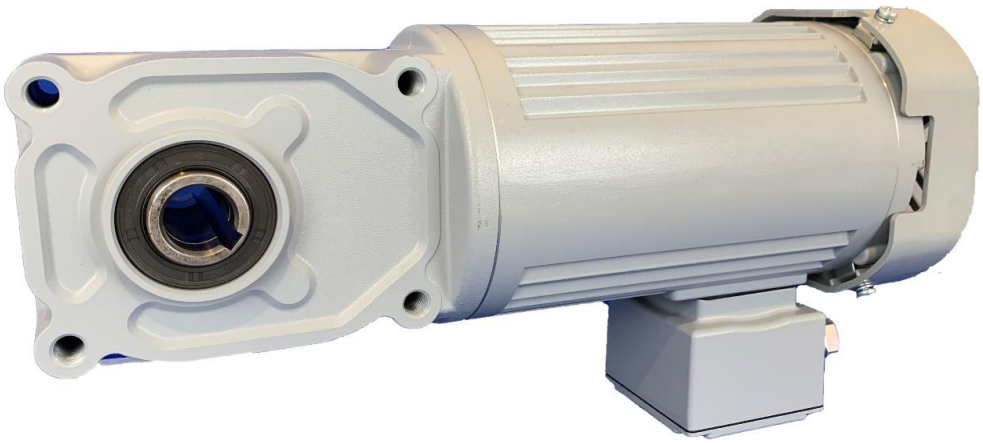
MID SERIES 1/8HP to 1/2HP (0.1kW to 0.4kW)

Induction Gearmotor 1-Phase

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 to master how to use the product correctly before using it.
- Extents of hazard/damage expected to occur in the case of improper 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.

Please be aware that even the notes described in the "Caution" section may have serious consequences in certain circumstances.

They are all important pieces of information that must be followed.

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	
	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.
	Please 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.
	Never perform operations with wet hands. Failure to follow this precaution may result in electric shock.
Wiring	
	Do not work on the wiring while the power is on. Be sure to turn off the power before work. Failure to follow this precaution may result in electric shock.
	Be sure to ground the grounding terminal. Failure to follow this precaution may result in electric shock.
	Connect the wires according to the wiring diagram. If terminals are left unattended without proper wiring, there is a risk of electric shock.
Operation	
	Do not approach or touch rotating parts (output shafts, etc.) during operation. Failure to follow this precaution may result in injury due to entanglement.

⚠ WARNING

General	
	The operators in charge of transportation, installation, piping, 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.
	Be sure not to get water or oil/grease into the brake unit. Failure to follow this precaution may result in falling or dangerous accident due to the decreased brake torque.
	Do not repair, disassemble or remodel the product. Failure to follow this precaution may result in injury, fire, electric shock, and/or burns.
Operation	
	When the operation has stopped due to the occurrence 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 injury, fire, electric shock, burns and damage to the application.
	When performing a product test, fix the product in place and disconnect it from the application. Failure to follow this precaution may result in injury.
	When operating a 1-phase gearmotor in reverse, be sure to stop the motor completely first, and then start the motor in the reverse rotation. Failure to follow this precaution may result in out-of-control gearmotor due to not changing the rotational direction.
	Be sure to turn off the power when the built-in thermal protector of capacitor run motor is activated. Failure to follow this precaution may result in injury and damage to the application due to the sudden start of the motor when the built-in thermal protector automatically starts again.
	When the built-in thermal protector of capacitor run motor is activated, only motor is stopped and the brake is still released. So, the brake will not hold the gearmotor load. Be sure to implement safety measures. Failure to follow this precaution may result in injury and damage to the application.

⚠ Caution

General	
	Please operate the product under the conditions specified in this instruction manual. Failure to follow this precaution may result in damage to the application and/or injury.
	Do not expose the product to strong impacts/shocks. Failure to follow 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 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.
	Do not remove the nameplate.
	Products modified by a customer will not be covered by the warranty.
Transportation	
	The product must be transported correctly in accordance with its weight. Failure to follow this precaution may result in injury and/or malfunction.
	Do not overload/over stack the products. Failure to follow this precaution may result in injury and/or malfunction.
Installation	
	When handling the gearmotor, be careful with the sharp edges/points of the application. Failure to follow this precaution may result in injury.
	Please fix the gearmotor firmly in place. Failure to follow this precaution may result in damage to the application and/or injury.
	Do not stand on or place any heavy object on the product. Failure to follow this precaution may result in injury.
	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 put any combustible material near the product. Failure to follow this precaution may result in fire.
	Please 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. Failure to follow this precaution may result in defective products due to oil leakage.

Caution

Wiring	
	Be careful not to cause damage to the cable or 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	
	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 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.
	Do not touch the rotating part of the gearmotor. Failure to follow this precaution may result in injury.

Important Note

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 trouble caused by use that violates the cautions listed 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.

Contents

1 Inspection upon Unpacking

Caution	
⚠ ❗	Check whether the product received is consistent with your order. Failure to follow this precaution may result in injury and damage to the application 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 the Contents of the Package

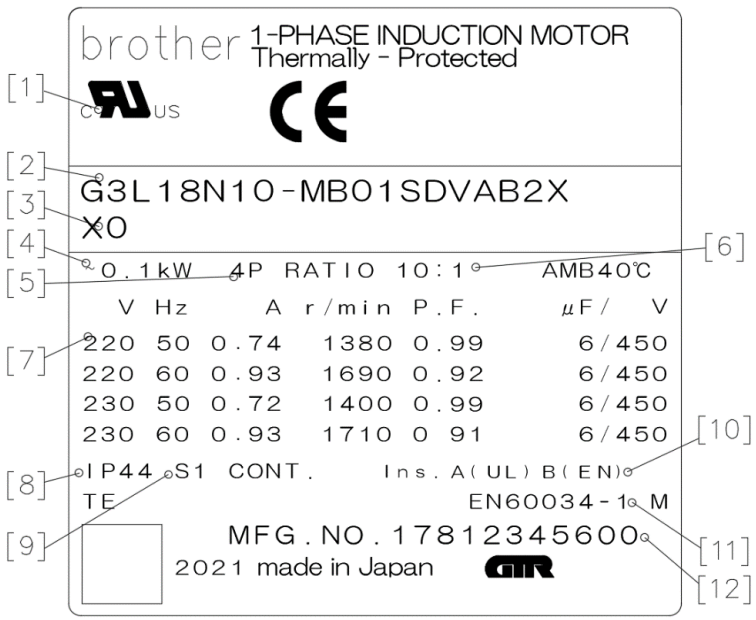
Please check for the following items upon unpacking the package.
If there are any defects, or if you have any questions, please contact the nearest service office immediately.

- Does the information on the nameplate match the product you ordered?
  (gearmotor model, reduction ratio, motor power, voltage, frequency, etc.)
- Were any parts damaged during transportation?
- Are there any loose screws, bolts, or nuts?
- In case of a brakemotor, is there a rectifier included in the package?
- Are run capacitors included with Capacitor Run type 1-phase motors (1/8 HP(0.1 kW)) and Capacitor Start Capacitor Run type 1-phase motors (1/4 HP(0.2 kW) and 1/2 HP(0.4 kW))?

1-2 Information Provided on Nameplate

The following is a typical nameplate.

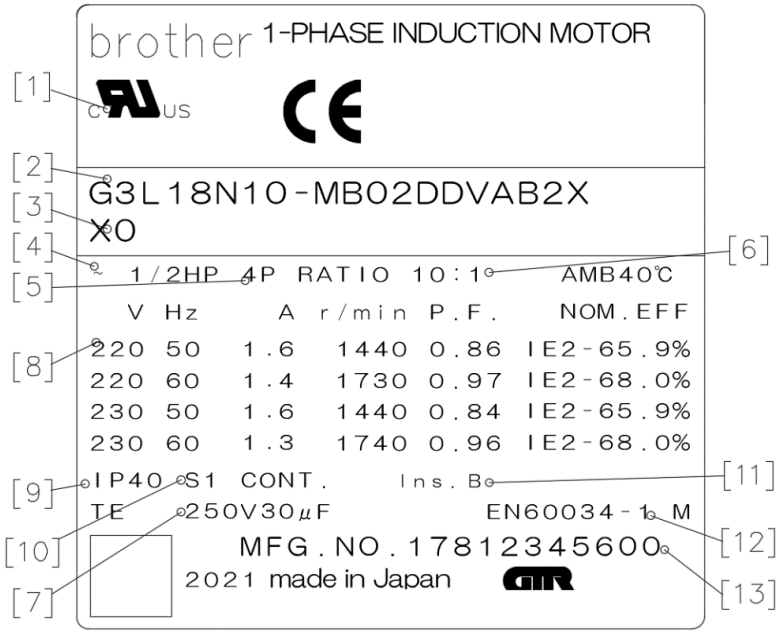
(1) Capacitor Start type 1-phase motors, Capacitor Run type 1-phase motors



No.	Description
1	Standards Conformance
2	Gearmotor Part Number
3	Option Code
4	Motor Power
5	Number of Poles
6	Gear Ratio
7	Motor Characteristics
8	IP Rating
9	Duty Rating
10	Insulation Class
11	Standards Number
12	Manufacturing Number (MFG No.)

- Please refer to "1-3 Gearmotor Part Number" for the gearmotor part number.
- Option codes may not be listed dependinng on the spec of the motor.
- When placing an inquiry, please provide the gearmotor part number/option code, gear ratio and MFG No.

(2) Capacitor Start Capacitor Run type 1-phase motor



No.	Description
1	Standards Conformance
2	Gearmotor Part Number
3	Option Code
4	Motor Power
5	Number of Poles
6	Gear Ratio
7	Withstand voltage and capacitance of run capacitor
8	Motor Characteristics
9	IP Rating
10	Duty Rating
11	Insulation Class
12	Standards Number
13	Manufacturing Number (MFG No.)

- Please refer to "1-3 Gearmotor Part Number" for the gearmotor part number.
- Option codes may not be listed dependinng on the spec of the motor.
- When placing an inquiry, please provide the gearmotor part number/option code, gear ratio and MFG No.

1-3 Gearmotor Part Number

The contents of gearmotor part number are as follows. Make sure the gearmotor part number on nameplate is consistent with your order.
The gearhead and the motor part number are described separately.

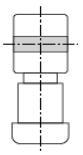
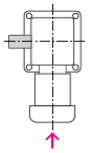
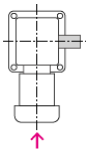
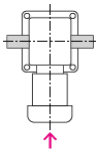
Gearhead Part Number

Gearhead Model					
[1]	[2]	[3]*3	[4]	[5]*4	
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
F3	Right Angle	S	Hollow Bore

[5] Reduction Ratio*4	
5	1/5
to	to
15X	1/1500

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

[4] Shaft Arrangement			
Material	Output shaft direction of right angle shaft type		
S43C	Output Shaft Direction	H2	F/F3
N	-	-	
L	The output shaft protrudes from the left when looking from the input shaft side(↑)		-
R	The output shaft protrudes from the right when looking from the input shaft side(↑)		-
T	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 : The [3] Frame Number depends on the lineup of each series.

