Motor unit and brake unit specifications

CONTENTS

MOTOR SPECIFICATIONS

Motor

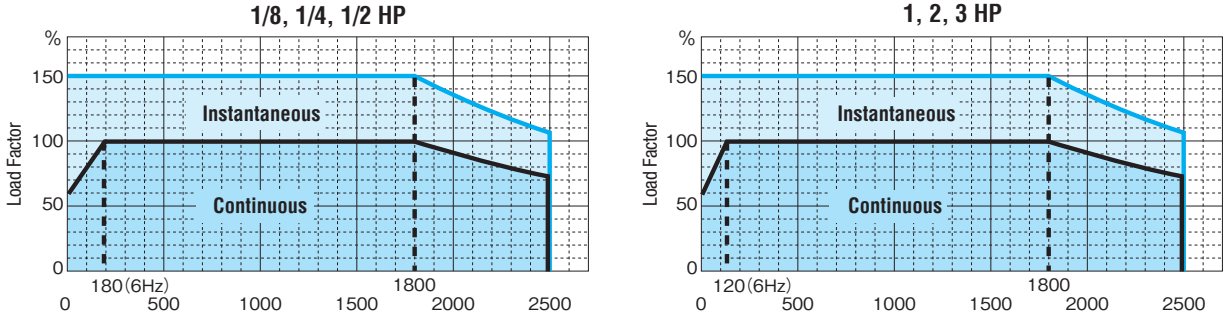
Motor Type			IPM Motor (Interior Permanent Magnet Motor)					
Motor Designation			010	020	040	075	150	220
Motor Power			0.1kW (1/8 HP)	0.2kW (1/4 HP)	0.4kW (1/2 HP)	0.75kW (1 HP)	1.5kW (2 HP)	2.2kW (3 HP)
Motor Poles (Note 1)			4 poles			6 poles		
Instantaneous Max. Torque (Vs. Rating)			150%					
Rated Current (A)			0.45	0.86	1.74	3.37	6.13	8.20
Minimum Speed (rpm) (Note 2)			0					
Rated Speed (rpm)			1800(60Hz)			1800(90Hz)		
Maximum Speed (rpm) (Note 3)			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			Totally Enclosed, Non-Ventilated (TENV), IP44	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

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

2. Rotational irregularities tend to increase when operating at motor speeds of 100 RPM or less.
3. 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.
2. 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.
3. When using an input speed above 1,800 rpm, multiply the value of the allowable inertia moment J (Allowable CD^2) with $(1{,}800/\text{input speed})^2$.
4. 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

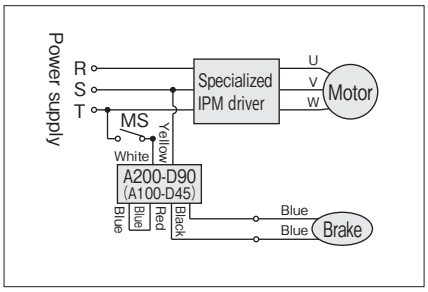
Item \ Motor Power	0.1kW (1/8 HP)		0.2kW (1/4 HP)		0.4kW (1/2 HP)		0.75kW (1 HP)		1.5kW (2 HP)	2.2kW (3 HP)
Motor Power Designation	010		020		040		075		150	220
Classification	B·J	H	B·J	H	B·J	H	B·J	H	B·J	B·J
Brake Type	Power-Off (Spring Close)									
Static Friction Torque (N·m) {kgf·m} Note 2	0.98 {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℃) (W)	14	10	14	10	16	12	24	16	37	37
Current Draw (at 75℃) (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.

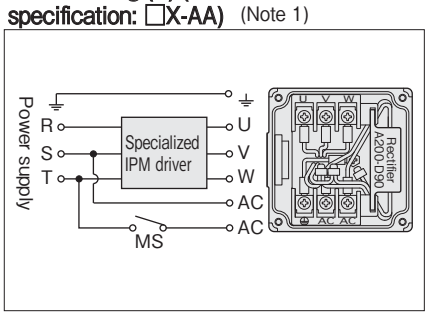
Brake Wiring

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)

