

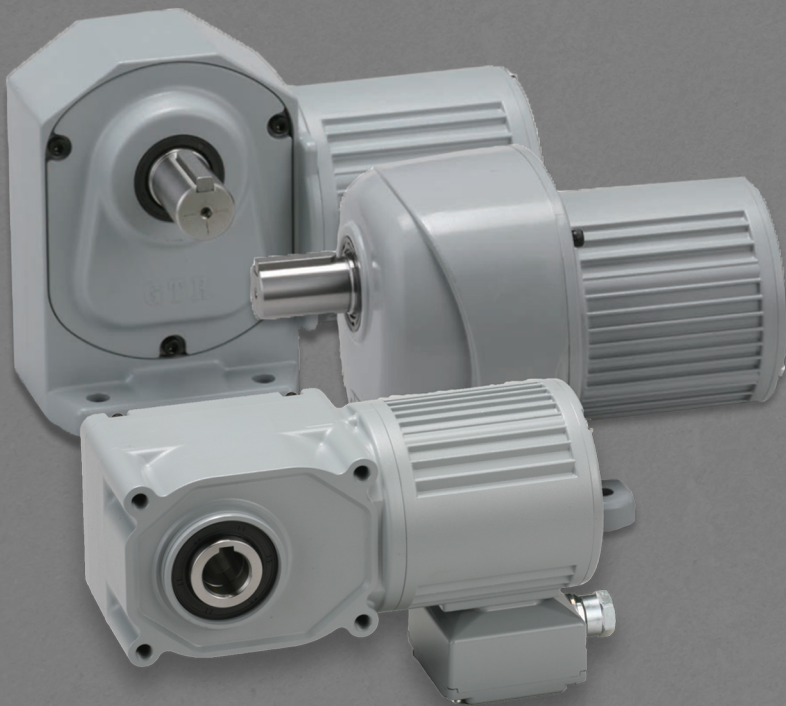
brother  
at your side

# BROTHER GEARMOTORS

0.1 kW - 2.2 kW (1/8 HP - 3 HP)

# IPMax

IPM **MAXIMUM** PERFORMANCE





## Precautions for Safety

### General

- Be sure to observe all safety regulations with regard to installation locations and equipment usage. (Ordinance on Labor Safety and Hygiene, Electrical Equipment Technical Standards, Internal Line Regulations, Factory Explosion Prevention Guidelines, Building Standards Law, etc.)
- Carefully read the Instruction Manual before actually operating our products, and operate them properly as instructed. If you do not have an Instruction Manual available where you are, ask your dealer or our nearest sales office. The Instruction Manual should be accessible by the end users who actually operate the product.

### Selection

- Select the most appropriate product for your usage environment and purposes. (When selecting a product, be sure to carefully read the "Technical information and Precautions for Use" sections.)
- IPM gear motors cannot be driven with commercial power supply. If commercial power supply is applied to the motor input terminals (U, V, W), the motor will be burned. Make sure to connect it to the output terminals of specialized driver.
- If the product is to be used in a human transport device or elevator, use other safeguard devices along with the product.
- Do not use in explosive atmosphere. There is risk of explosion, ignition, fire, electric shock, injury or damage on equipment.
- Do not use under live-wire operating conditions. Be sure to first turn off the power supply before operation. Otherwise, there is a risk of electrical shocks.
- Transportation, installation, plumbing and wiring, operation, maintenance and inspection should be conducted by people with specialized skills and knowledge. Otherwise, there is a risk of explosion, fire, blazes, shocks, injury, and equipment damage.
- For equipment that cannot be exposed to oil or grease, like food processing machinery, be sure to use a protective device such as an oil pan to protect the equipment from oil leakage due to breakdown or wear.

### Note:

The data in this catalog is subject to change without notice.

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# FEATURES

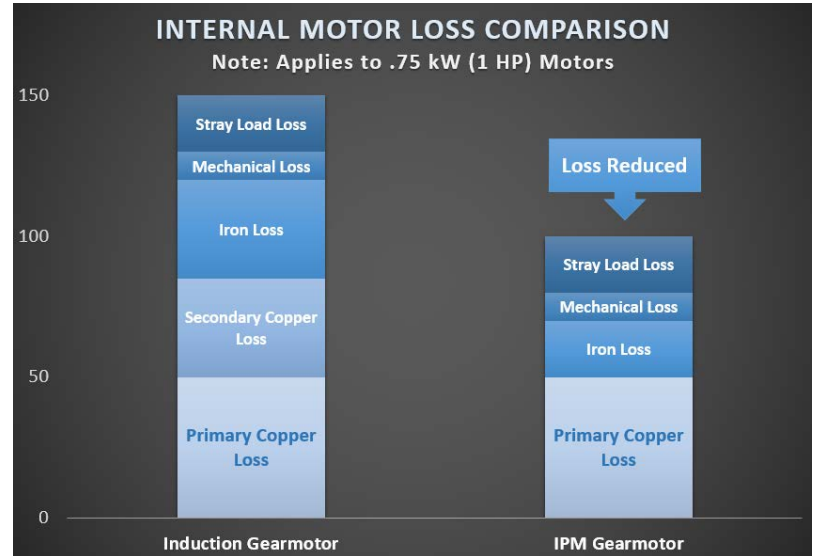
## BROTHER IPM GEARMOTORS

### High-Efficiency IPM Gearmotor

IPM is short for “interior permanent magnet” and refers to motors with built-in magnets.

- Since electricity does not flow through the rotor, there is no secondary copper loss.
- Magnetic flux is generated by permanent magnets, so the motor requires little electricity.
- Efficiency clears IE4 at the motor unit level. (IEC 60034-30)

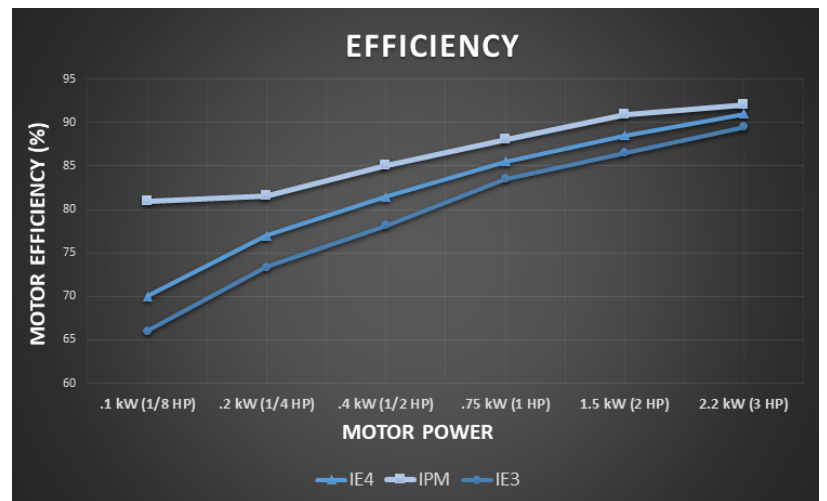
High-Efficiency



### IPM High-Efficiency Control

The driver unit’s rotation speed is set without the use of an encoder. In order to achieve optimum efficiency with an IPM motor, the electrical current is reduced to the minimum amount required.

Energy-Saving



# FEATURES

## Compact and Lightweight

Even though IPM gearmotors are highly efficient, they have the same installation dimensions as induction gearmotors and do not require design upgrades. Being fanless<sup>1</sup> makes them quiet and allows for size and weight reductions since they are compact and weigh less than before. The virtually maintenance-free brakes improve machine uptime. Since many of these motors lack components such as fans and fan covers, these environmentally friendly products emit less CO2 and require fewer materials during manufacturing.

1 Excluding IP44 gearmotors with brakes and 1.5kW / 2.2kW gearmotors.

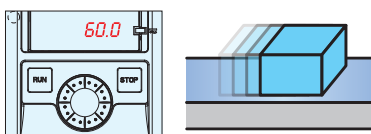
Compact & Resource-Saving

## Easy to Use

- **Synchronous**- Accurate speed control at varying loads Since the slip commonly found in Induction Gearmotors has been eliminated through the use of permanent magnets, the motor runs at the specified speed signaled by the drive, regardless of the load fluctuations.
- **Sensorless**- No need for a dedicated feedback cable Compared to other brushless motors of equivalent efficiency, the wiring of the IPM is simplified due to its sensorless feedback. This eliminates the need for a signal cable for a feedback sensor. The elimination of the dedicated feedback cable and feedback devices such as Hall IC or encoders also contribute to cost reduction.

Ease of use & Cost Reduction

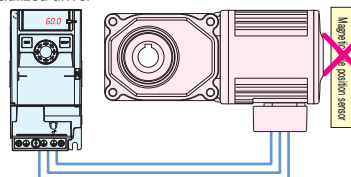
### Synchronous motor:



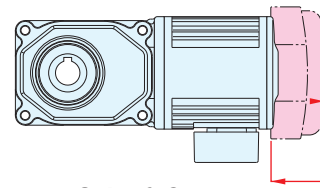
Constantly rotates at the speed specified by the frequency

### Sensorless:

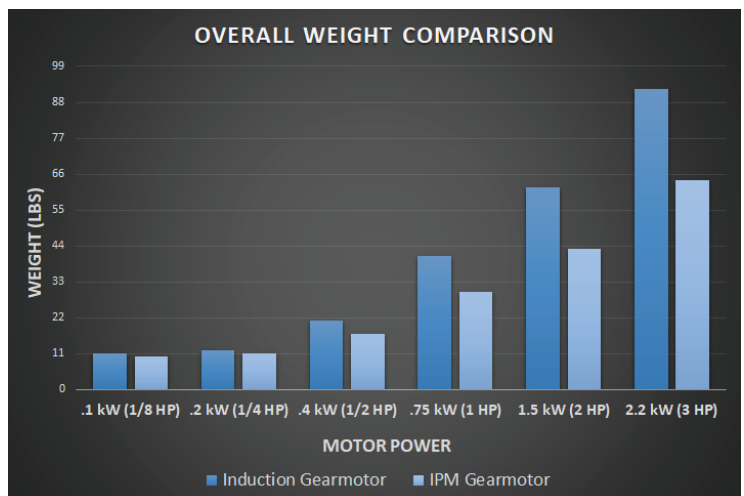
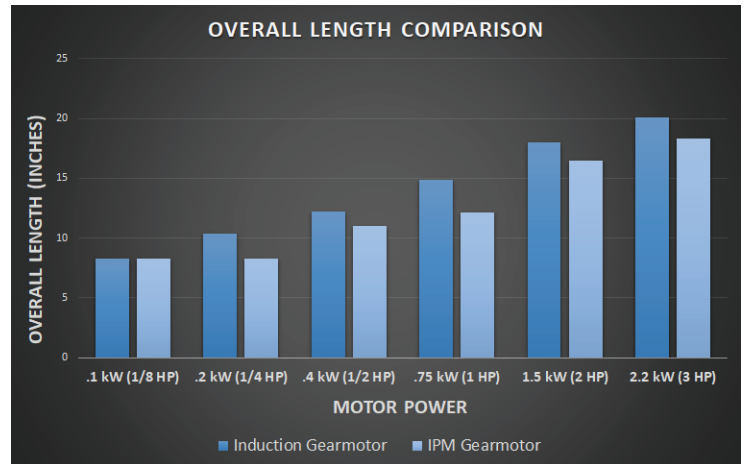
Specialized driver



No dedicated feedback cable required due to sensorless operation



Quiet & Compact



# FEATURES

## HIGH-EFFICIENCY GEARMOTOR WIDE VARIATION

### Abundant mounting variations



Parallel Shaft

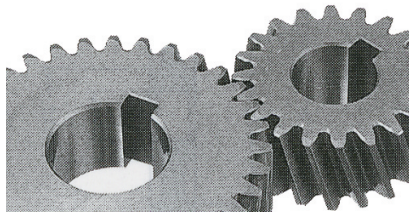


Right Angle Shaft



Right Angle Hollow Bore

### High Precision

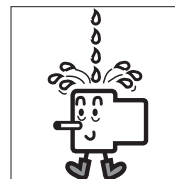


A low backlash specification, in addition to normal accuracy, is also included in the standard variations.

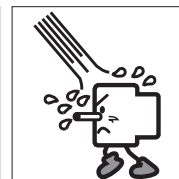
IP65 specification are also included in the standard variations



Dustproof



Drip-proof



Jet resistant

Gearmotors are available with IP44 or IP65 specifications.

### ROHS Compliant

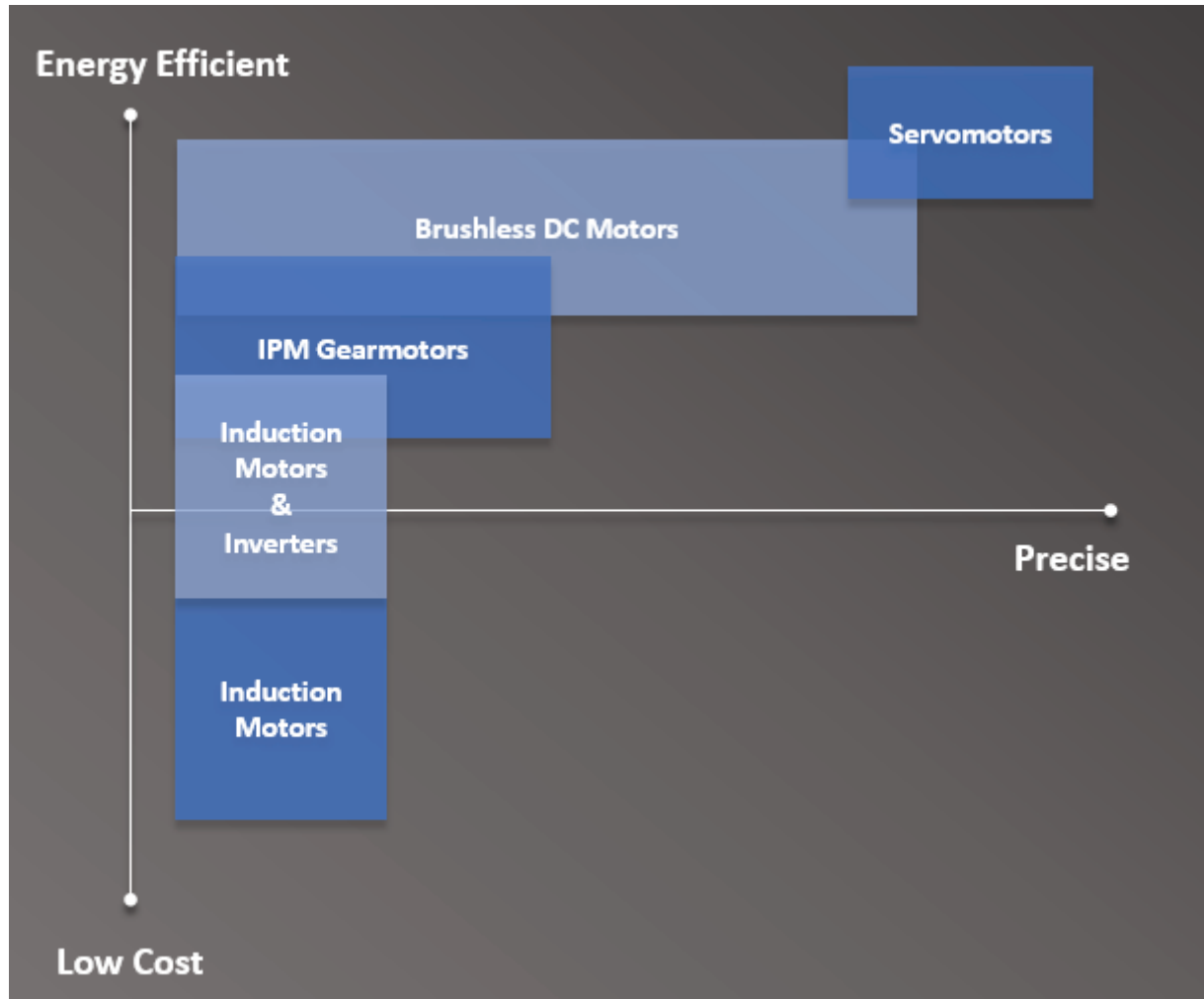


### Standards conformance

Conforming to UL, c-UL and EN



## Brother Gearmotor Product Line-up



### AC INDUCTION MOTORS

- Robust and sturdy with the ability to operate in various applications
- Virtually maintenance free
- Simple design and construction provides easy use

### IPM GEARMOTORS

- Synchronous motor with interior permanent magnet
- Compact and highly efficient

### BRUSHLESS DC MOTORS

- Compact and highly efficient
- Virtually maintenance free - no brushes or oil
- Synchronous, closed loop speed control

### SERVOMOTORS

- Control with extreme precision through sensors that measure rotational speed.

# FEATURES

Specialized driver for the  
Brother IPM Gearmotor

## VF-nC3M



## OPERATION

### One-Touch Setting Dial

The large setting dial at the center of the panel allows for simple operation. To set a parameter, turn the setting dial to select it and press the center of the dial to finalize the selection. The longer the setting dial is turned, the larger the setting value changes. Similarly, the shorter the setting dial is turned, the smaller the setting value changes. Both fine and coarse adjustments can be made simply.

### Simple Operations with RUN/ Stop Keys

Operation can be started or stopped with the RUN and STOP keys on the front face of driver. If the front cover is closed, it can prevent any unintended operation.

### Extension panel for remote operation (Option)

The extension panel options allow for remote operations of the driver. Since display items can be selected separately for the driver and the extension panel, different items can be displayed on them. For example, the operation frequency can be displayed on the main driver display while the output current can be displayed on the extension panel. In this way, it can also be used as a measurement tool.

\*The extension panel is connected to the driver main unit with a connection cable (option). It has no setting dial.



## SETTING

### Simple Parameter Setting

#### ① Choose which parameters to display.

The parameter setting can be optimized by selecting a simplified or standard mode for parameter display.

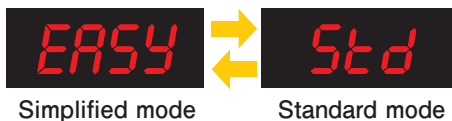
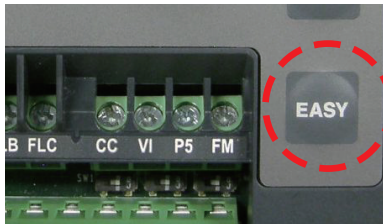
##### Simplified mode

The 7 most commonly used parameters are displayed. Up to 24 parameters can be registered.

##### Standard mode

All parameters are displayed.

#### ● Switching to the simplified mode



#### ② Choose parameters by function.

Depending on the functions that are to be used, required parameters can be set to display one after another to avoid omitting a setting.

#### ③ Choose the most recently changed parameters.

When repeated parameters adjustments are necessary for test runs it is convenient to have them available immediately. The history function displays the 5 latest parameters of which settings have been changed.

## INSTALLATION

### Space Saving with side-by-side Installation

Drivers should be installed taking heat dissipation into account. VF-nC3M can be installed side by side to save space in the panel.

#### ● Side-by-side installation



### Main Circuit Terminal Board Cover for Safety

The main circuit terminal board cover can be removed with a screwdriver for wiring. Since the cover can be installed after wiring installation both easy and safe connections can be achieved.

\* Depending on installation conditions, it may be necessary to reduce the output current or remove the upper label.

# FEATURES

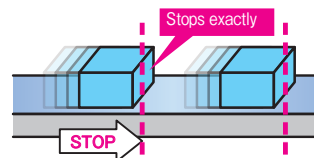
## 1 Servo lock function

It holds the motor in position so it does not rotate when stopped

- Position holding torque of 60% can be generated continuously or 150% if it is for a short period of time.
- It can return to a previous position even if it is moved externally.(Up to 10 electrical turns, 5 Revolutions)

\* For details, refer to (P. T27).

### With the servo lock function



A brake is not required for horizontal operation (Cost Reduction)  
Start/Stop Frequency is 30 times/min.

## 2 Torque limit function

It restricts torque generated by the motor in order to protect the mechanical system.  
(It cannot limit instantaneous torque)

- Up to 2 torque limits can be programmed and selected via an input terminal.

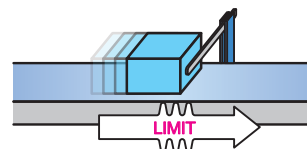
## 3 Impact stop sequence function

An input signal will reduce the speed of the drive. Once the impact torque limit has been reached a continuous torque that has been set is then applied.

- The torque limit value during the impact stop operation can be set separately from function ②.
- A status signal is output to show the completion of the impact stop sequence.

\* For details of the function, refer to (P. T28).

### With the torque limiting function



Contact stop/contact thrust

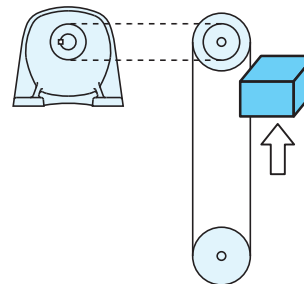
## 4 Brake sequence function

• Configures motor operation settings during mechanical brake opening/closing.

• A mechanical brake operation timing signal is output from the driver for raising/lowering applications, etc.

• Wear of the brake is reduced by using the servo lock operation during the transfers between start and stop and the release and activation of the brake.

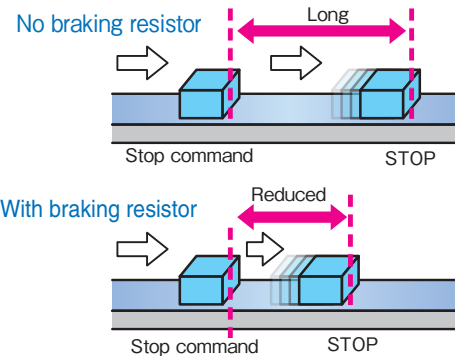
\* For details of the function, refer to (P. T26).



The motor is stopped with the servo lock and then the mechanical brake is applied.  
Virtually maintenance free by reducing wear on the mechanical brake.

## 5 A Braking resistor can be connected

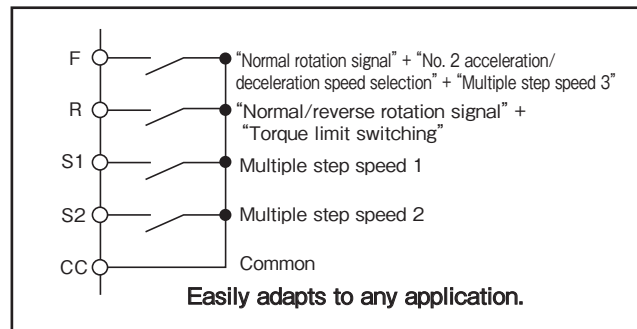
A full capacity brake transistor is built into the drive. If a braking resistor is installed, it is possible to reduce the braking time which can assist in applications such as elevators, etc.



## 6 Programmable I/O terminals

The function of the I/O terminals can be changed to accommodate multiple applications.

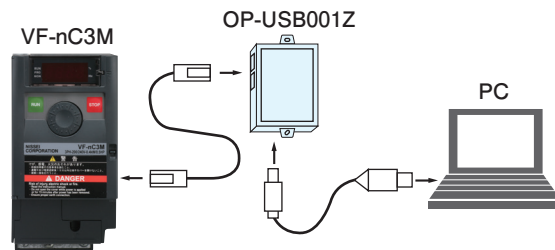
- A max. of 3 functions can be assigned to one input terminal and a max. of 2 functions can be assigned to one output terminal simultaneously.
- This allows for simplification of the external circuitry based on the application.



## 7 RS485

- If connected to a PC, parameters can be controlled and the states of operations can be monitored.
- Both Toshiba driver protocol and Modbus RTU are supported.

Contact us for more details.



RoHS Compliant



Standards conformance

Conforming to UL, c-UL and EN





# IPM Gearmotors + Gearmotors with Brake Model and Type Designations

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## Standard Model Lineup

### G3

Parallel Shaft  
(Foot Mount)  
(Flange Mount)

### H2

Right Angle Shaft  
(Foot Mount)

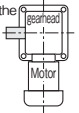
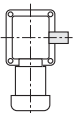
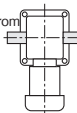
### F3S

Right Angle Hollow Bore

# MODEL AND TYPE DESIGNATIONS

IPM Gearmotor part numbers are made up of the following codes. Please specify a part number when placing an order or making an inquiry.

Mounting Type	Frame No.	Shaft Arrangement	Reduction Ratio	Backlash		Motor Ver	Motor Type	Motor Power	Voltage	Terminal Box	Option
<b>G3L</b>	<b>32</b>	<b>N</b>	<b>12X</b>	<b>N</b>	-	<b>IP</b>	<b>M</b>	<b>010</b>	<b>N</b>	<b>T</b>	<b>X</b>
<b>F3S</b>	<b>35</b>	<b>N</b>	<b>5</b>	<b>N</b>	-	<b>IP</b>	<b>H</b>	<b>075</b>	<b>N</b>	<b>E</b>	<b>X</b>
<b>H2L</b>	<b>32</b>	<b>L</b>	<b>200</b>	<b>L</b>	-	<b>IP</b>	<b>M</b>	<b>040</b>	<b>N</b>	<b>T</b>	<b>X</b>
①	②	③	④	⑤		⑥	⑦	⑧	⑨	⑩	⑪

① Mounting Type	G3L : Parallel Shaft Foot Mount			
	G3F : Parallel Shaft Flange Mount (Frame No. 40 and 50)			
	G3K : Parallel Shaft Small Flange Mount (Frame No. 18~32)			
	H2L : Right Angle Shaft Foot Mount			
	F3S : Right Angle Hollow Bore			
② Frame Number	Output Shaft Diameter (Hollow Bore Inner Diameter)			
③ Shaft Arrangement	Parallel Shafts, Right Angle Hollow Bore N: Not Applicable	<b>Right Angle Shafts</b> L: Output shaft on the left viewing from input shaft side 	R: Output shaft on right viewing from input shaft side 	T: Output shaft on both side viewing from input shaft side 
④ Reduction Ratio	<b>5 : 1/5 12X : 1/1200</b>			
⑤ Backlash (Note 1)	L : Backlash accuracy - 30 Arcmin (Excluding some models)			
	N : Normal			
⑥ Motor Ver	IP : Motor version name			
⑦ Motor Type (Note 2,3)	M : Motor (IP44 with Carbon Steel Output Shaft)			
	B : Brakemotor (IP44 with Carbon Steel Output Shaft)			
	J : Brakemotor with Manual Release (IP44 with Carbon Steel Output Shaft)			
	G : Motor (IP65 with Carbon Steel Output Shaft)			
	H : Brakemotor (IP65 with Carbon Steel Output Shaft)			
⑧ Motor Power	010 : 0.1kW			
	020 : 0.2kW			
	040 : 0.4kW			
	075 : 0.75kW			
	150 : 1.5kW			
	220 : 2.2kW			
⑨ Voltage	N : 200V~230V			
⑩ Terminal Box	T : Steel plate BOX (IP44 Models)			
	E : Aluminum BOX (IP65 Models)			
⑪ Option	Empty : Standard Specification			
	X : Designates a special option			

- (Notes)
1. Backlash accuracy is at the reducer unit level and is not the positioning accuracy.
  2. Motor Types M, B and J are only IP44 with the Terminal Box Type "T".
  3. Please note that 1.5 kW and 2.2 kW IP65 Brakemotors are not available.

# STANDARD MODEL LINEUP

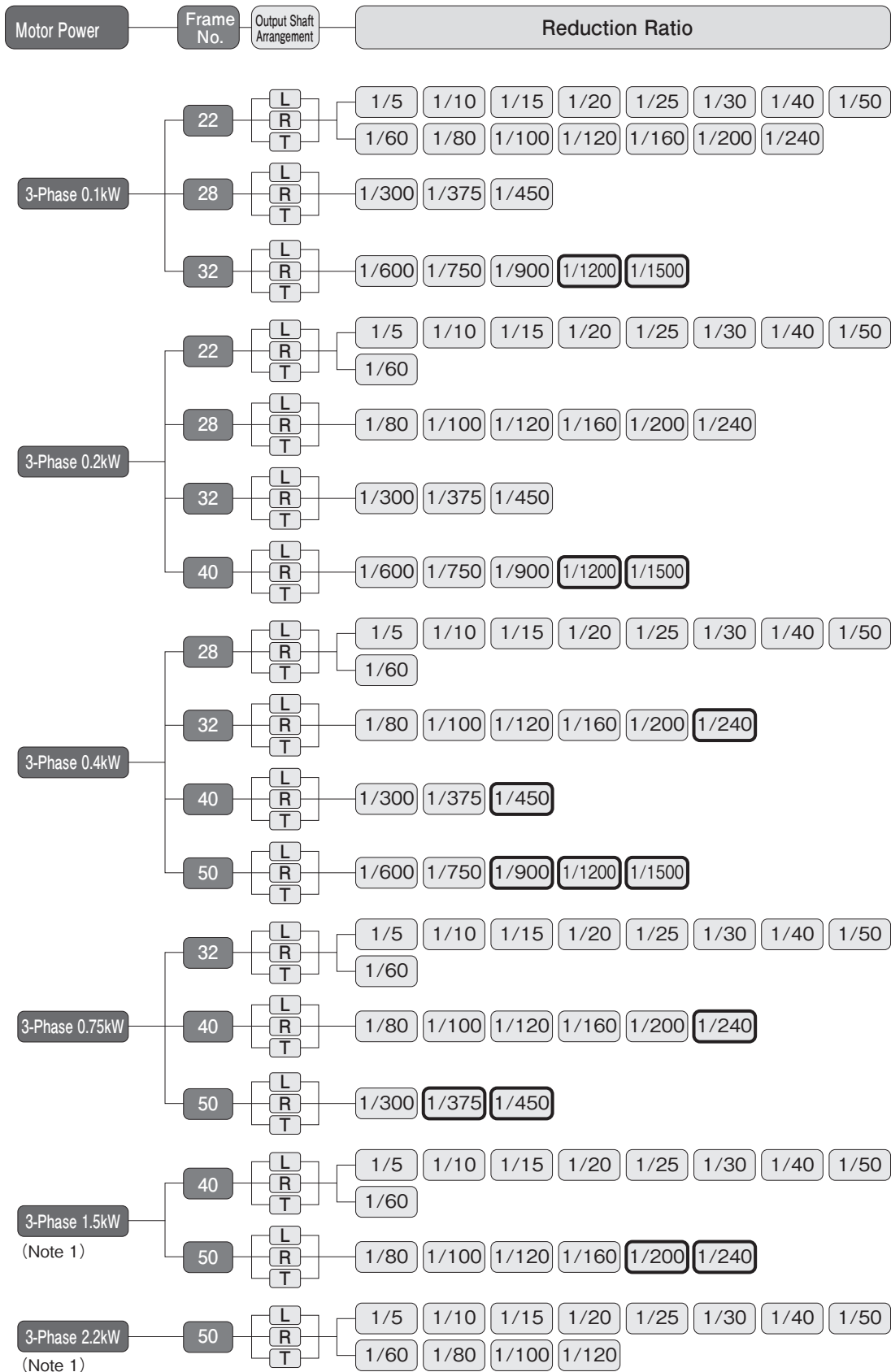
## G3 (Parallel Shaft) Standard Model Lineup

Motor Power	Frame No.	Reduction Ratio							
3-Phase 0.1kW	18	1/5	1/10	1/15	1/20	1/25	1/30	1/40	1/50
	22	1/60	1/80	1/100	1/120	1/160	1/200		
	28	1/300	1/375	1/450					
	32	1/600	1/750	1/900	1/1200				
3-Phase 0.2kW	18	1/5	1/10	1/15	1/20	1/25			
	22	1/30	1/40	1/50	1/60	1/80	1/100		
	28	1/100	1/120	1/160	1/200				
	32	1/300	1/375	1/450					
	40	1/600	1/750	1/900	1/1200				
3-Phase 0.4kW	22	1/5	1/10	1/15	1/20	1/25			
	28	1/30	1/40	1/50	1/60	1/80	1/100		
	32	1/100	1/120	1/160	1/200				
	40	1/300	1/375	1/450					
	50	1/600	1/750	1/900	1/1200				
3-Phase 0.75kW	28	1/5	1/10	1/15	1/20	1/25			
	32	1/30	1/40	1/50	1/60	1/80	1/100		
	40	1/100	1/120	1/160	1/200				
	50	1/300	1/375	1/450					
3-Phase 1.5kW	32	1/5	1/10	1/15	1/20	1/25			
	40	1/30	1/40	1/50	1/60	1/80	1/100		
	50	1/100	1/120	1/160	1/200				
3-Phase 2.2kW	40	1/5	1/10	1/15	1/20	1/25			
	50	1/30	1/40	1/50	1/60	1/80	1/100		

- (Note) 1. G3 (Parallel shaft) Gearmotors have both foot and flange mounts. Please note that small flange mounts (G3K) are limited to frames 18-32 while regular flange mounts (G3F) are limited to 40 and 50 frames.
2. 1.5kW and 2.2kW IP65 models cannot be provided with a brake.
3. Models shown in   are limited torque type. Be sure to refer to the allowable torque in the Performance Table.

# STANDARD MODEL LINEUP

## H2 (Right Angle Shaft) Standard Model Lineup

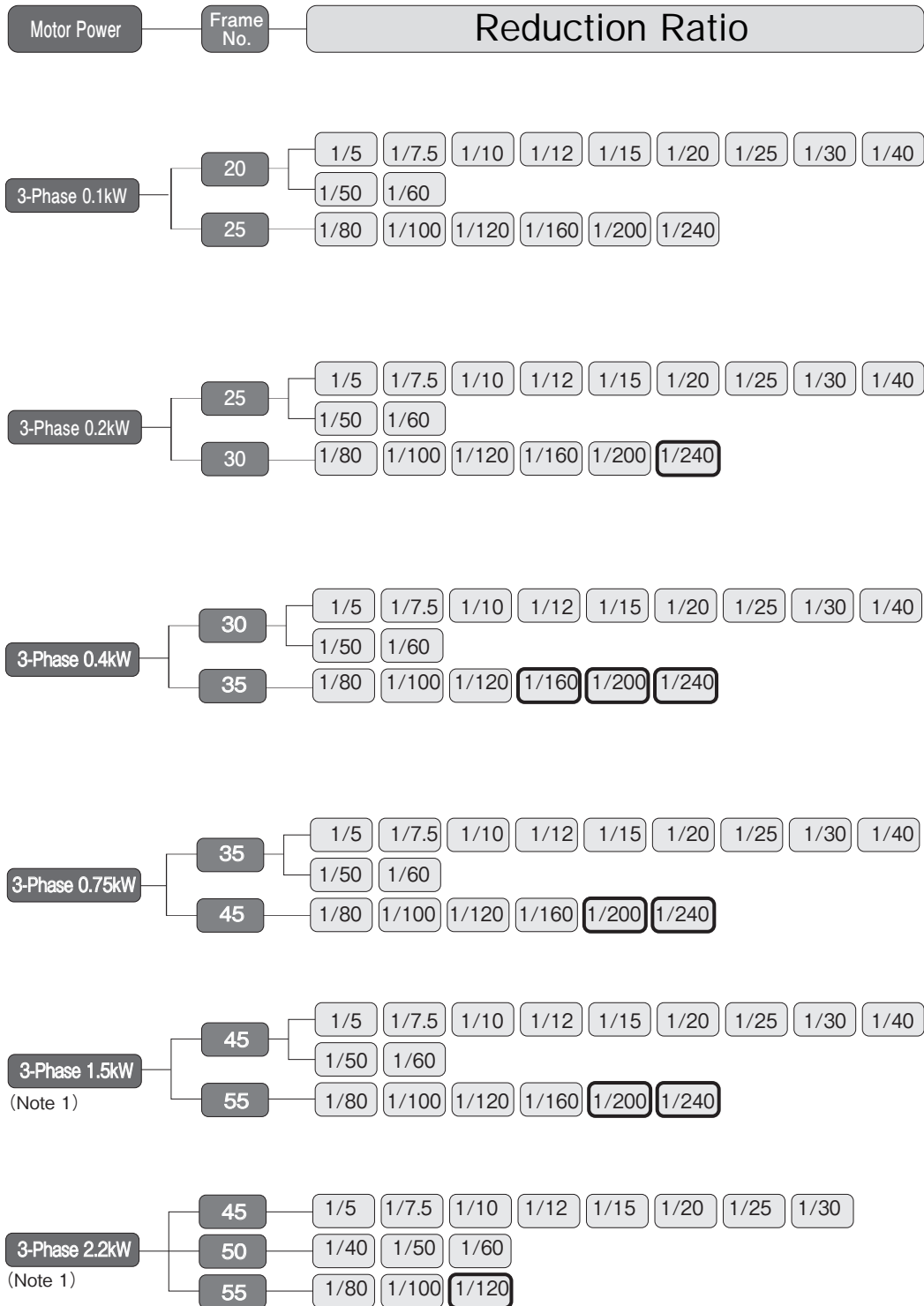


(Notes) 1. 1.5kW and 2.2kW IP65 models cannot be provided with a brake.  
 2. Models shown in   are limited torque type. Be sure to refer to the allowable torque in the Performance Table.



# STANDARD MODEL LINEUP

## F3S (Right Angle Hollow Bore) Standard Model Lineup



(Notes) 1. 1.5kW and 2.2kW IP65 models cannot be provided with a brake.

2. Models shown in   are limited torque type. Be sure to refer to the allowable torque in the Performance Table.



**Parallel Shaft IP44 and IP65**

**IPM Gearmotors  
+ Gearmotors with**

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**Brake Performance Tables  
& Dimension Diagrams**

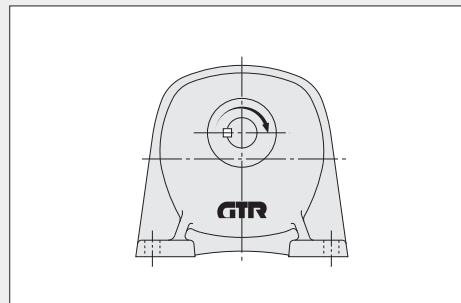
# G3 (PARALLEL SHAFT) 3-PHASE 0.1kW (1/8 HP)

## Performance Table

Values in parentheses in the performance tables and dimension diagrams indicate models with brakes.

### [Items to Note]

- Shaded cells (  ) in the performance table indicate that when a Clockwise (CW) direction is signaled by the driver, the output shaft will turn clockwise when the unit is oriented as shown in the figure to the right. Change the signal from the drive to Counter-Clockwise (CCW) in order to change the direction of rotation.

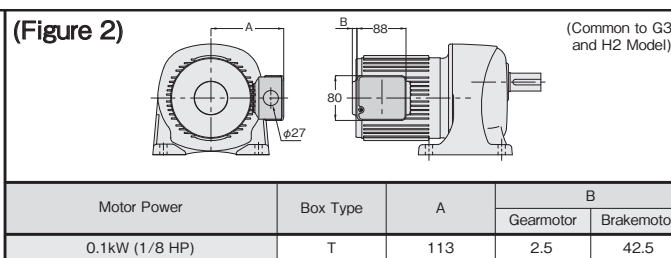
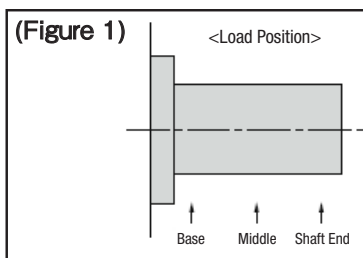


Motor Power	Frame No.	Nominal Reduction Ratio	Actual Reduction Ratio	Backlash <sup>2</sup> (Arcmin)		Output Shaft Rotational Speed (rpm)	Output Shaft Allowable Torque		Output Shaft Allowable O.H.L. <sup>1</sup>		Shape and Dimensions Diagram Page, Fig. No., <sup>4</sup>		
				N	L		(N·m)	(in·lb)	(N)	(lb)	Gearmotor (Brakemotor)		
											G3L	G3F	G3K
0.1kW (1/8 HP)	18	1/ 5	33/ 164	—	60	0~360	2.3	20.4	770	173	P.A3 Fig. A-1	P.A4 Fig. A-5	
		1/ 10	77/ 779	—	40	0~180	4.7	41.6	1140	256			
		1/ 15	119/ 1804	—	30	0~120	7.0	62	1270	286			
		1/ 20	49/ 984	—		0~90	9.2	81.4	1530	344			
		1/ 25	28/ 697	—		0~72	11.9	105	1650	371			
		1/ 30	35/ 1066	—		0~60	13.8	122	1780	400			
		1/ 40	35/ 1404	—		0~45	18.5	164	1910	429			
		1/ 50	7/ 351	—		0~36	23.1	204	2040	459			
	22	1/ 60	11/ 684	—	30	0~30	27.7	245	2800	629	P.A3 Fig. A-2	P.A4 Fig. A-6	
		1/ 80	21/ 1634	—		0~22	37.0	327	3180	715			
		1/ 100	7/ 684	—		0~18	46.2	409	3180	715			
		1/ 120	147/17974	—		0~15	55.5	491	3180	715			
		1/ 160	21/ 3268	—		0~11	74.0	655	3180	715			
		1/ 200	21/ 4085	—		0~9.0	92.5	819	3180	715			
	28	1/ 300	221/65190	—	30	0~6.0	122	1080	3430	771	P.A3 Fig. A-3	P.A4 Fig. A-7	
		1/ 375	187/68370	—		0~4.8	153	1354	3430	771			
		1/ 450	181/79793	—		0~4.0	185	1637	3430	771			
	32	1/ 600	147/88192	—	30	0~3.0	246	2177	5880	1322	P.A3 Fig. A-4	P.A4 Fig. A-8	
		1/ 750	49/36464	—		0~2.4	307	2717	5880	1322			
		1/ 900	62/57063	—		0~2.0	369	3266	5880	1322			
		*1/1200	46/55195	—		0~1.5	407	3602	5880	1322			

(Chart 1)

- Allowable O.H.L is the value at the middle of the output shaft. (Figure 1)
- Backlash accuracy is at the reducer unit level and is not the positioning accuracy.
- The models marked with \* are limited torque models. Be sure to refer to the allowable torque in the Performance table.
- Dimensional diagrams on the subsequent pages are for IP65 Models and are intended to be for reference purposes only. See below for IP44 T Box Models reference Dimensions (Figure 2). The latest drawings can be found on our website.
- The figures illustrate standard terminal box positions. For optional positions, refer to page T53, and specify the appropriate codes when ordering.
- All G3 models with standard shafts have a tapped shaft per Chart 1.

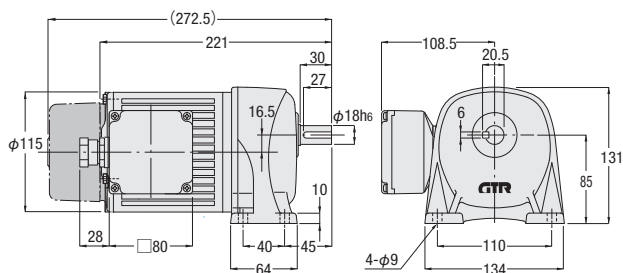
Shaft Dia. (Frame Number)	Size×Pitch×Effective Depth
18	M 6×1.0×15 ℓ
22, 28	M 8×1.25×20 ℓ
32, 40	M 10×1.5×25 ℓ
50	M 12×1.75×30 ℓ



# G3 (PARALLEL SHAFT) 3-PHASE 0.1kW (1/8 HP)

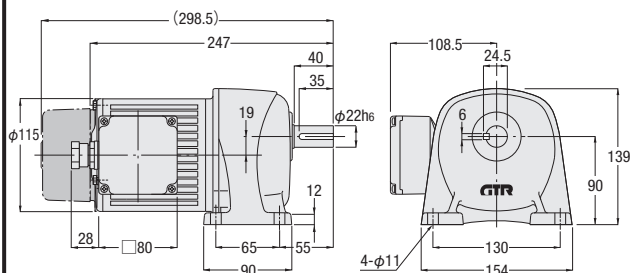
## Foot Mount Type

**Fig.A-1** G3L18N5~50<sup>L</sup><sub>N</sub>-IPG010NE  
(G3L18N5~50<sup>L</sup><sub>N</sub>-IPH010NE)



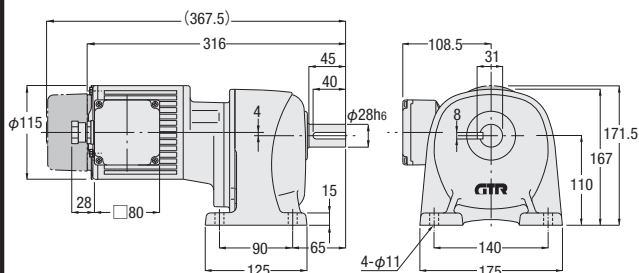
Approximate Weight : 5.5kg (7kg) / 12lb (15.5lb)

**Fig.A-2** G3L22N60~200<sup>L</sup><sub>N</sub>-IPG010NE  
(G3L22N60~200<sup>L</sup><sub>N</sub>-IPH010NE)



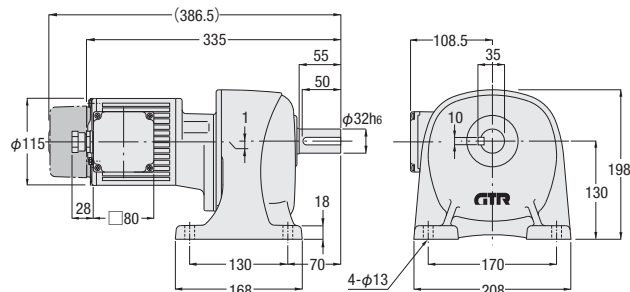
Approximate Weight : 6.5kg (8kg) / 14.5lb (17.5lb)

**Fig.A-3** G3L28N300~450<sup>L</sup><sub>N</sub>-IPG010NE  
(G3L28N300~450<sup>L</sup><sub>N</sub>-IPH010NE)



Approximate Weight : 9.5kg (11kg) / 21lb (24lb)

**Fig.A-4** G3L32N600~12X<sup>L</sup><sub>N</sub>-IPG010NE  
(G3L32N600~12X<sup>L</sup><sub>N</sub>-IPH010NE)



Approximate Weight : 12.5kg (14kg) / 27.5lb (31lb)

Model Codes  
P.12

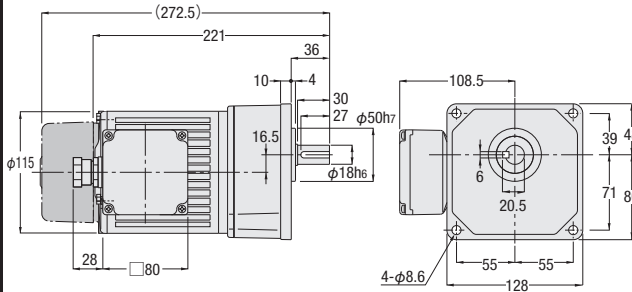
Detailed Output Shaft  
Dimension Diagrams  
P.T56

Options  
P.T70~T74

# G3 (PARALLEL SHAFT) 3-PHASE 0.1kW (1/8 HP)

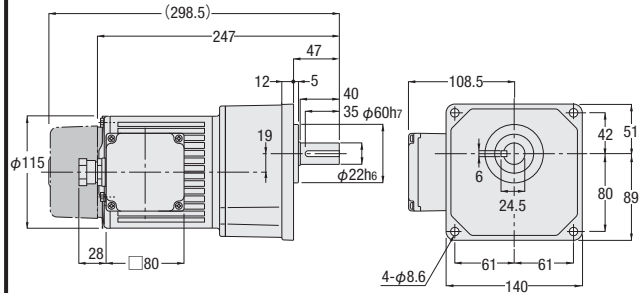
## Small Flange Mount Type

**Fig.A-5** G3K18N5~50<sub>N</sub><sup>L</sup>-IPG010NE  
(G3K18N5~50<sub>N</sub><sup>L</sup>-IPH010NE)



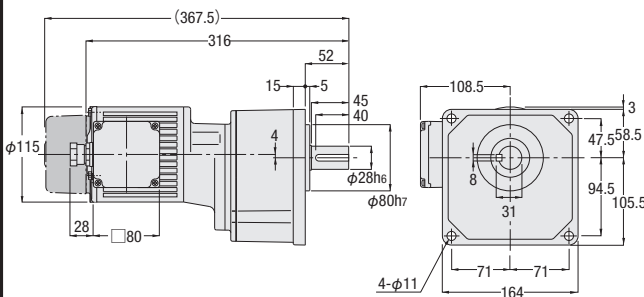
Approximate Weight : 6kg (7.5kg) / 13lb (16.5lb)

**Fig.A-6** G3K22N60~200<sub>N</sub><sup>L</sup>-IPG010NE  
(G3K22N60~200<sub>N</sub><sup>L</sup>-IPH010NE)



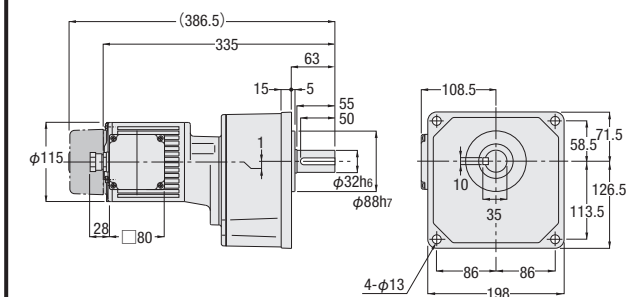
Approximate Weight : 7kg (8.5kg) / 15.5lb (19lb)

**Fig.A-7** G3K28N300~450<sub>N</sub><sup>L</sup>-IPG010NE  
(G3K28N300~450<sub>N</sub><sup>L</sup>-IPH010NE)

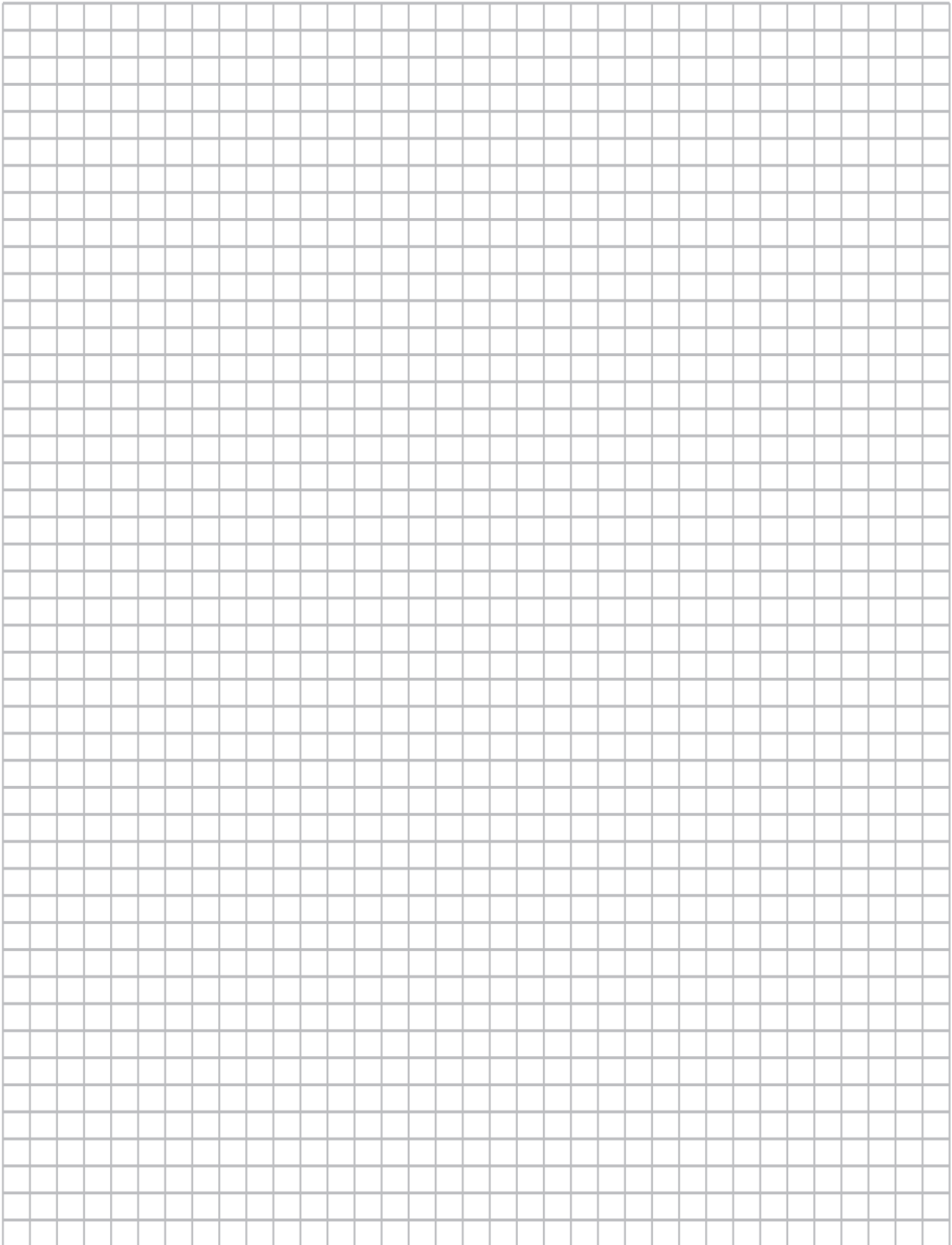


Approximate Weight : 10kg (11.5kg) / 22lb (25lb)

**Fig.A-8** G3K32N600~12X<sub>N</sub><sup>L</sup>-IPG010NE  
(G3K32N600~12X<sub>N</sub><sup>L</sup>-IPH010NE)



Approximate Weight : 13kg (14.5kg) / 28.5lb (32lb)




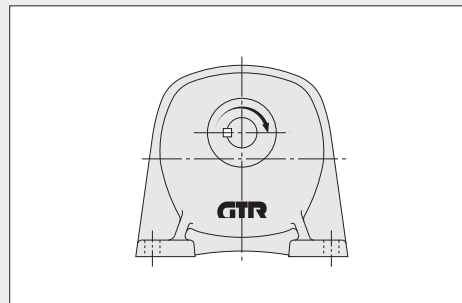
# G3 (PARALLEL SHAFT) 3-PHASE 0.2kW (1/4 HP)

## Performance Table

Values in parentheses in the performance tables and dimension diagrams indicate models with brakes.

### [Items to Note]

- Shaded cells (  ) in the performance table indicate that when a Clockwise (CW) direction is signaled by the driver, the output shaft will turn clockwise when the unit is oriented as shown in the figure to the right. Change the signal from the drive to Counter-Clockwise (CCW) in order to change the direction of rotation.