*4 : [5] Gear ratios are 12X for 1200 and 15X for 1500 as they are displayed with up to three digits.

Motor Part Number

	Motor Model							Brake Specs	Option	
	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]	[15] *4
-	Motor Type	Spec.	Motor Power	No. of Phases	Supply Voltage	Standards	Terminal Box	Brake	Special Option	Option Code
-	M	B	04	C	L	V	A	B2	X	X0

[6] Motor Type	
M	Standard

[7] Spec.		[8] Motor Power	
B	Insulation Class A	01	1/8HP (0.1kW)
	Insulation Class B	02	1/4HP (0.2kW)
		04	1/2HP (0.4kW)

[9] No. of Phases		
S*1	1-phase (Capacitor run type)	IE1 Efficiency
C	1-phase (Capacitor start type)	IE1 Efficiency
D*2	1-phase(Capacitor start capacitor run type)	IE2 Efficiency

[10] Voltage		[11] Standards		
			Safety Standards	
Symbol	Voltage (V) / Frequency (Hz)	Symbol	UL	CE*3
L	115,115/50,60	V	○	○
D	220,220,230,230/50,50,60,60	V	○	○

[12] Terminal Box	
A	A-type terminal box (Aluminum)

[13] Brake	
N	No Brake
B2	200V Brake

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

*1 : 1-phase (Capacitor Run) is only available in 1/8 HP (0.1 kW).

*2 : 1-phase (Capacitor Start Capacitor Run) is only available in 1/4 HP (0.2 kW) and 1/2 HP (0.4 kW).

*3 : We do not acquire CE marking on 1-phase (Capacitor Start type) 1/4 HP (0.2 kW) and 1/2 HP (0.4 kW) motors.

*4 : [15] Option code is added to specify the appropriate option. The main options are as follows.

Position for mounting the terminal box, change in lead wire lead-in direction, etc.

For more information on options, please refer to the catalog or contact our nearest customer service helpdesk listed on the last page of the instruction manual.

2 Transportation

DANGER
Do not enter underneath the product when it is lifted for transportation. Failure to follow this precaution may result in injury accidents due to dropping.

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. Failure to follow this precaution may result in damage to the hook and the application and/or injury due to dropping/falling.
Please check the weight of gearmotor with the nameplate, packaging box, appearance diagram, catalog, etc. Do not lift the gearmotor which is more than the rated load of the ceiling/application hook. Failure to follow this precaution may result in damage to the bolt and the application and/or injury due to dropping/falling.
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. Failure to follow this precaution may result in injury and damage to the application.

3 Installation

Please pay attention to the following points as installation quality affects the life-span of the gearmotor.

Caution
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 step on/hang from the gearmotor and terminal box. Failure to follow this precaution may result in injury.
Do not touch gearmotor keyways with a bare hand. Failure to follow this precaution may result in injury.
Please 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. Failure to follow this precaution may result in defective products due to oil leakage.
Wear debris of the brake, iron powder (metal pieces), etc. may be scattered after continuous use. Install a preventive device for food machinery and other applications in which contamination may be a problem. Failure to follow this precaution may result in defective products.
The guidance value of vibration from the mounting surface of the gearmotor or applied externally is 0.5 G or less.
In a hot and humid environment, sudden changes in ambient temperature may cause condensation to form inside the box. This is likely to happen especially during ocean transportation by ship, so please pay attention to the atmosphere during transportation. Condensation is a phenomenon that occurs when water vapor condenses and forms water droplets that adhere to the terminals when the temperature suddenly changes from high to low in a hot and humid environment, or when a reducer is suddenly moved from a low temperature environment to a hot and humid environment.
Please be careful of icing in temperatures below 0°C. Freezing refers to the icing of moisture on terminals caused by condensation or an abnormally humid atmosphere when the temperature falls below freezing. Avoid electric shock by being cautious of the risk of short-circuiting between terminals caused by icing.

3-1 Installation Environment

Items	Capacitor Run	Capacitor Start Capacitor Start Capacitor Run type
IP Rating	IP40/IP44 Differs depending on the model.	
Ambient Temperature	0℃ to 40℃ (32°F to 104°F)	0℃ to 40℃ (32°F to 104°F)
Ambient Humidity	85 % RH max (No Condensation)	
Altitude	1000 m (3,280 feet) or less	
Atmosphere	A well ventilated place free from corrosive gas, explosive gas, vapor, and/or chemicals Not to be exposed to direct rain. Not to be exposed to direct sunlight. The brake should not be exposed to water, powders, oils/greases, or oil mist Models with water protection rating IPX0 shall not be exposed directly to water.	

3-2 Installation Orientation

- There are no directional restrictions. (This is because a grease lubrication system is used.)

3-3 Installation Procedure

- 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).

- Shaft mount (torque arm)

  The product's dead weight should be supported by the driven shaft.

  [Important] The rotational reaction force should be the only force applied to the torque arm.

3-3-1 Installation bolt size and tightening torque (reference values)

Mounting hole	Bolt size	Tightening torque		
(mm)		(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

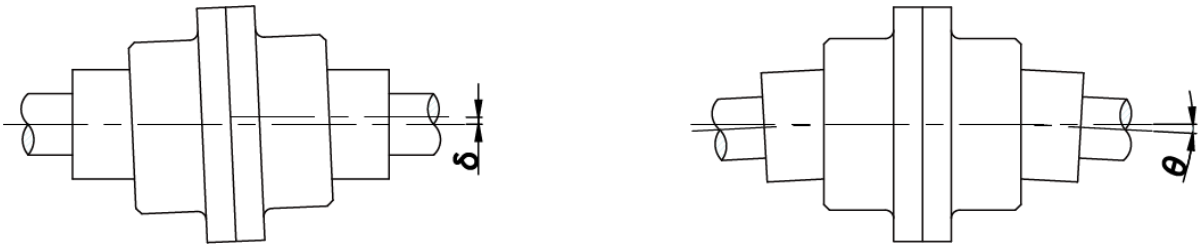
Caution	
	Please pay attention to the centering, belt tensioning, pulley alignment, etc. when the gearmotor is connected to the load. In case of a direct connection, make sure the connection is precise. When using a belt, make sure to adjust the belt tension correctly. Be sure to tighten the bolts for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

[Important] 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

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

Coupling Example

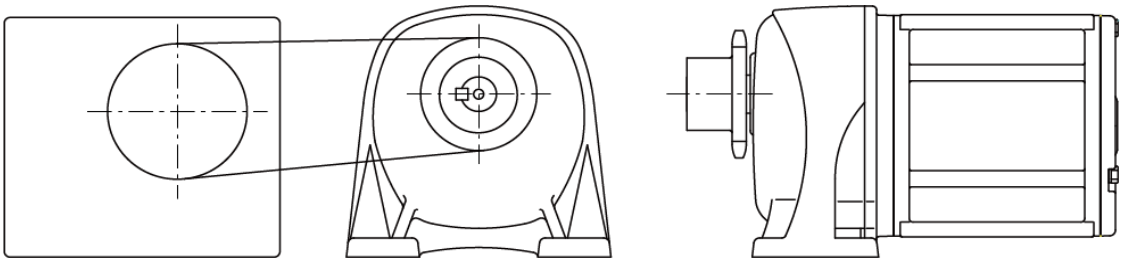


- The displacement amount of δ and θ should be minimized.
- The δ and θ differ according to the type of coupling. Therefore, they should be within the allowable value defined by the manufacturer.
  [Reference] In case of chain coupling, δ should be within 2% of the roller chain pitch and θ should be 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.
- 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.
- V-belt tension : If it is too tight, the bearing may become damaged.

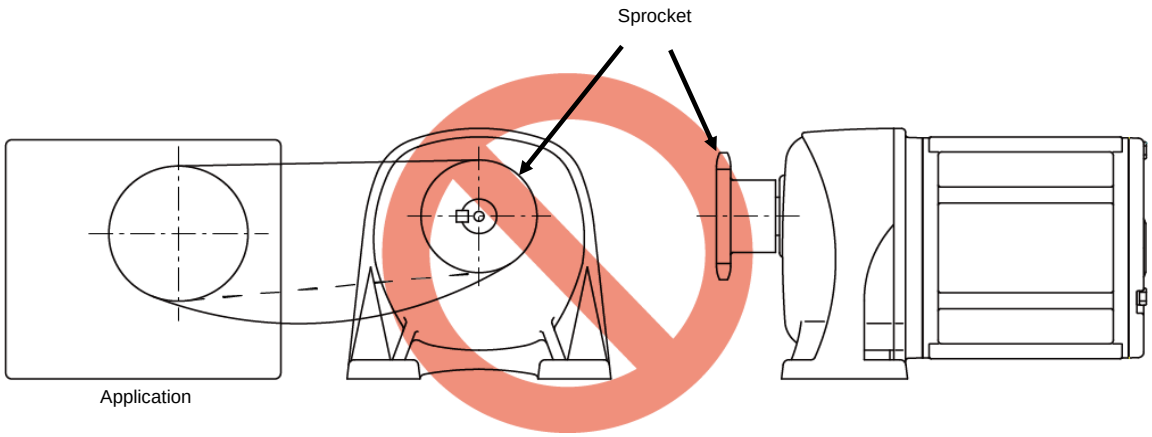
Correct



Application

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

Incorrect



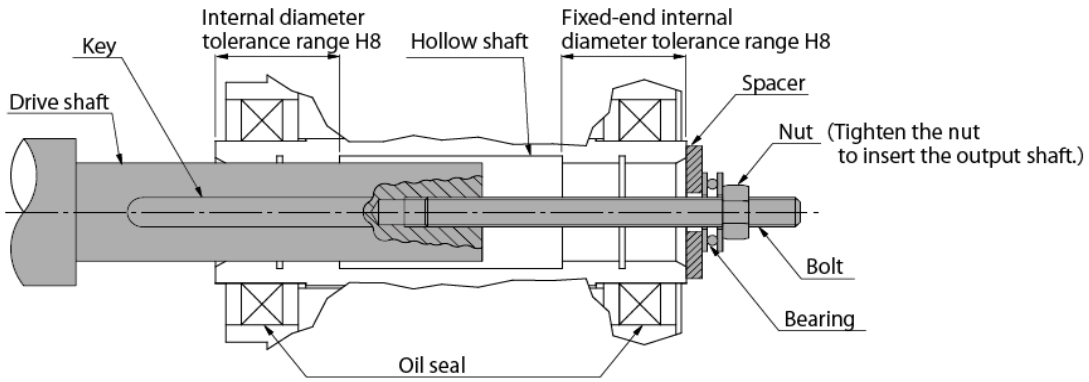
Application

- 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 drive shaft to 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.