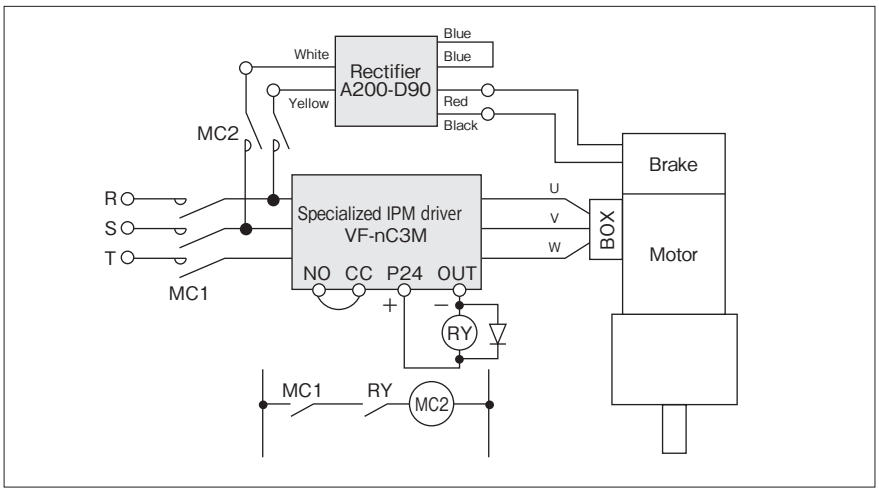


Terminal box (with built-in rectifier)
AC switching (A) (Custom order specification: □X-AA) (Note 1)



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

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



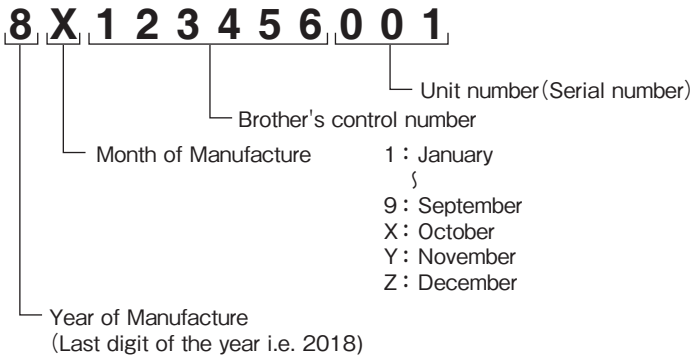
(Note) 1. The function of output terminal OUT utilizes the "Brake open signal" (Function No. 68 [Positive logic], 69 [Negative logic]). (Function No. 68 has already been assigned when shipped from the factory.)

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

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	**VF-nC3M-2001PY-A30**
0.2kW	**VF-nC3M-2002PY-A30**
0.4kW	**VF-nC3M-2004PY-A30**
0.75kW	**VF-nC3M-2007PY-A30**
1.5kW	**VF-nC3M-2015PY-A30**
2.2kW	**VF-nC3M-2022PY-A30**

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 stars.

% lamp

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

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

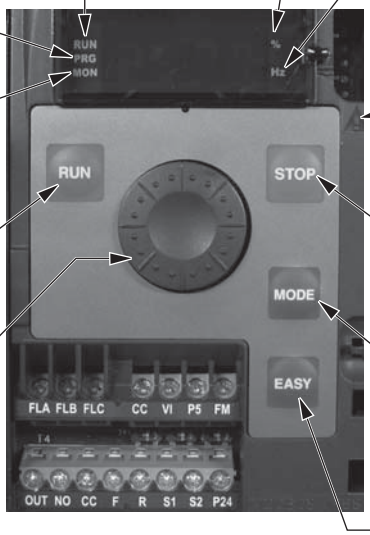
When the lamp is lit, it is in the monitor mode. When the lamp is flashing, it is in the state of "Detailed monitor display of past trip history".

RUN key

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

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.



Hz lamp

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

⚠ 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.

MODE key

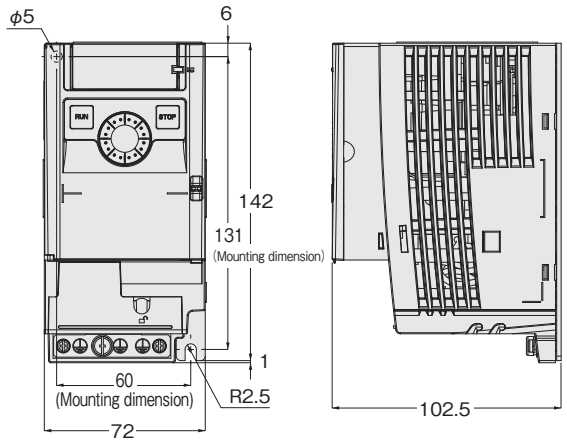
Use this key to switch between run, settings, and status monitor modes.