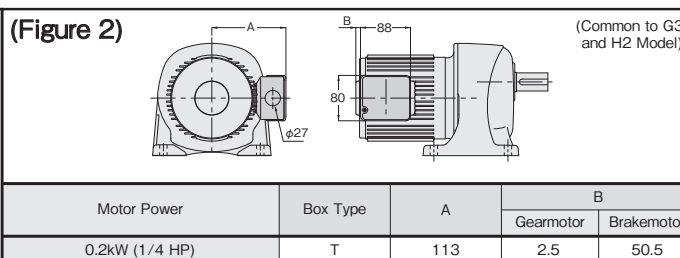
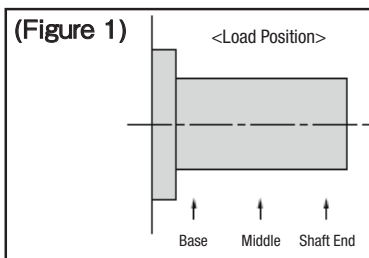


Motor Power	Frame No.	Nominal Reduction Ratio	Actual Reduction Ratio	Backlash <sup>2</sup> (Arcmin)		Output Shaft Rotational Speed (rpm)	Output Shaft Allowable Torque		Output Shaft Allowable O.H.L. <sup>1</sup>		Shape and Dimensions Diagram Page, Fig. No., <sup>4</sup>		
				N	L		(N·m)	(in·lb)	(N)	(lb)	Gearmotor (Brakemotor)		
											G3L	G3F	G3K
0.2kW (1/4 HP)	18	1/ 5	33/ 164		60	0 ~ 360	4.7	41.6	770	173	P.A7 Fig. A-9	/	P.A9 Fig. A-15
		1/ 10	77/ 779	—	40	0 ~ 180	9.3	82.3	1140	256			
		1/ 15	119/ 1804	—	40	0 ~ 120	13.9	123	1270	286			
		1/ 20	49/ 984	—	30	0 ~ 90	19.5	173	1450	326			
		1/ 25	28/ 697	—	30	0 ~ 72	24.2	214	1550	348			
	22	1/ 30	7/ 216	—	30	0 ~ 60	28.8	255	2280	513	P.A7 Fig. A-10	/	P.A9 Fig. A-16
		1/ 40	91/ 3600	—		0 ~ 45	37.2	329	2410	542			
		1/ 50	11/ 540	—		0 ~ 36	46.5	412	2540	571			
		1/ 60	637/39600	—		0 ~ 30	55.8	494	2800	629			
		1/ 80	91/ 7200	—		0 ~ 22	74.4	658	3000	674			
		* 1/ 100	11/ 1080	—		0 ~ 18	76.3	675	3180	715			
	28	1/ 100	13/ 1353	—	30	0 ~ 18	93.1	824	3690	830	P.A7 Fig. A-11	/	P.A9 Fig. A-17
		1/ 120	91/11000	—		0 ~ 15	111	982	4320	971			
		1/ 160	1/ 165	—		0 ~ 11	148	1310	4450	1000			
		1/ 200	7/ 1375	—		0 ~ 9.0	185	1637	4450	1000			
	32	1/ 300	91/27348	—	30	0 ~ 6.0	247	2186	5880	1322	P.A7 Fig. A-12	/	P.A9 Fig. A-18
		1/ 375	77/28620	—		0 ~ 4.8	309	2735	5880	1322			
		1/ 450	91/41022	—		0 ~ 4.0	371	3284	5880	1322			
	40	1/ 600	9/ 5300	—	30	0 ~ 3.0	494	4372	7060	1587	P.A7 Fig. A-13	P.A8 Fig. A-14	/
		1/ 750	62/46427	—		0 ~ 2.4	620	5487	7060	1587			
		* 1/ 900	23/21259	—		0 ~ 2.0	725	6417	7060	1587			
		* 1/1200	9/10600	—		0 ~ 1.5	725	6417	7060	1587			

1. Allowable O.H.L is the value at the middle of the output shaft. (Figure 1)
2. Backlash accuracy is at the reducer unit level and is not the positioning accuracy.
3. The models marked with \* are limited torque models. Be sure to refer to the allowable torque in the Performance table.
4. Dimensional diagrams on the subsequent pages are for IP65 Models and are intended to be for reference purposes only. See below for IP44 T Box Models reference Dimensions (Figure 2). The latest drawings can be found on our website.
5. The figures illustrate standard terminal box positions. For optional positions, refer to page T53, and specify the appropriate codes when ordering.
6. All G3 models with standard shafts have a tapped shaft per Chart 1.

(Chart 1)

Shaft Dia. (Frame Number)	Size×Pitch×Effective Depth
18	M 6×1.0×15 ℓ
22, 28	M 8×1.25×20 ℓ
32, 40	M 10×1.5×25 ℓ
50	M 12×1.75×30 ℓ

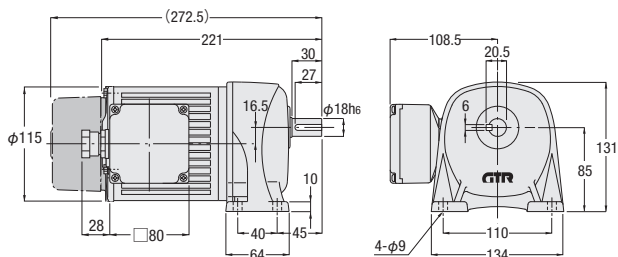




# G3 (PARALLEL SHAFT) 3-PHASE 0.2kW (1/4 HP)

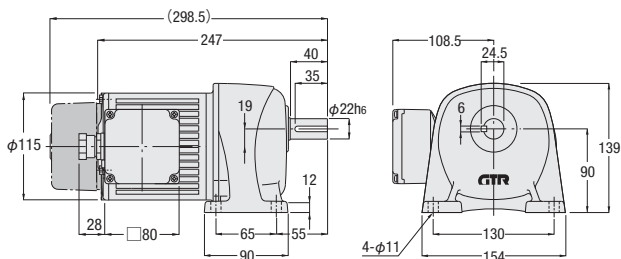
## Foot Mount Type

**Fig.A-9** G3L18N5~25<sub>N</sub>-IPG020NE  
(G3L18N5~25<sub>N</sub>-IPH020NE)



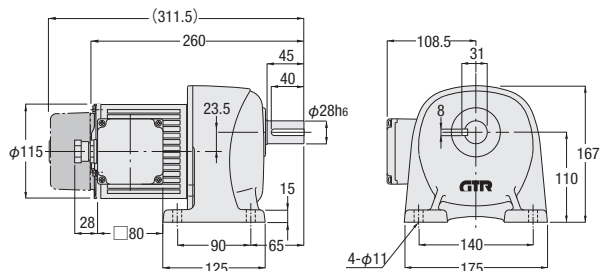
Approximate Weight : 5kg (6.5kg) / 11lb (14lb)

**Fig.A-10** G3L22N30~100<sub>N</sub>-IPG020NE  
(G3L22N30~100<sub>N</sub>-IPH020NE)



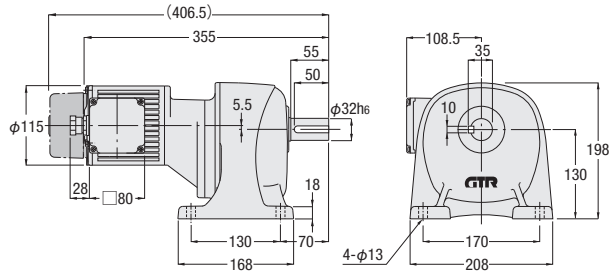
Approximate Weight : 6kg (7.5kg) / 13lb (16.5lb)

**Fig.A-11** G3L28N100~200<sub>N</sub>-IPG020NE  
(G3L28N100~200<sub>N</sub>-IPH020NE)



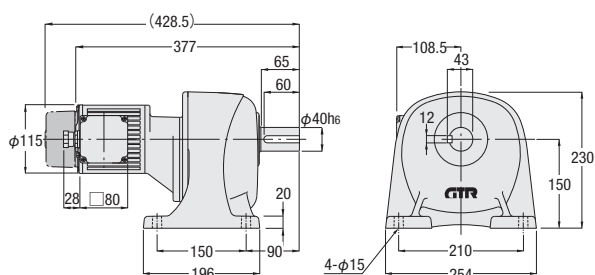
Approximate Weight : 8kg (9.5kg) / 17.5lb (21lb)

**Fig.A-12** G3L32N300~450<sub>N</sub>-IPG020NE  
(G3L32N300~450<sub>N</sub>-IPH020NE)



Approximate Weight : 12kg (13.5kg) / 26.5lb (30lb)

**Fig.A-13** G3L40N600~12X<sub>N</sub>-IPG020NE  
(G3L40N600~12X<sub>N</sub>-IPH020NE)



Approximate Weight : 18.5kg (20kg) / 41lb (44lb)

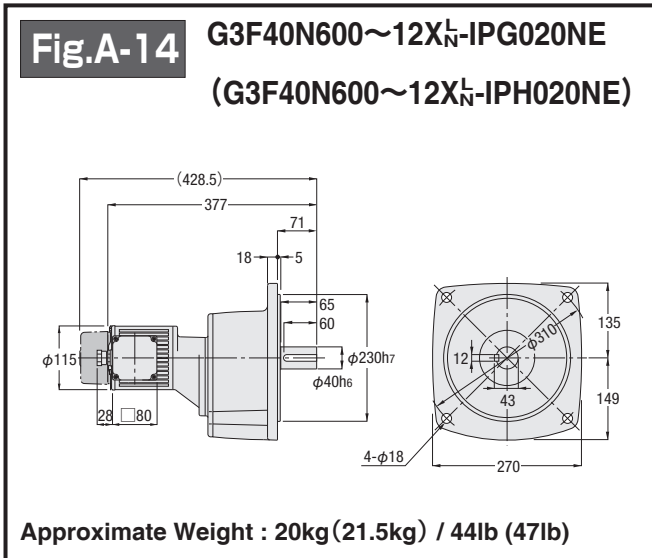
Model Codes  
P.12

Detailed Output Shaft  
Dimension Diagrams  
P.T56

Options  
P.T70~T74

# G3 (PARALLEL SHAFT) 3-PHASE 0.2kW (1/4 HP)

## Flange Mount Type



Values in parentheses in the performance tables and dimension diagrams indicate models with brakes.

Model Codes  
P.12

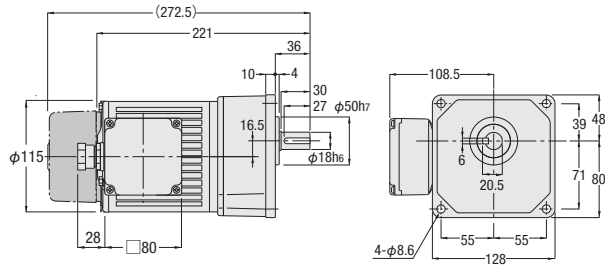
Detailed Output Shaft  
Dimension Diagrams  
P.T56

Options  
P.T70~T74

# G3 (PARALLEL SHAFT) 3-PHASE 0.2kW (1/4 HP)

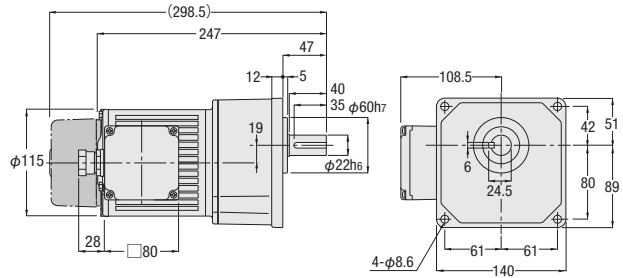
## Small Flange Mount Type

**Fig.A-15** G3K18N5~25<sub>N</sub>-IPG020NE  
(G3K18N5~25<sub>N</sub>-IPH020NE)



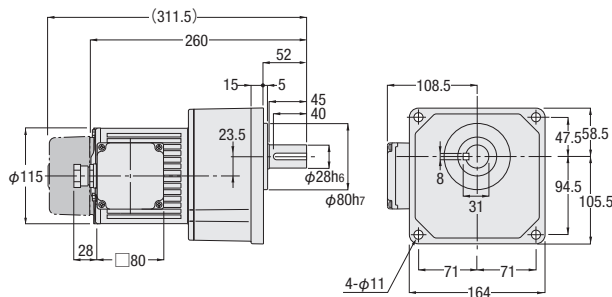
Approximate Weight : 5.5kg (7kg) / 12lb (15.5lb)

**Fig.A-16** G3K22N30~100<sub>N</sub>-IPG020NE  
(G3K22N30~100<sub>N</sub>-IPH020NE)



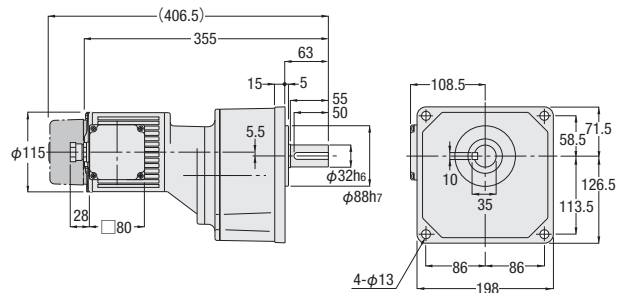
Approximate Weight : 6.5kg (8kg) / 14.5lb (17.5lb)

**Fig.A-17** G3K28N100~200<sub>N</sub>-IPG020NE  
(G3K28N100~200<sub>N</sub>-IPH020NE)



Approximate Weight : 8.5kg (10kg) / 19lb (22lb)

**Fig.A-18** G3K32N300~450<sub>N</sub>-IPG020NE  
(G3K32N300~450<sub>N</sub>-IPH020NE)




Approximate Weight : 12.5kg (14kg) / 27.5lb (31lb)

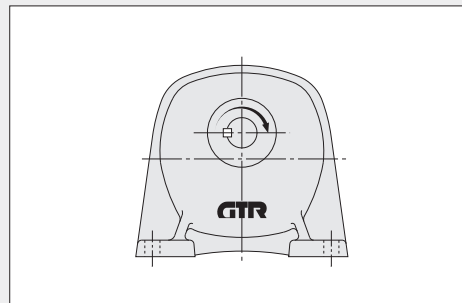
# G3 (PARALLEL SHAFT) 3-PHASE 0.4kW (1/2 HP)

## Performance Table

Values in parentheses in the performance tables and dimension diagrams indicate models with brakes.

### [Items to Note]

- Shaded cells (  ) in the performance table indicate that when a Clockwise (CW) direction is signaled by the driver, the output shaft will turn clockwise when the unit is oriented as shown in the figure to the right. Change the signal from the drive to Counter-Clockwise (CCW) in order to change the direction of rotation.

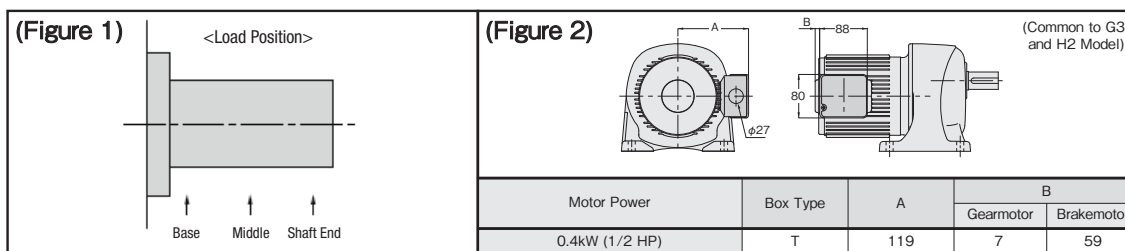


Motor Power	Frame No.	Nominal Reduction Ratio	Actual Reduction Ratio	Backlash <sup>2</sup> (Arcmin)		Output Shaft Rotational Speed (rpm)	Output Shaft Allowable Torque		Output Shaft Allowable O.H.L. <sup>1</sup>		Shape and Dimensions Diagram Page, Fig. No., <sup>4</sup>		
				N	L		(N·m)	(in·lb)	(N)	(lb)	Gearmotor (Brakemotor)		
				G3L	G3F	G3K							
0.4kW (1/2 HP)	22	1/ 5	7/ 34	—	60	0~360	9.3	82.3	1140	256	P.A11 Fig. A-19	/	P.A13 Fig. A-26
		1/ 10	7/ 68	—	40	0~180	19.7	174	1530	344			
		1/ 15	49/ 748	—	30	0~120	28.1	249	1780	400			
		1/ 20	7/ 136	—	30	0~90	37.5	332	1910	429			
	28	1/ 25	7/ 170	—	30	0~72	46.9	415	2050	461	P.A11 Fig. A-20	/	P.A13 Fig. A-27
		1/ 30	1/ 30	—	30	0~60	57.2	506	3310	744			
		1/ 40	221/ 8610	—	30	0~45	73.2	648	3690	830			
		1/ 50	187/ 9030	—	30	0~36	92.0	814	4080	917			
		1/ 60	169/ 9840	—	30	0~30	109	965	4450	1000			
		1/ 80	65/ 5166	—	30	0~22	146	1292	4450	1000			
	32	*1/ 100	55/ 5418	—	30	0~18	151	1336	4450	1000	P.A11 Fig. A-21	/	P.A13 Fig. A-28
		1/ 100	7/ 688	—	30	0~18	183	1620	6370	1432			
		1/ 120	77/ 9360	—	30	0~15	219	1938	7640	1718			
		1/ 160	21/ 3328	—	30	0~11	293	2593	7640	1718			
	40	1/ 200	189/38272	—	30	0~9.0	366	3239	7640	1718	P.A11 Fig. A-22	/	P.A12 Fig. A-24
		1/ 300	7/ 2160	—	30	0~6.0	489	4328	7060	1587			
		1/ 375	77/29328	—	30	0~4.8	613	5426	7060	1587			
	50	* 1/ 450	49/21600	—	30	0~4.0	717	6346	7060	1587	P.A11 Fig. A-23	/	P.A12 Fig. A-25
		1/ 600	57/35360	—	30	0~3.0	980	8674	9800	2203			
		* 1/ 750	25/19448	—	30	0~2.4	1150	10178	9800	2203			
		* 1/ 900	5/ 4338	—	30	0~2.0	1150	10178	9800	2203			
		* 1/1200	33/40664	—	30	0~1.5	1150	10178	9800	2203			

1. Allowable O.H.L is the value at the middle of the output shaft. (Figure 1)
2. Backlash accuracy is at the reducer unit level and is not the positioning accuracy.
3. The models marked with \* are limited torque models. Be sure to refer to the allowable torque in the Performance table.
4. Dimensional diagrams on the subsequent pages are for IP65 Models and are intended to be for reference purposes only. See below for IP44 T Box Models reference Dimensions (Figure 2). The latest drawings can be found on our website.
5. The figures illustrate standard terminal box positions. For optional positions, refer to page T53, and specify the appropriate codes when ordering.
6. All G3 models with standard shafts have a tapped shaft per Chart 1.

(Chart 1)

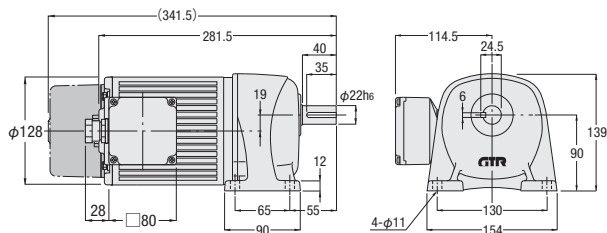
Shaft Dia. (Frame Number)	Size×Pitch×Effective Depth
18	M 6×1.0×15 ℓ
22, 28	M 8×1.25×20 ℓ
32, 40	M 10×1.5×25 ℓ
50	M 12×1.75×30 ℓ



# G3 (PARALLEL SHAFT) 3-PHASE 0.4kW (1/2 HP)

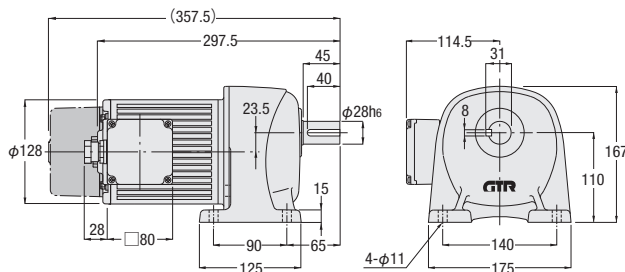
## Foot Mount Type

**Fig.A-19** G3L22N5~25<sub>N</sub>-IPG040NE  
(G3L22N5~25<sub>N</sub>-IPH040NE)



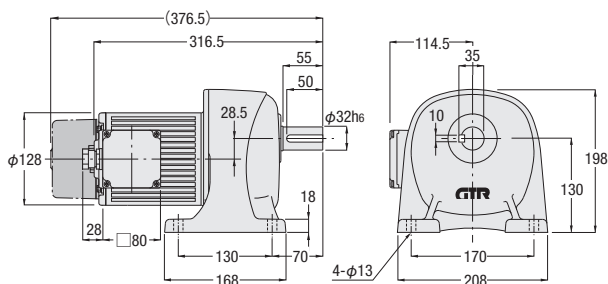
Approximate Weight : 8.5kg (10kg) / 19lb (22lb)

**Fig.A-20** G3L28N30~100<sub>N</sub>-IPG040NE  
(G3L28N30~100<sub>N</sub>-IPH040NE)



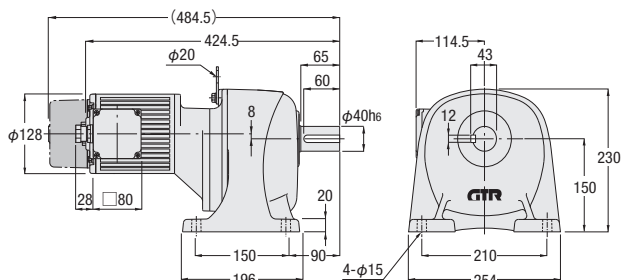
Approximate Weight : 10.5kg (12kg) / 23lb (26.5lb)

**Fig.A-21** G3L32N100~200<sub>N</sub>-IPG040NE  
(G3L32N100~200<sub>N</sub>-IPH040NE)



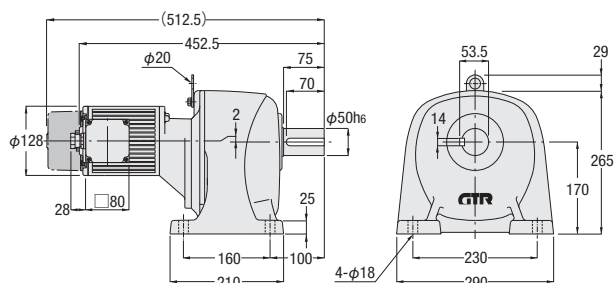
Approximate Weight : 13.5kg (15kg) / 30lb (33lb)

**Fig.A-22** G3L40N300~450<sub>N</sub>-IPG040NE  
(G3L40N300~450<sub>N</sub>-IPH040NE)



Approximate Weight : 22kg (23.5kg) / 48.5lb (52lb)

**Fig.A-23** G3L50N600~12X<sub>N</sub>-IPG040NE  
(G3L50N600~12X<sub>N</sub>-IPH040NE)



Approximate Weight : 51.5kg (53kg) / 113lb (116.5lb)

Model Codes  
P.12

Detailed Output Shaft  
Dimension Diagrams  
P.T56

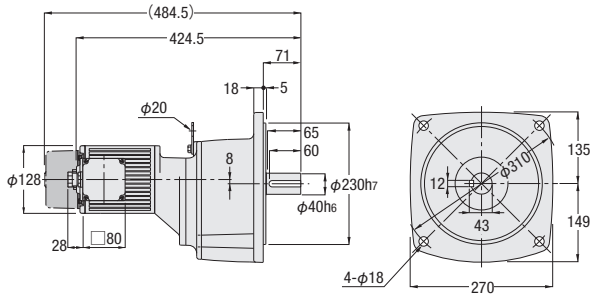
Options  
P.T70~T74

# G3 (PARALLEL SHAFT) 3-PHASE 0.4kW (1/2 HP)

## Flange Mount Type

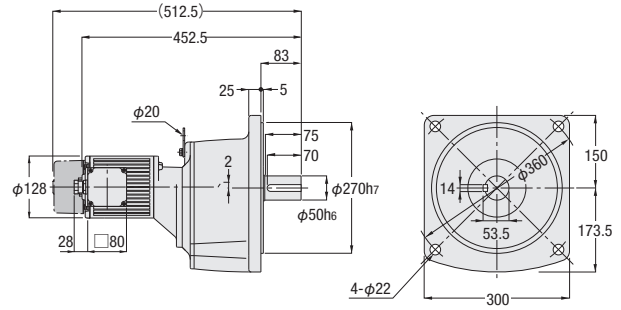
Values in parentheses in the performance tables and dimension diagrams indicate models with brakes.

**Fig.A-24** G3F40N300~450<sup>L</sup><sub>N</sub>-IPG040NE  
(G3F40N300~450<sup>L</sup><sub>N</sub>-IPH040NE)



Approximate Weight : 23.5kg (25kg) / 52lb (55lb)

**Fig.A-25** G3F50N600~12X<sup>L</sup><sub>N</sub>-IPG040NE  
(G3F50N600~12X<sup>L</sup><sub>N</sub>-IPH040NE)



Approximate Weight : 56.5kg (58kg) / 124lb (127.5lb)

Model Codes  
P.12

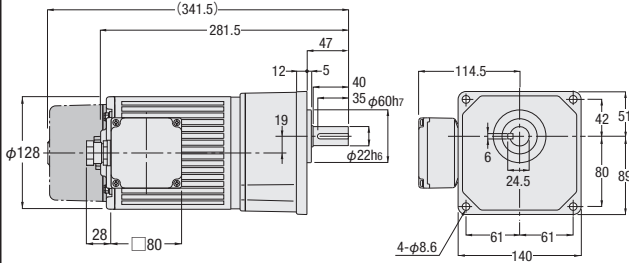
Detailed Output Shaft  
Dimension Diagrams  
P.T56

Options  
P.T70~T74

# G3 (PARALLEL SHAFT) 3-PHASE 0.4kW (1/2 HP)

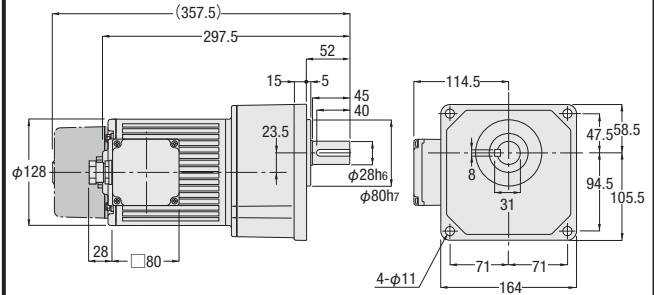
## Small Flange Mount Type

**Fig.A-26** G3K22N5~25<sub>N</sub>-IPG040NE  
(G3K22N5~25<sub>N</sub>-IPH040NE)



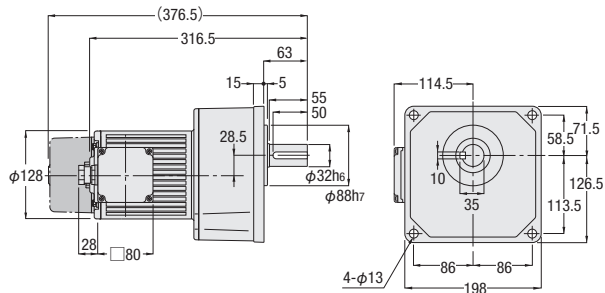
Approximate Weight : 9kg (10.5kg) / 20lb (23lb)

**Fig.A-27** G3K28N30~100<sub>N</sub>-IPG040NE  
(G3K28N30~100<sub>N</sub>-IPH040NE)



Approximate Weight : 11kg (12.5kg) / 24lb (27.5lb)

**Fig.A-28** G3K32N100~200<sub>N</sub>-IPG040NE  
(G3K32N100~200<sub>N</sub>-IPH040NE)




Approximate Weight : 14kg (15.5kg) / 31lb (34lb)

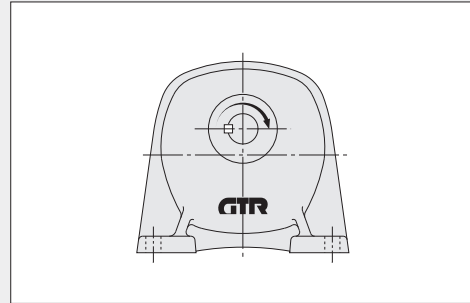
# G3 (PARALLEL SHAFT) 3-PHASE 0.75kW (1 HP)

## Performance Table

Values in parentheses in the performance tables and dimension diagrams indicate models with brakes.

### [Items to Note]

- Shaded cells (  ) in the performance table indicate that when a Clockwise (CW) direction is signaled by the driver, the output shaft will turn clockwise when the unit is oriented as shown in the figure to the right. Change the signal from the drive to Counter-Clockwise (CCW) in order to change the direction of rotation.

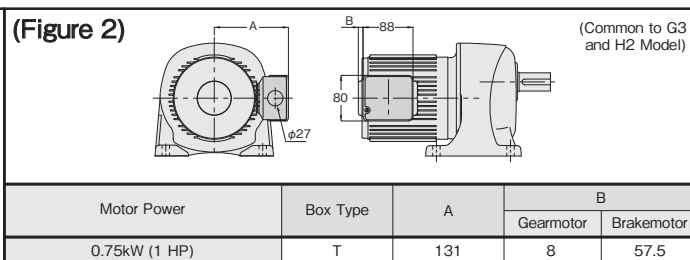
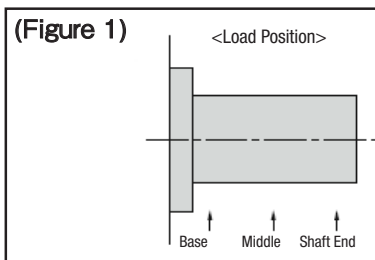


Motor Power	Frame No.	Nominal Reduction Ratio	Actual Reduction Ratio	Backlash <sup>2</sup> (Arcmin)		Output Shaft Rotational Speed (rpm)	Output Shaft Allowable Torque		Output Shaft Allowable O.H.L. <sup>1</sup>		Shape and Dimensions Diagram Page, Fig. No., <sup>4</sup>		
				N	L		(N·m)	(in·lb)	(N)	(lb)	Gearmotor (Brakemotor)		
				G3L	G3F	G3K							
0.75kW (1 HP)	28	1/ 5	91/ 459	—	50	0~360	18.1	160	1650	371	P.A15 Fig. A-29	P.A17 Fig. A-35	
		1/ 10	1/ 10	—	30	0~180	36.3	321	2280	513			
		1/ 15	91/ 1360	—		0~120	54.4	481	2800	629			
		1/ 20	5/ 102	—		0~90	71.6	634	3050	686			
		1/ 25	7/ 170	—		0~72	89.8	795	3180	715			
	32	1/ 30	3/ 92	—	30	0~60	108	956	5220	1174	P.A15 Fig. A-30	P.A17 Fig. A-36	
		1/ 40	13/ 516	—		0~45	139	1230	5470	1230			
		1/ 50	11/ 540	—		0~36	174	1540	5780	1299			
		1/ 60	13/ 774	—		0~30	210	1859	6080	1367			
		1/ 80	13/ 1032	—		0~22	279	2469	6180	1389			
		* 1/100	11/ 1080	—		0~18	288	2549	6770	1522			
	40	1/100	91/ 9000	—	30	0~18	349	3089	9170	2061	P.A15 Fig. A-31	P.A16 Fig. A-33	
		1/120	77/ 9400	—		0~15	419	3708	9170	2061			
		1/160	9/ 1400	—		0~11	559	4948	9170	2061			
		1/200	9/ 1750	—		0~9.0	699	6187	9170	2061			
	50	1/300	211/62013	—	30	0~6.0	934	8267	9800	2203	P.A15 Fig. A-32	P.A16 Fig. A-34	
		1/375	94/36103	—		0~4.8	1170	10355	9800	2203			
		* 1/450	65/29167	—		0~4.0	1170	10355	9800	2203			

(Chart 1)

Shaft Dia. (Frame Number)	Size × Pitch × Effective Depth
18	M 6×1.0×15 ℓ
22, 28	M 8×1.25×20 ℓ
32, 40	M 10×1.5×25 ℓ
50	M 12×1.75×30 ℓ

1. Allowable O.H.L. is the value at the middle of the output shaft. (Figure 1)
2. Backlash accuracy is at the reducer unit level and is not the positioning accuracy.
3. The models marked with \* are limited torque models. Be sure to refer to the allowable torque in the Performance table.
4. Dimensional diagrams on the subsequent pages are for IP65 Models and are intended to be for reference purposes only. See below for IP44 T Box Models reference Dimensions (Figure 2). The latest drawings can be found on our website.
5. The figures illustrate standard terminal box positions. For optional positions, refer to page T53, and specify the appropriate codes when ordering.
6. All G3 models with standard shafts have a tapped shaft per Chart 1.

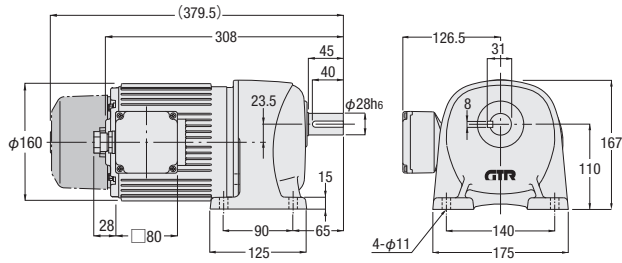




# G3 (PARALLEL SHAFT) 3-PHASE 0.75kW (1 HP)

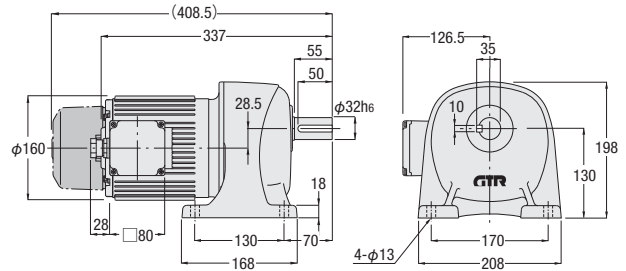
## Foot Mount Type

**Fig.A-29** G3L28N5~25<sub>N</sub>-IPG075NE  
(G3L28N5~25<sub>N</sub>-IPH075NE)



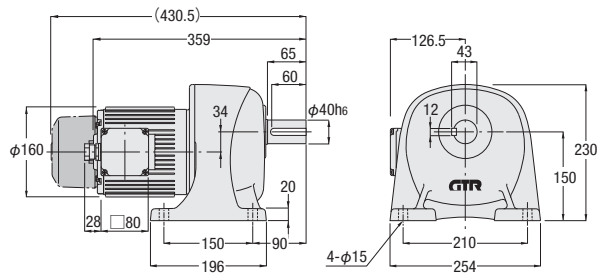
Approximate Weight : 13kg (15.5kg) / 28.5lb (34lb)

**Fig.A-30** G3L32N30~100<sub>N</sub>-IPG075NE  
(G3L32N30~100<sub>N</sub>-IPH075NE)



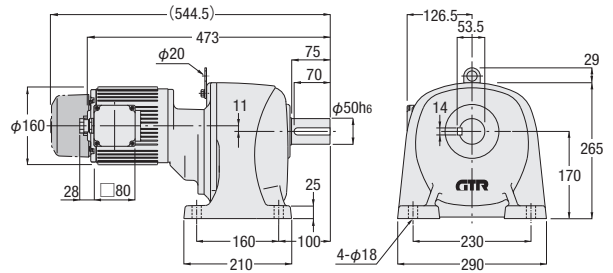
Approximate Weight : 16.5kg (19kg) / 35lb (42lb)

**Fig.A-31** G3L40N100~200<sub>N</sub>-IPG075NE  
(G3L40N100~200<sub>N</sub>-IPH075NE)



Approximate Weight : 23kg (25.5kg) / 50.5lb (56lb)

**Fig.A-32** G3L50N300~450<sub>N</sub>-IPG075NE  
(G3L50N300~450<sub>N</sub>-IPH075NE)



Approximate Weight : 54.5kg (57kg) / 120lb (125.5lb)

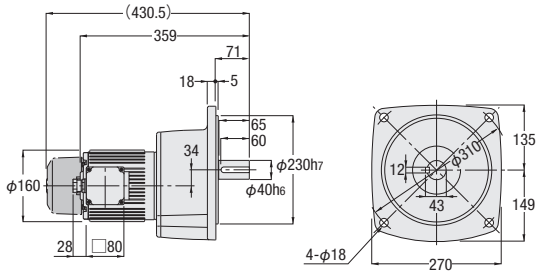
# G3 (PARALLEL SHAFT) 3-PHASE 0.75kW (1 HP)

## Flange Mount Type

Values in parentheses in the performance tables and dimension diagrams indicate models with brakes.

**Fig.A-33**

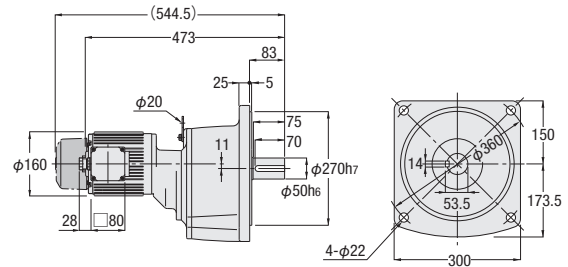
**G3F40N100~200<sub>N</sub>-IPG075NE**  
**(G3F40N100~200<sub>N</sub>-IPH075NE)**



Approximate Weight : 24.5kg (27kg) / 54lb (59.5lb)

**Fig.A-34**

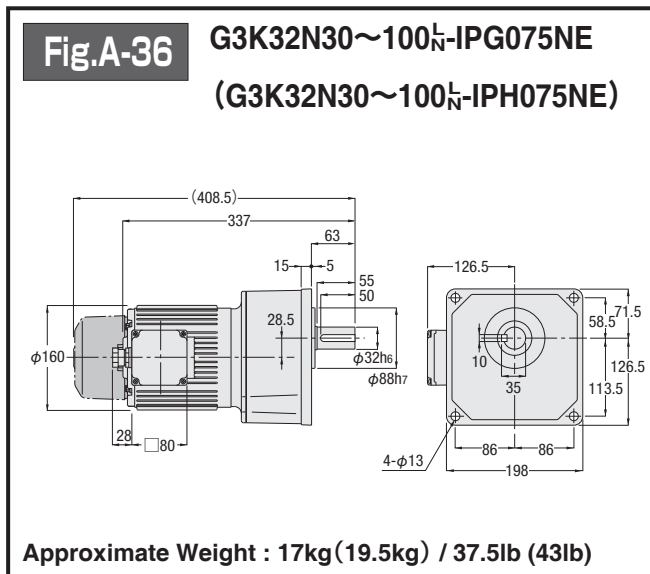
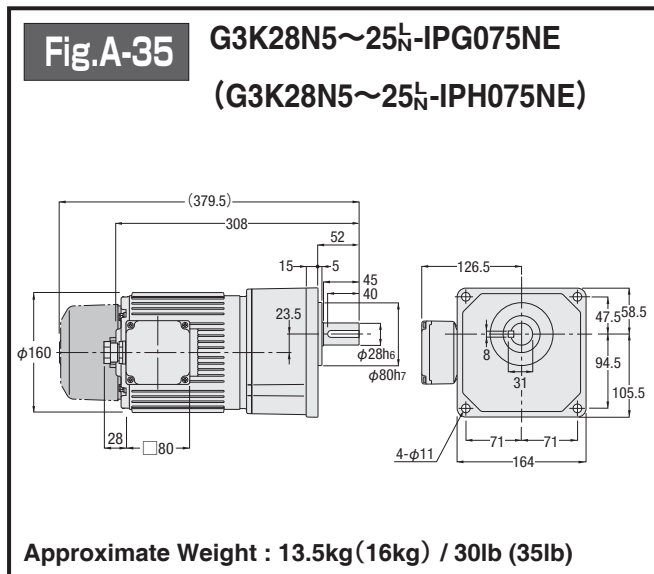
**G3F50N300~450<sub>N</sub>-IPG075NE**  
**(G3F50N300~450<sub>N</sub>-IPH075NE)**



Approximate Weight : 59.5kg (62kg) / 131lb (136.5lb)

# G3 (PARALLEL SHAFT) 3-PHASE 0.75kW (1 HP)

## Small Flange Mount Type

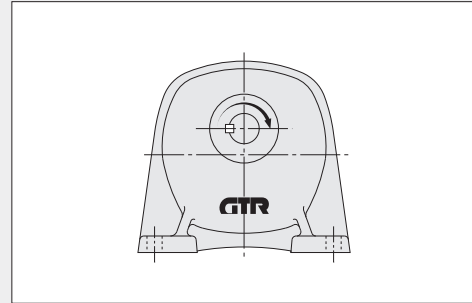


# G3 (PARALLEL SHAFT) 3-PHASE 1.5kW (2 HP)

## Performance Table

**[Items to Note]**

- Shaded cells (  ) in the performance table indicate that when a Clockwise (CW) direction is signaled by the driver, the output shaft will turn clockwise when the unit is oriented as shown in the figure to the right. Change the signal from the drive to Counter-Clockwise (CCW) in order to change the direction of rotation.

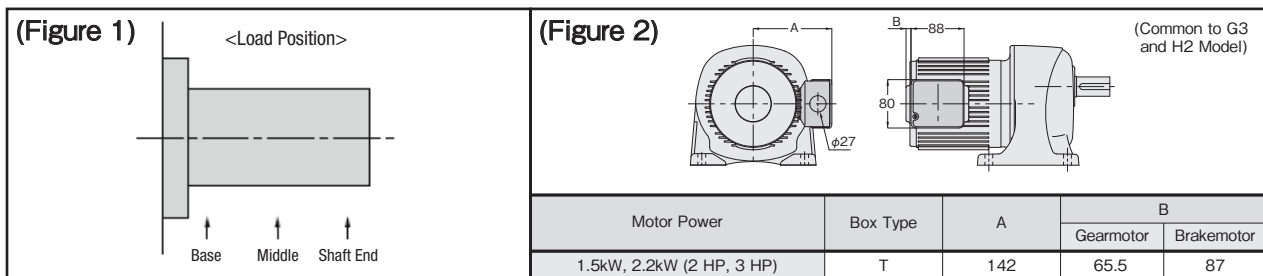


Motor Power	Frame No.	Nominal Reduction Ratio	Actual Reduction Ratio	Backlash <sup>2</sup> (Arcmin)		Output Shaft Rotational Speed (rpm)	Output Shaft Allowable Torque		Output Shaft Allowable O.H.L. <sup>1</sup>		Shape and Dimensions Diagram Page, Fig. No. <sup>4</sup>		
				N	L		(N·m)	(in·lb)	(N)	(lb)	Gear motor		
				G3L	G3F	G3K							
1.5kW (2 HP)	32	1/ 5	1/ 5	—	50	0~360	36.3	321	2280	513	P.A19 Fig. A-37	P.A21 Fig. A-42	
		1/ 10	1/ 10	—	30	0~180	71.6	634	3180	715			
		1/ 15	1/ 15	—		0~120	108	956	3690	830			
		1/ 20	1/ 20	—		0~90	144	1275	4190	942			
	40	1/ 25	9/ 230	—	30	0~72	180	1593	4410	991	P.A19 Fig. A-38	P.A20 Fig. A-40	
		1/ 30	1/ 30	—		0~60	215	1903	6600	1484			
		1/ 40	13/ 540	—		0~45	279	2469	6960	1565			
		1/ 50	11/ 564	—		0~36	349	3089	6960	1565			
		1/ 60	91/5400	—		0~30	419	3708	7210	1621			
		1/ 80	13/1080	—		0~22	559	4948	7400	1664			
	50	* 1/100	11/1128	—	30	0~18	576	5098	7400	1664	P.A19 Fig. A-39	P.A20 Fig. A-41	
		1/100	25/2618	—		0~18	699	6187	12500	2810			
		1/120	77/8993	—		0~15	838	7417	12500	2810			
		1/160	33/5474	—		0~11	1118	9895	12500	2810			
			* 1/200	30/5831	—		0~9.0	1175	10400	12500	2810		

1. Allowable O.H.L is the value at the middle of the output shaft. (Figure 1)
2. Backlash accuracy is at the reducer unit level and is not the positioning accuracy.
3. The models marked with \* are limited torque models. Be sure to refer to the allowable torque in the Performance table.
4. Dimensional diagrams on the subsequent pages are for IP65 Models and are intended to be for reference purposes only. See below for IP44 T Box Models reference Dimensions (Figure 2). The latest drawings can be found on our website.
5. The figures illustrate standard terminal box positions. For optional positions, refer to page T53, and specify the appropriate codes when ordering.
6. All G3 models with standard shafts have a tapped shaft per Chart 1.

(Chart 1)

Shaft Dia. (Frame Number)	Size×Pitch×Effective Depth
18	M 6×1.0×15 ℓ
22, 28	M 8×1.25×20 ℓ
32, 40	M 10×1.5×25 ℓ
50	M 12×1.75×30 ℓ



Model Codes  
P.12

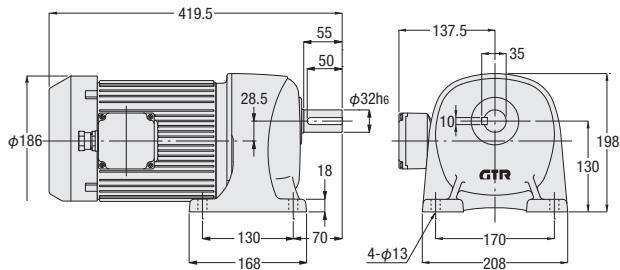
Detailed Output Shaft  
Dimension Diagrams  
P.T56

Options  
P.T70~T74

# G3 (PARALLEL SHAFT) 3-PHASE 1.5kW (2 HP)

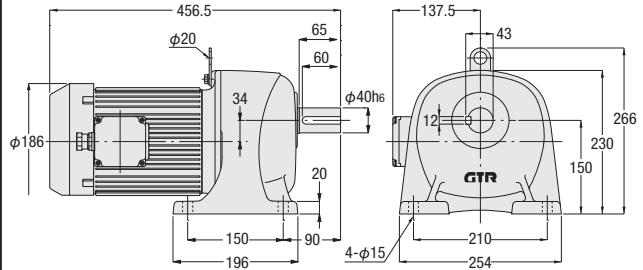
## Foot Mount Type

**Fig.A-37** G3L32N5~25<sub>N</sub>-IPG150NE



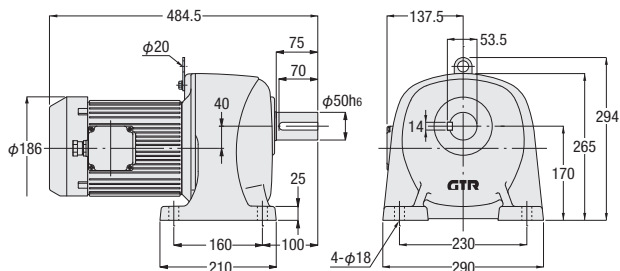
Approximate Weight : 20kg / 44lb

**Fig.A-38** G3L40N30~100<sub>N</sub>-IPG150NE



Approximate Weight : 27kg / 59.5lb

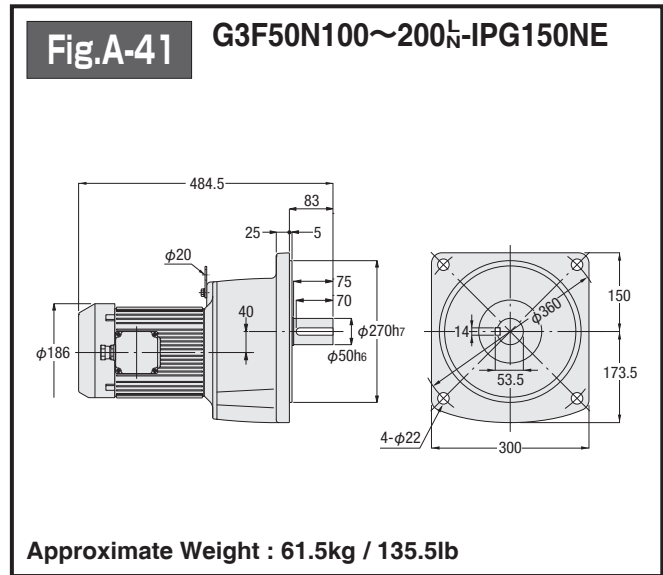
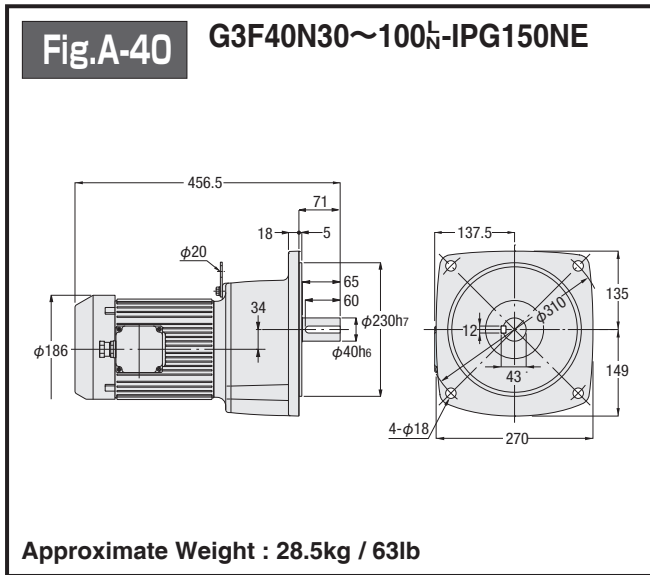
**Fig.A-39** G3L50N100~200<sub>N</sub>-IPG150NE



Approximate Weight : 56.5kg / 124.5lb

# G3 (PARALLEL SHAFT) 3-PHASE 1.5kW (2 HP)

## Flange Mount Type



Model Codes  
P.12

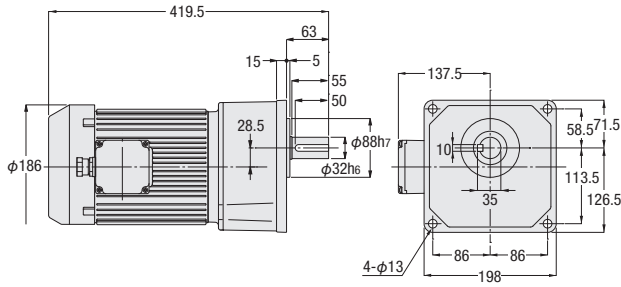
Detailed Output Shaft  
Dimension Diagrams  
P.T56

Options  
P.T70~T74

# G3 (PARALLEL SHAFT) 3-PHASE 1.5kW (2 HP)

## Small Flange Mount Type

**Fig.A-42** G3K32N5~25<sub>N</sub>-IPG150NE



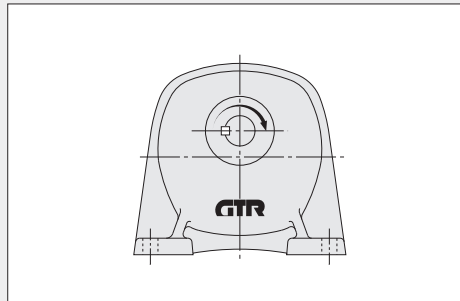
Approximate Weight : 20.5kg / 45lb

# G3 (PARALLEL SHAFT) 3-PHASE 2.2kW (3 HP)

## Performance Table

**[Items to Note]**

- Shaded cells (  ) in the performance table indicate that when a Clockwise (CW) direction is signaled by the driver, the output shaft will turn clockwise when the unit is oriented as shown in the figure to the right. Change the signal from the drive to Counter-Clockwise (CCW) in order to change the direction of rotation.

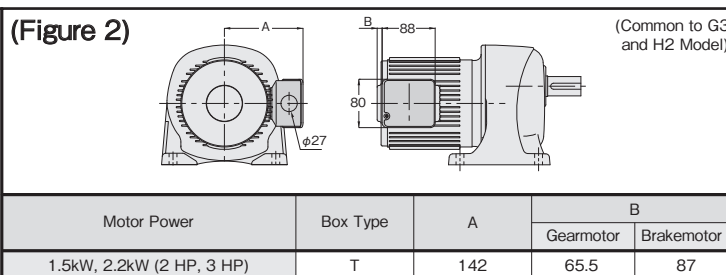
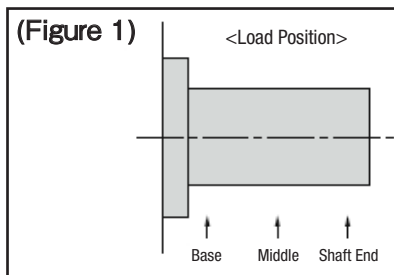


Motor Power	Frame No.	Nominal Reduction Ratio	Actual Reduction Ratio	Backlash <sup>2</sup> (Arcmin)		Output Shaft Rotational Speed (rpm)	Output Shaft Allowable Torque		Output Shaft Allowable O.H.L. <sup>1</sup>		Shape and Dimensions Diagram Page, Fig. No. <sup>4</sup>		
				N	L		(N·m)	(in·lb)	(N)	(lb)	Gearmotor (Brakemotor)		
				G3L	G3F	G3K							
2.2kW (3 HP)	40	1/ 5	7/ 36	—	50	0~360	52.5	465	2800	629	P.A23 Fig. A-43	P.A23 Fig. A-45	
		1/ 10	7/ 72	—	30	0~180	104	920	4080	917			
		1/ 15	49/ 720	—		0~120	156	1381	4580	1030			
		1/ 20	7/ 144	—		0~90	207	1832	5220	1174			
		1/ 25	7/ 180	—		0~72	260	2301	6110	1374			
	50	1/ 30	5/ 154	—	30	0~60	311	2753	9040	2032	P.A23 Fig. A-44	P.A23 Fig. A-46	
		1/ 40	399/15488	—		0~45	402	3558	9420	2118			
		1/ 50	399/20240	—		0~36	504	4461	10000	2248			
		1/ 60	49/ 2904	—		0~30	604	5346	10000	2248			
		1/ 80	49/ 3795	—		0~22	805	7125	10100	2271			
		1/ 100	21/ 2116	—		0~18	1014	8975	10100	2271			

1. Allowable O.H.L is the value at the middle of the output shaft. (Figure 1)
2. Backlash accuracy is at the reducer unit level and is not the positioning accuracy.
3. The models marked with \* are limited torque models. Be sure to refer to the allowable torque in the Performance table.
4. Dimensional diagrams on the subsequent pages are for IP65 Models and are intended to be for reference purposes only. See below for IP44 T Box Models reference Dimensions (Figure 2). The latest drawings can be found on our website.
5. The figures illustrate standard terminal box positions. For optional positions, refer to page T53, and specify the appropriate codes when ordering.
6. All G3 models with standard shafts have a tapped shaft per Chart 1.