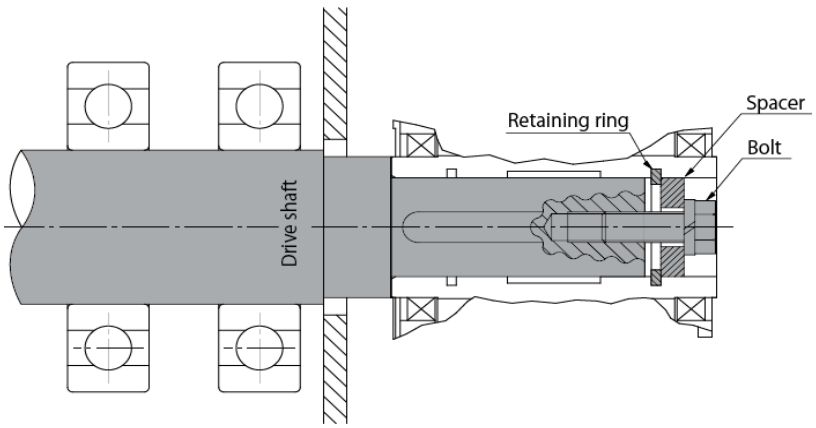
Customers need to provide their own spacer, nut, bolt, key and bearing.

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

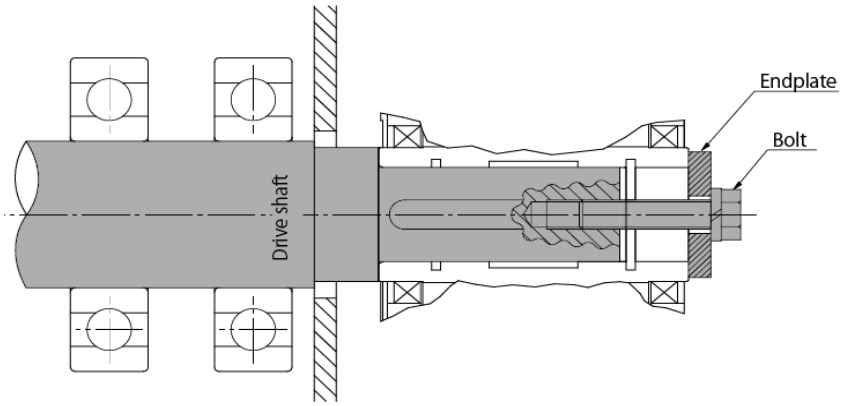
[Important] Be careful when tightening the bolt, as tightening it too much can distort the shape of the retaining ring.



Customers need to provide their own spacer, bolt, and retaining ring.

Attachment Using an Endplate

[Caution] Please note that for the connection method below, mounting of 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.

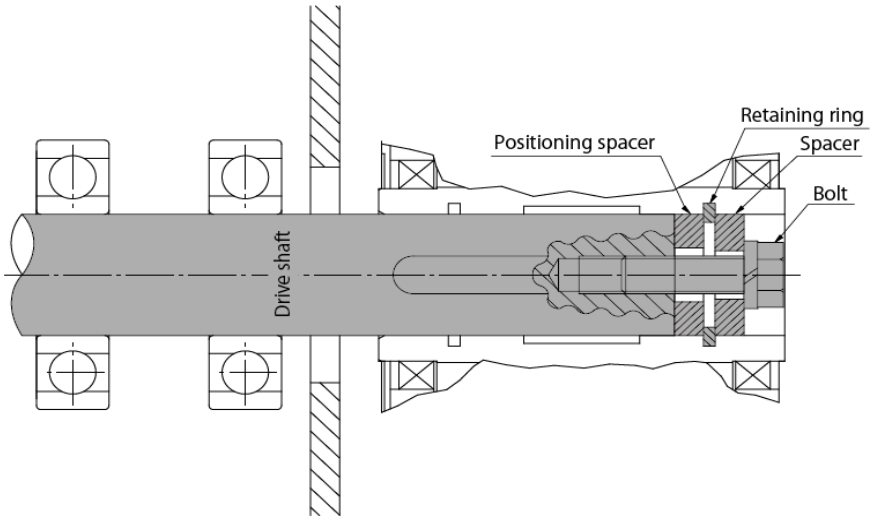


Customers need to provide their own endplate and bolt.

When there are no steps on the drive shaft

Attachment Using a Spacer and Retaining Ring

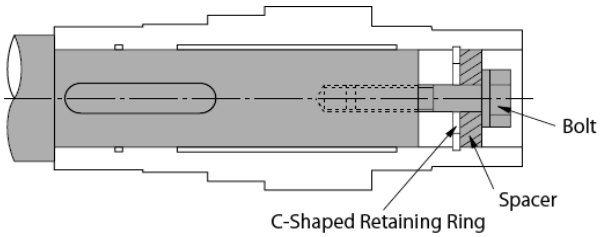
[Important] Make sure there is a gap between the outer diameter of the spacer and the internal diameter of the hollow bore.
If the fit is too tight and the outer diameter of the spacer is inaccurate, axial runout of the drive shaft and hollow bore can result.
The positioning spacer is used to position the reducer. It is not required if you know the length of the drive shaft in advance.
In addition, attaching a positioning spacer enables you to smoothly remove the shaft from the right angle hollow bore.
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 spacer, bolt, and retaining ring.

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

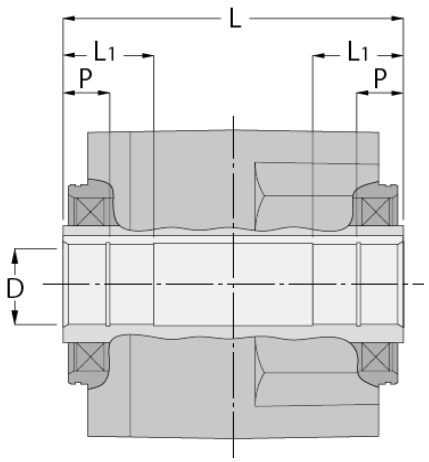
・yard-pound (in)

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

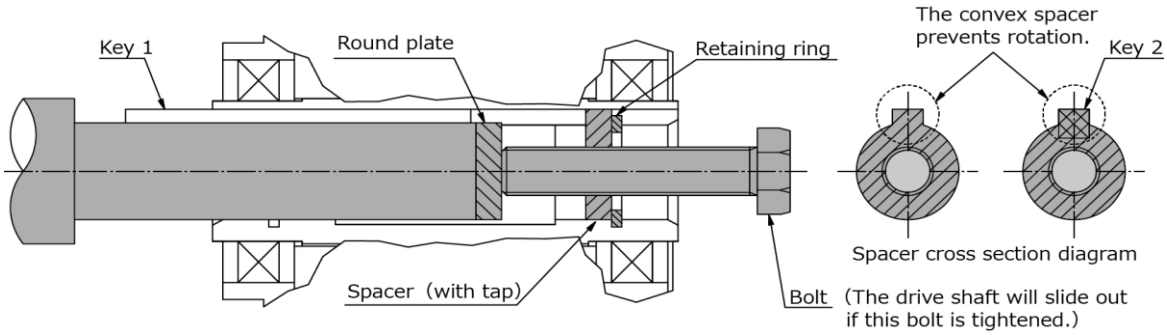
- Make sure the drive shaft reaches both ends of L1.
  However, take note of how much room is necessary for spacers in the section titled "4-3-5 Removal from the Hollow Bore".

- 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

Avoid applying excessive force to the casing and/or the hollow bore.
If you make and use a jig like the one below, drive shaft removal will be easier.



Customers need to provide their own spacer, round plate, bolt and retaining ring key.

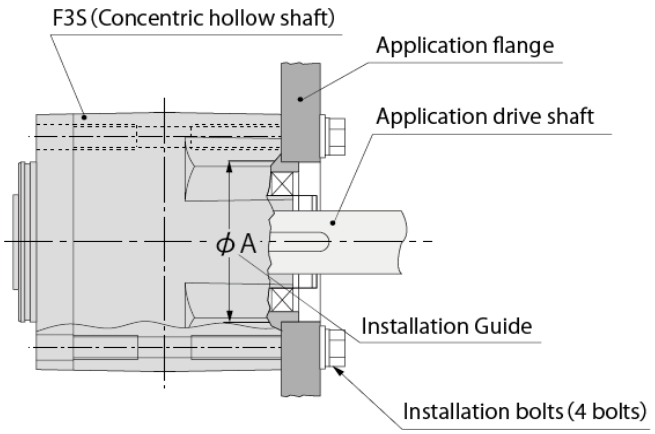
4-4 Installing a Flange/Torque Arm

Advantages and disadvantages of flange and torque arm installation

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

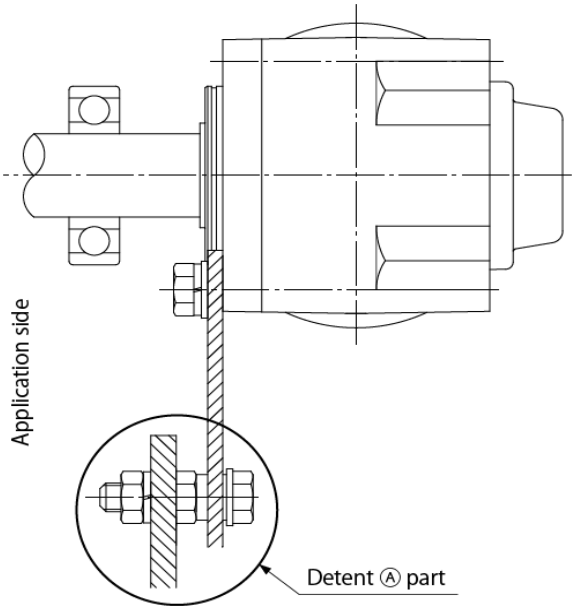
4-4-1 Flange Installation

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.
Four bolts should be used.



4-4-2 Fastening the Reducer and 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. Refer to the table below for tightening torque.