EASY key

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

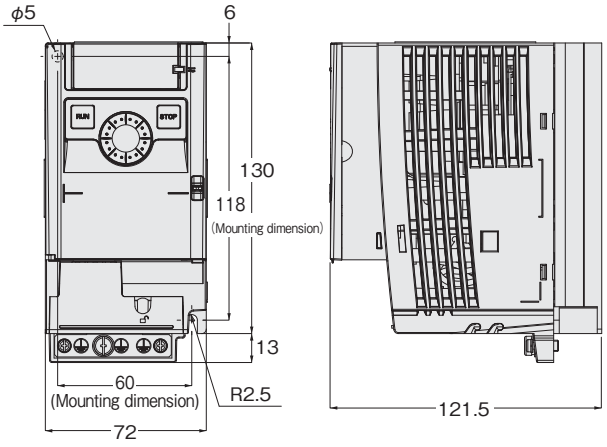
Control Unit Specs

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



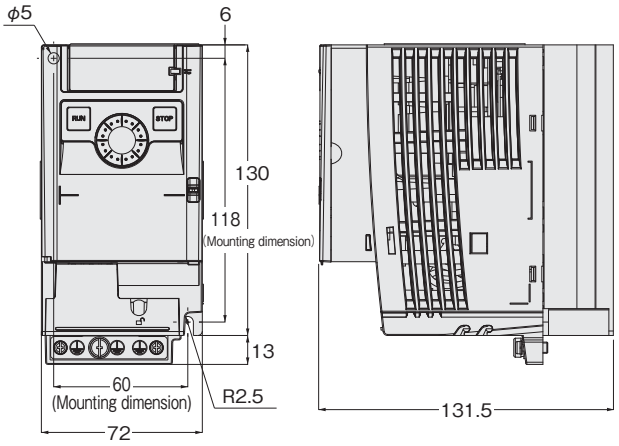
Approximate Weight : 1.0kg / 2.2 lb

Fig.T2 VF-nC3M-2004PY-A30



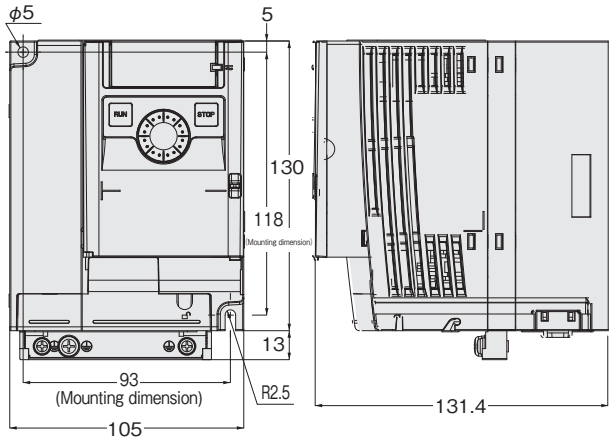
Approximate Weight : 1.0kg / 2.2 lb

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 ±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℃ (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^2 (0.6G) (10 – 55Hz)					
	Wiring Length between Specialized driver and IPM gearmotor (Note 10)	50 m or less					