(Chart 1)

Shaft Dia. (Frame Number)	Size×Pitch×Effective Depth
18	M 6×1.0×15 ℓ
22, 28	M 8×1.25×20 ℓ
32, 40	M 10×1.5×25 ℓ
50	M 12×1.75×30 ℓ



Model Codes  
P.12

Detailed Output Shaft  
Dimension Diagrams  
P.T56

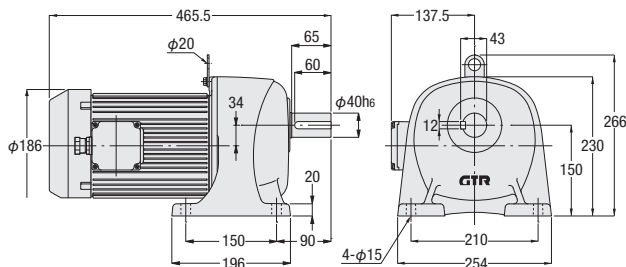
Options  
P.T70~T74



# G3 (PARALLEL SHAFT) 3-PHASE 2.2kW (3 HP)

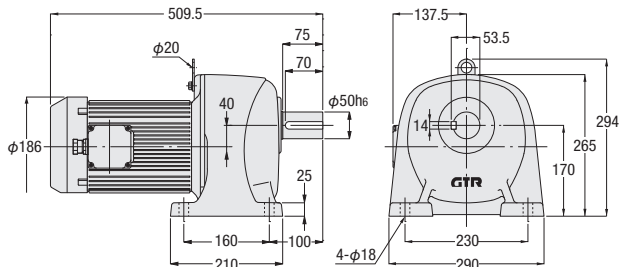
## Foot Mount Type

**Fig.A-43** G3L40N5~25<sub>N</sub>-IPG220NE



Approximate Weight : 30kg / 66lb

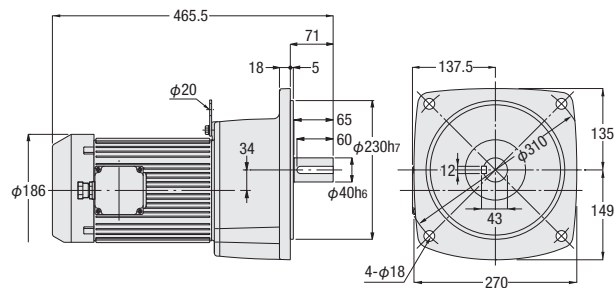
**Fig. A-44** G3L50N30~100<sub>N</sub>-IPG220NE



Approximate Weight : 60kg / 132lb

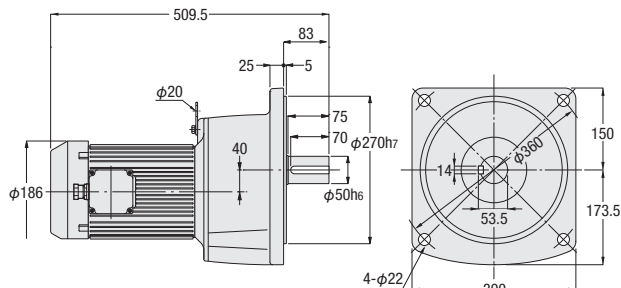
## Flange Mount Type

**Fig.A-45** G3F40N5~25<sub>N</sub>-IPG220NE



Approximate Weight : 31.5kg / 69.5lb

**Fig.A-46** G3F50N30~100<sub>N</sub>-IPG220NE



Approximate Weight : 65kg / 143lb



**Right Angle Shaft** | **IP44 and IP65**

# **IPM Gearmotors + Gearmotors with Brake**

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## **Performance Tables & Dimension Diagrams**

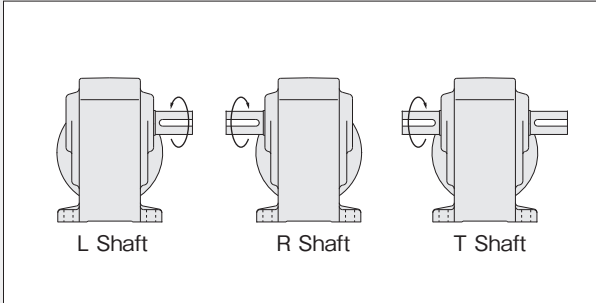
# H2 (RIGHT ANGLE SHAFT) 3-PHASE 0.1kW (1/8 HP)

## Performance Table

Values in parentheses in the performance tables and dimension diagrams indicate models with brakes.

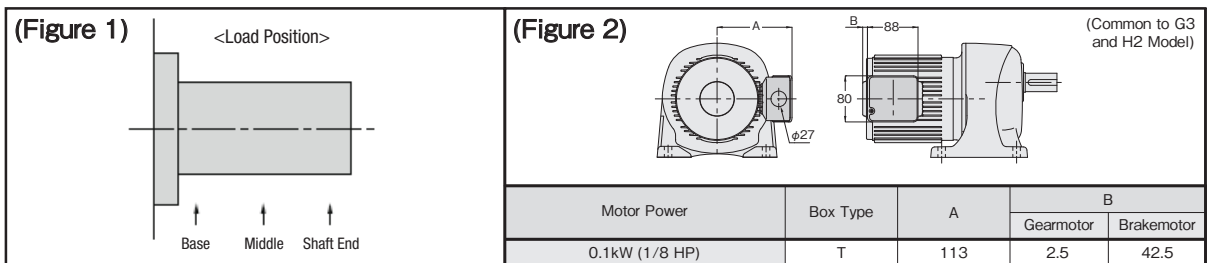
**[Items to Note]**

● Shaded cells (  ) in the performance table indicate that when a Clockwise (CW) direction is signaled by the driver, the output shaft will turn clockwise when the unit is oriented as shown in the figure to the right. Change the signal from the drive to Counter-Clockwise (CCW) in order to change the direction of rotation.



Motor Power	Frame No.	Nominal Reduction Ratio	Actual Reduction Ratio	Backlash <sup>2</sup> (Arcmin)		Output Shaft Rotational Speed (rpm)	Output Shaft Allowable Torque		Output Shaft Allowable O.H.L. <sup>1</sup>		Shape and Dimensions Diagram Page, Fig. No., <sup>4</sup>
				N	L		(N·m)	(in·lb)	(N)	(lb)	Gearmotor (Brakemotor)
				H2L							
0.1kW (1/8 HP)	22	1/ 5	1/ 5	—	60	0 ~ 360	2.2	19.5	588	132	P.B3 Fig. B-1
		1/ 10	1/ 10	—	40	0 ~ 180	4.5	39.8	931	209	
		1/ 15	1/ 15	—	30	0 ~ 120	6.8	60.2	1030	232	
		1/ 20	1/ 20	—		0 ~ 90	8.9	78.8	1180	265	
		1/ 25	1/ 25	—		0 ~ 72	11.3	100	1270	286	
		1/ 30	1/ 30	—		0 ~ 60	14.1	125	1370	308	
		1/ 40	1/ 40	—		0 ~ 45	17.9	158	1570	353	
		1/ 50	1/ 50	—		0 ~ 36	22.6	200	1720	387	
		1/ 60	1/ 59	—	0 ~ 30	26.4	234	1760	396		
		1/ 80	1/ 80	—	0 ~ 22	34.9	309	1760	396		
		1/ 100	1/ 100	—	0 ~ 18	43.4	384	1760	396		
		1/ 120	1/ 120	—	0 ~ 15	51.9	459	1760	396		
		1/ 160	1/ 160	—	0 ~ 11	69.8	618	1760	396		
		1/ 200	1/ 200	—	0 ~ 9.0	86.8	768	1760	396		
	1/ 240	1/ 236	—	0 ~ 7.5	104	920	1760	396			
	28	1/ 300	7/ 2120	—	30	0 ~ 6.0	114	1009	2840	638	P.B3 Fig. B-2
		1/ 375	7/ 2650	—		0 ~ 4.8	142	1257	2840	638	
		1/ 450	7/ 3127	—		0 ~ 4.0	170	1505	2840	638	
	32	1/ 600	7/ 4240	—	30	0 ~ 3.0	224	1983	4120	926	P.B3 Fig. B-3
		1/ 750	7/ 5300	—		0 ~ 2.4	281	2487	4120	926	
		1/ 900	7/ 6360	—		0 ~ 2.0	338	2992	4120	926	
* 1/1200		7/ 8480	—	0 ~ 1.5		407	3602	4120	926		
* 1/1500		7/10600	—	0 ~ 1.2		407	3602	4120	926		

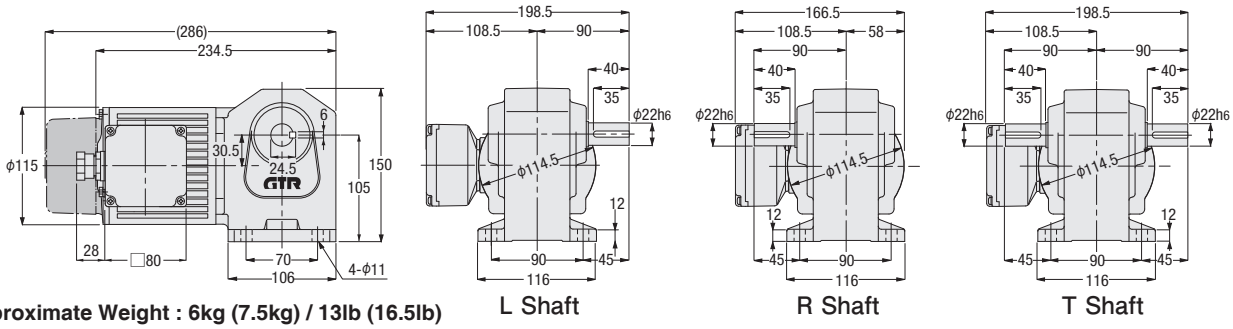
1. Allowable O.H.L is the value at the middle of the output shaft. (Figure 1)
2. Backlash accuracy is at the reducer unit level and is not the positioning accuracy.
3. The models marked with \* are limited torque models. Be sure to refer to the allowable torque in the Performance table.
4. Dimensional diagrams on the subsequent pages are for IP65 Models and are intended to be for reference purposes only. See below for IP44 T Box Models reference Dimensions (Figure 2). The latest drawings can be found on our website.
5. The figures illustrate standard terminal box positions. For optional positions, refer to page T53, and specify the appropriate codes when ordering.



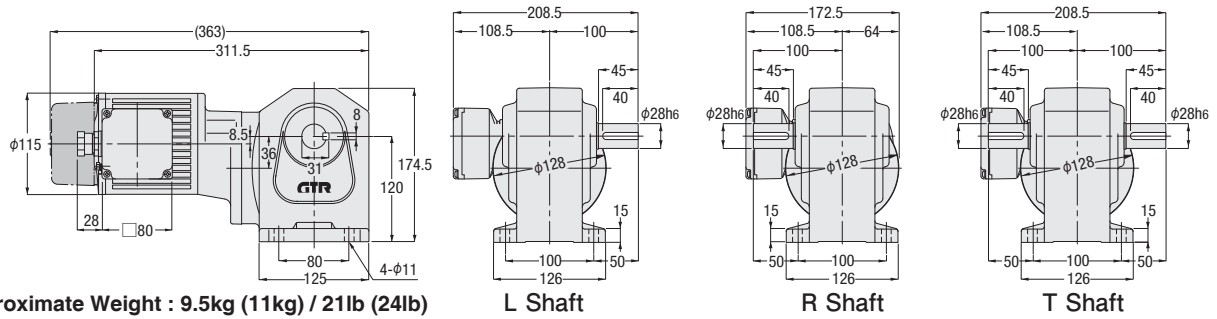
# H2 (RIGHT ANGLE SHAFT) 3-PHASE 0.1kW (1/8 HP)

## Foot Mount Type

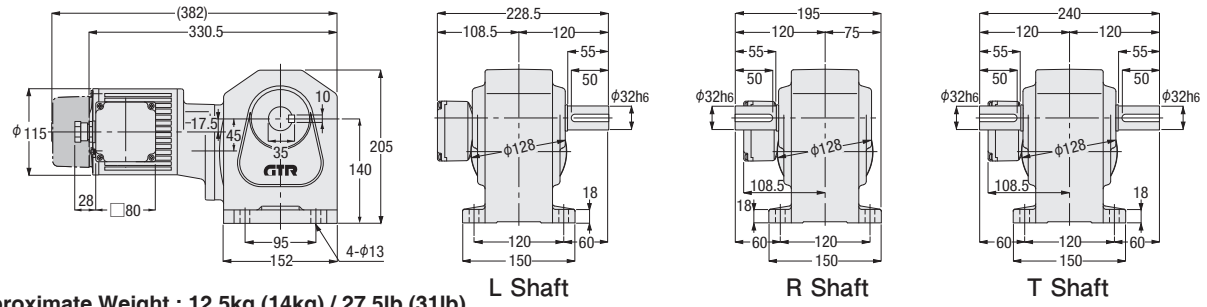
**Fig.B-1** H2L22  $\frac{1}{2}$  5~240  $\frac{1}{4}$  -IPG010NE  
(H2L22  $\frac{1}{2}$  5~240  $\frac{1}{4}$  -IPH010NE)



**Fig.B-2** H2L28  $\frac{1}{2}$  300~450  $\frac{1}{4}$  -IPG010NE  
(H2L28  $\frac{1}{2}$  300~450  $\frac{1}{4}$  -IPH010NE)



**Fig.B-3** H2L32  $\frac{1}{2}$  600~15X  $\frac{1}{4}$  -IPG010NE  
(H2L32  $\frac{1}{2}$  600~15X  $\frac{1}{4}$  -IPH010NE)



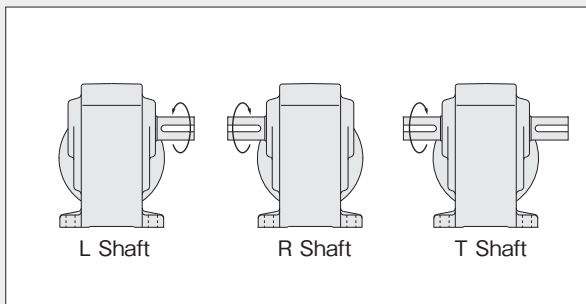
# H2 (RIGHT ANGLE SHAFT) 3-PHASE 0.2kW (1/4 HP)

## Performance Table

Values in parentheses in the performance tables and dimension diagrams indicate models with brakes.

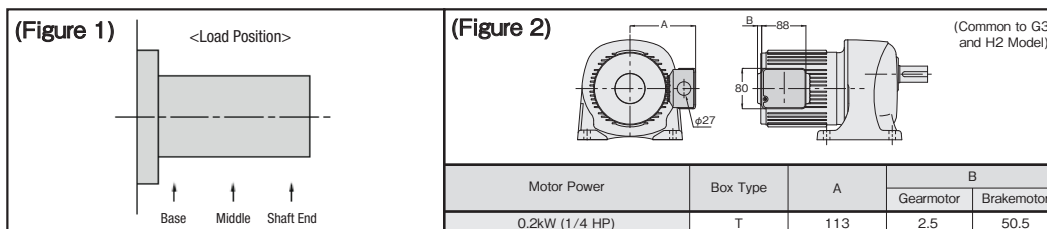
### [Items to Note]

- Shaded cells (  ) in the performance table indicate that when a Clockwise (CW) direction is signaled by the driver, the output shaft will turn clockwise when the unit is oriented as shown in the figure to the right. Change the signal from the drive to Counter-Clockwise (CCW) in order to change the direction of rotation.



Motor Power	Frame No.	Nominal Reduction Ratio	Actual Reduction Ratio	Backlash <sup>2</sup> (Arcmin)		Output Shaft Rotational Speed (rpm)	Output Shaft Allowable Torque		Output Shaft Allowable O.H.L. <sup>1</sup>		Shape and Dimensions Diagram Page, Fig. No., <sup>4</sup>
				N	L		(N·m)	(in·lb)	(N)	(lb)	Gearmotor (Brakemotor)
				H2L							
0.2kW (1/4 HP)	22	1/ 5	1/ 5	—	60	0~360	4.5	39.8	588	132	P.B5 Fig. B-4
		1/ 10	1/ 10	—	40	0~180	9.0	79.7	931	209	
		1/ 15	1/ 15	—	30	0~120	14.2	126	1030	232	
		1/ 20	1/ 20	—		0~90	18.0	159	1180	265	
		1/ 25	1/ 25	—		0~72	22.8	202	1270	286	
		1/ 30	1/ 30	—		0~60	26.6	235	1370	308	
		1/ 40	1/ 40	—		0~45	36.1	320	1570	353	
		1/ 50	1/ 50	—		0~36	45.6	404	1720	387	
	1/ 60	1/ 59	—	0~30	54.1	479	1810	407			
	28	1/ 80	1/ 80	—	30	0~22	70.3	622	2450	551	P.B5 Fig. B-5
		1/ 100	1/ 100	—		0~18	87.4	774	2650	596	
		1/ 120	1/ 120	—		0~15	105	929	2740	616	
		1/ 160	1/ 160	—		0~11	140	1239	2840	638	
		1/ 200	1/ 200	—		0~9.0	174	1540	2840	638	
		1/ 240	1/ 236	—		0~7.5	209	1850	2840	638	
	32	1/ 300	7/ 2120	—	30	0~6.0	232	2053	3820	859	P.B5 Fig. B-6
		1/ 375	7/ 2650	—		0~4.8	290	2567	4120	926	
		1/ 450	7/ 3127	—		0~4.0	349	3089	4120	926	
	40	1/ 600	7/ 4240	—	30	0~3.0	465	4116	6760	1520	P.B5 Fig. B-7
		1/ 750	7/ 5300	—		0~2.4	582	5151	6760	1520	
1/ 900		7/ 6360	—	0~2.0		698	6178	6760	1520		
* 1/1200		7/ 8480	—	0~1.5		725	6417	6760	1520		
* 1/1500		7/10600	—	0~1.2		725	6417	6760	1520		

1. Allowable O.H.L. is the value at the middle of the output shaft. (Figure 1)
2. Backlash accuracy is at the reducer unit level and is not the positioning accuracy.
3. The models marked with \* are limited torque models. Be sure to refer to the allowable torque in the Performance table.
4. Dimensional diagrams on the subsequent pages are for IP65 Models and are intended to be for reference purposes only. See below for IP44 T Box Models reference Dimensions (Figure 2). The latest drawings can be found on our website.
5. The figures illustrate standard terminal box positions. For optional positions, refer to page T53, and specify the appropriate codes when ordering.

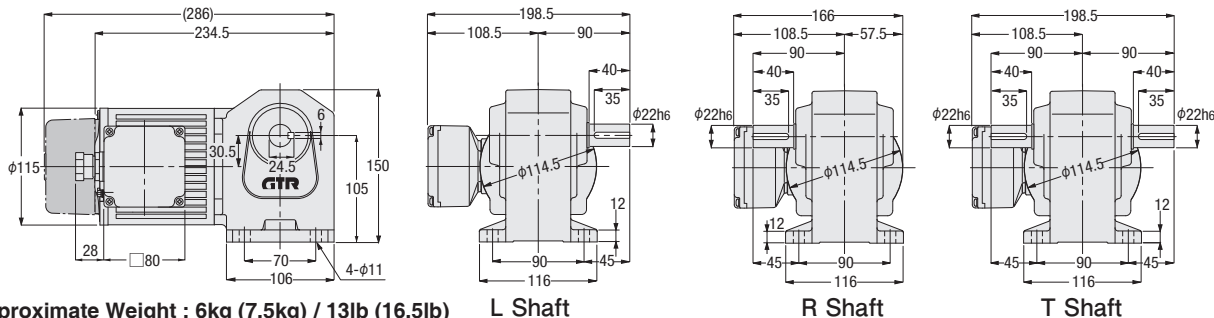


# H2 (RIGHT ANGLE SHAFT) 3-PHASE 0.2kW (1/4 HP)

## Foot Mount Type

**Fig.B-4**

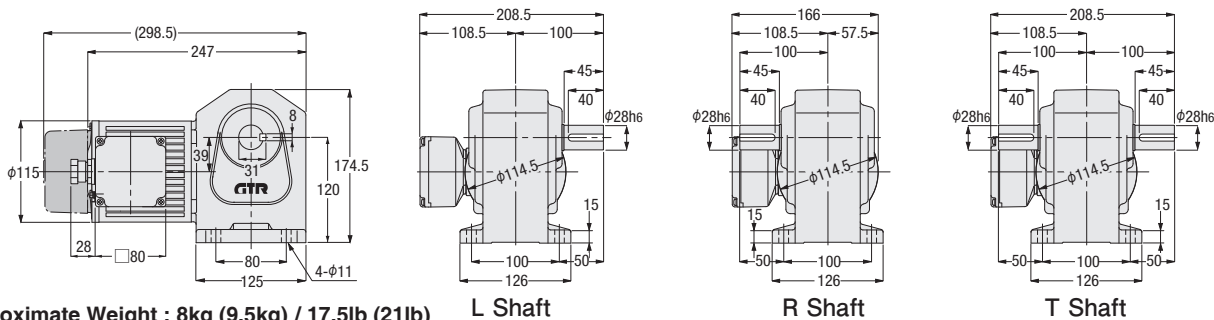
**H2L22  $\frac{1}{2}$  5~60  $\frac{1}{4}$  -IPG020NE**  
**(H2L22  $\frac{1}{2}$  5~60  $\frac{1}{4}$  -IPH020NE)**



Approximate Weight : 6kg (7.5kg) / 13lb (16.5lb)

**Fig.B-5**

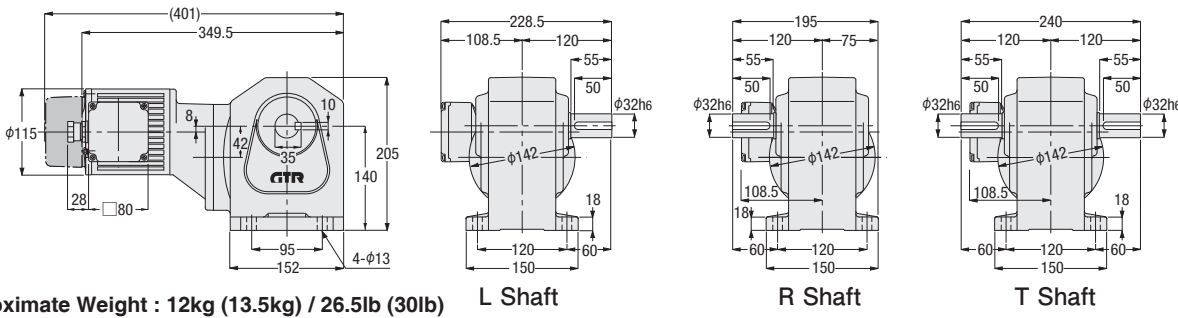
**H2L28  $\frac{1}{2}$  80~240  $\frac{1}{4}$  -IPG020NE**  
**(H2L28  $\frac{1}{2}$  80~240  $\frac{1}{4}$  -IPH020NE)**



Approximate Weight : 8kg (9.5kg) / 17.5lb (21lb)

**Fig.B-6**

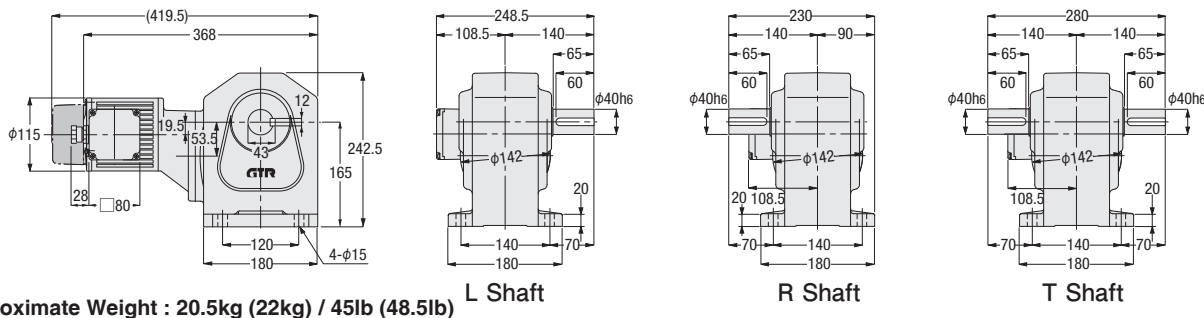
**H2L32  $\frac{1}{2}$  300~450  $\frac{1}{4}$  -IPG020NE**  
**(H2L32  $\frac{1}{2}$  300~450  $\frac{1}{4}$  -IPH020NE)**



Approximate Weight : 12kg (13.5kg) / 26.5lb (30lb)

**Fig.B-7**

**H2L40  $\frac{1}{2}$  600~15X  $\frac{1}{4}$  -IPG020NE**  
**(H2L40  $\frac{1}{2}$  600~15X  $\frac{1}{4}$  -IPH020NE)**



Approximate Weight : 20.5kg (22kg) / 45lb (48.5lb)

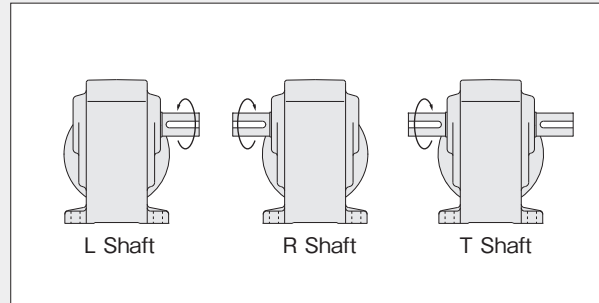
# H2 (RIGHT ANGLE SHAFT) 3-PHASE 0.4kW (1/2 HP)

## Performance Table

Values in parentheses in the performance tables and dimension diagrams indicate models with brakes.

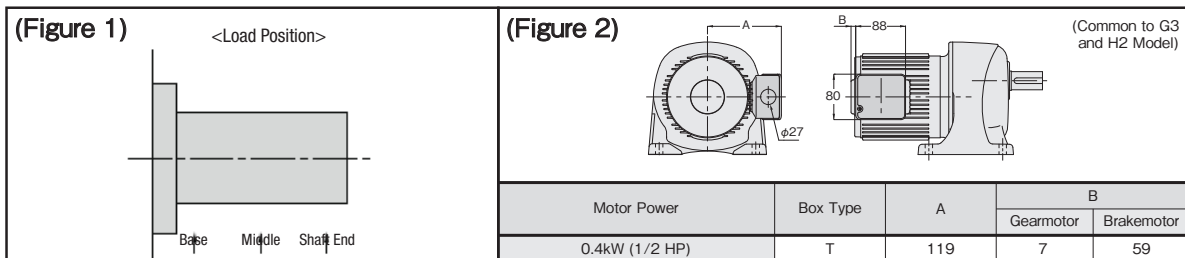
**[Items to Note]**

- Shaded cells (  ) in the performance table indicate that when a Clockwise (CW) direction is signaled by the driver, the output shaft will turn clockwise when the unit is oriented as shown in the figure to the right. Change the signal from the drive to Counter-Clockwise (CCW) in order to change the direction of rotation.



Motor Power	Frame No.	Nominal Reduction Ratio		Actual Reduction Ratio		Backlash <sup>2</sup> (Arcmin)		Output Shaft Rotational Speed		Output Shaft Allowable Torque		Output Shaft Allowable O.H.L. <sup>1</sup>		Shape and Dimensions Diagram Page, Fig. No., <sup>4</sup>
						N	L	(rpm)	(N·m)	(in·lb)	(N)	(lb)	Gearmotor (Brakemotor)	
													H2L	
0.4kW (1/2 HP)	28	1/ 5	1/ 5	—	50	0~360	8.9	78.8	931	209	P.B7 Fig. B-8			
		1/ 10	1/ 10	—	0~180	17.8	158	1470	330					
		1/ 15	1/ 15	—	0~120	26.2	232	1670	375					
		1/ 20	1/ 20	—	0~90	35.6	315	1860	418					
		1/ 25	1/ 25	—	0~72	45.0	398	2010	452					
		1/ 30	1/ 30	—	0~60	53.5	474	2210	497					
		1/ 40	1/ 40	—	0~45	71.3	631	2450	551					
		1/ 50	1/ 50	—	0~36	89.1	789	2650	596					
		1/ 60	1/ 59	—	0~30	107	947	2740	616					
	32	1/ 80	1/ 80	—	0~22	138	1221	3430	771	P.B7 Fig. B-9				
		1/ 100	1/ 100	—	0~18	172	1522	3820	859					
		1/ 120	1/ 120	—	0~15	207	1832	4120	926					
		1/ 160	1/ 160	—	0~11	276	2443	4120	926					
		1/ 200	1/ 200	—	0~9.0	346	3062	4120	926					
		* 1/ 240	1/ 236	—	0~7.5	404	3576	4120	926					
	40	1/ 300	7/ 2080	—	0~6.0	447	3956	6760	1520	P.B7 Fig. B-10				
		1/ 375	7/ 2600	—	0~4.8	560	4956	6760	1520					
		* 1/ 450	7/ 3120	—	0~4.0	671	5939	6760	1520					
	50	1/ 600	21/12220	—	0~3.0	896	7930	9510	2138	P.B7 Fig. B-11				
		1/ 750	1/ 728	—	0~2.4	1117	9886	9510	2138					
		* 1/ 900	7/ 6240	—	0~2.0	1154	10214	9510	2138					
		* 1/1200	21/24440	—	0~1.5	1154	10214	9510	2138					
		* 1/1500	1/ 1456	—	0~1.2	1154	10214	9510	2138					

1. Allowable O.H.L is the value at the middle of the output shaft. (Figure 1)
2. Backlash accuracy is at the reducer unit level and is not the positioning accuracy.
3. The models marked with \* are limited torque models. Be sure to refer to the allowable torque in the Performance table.
4. Dimensional diagrams on the subsequent pages are for IP65 Models and are intended to be for reference purposes only. See below for IP44 T Box Models reference Dimensions (Figure 2). The latest drawings can be found on our website.
5. The figures illustrate standard terminal box positions. For optional positions, refer to page T53, and specify the appropriate codes when ordering.



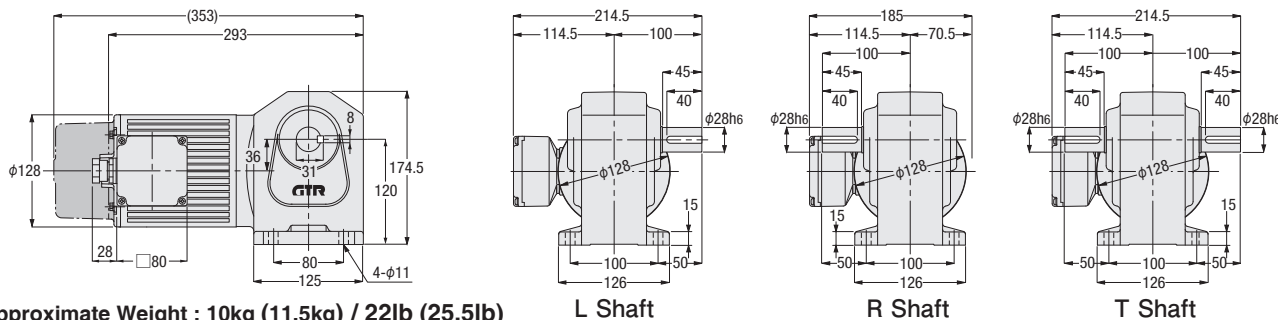


# H2 (RIGHT ANGLE SHAFT) 3-PHASE 0.4kW (1/2 HP)

## Foot Mount Type

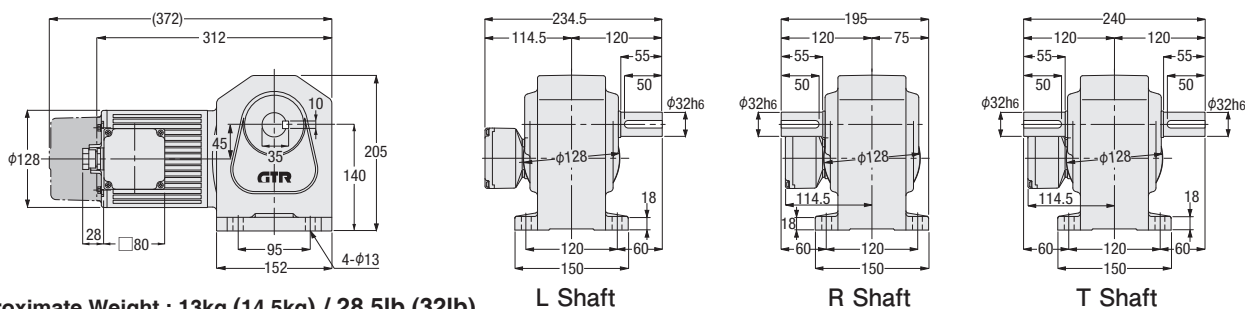
**Fig.B-8**

**H2L28  $\frac{1}{2}$  5~60  $\frac{1}{N}$  -IPG040NE  
(H2L28  $\frac{1}{2}$  5~60  $\frac{1}{N}$  -IPH040NE)**



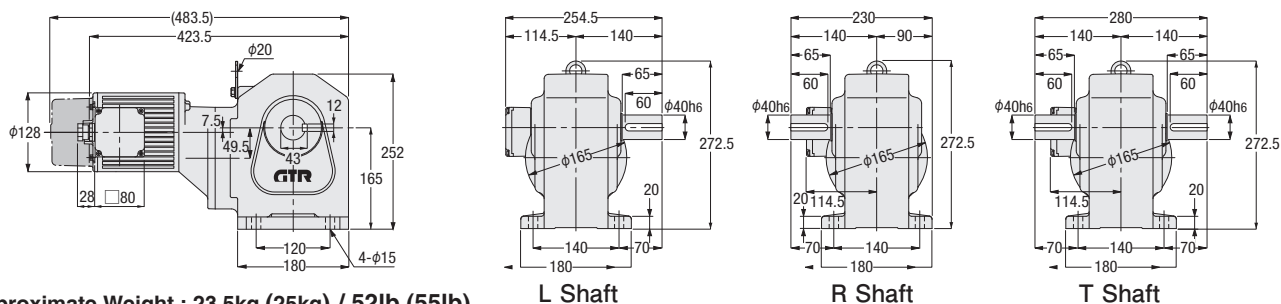
**Fig.B-9**

**H2L32  $\frac{1}{2}$  80~240  $\frac{1}{N}$  -IPG040NE  
(H2L32  $\frac{1}{2}$  80~240  $\frac{1}{N}$  -IPH040NE)**



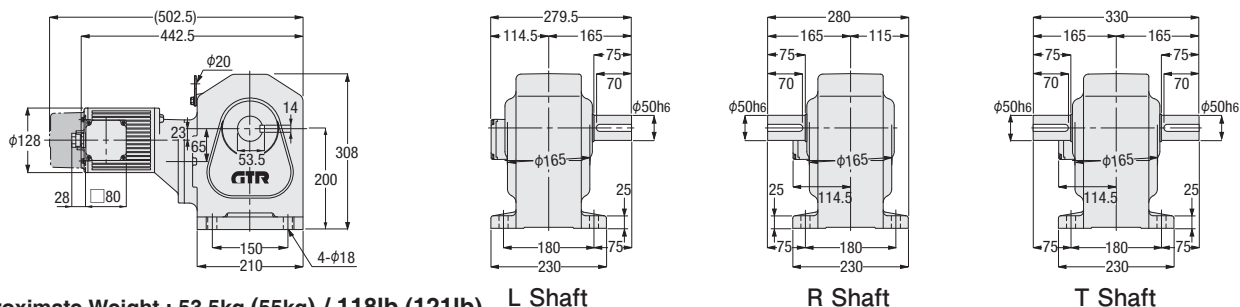
**Fig.B-10**

**H2L40  $\frac{1}{2}$  300~450  $\frac{1}{N}$  -IPG040NE  
(H2L40  $\frac{1}{2}$  300~450  $\frac{1}{N}$  -IPH040NE)**



**Fig.B-11**

**H2L50  $\frac{1}{2}$  600~15X  $\frac{1}{N}$  -IPG040NE  
(H2L50  $\frac{1}{2}$  600~15X  $\frac{1}{N}$  -IPH040NE)**



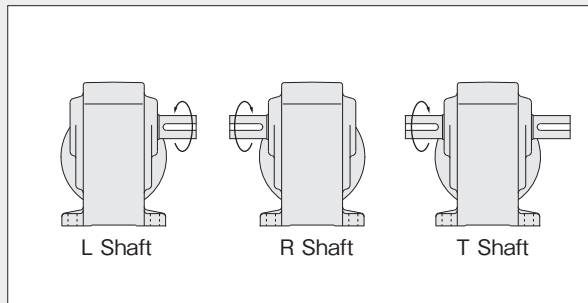
# H2 (RIGHT ANGLE SHAFT) 3-PHASE 0.75kW (1 HP)

## Performance Table

Values in parentheses in the performance tables and dimension diagrams indicate models with brakes.

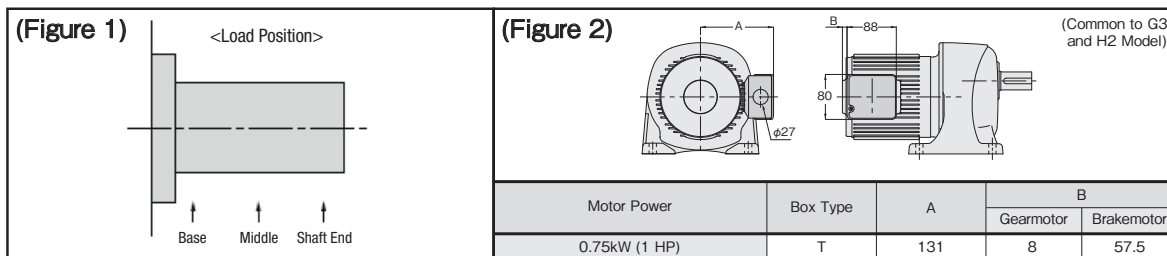
### [Items to Note]

- Shaded cells (  ) in the performance table indicate that when a Clockwise (CW) direction is signaled by the driver, the output shaft will turn clockwise when the unit is oriented as shown in the figure to the right. Change the signal from the drive to Counter-Clockwise (CCW) in order to change the direction of rotation.



Motor Power	Frame No.	Nominal Reduction Ratio	Actual Reduction Ratio	Backlash <sup>2</sup> (Arcmin)		Output Shaft Rotational Speed (rpm)	Output Shaft Allowable Torque		Output Shaft Allowable O.H.L. <sup>1</sup>		Shape and Dimensions Diagram Page, Fig. No. <sup>4</sup>	
				N	L		(N·m)	(in·lb)	(N)	(lb)	Gear	motor (Brakemotor)
0.75kW (1 HP)	32	1/ 5	1/ 5	—	50	0~360	17.2	152	1520	342	P.B9 Fig. B-12	
		1/ 10	1/ 10	—	30	0~180	34.4	304	2010	452		
		1/ 15	1/ 15	—		0~120	51.6	457	2210	497		
		1/ 20	1/ 20	—		0~ 90	68.8	609	2450	551		
		1/ 25	1/ 25	—		0~ 72	85.0	752	2740	616		
		1/ 30	1/ 30	—		0~ 60	102	903	2940	661		
		1/ 40	1/ 40	—		0~ 45	136	1204	3430	771		
		1/ 50	1/ 50	—		0~ 36	171	1513	3820	859		
		1/ 60	1/ 59	—		0~ 30	205	1814	4120	926		
	40	1/ 80	1/ 80	—	30	0~ 22	264	2337	5780	1299	P.B9 Fig. B-13	
		1/100	1/ 100	—		0~ 18	330	2921	6080	1367		
		1/120	1/ 120	—		0~ 15	396	3505	6270	1410		
		1/160	1/ 160	—		0~ 11	529	4682	6470	1455		
		1/200	1/ 200	—		0~ 9.0	661	5850	6660	1497		
		* 1/240	1/ 240	—		0~ 7.5	730	6461	6660	1497		
	50	1/300	7/2120	—	30	0~ 6.0	855	7567	7740	1740	P.B9 Fig. B-14	
		* 1/375	7/2650	—		0~ 4.8	1070	9470	8040	1807		
		* 1/450	7/3180	—		0~ 4.0	1175	10400	8530	1918		

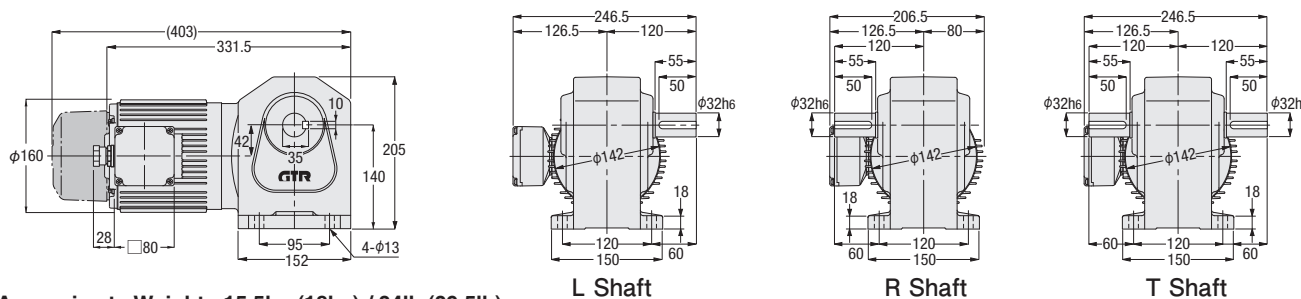
1. Allowable O.H.L is the value at the middle of the output shaft. (Figure 1)
2. Backlash accuracy is at the reducer unit level and is not the positioning accuracy.
3. The models marked with \* are limited torque models. Be sure to refer to the allowable torque in the Performance table.
4. Dimensional diagrams on the subsequent pages are for IP65 Models and are intended to be for reference purposes only. See below for IP44 T Box Models reference Dimensions (Figure 2). The latest drawings can be found on our website.
5. The figures illustrate standard terminal box positions. For optional positions, refer to page T53, and specify the appropriate codes when ordering.



# H2 (RIGHT ANGLE SHAFT) 3-PHASE 0.75kW (1 HP)

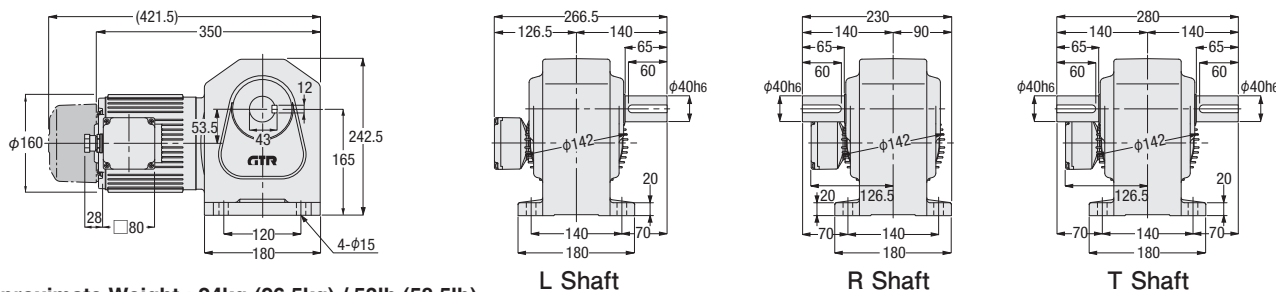
## Foot Mount Type

**Fig.B-12** H2L32  $\frac{1}{2}$  5~60  $\frac{1}{4}$  -IPG075NE  
(H2L32  $\frac{1}{2}$  5~60  $\frac{1}{4}$  -IPH075NE)



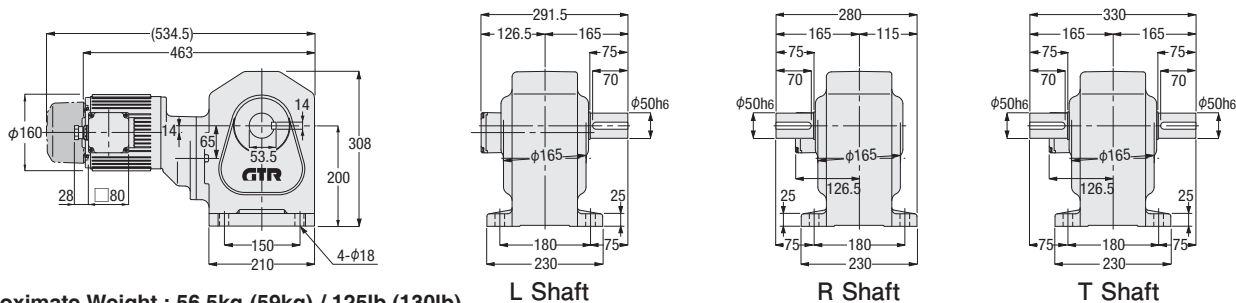
Approximate Weight : 15.5kg (18kg) / 34lb (39.5lb)

**Fig.B-13** H2L40  $\frac{1}{2}$  80~240  $\frac{1}{4}$  -IPG075NE  
(H2L40  $\frac{1}{2}$  80~240  $\frac{1}{4}$  -IPH075NE)



Approximate Weight : 24kg (26.5kg) / 53lb (58.5lb)

**Fig.B-14** H2L50  $\frac{1}{2}$  300~450  $\frac{1}{4}$  -IPG075NE  
(H2L50  $\frac{1}{2}$  300~450  $\frac{1}{4}$  -IPH075NE)



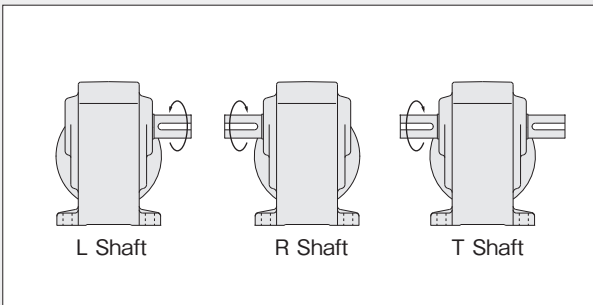
Approximate Weight : 56.5kg (59kg) / 125lb (130lb)

# H2 (RIGHT ANGLE SHAFT) 3-PHASE 1.5kW (2 HP)

## Performance Table

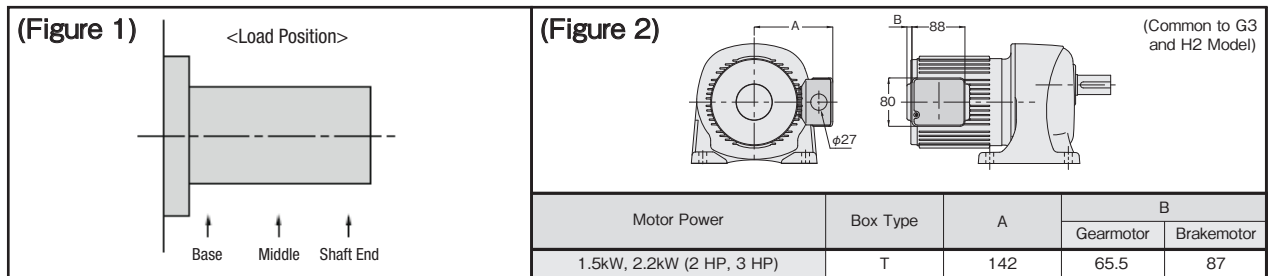
**[Items to Note]**

● Shaded cells (  ) in the performance table indicate that when a Clockwise (CW) direction is signaled by the driver, the output shaft will turn clockwise when the unit is oriented as shown in the figure to the right. Change the signal from the drive to Counter-Clockwise (CCW) in order to change the direction of rotation.



Motor Power	Frame No.	Nominal Reduction Ratio	Actual Reduction Ratio	Backlash <sup>2</sup> (Arcmin)		Output Shaft Rotational Speed (rpm)	Output Shaft Allowable Torque		Output Shaft Allowable O.H.L. <sup>1</sup>		Shape and Dimensions Diagram Page, Fig. No. <sup>4</sup>
				N	L		(N·m)	(in·lb)	(N)	(lb)	Gearmotor (Brakemotor)
											H2L
1.5kW (2 HP)	40	1/ 5	1/ 5	—	30	0~360	34.4	304	2650	596	P.B11 Fig. B-15
		1/ 10	1/ 10	—		0~180	68.8	609	3530	794	
		1/ 15	1/ 15	—		0~120	102	903	4410	991	
		1/ 20	1/ 20	—		0~ 90	136	1204	4700	1057	
		1/ 25	1/ 25	—		0~ 72	171	1513	5100	1147	
		1/ 30	1/ 30	—		0~ 60	205	1814	5290	1189	
		1/ 40	1/ 40	—		0~ 45	264	2337	5590	1257	
		1/ 50	1/ 50	—		0~ 36	330	2921	5880	1322	
		1/ 60	1/ 60	—		0~ 30	396	3505	6080	1367	
	50	1/ 80	3/235	—	30	0~ 22	529	4682	8530	1918	P.B11 Fig. B-16
		1/100	1/ 98	—		0~ 18	661	5850	8820	1983	
		1/120	1/120	—		0~ 15	793	7019	9020	2028	
		1/160	3/470	—		0~ 11	1060	9382	9310	2093	
		* 1/200	1/196	—		0~ 9.0	1175	10400	9510	2138	
		* 1/240	1/240	—		0~ 7.5	1175	10400	9510	2138	

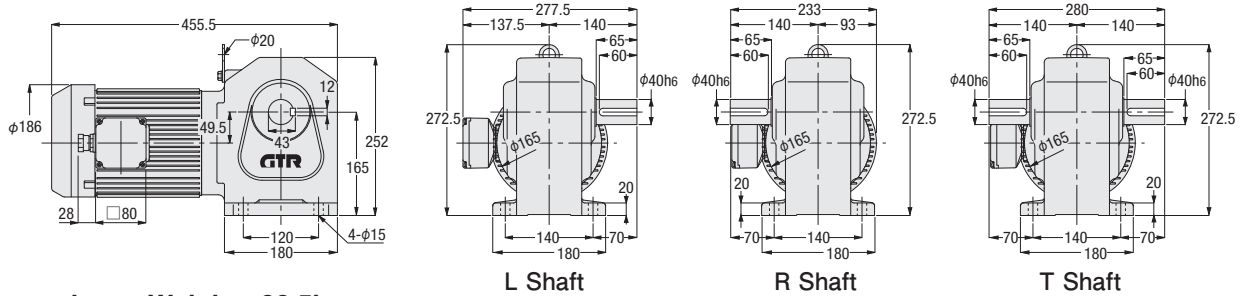
1. Allowable O.H.L is the value at the middle of the output shaft. (Figure 1)
2. Backlash accuracy is at the reducer unit level and is not the positioning accuracy.
3. The models marked with \* are limited torque models. Be sure to refer to the allowable torque in the Performance table.
4. Dimensional diagrams on the subsequent pages are for IP65 Models and are intended to be for reference purposes only. See below for IP44 T Box Models reference Dimensions (Figure 2). The latest drawings can be found on our website.
5. The figures illustrate standard terminal box positions. For optional positions, refer to page T53, and specify the appropriate codes when ordering.



# H2 (RIGHT ANGLE SHAFT) 3-PHASE 1.5kW (2 HP)

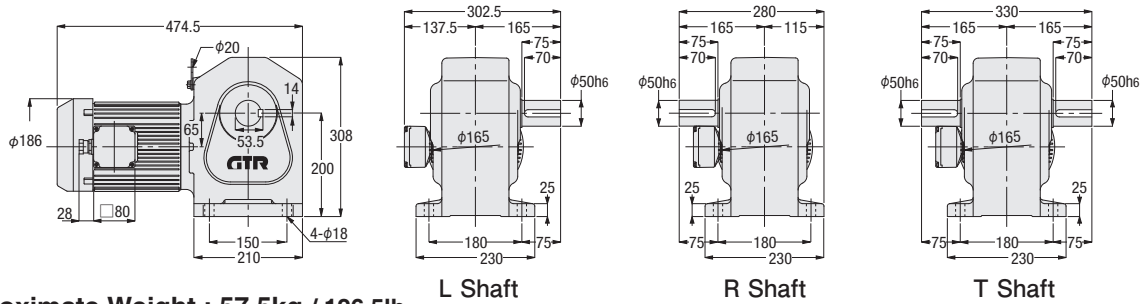
## Foot Mount Type

**Fig.B-15** H2L40  $\frac{1}{2}$  5~60  $\frac{1}{4}$  -IPG150NE



Approximate Weight : 28.5kg / 63lb

**Fig.B-16** H2L50  $\frac{1}{2}$  80~240  $\frac{1}{4}$  -IPG150NE



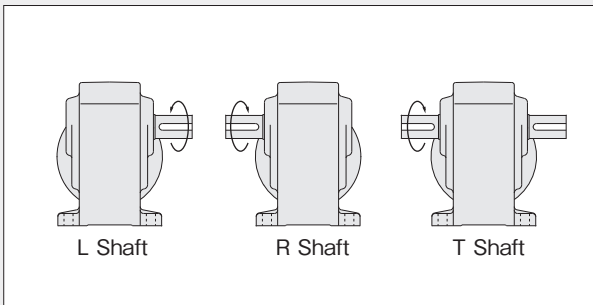
Approximate Weight : 57.5kg / 126.5lb

# H2 (RIGHT ANGLE SHAFT) 3-PHASE 2.2kW (3 HP)

## Performance Table

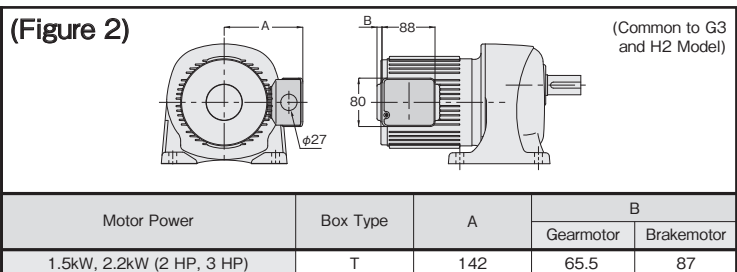
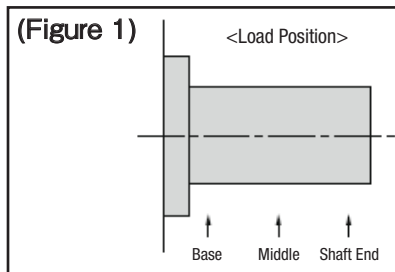
**[Items to Note]**

- Shaded cells (  ) in the performance table indicate that when a Clockwise (CW) direction is signaled by the driver, the output shaft will turn clockwise when the unit is oriented as shown in the figure to the right. Change the signal from the drive to Counter-Clockwise (CCW) in order to change the direction of rotation.



Motor Power	Frame No.	Nominal Reduction Ratio	Actual Reduction Ratio	Backlash <sup>2</sup> (Arcmin)		Output Shaft Rotational Speed (rpm)	Output Shaft Allowable Torque		Output Shaft Allowable O.H.L. <sup>1</sup>		Shape and Dimensions Diagram Page, Fig. No. <sup>4</sup>
				N	L		(N·m)	(in·lb)	(N)	(lb)	Gearmotor (Brakemotor)
											H2L
2.2kW (3 HP)	50	1/ 5	1/ 5	—	30	0 ~ 360	49.7	440	3920	881	P.B13 Fig. B-17
		1/ 10	1/ 10	—		0 ~ 180	98.5	872	4410	991	
		1/ 15	1/ 15	—		0 ~ 120	147	1301	4900	1102	
		1/ 20	12/235	—		0 ~ 90	197	1744	5490	1234	
		1/ 25	2/ 49	—		0 ~ 72	246	2177	6080	1367	
		1/ 30	1/ 30	—		0 ~ 60	295	2611	6570	1477	
		1/ 40	1/ 40	—		0 ~ 45	381	3372	7060	1587	
		1/ 50	1/ 50	—		0 ~ 36	476	4213	7550	1697	
		1/ 60	1/ 60	—		0 ~ 30	571	5054	8130	1828	
		1/ 80	3/235	—		0 ~ 22	762	6744	8430	1895	
		1/100	1/ 98	—		0 ~ 18	948	8391	8820	1983	
		1/120	1/120	—		0 ~ 15	1145	10134	8820	1983	

1. Allowable O.H.L is the value at the middle of the output shaft. (Figure 1)
2. Backlash accuracy is at the reducer unit level and is not the positioning accuracy.
3. The models marked with \* are limited torque models. Be sure to refer to the allowable torque in the Performance table.
4. Dimensional diagrams on the subsequent pages are for IP65 Models and are intended to be for reference purposes only. See below for IP44 T Box Models reference Dimensions (Figure 2). The latest drawings can be found on our website.
5. The figures illustrate standard terminal box positions. For optional positions, refer to page T53, and specify the appropriate codes when ordering.