Bolt size and tightening torque (reference values)

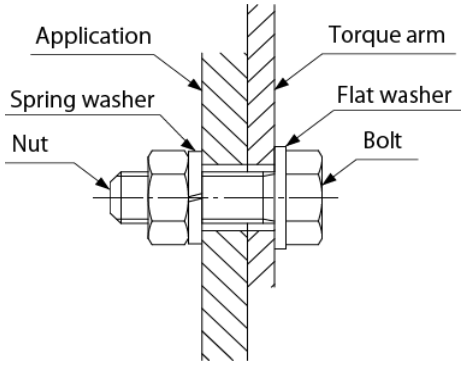
Bolt size	Tightening torque		
	(N•m)	(kgf•m)	(lbf・in)
M8	13	1.3	115
M10	25	2.6	221
M12	44	4.5	390
M14	69	7	611
M16	108	11	956

How to install the Torque Arm Detent Ⓐ

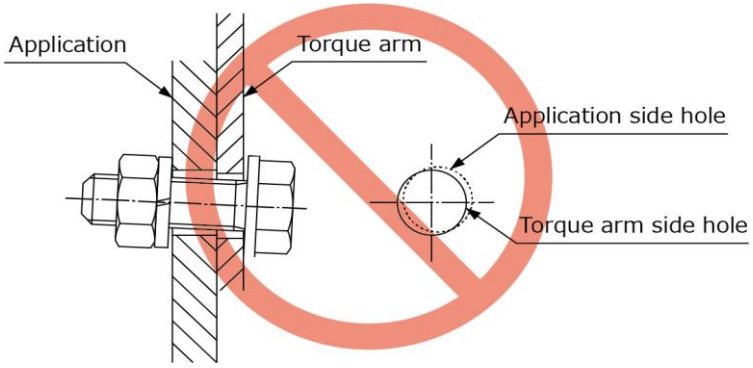
For normal/reverse rotation operation and intermittent unidirectional operation

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

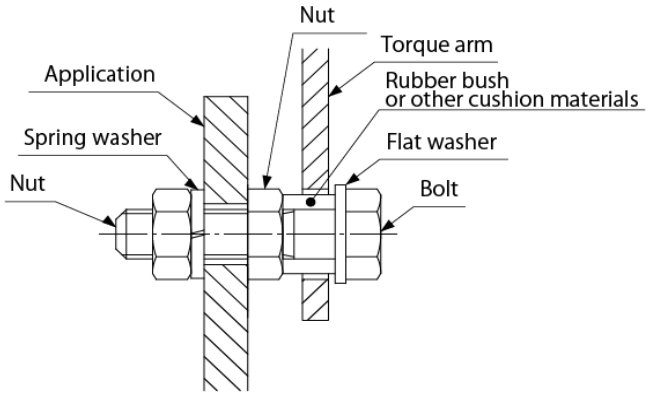


Bad example



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

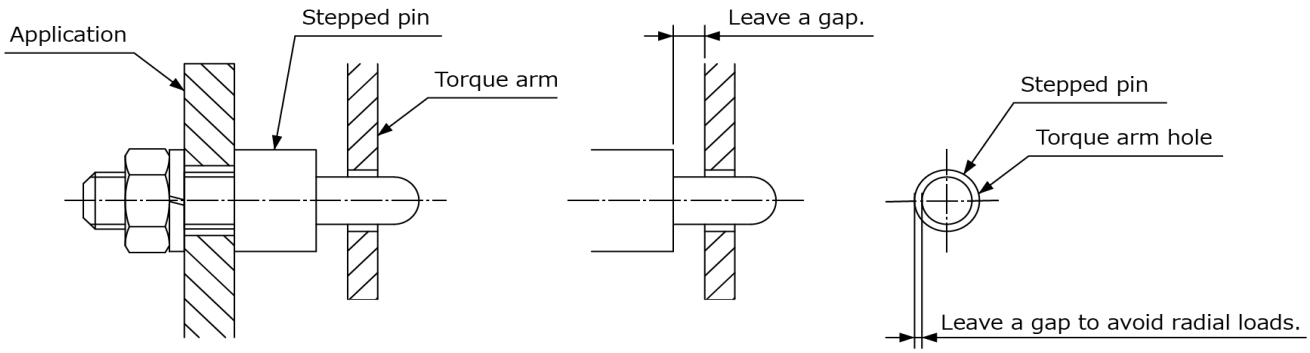
[Important] If the mounting is loose, impact may be applied to the torque arm with each startup and defects such as loosened bolts may occur.
If a firm mount is not possible, a rubber bush or other cushion materials should be inserted between the torque arm and the bolt as a protective measure.
Stronger 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

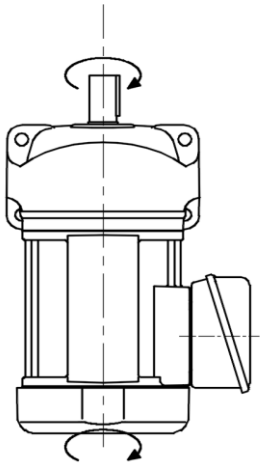
Check the rotational direction before the gearmotor is connected to the application. Running the application in the wrong direction may cause injury and/or damage to the application.

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

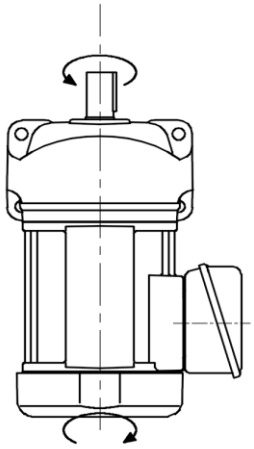
The following given rotational directions are when the gearmotors are wired according to the section "6 Wiring".

G3 Series

Motor Power	Gear Ratio
1/8HP(0.1kW)	1/5 to 1/50 and 1/300 to 1/1200
1/4HP and 1/2HP(0.2kW and 0.4kW)	1/5 to 1/30 and 1/300 to 1/1200

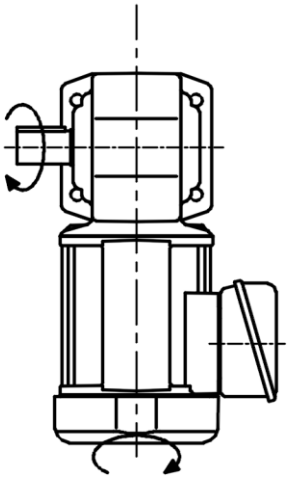


Motor Power	Gear Ratio
1/8HP(0.1kW)	1/60 to 1/200
1/4HP and 1/2HP(0.2kW and 0.4kW)	1/40 to 1/200

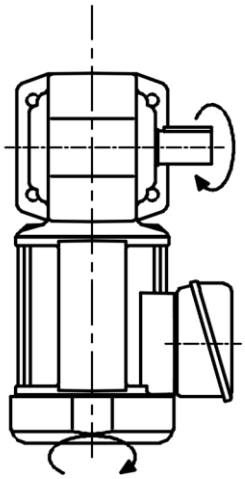


H2 Series

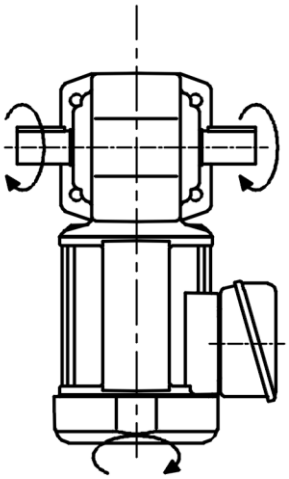
Motor Power	Gear Ratio
1/8HP and 1/4HP(0.1kW and 0.2kW)	1/5 to 1/60 and 1/600 to 1/1500
1/2HP(0.4kW)	1/5 to 1/60 and 1/300 to 1/1500



L Shaft

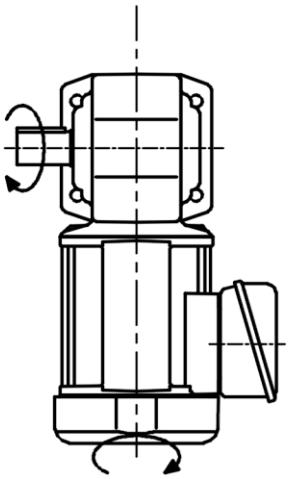


R Shaft

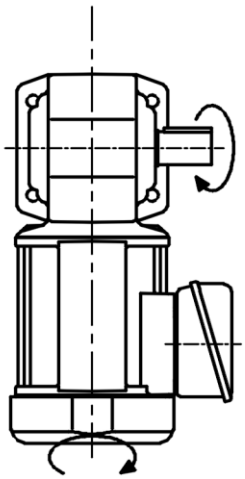


T Shaft

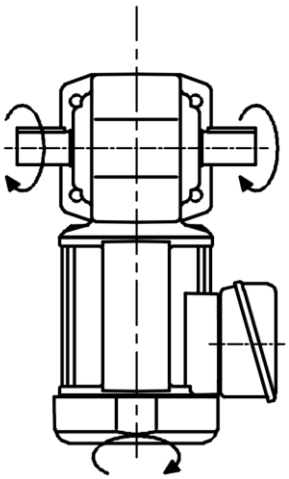
Motor Power	Gear Ratio
1/8HP and 1/4HP(0.1kW and 0.2kW)	1/80 to 1/450
1/2HP(0.4kW)	1/80 to 1/240



L Shaft



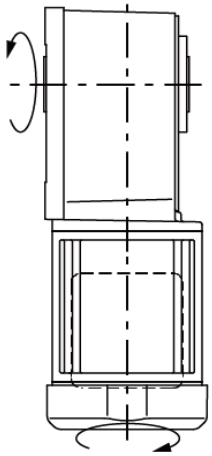
R Shaft



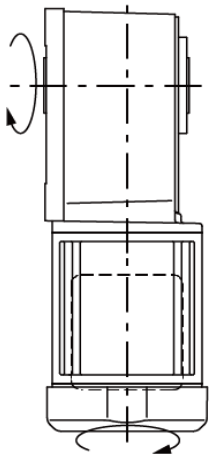
T Shaft

F Series

Motor Power	Gear Ratio
1/8HP to 1/2HP(0.1kW to 0.4kW)	1/5 to 1/60 and 1/300 to 1/1500

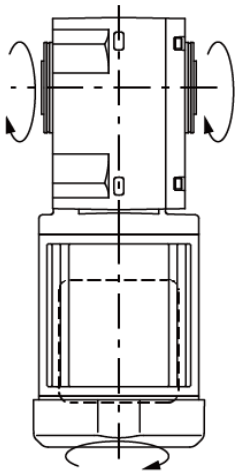


Motor Power	Gear Ratio
1/8HP to 1/2HP(0.1kW to 0.4kW)	1/80 to 1/240

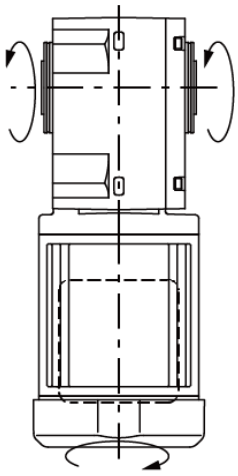


F3 Series

Motor Power	Gear Ratio
1/8HP to 1/2HP(0.1kW to 0.4kW)	1/5 to 1/60



Motor Power	Gear Ratio
1/8HP to 1/2HP(0.1kW to 0.4kW)	1/80 to 1/240



6. Wiring

DANGER	
	Please connect wires to the power cable in accordance with the wiring diagram in the Detailed Instruction Manual. Failure to follow this precaution may result in electric shock and fire. In case of motors without terminal box(flying leads), be sure to insulate the connections properly.
	Do not forcibly bend, pull or pinch the power cable and motor lead wires. Failure to follow this precaution may result in electric shock.
	Connect the wires according to the wiring diagram. If terminals are left unattended without proper wiring, there is a risk of electric shock.
	Be sure to ground the grounding terminal. Failure to follow this precaution may result in electric shock.
	Be sure to use the voltage described on the nameplate. Failure to follow this precaution may result in motor burn damage and fire.