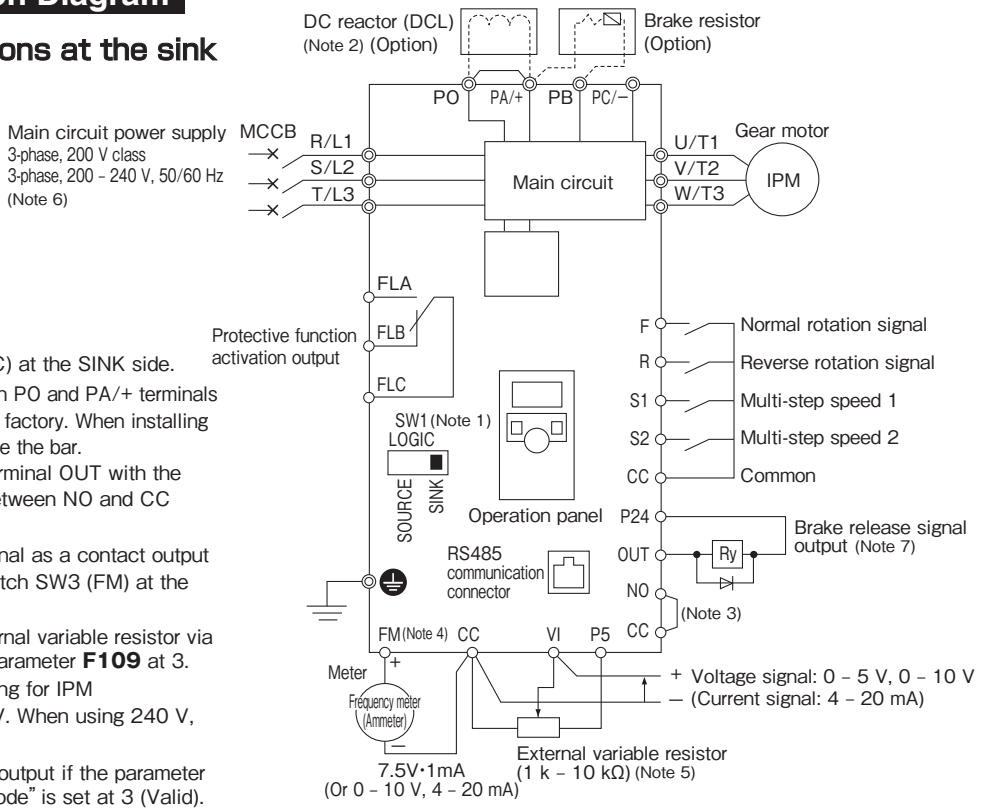
(Note)1. Rated output power is for the output voltage at 220 V.
2. The value for when PWM carrier frequency is 4 kHz or less. If it is 5 kHz – 12 kHz, the rated output current values in parentheses apply. Further reduction is necessary for 13 kHz or higher. PWM carrier frequency is set at 12 kHz as standard 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 ±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℃, remove the caution nameplate (Seal) at the top of driver main unit.
8. When the ambient temperature is higher than 50℃, 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℃, 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 ±0.1% of max. output frequency (−10 to 60℃) Analog setting: Within ±1.0% of max. output frequency (25℃±10℃)
	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