Model Codes  
P.12

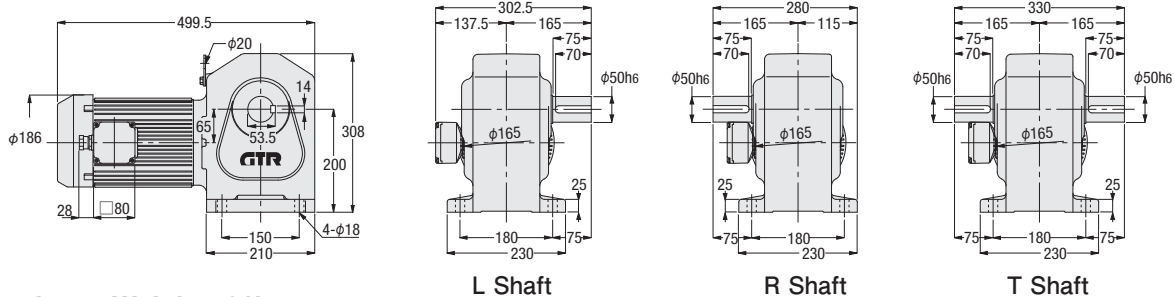
Detailed Output Shaft  
Dimension Diagrams  
P.T56

Options  
P.T70~T74

# H2 (RIGHT ANGLE SHAFT) 3-PHASE 2.2kW (3 HP)

## Foot Mount Type

**Fig.B-17** H2L50  $\frac{1}{2}$  5~120  $\frac{1}{4}$  -IPG220NE



Approximate Weight : 61kg / 134lb





Right Angle Hollow Bore

IP44 and IP65

# IPM Gearmotors + Gearmotors with Brakes

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## Performance Tables & Dimension Diagrams

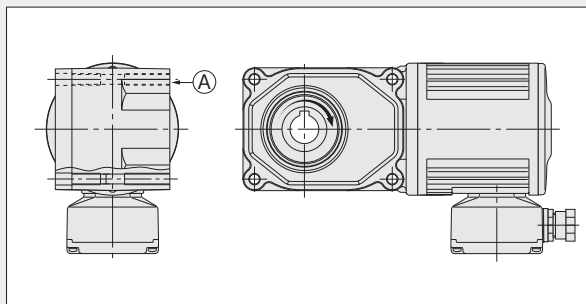
# F3S (RIGHT ANGLE HOLLOW BORE) 3-PHASE 0.1kW (1/8 HP)

## Performance Table

Values in parentheses in the performance tables and dimension diagrams indicate models with brakes.

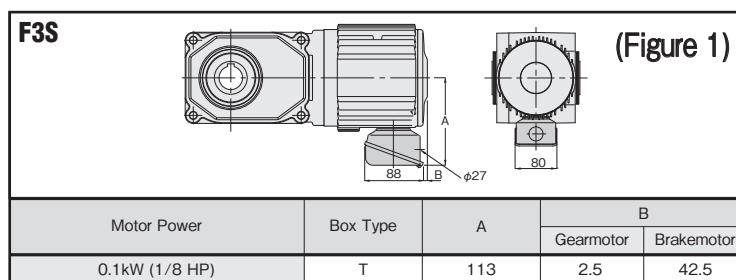
### [Items to Note]

- Shaded cells (  ) in the performance table indicate that when a Clockwise (CW) direction is signaled by the driver, the output shaft will turn clockwise when the unit is oriented as shown in the figure to the right. Change the signal from the drive to Counter-Clockwise (CCW) in order to change the direction of rotation.



Motor Power	Frame No.	Nominal Reduction Ratio		Actual Reduction Ratio		Backlash <sup>2</sup> (Arcmin)		Output Shaft Rotational Speed		Output Shaft Allowable Torque		Output Shaft Allowable O.H.L. <sup>1</sup>		Output Shaft Allowable Thrust Load		Shape and Dimensions Diagram Page, Fig. No. <sup>3</sup>
		N	L	N	L	N	L	(rpm)	(N·m)	(in·lb)	(N)	(lb)	(N)	(lb)	Gearmotor (Brakemotor)	
0.1kW (1/8 HP)	20	1/	5	1/	5	—	60	0 ~ 360	2.0	17.7	980	220	244	54.9	P.C3 Fig. C-1	
		1/	7.5	2/	15	—	50	0 ~ 240	3.0	26.6	1080	243	270	60.7		
		1/	10	1/	10	—	40	0 ~ 180	4.0	35.4	1180	265	294	66.1		
		1/	12	2/	25	—		0 ~ 144	5.1	45.1	1270	286	316	71		
		1/	15	1/	15	—	30	0 ~ 120	6.1	54	1320	297	333	74.9		
		1/	20	1/	20	—		0 ~ 90	8.1	71.7	1470	330	373	83.9		
		1/	25	1/	25	—		0 ~ 72	10.3	91.2	1570	353	392	88.1		
		1/	30	2/	59	—		0 ~ 60	12.2	108	1670	375	422	94.9		
		1/	40	1/	40	—		0 ~ 45	17.0	150	1810	407	451	101		
		1/	50	1/	50	—		0 ~ 36	20.7	183	1860	418	471	106		
	1/	60	1/	59	—	0 ~ 30	23.6	209	1860	418	471	106				
	25	1/	80	1/	80	—	30	0 ~ 22	30.2	267	2550	573	637	143	P.C3 Fig. C-2	
		1/	100	19/	1880	—		0 ~ 18	38.7	343	2550	573	637	143		
		1/	120	1/	120	—		0 ~ 15	46.2	409	2550	573	637	143		
		1/	160	1/	160	—		0 ~ 11	62.3	551	2550	573	637	143		
		1/	200	1/	200	—		0 ~ 9.0	76.5	677	2550	573	637	143		
		1/	240	1/	240	—		0 ~ 7.5	92.5	819	2550	573	637	143		

- (Notes)
1. Allowable O.H.L. is the value at the middle of the output shaft.
  2. Backlash accuracy is at the reducer unit level and is not the positioning accuracy.
  3. Dimensional diagrams on the subsequent pages are for IP65 Models and are intended to be for reference purposes only. See Figure 1 for IP44 T Box Models reference dimensions. The latest drawings can be found on our website.
  4. The figures illustrate standard terminal box positions. For optional positions, refer to page T55, and specify the appropriate codes when ordering.

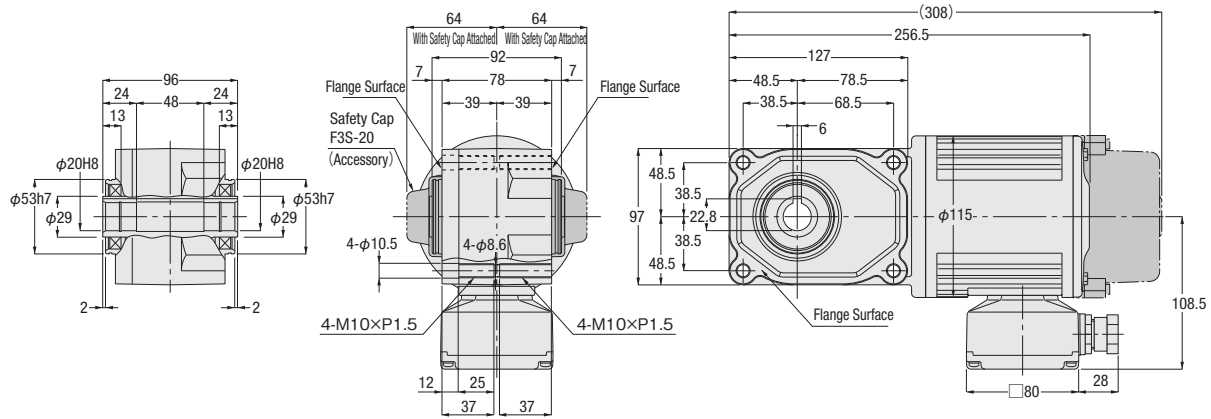


# F3S (RIGHT ANGLE HOLLOW BORE) 3-PHASE 0.1kW (1/8 HP)

## Hollow Bore Type

Fig.C-1

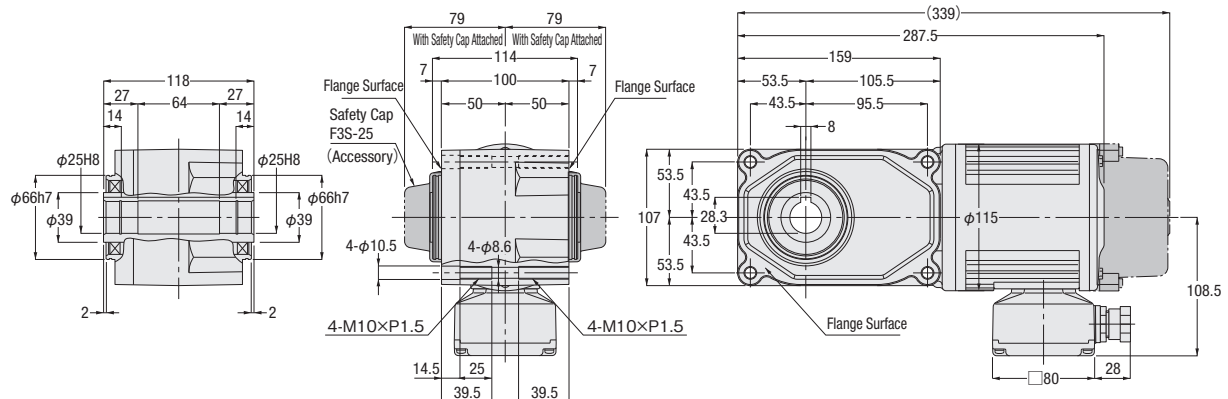
F3S20N5~60  $\frac{L}{N}$  -IPG010NE  
(F3S20N5~60  $\frac{L}{N}$  -IPH010NE)



Approximate Weight : 6kg (7.5kg) / 13lb (16.5lb)

Fig.C-2

F3S25N80~240  $\frac{L}{N}$  -IPG010NE  
(F3S25N80~240  $\frac{L}{N}$  -IPH010NE)



Approximate Weight : 7.5kg (9kg) / 16.5lb (20lb)

\* For a detailed diagram of the tapped holes for Flange Mount Installation (Standard Specification), refer to Page T57

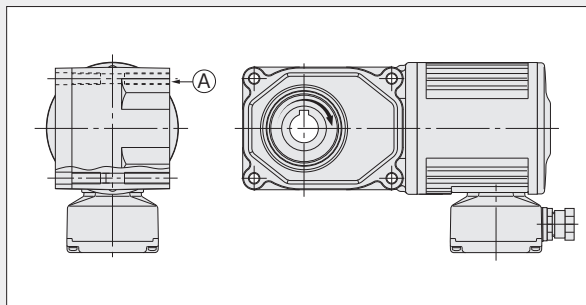
# F3S (RIGHT ANGLE HOLLOW BORE) 3-PHASE 0.2kW (1/4 HP)

## Performance Table

Values in parentheses in the performance tables and dimension diagrams indicate models with brakes.

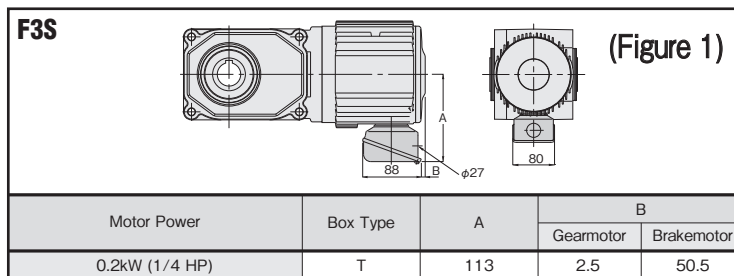
### [Items to Note]

- Shaded cells (  ) in the performance table indicate that when a Clockwise (CW) direction is signaled by the driver, the output shaft will turn clockwise when the unit is oriented as shown in the figure to the right. Change the signal from the drive to Counter-Clockwise (CCW) in order to change the direction of rotation.



Motor Power	Frame No.	Nominal Reduction Ratio	Actual Reduction Ratio	Backlash <sup>2</sup> (Arcmin)		Output Shaft Rotational Speed (rpm)	Output Shaft Allowable Torque		Output Shaft Allowable O.H.L. <sup>1</sup>		Output Shaft Allowable Thrust Load		Shape and Dimensions Diagram Page, Fig. No. <sup>4</sup>
				N	L		(N·m)	(in·lb)	(N)	(lb)	(N)	(lb)	Gearmotor (Brakemotor)
0.2kW (1/4 HP)	25	1/ 5	1/ 5	—	60	0 ~ 360	4.3	38.1	1230	277	307	69	P.C5 Fig. C-3
		1/ 7.5	1/ 15	—	50	0 ~ 240	6.6	58.4	1370	308	342	76.9	
		1/ 10	1/ 10	—	40	0 ~ 180	8.7	77	1520	342	380	85.4	
		1/ 12	1/ 235	—		0 ~ 144	11.4	101	1620	364	405	91	
		1/ 15	1/ 15	—	30	0 ~ 120	13.3	118	1720	387	429	96.4	
		1/ 20	1/ 20	—		0 ~ 90	18.0	159	1860	418	466	105	
		1/ 25	1/ 25	—		0 ~ 72	22.8	202	2010	452	502	113	
		1/ 30	1/ 30	—		0 ~ 60	25.6	227	2110	474	527	118	
		1/ 40	1/ 40	—		0 ~ 45	35.1	311	2300	517	576	129	
		1/ 50	1/ 50	—		0 ~ 36	43.7	387	2450	551	613	138	
	1/ 60	1/ 60	—	0 ~ 30	52.2	462	2550	573	637	143			
	30	1/ 80	1/ 80	—	30	0 ~ 22	67.4	597	3090	695	775	174	P.C5 Fig. C-4
		1/ 100	19/1880	—		0 ~ 18	82.6	731	3140	706	785	176	
		1/ 120	1/ 120	—		0 ~ 15	99.7	882	3140	706	785	176	
		1/ 160	1/ 160	—		0 ~ 11	133	1177	3140	706	785	176	
		1/ 200	1/ 200	—		0 ~ 9.0	166	1469	3140	706	785	176	
		1/ 240	1/ 240	—		0 ~ 7.5	174	1540	3140	706	785	176	

- (Notes)
1. Allowable O.H.L value is at the middle of the output shaft.
  2. Backlash accuracy is at the reducer unit level and is not the positioning accuracy.
  3. The models marked with \* are limited torque models. Be sure to refer to the allowable torque and the Performance Table.
  4. Dimensional diagrams on the subsequent pages are for IP65 Models and are intended to be for reference purposes only. See Figure 1 for IP44 T Box Models reference dimensions. The latest drawings can be found on our website.
  5. The figures illustrate standard terminal box positions. For optimal positions, refer to page T55, and specify the appropriate codes when ordering.

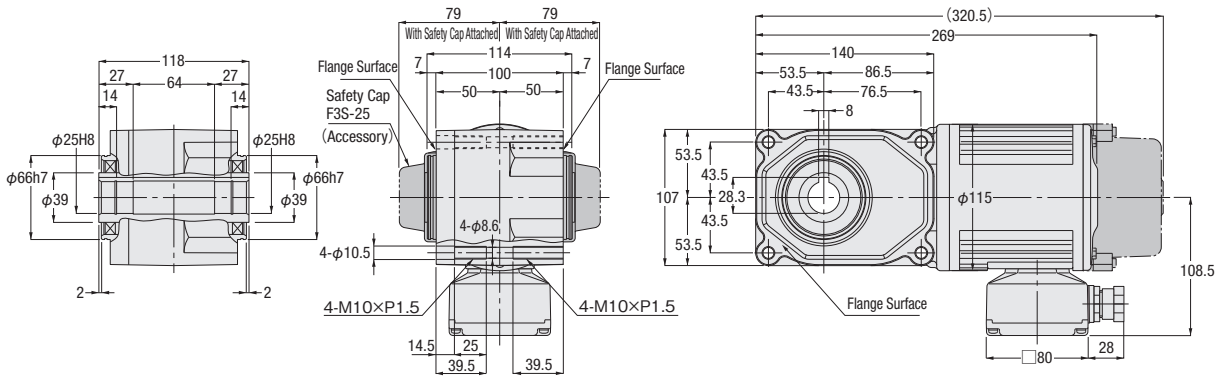


# F3S (RIGHT ANGLE HOLLOW BORE) 3-PHASE 0.2kW (1/4 HP)

## Hollow Bore Type

Fig.C-3

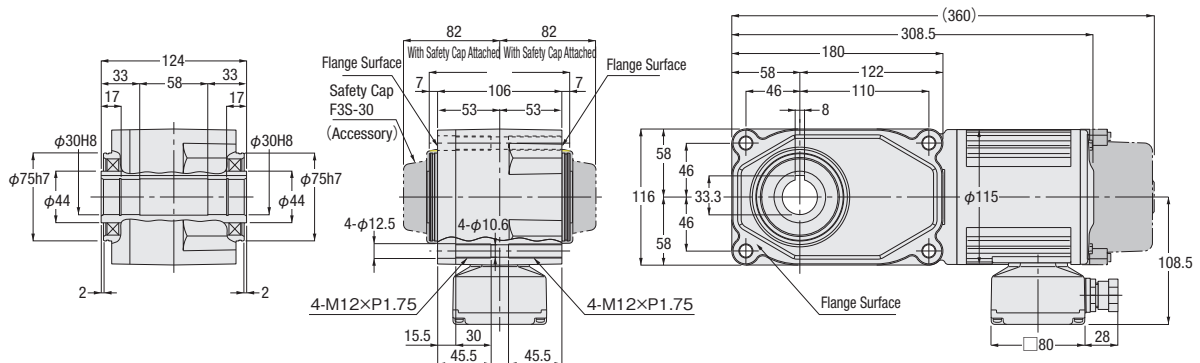
F3S25N5~60 $\frac{1}{N}$ -IPG020NE  
(F3S25N5~60 $\frac{1}{N}$ -IPH020NE)



Approximate Weight : 7kg (8.5kg) / 15.5lb (19lb)

Fig.C-4

F3S30N80~240 $\frac{1}{N}$ -IPG020NE  
(F3S30N80~240 $\frac{1}{N}$ -IPH020NE)



Approximate Weight : 8.5kg (10kg) / 19lb (22lb)

\* For a detailed diagram of the tapped holes for Flange Mount Installation (Standard Specification), refer to Page T57

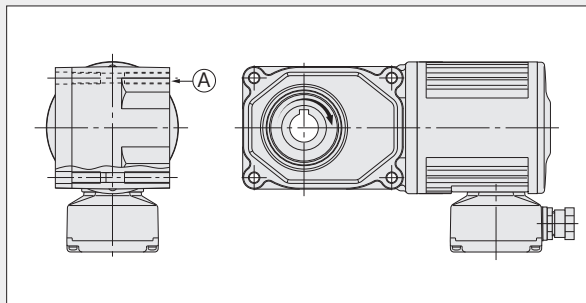
# F3S (RIGHT ANGLE HOLLOW BORE) 3-PHASE 0.4kW (1/2 HP)

## Performance Table

Values in parentheses in the performance tables and dimension diagrams indicate models with brakes.

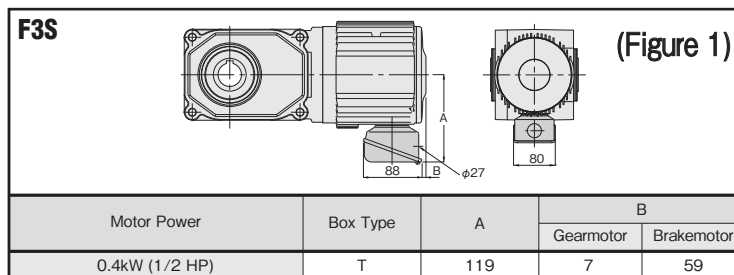
### [Items to Note]

- Shaded cells (  ) in the performance table indicate that when a Clockwise (CW) direction is signaled by the driver, the output shaft will turn clockwise when the unit is oriented as shown in the figure to the right. Change the signal from the drive to Counter-Clockwise (CCW) in order to change the direction of rotation.



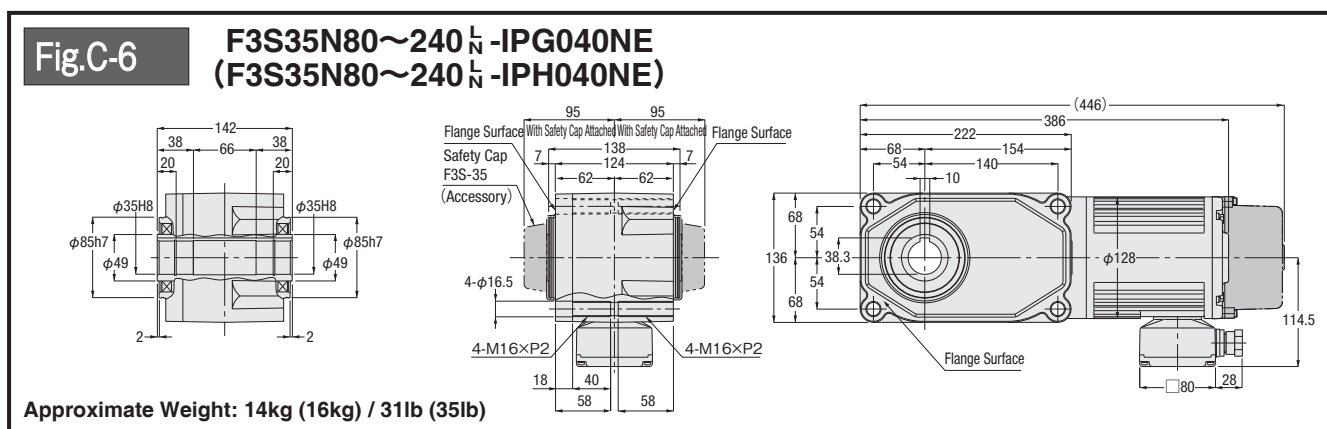
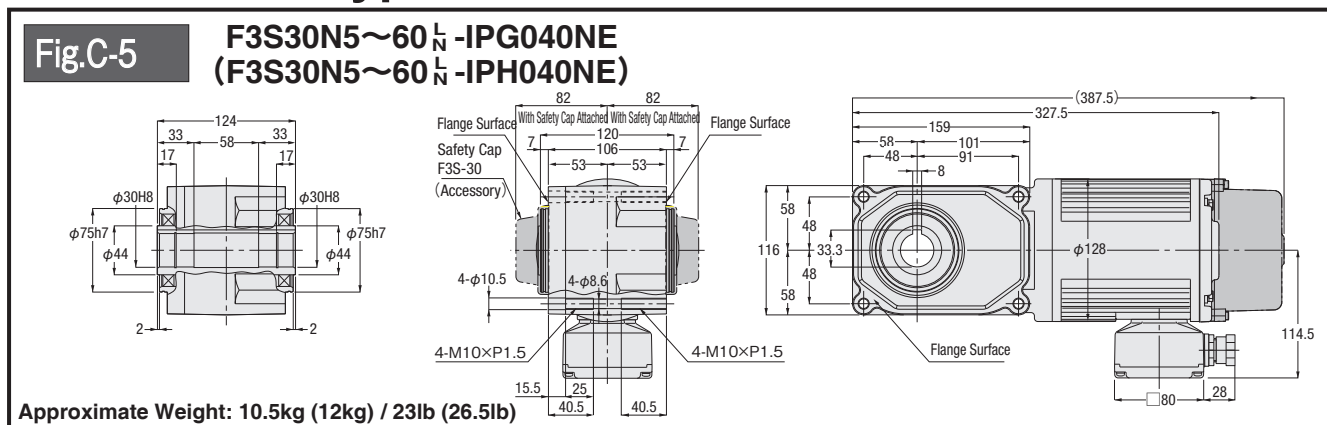
Motor Power	Frame No.	Nominal Reduction Ratio		Actual Reduction Ratio		Backlash <sup>2</sup> (Arcmin)		Output Shaft Rotational Speed		Output Shaft Allowable Torque		Output Shaft Allowable O.H.L. <sup>1</sup>		Output Shaft Allowable Thrust Load		Shape and Dimensions Diagram Page, Fig. No. <sup>4</sup>
		N	L	N	L	N	L	(rpm)	(N·m)	(in·lb)	(N)	(lb)	(N)	(lb)	Gearmotor (Brakemotor)	
0.4kW (1/2 HP)	30	1/ 5	1/ 5	1/ 5	1/ 5	—	—	0 ~ 360	8.6	76.1	1520	342	375	84.3	P.C7 Fig. C-5	
		1/ 7.5	2/ 15	—	—	—	—	0 ~ 240	13.1	116	1760	396	438	98.5		
		1/ 10	1/ 10	—	—	—	—	0 ~ 180	17.8	158	1910	429	475	107		
		1/ 12	19/ 235	—	—	—	—	0 ~ 144	22.5	199	2060	463	506	114		
		1/ 15	1/ 15	—	—	—	—	0 ~ 120	25.3	224	2160	486	539	121		
		1/ 20	1/ 20	—	—	—	—	0 ~ 90	34.7	307	2400	540	600	135		
		1/ 25	1/ 25	—	—	—	—	0 ~ 72	43.1	381	2550	573	637	143		
		1/ 30	1/ 30	—	—	—	—	0 ~ 60	51.6	457	2650	596	662	149		
		1/ 40	1/ 40	—	—	—	—	0 ~ 45	69.4	614	2840	638	711	160		
		1/ 50	1/ 50	—	—	—	—	0 ~ 36	86.3	764	2990	672	747	168		
	1/ 60	1/ 60	—	—	—	—	0 ~ 30	104	920	3090	695	767	172			
	35	1/ 80	1/ 80	—	—	—	—	0 ~ 22	131	1159	3480	782	873	196	P.C7 Fig. C-6	
		1/ 100	19/ 1880	—	—	—	—	0 ~ 18	164	1452	3530	794	883	199		
		1/ 120	1/ 120	—	—	—	—	0 ~ 15	198	1752	3530	794	883	199		
		* 1/ 160	1/ 160	—	—	—	—	0 ~ 11	253	2239	3630	816	912	205		
		* 1/ 200	1/ 200	—	—	—	—	0 ~ 9.0	253	2239	3630	816	912	205		
		* 1/ 240	1/ 240	—	—	—	—	0 ~ 7.5	253	2239	3630	816	912	205		

- (Notes)
1. Allowable O.H.L. value is at the middle of the output shaft.
  2. Backlash accuracy is at the reducer unit level and is not the positioning accuracy.
  3. The models marked with \* are limited torque models. Be sure to refer to the allowable torque and the Performance Table.
  4. Dimensional diagrams on the subsequent pages are for IP65 Models and are intended to be for reference purposes only. See Figure 1 for IP44 T Box Models reference dimensions. The latest drawings can be found on our website.
  5. The figures illustrate standard terminal box positions. For optimal positions, refer to page T55, and specify the appropriate codes when ordering.



# F3S (RIGHT ANGLE HOLLOW BORE) 3-PHASE 0.4kW (1/2 HP)

## Hollow Bore Type



\* For a detailed diagram of the tapped holes for Flange Mount Installation (Standard Specification), refer to Page T57

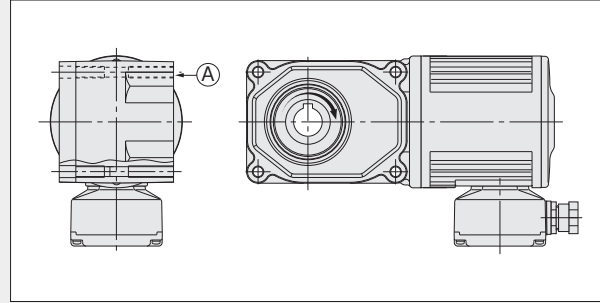
# F3S (RIGHT ANGLE HOLLOW BORE) 3-PHASE 0.75kW (1 HP)

## Performance Table

Values in parentheses in the performance tables and dimension diagrams indicate models with brakes.

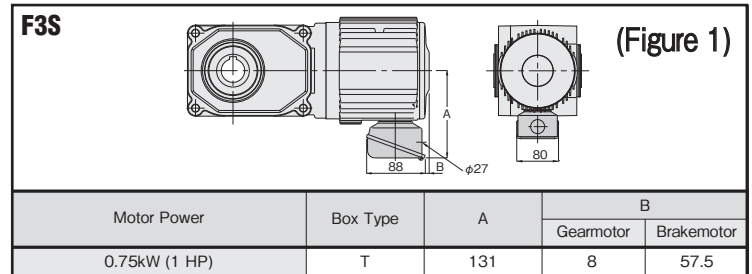
### [Items to Note]

- Shaded cells (  ) in the performance table indicate that when a Clockwise (CW) direction is signaled by the driver, the output shaft will turn clockwise when the unit is oriented as shown in the figure to the right. Change the signal from the drive to Counter-Clockwise (CCW) in order to change the direction of rotation.



Motor Power	Frame No.	Reduction Ratio		Backlash <sup>2</sup> (Arcmin)		Output Shaft Rotational Speed (rpm)	Output Shaft Allowable Torque		Output Shaft Allowable O.H.L. <sup>1</sup>		Output Shaft Allowable Thrust Load		Shape and Dimensions Diagram Page, Fig. No., <sup>4</sup> Gearmotor (Brakemotor) F3S
		N	L	N	L		(N·m)	(in·lb)	(N)	(lb)	(N)	(lb)	
0.75kW (1 HP)	35	1/ 5	1/ 5	—	30	0 ~ 360	17.2	152	1960	441	500	112	P.C9 Fig. C-7
		1/ 7.5	2/ 15	—		0 ~ 240	23.8	211	2250	506	567	127	
		1/ 10	1/ 10	—		0 ~ 180	32.4	287	2450	551	613	138	
		1/ 12	19/ 235	—		0 ~ 144	41.0	363	2600	585	669	150	
		1/ 15	1/ 15	—		0 ~ 120	49.6	439	2740	616	686	154	
		1/ 20	1/ 20	—		0 ~ 90	66.8	591	2990	672	747	168	
		1/ 25	1/ 25	—		0 ~ 72	82.1	727	3190	717	796	179	
		1/ 30	1/ 30	—		0 ~ 60	99.3	879	3280	737	821	185	
		1/ 40	1/ 40	—		0 ~ 45	131	1159	3480	782	870	196	
		1/ 50	1/ 50	—		0 ~ 36	165	1460	3480	782	870	196	
	1/ 60	1/ 60	—	0 ~ 30	198	1752	3480	782	870	196			
	45	1/ 80	1/ 80	—	30	0 ~ 22	251	2222	4750	1068	1177	265	P.C9 Fig. C-8
		1/ 100	19/1880	—		0 ~ 18	313	2770	4750	1068	1177	265	
		1/ 120	1/ 120	—		0 ~ 15	377	3337	4750	1068	1177	265	
		1/ 160	1/ 160	—		0 ~ 11	502	4443	5190	1167	1275	287	
		* 1/ 200	1/ 200	—		0 ~ 9.0	529	4682	5190	1167	1275	287	
		* 1/ 240	1/ 240	—		0 ~ 7.5	529	4682	5190	1167	1275	287	

- (Notes)
1. Allowable O.H.L value is at the middle of the output shaft.
  2. Backlash accuracy is at the reducer unit level and is not the positioning accuracy.
  3. The models marked with \* are limited torque models. Be sure to refer to the allowable torque and the Performance Table.
  4. Dimensional diagrams on the subsequent pages are for IP65 Models and are intended to be for reference purposes only. See Figure 1 for IP44 T Box Models reference dimensions. The latest drawings can be found on our website.
  5. The figures illustrate standard terminal box positions. For optimal positions, refer to page T55, and specify the appropriate codes when ordering.



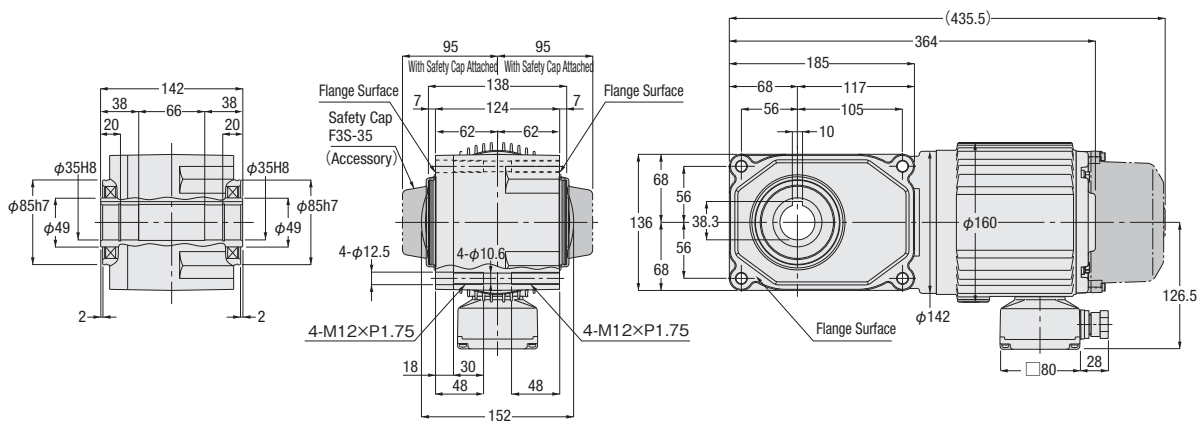


# F3S (RIGHT ANGLE HOLLOW BORE) 3-PHASE 0.75kW (1 HP)

## Hollow Bore Type

**Fig.C-7**

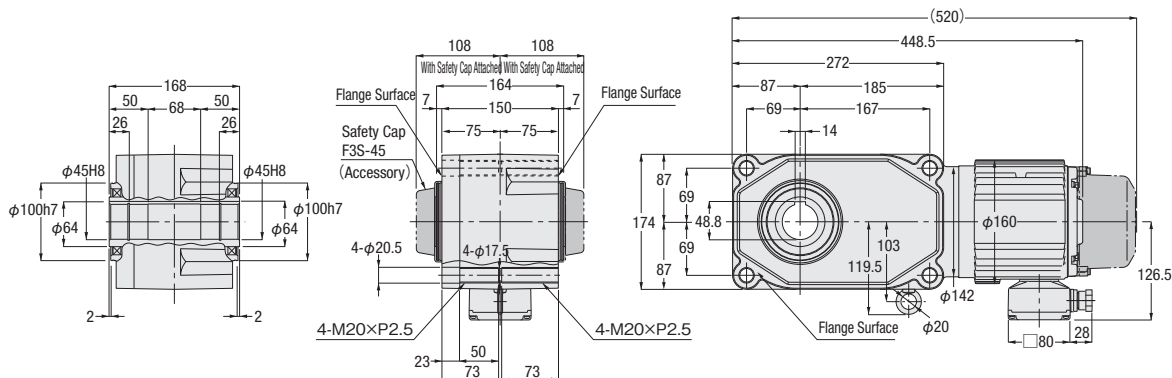
**F3S35N5~60<sup>1</sup>/<sub>N</sub> -IPG075NE**  
**(F3S35N5~60<sup>1</sup>/<sub>N</sub> -IPH075NE)**



**Approximate Weight : 15.5kg (17.5kg) / 34lb (38.5lb)**

**Fig.C-8**

**F3S45N80~240<sup>1</sup>/<sub>N</sub> -IPG075NE**  
**(F3S45N80~240<sup>1</sup>/<sub>N</sub> -IPH075NE)**



**Approximate Weight : 23kg (25kg) / 50.5lb (55lb)**

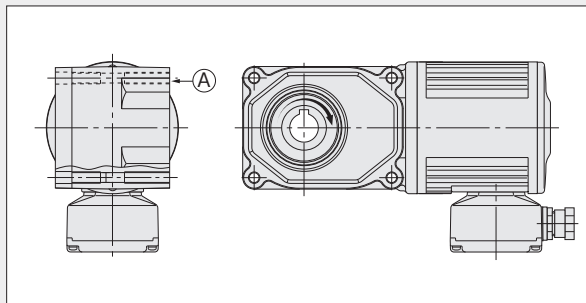
\* For a detailed diagram of the tapped holes for Flange Mount Installation (Standard Specification), refer to Page T57

# F3S (RIGHT ANGLE HOLLOW BORE) 3-PHASE 1.5kW (2 HP)

## Performance Table

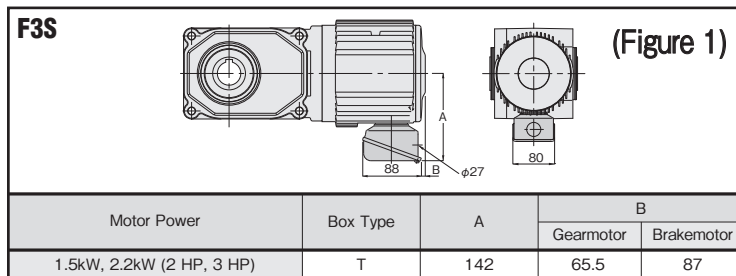
**[Items to Note]**

● Shaded cells (  ) in the performance table indicate that when a Clockwise (CW) direction is signaled by the driver, the output shaft will turn clockwise when the unit is oriented as shown in the figure to the right. Change the signal from the drive to Counter-Clockwise (CCW) in order to change the direction of rotation.



Motor Power	Frame No.	Nominal Reduction Ratio	Actual Reduction Ratio	Backlash <sup>2</sup> (Arcmin)		Output Shaft Rotational Speed (rpm)	Output Shaft Allowable Torque		Output Shaft Allowable O.H.L. <sup>1</sup>		Output Shaft Allowable Thrust Load		Shape and Dimensions Diagram Page, Fig. No., <sup>4</sup>
				N	L		(N·m)	(in·lb)	(N)	(lb)	(N)	(lb)	Gearmotor (Brakemotor)
1.5kW (2 HP)	45	1/5	1/5	—	30	0 ~ 360	32.4	287	2940	661	800	180	P.C11 Fig. C-9
		1/7.5	2/15	—		0 ~ 240	49.6	439	3330	749	900	202	
		1/10	1/10	—		0 ~ 180	66.8	591	3630	816	967	217	
		1/12	19/235	—		0 ~ 150	82.1	727	3920	881	1040	234	
		1/15	1/15	—		0 ~ 120	99.3	879	4070	915	1067	240	
		1/20	1/20	—		0 ~ 90	131	1159	4460	1003	1067	240	
		1/25	1/25	—		0 ~ 72	165	1460	4700	1057	1067	240	
		1/30	1/30	—		0 ~ 60	198	1752	4750	1068	1067	240	
		1/40	1/40	—		0 ~ 45	263	2328	4750	1068	1067	240	
		1/50	1/50	—		0 ~ 36	329	2912	4750	1068	1067	240	
	1/60	1/60	—	0 ~ 30	397	3514	4750	1068	1067	240			
	55	1/80	1/80	—	30	0 ~ 22	502	4443	6420	1443	1618	364	P.C11 Fig. C-10
		1/100	1/100	—		0 ~ 18	628	5558	6420	1443	1618	364	
		1/120	1/120	—		0 ~ 15	753	6665	7500	1686	1863	419	
		1/160	1/160	—		0 ~ 11	1002	8868	8330	1873	2059	463	
		* 1/200	1/200	—		0 ~ 9.0	1207	10683	9020	2028	2256	507	
		* 1/240	1/240	—		0 ~ 7.5	1207	10683	9800	2203	2452	551	

- (Notes)
1. Allowable O.H.L value is at the middle of the output shaft.
  2. Backlash accuracy is at the reducer unit level and is not the positioning accuracy.
  3. The models marked with \* are limited torque models. Be sure to refer to the allowable torque and the Performance Table.
  4. Dimensional diagrams on the subsequent pages are for IP65 Models and are intended to be for reference purposes only. See Figure 1 for IP44 T Box Models reference dimensions. The latest drawings can be found on our website.
  5. The figures illustrate standard terminal box positions. For optimal positions, refer to page T55, and specify the appropriate codes when ordering.



Model Codes  
P.12

Detailed Output Shaft  
Dimension Diagrams  
P.T56

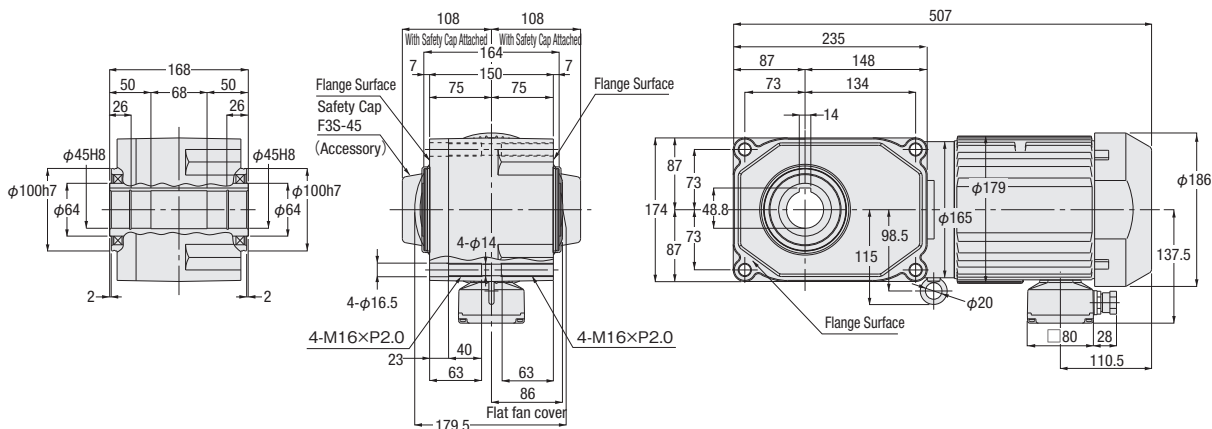
Options  
P.T70~T74

# F3S (RIGHT ANGLE HOLLOW BORE) 3-PHASE 1.5kW (2 HP)

## Hollow Bore Type

Fig.C-9

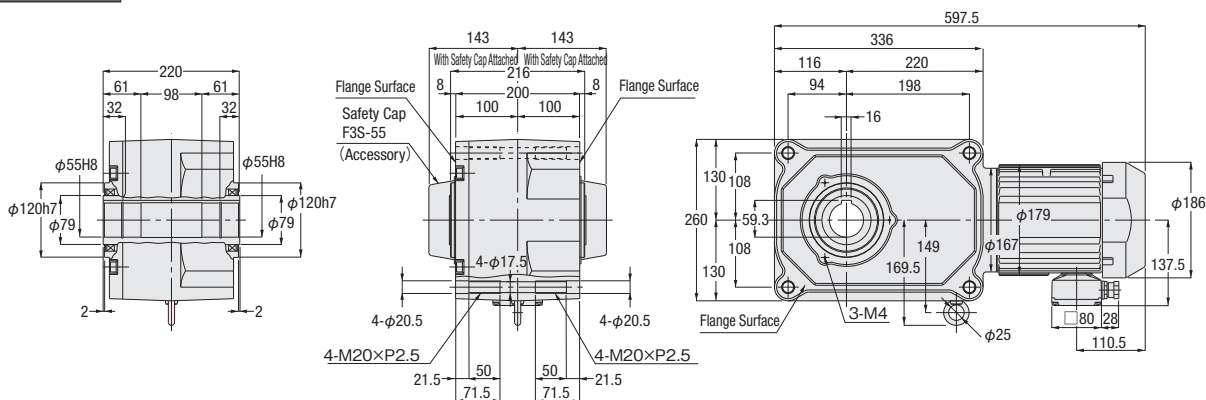
F3S45N5~60 $\frac{1}{N}$  -IPG150NE



Approximate Weight : 27.5kg / 60.5lb

Fig.C-10

F3S55N80~240 $\frac{1}{N}$  -IPG150NE



Approximate Weight : 81.5kg / 179.5lb

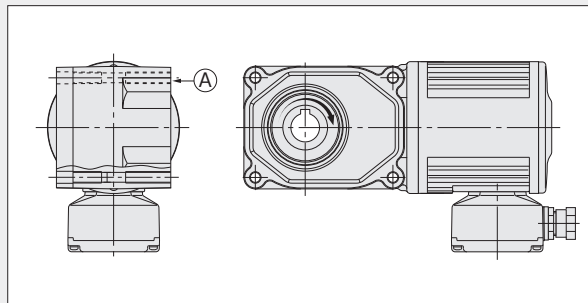
\* For a detailed diagram of the tapped holes for Flange Mount Installation (Standard Specification), refer to Page T57

# F3S (RIGHT ANGLE HOLLOW BORE) 3-PHASE 2.2kW (3 HP)

## Performance Table

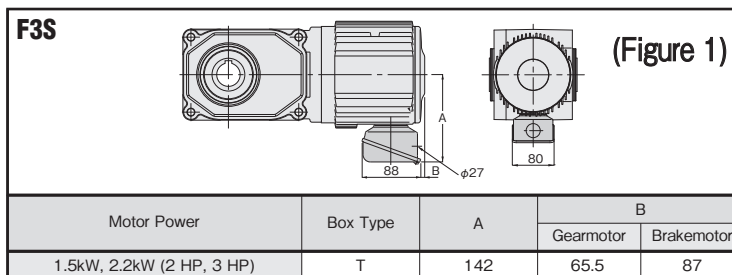
**[Items to Note]**

- Shaded cells (  ) in the performance table indicate that when a Clockwise (CW) direction is signaled by the driver, the output shaft will turn clockwise when the unit is oriented as shown in the figure to the right. Change the signal from the drive to Counter-Clockwise (CCW) in order to change the direction of rotation.



Motor Power	Frame No.	Nominal Reduction Ratio	Actual Reduction Ratio	Backlash <sup>2</sup> (Arcmin)		Output Shaft Rotational Speed (rpm)	Output Shaft Allowable Torque		Output Shaft Allowable O.H.L. <sup>1</sup>		Output Shaft Allowable Thrust Load		Shape and Dimensions Diagram Page, Fig. No. <sup>4</sup>
				N	L		(N·m)	(in·lb)	(N)	(lb)	(N)	(lb)	Gearmotor (Brakemotor)
2.2kW (3 HP)	45	1/ 5	1/ 5	—	30	0 ~ 360	47.8	423	3140	706	800	180	P.C13 Fig. C-11
		1/ 7.5	2/ 15	—		0 ~ 240	71.3	631	3530	794	900	202	
		1/ 10	1/ 10	—		0 ~ 180	95.7	847	3920	881	967	217	
		1/ 12	19/235	—		0 ~ 150	118	1044	4120	926	1040	234	
		1/ 15	1/ 15	—		0 ~ 120	142	1257	4410	991	1067	240	
		1/ 20	1/ 20	—		0 ~ 90	190	1682	4750	1068	1067	240	
		1/ 25	1/ 25	—		0 ~ 72	238	2106	4750	1068	1067	240	
		1/ 30	1/ 30	—		0 ~ 60	286	2531	4750	1068	1067	240	
	50	1/ 40	1/ 40	—	30	0 ~ 45	381	3372	5240	1178	1275	287	P.C13 Fig. C-12
		1/ 50	1/ 50	—		0 ~ 36	476	4213	5240	1178	1275	287	
		1/ 60	1/ 60	—		0 ~ 30	571	5054	5240	1178	1275	287	
	55	1/ 80	1/ 80	—	30	0 ~ 22	723	6399	6420	1443	1618	364	P.C13 Fig. C-13
		1/100	1/100	—		0 ~ 18	905	8010	6420	1443	1618	364	
		* 1/120	1/120	—		0 ~ 15	1085	9603	7500	1686	1863	419	

- (Notes)
1. Allowable O.H.L. value is at the middle of the output shaft.
  2. Backlash accuracy is at the reducer unit level and is not the positioning accuracy.
  3. The models marked with \* are limited torque models. Be sure to refer to the allowable torque and the Performance Table.
  4. Dimensional diagrams on the subsequent pages are for IP65 Models and are intended to be for reference purposes only. See Figure 1 for IP44 T Box Models reference dimensions. The latest drawings can be found on our website.
  5. The figures illustrate standard terminal box positions. For optimal positions, refer to page T55, and specify the appropriate codes when ordering.



Model Codes  
P.12

Detailed Output Shaft  
Dimension Diagrams  
P.T56

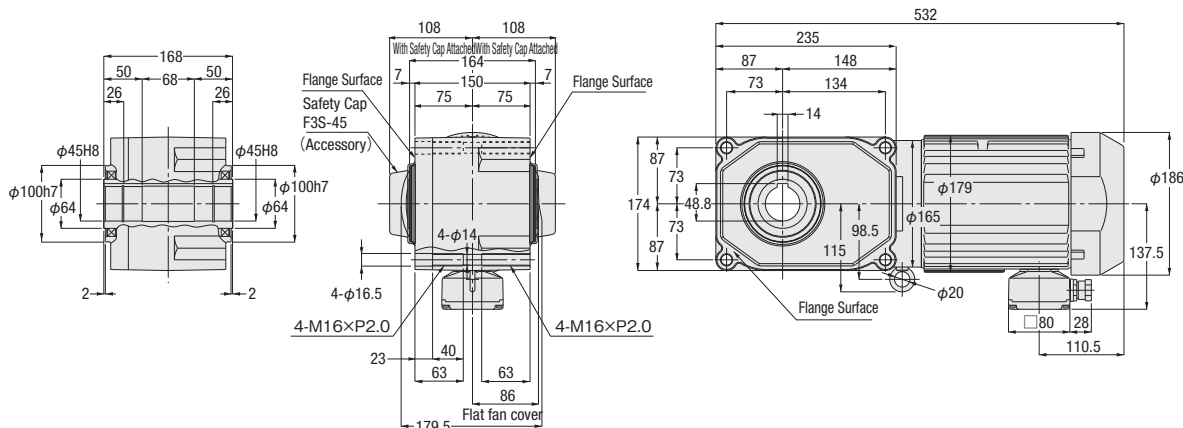
Options  
P.T70~T74

# F3S (RIGHT ANGLE HOLLOW BORE) 3-PHASE 2.2kW (3 HP)

## Hollow Bore Type

**Fig.C-11**

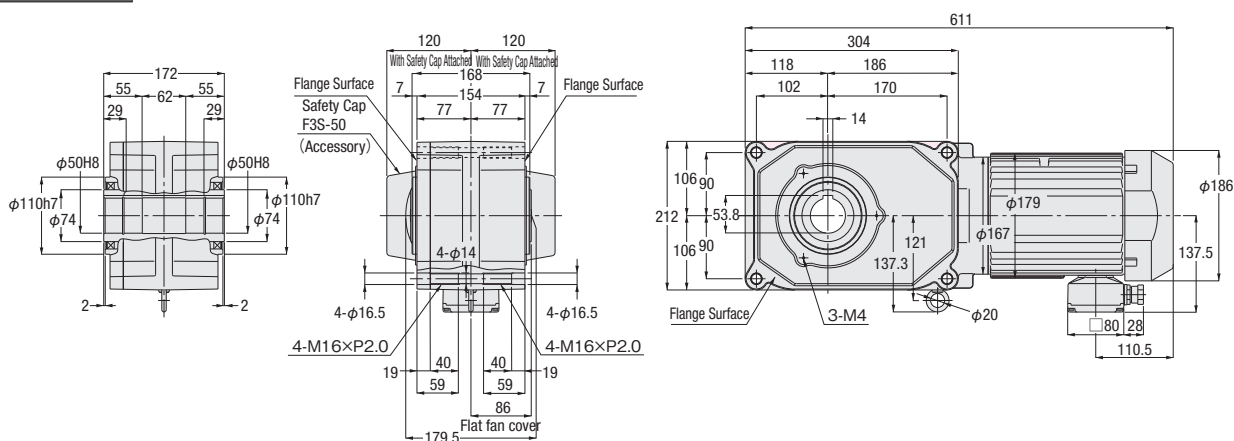
**F3S45N5~30 $\frac{1}{2}$  -IPG220NE**



Approximate Weight : 30.5kg / 67lbs

**Fig.C-12**

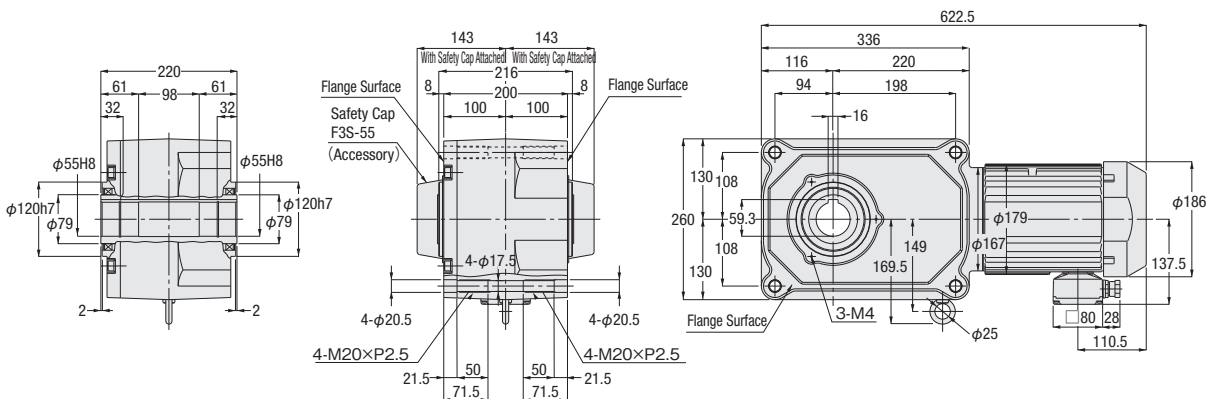
**F3S50N40~60 $\frac{1}{2}$  -IPG220NE**



Approximate Weight : 39.5kg / 87lbs

**Fig.C-13**

**F3S55N80~120 $\frac{1}{2}$  -IPG220NE**



Approximate Weight : 86.5kg / 190.5

\* For a detailed diagram of the tapped holes for Flange Mount Installation (Standard Specification), refer to Page T57



# Motor unit and brake unit specifications

## CONTENTS

- Motor Unit Specification..... P. T2
- Brake Specification ..... P. T3
- How to read the Nameplate..... P. T4

# MOTOR SPECIFICATIONS

## Motor

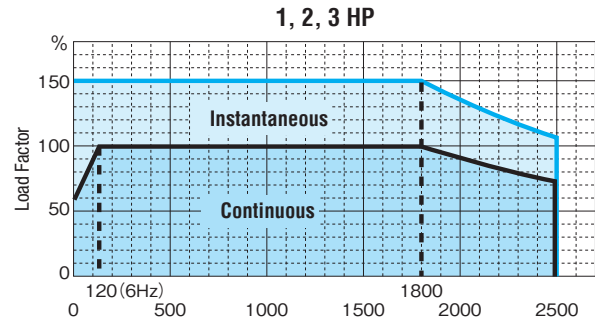
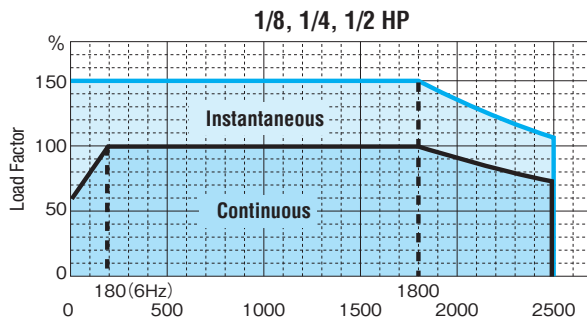
Motor Type		IPM Motor (Interior Permanent Magnet Motor)						
Motor Designation		010	020	040	075	150	220	
Motor Power		0.1kW (1/8 HP)	0.2kW (1/4 HP)	0.4kW (1/2 HP)	0.75kW (1 HP)	1.5kW (2 HP)	2.2kW (3 HP)	
Motor Poles <small>(Note 1)</small>		4 poles			6 poles			
Instantaneous Max. Torque (Vs. Rating)		150%						
Rated Current (A)		0.45	0.86	1.74	3.37	6.13	8.20	
Minimum Speed (rpm) <small>(Note 2)</small>		0						
Rated Speed (rpm)		1800(60Hz)			1800(90Hz)			
Maximum Speed (rpm) <small>(Note 3)</small>		2500(83.3Hz)			2500(125Hz)			
Constant Torque Speed Control Range (rpm)		180 – 1800(1:10)			120 – 1800(1:15)			
Protection	Classification	M	Totally Enclosed Non-Ventilated (TENV), IP44		<small>Totally Enclosed, Non-Ventilated (TENV), IP44</small>	Totally Enclosed Fan-Cooled (TEFC), IP44		
		B·J	Totally Enclosed Fan-Cooled (TEFC), IP44		Totally Enclosed Fan-Cooled (TEFC), IP44			
		G	Totally Enclosed Non-Ventilated (TENV), IP65			Totally Enclosed Fan-Cooled (TEFC), IP65		
		H	Totally Enclosed Non-Ventilated (TENV), IP65			—		
Heat Resistance Class		Class B						

(Note) 1. The number of IPM motor poles vary depending on the motor power. Please note that the number of poles affect the synchronous speed of the motor per the

$$\text{Speed (rpm)} = \frac{(120 \times \text{Frequency setting})}{\text{Number of motor poles}}$$

- Rotational irregularities tend to increase when operating at motor speeds of 100 RPM or less.
- When using the motor above 1800 RPM, refer to the charts below to determine appropriate output torque capabilities.

