [lbf・in]	Screw size
				Initial	Limitation	Adjustable		
1/8	200 (400)	90 (180)	8.67	0.0020 to 0.0098	0.0157	0.0118	18.6 to 20.4	M4
1/4			17.35	0.0020 to 0.0098	0.0157	0.0118	18.6 to 20.4	M4
1/2			34.70	0.0020 to 0.0098	0.0157	0.0138	18.6 to 20.4	M4
1			65.1	0.0020 to 0.0098	0.0177	0.0157	18.6 to 20.4	M4
2			130	0.0020 to 0.0098	0.0217	0.0197	61.1 to 67.3	M6
3			191	0.0020 to 0.0138	0.0217	0.0197	61.1 to 67.3	M6

Washdown IP65 (Brake model : V2, V4)

[metric]

Motor Power [kW]	Brake supply AC voltage [V]	Brake supply DC voltage [V]	Braking torque [N・m]	Gap [mm]			Recommended tightening torque [N・m]	Screw size
				Initial	Limitation	Adjustable		
0.1	200 (400)	90 (180)	0.98	0.05 to 0.15	0.45	0.4	2.1 to 2.3	M4
0.2			1.96	0.05 to 0.15	0.45	0.4	2.1 to 2.3	M4
0.4			3.92	0.05 to 0.15	0.45	0.4	2.1 to 2.3	M4
0.75			7.35	0.05 to 0.15	0.5	0.4	2.1 to 2.3	M4

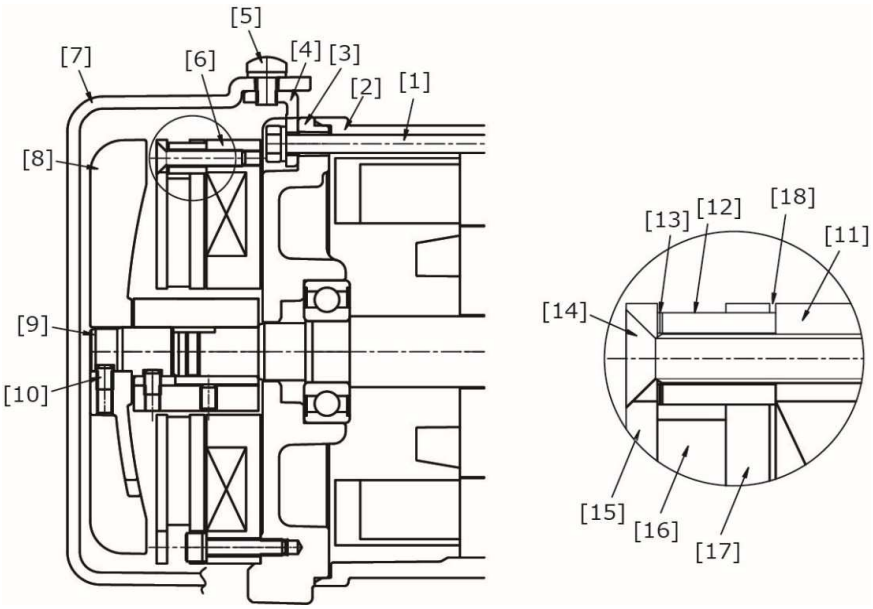
[yard - pound]

Motor Power [HP]	Brake supply AC voltage [V]	Brake supply DC voltage [V]	Braking torque [lbf・in]	Gap [inch]			Recommended tightening torque [lbf・in]	Screw size
				Initial	Limitation	Adjustable		
1/8	200 (400)	90 (180)	8.67	0.0020 to 0.0059	0.0177	0.0157	18.6 to 20.4	M4
1/4			17.35	0.0020 to 0.0059	0.0177	0.0157	18.6 to 20.4	M4
1/2			34.70	0.0020 to 0.0059	0.0177	0.0157	18.6 to 20.4	M4
1			65.1	0.0020 to 0.0059	0.0197	0.0157	18.6 to 20.4	M4

- Due to the structure of the brake, the lining may make an abrasive noise during motor operation, however, this does not affect the performance of the brake.
- Due to the structure of the brake, operating the motor via an inverter may increase the noise level coming from the brake part. This however, does not affect the performance of the brake.