Caution	
	Do not touch the terminals when measuring the insulation resistance. Failure to follow this precaution may result in electric shock.
	When wiring, follow your facility's electrical codes and extension regulations. Failure to follow this precaution may result in burning, electric shock, injury, and fire.
	Capacitor Start type motors and Capacitor Start Capacitor Run type motors do not have a protective device. (A capacitor run motor has a built-in thermal protector.) Overload protective devices are required to be installed by the facility's electrical codes. Not only overload protective device but also a ground leakage breaker is recommended to be installed. Failure to follow this precaution may result in damage, electric shock, fire and injury.
	When running the gearmotor off the application, please remove the temporarily attached key from the output shaft. Failure to follow this precaution may result in injury.
	Check the rotational direction before the gearmotor is connected to the application. Failure to follow this precaution may result in injury and damage to the application due to running the application in the wrong direction.
	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. Failure to follow this precaution may result in damage to the application due to forward and reverse operation by plucking.
	For brakemotors, do not energize the brake coil continuously while the motor is stationary. Failure to follow this precaution may result in coil burn damage and/or fire due to reduced ventilation.
	If a brakemotor is utilized for lifting applications, please be sure to utilize the DC switching connection. Failure to follow this precaution may result in drop accident.

6-1 Precautions for Terminal Box

- There is no terminal block in the terminal box.
- Be sure to assemble and fasten the terminal box lid with the fixing screws after wiring.
- The tightening torque for the lid on the A type terminal box is 0.4 to 0.8 N・m (3.5 to 7.1 lbf・in).
- A rubber gasket is attached to the lid of A type terminal boxes.
  Please do not remove the rubber gasket between the case and lid of the terminal box.
- Do not remove the terminal box.
- Customers may not change the position of the terminal box and the lead wire/cable direction terminal box.

6-2 Precautions when Wiring a Brakemotor

- The brake voltage is 90V DC.
- Utilize “DC Switching” if the motor is used for lifting applications.
- Connect a surge protector (optional accessory) between the contacts for a DC Switching connection.
  Please contact the nearest service office for details on the surge protector. (Optional Accessory).
- Use switches of 110V DC with a contact point rating of 13 DC to block the inductive load of the DC coil when using DC Switching.
  Please contact the nearest service office for further details.
  [Reference] 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 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.

Rectifier	Allowable input voltage
A100-D90-UL	AC100V to 120V±10%
A200-D90-UL	AC100V to 120V±10%

Brake Lag Time : ta

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

Motor Power	AC Switching (B)	AC Switching (A)	DC Switching
1/8HP and 1/4HP(0.1kW and 0.2kW)	0.1 to 0.2	0.03 to 0.10	0.005 to 0.015
1/2HP (0.4kW)	0.2 to 0.4	0.08 to 0.20	0.005 to 0.015

6-3 Gearmotor wiring

- Refer to the "6-3-1 Capacitor Run Connection Table" "6-3-4 Capacitor Start Connection Table" and "6-3-7 Capacitor Start Capacitor Run Connection Table" for the appropriate wiring diagram to wire the gearmotor.
- For the rotational direction of motor in the "6-3-3 Capacitor Run Connection Chart" "6-3-6 Capacitor Start Connection Chart" and "6-3-10 Capacitor Start Capacitor Run Connection Chart" 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 gear ratio of the gearhead. Check the gear ratio before connecting wires.
  (Refer to "5 Rotational Direction")
- Be sure to ground the grounding terminal. Failure to follow this precaution may result in electric shock.
  If the motor has a terminal box, the terminal box contains a grounding terminal.
- Please connect the Capacitor Run motor and Capacitor Start Capacitor Run motor with the capacitor comes with the product.
- Almost double of the power voltage is applied to both terminals of the capacitor for the capacitor run motor.
  For safety, be sure to apply proper insulation to the terminals.
- 1-phase motor isn't compatible with Inverter/VFD.

6-3-1 Capacitor Run Connection Table

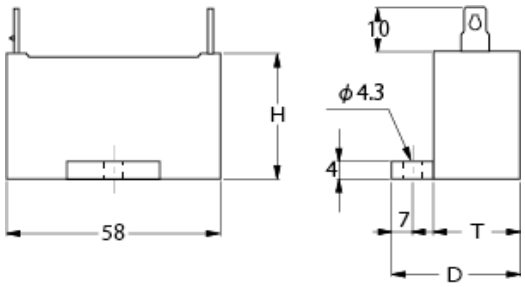
Part Number		Motor		Brake	Wiring diagram			
Number of phases (operation method)	Supply Voltage	Voltage (V)/ Frequency (Hz)	Number of Lead wires	Rectifier (Accessory)	Non-Brake	With Brake		
						AC Switching (B)	AC Switching (A)	DC Switching
S Capacitor Run	L	115/50 115/60	3	A100-D90-UL	Fig.-[1]	Fig.-[3]	Fig.-[5]	Fig.-[7]
	D	220/50 220/60 230/50 230/60	3	A200-D90-UL	Fig.-[2]	Fig.-[4]	Fig.-[6]	Fig.-[8]

[Reference] A rectifier is included a breakmotor only.

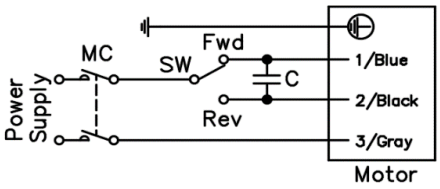
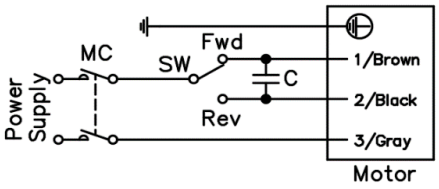
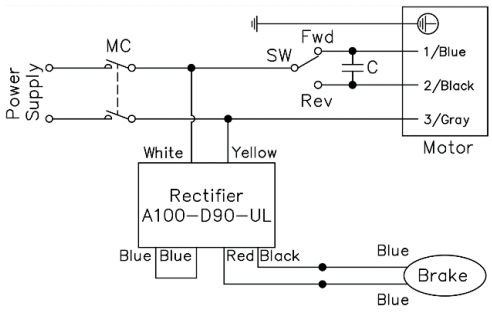
6-3-2 Capacitor Specification for "Capacitor Run" style.

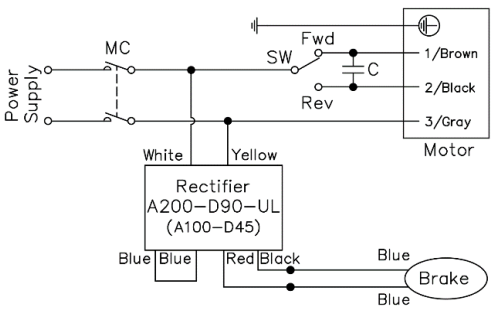
Part Number			Voltage (V)/Frequency (Hz)	Capacitor(Accessory)				
Motor Power (kW)	Number of phases (operation method)	Supply Voltage		Capacitance [μF]	Withstand Voltage[V]	Outline Dimensions[mm]		
						H	T	D
01 (0.1)	S Capacitor Run	L	115,115 / 50,60	24	220	41	29	44
		D	220,220,230,230 / 50,60,50,60	6	450			

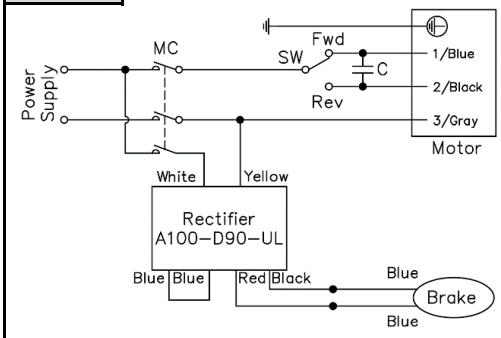
External dimensions of capacitor [mm]

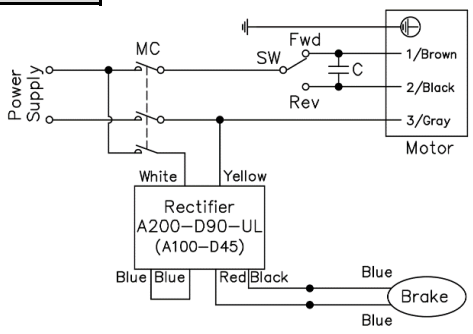


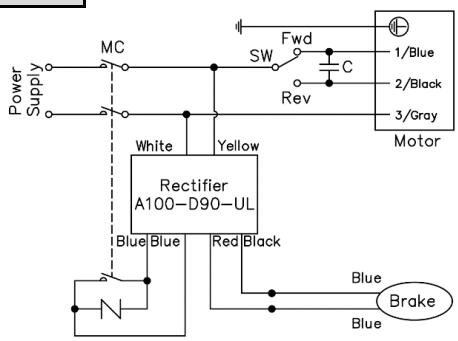
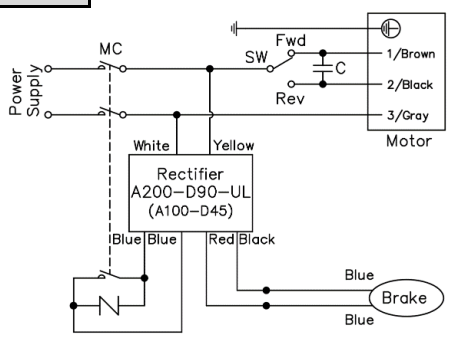
6-3-3 Capacitor Run Connection Chart

<table>
<tr><th rowspan="2">Number of phases (operation method)</th><th rowspan="2">Brake wiring</th><th colspan="2">Wiring diagram</th></tr>
<tr><th>100 V class</th><th>200 V class</th></tr>
<tr><td rowspan="4">S
Capacitor Run</td><td>Non-Brake</td><td>Fig.-[1]
 
</td><td>Fig.-[2]
 
</td></tr>
<tr><td>AC Switching (B)</td><td>Fig.-[3]
 

Please short the rectifier's blue-blue wires.</td><td>Fig.-[4]
 

Please short the rectifier's blue-blue wires.</td></tr>
<tr><td>AC Switching (A)</td><td>Fig.-[5]
 