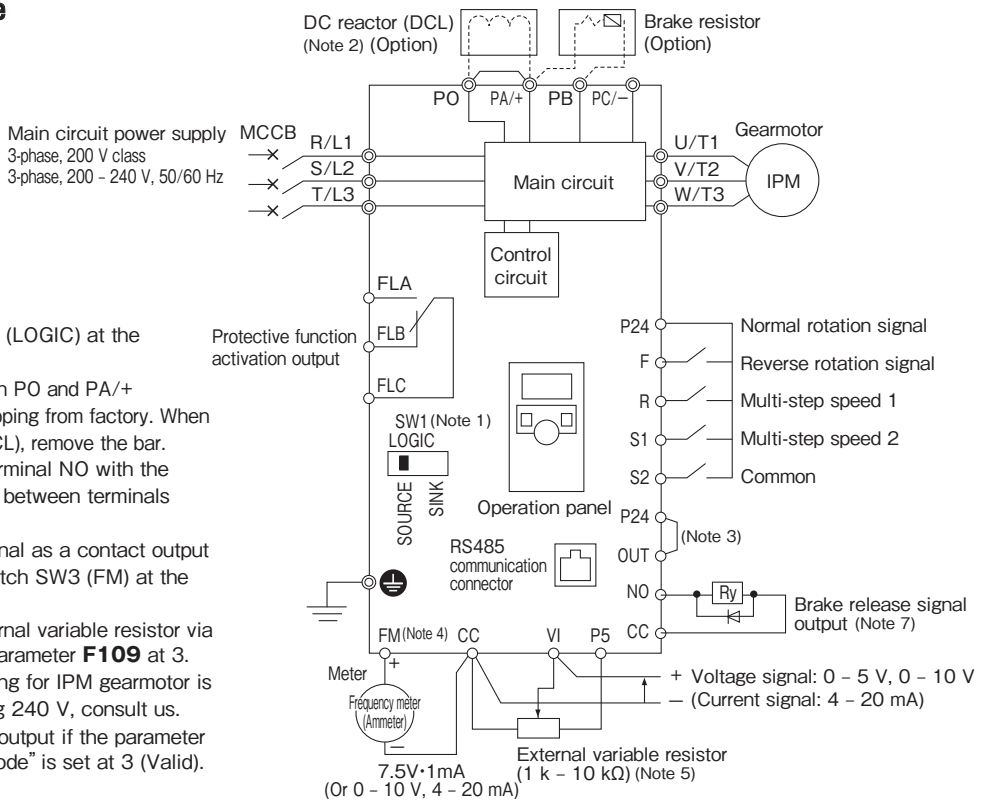
Standard Connection Diagram

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



(Note)1. Set the slide SW1 (LOGIC) at the SINK side.
2. 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.
3. When using the output terminal OUT with the sink logic, short-circuit between NO and CC terminals.
4. When using the FM terminal as a contact output terminal, set the slide switch SW3 (FM) at the OUT2 side.
5. When connecting an external variable resistor via the P5 terminal, set the parameter **F109** at 3.
6. Power supply voltage rating for IPM gearmotor is 200 – 230 V. When using 240 V, consult us.
7. 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



(Note)1. Set the slide switch SW1 (LOGIC) at the SOURCE side.
2. 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.
3. When using the output terminal NO with the source logic, short-circuit between terminals P24 and OUT.
4. When using the FM terminal as a contact output terminal, set the slide switch SW3 (FM) at the OUT2 side.
5. When connecting an external variable resistor via the P5 terminal, set the parameter **F109** at 3.
6. Power supply voltage rating for IPM gearmotor is 200 – 230 V. When using 240 V, consult us.
7. The brake open signal is output if the parameter **F341** "Brake function mode" is set at 3 (Valid).

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 **F304,F305,F308** or **F309** 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	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.	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 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.	
S1	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.	
S2	Input		It is short-circuited between S2 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	·Multiple function programmable analog input. With the standard shipment setting (**F109** = 0), the input is 0 – 10 Vdc and the frequency setting is 0 – 60/90 Hz. ·If the parameter setting is changed (F109 = 1), the input can be changed to 4 – 20 mAdc (0 – 20 mA). ·If the parameter is changed (F109 = 3), the input can be changed to 0 – 5 Vdc. When connecting an external variable resistor via P5 terminal, change to this setting. ·If the parameter is changed (F109 = 2), it can be used as the multiple function programmable contact input terminal. Use the slide switch SW1 (LOGIC) and the parameter F127. In this case, set the slide switch SW2 (RESIST) at the ON side.		5 V/10 Vdc (Internal impedance: 40 kΩ) 4 – 20 mA (Note 1) (Internal impedance: 250 Ω)
FM	Output	·Multiple function programmable analog output Standard shipment setting is the output frequency. ·If the parameter (**F681**) is changed, it can be changed to 0 – 20 mAdc (4 – 20 mA) or 0 – 10 Vdc. ·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)		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	·Multiple function programmable open collector output. With the standard shipment setting, it detects and outputs the brake release signal. (When the parameter **F341** is set at 3) ·This is a combined function output terminal to which 2 function can be assigned simultaneously. ·NO terminal is the equipotential terminal for OUT. This is insulated from CC terminal. ·If the parameter is changed (**F669**), it can be used as the multiple function programmable pulse train output. Pulse duty is 50%.		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	·Multiple function programmable relay contact output. With the standard shipment setting, it detects and outputs the activation of inverter's protective function. ·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.		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.