## Operation Range



- (Note) 1. Allowable torque in the performance tables is applicable for motor speeds of 1,800 rpm. To find the allowable torque for another speed, multiply the allowable torque in the performance table by the corresponding allowable torque ratio in the diagram above.
- To obtain adjusted O.H.L. values for another speed, multiply the allowable O.H.L. in the performance table by the corresponding allowable torque ratio in the diagram above.
  - When using an input speed above 1,800 rpm, multiply the value of the allowable inertia moment J (Allowable CD<sup>2</sup>) with (1,800/input speed)<sup>2</sup>.
  - If 0.75 kW, 1.5 kW or 2.2 kW brakemotors are operated at low speeds (less than 300 rpm) for a long period of time the brake will begin to heat up due to the decreased cooling effect of the fan. Contact us for more details.



# BRAKE SPECIFICATIONS

## Brake

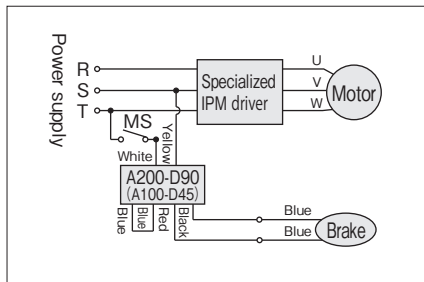
Item	Motor Power									
	0.1kW (1/8 HP)		0.2kW (1/4 HP)		0.4kW (1/2 HP)		0.75kW (1 HP)		1.5kW (2 HP)	2.2kW (3 HP)
Motor Power Designation	010		020		040		075		150	220
Classification	B·J	H	B·J	H	B·J	H	B·J	H	B·J	B·J
Brake Type	Power-Off (Spring Close)									
Static Friction Torque (N·m) [kgf·m] Note 2	0.98 {0.10}		1.96 {0.20}		3.92 {0.40}		7.35 {0.75}		14.7 {1.50}	21.6 {2.20}
With VDC (Average) Rectifier (V)	90									
Power Draw (at 75°C) (W)	14	10	14	10	16	12	24	16	37	37
Current Draw (at 75°C) (A)	0.15	0.11	0.15	0.11	0.18	0.13	0.27	0.17	0.41	0.41

- (Note) 1. The brake is meant for holding and should not be used for braking.  
 2. This value should only be used as a guide since it is not guaranteed.  
 3. Avoid applying power to the brake coil continuously when the motor is stopped as it will begin to heat up due to the reduced cooling effect of the fan.  
 4. Do not apply the simplified servo block continuously when power is not supplied to the brake (at braking). Motor current could increase so that it may trip owing to overload.

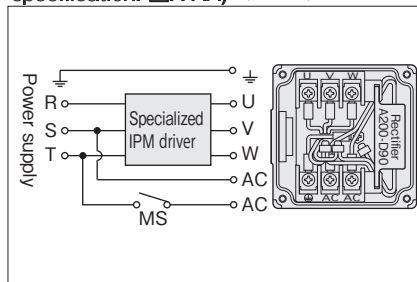
## Brake Wiring

Make sure the brake wiring bypasses the driver so that the brake is powered from the input side of the driver. This is important since the brake may malfunction if wired to the output side of the driver due to fluctuations in voltage. Use the brake sequence function (driver specification (P. T26) for the timing to turn ON/OFF the brake.

### AC switching (A)

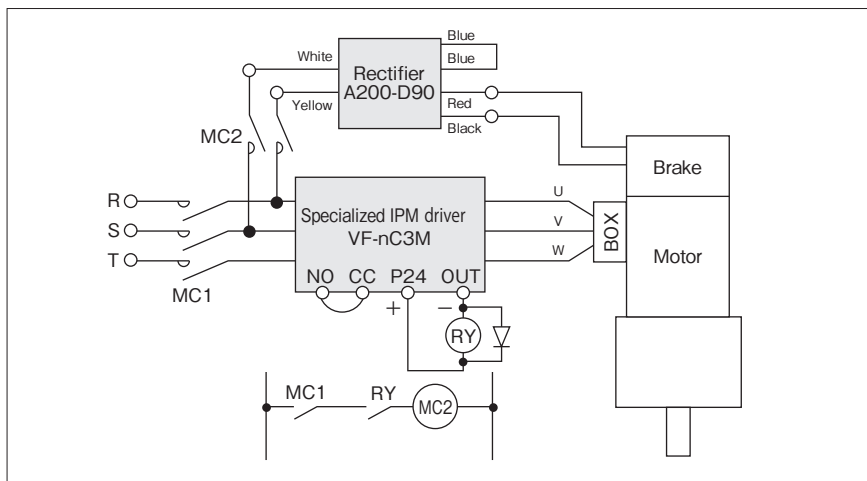


### Terminal box (with built-in rectifier) AC switching (A) (Custom order specification: □X-AA) (Note 1)



(Note) 1. □ is for the type of terminal box. For details, refer to (P. T49).

## Example circuit for brake ON/OFF (AC switching (A))



(Note) 1. The function of output terminal OUT utilizes the "Brake open signal" (Function No. 68 [Positive logic], 69 [Negative logic]). (Function No. 68 has already been assigned when shipped from the factory.)

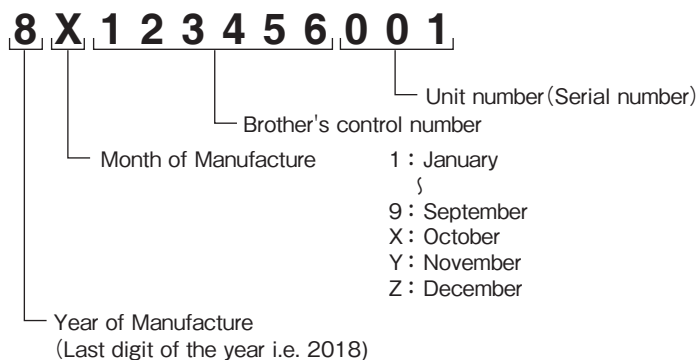
# NAMEPLATE

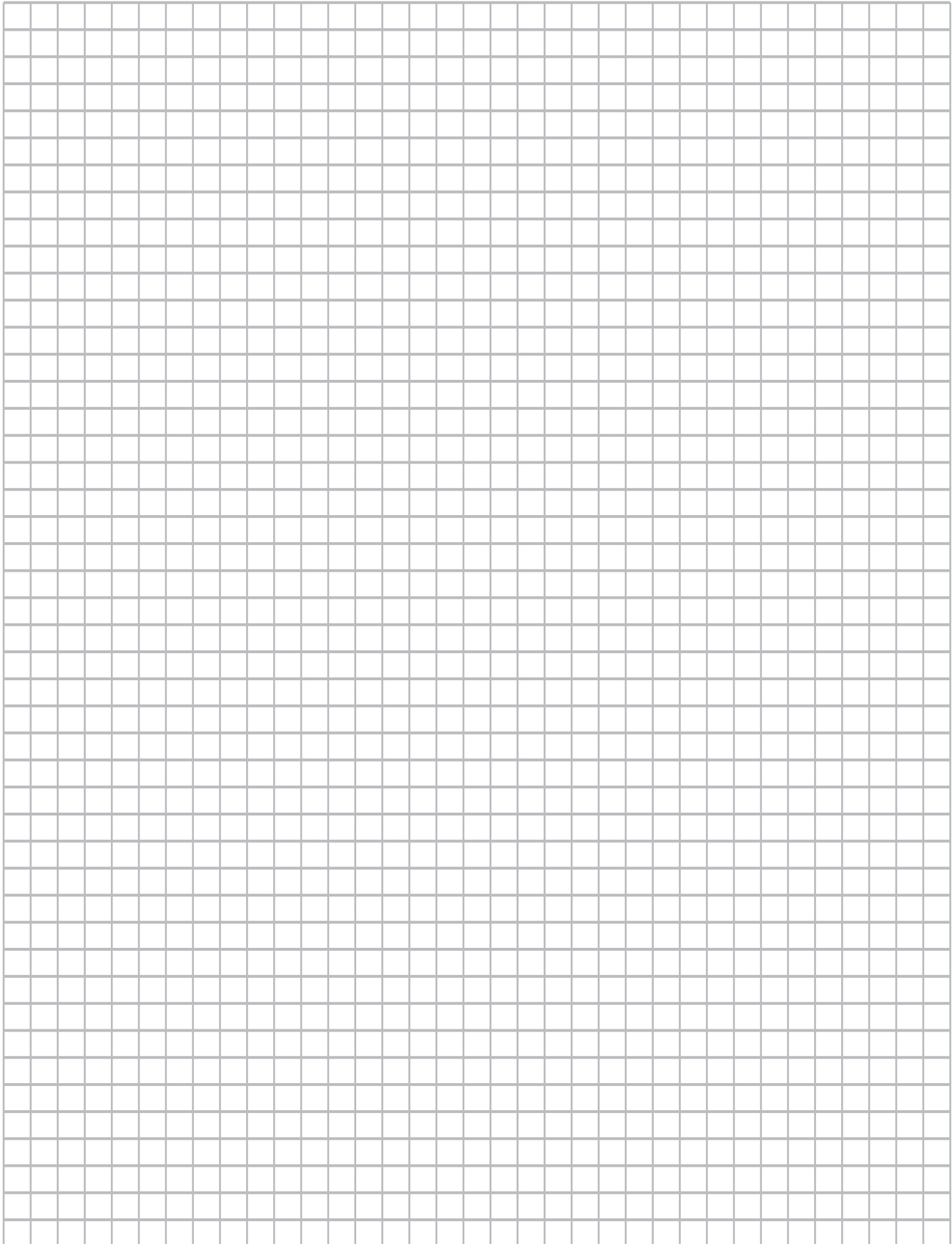
## How to read the Nameplate



- Ⓐ Product Name
- Ⓑ Reduction Ratio
- Ⓒ Motor Power
- Ⓓ Manufacturing number
- Ⓔ Number of Phases
- Ⓕ Duty Rating
- Ⓖ Motor Characteristics
- Ⓗ Insulation Class
- Ⓘ Number of Poles
- Ⓝ Option
- Ⓚ Option Code
- Ⓛ QR code (Brother private controlling code)

## How to read the manufacturing number







# Driver Specifications

## CONTENTS

■ Specialized driver, type code .....	P. T8
■ External dimensions of specialized driver .....	P. T9
■ driver specifications .....	P.T10
■ Connection diagram of specialized driver .....	P.T12
■ Terminal board functions .....	P.T13
■ Panel and operating method .....	P.T14
■ Basic parameter .....	P.T16
■ Expansion parameter .....	P.T18
■ Table of I/O terminal function .....	P.T24
■ Chart	
● Brake sequence function .....	P.T26
● Simplified servo lock function .....	P.T27
● Contact stop/contact thrust function .....	P.T28
● Free unit display function .....	P.T29
■ Options for driver .....	P.T30
■ Caution for use .....	P.T34
■ Caution for use (driver) .....	P.T35

# CONTROL UNIT SPECIFICATIONS

Specialized inverters for IPM gearmotors are classified with the following codes. Specify these codes when placing orders or inquiring.

Motor capacity	Type of Specialized Inverter
0.1kW	<b>VF-nC3M-2001PY-A30</b>
0.2kW	<b>VF-nC3M-2002PY-A30</b>
0.4kW	<b>VF-nC3M-2004PY-A30</b>
0.75kW	<b>VF-nC3M-2007PY-A30</b>
1.5kW	<b>VF-nC3M-2015PY-A30</b>
2.2kW	<b>VF-nC3M-2022PY-A30</b>

## Names and functions of respective sections

### ■ Appearance

#### ● With cover closed



**Charge lamp**  
Indicates there is still high voltage left in the driver. For safety, do not open the terminal block cover when the lamp is lit.

**Terminal Block Cover**  
This is the body or terminal block cover. Always close this cover before operation to avoid accidentally touching the terminal block.

**Cover Locking Hole**  
You can lock the terminal block cover by shutting it and passing a wire key through this hole.

#### ● With cover opened

**RUN lamp**  
This lamp is lit when the operation command is turned ON but frequency is not output. The lamp starts to flash when the operation starts.

**% lamp**  
When this lamp is lit, the unit of value on display is %.

**Hz lamp**  
When this lamp is lit, the unit of value on display is Hz.

**PRG lamp**  
When the lamp is lit, it is in the parameter setting mode. When the lamp is flashing, it is in the state of **AUH** (History function), or Gr-U.

**MON lamp**  
When the lamp is lit, it is in the monitor mode. When the lamp is flashing, it is in the state of "Detailed monitor display of past trip history".

**Caution mark for high voltage**  
High voltages are applied to the internal terminals at the top right. Never touch them.

**STOP key**  
If this key is pressed when the RUN lamp is flashing, the equipment decelerates and stops.

**RUN key**  
If this key is pressed when the RUN lamp is lit, operation starts.

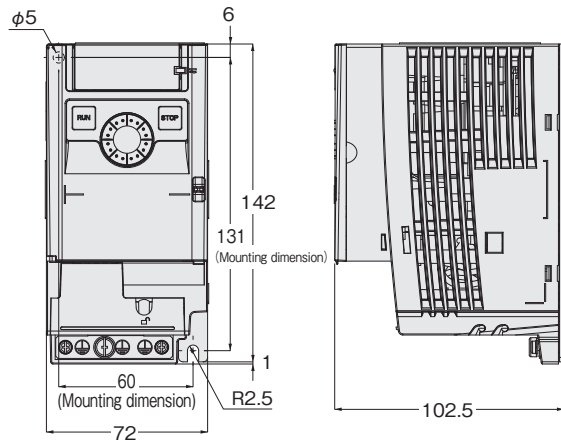
**MODE key**  
Use this key to switch between run, settings, and status monitor modes.

**Setting dial**  
Turning the dial left and right changes the operation frequency, cycles parameters, and cycles among menus within parameters. Press the center of dial to finalize the setting.

**EASY key**  
Use this key to select between the simplified or standard setting modes.

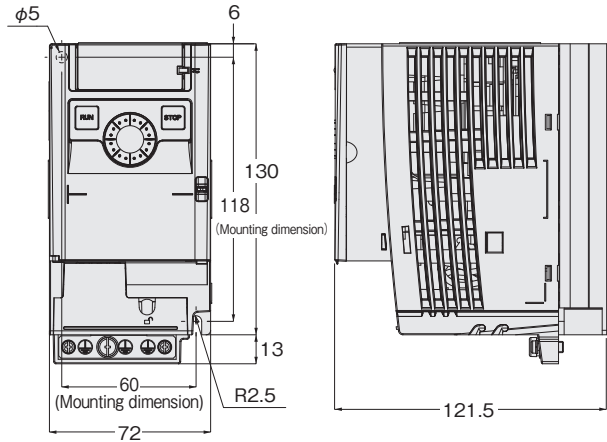
## Control Unit Specs

**Fig.T1** VF-nC3M-2001PY-A30  
VF-nC3M-2002PY-A30



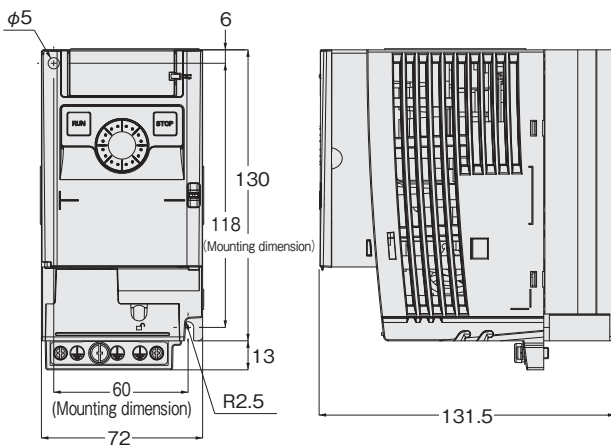
Approximate Weight : 1.0kg / 2.2 lb

**Fig.T2** VF-nC3M-2004PY-A30



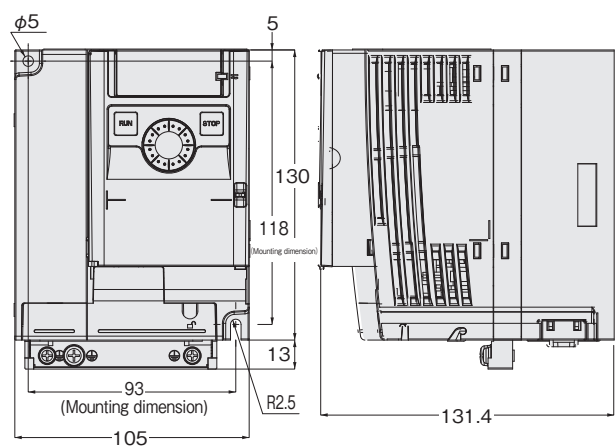
Approximate Weight : 1.0kg / 2.2 lb

**Fig.T3** VF-nC3M-2007PY-A30



Approximate Weight : 1.0kg / 2.2 lb

**Fig.T4** VF-nC3M-2015PY-A30  
VF-nC3M-2022PY-A30



Approximate Weight : 1.5kg / 3.3 lb

# DRIVER SPECIFICATIONS

## Standard specifications

Item		Description					
Input Voltage Class		3-phase, 200 V Class					
Applicable Motor Output		0.1kW	0.2kW	0.4kW	0.75kW	1.5kW	2.2kW
Device Rating	Model	VF-nC3M					
		2001PY-A30	2002PY-A30	2004PY-A30	2007PY-A30	2015PY-A30	2022PY-A30
	Output Power (kVA) (Note 1)	0.3	0.6	1.0	1.6	2.9	3.9
	Rated Output Current (A) (Note 2)	0.7	1.4	2.4	4.2	7.5	10.0
		(0.7)	(1.4)	(2.4)	(3.6)	(7.5)	(8.5)
	Output Voltage (Note 3)	3-phase, 200 - 240 V (Note 4)					
Overload Current Rating	150% - 1 min, 200% - 0.5 sec (Anti-time limit characteristic)						
Power Supply	Voltage, Frequency	3-phase, 200 - 240 V, 50 Hz/60 Hz (Note 4)					
	Allowable Fluctuation	Voltage 170 V - 264 V (Note 5), frequency $\pm 5\%$					
Protective Structure		IP20					
Cooling Structure		Self-cooled			Forced windchill		
Paint Color		JIS equivalent color 10B, 2.5/1 (Note 6)					
Built-in Filter		—					
Environment	Ambient Temperature	-10~60°C (Note 7) (Note 8) (Note 9)					
	Relative Humidity	5% - 95% (Dewing, vapor not allowed)					
	Altitude	Altitude not higher than 3,000 m (It is necessary to reduce current if higher than 1,000 m.)					
	Installation Environment	Indoors. No direct exposure to sunlight. Free from corrosive gas, explosive gas, combustible gas, oil mist, dust, etc.					
	Vibration	Less than 5.9m/S <sup>2</sup> (0.6G) (10 - 55Hz)					
	Wiring Length between Specialized driver and IPM gearmotor (Note 10)	50 m or less					

(Note)1. Rated output power is for the output voltage at 220 V.

2. The value for when PWM carrier frequency is 4 kHz or less. If it is 5 kHz - 12 kHz, the rated output current values in parentheses apply. Further reduction is necessary for 13 kHz or higher. PWM carrier frequency is set at 12 kHz as standard when shipped from factory.
3. Max. output voltage turns out to be same as the input power supply voltage.
4. Power supply voltage rating of the motor unit of IPM gearmotor is 200 - 230 V. When using 240 V, consult us.
5. It is  $\pm 10\%$  when using continuously (100% load).
6. Actual paint color is RAL7016 (DIN Standard). JIS code of equivalent color is used in the table.
7. When the ambient temperature is higher than 40°C, remove the caution nameplate (Seal) at the top of driver main unit.
8. When the ambient temperature is higher than 50°C, remove the caution nameplate (Seal) at the top of driver main unit and further reduce the rated output current.
9. In case of the side-by-side installation (disposing closely), remove the caution nameplate (Seal) at the top of driver main unit. When the ambient temperature is higher than 40°C, however, remove the caution nameplate (Seal) at the top of driver main unit and further reduce the rated output current.
10. Do not use a shielded cable. If it is necessary to use shielded cables to suppress noise, for example, consult us.  
When using a zero phase reactor to reduce radio noise, the number of turns to the reactor of each phase must be 4 turns or less.



## Main Functions

	Item	Description
Control Function	Control Method	Sinusoidal PWM control
	Control Motor	IPM Gearmotor
	Operation Frequency Range	0.1 – 400.0 Hz
	Frequency Setting Resolution	0.1 Hz: Analog input, 0.01 Hz: Input from operation panel
	Frequency Accuracy	Digital setting: Within $\pm 0.1\%$ of max. output frequency ( $-10$ to $60^{\circ}\text{C}$ ) Analog setting: Within $\pm 1.0\%$ of max. output frequency ( $25^{\circ}\text{C} \pm 10^{\circ}\text{C}$ )
	Acceleration/Deceleration Time	0.0 – 3,000 sec, switching of acceleration/deceleration times 1 and 2, switching of “S” accelerations 1 and 2
	PWM Carrier Frequency	Adjustable within 2 – 16 Hz (Standard setting 12 kHz)
	Multiple Function Input Terminal	Functions selected from approx. 60 functions, including the normal/reverse rotation signal, multi-step speed commands 1 – 4, reset signal, contact stop deceleration signal, etc., can be assigned to 5 input terminals. Sink and source can be switched.
	Multiple Function Output Terminal	Functions selected from approx. 40 functions, including the upper/lower limit of frequency, error signal, simplified servo lock brake signal, contact stop state output, etc., can be assigned to the FL relay output and open collector output.
	Normal/Reverse Rotation	Press “RUN” key on the panel for normal rotation. Press “STOP” key to stop. Normal/reverse rotation may be selected with the contact input from terminal board and the communication function.
	Multi-step Speed Operation	It is operable with the basic setting frequency + 15-step speed by combinations of 4 contact inputs from the terminal board.
	Error Detection Signal	Output from 1c contact (250 Vac – 2 A ( $\cos\phi = 1$ ): At resistance load, 30 Vdc – 1 A, 250 Vac – 1 A ( $\cos\phi = 0.4$ ))
Protective Function	Protective Function	Stall prevention, current limit, over-current, output short-circuit, over-voltage, under-voltage, grounding detection, input phase interruption, output phase interruption, overload by electronic thermal, arm over-current at startup, load side overload at startup, over-torque, low current, overheat, accumulated operation time, life time alarm, emergency stop, various pre-alarms
	Electronic Thermal Characteristics	Setting of motor electronic-thermal protection level 1, setting of overload trip time, adjustment of stall prevention levels 1, selection of overload stall
	Reset	Function of resetting by closing contact 1a or by turning off power or the operation panel. This function is also used to save and clear trip records.
Display Function	Alarm Display	Stall prevention during operation, over-voltage limiting, overload, under-voltage, setting error, in retry, upper/lower limit
	Cause of Error	Over-current, over-voltage, overheat, output short-circuit, grounding, driver overload, arm over current at startup, load side over-current at startup, CPU error, EEPROM error, RAM error, ROM error, communication error
	Monitoring Function	Operation frequency, operation frequency command, normal/reverse rotation, output current, input (DC unit) voltage, output voltage, torque, torque current, driver load factor, input power, output power, input terminal information, output terminal information, logic setting of input terminal, CPU1 version, CPU2 version, PID feed back amount, actual output frequency, causes 1 – 4 of past trip, part replacement alarm information, accumulated operation time
	Monitoring Function for Past Trip	Number of continuous trips, operation frequency, normal/reverse rotation, operation frequency command, output current, input (DC unit) voltage, output voltage, input terminal information, memory of 4 accumulated times of operation in the past
	4-digit 7-segment LED	Frequency display: driver output frequency Alarm display: Over-voltage alarm “P”, overload alarm “L”, overheat alarm “H” Status display: States of driver (frequency, cause of tripped protective function, output current, etc) and setting parameters Free unit display: Displays arbitrary unit for output frequency (speed, etc.)
	Lamp Lighting	States of driver operation are indicated by lighting RUN lamp, MON lamp, PRG lamp, % lamp and Hz lamp. Charge level of main circuit capacitor is indicated with the LED charge lamp

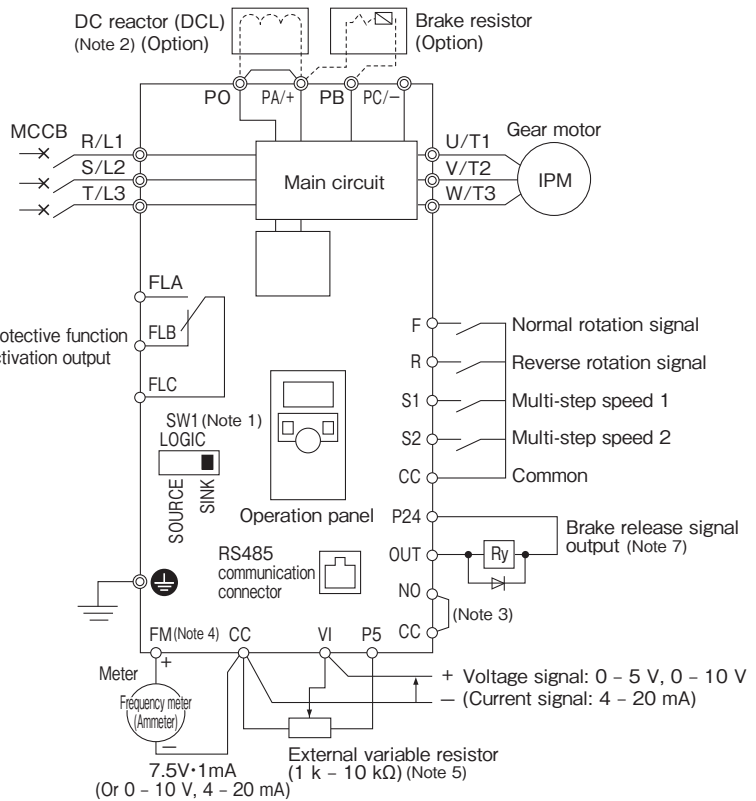
# DRIVER SPECIFICATIONS

## Standard Connection Diagram

### Example of connections at the sink (Common: CC) side

Main circuit power supply  
3-phase, 200 V class  
3-phase, 200 - 240 V, 50/60 Hz  
(Note 6)

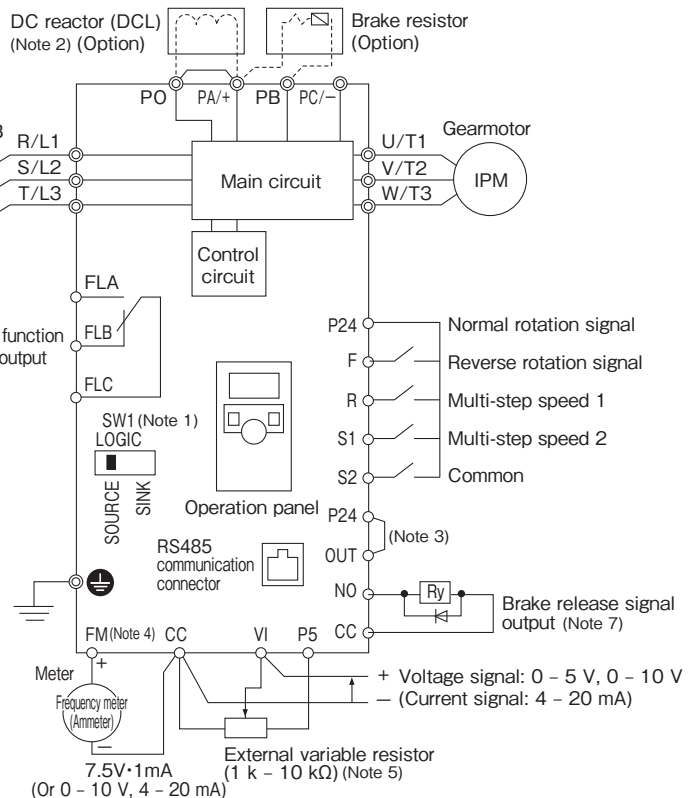
- (Note)1. Set the slide SW1 (LOGIC) at the SINK side.
- It is short-circuited between PO and PA/+ terminals with a bar at shipping from factory. When installing a DC reactor (DCL), remove the bar.
  - When using the output terminal OUT with the sink logic, short-circuit between NO and CC terminals.
  - When using the FM terminal as a contact output terminal, set the slide switch SW3 (FM) at the OUT2 side.
  - When connecting an external variable resistor via the P5 terminal, set the parameter **F109** at 3.
  - Power supply voltage rating for IPM gearmotor is 200 - 230 V. When using 240 V, consult us.
  - The brake open signal is output if the parameter **F341** "Brake function mode" is set at 3 (Valid).



### Example of connections at the source (Common: P24) side

Main circuit power supply  
3-phase, 200 V class  
3-phase, 200 - 240 V, 50/60 Hz


- (Note)1. Set the slide switch SW1 (LOGIC) at the SOURCE side.
- It is short-circuited between PO and PA/+ terminals with a bar at shipping from factory. When installing a DC reactor (DCL), remove the bar.
  - When using the output terminal NO with the source logic, short-circuit between terminals P24 and OUT.
  - When using the FM terminal as a contact output terminal, set the slide switch SW3 (FM) at the OUT2 side.
  - When connecting an external variable resistor via the P5 terminal, set the parameter **F109** at 3.
  - Power supply voltage rating for IPM gearmotor is 200 - 230 V. When using 240 V, consult us.
  - The brake open signal is output if the parameter **F341** "Brake function mode" is set at 3 (Valid).



# DRIVER SPECIFICATIONS

## Terminal Board Function

### Function of main circuit terminal

Terminal No.	Function of Terminal
	This is the grounding terminal for specialized driver. There are 3 terminals.
R/L1, S/L2, T/L3	200 V class: 3-phase, 200 – 240 V, 50/60 Hz (Note 1)
U/T1, V/T2, W/T3	Connect these to IPM gearmotor.
PA/+, PB	Connect these to the brake resistor. Set <b>F304, F305, F308</b> or <b>F309</b> as required.
PC/–	This is the negative potential terminal of internal DC main circuit. DC common power supply can be input between this and PA/+ terminal (positive potential).
PO, PA/+	These are terminals to connect the DC reactor (DCL: Stand alone, option). These are short-circuited with the short-circuit bar at the shipment from factory. Remove the short-circuit bar when DCL is installed.

(Note)1. Power supply voltage rating of IPM gearmotor is 200 – 230 V. When 240 V is required, consult us.

### Function of control circuit terminal

Terminal No.	I/O	Function	Electrical Specification	
F	Input	Multiple function programmable contact input	No voltage contact input 24 Vdc, 5 mA or less ※Sink and source can be switched with the slide switch SW1 (LOGIC). (Descriptions at left are for the sink logic.)	
R	Input			It is short-circuited between F and CC with the standard shipment setting for normal rotation operation. If it is opened, the equipment decelerates and stops. (When ST is always ON) Three functions can be assigned simultaneously to this terminal.
S1	Input			It is short-circuited between R and CC with the standard shipment setting for reverse rotation operation. If it is opened, the equipment decelerates and stops. (When ST is always ON) Three functions can be assigned simultaneously to this terminal.
S2	Input			It is short-circuited between S1 and CC with the standard shipment setting for multi-step speed operation. Two functions can be assigned simultaneously to this terminal.
CC	Common to I/O	This is the equipotential terminal of control circuit. (2 places)	—	
P5	Output	This is the power supply output for analog input setting.	5 Vdc (Allowable load current: 10 mAdc)	
VI	Input	<ul style="list-style-type: none"> <li>Multiple function programmable analog input. With the standard shipment setting (<b>F109</b> = 0), the input is 0 – 10 Vdc and the frequency setting is 0 – 60/90 Hz.</li> <li>If the parameter setting is changed (<b>F109</b> = 1), the input can be changed to 4 – 20 mAdc (0 – 20 mA).</li> <li>If the parameter is changed (<b>F109</b> = 3), the input can be changed to 0 – 5 Vdc. When connecting an external variable resistor via P5 terminal, change to this setting.</li> <li>If the parameter is changed (<b>F109</b> = 2), it can be used as the multiple function programmable contact input terminal. Use the slide switch SW1 (LOGIC) and the parameter <b>F127</b>. In this case, set the slide switch SW2 (RESIST) at the ON side.</li> </ul>	5 V/10 Vdc (Internal impedance: 40 kΩ) 4 – 20 mA (Note 1) (Internal impedance: 250 Ω)	
FM	Output	<ul style="list-style-type: none"> <li>Multiple function programmable analog output</li> <li>Standard shipment setting is the output frequency.</li> <li>If the parameter (<b>F681</b>) is changed, it can be changed to 0 – 20 mAdc (4 – 20 mA) or 0 – 10 Vdc.</li> <li>If the slide switch SW3 (FM) is set at the OUT side, it can be used as the multiple programmable open collector output. (Sink logic only)</li> </ul>	Analog output •1 mA full scale DC ammeter •0 – 20 mA (4 – 20 mA) DC ammeter Allowable load resistance: 750 Ω or less •0 – 10 V DC voltmeter Allowable load resistance: 1 kΩ or more  Open collector output •25 Vdc, 50 mA	
P24	Output	24 Vdc power supply output	24 Vdc, 100 mA	
OUT NO	Output	<ul style="list-style-type: none"> <li>Multiple function programmable open collector output. With the standard shipment setting, it detects and outputs the brake release signal. (When the parameter <b>F341</b> is set at 3)</li> <li>This is a combined function output terminal to which 2 function can be assigned simultaneously.</li> <li>NO terminal is the equipotential terminal for OUT. This is insulated from CC terminal.</li> <li>If the parameter is changed (<b>F669</b>), it can be used as the multiple function programmable pulse train output. Pulse duty is 50%.</li> </ul>	Open collector output 24 Vdc, 100 mA Pulse train output It is necessary to apply a current of 10 mA or more. Pulse frequency range: 25 – 1,600 pps	
FLA FLB FLC	Output	<ul style="list-style-type: none"> <li>Multiple function programmable relay contact output. With the standard shipment setting, it detects and outputs the activation of inverter's protective function.</li> <li>If the activation of protective function is detected, it is closed between FLA and FLC while it is opened between FLB and FLC if the activation of protective function is detected.</li> </ul>	Max. contact capacity •250 Vac, 2 A (cosφ = 1): At resistance load •30 Vdc, 1 A: At resistance load •250 Vac, 1 A (cosφ = 0.4) Min. contact capacity •5 Vdc, 100 mA	

(Note)1. VI terminal: If 4 – 20 mA is selected, the internal impedance is 250Ω when the specialized driver is turned ON. Care must be taken because, if the power supply is turned OFF, the internal impedance increases largely to approx. 40 kΩ.

# DRIVER SPECIFICATIONS

## Panel and operating method

### Monitor display

Following codes are used on the LED indicator on the operation panel in order to show the activation, parameter, etc.

### LED display (Numeral)

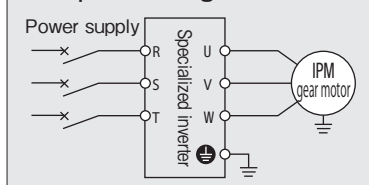
0	1	2	3	4	5	6	7	8	9	—
0	1	2	3	4	5	6	7	8	9	—

### LED display (Alphabet)

Aa	Bb	C	c	Dd	Ee	Ff	Gg	H	h	I	i	Jj	Kk	Ll
A	b	C	c	d	E	F	G	H	h	I	i	J	K	L
Mm	Nn	O	o	Pp	Qq	Rr	Ss	Tt	Uu	Vv	Ww	Xx	Yy	Zz
M	n	O	o	P	q	r	S	t	U	v	W	X	Y	Z

### Panel operating method

#### Example of wiring



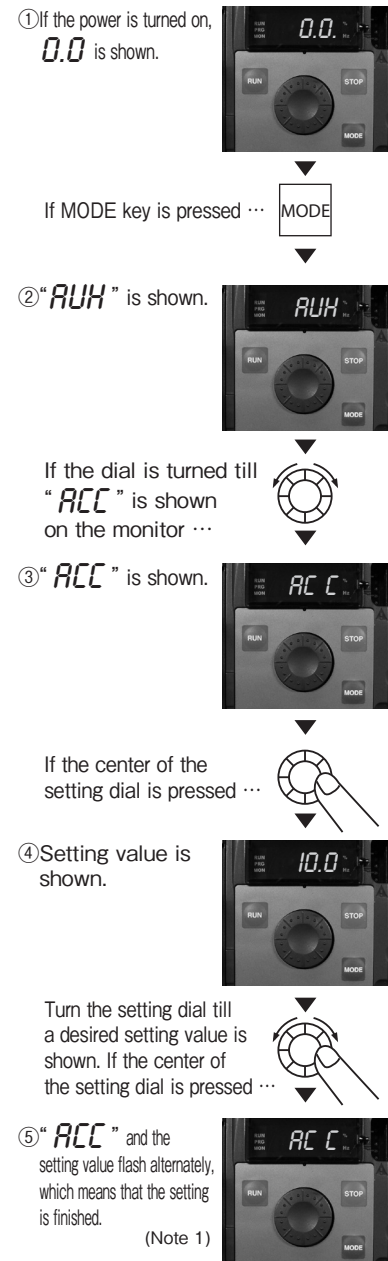
#### Operation



#### Monitor



#### Setting



(Note)1 If the center of the setting dial is pressed without changing the setting value, the parameter "DEC" is shown.

# DRIVER SPECIFICATIONS

Display Contents	Panel Control	LED Display	Description
Operation frequency (Note 1)		60.0	Displays operation frequency (during 60 Hz operation). (When the standard monitor display selection is set as $F710=0$ [Operation frequency])
Parameter setting mode		RUH	Displays the first basic parameter: "History function (RUH)".
Rotating direction		Fr-F	Displays the revolving direction. (Fr-F : Normal rotation, Fr-r : Reverse rotation)
Operation frequency command (Note 1)		F60.0	Displays the operation frequency command value (Hz/free unit). (When $F711=2$ )
Torque (Note 1)		980	Displays the driver output torque (%). (When $F712=7$ )
Output current (Note 1)		C00	Displays the driver output current (Load current) (%). (When $F713=1$ )
Input voltage (Note 1)		4100	Displays the driver input voltage (DC unit) (%). (When $F714=3$ )
Free unit display magnification 2 (Note 1)		1800	Displays the value set with the free unit display magnification 2. (See P. T18.) (When $F715=50$ )
LED display valid number of digits (Note 1)		d 0	Displays the position of decimal point for the display value of free unit display magnification 2. (When $F715=51$ )
Input terminal		R . . . .	Displays the ON/OFF state of control input terminals (FR, S1, S2, VI) in bits. At ON:   At OFF:   
Output terminal		0 . .	Displays the ON/OFF state of control input terminals (OUT, FL) in bits. At ON:   At OFF:   
Input terminal logic setting		L-51	Displays the logic setting with $F127$ L-51 : Sink logic (Internal power supply) L-50 : Source logic L-49 : Sink logic (External power supply)
CPU1 version		u62	Displays CPU1 version.
CPU2 version		uc08	Displays CPU2 version.
Past trip 1 display		OC3↔1	Past trip 1 (Alternate flashing) (Note 2)
Past trip 2 display		OH↔2	Past trip 2 (Alternate flashing) (Note 2)
Past trip 3 display		OP3↔3	Past trip 3 (Alternate flashing) (Note 2)
Past trip 4 display		nErr↔4	Past trip 4 (Alternate flashing) (Note 2)
Part replacement alarm information		n . . . .	Displays the part replacement alarm for cooling fan, control PCB capacitor and main circuit capacitor, and ON/OFF state of accumulated operation time in bits. At ON:   At OFF:   
Accumulated operation time display		t0.10	Displays the accumulated operation time. (0.01 = 1 hr, 1.00 = 100 hrs)
Standard setting mode		60.0	Displays the operation frequency (During 60 Hz operation).

Note1 : Shows the contents set with  $F710 - F716$ . ( $F720$ ).

2 : Detail information on trips in the past also can be checked.

# DRIVER SPECIFICATIONS

## Basic Parameter

### Operation frequency parameter

Title	Function	Range of Use [Adjustable Range]	Standard Shipment
<i>FC</i>	Panel operation frequency	<b>LL</b> - <b>UL</b> (Hz)	0.0

### Other basic parameter

Title	Function	Range of Use [Adjustable Range]	Standard Shipment
<i>RUH</i>	History function	Displays the latest 5 parameters on which setting has been changed, as a group. (It may be edited.)	—
<i>RUF</i>	Guidance function	0:— 1:— 2:Multi-step speed operation guidance 3:Analog signal operation guidance	0
<i>RUI</i>	Pre-determined acceleration/deceleration	0:None (Manual setting) 1:Automatic setting 2:Automatic setting (At acceleration only)	0
<i>CNOd</i>	Command mode selection	0:Terminal board 1:Panel (Including extension panel) 2:RS485 communication	1
<i>FNOd</i>	Frequency setting mode selection	0:Terminal board VI 1:Setting dial 1 (Press the center to memorize.) 2:Setting dial 2 (Memorable even with power-off) 3:RS485 communication 4:— 5:External contact up/down	2
<i>FNSL</i>	Connection meter selection	0:Output frequency 1:Output current 2:Set frequency value 3:Input voltage (Detected at DC unit) 4:Output voltage (Command value) 5:Input voltage 6:Output voltage 7 - 10:— 11:Braking resistor accumulated load ratio 12:Actual output frequency 13:VI input value 14:— 15:Fixed output 1 (Equivalent to 100% of input current) 16:Fixed output 2 (Equivalent to 50% of input current) 17:Fixed output 3 (Other than output current) 18:RS485 communication data 19:For adjustment (Displays the value of <b>FM</b> .) 20 - 22:—	0
<i>FN</i>	Connection meter adjustment gain	1 - 1280	512
<i>Fr</i>	Normal or reverse rotation selection (During panel operation)	0:Normal rotation 1:Reverse rotation 2:Normal rotation (Normal/reverse switchable on extension panel) 3:Reverse rotation (Normal/reverse switchable on extension panel)	0

(Note) Range of use and [Adjustable range]

- Range of use: Means the range in which IPM gearmotor is operable (Value and function No.)
- Adjustable range (Value in [ ]): Although the driver allows setting values in this range, make sure to use the values within the range of use for IPM motor.

# DRIVER SPECIFICATIONS

Title	Function	Range of Use [Adjustable Range]	Standard Shipment
<i>RCC</i>	Acceleration time 1	0.0 – 3000(s)	1.5
<i>dEC</i>	Deceleration time 1	0.0 – 3000(s)	5.0
<i>FH</i>	Max. frequency	0.1kW – 0.4kW 30 – 83.4Hz [30 – 400Hz] 0.75kW – 2.2kW 30 – 125Hz [30 – 400Hz]	Capacity base
<i>UL</i>	Upper limit frequency	0.5 – <b>FH</b> (Hz)	Capacity base
<i>LL</i>	Lower limit frequency	0.0 – <b>UL</b> (Hz)	0.0
<i>Sr1 – Sr7</i>	Multi-step speed operation frequency 1 - 7	<b>LL – UL</b> (Hz)	0.0
<i>LYP</i>	Standard shipment setting	0:– 1 - 3:– 4:Clear of trip history 5:Clear of accumulated operation time 7:Memory of parameters set by customer 8:Initializing or retrieval of customer's parameter 9:Clear of accumulated fan operation time 10 – 13:–	0
<i>PSEL</i>	Registered parameter display selection	0:Standard setting mode at power-on 1:Simplified setting mode at power-on Simplified setting mode only	0
<i>F1 – F8</i>	Expansion parameter 100s – 900s	—	—

(Note) Range of use and [Adjustable range]

- Range of use: Means the range in which IPM gearmotor is operable (Value and function No.)
- Adjustable range (Value in [ ]): Although the driver allows setting values in this range, make sure to use the values within the range of use for IPM motor.

# DRIVER SPECIFICATIONS

## Expansion Parameter

### I/O parameter

Title	Function	Range of Use [Adjustable Range]	Standard Shipment															
<i>F100</i>	Low speed signal output frequency	0.0 – FH(Hz)	0.0															
<i>F101</i>	Speed attainment designation frequency	0.0 – FH(Hz)	0.0															
<i>F102</i>	Speed attainment detection width	0.0 – FH(Hz)	2.5															
<i>F105</i>	Selection of valid at simultaneous normal/reverse rotation command input	0 : Reverse rotation, 1 : Deceleration stop	1															
<i>F104</i>	Normally trip function selection 1	0 – 153	0															
<i>F108</i>	Normally trip function selection 2	0 – 153	70															
<i>F110</i>	Normally trip function selection 3	0 – 153	6															
<i>F109</i>	Analog/contact input selection (VI terminal)	0 : Voltage signal input (0 – 10 V) 1 : Current signal input (4 – 20 mA) 2 : Contact input 3 : Voltage signal input (0 – 5 V)	0															
<i>F111</i>	Input terminal selection 1A (F)	0 – 201	2															
<i>F112</i>	Input terminal selection 2A (R)	0 – 201	4															
<i>F113</i>	Input terminal selection 3A (S1)	0 – 201	10															
<i>F114</i>	Input terminal selection 4A (S2)	0 – 201	12															
<i>F115</i>	Input terminal selection 5 (VI)	8 – 55	14															
<i>F127</i>	Sink/source switching	0 : Sink (Internal power supply) 100 : Source 200 : Sink (External power supply) 1 – 99, 101 – 199, 201 – 255 invalid	0															
<i>F130</i>	Output terminal selection 1A (OUT)	0 – 255	68															
<i>F131</i>	Output terminal selection 2A (FM)	0 – 255	6															
<i>F132</i>	Output terminal selection 3A (FL)	0 – 255	10															
<i>F137</i>	Output terminal selection 1B (OUT)	0 – 255	255															
<i>F138</i>	Output terminal selection 2B (FM)	0 – 255	255															
<i>F139</i>	Output terminal logic selection (OUT, FM)	<table border="1"> <thead> <tr> <th></th> <th>OUT</th> <th>FM</th> </tr> </thead> <tbody> <tr> <td>0</td> <td><b>F130 and F137</b></td> <td><b>F131 and F138</b></td> </tr> <tr> <td>1</td> <td><b>F130 or F137</b></td> <td><b>F131 and F138</b></td> </tr> <tr> <td>2</td> <td><b>F130 and F137</b></td> <td><b>F131 or F138</b></td> </tr> <tr> <td>3</td> <td><b>F130 or F137</b></td> <td><b>F131 or F138</b></td> </tr> </tbody> </table>		OUT	FM	0	<b>F130 and F137</b>	<b>F131 and F138</b>	1	<b>F130 or F137</b>	<b>F131 and F138</b>	2	<b>F130 and F137</b>	<b>F131 or F138</b>	3	<b>F130 or F137</b>	<b>F131 or F138</b>	0
	OUT	FM																
0	<b>F130 and F137</b>	<b>F131 and F138</b>																
1	<b>F130 or F137</b>	<b>F131 and F138</b>																
2	<b>F130 and F137</b>	<b>F131 or F138</b>																
3	<b>F130 or F137</b>	<b>F131 or F138</b>																
<i>F669</i>	Logic output/pulse train output selection (OUT)	0 : Logic output 1 : Pulse train output	0															
<i>F676</i>	Pulse train output function selection (OUT)	Same as FMSL	0															
<i>F677</i>	Pulse train output max. number of pulses	0.50 – 1.60(kpps)	0.80															
<i>F681</i>	Analog output signal selection	0 : Meter option (0 – 1 mA) 1 : Current (0 – 20 mA) output 2 : Voltage (0 – 10 V) output	0															
<i>F691</i>	Analog output slope selection	0 : Negative slope, 1 : Positive slope	1															

(Note) There are other parameters than above. Refer to the instruction manual of driver for more details.



## Frequency parameter

Title	Function	Range of Use [Adjustable Range]	Standard Shipment
<i>F240</i>	Startup frequency setting	0.1 – 10.0(Hz)	0.1
<i>F241</i>	Operation start frequency	0.0 – FH(Hz)	0.0
<i>F242</i>	Operation start frequency hysteresis	0.0 – FH(Hz)	0.0
<i>F256</i>	At continuous lower limit frequency operation Automatic stop time	0.0 : No trip 0.1 – 600.0(s)	0.0
<i>F264</i>	External contact input up response time	0.0 – 10.0(s)	0.1
<i>F265</i>	External contact input up frequency step width	0.0 – FH(Hz)	0.1
<i>F266</i>	External contact input down response time	0.0 – 10.0(s)	0.1
<i>F267</i>	External contact input down frequency step width	0.0 – FH(Hz)	0.1
<i>F268</i>	Initial value of up/down frequency	LL – UL (Hz)	0.0
<i>F269</i>	Rewriting of initial value of up/down frequency	0 : Not rewritten 1 : <b>F268</b> is rewritten at power OFF.	1
<i>F270</i>	Jump frequency	0.0 – FH(Hz)	0.0
<i>F271</i>	Jump width	0.0 – 30.0(Hz)	0.0
<i>F287</i> – <i>F294</i>	Multi-step speed operation frequency 8 - 15	LL – UL (Hz)	0.0

(Note) There are other parameters than above. Refer to the instruction manual of driver for more details.

## Simplified servo lock function

Title	Function	Range of Use [Adjustable Range]	Standard Shipment
<i>F257</i>	Servo lock function prohibited/permitted (Switchable during operation)	0 : Prohibited 1 : Permitted	0
<i>F930</i>	Servo lock gain (Position loop gain)	0 – 250	100

## PWM carrier frequency control

Title	Function	Range of Use [Adjustable Range]	Standard Shipment
<i>F300</i>	PWM carrier frequency	2 – 16 (kHz)	12
<i>F312</i>	Mild control	0 : None 1 : With	0
<i>F316</i>	Carrier frequency control mode selection	0 : No automatic reduction of carrier frequency 1 : With automatic reduction of carrier frequency	1

## Trip-less reinforcement function

Title	Function	Range of Use [Adjustable Range]	Standard Shipment
<i>F302</i>	Instantaneous power outage non-stop control (Selection of deceleration and stop at power outage)	0 : None 1 : With 2 : With (Deceleration stop)	0
<i>F303</i>	Retry selection (Number of times)	0 : None 1 – 10 (Times)	0
<i>F305</i>	Over-voltage limiting trip (Deceleration stop mode selection)	0 : With 1 : None 2 : With (Short-time deceleration control) 3 : With (Dynamic short-tie deceleration control)	2
<i>F311</i>	Reverse rotation operation prohibition selection	0 : Normal, reverse rotation permitted 1 : Reverse rotation prohibited 2 : Normal rotation prohibited	0

# DRIVER SPECIFICATIONS

## Expansion Parameter

### Dynamic braking trip function

Title	Function	Range of Use [Adjustable Range]	Standard Shipment
<i>F304</i>	Dynamic braking trip selection	0 : No dynamic braking 1 : With dynamic braking and overload protection 2 : With dynamic braking. 3 : With dynamic braking and overload protection (Only at input to ST terminal) 4 : With dynamic braking (Only at input to ST terminal)	0
<i>F308</i>	Braking resistance value	1.0 – 1000(Ω)	Capacity base
<i>F309</i>	Allowable capacity for continuous braking resistance	0.01 – 10.00(kW)	Capacity base

### Brake sequence function

Title	Function	Range of Use [Adjustable Range]	Standard Shipment
<i>F341</i>	Brake function mode selection	0 : Brake sequence invalid 1, 2 : – 3 : Brake sequence valid	0
<i>F340</i>	Creep time	0.00 – 10.00(s)	0
<i>F345</i>	Brake release time	0.00 – 10.00(s)	0.5
<i>F346</i>	Creep frequency	<b>F240</b> – 20(Hz)	3
<i>F347</i>	Braking delay time	0.00 – 10.00(s)	0.3

### PID control

Title	Function	Range of Use [Adjustable Range]	Standard Shipment
<i>F360</i>	PID normal/reverse characteristic selection	0 : None 1 : With	0
<i>F359</i>	PID control start standby time	0 – 2400(s)	0
<i>F362</i>	Proportional gain	0.01 – 100.0	0.30
<i>F363</i>	Integral gain	0.01 – 100.0	0.20
<i>F366</i>	Derivative gain	0.00 – 2.55	0.00
<i>F380</i>	PID normal/reverse characteristic selection	0 : Normal characteristic 1 : Reverse characteristic	0

### Contact stop/contact thrust function

Title	Function	Range of Use [Adjustable Range]	Standard Shipment
<i>F382</i>	Contact stop function Valid/Invalid	0 : Invalid 1 : – 2 : Valid	0
<i>F383</i>	Contact stop frequency setting	0.1kW – 0.4kW : 0.1 – 5.0Hz [0.1 – 30.0Hz] 0.75kW – 2.2kW : 0.1 – 7.5Hz [0.1 – 30.0Hz]	Capacity base
<i>F384</i>	Contact stop limit torque	0.0 – 120(%)	100
<i>F385</i>	Contact stop detection time	0.0 – 25.0(s)	0.3
<i>F386</i>	Contact thrust limit torque	0.0 – 100(%)	10

(Note) Range of use and [Adjustable range]

- Range of use: Means the range in which IPM gearmotor is operable (Value and function No.)
- Adjustable range (Value in [ ]): Although the driver allows setting values in this range, make sure to use values within the range of use for IPM motor.