9-3-2 Brake Structure

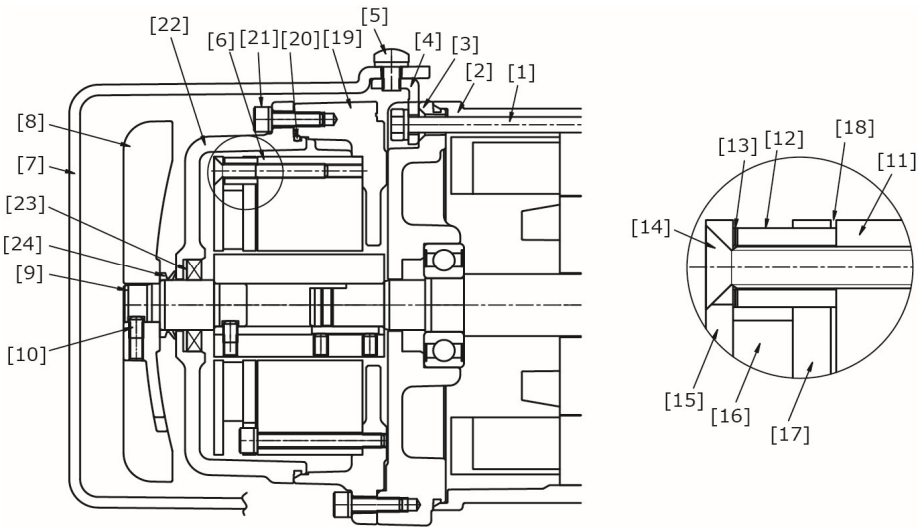
Standard (Brake model : B2, B4, J2, J4)



[1]	Through bolt
[2]	Motor frame
[3]	Bracket
[4]	Stay
[5]	Fan cover fixing screw
[6]	Brake
[7]	Fan cover
[8]	Fan
[9]	Extended Shaft
[10]	Fan fixing screw
[11]	Magnet ASSY
[12]	Collar
[13]	Shim
[14]	Plate screw
[15]	Plate
[16]	Disk
[17]	Armature
[18]	Gap

* 1/8HP (0.1kW) has no fans as they are Totally Enclosed Non-ventilated (TENV).

Washdown IP65 (Brake model : V2, V4)



* 1/8HP (0.1kW) washdown IP65 has no fan cover, fan, and V-Ring as they are Totally Enclosed Non-ventilated type.

[1]	Through bolt
[2]	Motor frame
[3]	Bracket
[4]	Stay
[5]	Fan cover fixing screw
[6]	Brake
[7]	Fan cover
[8]	Fan
[9]	Extended Shaft
[10]	Fan fixing screw
[11]	Magnet ASSY
[12]	Collar
[13]	Shim
[14]	Plate screw
[15]	Plate
[16]	Disk
[17]	Armature
[18]	Gap
[19]	Spacer
[20]	O-Ring
[21]	Cover fixing bolt
[22]	Brake cover
[23]	Oil seal
[24]	V-Ring

9-3-3 How to Inspect the Brake Gap

Note) Be sure to turn off the power before performing any work. Failure to follow this precaution may result in electric shock and injury.

(1) Loosen the [5] Fan cover fixing screw and remove the [7] Fan cover.
For washdown IP65, loosen the [10] Fan fixing screw and remove the [8] Fan and [24] V-Ring.
Then, loosen the [21] Cover fixing bolt and remove the [22] Brake cover.
* Be sure the [23] Oil seal does not get damaged as it may lose its water-resistant ability.

(2) Check that the [18] Gap between the [11] Magnet ASSY and the [17] Armature is less than or equal to the limitation gap listed under "9-3-1 Brake Specifications" with a clearance gauge, etc.