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)

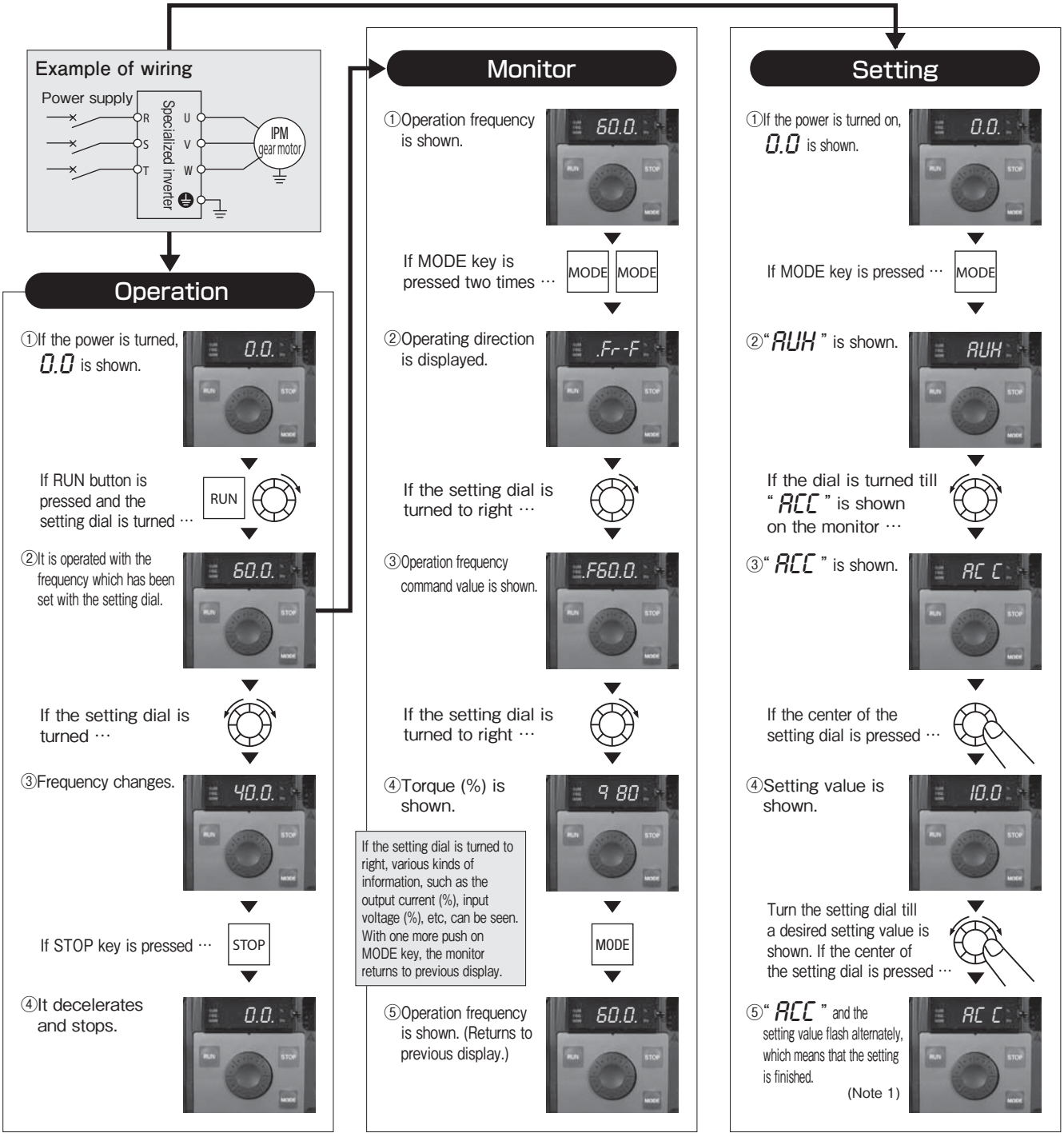
0	1	2	3	4	5	6	7	8	9	—
0	1	2	3	4	5	6	7	8	9	—

■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		L

Mm	Nn	O	o	Pp	Qq	Rr	Ss	Tt	Uu	Vv	Ww	Xx	Yy	Zz
n	n	O	o	P	q	r	S	t	U	u			y	

■Panel operating method



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

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	MODE	AUH	Displays the first basic parameter: "History function (AUH)".
Rotating direction	MODE	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)		9 80	Displays the driver output torque (%). (When F712=7)
Output current (Note 1)		C 00	Displays the driver output current (Load current) (%). (When F713=1)
Input voltage (Note 1)		9100	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 F716=51)
Input terminal		A,,1,1	Displays the ON/OFF state of control input terminals (FR, S1, S2, VI) in bits. At ON: 1 At OFF: , A ,,1,1 VI S2 S1 F R
Output terminal		0 ,1	Displays the ON/OFF state of control input terminals (OUT, FL) in bits. At ON: 1 At OFF: , 0 ,1 OUT FL
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 ,,,1	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: 1 At OFF: , n ,,,1 Accumulated operation time Cooling fan Control PCB capacitor Main circuit capacitor
Accumulated operation time display		t0.10	Displays the accumulated operation time. (0.01 = 1 hr, 1.00 = 100 hrs)
Standard setting mode	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.