# DRIVER SPECIFICATIONS

## Acceleration/deceleration time parameter

Title	Function	Range of Use [Adjustable Range]	Standard Shipment
<i>F500</i>	Acceleration time 2	0.0 – 3000(s)	10.0
<i>F501</i>	Deceleration time 2	0.0 – 3000(s)	10.0
<i>F502</i>	Pattern of acceleration/deceleration 1	0 : Straight line 1 : S-shape 1 2 : S-shape 2	0
<i>F503</i>	Pattern of acceleration/deceleration 2	0 : Straight line 1 : S-shape 1 2 : S-shape 2	0
<i>F505</i>	Acceleration/deceleration 1, 2 switching frequency	0.0 (No trip) 0.1 – Based on capacity (Hz)	0.0

## Protection parameter

Title	Function	Range of Use [Adjustable Range]	Standard Shipment
<i>F441</i>	“KA” line torque limit 1 level	0 – 150(%) [0 – 250(%)]	150
<i>F443</i>	Regenerative torque limit 1 level	0 – 150(%) [0 – 250(%)]	150
<i>F444</i>	“KA” line torque limit 2 level	0 – 150(%) [0 – 250(%)]	150
<i>F445</i>	Regenerative torque limit 2 level	0 – 150(%) [0 – 250(%)]	150
<i>F601</i>	Stall prevention trip level 1	10 – 199 (% (A)) 200 (No trip)	150
<i>F603</i>	Emergency stop selection	0 : Free run stop 1 : Deceleration stop	0
<i>F605</i>	Output phase interruption detection trip selection	0 : None 1 : At startup (Only once after power-on) 2 : At startup (Every time)	0
<i>F608</i>	Input phase interruption detection trip selection	0 : None 1 : With	1
<i>F610</i>	Low current trip/alarm selection	0 : Alarm only 1 : With trip	0
<i>F611</i>	Low current detection current	0 – 150(%(A))	0
<i>F612</i>	Low current detection time	0 – 255(s)	0
<i>F613</i>	Startup short-circuit detection selection	0 : Every time (Standard pulse) 1 : Only once after power-on (Standard pulse) 2 : Every time (Short time pulse) 3 : Only once after power-on (Short time pulse)	0
<i>F615</i>	Over-torque trip/alarm selection	0 : Alarm only 1 : With trip	0
<i>F616</i>	Over-torque detection level	0 : No trip 1 – 200 (%)	200
<i>F618</i>	Over-torque detection time	0.0 – 10.0(s)	0.5
<i>F620</i>	Cooling fan ON/OFF control	0 : With ON/OFF control 1 : Normally ON	0
<i>F621</i>	Accumulated operation alarm time	0.0 – 999.9 (x 100 hrs)	610.0
<i>F648</i>	Number of startups alarm	0.0 – 999.9 (x 10,000 times)	100.0

(Note) Range of use and [Adjustable range]

- Range of use: Means the range in which IPM gearmotor is operable (Value and function No.)
- Adjustable range (Value in [ ]): Although the driver allows setting values in this range, make sure to use values within the range of use for IPM motor.

(Note) There are other parameters than above. Refer to the instruction manual of driver for more details.

# DRIVER SPECIFICATIONS

## Expansion Parameter

### Panel parameter

Title	Function	Range of Use [Adjustable Range]	Standard Shipment
<i>F701</i>	Current/voltage unit selection	0 : % 1 : A/V	0
<i>F702</i>	Free unit display magnification 1	0.00: No free unit 0.01 - 200	0.00
<i>F707</i>	Change step width setting (1 step rotation of setting dial)	0.00: Invalid 0.01 - FH	0.00
<i>F710</i>	Panel initial display selection	0 : Operation frequency 1 : Output current 2 : Set frequency value 3 - 17 : -	0
<i>F720</i>	Extension panel initial display selection	18 : Arbitrary display by communication 19 - 33 : - 34 : Number of startups (10,000 times) 52 : Set frequency value/operation frequency	0
<i>F711</i>	Status monitor 1	0 : Operation frequency 1 : Output current 2 : Set frequency value	2
<i>F712</i>	Status monitor 2	3 : Input voltage (DC unit detection) 4 : Output voltage (Command value)	7
<i>F713</i>	Status monitor 3	5 : Input power (kW) 6 : Output power (kW) 7 : Torque	1
<i>F714</i>	Status monitor 4	8 : Torque current 9, 10 : - 11 : Braking resistor accumulated load ratio 12 : Actual output frequency 13 - 22 : -	3
<i>F715</i>	Status monitor 5	23 : PID feedback value 24 - 26 : - 27 : driver load ratio 28 - 33 : -	50
<i>F716</i>	Status monitor 6	34 : Number of startups (10,000 times) 35 - 49 : - 50 : Free unit display magnification 2 monitor display 51 : Free unit display magnification 2 decimal point position 52 : Set frequency value/operation frequency	51
<i>F751</i> - <i>F774</i>	Simplified setting mode parameter	0 - 999 (Set with communication No.)	

(Note) There are other parameters than above. Refer to the instruction manual of driver for more details.

### Parameter setting prohibition function

Title	Function	Range of Use [Adjustable Range]	Standard Shipment
<i>F700</i>	Parameter write prohibition selection	0 : Permission 1 : Panel prohibition 2 : Panel + RS485 communication prohibition	0
<i>F730</i>	Panel frequency setting prohibition selection (FC)	0 : Permission 1 : Prohibition	0
<i>F733</i>	Panel operation prohibition selection (RUN key)	0 : Permission 1 : Prohibition	0
<i>F734</i>	Panel emergency stop operation prohibition selection	0 : Permission 1 : Prohibition	0
<i>F735</i>	Panel reset operation prohibition selection	0 : Permission 1 : Prohibition	0
<i>F736</i>	In-operation CMCD (Command mode selection)/ FMOD (Frequency setting mode selection) change prohibition selection	0 : Permission 1 : Prohibition	1
<i>F738</i>	Password setting (F700)	0 : No setting 1 - 9998, 9999 : With setting	0
<i>F739</i>	Password reset	0 : No setting 1 - 9998, 9999 : With setting	0

# DRIVER SPECIFICATIONS

## Communication Parameter

Title	Function	Range of Use [Adjustable Range]	Standard Shipment
<i>F800</i>	Communication speed	3 : 9600bps 4 : 19200bps 5 : 38400bps	4
<i>F801</i>	Parity	0 : NON (No parity) 1 : EVEN (Even parity) 2 : ODD (Odd parity)	1
<i>F802</i>	driver No.	0 - 247	0
<i>F803</i>	Communication error trip time	0.0 : No trip 0.1 - 100	0.0
<i>F804</i>	Trip at communication error	0 : Alarm only 1 : With trip (Free run) 2 : With trip (Deceleration stop)	0
<i>F808</i>	Communication error detecting condition	0 : Normally 1 : When communication is selected for CMOD or FMOD 2 : 1 and during operation	1
<i>F829</i>	Communication protocol selection	0 : Toshiba driver protocol 1 : Modbus RTU protocol	0
<i>F870</i>	Block write data 1	0 : No selection 1 : Command information 2 : —	0
<i>F871</i>	Block write data 2	3 : Set frequency value 4 : Terminal board output data 5 : Communication analog output	0
<i>F875</i>	Block read data 1	0 : No selection	0
<i>F876</i>	Block read data 2	1 : Status information 2 : Output frequency 3 : Output current	0
<i>F877</i>	Block read data 3	4 : Output voltage 5 : Alarm information	0
<i>F878</i>	Block read data 4	6 : PID feedback value 7 : Input terminal board monitor 8 : Output terminal board monitor	0
<i>F879</i>	Block read data 5	9 : VI terminal monitor	0

# DRIVER SPECIFICATIONS

## Table of I/O Terminal Function

### Input terminal function

The function numbers in the following table may be assigned to the parameters **F104, F108, F110 – F115** and **F151 – F156**

Function No.		Function
Positive Logic	Negative Logic	
0.1		No function is assigned.
2	3	Normal rotation operation command
4	5	Reverse rotation operation command
6	7	Operation preparation
8	9	Reset command
10	11	Multi-step speed shift command 1
12	13	Multi-step speed shift command 2
14	15	Multi-step speed shift command 3
16	17	Multi-step speed shift command 4
18	19	Jog operation mode
20	21	External input trip stop command
24	25	No. 2 acceleration/deceleration selection
32	33	Torque limit switching
36	37	PID control prohibited
48	49	Switching from communication to local
50	51	Operation retention (Retention of 3-wire operation)
52	53	PID integral/derivative clear
54	55	Switching of PID characteristic
70	71	Servo lock input signal
88	89	External contact up frequency input
90	91	External contact down frequency input
92	93	External contact up/down frequency clear
96	97	Free run command
106	107	Switching to frequency command terminal board
108	109	Command mode terminal board
110	111	Parameter edit permitted
122	123	Forced deceleration command
150	151	Contact stop normal/reverse rotation/deceleration input
200	201	Parameter edit prohibited

(Note)1. "No function is assigned" to any function numbers not found in the table.

2. For details of functions, refer to the instruction manual of driver.

# DRIVER SPECIFICATIONS

## ■ Output terminal function

The function numbers in the following table may be assigned to the parameters **F130 – F138, F157** and **F158**.

Function No.		Function
Positive Logic	Negative Logic	
0	1	Frequency lower limit
2	3	Frequency upper limit
4	5	Slow speed detection signal
6	7	Output frequency attainment signal (Acceleration/deceleration completed)
8	9	Specified frequency attainment signal
10	11	Error signal (Trip output)
14	15	Over-current detection pre-alarm
16	17	Overload detection pre-alarm
20	21	Overheat detection pre-alarm
22	23	Over-voltage detection pre-alarm
24	25	Main circuit under-voltage detection
26	27	Low current detection
28	29	Over-torque detection
30	31	Braking resistor overheat detection pre-alarm
40	41	Operation/stop
56	57	Accumulated operation time alarm
60	61	Normal/reverse rotation
68	69	Brake release signal output
78	79	RS485 communication error
92	93	Specified data output
128	129	Part replacement alarm
146	147	Error signal (Output even in retry standby)
162	163	Number of startups alarm
174	175	Contact stop state output signal
176	177	Servo lock brake signal
178	179	Servo lock in-trip signal

(Note)1. Since “No function assigned” to function numbers not listed in the above table, even numbers are normally OFF while odd numbers are normally ON.

2. In case of positive logic :

“ON” : Open collector output transistor or relay is ON.

“OFF” : Open collector output transistor or relay is OFF.

In case of negative logic :

“ON”: Open collector output transistor or relay is OFF.

“OFF”: Open collector output transistor or relay is ON.

3. For details of functions, refer to the instruction manual of driver.

# DRIVER SPECIFICATIONS

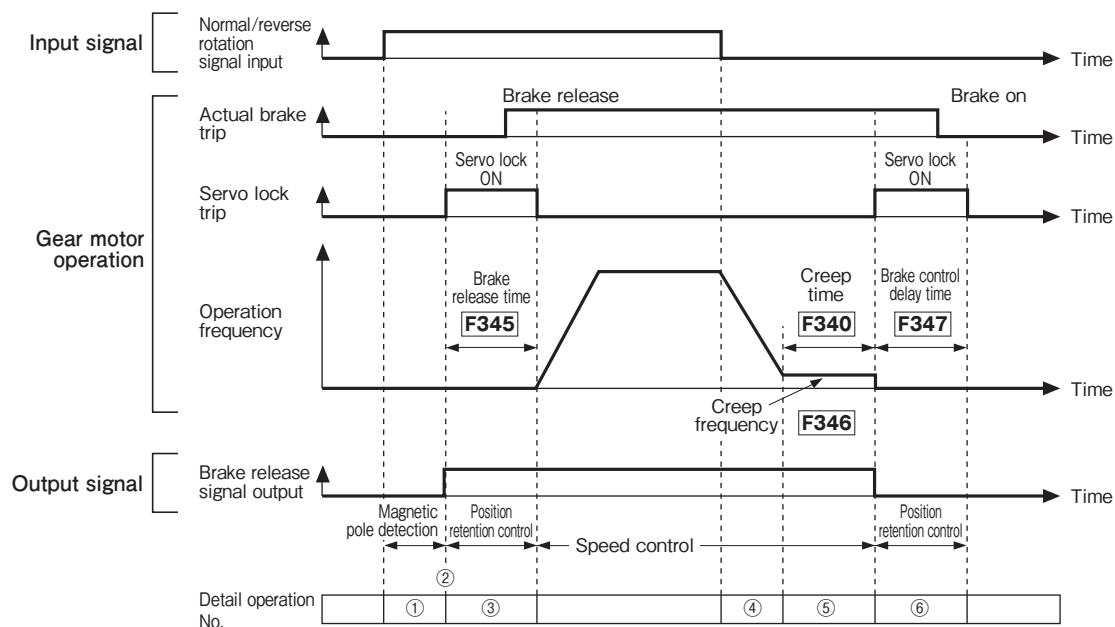
## Chart Control Unit Specs - Brake Sequence Function

Features	
<ul style="list-style-type: none"> <li>•Motor operations at mechanical brake release or on are set. driver outputs the mechanical brake trip timing signal.</li> <li>•By inserting the servo lock trip only at the transfer of the start/stop and the brake release/on, abrasion on the motor is suppressed.</li> </ul>	
Application	
Applications to use mechanical brakes for prevention of drops at the startup or stop of elevating operation	

Parameter setting					
No.	Function	Unit	Adjustment Range	Standard Shipment Value	Remarks
<b>F341</b>	Brake function mode selection	—	0 : Invalid 1, 2 : — 3 : Valid	0	When 3: Valid is set, it becomes unable to use the simplified servo lock function.
<b>F345</b>	Brake release time	sec	0.00 - 10.00	0.5	Servo lock trip time. Set this in such a way as it matches the brake release delay time.
<b>F340</b>	Creep time	sec	0.00 - 10.00	0.00	
<b>F346</b>	Creep frequency	Hz	<b>F240</b> - 20	3	
<b>F347</b>	Braking delay time	sec	0.00 - 10.00	0.3	Servo lock trip time Set this in such a way as it matches the braking delay time.

Output terminal function		
No.	Function	Operation
68	Brake release signal	ON : After the normal/reverse operation command is turned ON and the magnetic pole detection is completed, it is turned ON simultaneously with the servo lock start.
69	Brake release signal (Inversion)	OFF : After the normal/reverse operation command is turned OFF, the motor is decelerated and <b>F340</b> : Creep time is over, it is turned OFF simultaneous with the servo lock start.

Detail of operation	
①	After the normal/reverse rotation operation command is turned ON and the magnetic pole detection (approx. 0.15 sec) is over, the servo lock starts.
②	The brake release signal is turned ON simultaneously with the servo lock start.
③	After the brake release time, which is set with <b>F345</b> , the servo lock is released and the motor is driven.
④	The normal/reverse rotation operation command is turned OFF and the operation frequency drops to the creep frequency set with <b>F346</b> .
⑤	The motor drives with the creep frequency and, after the creep time, which is set with <b>F340</b> , elapses, the servo lock starts. The
⑥	brake release signal is turned OFF simultaneously with the servo lock start and, after the braking delay time which is set with <b>F347</b> elapses, the servo lock is released.
(Note) •The output terminal function "Brake release signal" is not output unless <b>F341</b> is set at 3 (Valid). •With the standard shipment setting, the brake release signal (No. 68) is assigned to the output terminal OUT.	





# DRIVER SPECIFICATIONS

## Chart Simplified servo lock function

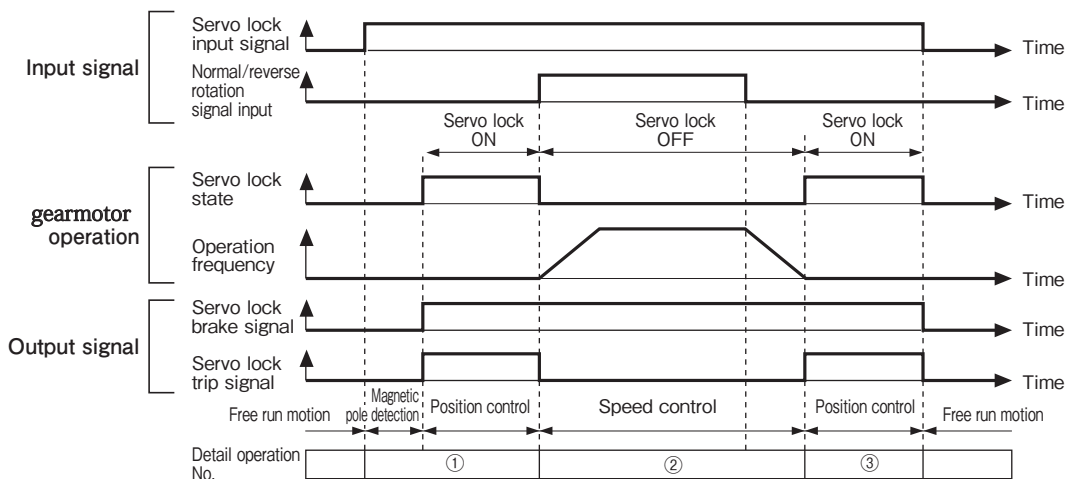
Features					
When waiting for operating motion (duration of operation stop), the servo lock trips and the stop position is retained.					
Application					
Performs the simplified position retaining control.					

Parameter setting					
No.	Function	Unit	Adjustment Range	Standard Shipment Value	Remarks
<b>F257</b>	Servo lock function Prohibited/Permitted	—	0 : Prohibited 1 : Permitted	0 (Prohibited)	May be changed during operation.
<b>F930</b>	Servo lock gain	—	1 - 250	100	Adjusts the response to load fluctuation during the servo lock.

Input terminal function		
No.	Function	Operation
70	Servo lock input signal	ON : Servo lock trips during operation stop.
71	Servo lock input signal (Inversion)	OFF : Servo lock is released.

Output terminal function		
No.	Function	Operation
176	Servo lock brake signal	ON : It turns ON simultaneously with the servo lock start after the servo lock input signal is turned ON.
177	Servo lock brake signal (Inversion)	OFF : It is turned OFF with the servo lock input signal OFF or when it trips.
178	Servo lock trip signal	ON : On at servo lock trip
179	Servo lock trip signal (Inversion)	OFF : Normally OFF other than the servo lock trip

Detail of operation	
•	When the servo lock function set with <b>F257</b> is 1 (Permitted) and the brake sequence function set with <b>F341</b> is 0 (Invalid), the servo lock can trip.
•	Monitor displays “Srvo” when the servo lock is tripped.
①	In the state that the servo lock is operable, if the operation preparation signal is ON and the servo lock input signal is ON, the servo lock trips when the operation command is turned OFF (when motor is stopped).
②	Servo lock is released when the normal/reverse rotation operation command is turned ON.
③	When the normal/reverse rotation operation command is OFF, the servo lock trips simultaneously as the output frequency turns to 0 Hz.
(Note)	<b>F257</b> : Setting of the servo lock function Prohibited/Permitted can be switched even during driver operation. Care must be taken to switch during operation.
•	If the frequency setting is changed to 0 Hz when the operation command is ON, the servo lock does not trip.
•	With the shipment from factory setting, <b>F108</b> (Normally trip function selection 2) is assigned to the input terminal function No. 70. As a result, if <b>F257</b> is set at 1 (Permitted), it becomes in the state of normally servo lock when the operation command is OFF. “Brake sequence function” and “Simplified servo lock function” cannot be used simultaneously.
•	When using the servo lock function on IPM gearmotor with brake, use the servo lock brake signal to turn ON/OFF the brake.



# DRIVER SPECIFICATIONS

## Chart Contact stop/contact thrust function

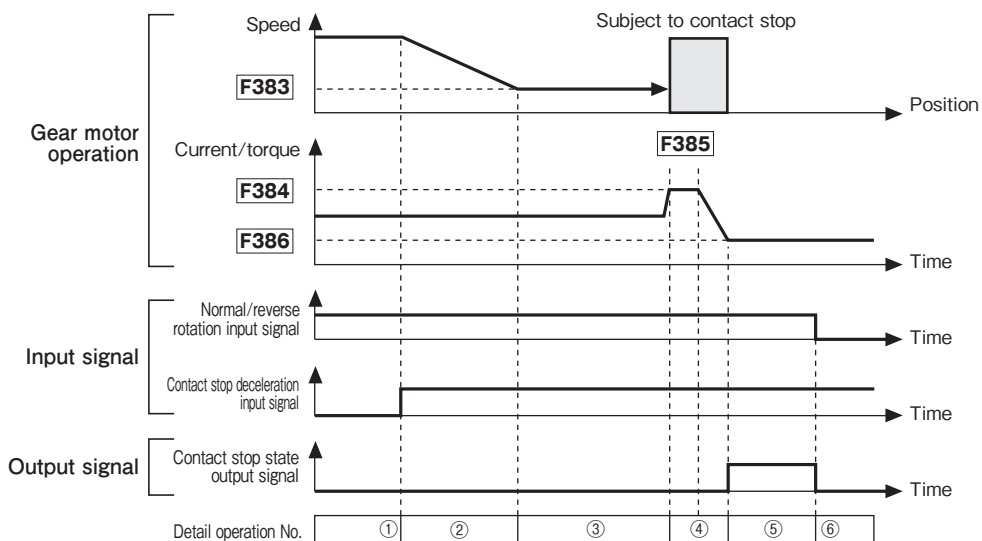
Features	
Performs the sequence of Deceleration → Contact stop → Contact thrust with signal input. Contact stop state complete signal is output from the driver.	
Application	
Simplified positioning of workpiece	

Parameter setting					
No.	Function	Unit	Adjustment Range	Standard Shipment Value	Remarks
<b>F382</b>	Contact stop function Valid/Invalid	—	0 : Invalid 1 : — 2 : Valid	0	
<b>F383</b>	Contact stop frequency setting	Hz	0.1 - 30	5 (0.1k - 0.4kW) 7.5 (0.75k-2.2kW)	Caution! Adjust with a frequency no larger than the standard shipment value.
<b>F384</b>	Contact stop limit torque	%	0 - 120	100	Rated torque ratio
<b>F385</b>	Contact stop detection time	sec	0.0 - 25.0	0.3	
<b>F386</b>	Contact thrust limit torque	%	0 - 100	10	Rated torque ratio

Input terminal function		
No.	Function	Operation
150	Contact stop normal/reverse rotation-deceleration input signal	ON : Switches to the speed of contact stop frequency setting. OFF : Normal operation (Returns to normal operation when ON ⇒ OFF.) (Note)•Use the retention input signal. •Priority of the normal/reverse rotation command is higher than the contact stop deceleration signal.
151	Contact stop normal/reverse rotation-deceleration input signal (Inversion)	

Output terminal function		
No.	Function	Operation
174	Contact stop state output signal	ON : It is turned ON if the motor is arrested and it is switched to the contact thrust limit torque. OFF : Output is OFF if the normal/reverse operation command is turned OFF.
175	Contact stop state output signal (Inversion)	

Detail of operation	
①	Contact stop deceleration input signal is turned ON. (Retention input signal)
②	It decelerates to the slow frequency (speed) set with <b>F383</b> .
③	Upon completion of deceleration, it is changed to the mode to detect the torque set with <b>F384</b> .
④	If the torque set with <b>F384</b> continues longer than the time set with <b>F385</b> , it controls the output less than the torque set with <b>F386</b> .
⑤	Contact stop state output is turned ON.
⑥	If the normal/reverse rotation operation command is turned OFF, the contact stop state output is turned OFF.



## Chart Control Unit Specs - Free Unit Display Function

### Features

Allows to change freely the monitor display and the parameter frequency display to the motor speed, speed of load equipment, etc. (Two types of free unit can be displayed.)

### 〈Free unit display magnification 1〉

#### Parameter setting

No.	Function	Adjustment Range	Standard Shipment Value	Remarks
<b>F702</b>	Free unit display magnification 1	0.00 : No free unit display (Frequency display) 0.01 - 200.0	0.00	

#### Detail of operation

Value obtained by multiplying the frequency on display with the value set with **F702** is displayed.

$$\boxed{\text{Display value}} = \boxed{\text{Frequency of monitor display or parameter}} \times \boxed{\text{F702}}$$

#### Example 1) Display of the speed of load equipment

If it is necessary to display 60 Hz as the conveyor speed 6 (m/min) with the standard shipment setting:

$$\boxed{60} \text{ Hz} \rightarrow \boxed{6}$$

**F702** = 0.10 ( 60×0.10 = 6.00 )

#### Example 2) Display of the number of produced units

If it is necessary to display the number of units (Unit/min) which are transferred with a conveyor having a capacity to transfer 5 units of workpiece/100 rpm, at the operation frequency of 60 Hz (1,800 rpm):

$$\boxed{60} \text{ Hz} \rightarrow \boxed{90}$$

**F702** = 30×5/100 = 1.5 ( 60×1.50 = 90 )

### 〈Free unit display magnification 2〉

#### Parameter setting

No.	Function	Adjustment Range	Standard Shipment Value	Remarks
<b>F900</b>	Significant digits of LED display	1 : Higher 1 digit 2 : Higher 2 digits 3 : Higher 3 digits 4 : Higher 4 digits	4	For details, refer to the instruction manual of driver.
<b>F901</b>	Machine ratio 1 (Denominator)	1 - 9999	1	Used to set mainly gearmotor reduction ratio, etc.
<b>F902</b>	Machine ratio 2 (Denominator)	0.1 - 1800	1.0	

#### Detail of operation

driver output frequency is converted with the following formula and the significant higher 4 digits of the result are displayed.

$$\boxed{\text{Display value}} = \boxed{\text{Motor shaft speed}} \times \boxed{1/\text{F901}} \times \boxed{1/\text{F902}}$$

#### Example 1) Motor shaft speed display

If it is necessary to display the speed of motor (4-pole) shaft running at the frequency of 60 Hz:

$$\boxed{60} \text{ Hz} \rightarrow \boxed{1800}$$

**F901** = 1 **F902** = 1.0 **F900** = 4  
(1800×1/1×1/1.0=1800)

#### Example 2) Gearmotor output shaft speed display

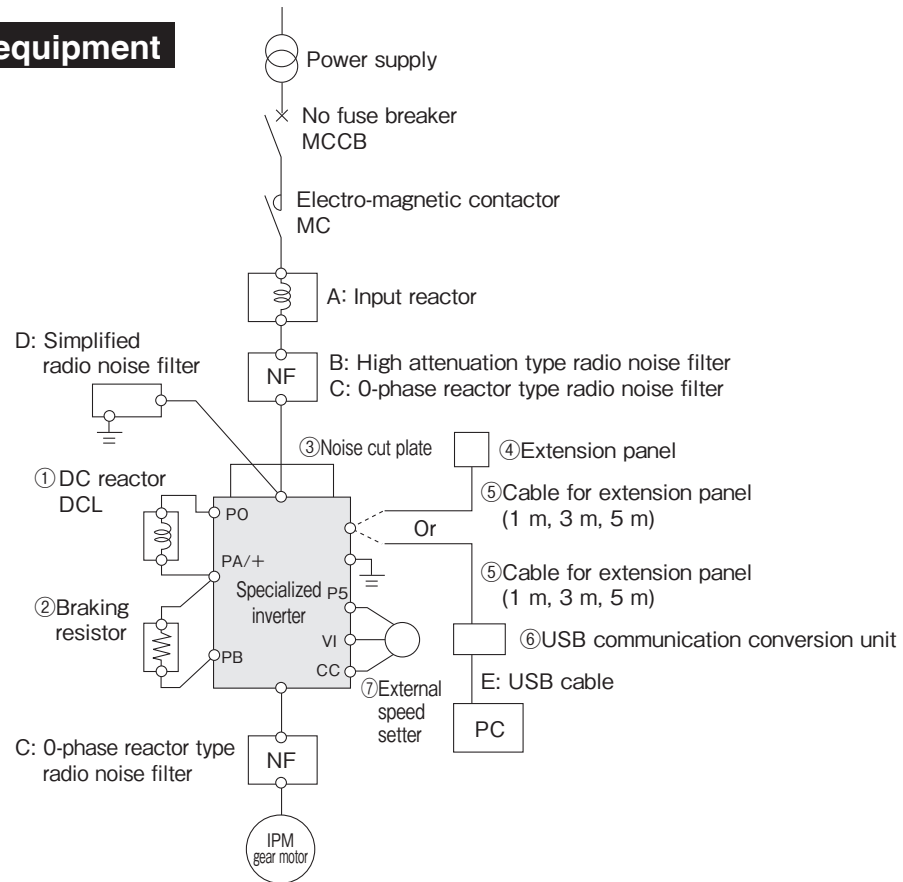
If it is necessary to display the speed of motor (4-pole) output shaft running at reduction ratio of 1 : 12.5 and frequency of 60Hz:

$$\boxed{60} \text{ Hz} \rightarrow \boxed{144}$$

**F901** = 1 **F902** = 12.5 **F900** = 3  
(1800×1/1×1/12.5=144)

# DRIVER OPTION

## Control Unit Option - **Peripheral equipment**



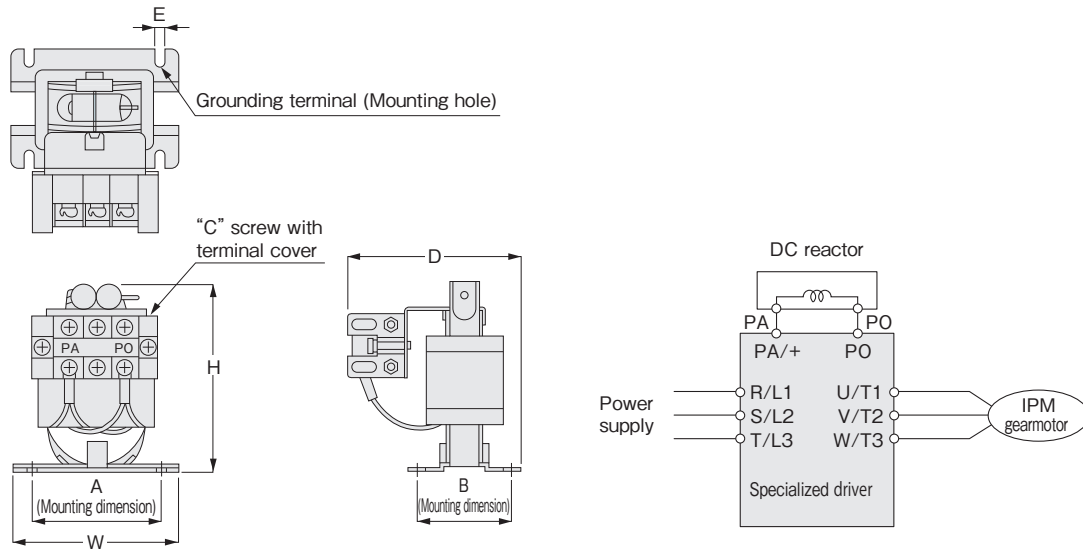
No.	Name	Function, Etc.	Stock
①	DC reactor	Used to reduce the harmonic at the driver power supply side and to improve the input power factor.	○
②	Braking resistor	Used when sudden deceleration and stop are required frequently or it is necessary to short-cut the deceleration time for a load of higher inertia. This is a resistor to consume the regenerative energy at the dynamic braking.	○
③	EMC plate	Sheet metal used to ground the grounding wire of shielded cable for inverter's power cable or external grounding wire	○
④	Extension panel	Operation panel for extension which has LED indicator and keys. If the parameter write function is provided, setting parameters can be read collectively, copied or written, and 3 kinds of data can be memorized.	○
⑤	Cable for extension panel	Cable for connecting the specialized driver to the extension panel and USB conversion unit. The length is 1 m, 3 m or 5 m.	○
⑥	USB communication conversion unit	Conversion unit to be connected to USB port of PC, etc. Separate connecting cable is necessary.	○
⑦	External speed setter	Variable resistor for frequency setting. It has a set of variable resistor, knob and scale plate.	○
A	Input reactor	Use to reduce harmonic at the driver power supply side, improve the input power factor and suppress external surge.	× (Note)1
B	Radio noise reduction filter	High attenuation type (LC filter) •This is installed at the driver input side. •This is used when any peripheral equipment, which is susceptible to noise, is used nearby.	× (Note)1
C		0-phase reactor (Induction filter) core type •Can be installed at the input and output sides of driver. •This is used when any peripheral equipment, which is susceptible to noise, is used nearby. Caution: If it is set at the output side, limit the number of turns to the reactor of each phase to 4 or less.	× (Note)1
D		Simplified (Capacity filter) capacitor type •Installed at the driver input side. •This is used when any peripheral equipment, which is susceptible to noise, is used nearby. •Since this is of a capacitor type, the leak current increases. Avoid using many where an earth leakage breaker is installed at the power supply side.	× (Note)1
E	USB cable	Cable to connect USB conversion unit to USB port of PC, etc.	× (Note)2

(Note)1. Not in our product line. Customer is requested to procure from an alternate source.

(Recommendation: Optional peripheral equipment for driver from Toshiba Schneider driver Corp.)

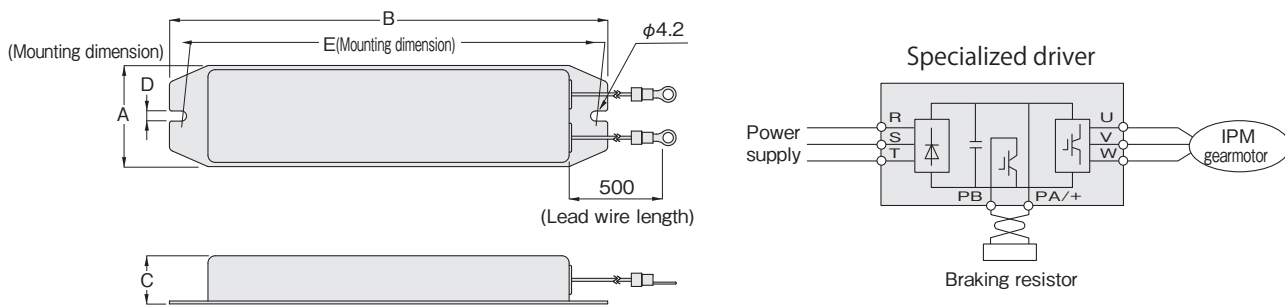
- Not in our product line. Customer is requested to procure commercial A-B connection type products compliant to USB1.1/2.0.
- ① - ⑥ are the products of Toshiba Schneider driver Corp.

## DC reactor



Reactor Model	Rated Current (A)	Applicable driver Power	Dimensions (mm)							Approx. Weight (kg)
			W	H	D	A	B	C	E	
OP-DCL2-2002	1.8	0.1kW、0.2kW	63	79	72	48	32	M3.5	4.5	0.4
OP-DCL2-2004	4	0.4kW	72	92	75	57	42	M3.5	4.5	0.6
OP-DCL2-2007	6	0.75kW	72	94	80	57	42	M3.5	4.5	0.7
OP-DCL2-2015	9.5	1.5kW	75	99	79	60	42	M3.5	4.5	0.9
OP-DCL2-2022	13	2.2kW	74	101	81	59	47	M3.5	4.5	1.0

## Braking Resistor



Braking Resistor Model	Rating	Continuous Allowable Power	Applicable driver Power	Dimensions (mm)					Approx. weight (kg)
				A	B	C	D	E	
OP-PBR-2007	120W-200Ω	90W	0.1kW~0.75kW	42	182	20	4.2	172	0.28
OP-PBR-2022	120W-75Ω	90W	1.5kW~2.2kW						

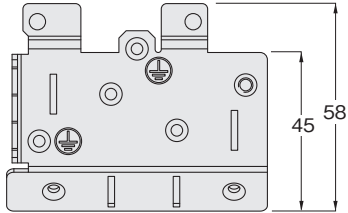
(Note) The braking resistor shown above has a built-in thermal fuse.

# DRIVER OPTION

## EMC Plate

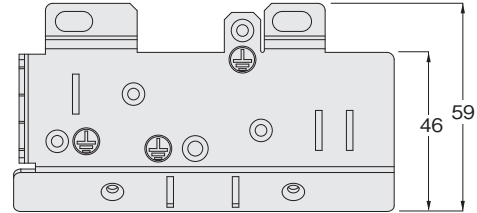
● For 0.1 kW – 0.75 kW

Model : OP-EMP007Z (Approx. weight 0.3 kg)



● For 1.5 kW, 2.2 kW

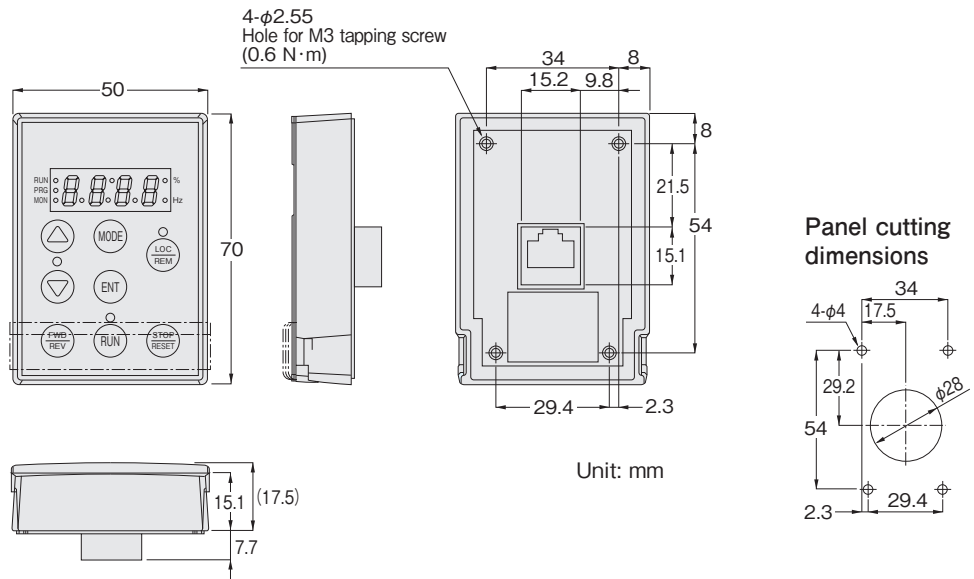
Model : OP-EMP008Z (Approx. weight 0.4 kg)



## Extension Panel

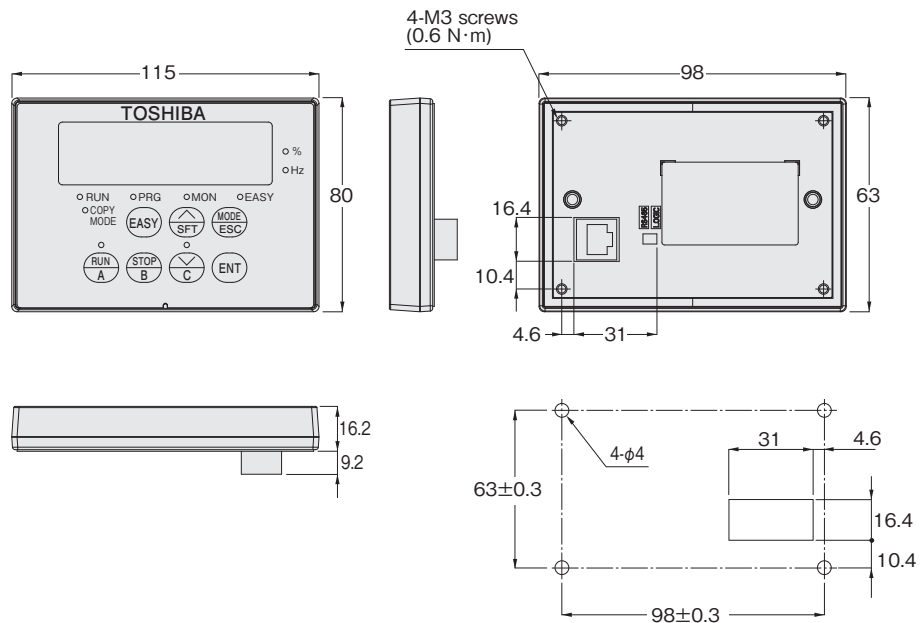
● Extension panel

Model : OP-RKP007Z



● Extension panel with parameter writer function

Model: OP-RKP002Z

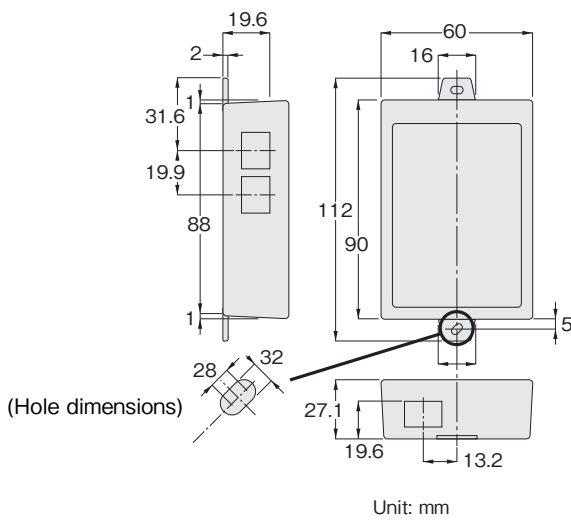


## Extension Panel Cable

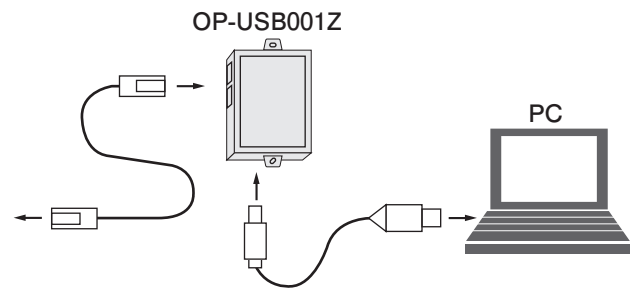
- For extension panel (Model: OP-RKP007Z)
  - Model : OP-CAB0071 (1 m)
  - Model : OP-CAB0073 (3 m)
  - Model : OP-CAB0075 (5 m)
- For extension panel with parameter write function (Model: OP-RKP002Z)
  - Model: OP-CAB0011 (1 m)
  - Model: OP-CAB0013 (3 m)
  - Model: OP-CAB0015 (5 m)
- For UBS communication conversion unit (Model: OP-USB001Z)

## USB Communication Conversion Unit

Model : OP-USB001Z



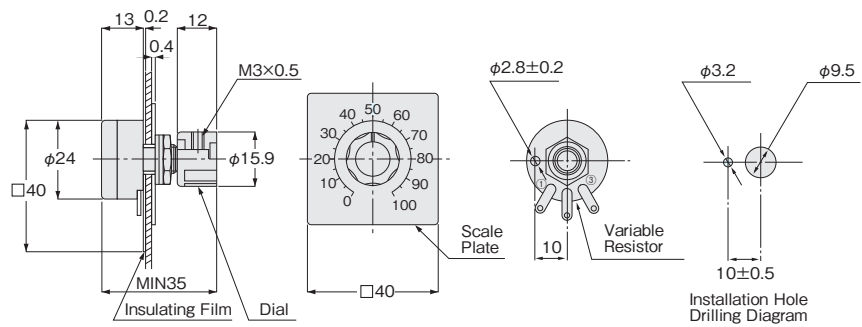
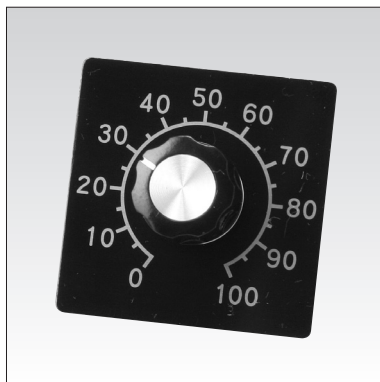
VF-nC3M



(Note) Use a USB cable (A-B connection type compliant to USB 1.1/2.0)

## External Speed Setter

Model : OP-RV-24B5K



# CAUTION FOR SAFETY

## Installation Location

	IP44	IP65
Ambient Temperature	-10°C - 40°C	-10°C - 40°C
Ambient Humidity	85% max.(without any dew condensation)	100% max.(without any dew condensation)
Altitude	1,000m max.	1,000m max.
Installation Location	Well ventilated place free from corrosive gas, explosive gas, vapor and/or dust	Well ventilated place free from corrosive gas, Should not be used in water and the place where high-hydrostatic pressure receives.
Installation place	Indoors	Indoors/Outdoors

## Installation Surface

Install the products with four bolts on a flat and machined surface free from vibration. For the mounting of the hollow bore refer to page T62-T64.

## Mounting Position

All products can be mounted in any direction due to a grease lubrication system.

## Connecting with Other Equipment

- 1 "H7" fit is recommended for the hole for couplings, sprockets, pulleys, gears etc., when attaching to the reducer.
- 2 In case of direct connection, connect a reducer shaft and a shaft of the connecting machine precisely, so that the center of the shaft of both machines will be fully aligned.
- 3 In case of using chains, belts gears, etc. connect the units precisely, so that the shaft of the reducer and that of the other machine are parallel. Also, be sure that the centerline of the sprockets and pulleys must be perpendicular to the shaft.
- 4 When attaching couplings or connecting equipment to the output shaft, be sure not to give any strong impact by hammer, etc. Failure to observe this warning may cause damage to the bearings, which may lead to noise, vibration or failure.

## Cautions for Operation

- 1 IPM motors cannot be driven with a commercial power supply. If commercial power supply is applied to the input terminals (U, V, W) of motor, the motor will be burned. Always connect them to the output terminals of the driver specified by us.
- 2 Do not use the equipment in explosive atmosphere. It could cause explosion, ignition, fire, electric shock, injury or damage on the equipment.
- 3 Never use the equipment at a place where it may be splashed with water, in corrosive atmosphere, atmosphere containing inflammable gas or near a combustible object. It could cause fire or accident.
- 4 Take care not wet the brake with water, oil or grease. It could reduce the brake torque, resulting in drop or runaway.
- 5 Connect wires properly and securely to the input power supply, motor and driver. Otherwise it could damage devices.

- 6 Only personnel who have professional knowledge and skills should be allowed to transport, install, connect wires and pipes to, operate, control, service and inspect the equipment. There is risk of explosion, ignition, fire, electric shock, injury or damage on the equipment.
- 7 When using for applications that are directly connected with physical hazards such as equipment for transportation of people, or the like, protective devices for safety must be installed on the equipment. There is risk of physical injury or damage on the equipment.
- 8 When using on elevating equipment, install safety devices on the equipment to prevent drops. There is risk of physical injury or damage on the equipment, when the elevating unit was dropped.
- 9 Use motors and inverters in the specified combinations. Otherwise it could cause damage on devices or fire.
- 10 Driver or motor may become very hot while power is supplied or for a while after shutting down the power supply. Carefully avoid touching it. There is risk of burn.
- 11 When any error has occurred, stop operation immediately. There is risk of injury or fire.
- 12 Keep combustible objects away from the periphery. They could catch fire.
- 13 Avoid touching revolving section of motor. There is risk of injury.
- 14 Operate the equipment within the allowable ranges of the load torque, load inertia moment and O.H.L.
- 15 High voltage generates at the motor connection terminals while the motor is running still, even if the power supply has been turned off. Take care to avoid electric shock. Always make sure that motor is stopped before starting maintenance, inspection or wiring.

## Lubrication

All the G3, H2 and F3 Series models employ a grease lubrication system and filled with specified quantities of high-grade grease before shipment from our factories. The grease contains the additive agent of extreme-pressure, which is equivalent to NLGI-O or NLGI-O.



## ■ Combination of motor and driver

- 1 Use motors and inverters in the combinations specified by us. Otherwise it could cause malfunction, damage on equipment or fire.
- 2 It takes approx. 0.15 seconds (magnetic pole detection time) before the motor starts after the start command is received by the driver.
- 3 Two or more motors cannot be connected to one driver. It cannot control motors in this way.
- 4 When the motor is equipped with a brake, the brake may malfunction by the fluctuation in voltage. It is necessary to let the brake wires bypass the driver.
- 5 Even when the driver is stopped (no drive command), if the IPM motor is rotated by a load, an inductive voltage generates on the motor.  
The inductive voltage could damage the driver. Take measures to prevent the motor being rotated at 3,000 rpm (Motor shaft equivalent) from the load side.  
Alternately, when it is possible to be rotated by the load, make sure to insert a switch at the output side of driver. It is necessary to arrange so that the switch will never trip when driving the driver. Otherwise the driver may be damaged.

## ■ Caution for installation

- 1 Install at a clean place, avoiding places where high temperature, high humidity, dewing or frosting occurs or hazardous environments that contain corrosive gas, explosive gas, combustible gas, oil mist, profuse dust or metallic powder. It is necessary to place in a "hermetic type" panel for protection against floating particles. If it is placed in such panel, employ a size of panel or internal cooling which is sufficient to restrict the ambient temperature of driver below the allowable temperature level.
- 2 Since the driver may become very hot locally, install it on an incombustible surface of metal, or other, in place of combustible materials such as wood board.
- 3 Install it with the oblong side vertically.
- 4 Do not mount or place any heavy object on it. There is risk of injury.
- 5 Protect it from strong impacts. It may be damaged.

## ■ Caution for wiring

### 1 Installation of no fuse breaker (MCCB)

- (1) Install a no fuse breaker at the power supply side to protect wires.
- (2) It should be avoided to start and stop frequently by turning ON or OFF the no fuse breaker.
- (3) When it is necessary to start and stop frequently, implement it by turning ON or OFF between the control terminals F (or R) and CC.

### 2 Installation of electromagnetic contactor (MC) (Primary side)

- (1) Install an electromagnetic contactor at the power supply side of driver to prevent the restart after a power outage, trip of thermal relay or activation of inverter's protective circuit.
- (2) Since this driver has a built-in error detection relay (FL), if this contact is connected to the operation circuit of electromagnetic contactor at primary side, the electromagnetic contactor is opened when the inverter's protective circuit is operated.

- (3) The driver can be used without an electromagnetic contactor. In such occasion, it is necessary to open the primary side circuit with a no fuse breaker when the inverter's protective circuit has operated.
- (4) Avoid frequent starts and stops by turning ON or OFF the electromagnetic contactor at the primary side.
- (5) If it is necessary to start and stop frequently, implement it by turning ON or OFF between the control terminals F (or R) and CC.
- (6) Install a surge suppressor on the exciting coil of electromagnetic contactor.
- (7) When connecting a braking resistor to the driver, produce a sequence so that, when the thermal relay built in the braking resistor has tripped, the electromagnetic contactor will be turned OFF at the thermal relay contact to shut down the power supply at the primary side of driver.

### 3 Installation of electromagnetic contactor (MC) (Secondary side)

Do not, in principle, install an electromagnetic contactor between the driver and the motor to turn it ON or OFF during operation (if the secondary side is turned ON or OFF during operation, the driver may be damaged by a large current).

#### External signal

- 4 (1) Use a relay for fine current. Install a surge suppressor on the exciting coil of relay.
- (2) Use shielded or twisted cables on the control circuit.
- (3) Since the control terminals (control terminals excluding FLA, FLB and FLC) are for electronic circuits, make sure to insulate input signals from the main circuit (in terms of circuit).

### 5 Wiring

- (1) Confirm that the input power supply is OFF, before starting the wiring work. There is risk of electric shock or fire.
- (2) Do not touch the inside of driver in any event. There is risk of electric shock.
- (3) Implement connections to the power supply cable as instructed in the instruction manual. If wires are connected to wrong terminals, it could damage the driver or cause electric shock of fire.
- (4) DC terminals (P0, PA/+, PB, PC/-) are for connection of specialized optional devices. Do not connect any device other than specialized optional devices.
- (5) Since it takes time to discharge electricity from the capacitor in the converter after shutting down the power supply to the driver. Before starting wiring, inspection, or other, wait for more than 15 minutes after shutting down the input power supply. Confirm also that the charge lamp is turned off, and check the DC main circuit voltage (between main circuit terminals PA-PC) with a tester, or the like.

### 6 Grounding

The driver and the motor must be grounded. To ground the driver, be sure to use its grounding terminal.

# CAUTION FOR USE (DRIVER)

## ■ Caution for operation

- 1 Be sure to use the power supply which is specified on the nameplate. Otherwise it could cause damage on the motor or fire.
- 2 When any error occurs, the driver activates its protective function to stop output. However, it cannot stop the motor suddenly. When the emergency stop is required on the machine or equipment, it is necessary to install a mechanical stop or protective function.
- 3 When controlling a machine or equipment on which load is applied repeatedly, if large currents flow repeatedly at the stop and start of operation, the life of semiconductor elements built in the driver may be reduced as a result of thermal fatigue. The life may be extended by suppressing the starting current and load current with extended acceleration and deceleration times, or by setting the PWM carrier frequency at a low level.
- 4 When using for elevating operation, always calculate the resistance value to consume the regenerative power at the descending operation and install adequate regenerative discharge resistor. If the resistance is not enough, the alarm lamp of excessive regeneration lights up on the driver and the power supply from the driver to the motor is stopped. In such occasion, if the motor has not a built-in electromagnetic brake (Motor classification – Types M, G), the equipment may drop off.
- 5 If the power supply is turned ON while the operation signal is ON, the motor starts to run suddenly. Make sure to confirm the operation signal is OFF before turning the power supply ON. There is risk of injury.
- 6 Do not operate while the face cover and the terminal board cover are removed from the driver. Replace the face cover and the terminal board cover properly before starting operation. There is risk of electric shock.
- 7 Operation may restart suddenly after an instantaneous power interruption when the power supply is restored. Keep away from the machine. There is risk of injury.
- 8 If operation has stopped after an error or by the protective function, never attempt to restart before identifying and removing the cause.
- 9 Although the motor is not driving while the servo lock is activated, since the driver is controlling to stop the IPM motor, take care not to touch the terminal board of main circuit, or other. There is risk of electric shock.
- 10 When the motor is in the state of free run, be sure to give the operation command only after confirming that the motor is stopped. If the operation command is given while the motor is in the state of free run and running, it may be stopped if the "SOUT" trips.

## ■ Guidelines for harmonic to power supply and measures for suppression

### 1 Harmonic to power supply and its influence

Harmonic means a sine wave form which has a frequency equal to the integral multiple of sine wave form (Basic frequency: 50 Hz or 60 Hz) of commercial power supply. If harmonics are contained in the commercial power supply, the wave form is distorted. Distorted waves generate from the rectifying circuit and the smoothing circuit provided at the input side of driver. Harmonics generated from the driver may cause harmful effects (overheat of phase

advance capacitor or reactor, among others) on electrical equipment connected to the same power system.

### 2 Guidelines for harmonic suppression measures

Since harmonic current from a harmonic generating device, such as driver, causes harmful effects on other devices connected in the same power system, the guidelines for harmonic suppression measures was established in September 1994.