* If the gap is exceeds the limitation gap listed under "9-3-1 Brake Specifications", please adjust the brake gap. Even if the gap is not exceeding the limitation gap value, the brake gap can be adjusted if it is larger than the given minimum adjustable gap value.

9-3-4 How to Adjust the Brake Gap

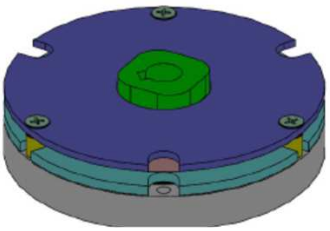
If the disk is worn out after long term usage and the [18] Gap between the [11] Magnet ASSY and the [17] Armature exceeds the gap limitation value described in the brake standard specifications, malfunctions of the brake may occur. Please adjust the brake gap as follows.

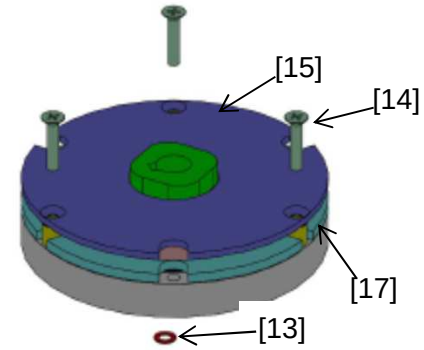
Even if the gap is not exceeding the limitation gap value, the brake gap can be adjusted if it is larger than the given minimum adjustable gap value. The brake gap adjustment can only be done once.

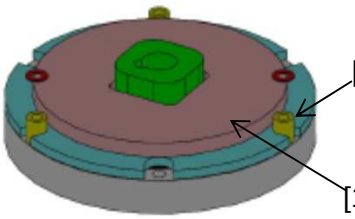
Note) If the gap is equal to or below the minimum adjustable gap value, do not attempt to adjust the gap. This may result in malfunctions.

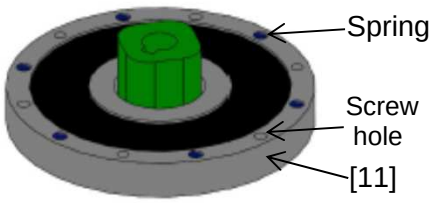
<Gap adjustment procedure>

Note) Be sure to turn off the power before performing any work. Failure to follow this precaution may result in electric shock and injury.









・For a standard brake

(1) Loosen the [5] Fan cover fixing screw and remove the [7] Fan cover.

(2) Check that the brake gap is greater than or equal to the adjustable gap of "9-3-1 Brake Specifications" under no energization state.

(3) Loosen the [10] Fan fixing screw and remove the [8] Fan.

* The brake for a 0.1 kW motor has no fan.

・For a washdown IP65 brake

(1) Loosen the [5] Fan cover fixing screw and remove the [7] Fan cover. Then, loosen the [10] Fan fixing screw and remove the [8] Fan and [24] V-Ring.

* 0.1kW has no fan cover, fan, and v-ring.

(2) Loosen the [21] Cover fixing bolt and remove the [22] Brake cover.

* Be sure that the oil seal does not get damaged as it may lose its water-resistant ability.

(3) Check that the brake gap is greater than or equal to the adjustable gap of "9-3-1 Brake Specifications" under non-energized state.

・For both brake types

(4) Remove any wear debris with an air gun.

* The gap is the space between the [11] Magnet ASSY and the [17] Armature under no power.

(5) Remove the [14] Plate screw.

(6) Clean attachments on the screw part.

* If the screw has a scratch, etc. , please replace it with a new one.

(7) Remove the [15] Plate.

* Pay attention so that the friction surfaces of the parts are not made dirty.

* Check that the friction surfaces have no scratches or other abnormalities.

(8) Pull out all [13] Shims.

(9) Remove the [12] Collar and the [17] Armature and clean the wear debris on the [11] Magnet ASSY with an air gun.

* Be cautious not to lose the spring.