Basic Parameter

Operation frequency parameter

Title	Function	Range of Use [Adjustable Range]	Standard Shipment
FC	Panel operation frequency	**LL** – **UL** (Hz)	0.0

Other basic parameter

Title	Function	Range of Use [Adjustable Range]	Standard Shipment
RUH	History function	Displays the latest 5 parameters on which setting has been changed, as a group. (It may be edited.)	—
RUF	Guidance function	0:— 1:— 2:Multi-step speed operation guidance 3:Analog signal operation guidance	0
RUI	Pre-determined acceleration/deceleration	0:None (Manual setting) 1:Automatic setting 2:Automatic setting (At acceleration only)	0
CMOd	Command mode selection	0:Terminal board 1:Panel (Including extension panel) 2:RS485 communication	1
FMOd	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
FMSL	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 **FM**.) 20 - 22:—	0
FM	Connection meter adjustment gain	1 - 1280	512
Fr	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.

Title	Function	Range of Use [Adjustable Range]	Standard Shipment
ACC	Acceleration time 1	0.0 – 3000(s)	1.5
dEC	Deceleration time 1	0.0 – 3000(s)	5.0
FH	Max. frequency	0.1kW – 0.4kW 30 – 83.4Hz〔30 – 400Hz〕 0.75kW – 2.2kW 30 – 125Hz〔30 – 400Hz〕	Capacity base
UL	Upper limit frequency	0.5 – **FH** (Hz)	Capacity base
LL	Lower limit frequency	0.0 – **UL** (Hz)	0.0
Sr1 - Sr7	Multi-step speed operation frequency 1 - 7	**LL** – **UL** (Hz)	0.0
tYP	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
PSEL	Registered parameter display selection	0:Standard setting mode at power-on 1:Simplified setting mode at power-on Simplified setting mode only	0
F1 - F8	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.

Expansion Parameter

I/O parameter

Title	Function	Range of Use [Adjustable Range]	Standard Shipment
F100	Low speed signal output frequency	0.0 – FH(Hz)	0.0
F101	Speed attainment designation frequency	0.0 – FH(Hz)	0.0
F102	Speed attainment detection width	0.0 – FH(Hz)	2.5
F105	Selection of valid at simultaneous normal/reverse rotation command input	0 : Reverse rotation, 1 : Deceleration stop	1
F104	Normally trip function selection 1	0 – 153	0
F108	Normally trip function selection 2	0 – 153	70
F110	Normally trip function selection 3	0 – 153	6
F109	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
F111	Input terminal selection 1A (F)	0 – 201	2
F112	Input terminal selection 2A (R)	0 – 201	4
F113	Input terminal selection 3A (S1)	0 – 201	10
F114	Input terminal selection 4A (S2)	0 – 201	12
F115	Input terminal selection 5 (VI)	8 – 55	14
F127	Sink/source switching	0 : Sink (Internal power supply) 100 : Source 200 : Sink (External power supply) 1 – 99, 101 – 199, 201 – 255 invalid	0
F130	Output terminal selection 1A (OUT)	0 – 255	68
F131	Output terminal selection 2A (FM)	0 – 255	6
F132	Output terminal selection 3A (FL)	0 – 255	10
F137	Output terminal selection 1B (OUT)	0 – 255	255
F138	Output terminal selection 2B (FM)	0 – 255	255
F139	Output terminal logic selection (OUT, FM)	<table><tr><th></th><th>OUT</th><th>FM</th></tr><tr><td>0</td><td>**F130** and **F137**</td><td>**F131** and **F138**</td></tr><tr><td>1</td><td>**F130** or **F137**</td><td>**F131** and **F138**</td></tr><tr><td>2</td><td>**F130** and **F137**</td><td>**F131** or **F138**</td></tr><tr><td>3</td><td>**F130** or **F137**</td><td>**F131** or **F138**</td></tr></table>	0
F669	Logic output/pulse train output selection (OUT)	0 : Logic output 1 : Pulse train output	0
F676	Pulse train output function selection (OUT)	Same as FMSL	0
F677	Pulse train output max. number of pulses	0.50 – 1.60(kpps)	0.80
F681	Analog output signal selection	0 : Meter option (0 – 1 mA) 1 : Current (0 – 20 mA) output 2 : Voltage (0 – 10 V) output	0
F691	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
F240	Startup frequency setting	0.1 – 10.0(Hz)	0.1
F241	Operation start frequency	0.0 – FH(Hz)	0.0
F242	Operation start frequency hysteresis	0.0 – FH(Hz)	0.0
F256	At continuous lower limit frequency operation Automatic stop time	0.0 : No trip 0.1 – 600.0(s)	0.0
F264	External contact input up response time	0.0 – 10.0(s)	0.1
F265	External contact input up frequency step width	0.0 – FH(Hz)	0.1
F266	External contact input down response time	0.0 – 10.0(s)	0.1
F267	External contact input down frequency step width	0.0 – FH(Hz)	0.1
F268	Initial value of up/down frequency	LL – UL(Hz)	0.0
F269	Rewriting of initial value of up/down frequency	0 : Not rewritten 1 : **F268** is rewritten at power OFF.	1
F270	Jump frequency	0.0 – FH(Hz)	0.0
F271	Jump width	0.0 – 30.0(Hz)	0.0
F287 – F294	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
F257	Servo lock function prohibited/permitted (Switchable during operation)	0 : Prohibited 1 : Permitted	0
F930	Servo lock gain (Position loop gain)	0 – 250	100