"Guidelines for harmonic suppression measures by consumers receiving high or specially high voltage" The guidelines provides upper limit values for the harmonic currents released from the customer, who receives high or specially high voltage power, when they newly install, add or update a harmonic generating device. When the currents exceed the upper limit value of harmonic current, it is necessary to provide measures to suppress the currents lower than the upper limit value.

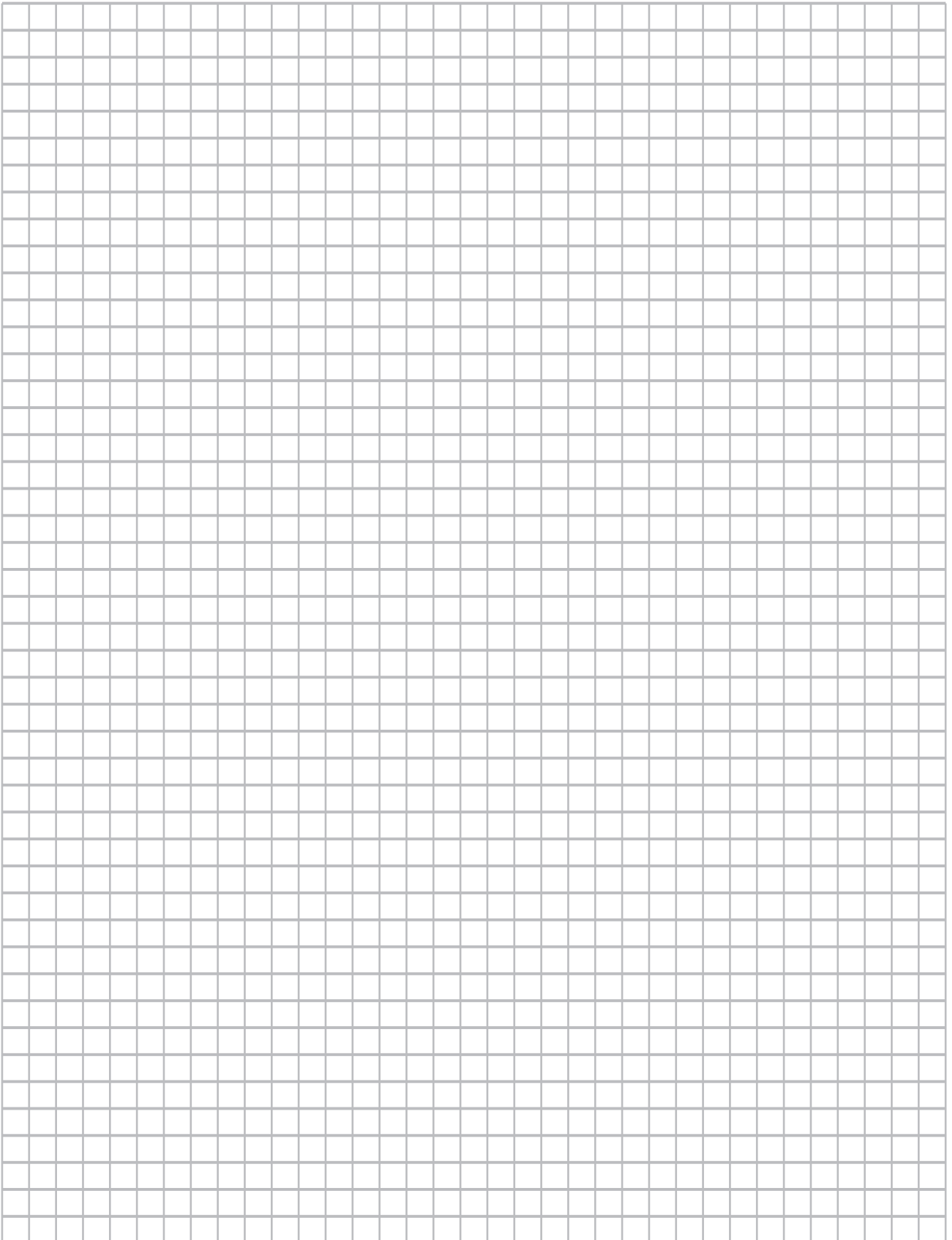
### 3 Guideline for suppression of harmonic of inverter

In order to enlighten the awareness concerning comprehensive harmonic suppression among customers to whom the above guidelines does not apply, the Japan Electrical Manufacturers' Association produced a guidelines for harmonic currents on inverters of which the input voltage is of 100 V class or 200 V class and the input current is 20 A or less. It recommends connecting an input reactor or DC reactor for compliance to the guidelines. Regarding the reactors, refer to the pages concerning peripheral equipment.

## ■ Request for disposal

When disposing this unit, ask a professional industrial disposal operator for disposal. It should not be attempted to dispose by one's own because there is risk of injury when capacitors exploded or hazardous gas was released.

※Professional industrial waste disposal operator means the "Industrial waste disposal operator" and "Industrial waste collection and transportation operator". It is penalized by the law if industrial waste is collected, transported or disposed by any person other than the authorized operators. (Act on the Disposal and Cleaning of Waste")





# Technical Section

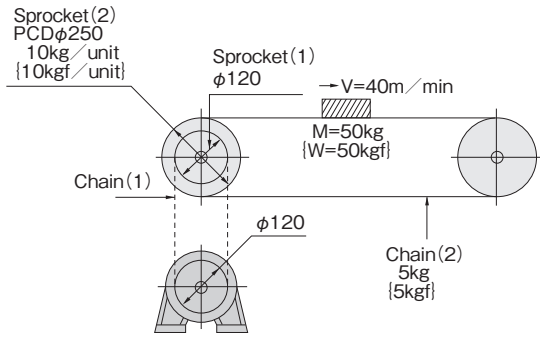
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# GEARMOTOR SELECTION PROCESS EXAMPLES

## Example Selection In Case of Foot or Flange Mount

Application ..... Conveyor (Moderate shock load)  
 Conveyor Speed ..... 10m/min  
 Weight of Work ..... 620Kg  
 (Mass of Work ..... 620kgf)  
 Type of Drive ..... Chain(Located on the center of the shaft)  
 Operating Time ..... 12 hours/day  
 Coefficient of Friction ..... 0.2 (Estimated)  
 Chain(1), Sprocket(1) and other conditions were neglected for this calculation.



Selection Process		Selection Example	
		SI Unit	Gravimetric Unit
Decide Type	Decide on Parallel Shaft, Right Angle Shaft or Hollow Bore	Decide on a G3 (parallel shaft) considering the mounting space.	
Determine Reduction Ratio	Determine Reduction Ratio:  Required rotating speed for output shaft $i = \frac{\text{Rated motor rotation speed}}{\text{Required rotating speed for output shaft}}$	Required Rotation Speed of Conveyor Shaft = $\frac{40 \times 1000}{250 \times \pi} \doteq 50.9 \text{ rpm}$ Since the diameter of the sprocket for the conveyor shaft and that of the reducer output shaft are the same, we obtain; $i = \frac{50.9}{1800} \doteq \frac{1}{30}$	
Check Torque	Calculate Actual Load Torque(TL)	$T_L = 9.8 \times (50 + 2 \times 10 + 5) \times 0.2 \times \frac{250}{2 \times 1000} = 18.4 \text{ N} \cdot \text{m}$	$T_L = (50 + 2 \times 10 + 5) \times 0.2 \times \frac{250}{2 \times 1000} = 1.9 \text{ kgf} \cdot \text{m}$
	Calculate equivalent torque(TLE) of output shaft from service factor; (sf given in Table-1 on page T42) $T_{LE} = T_L \times S_f$	Adjust Actual Load Torque(TL) using a Service Factor (Sf). $T_{LE} = 18.4 \times 1.25 = 23 \text{ N} \cdot \text{m}$	$T_{LE} = 1.9 \times 1.25 = 2.4 \text{ kgf} \cdot \text{m}$
	Choose the allowable torque(TA) of output shaft from the performance table, which should be greater than TLE	Select an appropriate model of $T_{LE} \leq T_A$ G3L22N30N-IPM020NT	
Check Inertia	Calculate Actual Load Inertia	Calculate Actual Load Inertia Moment(JL) $J_L = [50 \times (\frac{0.25}{2})^2] + [\frac{1}{2} \times 10 \times (\frac{0.25}{2})^2 \times 2] + [5 \times (\frac{0.25}{2})^2]$ $= 1.02 \text{ kg} \cdot \text{m}^2$	Calculate Actual Load $GD^2$ ( $GD_L^2$ ) $GD_L^2 = (50 \times 0.25^2) + (\frac{1}{2} \times 10 \times 0.25^2 \times 2) + (5 \times 0.25^2)$ $= 4.06 \text{ kgf} \cdot \text{m}^2$
	Calculate Load Inertia converted to Motor Shaft	Convert J <sub>L</sub> into the equivalent value at the motor shaft (J <sub>g</sub> ) $J_g = J_L \times (i)^2$ $J_g = 1.02 \times (\frac{1}{30})^2$ $\doteq 0.001128 \text{ kg} \cdot \text{m}^2$	Convert $GD_L^2$ into the equivalent value at the motor shaft ( $GD_g^2$ ) $GD_g^2 = GD_L^2 \times (i)^2$ $GD_g^2 = 4.06 \times (\frac{1}{30})^2$ $\doteq 0.00451 \text{ kgf} \cdot \text{m}^2$
	Select a model of which actual load inertia moment $\leq$ allowable inertia, from (P. T42, Table 2).	G3L28N30N-IPM040NT	
Check O.H.L.	Determine K1 by the type of drive (Table 6 on page T46) Determine K2 by the location of the load (Table-7 on page ET46) $O.H.L. = \frac{T_{LE} \times K_1 \times K_2}{R}$ * R: Pitch Circle Radius of sprocket, etc. equipped to reducer shaft	$K_1 = 1$ $K_2 = 1$ $O.H.L. = \frac{23 \times 1 \times 1}{120} = 384 \text{ N}$	$O.H.L. = \frac{2.4 \times 1 \times 1}{120} = 40 \text{ kgf}$
	Select O.H.L. $\leq$ Allowable O.H.L. from the performance table	Select the model which satisfy O.H.L. $\leq$ Allowable O.H.L., then found G3L22N30N-IPM020NT	
Final Decision	Select the most appropriate model which will satisfy all the torque, inertia and O.H.L.	The most appropriate model is G3L28N30N-IPM040NT	

(Note) A specialized IPM driver is required (Sold Separately).

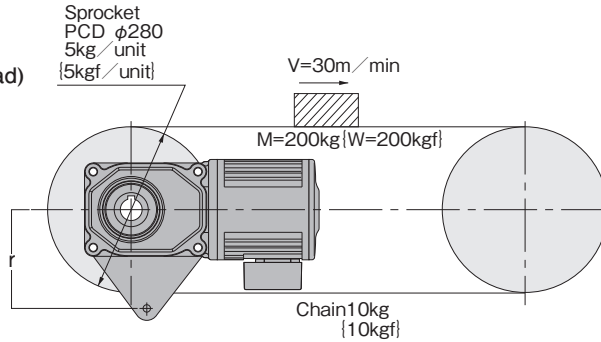
# GEARMOTOR SELECTION PROCESS EXAMPLES

## Example Selection

In case of Shaft Mount

- Application ..... Conveyor (Moderate shock load)
- Conveyor Speed ..... 30m/min
- Weight of Work ..... 200Kg  
(Mass of Work ..... 200kgf)
- Type of Drive ..... Chain
- Operating Time ..... 12 hours/day
- Coefficient of Friction ..... 0.2 (Estimated)

Conditions other than above stated were not considered in this calculation.



Selection Process		Selection Example	
		SI Unit	Gravimetric Unit
Decide Type	Selection of hollow bore, right angle shaft, or parallel shaft	Decide on F3S (Hollow Bore) model considering from the shaft mounting.	
Determine Reduction Ratio	Determine Reduction Ratio:  Required rotating speed for output shaft $i = \frac{\text{Rated motor rotation speed}}{\text{Required rotating speed for output shaft}}$	Required Rotation Speed of Conveyor Shaft = $\frac{30 \times 1000}{280 \times \pi} \approx 34.1 \text{ rpm}$ Since the rotation speed of the conveyor shaft and that of the reducer's output shaft are the same. $i = \frac{1800}{34.1} \approx \frac{1}{50}$	
Check Torque	Calculate Actual Load Torque(TL)	$T_L = 9.8 \times (200 + 2 \times 5 + 10) \times 0.2 \times \frac{280}{2 \times 1000} = 60.4 \text{ N} \cdot \text{m}$	$T_L = (200 + 2 \times 5 + 10) \times 0.2 \times \frac{280}{2 \times 1000} = 6.16 \text{ kgf} \cdot \text{m}$
	Calculate equivalent torque(TLE) of output shaft from service factor: (sf given in Table-1 on page T42) $T_{LE} = T_L \times S_f$	Adjust Actual Load Torque(TL) using a Service Factor (Sf). $T_{LE} = 60.4 \times 1.25 = 75.5 \text{ N} \cdot \text{m}$	$T_{LE} = 6.16 \times 1.25 = 7.7 \text{ kgf} \cdot \text{m}$
	Choose the allowable torque(TA) of output shaft from the performance table, which should be greater than TLE	Select an appropriate model of $T_{LE} \leq T_A$ F3S30N50N-IPM040NT	
Check Inertia	Calculate Actual Load Inertia	Calculate Actual Load Inertia Moment(JL) $J_L = [200 \times (\frac{0.28}{2})^2] + [\frac{1}{2} \times 5 \times (\frac{0.28}{2})^2 \times 2] + [10 \times (\frac{0.28}{2})^2]$ $= 4.21 \text{ kg} \cdot \text{m}^2$	Calculate Actual Load $GD^2$ ( $GD_L^2$ ) $GD_L^2 = (200 \times 0.28^2) + (\frac{1}{2} \times 5 \times 0.28^2 \times 2) + (10 \times 0.28^2)$ $= 16.86 \text{ kgf} \cdot \text{m}^2$
	Calculate Load Inertia converted to Motor Shaft	Convert J <sub>L</sub> into the equivalent value at the motor shaft (J <sub>g</sub> ) $J_g = J_L \times (i)^2$ $J_g = 4.21 \times (\frac{1}{50})^2$ $= 0.001686 \text{ kg} \cdot \text{m}^2$	Convert $GD_L^2$ into the equivalent value at the motor shaft ( $GD_g^2$ ) $GD_g^2 = GD_L^2 \times (i)^2$ $GD_g^2 = 16.86 \times (\frac{1}{50})^2$ $\approx 0.00674 \text{ kgf} \cdot \text{m}^2$
	Select a model of which actual load inertia moment $\leq$ allowable inertia, from (P. T42, Table 2).	F3S35N50N-IPM075NT	
Final Decision	Select the most appropriate model which will satisfy all the torque, inertia and O.H.L.	Finally we can determine the model F3S35N50N-IPM075NT Torque Arm TAF3S-35(Option Number) is recommended. Refer to page PT67.  $r \geq \frac{\text{Actual Load Torque} \times 1000}{\text{Allowable O.H.L.} - \text{mass of Reducer}} = \frac{75.5 \{7.7\} \times 1000}{3480 \{355\} - 9.8 \times 15.5 \{15.5\}} = 22.7$	

\*For torque arm calculations, please see page T68.

(Note) A specialized IPM driver is required (Sold Separately).

# SERVICE FACTOR, ALLOWABLE INERTIA MOMENT

## Service Factor (Sf)

IPM gearmotors are designed to run for 10 hours a day under uniform loads. When used under conditions that exceed the prior, load torque should be revisited according to the service factors in the table below.

〈Table-1〉

Load Condition	Service Factor(Sf)			Application
	Under 3 hrs/day	3~10 hrs./day	Over 10 hrs/day	
Uniform Load	1	1	1	Conveyors(uniform load), Screens, Agitators(low viscosity), Sewage Disposal Equipments(light load), Machine Tools(feed shaft), Elevators, Extruders, Distillers
Moderate Shock Load	1	1	1.25	Conveyors (non-uniform or heavy load), Agitators (high viscosity), Machines for Vehicles, Sewage Disposal Equipments (moderate load), Hoists (light load), Paper Mills, Feeders, Food Machines, Pumps, Sugar Mills, Textile Machines
Heavy Shock Load	1	1.25	1.5	Hoists (heavy load), Hammer Mills, Metal Mills, Crushers, Tumblers

## Allowable Inertia Moment J (JA) Allowable ( GD<sup>2</sup> )

If operated intermittently with high-inertia loads starting and stopping may cause sudden increase in torque which can cause unexpected accidents. The inertia of the application should be kept within the allowable ranges given in the tables below with regard to linkage method and start-up frequency.

### ■ Allowable Inertia Moment J by Motor Power {GD<sup>2</sup>}

(Motor shaft Equivalent)

Unit: Inertia Moment J (kg·m<sup>2</sup>) {GD<sup>2</sup>(kgf·m<sup>2</sup>)} 〈Table-2〉

3-Phase	Allowable Inertia Moment J (JA) {AllowableGD <sup>2</sup> }
0.1kW	0.0008 {0.003}
0.2kW	0.0010 {0.004}
0.4kW	0.0015 {0.006}
0.75kW	0.0030 {0.012}
1.5kW	0.008 {0.032}
2.2kW	0.011 {0.042}

(Note) 1. Motor shaft equivalent inertia moment J  
 = Output shaft inertia moment J × (reduction ratio)<sup>2</sup>  
 (Motor shaft equivalent GD<sup>2</sup> = Output shaft GD<sup>2</sup> × (reduction ratio)<sup>2</sup>)  
 (Example: In case the reduction ratio is 1/20, the answer is 1/400.)



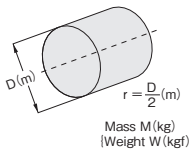
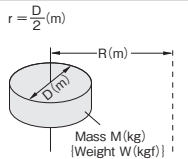
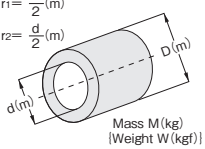
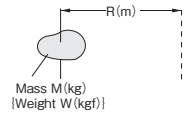
# CALCULATION OF INERTIA MOMENT

## Calculation of Inertia Moment J {GD<sup>2</sup> (Flywheel Effect)}

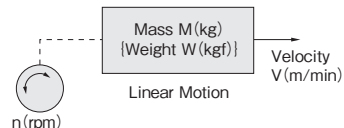
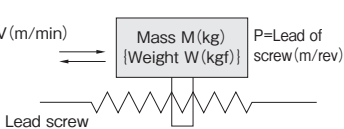
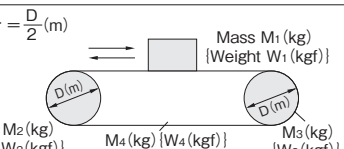
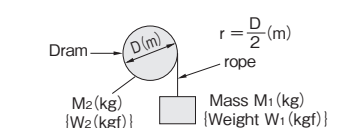
The conversion between the inertia moment J (kg·m<sup>2</sup>)-(SI units) and the gravimetric units GD<sup>2</sup> (kg·m<sup>2</sup>) are calculated as follows:

$$J = \frac{GD^2}{4} \begin{cases} G : \text{Gravity (kgf)} \\ D : \text{Rotation Diameter (m)} \\ J : \text{Inertia Moment (kg}\cdot\text{m}^2) \end{cases}$$

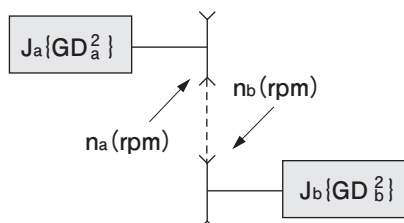
### Inertia Moment in Rotation J {GD<sup>2</sup>}

When the center of rotation is concentric with the center of gravity		When the center of rotation is not concentric with the center of gravity			
	SI Unit	Gravimetric Unit			
	$J = \frac{1}{2} Mr^2$ (kg·m <sup>2</sup> )	$GD^2 = \frac{1}{2} WD^2$ {kgf·m <sup>2</sup> }		$J = \frac{1}{2} Mr^2 + MR^2$ (kg·m <sup>2</sup> )	$GD^2 = \frac{1}{2} WD^2 + 4WR^2$ {kgf·m <sup>2</sup> }
	$J = \frac{1}{2} M(r_1^2 + r_2^2)$ (kg·m <sup>2</sup> )	$GD^2 = \frac{1}{2} W(D^2 + d^2)$ {kgf·m <sup>2</sup> }		(when you can ignore size) $J = MR^2$ (kg·m <sup>2</sup> )	(when you can ignore size) $GD^2 = 4WR^2$ {kgf·m <sup>2</sup> }

### Inertia Moment in Linear Motion J {GD<sup>2</sup>}

		SI Unit	Gravimetric Unit
Ordinary Use		$J = \frac{1}{4} M \cdot \left( \frac{V}{\pi \cdot n} \right)^2$ (kg·m <sup>2</sup> )	$GD^2 = W \cdot \left( \frac{V}{\pi \cdot n} \right)^2$ {kgf·m <sup>2</sup> }
Horizontal Linear Motion (driven with lead screw)		$J = \frac{1}{4} M \cdot \left( \frac{P}{\pi} \right)^2$ $= \frac{1}{4} M \cdot \left( \frac{V}{\pi \cdot n} \right)^2$ (kg·m <sup>2</sup> )	$GD^2 = W \cdot \left( \frac{P}{\pi} \right)^2$ $= W \cdot \left( \frac{V}{\pi \cdot n} \right)^2$ {kgf·m <sup>2</sup> }
Horizontal Linear Motion (conveyors, etc.)		$J = M_1 r^2 + \frac{1}{2} M_2 r^2$ $+ \frac{1}{2} M_3 r^2 + M_4 r^2$ (kg·m <sup>2</sup> )	$GD^2 = W_1 D^2 + \frac{1}{2} W_2 D^2$ $+ \frac{1}{2} W_3 D^2 + W_4 D^2$ {kgf·m <sup>2</sup> }
Vertical Linear Motion (cranes, winches, etc.)		$J = M_1 r^2 + \frac{1}{2} M_2 r^2$ (kg·m <sup>2</sup> )	$GD^2 = W_1 D^2 + \frac{1}{2} W_2 D^2$ {kgf·m <sup>2</sup> }

### Conversion of Inertia Moment when Speed Ratio is available



The inertia moment J<sub>b</sub> (GD<sub>b</sub><sup>2</sup>) of the load can be converted into the equivalent value at the n<sub>a</sub> shaft as shown below:

$$J = J_a + \left( \frac{n_b}{n_a} \right)^2 \times J_b$$

$$\{GD^2 = GD_a^2 + \left( \frac{n_b}{n_a} \right)^2 \times GD_b^2\}$$

# INERTIA MOMENT (GEARMOTOR)

## ■ Inertia moment J {GD<sup>2</sup>} of the Gearmotor at the Motor Shaft by Motor Power (Motor Shaft Equivalent, Common to Every Reduction Ratio)

● IP44 and IP65

〈Table-3〉

Motor Power	0.1kW	0.2kW	0.4kW	0.75kW	1.5kW	2.2kW
Inertia Moment J (kg·m <sup>2</sup> ) {GD <sup>2</sup> (kgf·m <sup>2</sup> )}	0.00034 {0.0013}	0.00034 {0.0013}	0.00074 {0.0030}	0.00128 {0.0051}	0.00341 {0.0134}	0.00505 {0.0202}

## ■ Inertia moment J {GD<sup>2</sup>} of the Brakemotor at the Motor Shaft by Motor Power (Motor Shaft Equivalent, Common to Every Reduction Ratio)

● IP44

〈Table-4〉

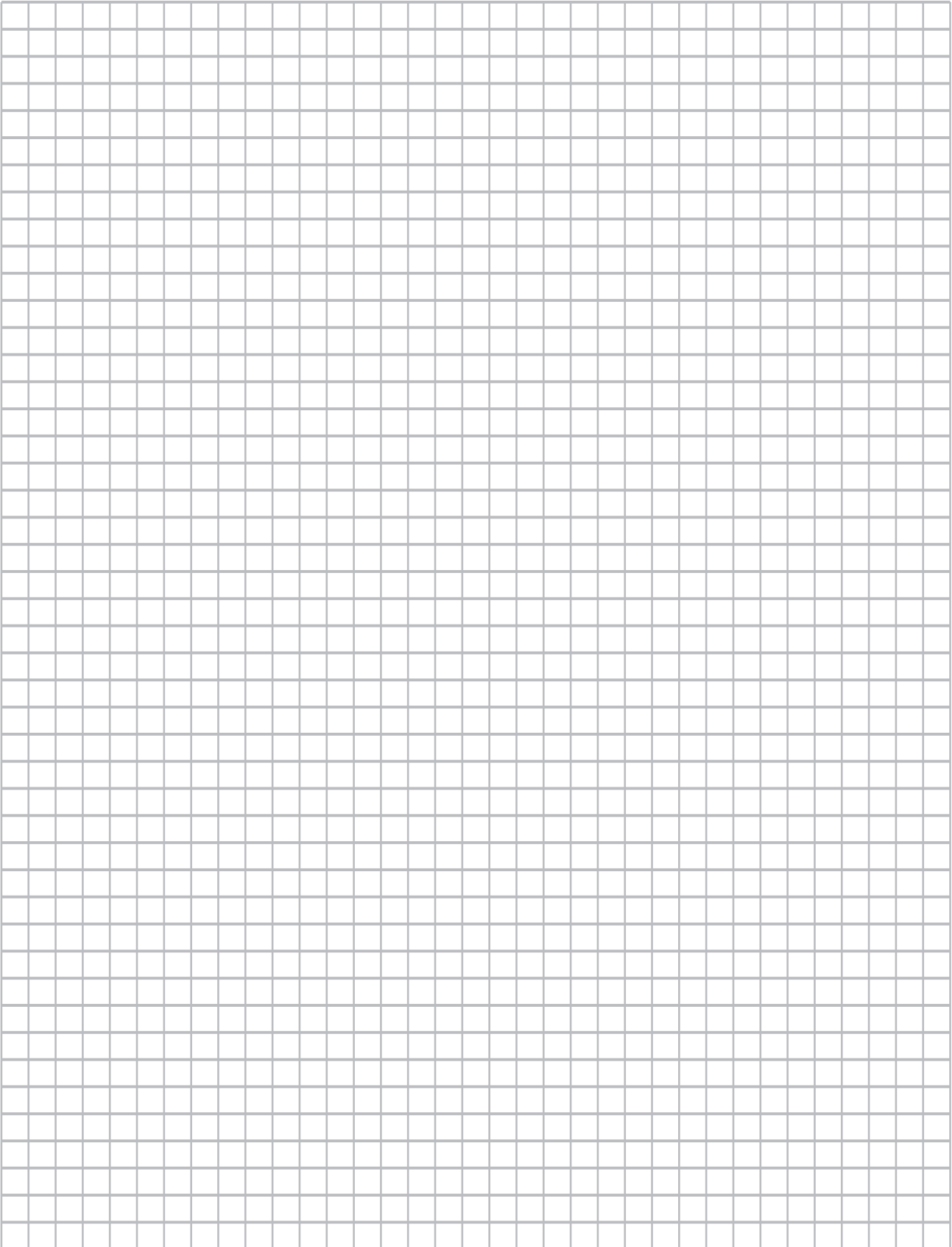
Motor Power	0.1kW	0.2kW	0.4kW	0.75kW	1.5kW	2.2kW
Inertia Moment J (kg·m <sup>2</sup> ) {GD <sup>2</sup> (kgf·m <sup>2</sup> )}	0.00042 {0.0017}	0.00058 {0.0023}	0.00098 {0.0039}	0.00192 {0.0077}	0.00452 {0.0181}	0.00616 {0.0246}

● IP65

〈Table-5〉

Motor Power	0.1kW	0.2kW	0.4kW	0.75kW
Inertia Moment J (kg·m <sup>2</sup> ) {GD <sup>2</sup> (kgf·m <sup>2</sup> )}	0.00039 {0.0016}	0.00039 {0.0016}	0.00088 {0.0035}	0.00153 {0.0061}

\* 1.5 kW and 2.2 kW IP65 models do not have a brake option.



# OVERHUNG LOAD (O.H.L.)

## Overhung Load (O.H.L.)

An overhung load is suspending load imposed on a shaft. In the coupling of a reducer shaft and an application, if chains, belts or gears are used, this O.H.L. must be taken into consideration.

$$O.H.L. = \frac{T_{LE} \times K_1 \times K_2}{R} \text{ (N) (kgf)}$$

{

T<sub>LE</sub> : Equivalent output torque imposed on reducer shaft (N·m) {kgf·m}

R : Pitch Circle Radius(m) of sprocket, pulley, gear, etc. attached to reducer shaft.

K<sub>1</sub> : Factor for the connecting method (Refer to Table-6)

K<sub>2</sub> : Factor for the load point (Refer to Table-7)

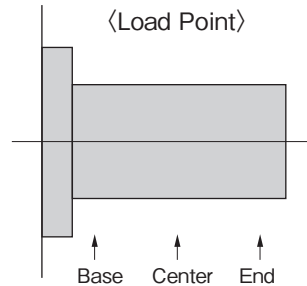
- Be sure that the O.H.L. value calculated by above formula does not exceed the allowable O.H.L. value listed in the performance table.
- In the case of a Hollow Bore gearhead, please calculate with 1.00 for coefficient K2.

### Factor K<sub>1</sub> (Table-6)

Connecting Method	K <sub>1</sub>
Chain, Timing Belt	1.00
Gear	1.25
V-Belt	1.50

### Factor K<sub>2</sub> (Table-7)

Load Point	K <sub>2</sub>
Base of the Shaft	0.75
Middle of the shaft	1.00
End of the shaft	1.50



# OVERHUNG LOAD (O.H.L.)

## Hollow Bore Overhung Loads (O.H.L.)

### Flange Mounting

#### (1) Load Point of O.H.L.

The allowable O.H.L. load position is calculated to be 20mm from the end of the output shaft.

#### (2)-1 O.H.L. Corrections when one end can't take a pillow block bearing

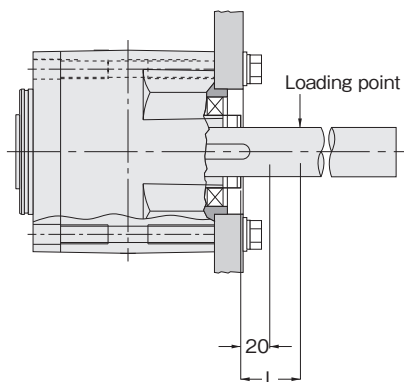
If the length of the load point (L) becomes greater than 20mm, it can be corrected using the following formula:

$$\text{Corrected O.H.L. (N) [kgf]} = \frac{A+20}{A+L} \times \text{Allowable O.H.L. (N) [kgf]}$$

(Note) Refer Table-8-2 for A.

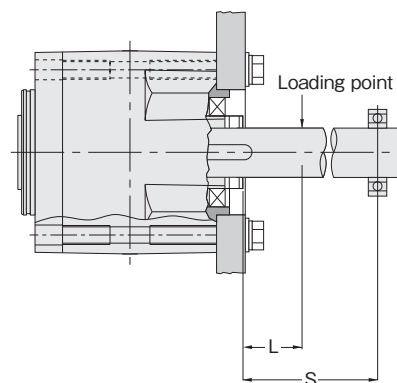
(Table-8-2)

Frame Number	A (mm)
20	68.5
25	84.5
30	91
35	98
45	113
50	139
55	184.5



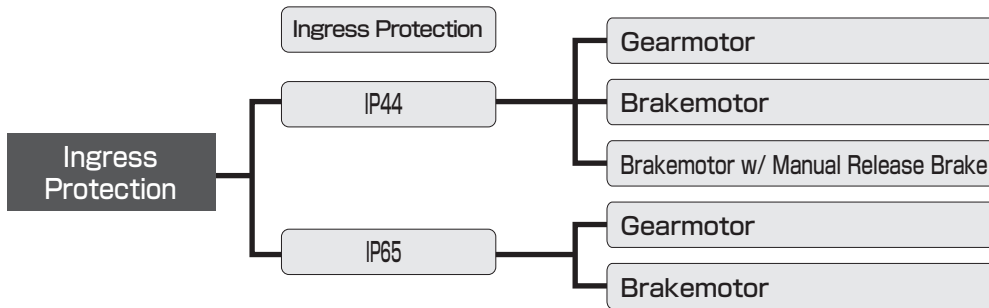
#### (2)-2 O.H.L Corrections when one end can take a pillow block bearing

$$\text{Corrected O.H.L. (N) [kgf]} = \frac{S}{S-L} \times \text{Allowable O.H.L. (N) [kgf]}$$



# TYPES, TERMINAL BOX

## IPM Gearmotor Types



## Ingress Protection

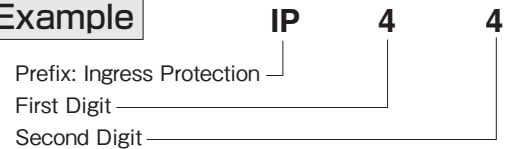
### ■ (IEC 60034-5 2000)

Ingress Protection rating are assigned according to the level of protection provided by the motor enclosure.

First Digit - Level of protection against the ingress of solids

Second Digit - Level of protection against the ingress of liquids

### Example



First Digit	Description
0 or X	Structure having no particular protection against contact of human body or ingress of solid objects
1	Structure that prevents any large surface of the body, such as a hand, from contacting accidentally revolving or live sections in the equipment. Structure that prevents ingress of solid objects of $\phi 50$ mm or larger.
2	Structure that prevents fingers, etc., from contacting revolving or live sections in the equipment. Structure that prevents ingress of solid objects of $\phi 12$ mm or larger.
4	Structure that prevents objects, such as tools, wires, etc., of which the minimum width or thickness is larger than 1 mm, from touching any revolving or live sections in the equipment. Structure that prevents ingress of objects of $\phi 1$ mm or larger. Structure rated as 2 of the characteristic numeral, however, may be used for a drain hole, suction inlet and exhaust outlet.
5	Structure that prevents any object from contacting revolving or live sections in the equipment. Structure that prevents ingress of dust and, even if such may ingress, it will not produce any harmful effect.
6	Structure that prevents ingress of dust at the inside.

Second Digit	Description
0 or X	Structure having no particular protection against ingress of water
2	Structure with which vertically dripping water at an angle up to $15^\circ$ has no harmful effect.
3	Structure with which vertically dripping water at an angle up to $60^\circ$ has no harmful effect.
4	Structure with which water splashing from any direction has no harmful effect.
5	Structure with which water projected by a nozzle from any direction has no harmful effect.
6	Structure with which water projected in powerful jet has no harmful effect.
7	Structure with which, when immersed in water at the specified depth and time, no harmful effect will be produced even if water entered the inside.
8	Structure that can operate properly in water.

(Note) 1. Motors rated as IP44 are not waterproof. Take proper care in order to protect against the splashing of liquids such as oil or water.

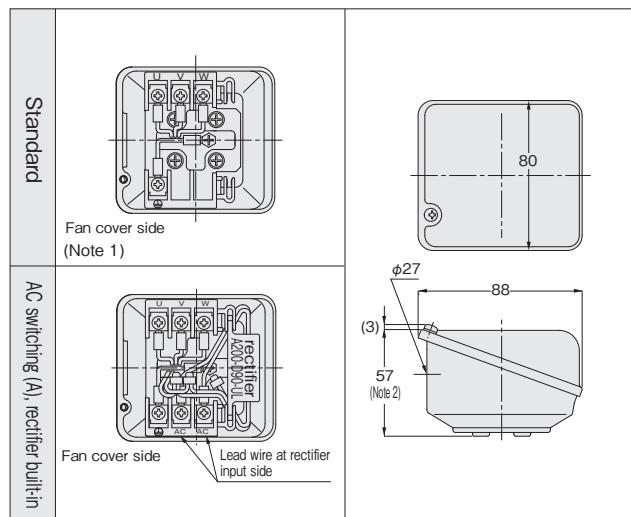
# TYPES, TERMINAL BOX

## Type and Specification of Terminal Box

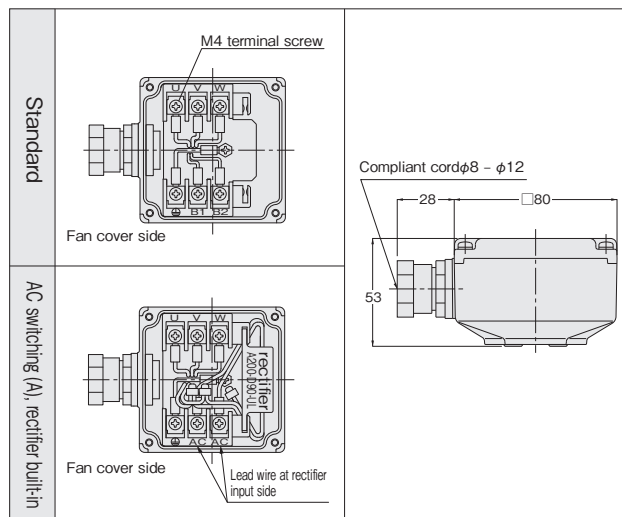
Motor Specification			Terminal Box Specification								Gearmotor with Brake, Built-in Rectifier	
Motor Type	Brake	Protection	Type	Code	Standard or Optional Specification						Adaptation	Designation
					0.1kW	0.2kW	0.4kW	0.75kW	1.5kW	2.2kW		
M	None	IP44	Steel plate	T	△	△	△	○	○	○	—	—
B·J	With	IP44	Steel plate	T	△	△	△	○	○	○	△	"□X-AA" is added to Code.
G	None	IP65	Aluminum	E	○	○	○	○	○	○	—	—
H	With	IP65	Aluminum	E	○	○	○	○	—	—	△	"□X-AA" is added to Code.

- (Note) 1. Motor type B is equipped with a brake. Type J is equipped with a manual release device. IP65 with brake has no manual release device.  
 2. Gearmotor with brake (Motor types B, J, H) has a stand alone rectifier as the standard. It may be built in as the optional specification.  
 3. Built-in rectifier is wired with the "AC switching (A)". Specify by adding "□X-AA" to the end of Code.  
 The code of terminal box is filled in "□". Example: G3L22N30L-IPB020NTX-AA  
 For the schematics of "AC switching (A)", refer to (P. T49).  
 4. "○", "△", "×" and "※" in the table mean the standard, optional specification, custom specification and unable to adapt, respectively.

### ■Type T terminal box (Steel plate), for IP44



### ■Type E terminal box (Aluminum), for IP65

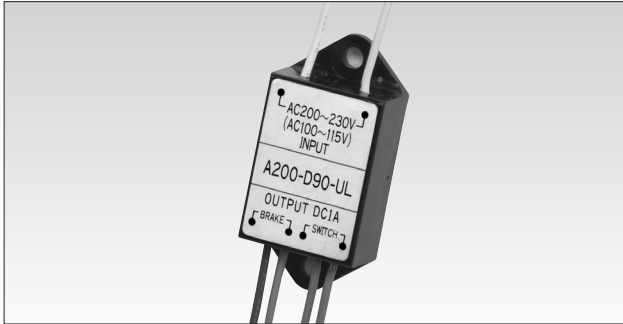


- (Note) 1. When a brake motor is attached, the brake lead wires are taken out loosely from the brake unit.  
 2. For the T terminal box, when the optional manual brake release device is attached for models 0.75 kW or less, add 9.5 mm to the height because a spacer is used. (Type T = 66.5 mm)

# CONNECTION AND RECTIFIER

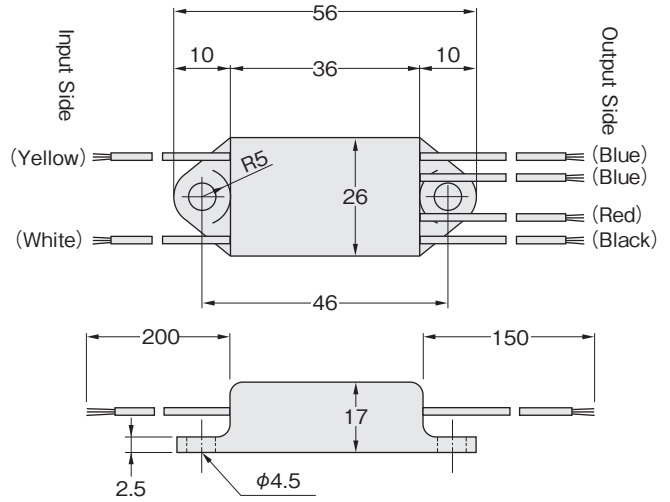
## ■ Rectifier

To operate the brake on an IPM gearmotor with brake, the included rectifier A200-D90-UL is required. Although a surge protector is built into the rectifier, use an additional surge killer or noise filter if it is considered necessary.



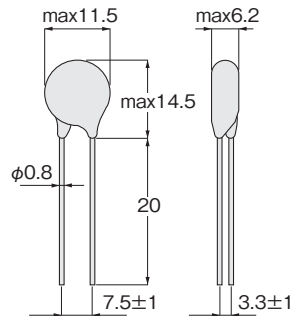
## ■ A200—D90—UL Dimension Diagram

(Approximate weight: 40g) (A100—D45)



## ■ Surge Suppressor (Option) OP-ERZV10D471

Use this to extinguish sparks on SWs on the power supply line.





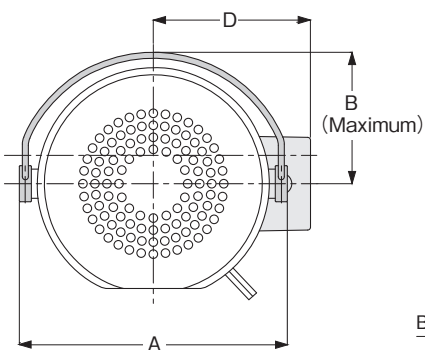
# MANUAL RELEASE DEVICE

Type T terminal box of 0.1 – 0.75 kW has outer dimensions different from those of standard gear motors with brake because it uses a spacer for its function.

Refer to the following table of dimension D.

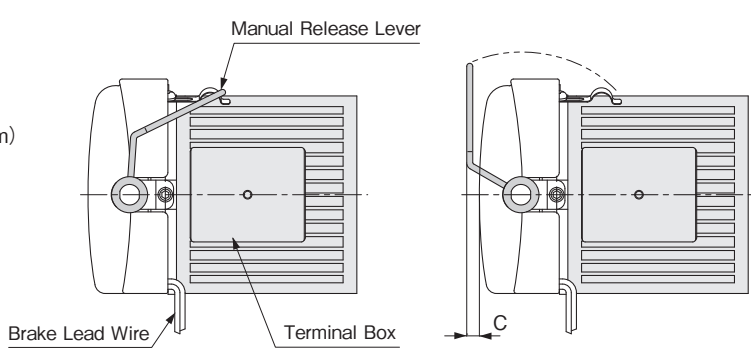
The manual brake release device cannot be installed on (IP65) models.

## G3·H2

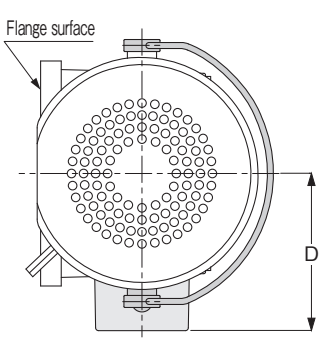


## ●During Operation

## ●Brake Released



## F3



\* Above diagram is just a representative.  
In case of F3, the shape of the gear head is different.

## Dimensions by Motor Power G3 · H2 · F3

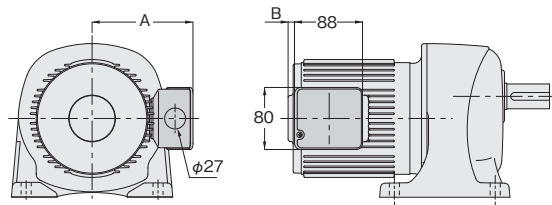
Motor Power	0.1kW	0.2kW	0.4kW	0.75kW	1.5kW, 2.2kW
A	156	156	156	180	213
B	83	83	83	102	124
C	8	0	0	2	6
D	91.5	91.5	97.5	141	142

- (Note) 1. The lead wire or terminal box and the manual release lever are basically on the same level. When changing the position of the terminal box with built-in rectifier on a model with the manual releasing device, there are some prohibited positions. Contact us for details.  
3. When the position of the terminal box has been changed, refer to (P. T52 – P. T55) for the relationship with the flat section of fan cover.

# TERMINAL BOX MEASURE AND POSITION

## Terminal Box Dimensions (G3 & H2)

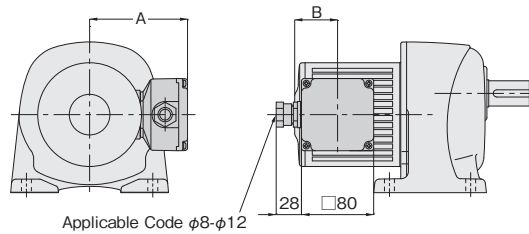
Common to G3 and H2 (IP44)



Motor Power	Box Type	A	B		Modification of Box Position
			Gearmotor	Brake Gearmotor	
0.1kW	T	113	2.5	42.5	90°
0.2kW	T	113	2.5	50.5	90°
0.4kW	T	119	7	59	90°
0.75kW	T	131	8	57.5	90°
1.5kW, 2.2kW	T	142	65.5	87	90°

- (Note) 1. The figures above illustrate standard terminal box positions.  
 For optional positions, refer to page T53, and specify the appropriate codes when ordering  
 2. The figure above is only a reference.

Common to G3 and H2 (IP65)



Motor Power	Box Type	A	B		Modification of Box Position
			Gearmotor	Brake Gearmotor	
0.1kW	E	108.5	47.5	99	90°
0.2kW	E	108.5	47.5	99	90°
0.4kW	E	114.5	52	112	90°
0.75kW	E	126.5	53	124.5	90°
1.5kW, 2.2kW	E	137.5	110.5		90°

- (Note) 1. The figures above illustrate standard terminal box positions.  
 For optional positions, refer to page T53, and specify the appropriate codes when ordering  
 2. The figure above is only a reference.

# TERMINAL BOX MEASURE AND POSITION

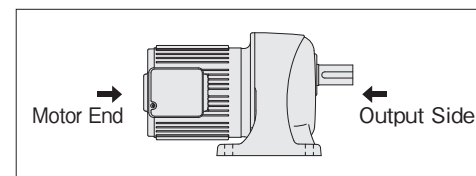
## Terminal Box Positions (G3 & H2)

When a terminal box position other than the standard is required, please specify the position when the naming shown in the greyed area ( ).

### Procedure

Motor Power · 0.1kW · 0.2kW				Motor Power · 0.4kW · 0.75kW · 1.5kW · 2.2kW			
Terminal Box and Lead Wire Outlet Hole Positions				Terminal Box and Lead Wire Outlet Hole Positions			
Standard	H6	H3	HZ	Standard	H6	H3	HZ
TZ	TZ H6	TZ H3	TZ HZ	TZ	TZ H6	TZ H3	TZ HZ
T9	T9 H6	T9 H3	T9 HZ	T9	T9 H6	T9 H3	T9 HZ
T6	T6 H6	T6 H3	T6 HZ	T6	T6 H6	T6 H3	T6 HZ

- (Note) 1. All figures are viewed from the Motor End.  
 2. It is not necessary to specify if it is standard.  
 3. Customers should not change the position of the terminal box in the field due to structural reasons. If an optional position is required, please order it with the codes in the figure above.  
 4. For 0.2kW, G3 models with a 28 frame size, if the terminal box is positioned at "TZ (top)" and "T6 (bottom)", it is displaced by 17 degrees in clockwise direction. Please note that it cannot be positioned at right above or right below.  
 5. Fan cover is provided on the gear motors with brake of 1.5 kW, 2.2 kW and IP44 Gearmotors.



● Meanings

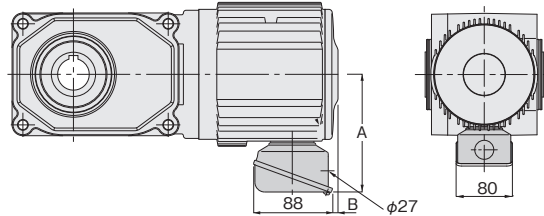
- 1) "T" indicates "Terminal Box".
- 2) "H" indicates the supply inlet hole.

# TERMINAL BOX MEASURE AND POSITION

## Gearmotor • Gearmotor with Brake in common

### Terminal Box Dimensions (F3S)

F3S (IP44)

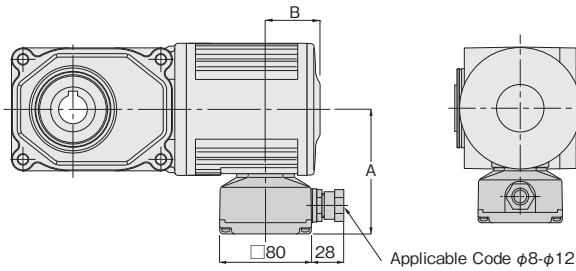


Motor Power	Box Type	A	B		Modification of Box Position
			Gearmotor	Brake Gearmotor	
0.1kW	T	113	2.5	42.5	90°
0.2kW	T	113	2.5	50.5	90°
0.4kW	T	119	7	59	90°
0.75kW	T	131	8	57.5	90°
1.5kW, 2.2kW	T	142	65.5	87	90°

(Note) 1. The figures above illustrate standard terminal box positions. For optional positions, refer to page T55, and specify the appropriate codes when ordering.

2. The figure above is only a reference.

Common to F3S (IP65)



Motor Power	Box Type	A	B		Modification of Box Position
			Gearmotor	Brake Gearmotor	
0.1kW	E	108.5	47.5	99	90°
0.2kW	E	108.5	47.5	99	90°
0.4kW	E	114.5	52	112	90°
0.75kW	E	126.5	53	124.5	90°
1.5kW, 2.2kW	E	137.5	110.5		90°


(Note) 1. The figures above illustrate standard terminal box positions. For optional positions, refer to page T55, and specify the appropriate codes when ordering.

2. The figure above is only a reference.

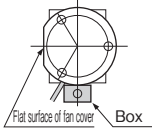
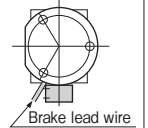
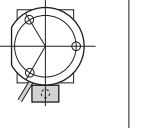
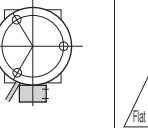
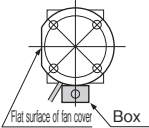
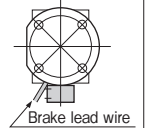
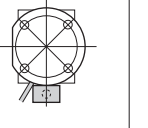
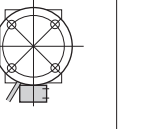
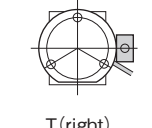
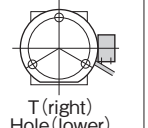
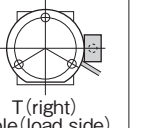
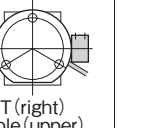
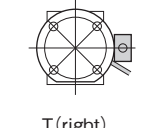
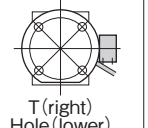
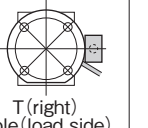
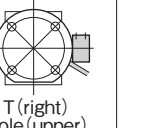
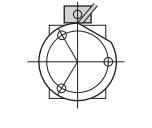
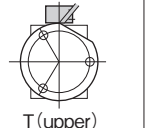
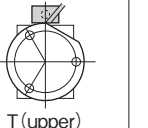
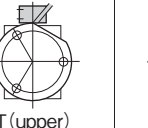
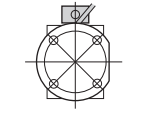
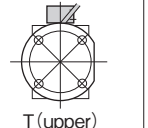
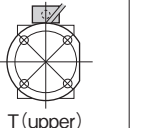
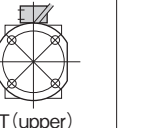
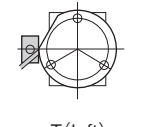
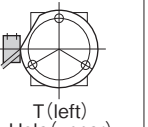
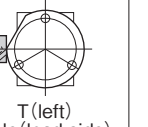
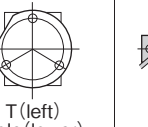
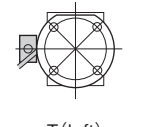
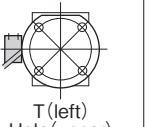
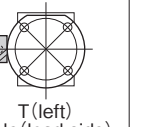
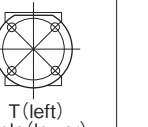
# TERMINAL BOX MEASURE AND POSITION

## Gearmotor • Gearmotor with Brake in common

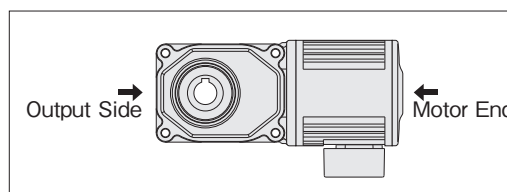
### Terminal Box Dimensions (F3S)

When a terminal box position other than the standard is required, please specify the position when the naming shown in the greyed area (  ).

#### Procedure

Motor Power • 0.1kW • 0.2kW				Motor Power • 0.4kW • 0.75kW • 1.5kW • 2.2kW			
Terminal Box and Lead Wire Outlet Hole Positions				Terminal Box and Lead Wire Outlet Hole Positions			
 Standard	 H6	 H3	 HZ	 Standard	 H6	 H3	 HZ
 T3	 T3 H6	 T3 H3	 T3 HZ	 T3	 T3 H6	 T3 H3	 T3 HZ
 TZ	 TZ H6	 TZ H3	 TZ HZ	 TZ	 TZ H6	 TZ H3	 TZ HZ
 T9	 T9 H6	 T9 H3	 T9 HZ	 T9	 T9 H6	 T9 H3	 T9 HZ

- (Note)
1. All figures are viewed from the Motor End.
  2. It is not necessary to specify if it is standard.
  3. Customers should not change the position of the terminal box in the field due to structural reasons. If an optional position is required, please order it with the codes in the figure above.
  4. Fan cover is provided on the gear motors with brake of 1.5 kW, 2.2 kW and IP44 Gearmotors.

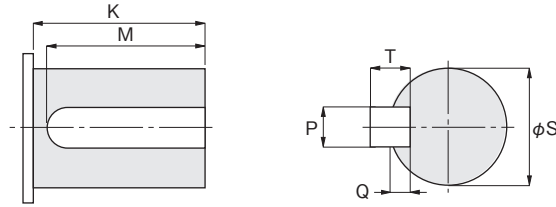


- Meanings
- 1) "T" indicates "Terminal Box".
  - 2) "H" indicates the supply inlet hole.