(10) Clean the screw hole of [11] Magnet ASSY with an air gun.

* Check to make sure the screw re-inserts easily after cleaning.

(11) Apply adhesive on the screw to prevent looseness in the screw hole.
(Recommended adhesive: Loctite 243 by Henkel)

(12) Put all parts except for the shims back in their original positions and tighten the [14] Plate screw.

* Refer to "9-3-1 Brake Specifications" for the tightening torque.

(13) Check that the [18] Brake gap is within the initial gap on the "9-3-1 Brake Specifications".

(14) Check the operation of the brake (Brake release/brake actuation).

9-3-5 Brake Replacement Work

The brake gap adjustment described above can only be done once.
If the gap between the [11] Magnet ASSY and the [17] Armature exceeds the limitation gap described on the "9-3-1 Brake Specifications" table due to the disk wear after the gap adjustment, the brake must be replaced. Please contact your nearest service office.

* For the brake replacement procedure, please check the replacement procedure included in the packaging of the new brake kit. However, please note that defects caused by brake replacement by a customer are not covered by our warranty.

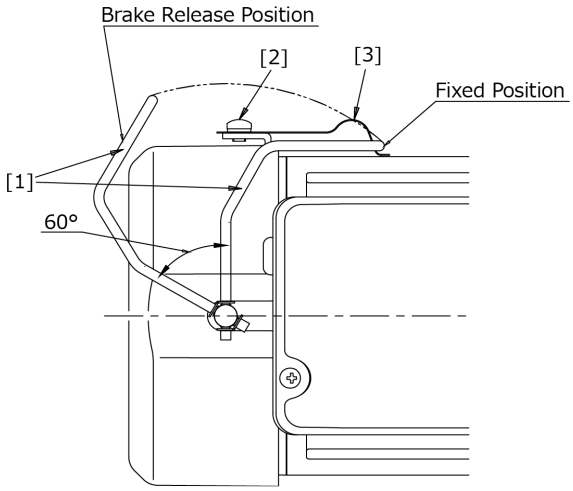
9-3-6 Brake Gap Adjustment for Gearmotor with Clutch Brake

Gap adjustment for the clutch brake are not required as a unique auto-gap mechanism is built into gearmotors with a clutch brake.

9-4 How to Use the Manual Release Brake

(1) Turn the manual release lever held by the lever fixing metal fitting at the upper part of the fan cover by 60° towards the back of the motor to release the brake.
   * Do not exceed 90° for releasing.
   * Turn the manual release lever while holding the lever fixing metal fitting. Failure to follow this instruction may result in unexpected injury.

(2) Be sure to return the lever to its original position (fixing position) after the manual release work is completed.



[1]	Manual Release Lever
[2]	Screw for Fixing Metal Fitting
[3]	Lever fixing Metal Fitting

9-4-1 Precautions on Use of the Manual Release Brake

- Operate the manual release lever by hand.
- Do not carry the gearmotor by holding the manual release lever.
  This may cause the lever to come off and result in you dropping the motor.

9-4-2 Warning Label

“Warning labels” with descriptions of precautions for handling the brake manual release device are attached to a gearmotor with a manual brake release device.
If the “Warning label” is peeled off or cannot be read, please immediately contact our nearest service office.

10 Troubleshooting

If any abnormal operation occurs, refer to "10-1 Gearmotor Troubleshooting" "10-2 Brakemotor Troubleshooting" or "10-3 Gearmotor with Clutch Brake Troubleshooting" to promptly take appropriate measures.