Please short the rectifier's blue-blue wires.</td><td>Fig.-[6]
 

Please short the rectifier's blue-blue wires.</td></tr>
<tr><td>DC Switching</td><td>Fig.-[7]
 
</td><td>Fig.-[8]
 
</td></tr>
</table>

MC : Magnetic Contactor
SW : Rotation Changeover Switch
C : Capacitor (Accessory)
⊣N⊢ : Surge Suppressor (Optional)

6-3-4 Capacitor Start Connection Table

Part Number		Motor		Brake	Wiring diagram			
Number of phases (operation method)	Supply Voltage	Voltage (V)/ Frequency (Hz)	Number of Lead wires	Rectifier (Accessory)	Non-Brake	With Brake		
						AC Switching (B)	AC Switching (A)	DC Switching
C (Capacitor Start)	L	115/50 115/60	4	A100-D90-UL	Fig.-[9]	Fig.-[11]	Fig.-[13]	Fig.-[15]
	D	220/50 220/60 230/50 230/60	3	A200-D90-UL	Fig.-[10]	Fig.-[12]	Fig.-[14]	Fig.-[16]

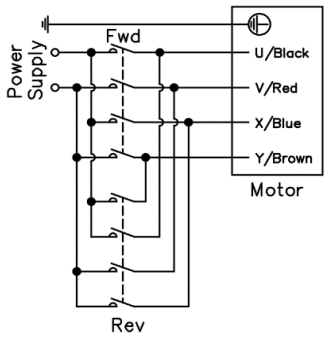
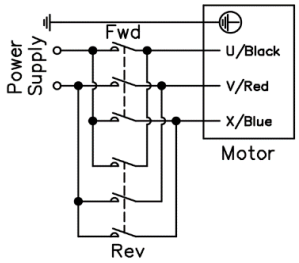
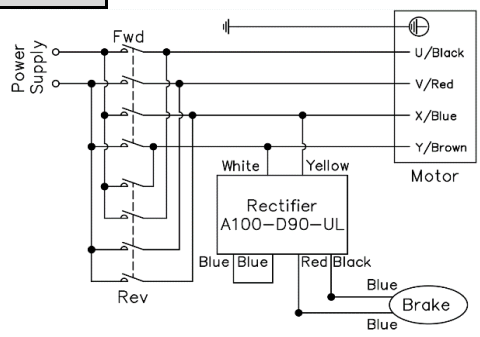
[Reference] A rectifier is included a breakmotor only.

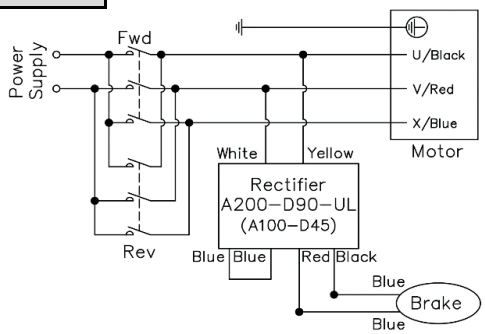
6-3-5 Capacitor Specification for "Capacitor Start" style.

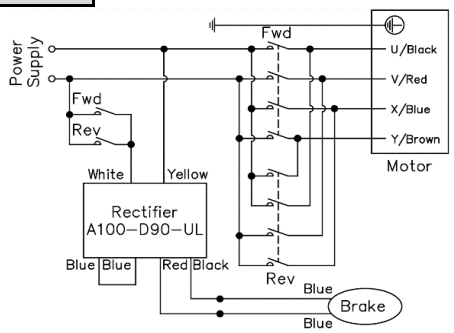
Part Number			Voltage (V)/Frequency (Hz)	Capacitor capacity (μF)
Motor Power (kW)	Number of phases (operation method)	Supply Voltage		
02 (0.2)	C Capacitor Start	L	115,115 / 50,60	250
		D	220,220,230,230 / 50,60,50,60	250
04 (0.4)		L	115,115 / 50,60	250
		D	220,220,230,230 / 50,60,50,60	250

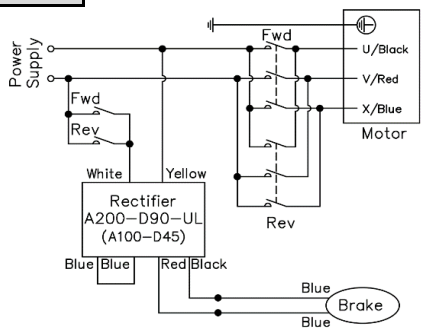
6-3-6 Capacitor Start Connection Chart

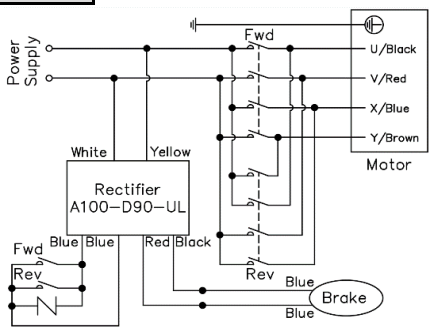
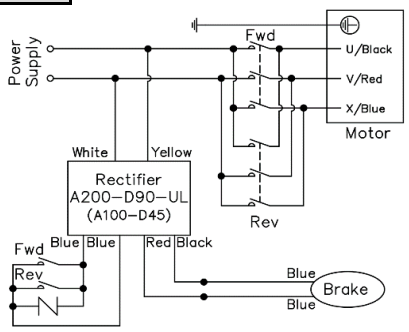
<table>
<tr><th rowspan="2">Number of phases (operation method)</th><th rowspan="2">Brake wiring</th><th colspan="2">Wiring diagram</th></tr>
<tr><th>100 V class</th><th>200 V class</th></tr>
<tr><td rowspan="3">C

Capacitor Start</td><td>Non-Brake</td><td>Fig.-[9]
 
</td><td>Fig.-[10]
 
</td></tr>
<tr><td>AC Switching (B)</td><td>Fig.-[11]
 

Please short the rectifier's blue-blue wires.</td><td>Fig.-[12]
 

Please short the rectifier's blue-blue wires.</td></tr>
<tr><td>AC Switching (A)</td><td>Fig.-[13]
 

Please short the rectifier's blue-blue wires.</td><td>Fig.-[14]
 

Please short the rectifier's blue-blue wires.</td></tr>
<tr><td>DC Switching</td><td>Fig.-[15]
 
</td><td>Fig.-[16]
 
</td></tr>
</table>

⊣N⊢ : Surge Suppressor (Optional)

6-3-7 Capacitor Start Capacitor Run type Connection Table

Part Number		Motor		Brake	Wiring diagram			
Number of phases (operation method)	Supply Voltage	Voltage (V)/ Frequency (Hz)	Number of Lead wires	Rectifier (Accessory)	Non-Brake	With Brake		
						AC Switching (B)	AC Switching (A)	DC Switching
D Capacitor Start Capacitor Run style.	L	115/50 115/60	5	A100-D90-UL	Fig.-[17]	Fig.-[19]	Fig.-[21]	Fig.-[23]
	D	220/50 220/60 230/50 230/60	4	A200-D90-UL	Fig.-[18]	Fig.-[20]	Fig.-[22]	Fig.-[24]

[Reference] A rectifier is included a breakmotor only.

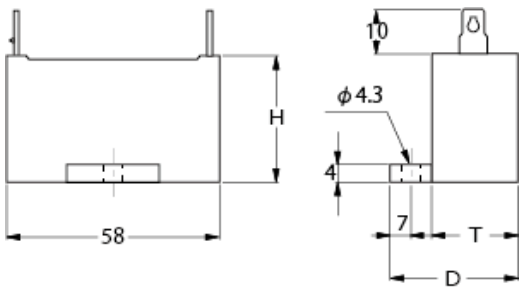
6-3-8 Start Capacitor Specification for "Capacitor Start Capacitor Run" style.

Part Number			Voltage (V)/Frequency (Hz)	Capacitor capacity (μF)
Motor Power (kW)	Number of phases (operation method)	Supply Voltage		
02 (0.2)	D Capacitor Start Capacitor Run style.	L	115,115 / 50,60	220
		D	220,220,230,230 / 50,60,50,60	220
04 (0.4)		L	115,115 / 50,60	300
		D	220,220,230,230 / 50,60,50,60	300

6-3-9 Run Capacitor Specification for "Capacitor Start Capacitor Run" style.

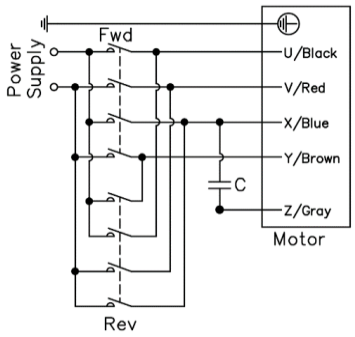
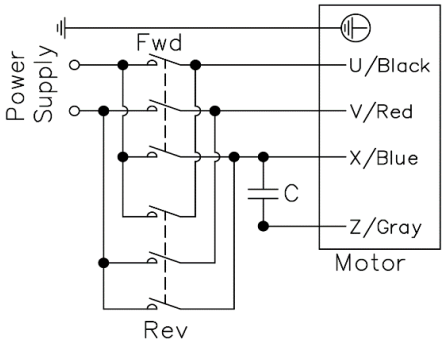
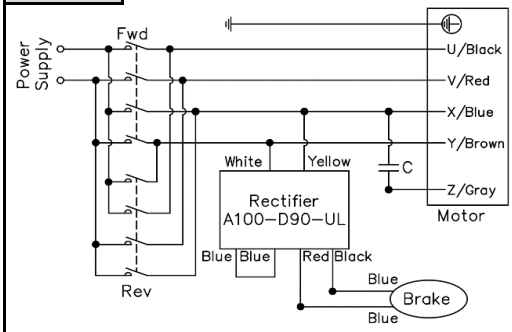
Part Number			Voltage (V)/Frequency (Hz)	Capacitor(Accessory)				
Motor Power (kW)	Number of phases (operation method)	Supply Voltage		Capacitance [μF]	Withstand Voltage[V]	Outline Dimensions[mm]		
						H	T	D
02 (0.2)	D Capacitor Start Capacitor Run style.	L	115,115 / 50,60	30	250	50	35	50
		D	220,220,230,230 / 50,60,50,60	30	250			
04 (0.4)		L	115,115 / 50,60	30	250			
		D	220,220,230,230 / 50,60,50,60	30	250			

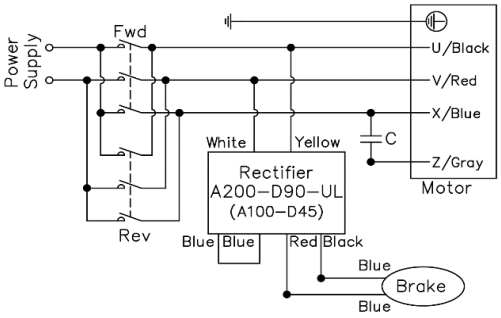
External dimensions of capacitor [mm]