# OUTPUT SHAFT DIMENSION DIAGRAMS

**G3, H2**

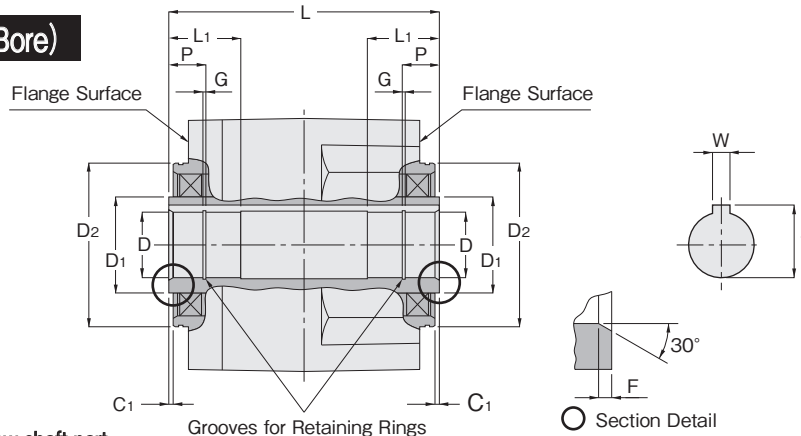
**Tap<sup>1</sup>**



Dimension Frame Number	K	M	S (h <sub>6</sub> )		Key				Q	Size × Pitch × Effective Depth		
					P (h <sub>9</sub> )		T					
18	30	27	18	$\begin{matrix} 0 \\ -0.011 \end{matrix}$	6	$\begin{matrix} 0 \\ -0.030 \end{matrix}$	6	$\begin{matrix} 0 \\ -0.030 \end{matrix}$	3.5	M 6×1.0×15 ℓ		
22	40	35	22	$\begin{matrix} 0 \\ -0.013 \end{matrix}$						8	7	$\begin{matrix} 0 \\ -0.036 \end{matrix}$
28	45	40	28	$\begin{matrix} 0 \\ -0.016 \end{matrix}$	10	8	$\begin{matrix} 0 \\ -0.090 \end{matrix}$	5	5.5	M 10×1.5×25 ℓ		
32	55	50	32		12						9	$\begin{matrix} 0 \\ -0.043 \end{matrix}$
40	65	60	40		14							
50	75	70	50							M 12×1.75×30 ℓ		

1. G3 models with standard shafts come standard with a tap. If a tapped shaft is required for an H2 model, please see page T70 for available options.

**F3S (Right Angle Hollow Bore)**

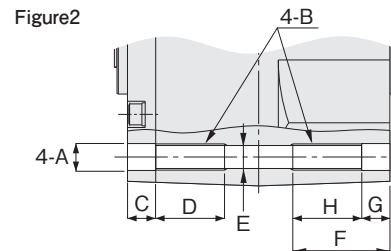
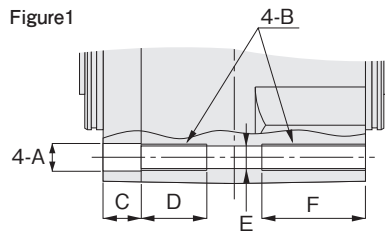


Detailed dimension table for the hollow shaft part

Frame Number	D (H <sub>8</sub> )	D <sub>1</sub>	D <sub>2</sub> (h <sub>7</sub> )	W	T	L	L <sub>1</sub>	P	C <sub>1</sub>	F	G
20	φ20	φ29	φ53	6	22.8	96	24	13	2	2	1.15
25	φ25	φ39	φ66	8	28.3	118	27	14	2	2	1.35
30	φ30	φ44	φ75	8	33.3	124	33	17	2	2	1.35
35	φ35	φ49	φ85	10	38.3	142	38	20	2	2	1.75
45	φ45	φ64	φ100	14	48.8	168	50	26	2	2	1.95
50	φ50	φ74	φ110	14	53.8	172	55	29	2	2	2.20
55	φ55	φ79	φ120	16	59.3	220	61	32	2	2	2.20

# OUTPUT SHAFT DIMENSION DIAGRAMS

## Detailed Diagram of Tapped Holes for F3S Installation (Standard Specifications)



Frame No.	Reduction Ratio	Motor Power	Shape	A	B	C	D	E	F	G	H
20	1 / 5~1 / 60	0.1 kW	Figure 1	φ10.5	M10×P1.5	12	25	φ8.6	37	—	—
25	1 / 5~1 / 60	0.2 kW		φ10.5	M10×P1.5	14.5	25	φ8.6	39.5	—	—
	1 / 80~1 / 240	0.1 kW		φ10.5	M10×P1.5	14.5	25	φ8.6	39.5	—	—
30	1 / 5~1 / 60	0.4 kW		φ10.5	M10×P1.5	15.5	25	φ8.6	40.5	—	—
	1 / 80~1 / 240	0.2 kW		φ12.5	M12×P1.75	15.5	30	φ10.6	45.5	—	—
30	1 / 300~1 / 375	0.1 kW		φ12.5	M12×P1.75	18	30	φ10.6	48	—	—
35	1 / 5~1 / 60	0.75kW		φ16.5	M16×P2	18	40	φ14	58	—	—
	1 / 80~1 / 240	0.4 kW		φ16.5	M16×P2	23	40	φ14	63	—	—
35	1 / 300~1 / 375	0.2 kW									
	35	1 / 450~1 / 750		0.1 kW	φ20.5	M20×P2.5	23	50	φ17.5	73	—
45		1 / 5~1 / 60		1.5 kW							
	1 / 5~1 / 30	2.2 kW									
	1 / 80~1 / 240	0.75kW									
45	1 / 300~1 / 375	0.4 kW		φ20.5	M20×P2.5	23	50	φ17.5	73	—	—
	1 / 450~1 / 750	0.2 kW									
	1 / 900~1 / 1200	0.1 kW									
50	1 / 40~1 / 60	2.2 kW	Figure 2	φ16.5	M16×P2	19	40	φ14	59	19	40
55	1 / 80~1 / 240	1.5 kW		φ20.5	M20×P2.5	21.5	50	φ17.5	71.5	21.5	50
	1 / 80~1 / 120	2.2 kW									
	1 / 300	0.75kW									
	1 / 450~1 / 600	0.4 kW									
	1 / 900~1 / 1200	0.2 kW									
	1 / 1500	0.1 kW									

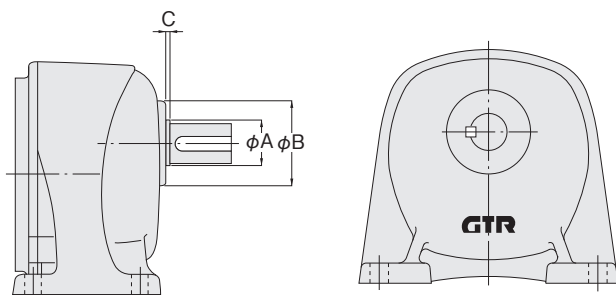
(Note) When attaching the mounting bolts, it is recommended to have the engagement of the bolt with thread D or F be at least two times the screw size (bolt diameter).

(i.e. For an M10, 20mm or more of the thread engagement with D or F is recommended.

# OUTPUT SHAFT DIMENSION DIAGRAMS

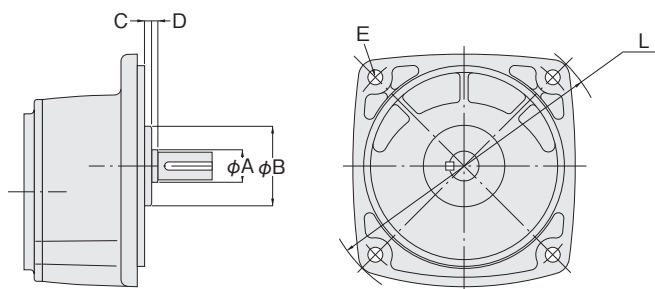
## G3

### G3L (Foot Mount)



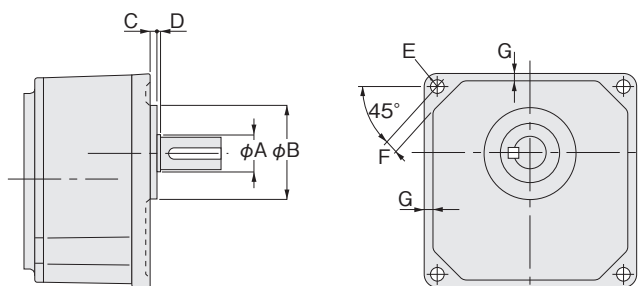
Dimension / Frame Number	A	B	C
18	20	43	2
22	24	50	2
28	30	60	2
32	34	68	3
40	42	90	3
50	53	105	3

### G3F (Flange Mount)



Dimension / Frame Number	A	B	C	D	E	L
40	42	100	-2	3	19	φ350
50	53	120	0	3	20	φ412

### G3K (Small Flange Mount)



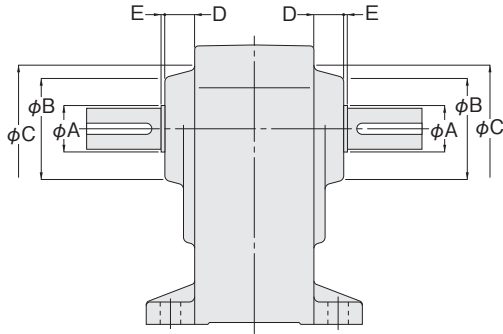
Dimension / Frame Number	A	B	C	D	E	F	G
18	20	50h7	4	2	9	9	5
22	24	60h7	5	2	9	9	5
28	30	80h7	5	2	11	11	7
32	34	88h7	5	3	13	13	8



# OUTPUT SHAFT DIMENSION DIAGRAMS

## H2

### H2L (Foot Mount)



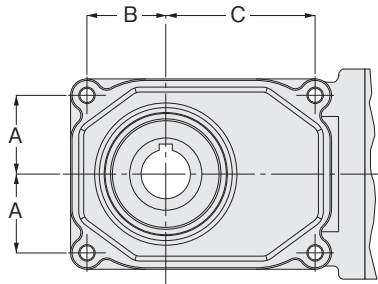
Dimension Frame Number	A	B	C	D	E
22	25	55	63.5	16	2
28	30	67	76	16	2
32	35	78	88	17	3
40	45	92	104	21	2
50	55	110	122	22	3

# F3S FRAME NUMBERS

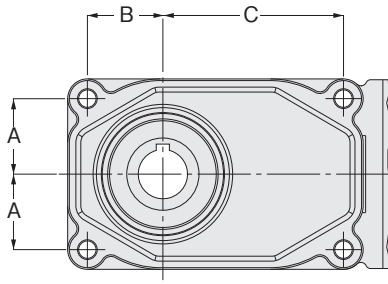
■ F3S reducers have two different model formats with the same frame numbers.

**Figure**

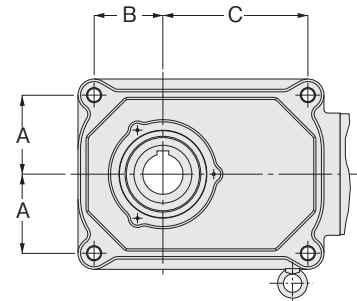
<Figure-1>



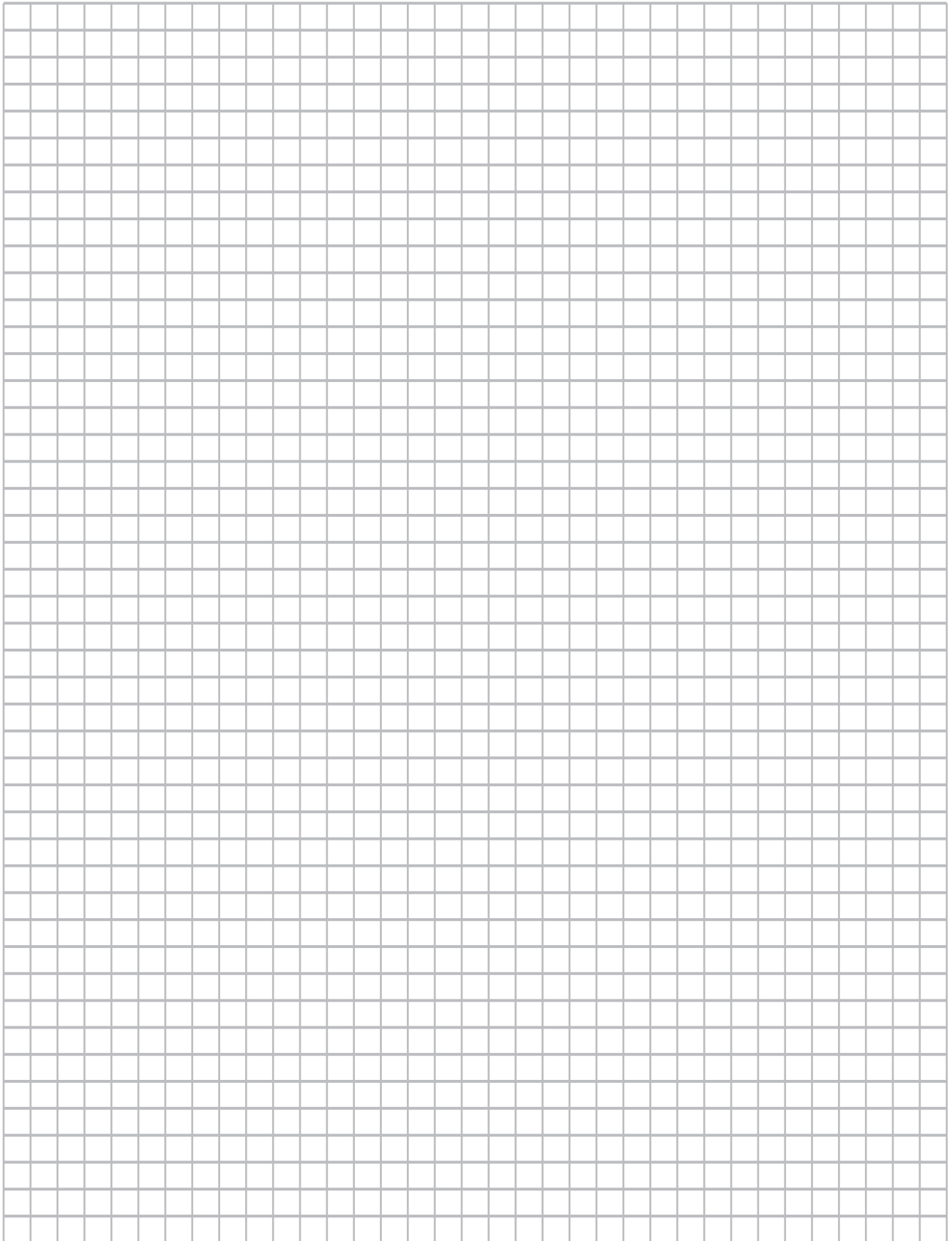
<Figure-2>



<Figure-3>



Frame Number	Reduction Ratio	Motor Power	Shape	A	B	C
20	1/ 5~1/ 60	0.1 kW	Figure 1	38.5	38.5	68.5
25	1/ 5~1/ 60	0.2 kW	Figure 1	43.5	43.5	76.5
	1/ 80~1/ 240	0.1 kW	Figure 2	43.5	43.5	95.5
30	1/ 5~1/ 60	0.4 kW	Figure 1	48	48	91
	1/ 80~1/ 240	0.2 kW	Figure 2	46	46	110
	1/ 300~1/ 375	0.1 kW	Figure 2	46	46	110
35	1/ 5~1/ 60	0.75 kW	Figure 1	56	56	105
	1/ 80~1/ 240	0.4 kW	Figure 2	54	54	140
	1/ 450~1/ 750	0.1 kW	Figure 2	54	54	140
	1/ 300~1/ 375	0.2 kW				
45	1/ 5~1/ 60	1.5 kW	Figure 1	73	73	134
	1/ 5~1/ 30	2.2 kW				
	1/ 80~1/ 240	0.75 kW	Figure 2	69	69	167
	1/ 900~1/1200	0.1 kW	Figure 2	69	69	167
	1/ 450~1/ 750	0.2 kW				
1/ 300~1/ 375	0.4 kW					
50	1/ 40~1/ 60	2.2 kW	Figure 3	90	102	170
55	1/ 80~1/ 240	1.5 kW	Figure 3	108	94	198
	1/ 80~1/ 120	2.2 kW				
	1/1500	0.1 kW				
	1/ 900~1/1200	0.2 kW				
	1/ 450~1/ 600	0.4 kW				
	1/ 300	0.75 kW				



# INSTALLATION AND REMOVAL OF HOLLOW BORE

## Attaching the Hollow Bore of the Reducer to the Drive Shaft

- ① Coat the drive shaft surface and bore surface with a lubricant (molybdenum disulfide) suitable to the atmosphere in which they are used and connect the reducer to the drive shaft.
- ② When used with uniform loads, a drive shaft tolerance of  $h_7$  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 the hollow bore is designed to be  $H_8$ .
- ③ 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.

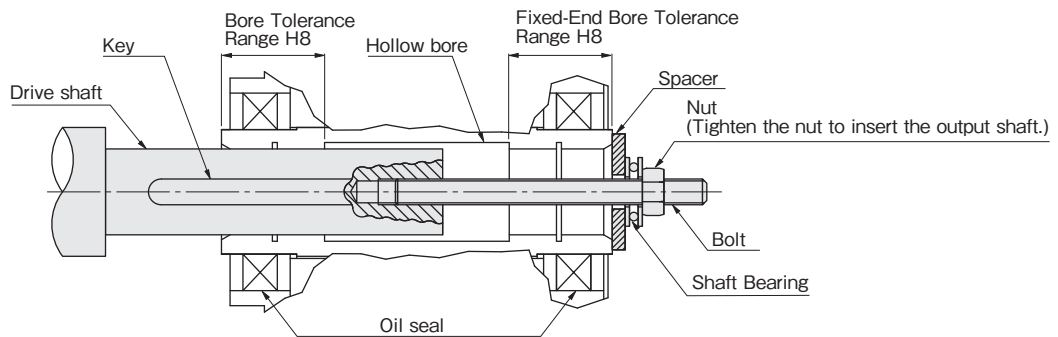


Figure-1

(Customers need to provide their own spacers, nuts, bolts, keys and shaft bearings.)

- ④ For the length of the turn-stop key for the drive shaft, tolerance range H8 for the bore on the fixed side is recommended. (The dimension for bore tolerance  $H_8$  corresponds to  $L_1$  of the Detailed Dimensions Chart for the Hollow Bore on page T56)
- ⑤ It is recommended that axial runout for the shaft being 0.05mm or less at the shaft end. If major wobbling occurs during operation, it may have a negative effect on the reducer.

## Connecting the Reducer to the Drive Shaft

- ① When there are steps on the drive shaft

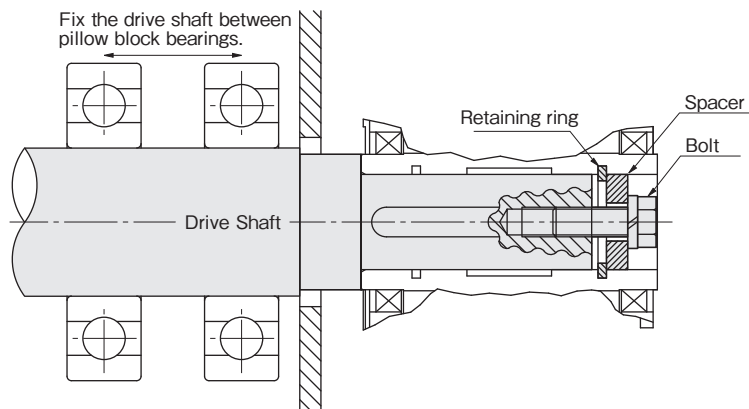
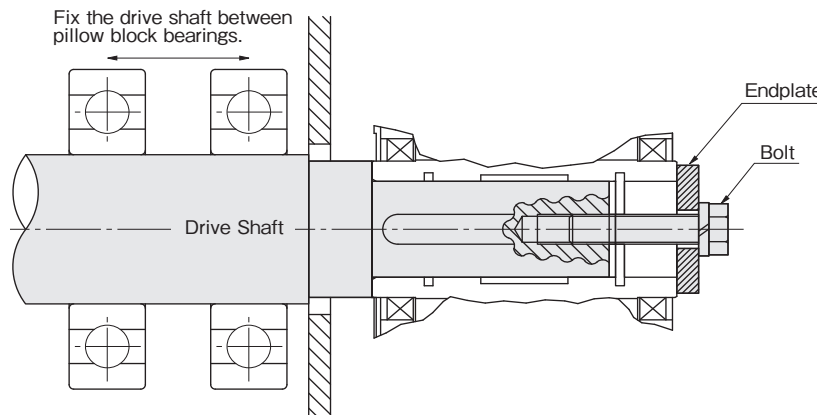


Figure-2: Attachment Using a Spacer and Retaining Ring

(Customers need to provide their own spacers, bolts, and retaining rings)

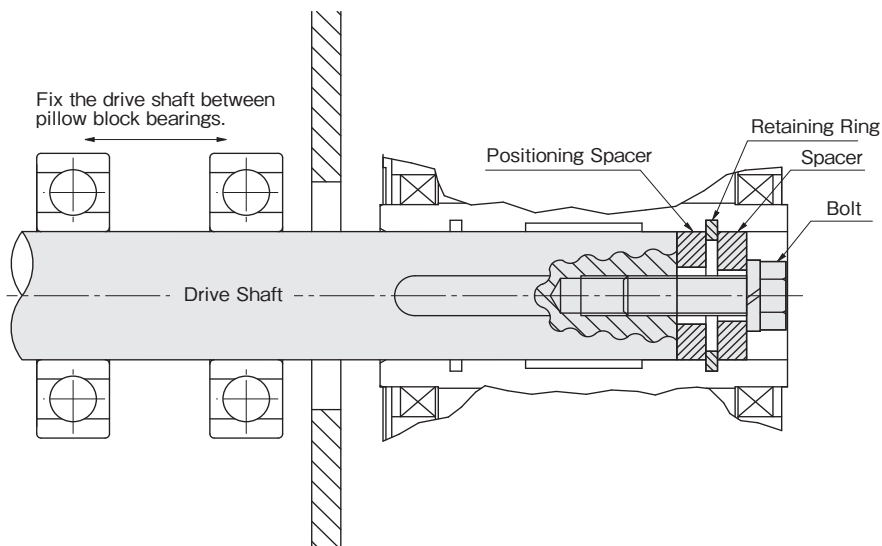
(Note) Be careful when tightening the bolt, as tightening it too much can distort the shape of the retaining ring.

# INSTALLATION AND REMOVAL OF HOLLOW BORE



**Figure-3: Attachment Using an Endplate**  
 (Customers need to provide their own endplates and bolts.)

② When there are no steps on the drive shaft



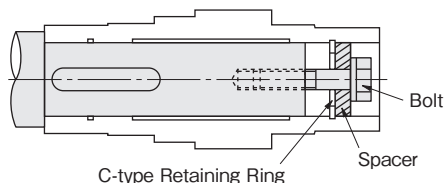
**Figure-4: Attachment Using a Space and Retaining Ring**  
 (Customers need to provide their own spacers, positioning spacers, bolts and retaining rings.)

(Note) Make sure there is a gap between the outer diameter of the spacer and the bore diameter of the hollow bore. If the fit is too tight and the outer diameter of the spacer is inaccurate, burring and 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 Figure-5, page T64 for more on removal from the hollow bore.)

# INSTALLATION AND REMOVAL OF HOLLOW BORE

## Recommended Sizes for the Fixing Elements of the Drive Shaft



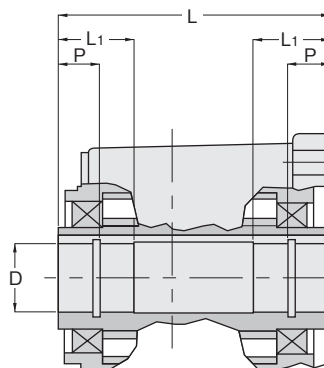
Recommended Sizes for the Fixing Elements of the Drive Shaft (mm)

	Bolt Size	Spacer Dimensions			C-Shaped Retaining Ring for Holes
		Outer Diameter	Inner Diameter	Width	
F3S-20	M6	φ19.5	φ7	3	20
F3S-25	M6	φ24.5	φ7	4	25
F3S-30	M8	φ29.5	φ9	5	30
F3S-35	M10	φ34.5	φ11	5	35
F3S-45	M10	φ44.5	φ11	5	45
F3S-50	M12	φ49.5	φ13	6	50
F3S-55	M12	φ54.5	φ13	6	55

### Drive Shaft Length

Make sure the drive shaft reaches both ends of L1 (See figure at right.) However, look at the dimension leeway for spacers in the section titled "Removal from the Hollow Bore."

For more details, refer to the detailed dimension charts for hollow bore and output shafts on p.T56.



### Drive Shaft Key Length

The length of the key should be at least 1.5 times the width of the hollow bore. Additionally, the key is inserted in such a position that at least half its length is in L1. (See figure at right)

For more details, refer to the detailed dimension chart for hollow bores and output shafts on p.T56.

### Removal from the Hollow Bore

Make sure there is room to spare between the casing and the hollow bore. If you make and use a jig like the one below, drive shaft removal will be easier.

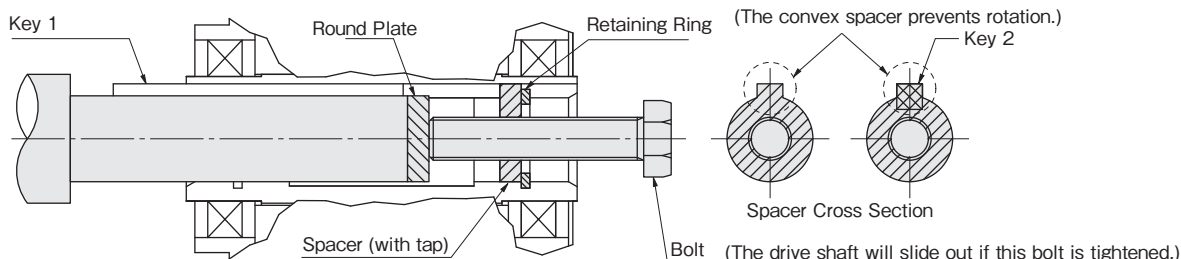


Figure 5

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

# INSTALLATION AND REMOVAL OF HOLLOW BORE

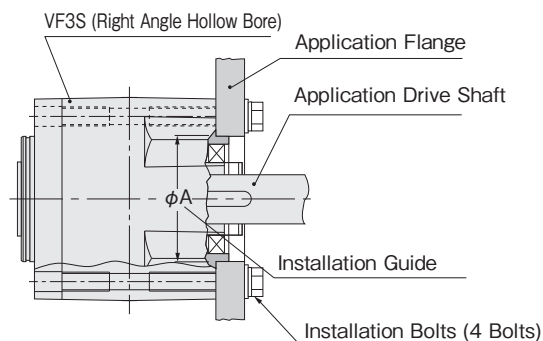
## How to Install the Reducer

Merits and demerits of flange mounted and torque arm mounted.

	Advantages	Disadvantages
Flange Installation	<ul style="list-style-type: none"> <li>•Can be installed directly on the device.</li> <li>•Saves space.</li> </ul>	<ul style="list-style-type: none"> <li>•Centering with the application is required</li> </ul>
Torque Arm Installation	<ul style="list-style-type: none"> <li>•Makes centering with the application easy.</li> <li>•Fastening to the application only requires one detent.</li> </ul>	<ul style="list-style-type: none"> <li>•Requires a torque arm.</li> <li>•Requires space for installing a torque arm.</li> </ul>

## Hollow Bore and Flange Installation

When the hollow bore is installed directly to the flange of an application, it can cause burn-out bearing damage if it is off-center, so be sure to center it properly. There is an installation guide, as shown in the diagram at right. The dimension tolerance for  $\phi A$  for the installation guide is h7 in case of VF3S.  
 The installation bolts are installed as shown in the diagram at right. Four bolts should be used.



# TORQUE ARM

## Fixing a Reducer and a Torque Arm

- 1 Because the torque arm sustains a reactive force from rotation, consideration needs to be given to impact loads particularly during startup and braking, and bolts and plates that are sufficiently strong must be used. It's best to use an optional torque arm (See page T67-T68.)
- 2 To install the torque arm and reducer, fasten them using spring washers and flat washers with the installation bolts.

Bolt Size and Respective Tightening Torque

Bolt Size	Tightening Torque N·m {kgf·m}
M5	2.9 { 0.3 }
M6	4.9 { 0.5 }
M8	13 { 1.3 }
M10	25 { 2.6 }
M12	44 { 4.5 }
M14	69 { 7.0 }
M16	108 { 11 }
M20	294 { 30 }

## How to Install the Torque Arm Detent

### 1 Oscillating Movement

Fasten the torque arm detent so there is no looseness or wobble. 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 shaft of the reducer. (See Fig. 6)

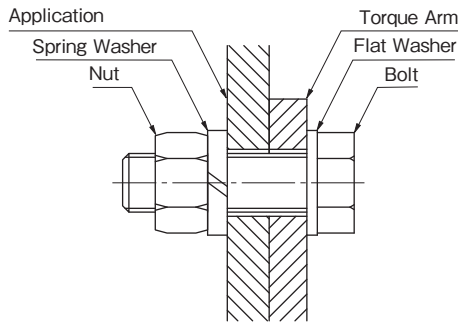
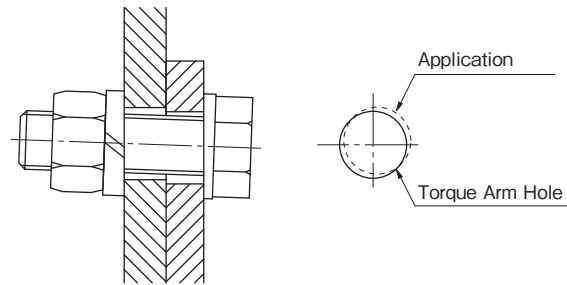


Figure 6: Fastening the Detent



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

Bad example

(Note) If looseness develops due to oscillating movement or start and stop frequency, start-up impact will be borne by the torque arm, causing the installation bolt to loosen, which can result in defects.

### 2 Unidirectional Movement

When start-up torque is not frequently applied, the torque arm can be used without a detent. However, it is still necessary to fasten the drive shaft to the reducer. Refer to pages T62-T63.

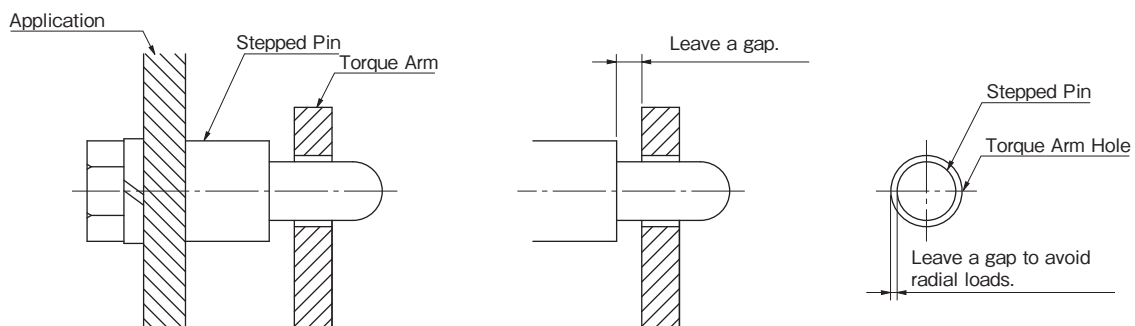
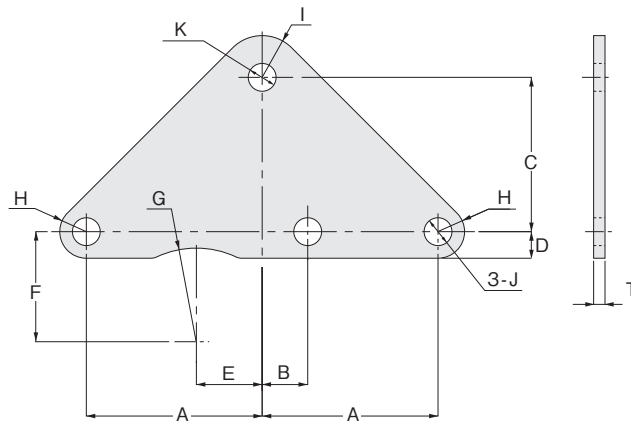


Figure 7: Example of Stepped Pin Usage



**F3S (Hollow Shaft) · Torque Arm (Option)**



**Specification**

Frame Number	Part Number	Motor Power	Corresponding Reduction Ratio	A	B	C	D	E	F	G	H	I	J	K	T	Weight (kg)
20	TAF3S-20-2	0.1 kW	1/ 5~1/ 60	53.5	23.5	52	10.5	—	—	—	R10.5	R11	φ11	φ9	3.2	0.1
25	TAF3S-25-2	0.2 kW	1/ 5~1/ 60	60	27	61	10.5	16.5	43.5	R37	R10.5	R15	φ11	φ9	3.2	0.2
	TAF3S-25-3	0.1 kW	1/ 80~1/ 240	69.5	17.5	61	10.5	26	43.5	R37	R10.5	R 6.5	φ11	φ11	4.5	0.2
30	TAF3S-30-2	0.4 kW	1/ 5~1/ 60	69.5	26.5	70	10.5	21.5	48	R41.5	R10.5	R15	φ11	φ11	4.5	0.3
	TAF3S-30-3	0.1 kW	1/ 300~1/ 375	78	14	70	12	32	46	R41.5	R12	R16.5	φ13.5	φ13.5	6	0.4
		0.2 kW	1/ 80~1/ 240													
35	TAF3S-35-2	0.75 kW	1/ 5~1/ 80	80.5	31.5	94	12	24.5	56	R46.5	R12	R18	φ13.5	φ13.5	6	0.6
	TAF3S-35-3	0.1 kW	1/ 450~1/ 750	97	11	94	15	43	54	R46.5	R15	R22.5	φ17.5	φ17.5	9	1.2
		0.2 kW	1/ 300~1/ 375													
		0.4 kW	1/ 80~1/ 240													
45	TAF3S-45-2	1.5 kW	1/ 5~1/ 60	103.5	42.5	110	15	—	—	—	R15	R20	φ17.5	φ17.5	9	1.4
		2.2 kW	1/ 5~1/ 30													
	TAF3S-45-3	0.1 kW	1/ 900~1/ 1200													
		0.2 kW	1/ 450~1/ 750													
		0.4 kW	1/ 300~1/ 375													
		0.75 kW	1/ 80~1/ 240													
50	TAF3S-50-2	2.2 kW	1/ 40~1/ 60	136	44	140	15	—	—	—	R15	R20	φ17.5	φ17.5	9	2.1
55	TAF3S-55-3	0.1 kW	1/1500	146	70	160	18.5	—	—	—	R18.5	R28.5	φ20.5	φ20.5	12	3.6
		0.2 kW	1/ 900~1/ 1200													
		0.4 kW	1/ 450~1/ 600													
		0.75 kW	1/ 300													
		1.5 kW	1/ 80~1/ 240													
		2.2 kW	1/ 80~1/ 120													

Material	Surface Treatment	Color
SS400	Trivalent Chromate	white

# TORQUE ARM

## Torque Arm Design

For customers wishing to make their own torque arms: if the torque arm is to be used as shown in Fig. 8, gap "r" between the output shaft center and the detent should be:

SI Unit

$$r(\text{mm}) \geq \frac{\text{load torque (N}\cdot\text{m)} \times 1000}{\text{allowable O.H.L. (N)} - 9.8 \times \text{reducer weight (kg)}}$$

Gravimetric Unit

$$r(\text{mm}) \geq \frac{\text{load torque (kgf}\cdot\text{m)} \times 1000}{\text{allowable O.H.L. (kgf)} - \text{reducer weight (kgf)}}$$

In case of using the torque arm as shown in the Figure-9, the distance between the center of the output shaft and the fixing point(r) can be calculated with the following formulas:

SI Unit

$$r(\text{mm}) \geq \frac{\text{load torque (N}\cdot\text{m)} \times (A+M) \times 1000}{\{\text{allowable O.H.L. (N)} - 9.8 \times \text{reducer weight (kg)}\} \times (A+20)}$$

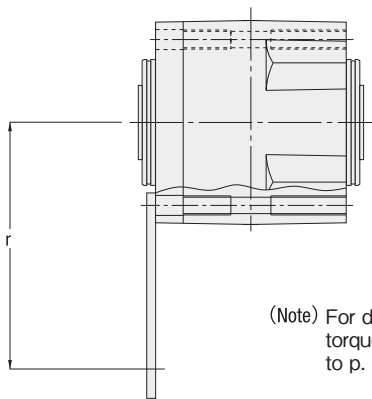
Gravimetric Unit

$$r(\text{mm}) \geq \frac{\text{Actual load torque (kgf}\cdot\text{m)} \times (A+M) \times 1000}{\{\text{allowable O.H.L. (kgf)} - \text{reducer weight (kgf)}\} \times (A+20)}$$

(Note) Refer to the table below for "A".

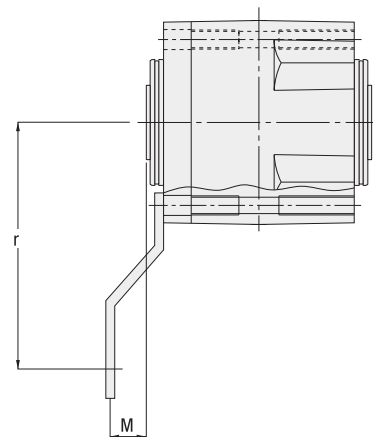
Ratio	A (mm)
20	68.5
25	84.5
30	91
35	98
45	113
55	150

<Figure 8>



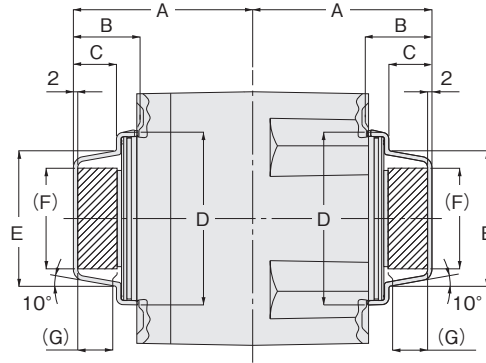
(Note) For details on the torque arm plate, refer to p. T67


<Figure 9>



# DETAILED DIAGRAM FOR HOLLOW SHAFT SAFETY CAP

**F3S**



 The shaded area represents empty space.

Frame Number	A	B	C	D	E	F	G
20	64	25.5	15.7	φ 57	φ 40	φ 26	14
25	79	29.5	19.7	φ 70	φ 53	φ 37.5	18
30	82	29.5	19.7	φ 79	φ 62	φ 46.5	18
35	95	33.5	23.7	φ 89	φ 72	φ 55	22
45	108	33.5	23.7	φ 104	φ 87	φ 70	22
50	120	43	41	φ 141	φ 127.5	φ 104	32
55	143	43	41	φ 141	φ 127.5	φ 104	32

# OPTIONS

## Tapped Output Shafts

Tapped output shafts are available with the dimensions given in the table below. Carbon steel G3 models have a tap on the shaft, but optional stainless steel shafts do not. H2 models do not have a tap as standard. If a tap is required, be sure to mention this when requesting a quote.

**[Notes]** ● In the table below, a circle means that the tapped output shaft will not add to the lead time. A triangle means that extra time will be required.

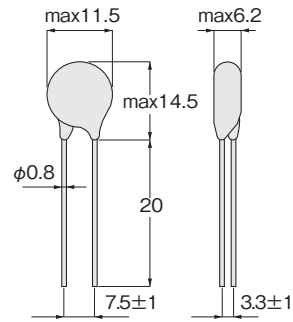


(Stainless)

(Carbon Steel and Stainless)

Shaft Dia. (Frame Number)	Size × Pitch × Effective Depth	(G3 Parallel Shaft)	H2 (Right Angle Shaft)		
			L-shaft	R-shaft	T-shaft
18	M 6×1.0×15 <i>l</i>	●	None	None	None
22, 28	M 8×1.25×20 <i>l</i>	●	●	●	▲
32, 40	M 10×1.5×25 <i>l</i>	●	●	●	▲
50	M 12×1.75×30 <i>l</i>	●	●	●	▲

## Surge Suppressor for Brake Wiring/OP-ERZV10D471



- Appropriate for cutting off the sparks of a brake switch for AC line switching.

## Change of terminal box position

Refer to (P. T52 – P. T55).

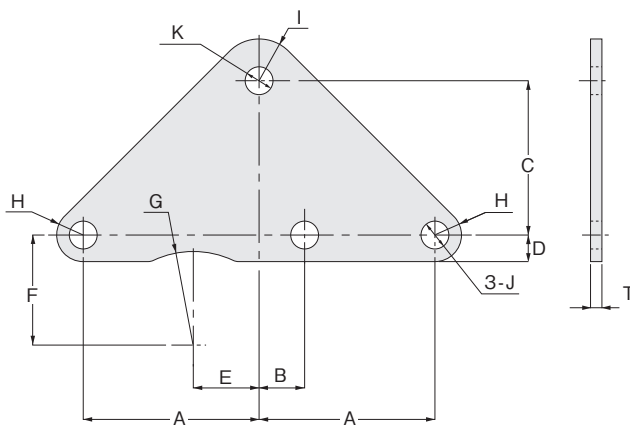
## Built-in Rectifier for Brakemotors

Refer to (P. T49).

## Driver Options

Refer to (P. T30 – P. T33) for options for the driver.

## F3S Torque Arm



### Specifications

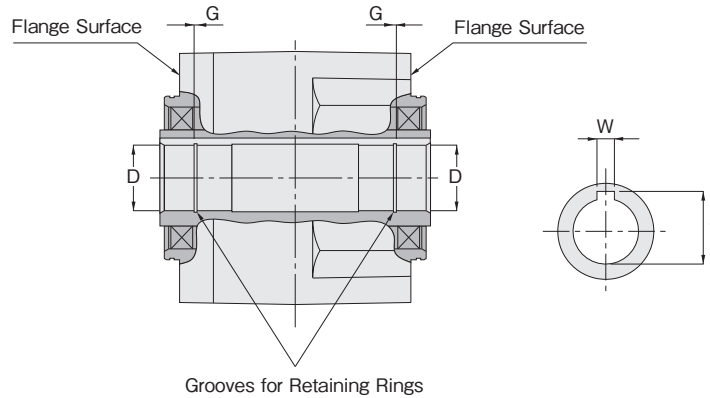
Corresponding Frame No.	Product Name	Motor Power	Corresponding Reduction Ratio	A	B	C	D	E	F	G	H	I	J	K	T	Weight (kg)
20	TAF3S-20-2	0.1 kW	1/ 5~1/ 60	53.5	23.5	52	10.5	—	—	—	R10.5	R11	φ11	φ9	3.2	0.1
25	TAF3S-25-2	0.2 kW	1/ 5~1/ 60	60	27	61	10.5	16.5	43.5	R37	R10.5	R15	φ11	φ9	3.2	0.2
	TAF3S-25-3	0.1 kW	1/ 80~1/ 240	69.5	17.5	61	10.5	26	43.5	R37	R10.5	R 6.5	φ11	φ11	4.5	0.2
30	TAF3S-30-2	0.4 kW	1/ 5~1/ 60	69.5	26.5	70	10.5	21.5	48	R41.5	R10.5	R15	φ11	φ11	4.5	0.3
	TAF3S-30-3	0.1 kW	1/ 300~1/ 375	78	14	70	12	32	46	R41.5	R12	R16.5	φ13.5	φ13.5	6	0.4
		0.2 kW	1/ 80~1/ 240													
35	TAF3S-35-2	0.75 kW	1/ 5~1/ 80	80.5	31.5	94	12	24.5	56	R46.5	R12	R18	φ13.5	φ13.5	6	0.6
	TAF3S-35-3	0.1 kW	1/ 450~1/ 750	97	11	94	15	43	54	R46.5	R15	R22.5	φ17.5	φ17.5	9	1.2
		0.2 kW	1/ 300~1/ 375													
		0.4 kW	1/ 80~1/ 240													
45	TAF3S-45-2	1.5 kW	1/ 5~1/ 60	103.5	42.5	110	15	—	—	—	R15	R20	φ17.5	φ17.5	9	1.4
		2.2 kW	1/ 5~1/ 30													
	TAF3S-45-3	0.1 kW	1/ 900~1/ 1200	118	20	110	18.5	49	69	R54	R18.5	R28.5	φ22	φ22	9	1.7
		0.2 kW	1/ 450~1/ 750													
		0.4 kW	1/ 300~1/ 375													
		0.75 kW	1/ 80~1/ 2400													
50	TAF3S-50-2	2.2 kW	1/ 40~1/ 60	136	44	140	15	—	—	—	R15	R20	φ17.5	φ17.5	9	2.1
55	TAF3S-55-3	0.1 kW	1/1500	146	70	160	18.5	—	—	—	R18.5	R28.5	φ20.5	φ20.5	12	3.6
		0.2 kW	1/ 900~1/ 1200													
		0.4 kW	1/ 450~1/ 600													
		0.75 kW	1/ 300													
		1.5 kW	1/ 80~1/ 240													
		2.2 kW	1/ 80~1/ 120													

Material	Surface Treatment	Color
SS400	Trivalent Chromate	White

### Optional F3S Bore Diameters

F3S models have optional bore sizes that can be ordered per the table below.

(Note) When using one of the hole diameters listed below, proper consideration must be given to the tightness and strength of the inserted drive shaft.

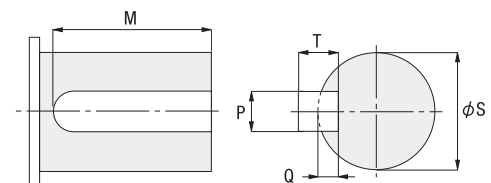


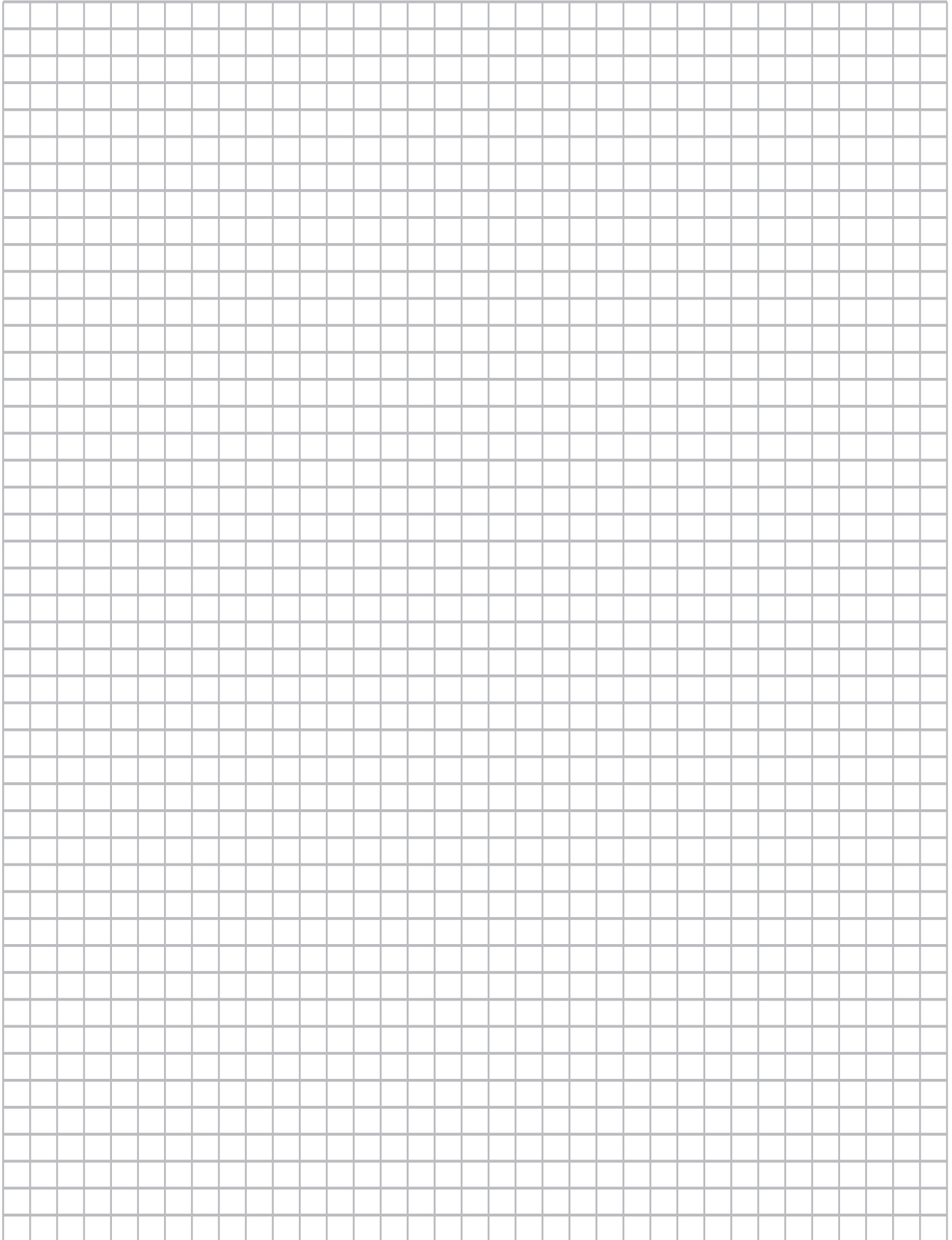
Frame No.	D (H8)	W	T	G
<b>F3S20</b>	17 mm	5 mm	19.3 mm	1.15 mm
	0.7500 in	0.1875 in	0.8380 in	0.0390 in
<b>F3S25</b>	20 mm	6 mm	38.3 mm	1.15 mm
	0.7500 in	0.1875 in	0.8380 in	0.0390 in
	1.0000 in	0.2500 in	1.1140 in	0.0460 in
<b>F3S30</b>	20 mm	6 mm	43.3 mm	1.15 mm
	25 mm	8 mm	43.3 mm	1.35 mm
	1.0000 in	0.2500 in	1.1140 in	0.0460 in
<b>F3S35</b>	1.2500 in	0.2500 in	1.3660 in	0.0560 in
	25 mm	8 mm	48.3 mm	1.35 mm
	30 mm	8 mm	53.3 mm	1.35 mm
	1.0000 in	0.2500 in	1.1140 in	0.0460 in
	1.2500 in	0.2500 in	1.3660 in	0.0560 in

Frame No.	D (H8)	W	T	G
<b>F3S45</b>	30 mm	8 mm	33.3 mm	1.35 mm
	35 mm	10 mm	38.3 mm	1.75 mm
	40 mm	12 mm	43.3 mm	1.95 mm
	1.3750 in	0.3125 in	1.5200 in	0.0560 in
	1.5000 in	0.3750 in	1.6690 in	0.0560 in
<b>F3S50</b>	1.6875 in	0.3750 in	1.8580 in	0.0680 in
	40 mm	12 mm	43.3 mm	1.95 mm
	45 mm	14 mm	48.8 mm	1.95 mm
	1.5000 in	0.3750 in	1.6690 in	0.0560 in
<b>F3S55</b>	1.9375 in	0.5000 in	2.1610 in	0.0680 in
	40 mm	12 mm	43.3 mm	1.95 mm
	45 mm	14 mm	48.8 mm	1.95 mm
	50 mm	14 mm	53.8 mm	2.20 mm
	2.0000 in	0.5000 in	2.2240 in	0.0680 in

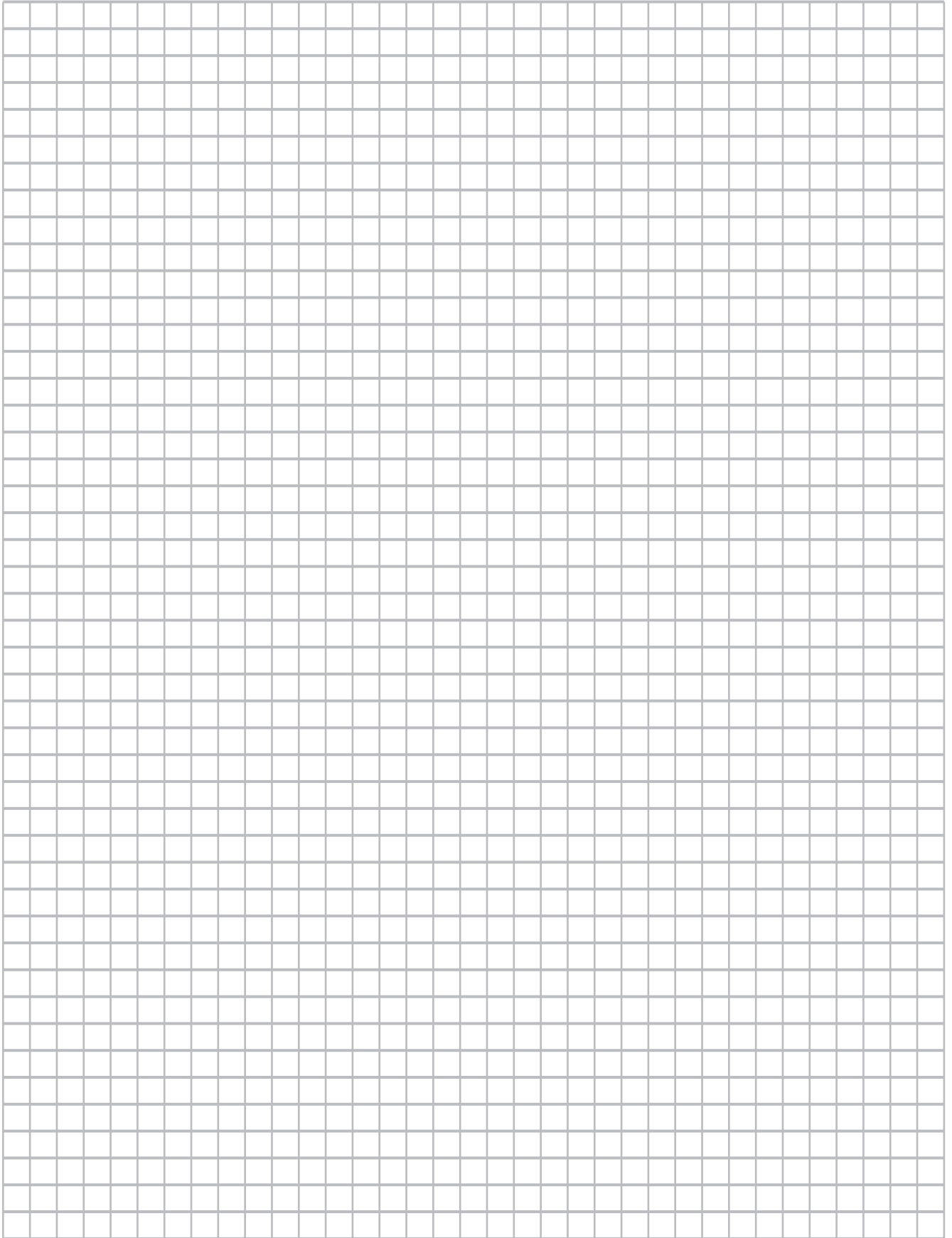
### Optional G3 and H2 Shaft Diameters

Frame No.	S	P	T	Q	M
<b>18</b>	0.7500 in	0.1875 in	0.1875 in	0.1055 in	0.9700 in
<b>22</b>	0.8750 in	0.1875 in	0.1875 in	0.1035 in	1.5700 in
<b>28</b>	1.1250 in	0.2500 in	0.2500 in	0.1390 in	1.7700 in
<b>32</b>	1.2500 in	0.2500 in	0.2500 in	0.1380 in	2.1700 in
<b>40</b>	1.6250 in	0.3750 in	0.3750 in	0.2090 in	2.4400 in
<b>50</b>	2.0000 in	0.5000 in	0.5000 in	0.2820 in	2.8100 in









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