10-1 Gearmotor Troubleshooting

Failure detail	Cause	Measures
The motor does not run while unloaded.	Power failure	Check the power supply. / Contact the power company.
	Defective connection line	Inspect the circuit/wiring parts.
	Defective contact of the short board	Inspect the circuit/wiring parts.
	Defective contact of the switch	Repair or replace it.
	Disconnection of the stator winding	Repair it at our factory.
	1-phase power supply voltage (3-phase motor)	Check the terminal voltage.
	Broken gear/shaft/bearing	Repair it at our factory.
The motor does not turn when a load is applied.	Voltage drop	Check the wiring length.
	Worn gear	Repair it at our factory.
	Overloaded operation	Lessen the load.
The motor generates abnormal heat.	Overloaded operation	Lessen the load.
	Frequent startup/stop	Lower the frequency.
	Damaged bearing	Repair it at our factory.
	High/ Low voltage	Check the voltage.
Abnormal loud noise during operation.	Continuous sound - Damaged bearing/worn gear	Repair it at our factory.
	Intermittent sound - Scratch on the gear, something inside the reducer	Repair it at our factory.
Abnormal vibration during operation.	Worn gear	Repair it at our factory.
	Defective installation/loose bolt	Tighten it.
Grease leaks.	Loose fastening part	Tighten it.
	Damaged oil seal	Repair it at our factory.

10-2 Brakemotor Troubleshooting

Failure detail	Cause	Measures
The brake does not work.	Wrong connection	Check the connection.
	Defective switch	Replace/repair it.
The braking time is long	Oil/dust, etc. attached to the friction plate	Clean it or repair it at our factory.
	Life time of the friction plate	Replace it or repair it at our factory.
	Large load inertia moment	Lessen the load.
	AC switching connection	Change it to DC switching.
The motor does not run (The speed is not increasing.) The motor generates abnormal heat. The thermal relay is tripped. The brake sound is abnormally loud.	Wrong brake connection	Check the connection.
	Large brake gap	Adjust the gap.
	Defective rectifier	Replace it.
	Brake coil disconnection or short circuit	Replace it or repair it at our factory.
	Defective contact of the switch	Replace/repair it.
The motor generates abnormal heat.	Frequent braking	Lower the frequency.
	Large load torque/inertia moment	Lessen the load.

10-3 Gearmotor with Clutch Brake Troubleshooting

Failure detail	Cause	Measures
The clutch and brake do not work.	Wrong connection	Check the connection.
	Defective rectifier	Replace it.
	Clutch/brake coil disconnection or short circuit	Repair it at our factory.
	Defective switch	Replace/repair it.
There is a delay for the output shaft to rotate when the clutch is activated. The brake does not work well.	Oil/dust, etc. attached to the friction plate	Clean it or repair it at our factory.
	Life of the friction plate	Replace/repair it.
	Large load torque/inertia moment	Lessen the load.

10-4 Replacement Parts

For inquiries regarding brake-related parts, please contact our nearest service office described on the last page of the instruction manual.
Defects caused by the replacement of the parts by a customer are not covered by our warranty.

11 Disposal

Caution
When disposing of the product, dispose of it as a general industrial waste. Please follow local laws and regulations if any apply and take care of the waste accordingly.

12 Storage

1. Storage Location

(1) When the product is stored for six months or longer, it shall be stored in a dry place indoors, with good ventilation, without direct sunlight, temperature change, humidity, dust, and/or corrosive gas.
(2) Do not directly place the product on the ground when it is stored.
(3) If there is a micro vibration the bearing may be damaged by fretting corrosion even when the product is stored. Please store the product in a place without vibration.

2. Operation During Storage

(1) To prevent the bearings from getting rusty, operate the motor every six months to check if the motor rotates smoothly and there is no abnormal sound.
(2) Measure the insulation resistance with an insulation resistance tester with a 500V of the measuring voltage to check if it is 1 MΩ or higher.
(3) Apply rust prevention to the output shaft and the flange side and other uncoated processed surfaces every six months.

3. Use After Storage

(1) Check that there is no abnormal sound, vibration, heat generation and other abnormalities during the initial operation.
(2) For gearmotors with a brake, check that the brake operates properly.
If any abnormality is found, please immediately contact our nearest service office.

13 Terms and Conditions

Full Terms and Conditions can be found at the link below.

www.brother-usa.com/GM-terms-conditions

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Gearmotor Division

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