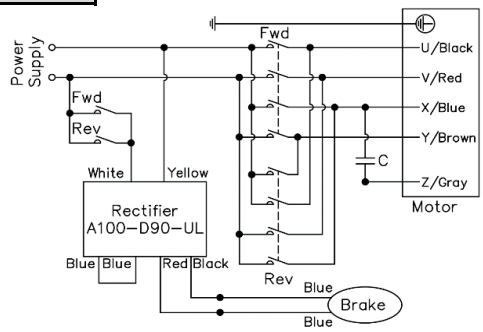


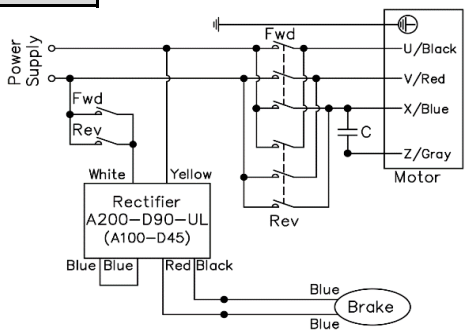
6-3-10 Capacitor Start Capacitor Run Connection Chart

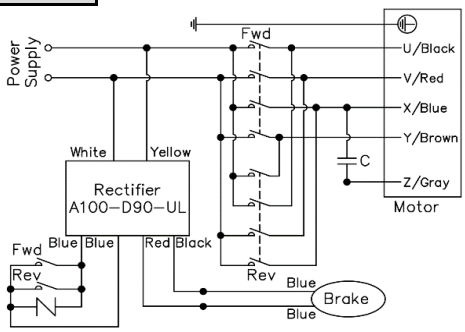
<table>
<tr><th rowspan="2">Number of phases (operation method)</th><th rowspan="2">Brake wiring</th><th colspan="2">Wiring diagram</th></tr>
<tr><th>100 V class</th><th>200 V class</th></tr>
<tr><td rowspan="4">D

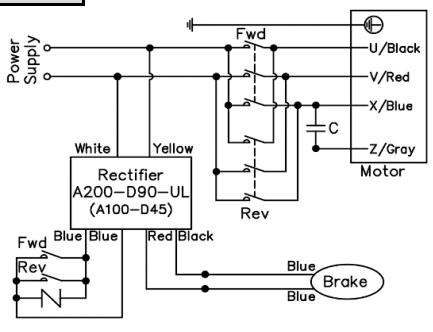
(Capacitor Start Capacitor Run style.)</td><td>Non-Brake</td><td>Fig.-[17]
 
</td><td>Fig.-[18]
 
</td></tr>
<tr><td>AC Switching (B)</td><td>Fig.-[19]
 

Please short the rectifier's blue-blue wires.</td><td>Fig.-[20]
 

Please short the rectifier's blue-blue wires.</td></tr>
<tr><td>AC Switching (A)</td><td>Fig.-[21]
 

Please short the rectifier's blue-blue wires.</td><td>Fig.-[22]
 

Please short the rectifier's blue-blue wires.</td></tr>
<tr><td>DC Switching</td><td>Fig.-[23]
 

Please short the rectifier's blue-blue wires.</td><td>Fig.-[24]
 

Please short the rectifier's blue-blue wires.</td></tr>
</table>

⊣N⊢ : Surge Suppressor (Optional)

C : Capacitor (Accessory)

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. Failure to follow this precaution may result in electric shock.
	Do not approach or touch rotating parts (output shafts, etc.) during operation. Failure to follow this precaution may result in injury due to entanglement.
	Be sure to turn off the power switch when a power failure occurs. Failure to follow this precaution may result in electric shock, injury and application damage due to the sudden power recovery.
	Connect the wires according to the wiring diagram. If terminals are left unattended without proper wiring, there is a risk of electric shock.

WARNING	
	Do not perform impact stop to the motor. Failure to follow this precaution may result in damage to the gearmotor and the application. In case of 1-phase gearmotor, failure to follow this precaution may result in out-of-control gearmotor due to reversing the rotation.
	When operating a 1-phase gearmotor in reverse, be sure to stop the motor completely first, and then start the motor in the reverse rotation. Failure to follow this precaution may result in out-of-control gearmotor due to not changing the rotational direction.
	Be sure to turn off the power when the built-in thermal protector of capacitor run motor is activated. Failure to follow this precaution may result in injury and damage to the application due to the sudden start of the motor when the built-in thermal protector automatically starts again.
	When the built-in thermal protector of capacitor run motor is activated, only motor is stopped and the brake is still released. So, the brake will not hold the gearmotor load. Be sure to implement safety measures. Failure to follow this precaution may result in injury and damage to the application.

Caution	
	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 use the motor under loads that exceed the ratings. Failure to follow this precaution may result in injury and damage to the application.
	Please do not touch the energized part of capacitor for 1-phase gearmotor until it is discharged completely. Failure to follow this precaution may result in electric shock.

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 .

[Caution] Immediately stop the operation if there is any abnormality.
Failure to follow this precaution may result in injury, fire, electric shock, burns and damage to the application.

[Important] 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.

7-4 Built-in Thermal Protector (Capacitor Run Only)

[Caution] A capacitor run motor has a built-in thermal protector.
Upon reaching the specified temperature, the motor will be stopped by the activated built-in thermal protector.
(Specified temperature : 120℃±5℃)
In such cases, for brakemotors, the thermal switch only stops the motor, and the brake is still released. And so, the brake will not hold the load.
Be sure to implement safety measures. Failure to follow this precaution may result in injury and damage to the application.
The built-in thermal protector is an automatic restoration type. When the motor's temperature goes down, the motor will automatically start again.
Be sure to turn off the power before inspection work. Failure to follow this precaution may result in injury due to the sudden start of the motor.
In addition, do not energize the brake coil continuously while the motor is stationary.

8 Safety Standards

8-1 Gearmotor safety standards

Country name	U.S.A.	Canada	Europe (EU)
Number of phases	1-phase	1-phase	1-phase
Safety Standards	UL	CSA	EN
Standard No.	UL1004-1	CSA C22.2 No.100	EN60034-1 EN60034-5
UL File No.	PRGY2. E172621	PRGY8. E172621	

8-2 Efficiency regulation compliance of 1-phase induction motors

Country name		Europe (EU)
Law		COMMISSION REGULATION
Safety Standards		IEC60034-30-1
Our correspondence contents	Capacity range	1/4HP and 1/2HP (0.2kW and 0.4kW)
	Number of Poles	4
	Efficiency Class	IE2

- Nissei's product range describes the ranges covering each gearmotor efficiency regulation.
- The product range described above are subject to change without prior notice in response to changes to standards etc.

8-3 Efficiency values of high-efficiency gearmotors for Europe

8-3-1 Efficiency values of high-efficiency gearmotors for Europe

Efficiency values for each load factor (50% and 75%) at 50 Hz

* For efficiency values at 100% load factor, please see the product nameplate.

Efficiency values:%

Efficiency Class	Motor Power	Voltage Codes	Voltage	Frequency	Load Factor	
					50%	75%
IE2	0.2kW	L	115V	50Hz	54.4	62.9
		D	220V	50Hz	55.4	63.2
			230V	50Hz	52.5	61.1
	0.4kW	L	115V	50Hz	61.1	67.9
		D	220V	50Hz	63.4	69.3
			230V	50Hz	61.2	68.2

Subject Laws: COMMISSION REGULATION (EU) 2019/1781

8-3-2 Power Losses of high-efficiency gearmotors for Europe

This product is inapplicable because it cannot be used in combination with an inverter.

8-4 By Country (Region)

8-4-1 U.S.A.

● Safety Certification

<Applicable Standard and UL File>

Number of phases	Applicable Standard	Acquired UL File	Motor Power	Correspondence details by [Supply Voltage/Standards model]	
				LV	DV
1-phase	UL1004-1 (Standard for Rotating Electrical Machines – General Requirements)	PRGY2. E172621	1/8HP (0.1kW) to 1/2HP (0.4kW)	c UL us	

8-4-2 Canada

● Safety Certification

<Applicable Standard and UL File>

Number of phases	Applicable Standard	Acquired UL File	Motor Power	Correspondence details by [Supply Voltage/Standards model]	
				LV	DV
1-phase	C22.2 No.100 (Motors and Gearmotors)	PRGY8. E172621	1/8HP (0.1kW) to 1/2HP (0.4kW)	c UL us	

8-4-3 Europe

● Safety Certification

Number of phases	EU Directive	Applicable Standard	Motor Power	Correspondence details by [Supply Voltage/Standards model]	
				LV	DV
1-phase	Low Voltage Directive 2014/35/EU Low Voltage Directive	EN60034-1: Rotating electrical machines - Part 1 Ratings and characteristics EN60034-5: Rotating electrical machines - Part 5 Classification of ingress protection rating provided by the integral design of rotating electrical machines (IP code)	1/8HP (0.1kW) to 1/2HP (0.4kW)	CE	

● High Efficiency Regulation

Number of phases	Applicable Standard	Motor Power	Correspondence details by [Supply Voltage/Standards model]	
			LV	DV
1-phase	IEC 60034-30-1	1/4HP(0.2kW) and 1/2HP(0.4kW)	CE	

9 Inspection and Adjustments

DANGER	
	Do not touch rotating parts (output shafts, etc.) when the gearmotor is being maintained/inspected during operation. Failure to follow this precaution may result in injury accidents due to entanglement.
	Do not remove the internal inspection cover during operation. Failure to follow this precaution may result in burns due to dispersing high-temperature lubricant.
	Be sure to stop rotation of the application when checking the tooth surface condition of the stopped gear. Failure to follow this precaution may result in injury accidents due to entanglement to the gear engagement part.
	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. Failure to follow this precaution may result in injury.
	Do not operate the product while the safety cover, etc. is removed during inspection. Failure to follow this precaution may result in injury due to entanglement.
	Never energize the gearmotor when the brake gap is inspected/adjusted. Failure to follow this precaution may result in electric shock, injury and damage to the application.
	Do not operate the product while the fan cover (brake cover) is removed after the inspection/adjustment of brake gap. Failure to follow this precaution may result in injury due to entanglement.
	Please turn the power ON and OFF to check the brake operation before operating the motor after the inspection/adjustment of brake gap. Failure to follow this precaution may result in falling or dangerous accident.
	If the product is used for lifting, do not release the brake while a load is lifted. Failure to follow this precaution may result in drop accident.

WARNING	
	Be sure to turn off the power before inspection work when the built-in thermal protector of capacitor run motor is activated. The built-in thermal protector is an automatic restoration type. When the motor's temperature goes down, the motor will automatically start again. Failure to follow this precaution may result in injury due to the sudden start of the motor.

Caution	
	Do not touch the terminals when measuring the insulation resistance. Failure to follow this precaution may result in electric shock.
	Do not touch the gearmotor surface with your bare hand because the surface may become very hot. Failure to follow this precaution may result in burns.
	Any abnormality should be diagnosed in accordance with the instruction manual. Never operate the motor until the cause of the abnormality has been identified and corrective measures have been implemented.
	Be sure that repair/disassembly/assembly is done by an authorized expert. Failure to follow this precaution may result in electric shock, injury and fire.

9-1 Grease/Oil Seal/O-Ring

- All gearmotors utilize grease for lubrication 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. Please note that oil seals must be replaced at our factory and are considered repair orders.
- 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. Failure to follow this precaution may result in defective products due to oil leakage.
  (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.

[Important] If a customer needs to replace grease, oil seals, or O-rings for maintenance or inspection purposes, please contact the nearest customer service helpdesk (listed on the last page of the instruction manual).
Please note, however, that the warranty does not cover defects caused by parts replacement conducted by the customer.

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	There is no unusual noise (rattling, periodic noise) * Place a listening stick on the bearing to check for unusual noises.
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.

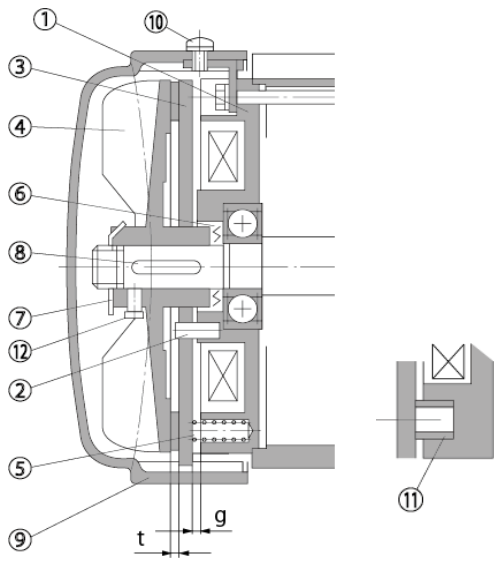
Inspection Item		Inspection Frequency	Inspection Details
Mounting Bolt		Every 6 months	Check the looseness with a spanner. Tighten it if it is loose.
Chain and V-belt		Every 6 months	Check the tension. Adjust if too loose or too tight.
Motor Insulation Resistance		Every 6 months	Measure with an insulation resistance tester. Resistance must be 1 MΩ or higher under 500V.
Brake	Gap Amount	Annually or every 1 to 1.5 million times of brake usage	Check that the gap is within the appropriate gap range. For adjustment methods, refer to "9-4-4 How to Adjust the Brake Gap".
	Friction Disk	1 year	Check the thickness of the Friction Disk. If the thickness of the friction disk becomes less than 1.5mm, replace it with a new disk or send the unit to the nearest certified service provider for repair.

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

9-4 Adjustment of the Brake Gap

After operating for an extended period of time, the friction disk of brake will wear and the gap(g) will gradually increase.
If the gap(g) becomes wider than the allowable gap, it becomes more difficult for the magnet to attract the armature upon activation, and the brake may not be able to release properly.
Using the motor continuously under this condition, would mean that the motor is running with brake-on. This may cause overheating on both the motor and brake, and will negatively affect the functionality of the motor.
In order to operate this product safety, it is recommended to check or adjust the brake gap periodically(annually or every 1 to 1.5 million times of brake usage).

9-4-1 Brake Structure



No.	Name
①	Bracket with Field
②	Spring Pin
③	Armature
④	Fan/Friction Disk
⑤	Spring 1
⑥	Spring 2
⑦	Lock Washer/Nut
⑧	Key
⑨	Fan Cover
⑩	Fan Cover Fixing Screw ● Morot Power 0.1kW to 0.4kW: Cross-recessed pan head screw M5
⑪	Bush
⑫	Fan Fixing Screw ● Morot Power 0.1kW,0.2kW: Hex Head Phillips Bolt M5 ● Morot Power 0.4kW: Hex Head Cap Screw M5

g: Gap
t: Friction Disk

9-4-2 Brake Specifications

[Metric notation]

Motor Power [kW]	Brake Power		Static Friction Torque [N·m]	Allowable Gap [mm]	Appropriate Gap [mm]
	AC voltage [V]	DC voltage [V]			
0.1	100 (200)	90 (90)	0.98	g: 2.3 or less	g : 1.9±0.1
0.2			1.96	g: 2.3 or less	g : 1.9±0.1
0.4			3.92	g: 2.4 or less	g : 2.0±0.1

[Reference] Use the rectifier that comes with the product to convert AC into DC voltage.

[Yard-pound notation]

Motor Power [HP]	Brake Power		Static Friction Torque [lbf·in]	Allowable Gap [inch]	Appropriate Gap [inch]
	AC voltage [V]	DC voltage [V]			
1/8	100 (200)	90 (90)	8.67	g: 0.091 or less	g : 0.075±0.004
1/4			17.35	g: 0.091 or less	g : 0.075±0.004
1/2			34.70	g: 0.094 or less	g : 0.079±0.004

[Reference] Use the rectifier that comes with the product to convert AC into DC voltage.

9-4-3 How to Check the Brake Gap

[Caution] Be sure to turn off the power before work. Failure to follow this precaution may result in electric shock and injury.

1 Loosen the [10] Fan cover fixing screw and remove the [9] Fan cover.
2 Check whether it is within the appropriate gap range by using gap gauge.

[Important] Adjust the brake gap if the gap isn't within the appropriate gap range,

9-4-4 How to Adjust the Brake Gap

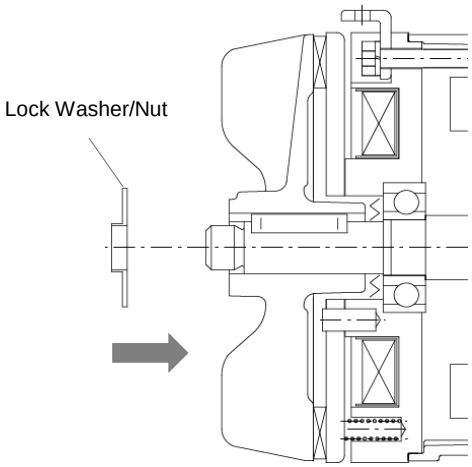
[Caution] Be sure to turn off the power before work. Failure to follow this precaution may result in electric shock and injury.

1 Loosen the [10] Fan cover fixing screw and remove the [9] Fan cover.
2 Loosen the [12] Fan fixing screw and raise the tooth of [7] Lock washer/nut from [4] Fan/friction disk.
3 Tighten the [7] Lock washer/nut until it is slightly locked.
4 Loosen the [7] Lock washer/nut by about 100°~180°.
[Important] Be sure to mount the lock washer/nut in the right direction when it was removed. If it is mounted in the wrong direction, it may be damaged.
Refer to "9-4-5 Mounting Direction of Lock Washer/Nut" about the right direction.
5 Check whether it is within the appropriate gap range by using gap gauge.
6 Fold the tooth of [7] Lock washer/nut into the nearest slot of [4] Fan/friction disk.
7 12) Tighten the fan fixing screws. * Tightening torque for fan fixing screws: 2.3 to 3.0 N-m
8 9) Install the fan cover and 10) tighten the fan cover fixing screws. * Torque required to tighten fan cover screws: 1.6 to 3.0 N-m

9-4-5 Mounting Direction of Lock Washer/Nut

The mounting direction of lock washer/nut is shown below.

[Important] Be sure to mount the lock washer/nut in the right direction when it was removed. If it is mounted in the wrong direction, it may be damaged.



10 Troubleshooting

If there is any abnormality, refer to the table below and take corrective actions,

10-1 Gearmotor Troubleshooting

Failure Detail	Cause	Corrective Actions
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 switch	Repair or replace it.
	Disconnection of the stator winding	Repair at a certified facility
	Forgot to connect the capacitor(Capacitor run)	Connect the capacitor.
	Malfunction of the centrifugal switch (Capacitor start)	Repair at a certified facility
	Activation of the built-in thermal protector (Capacitor run)	Check the cause of overheating.
	Broken gear/shaft/bearing	Repair at a certified facility
The motor does not run when a load is applied.	Voltage drop	Check the wiring length.
	Worn gear	Repair at a certified facility
	Overloaded operation	Lessen the load.
The motor overheats.	Overloaded operation	Lessen the load.
	Frequent startup/stop	Lower the frequency.
	Damaged bearing	Repair at a certified facility
	High/ Low voltage	Check the voltage.
Abnormal loud noise during operation.	Continuous sound - Damaged bearing/worn gear	Repair at a certified facility
	Intermittent sound - Scratch on the gear, something inside the reducer	Repair at a certified facility
Abnormal vibration during operation.	Worn gear	Repair at a certified facility
	Defective installation/loose bolt	Tighten it.
Grease leaks.	Loose fastening part	Tighten it.
	Damaged oil seal	Repair at a certified facility

10-2 Brakemotor Troubleshooting

Failure Detail	Cause	Corrective Actions
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 disk	Clean or repair at a certified facility
	Life time of the friction disk	Replace or repair at a certified facility
	Large load inertia moment	Lessen the load.
	AC switching connection	Change it to DC switching.
The motor does not run. (No increase in speed) The motor overheats. Thermal relay is activated. The brake noise is loud.	Wrong brake connection	Check the connection.
	Large brake gap	Adjust the gap.
	Defective rectifier	Replace it.
	Brake coil disconnection or short circuit	Replace or repair at a certified facility
	Defective contact of the switch	Repair or replacement
	Activation of the built-in thermal protector	Check the cause of overheating.
The motor overheats.	Frequent braking	Lower the frequency.
	Large load torque/inertia moment	Lessen the load.

10-3 Replacement Parts

If you have any questions about brake parts, please contact the nearest customer service helpdesk listed 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

12-1 Storage Location

1. When the product is stored, it shall be stored indoors in a dry place with good ventilation, without direct sunlight, extreme temperature change, humidity, dust, and/or corrosive gas.
2. Do not place the product directly on the ground when it is stored.
3. If there are micro-vibrations, the bearings may be damaged by fretting corrosion even when the product is stored. Please store the product in a place free of vibration.

12-2 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, flange, and any other uncoated, processed surfaces every six months.

12-3 Usage after Storage

1. Check that there is no abnormal sound, vibration, heat generation or other abnormalities during initial operation.
2. For brakemotors, check that the brake operates properly.
   If any abnormality is found, please immediately contact the nearest service office.

13 Terms and Conditions

The full text of the Terms and Conditions can be found by clicking on the link below.

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

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