PWM carrier frequency control

Title	Function	Range of Use [Adjustable Range]	Standard Shipment
F300	PWM carrier frequency	2 – 16 (kHz)	12
F312	Mild control	0 : None 1 : With	0
F316	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
F302	Instantaneous power outage non-stop control (Selection of deceleration and stop at power outage)	0 : None 1 : With 2 : With (Deceleration stop)	0
F303	Retry selection (Number of times)	0 : None 1 – 10 (Times)	0
F305	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
F311	Reverse rotation operation prohibition selection	0 : Normal, reverse rotation permitted 1 : Reverse rotation prohibited 2 : Normal rotation prohibited	0

Expansion Parameter

Dynamic braking trip function

Title	Function	Range of Use [Adjustable Range]	Standard Shipment
F304	Dynamic braking trip selection	0 : No dynamic braking 1 : With dynamic braking and overload protection 2 : With dynamic baking. 3 : With dynamic braking and overload protection (Only at input to ST terminal) 4 : With dynamic braking (Only at input to ST terminal)	0
F308	Braking resistance value	1.0 – 1000(Ω)	Capacity base
F309	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
F341	Brake function mode selection	0 : Brake sequence invalid 1、2 : — 3 : Brake sequence valid	0
F340	Creep time	0.00 – 10.00(s)	0
F345	Brake release time	0.00 – 10.00(s)	0.5
F346	Creep frequency	**F240** – 20(Hz)	3
F347	Braking delay time	0.00 – 10.00(s)	0.3

PID control

Title	Function	Range of Use [Adjustable Range]	Standard Shipment
F360	PID normal/reverse characteristic selection	0 : None 1 : With	0
F359	PID control start standby time	0 – 2400(s)	0
F362	Proportional gain	0.01 – 100.0	0.30
F363	Integral gain	0.01 – 100.0	0.20
F366	Derivative gain	0.00 – 2.55	0.00
F380	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
F382	Contact stop function Valid/Invalid	0 : Invalid 1 : — 2 : Valid	0
F383	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
F384	Contact stop limit torque	0.0 – 120(%)	100
F385	Contact stop detection time	0.0 – 25.0(s)	0.3
F386	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.

Acceleration/deceleration time parameter

Title	Function	Range of Use [Adjustable Range]	Standard Shipment
F500	Acceleration time 2	0.0 – 3000(s)	10.0
F501	Deceleration time 2	0.0 – 3000(s)	10.0
F502	Pattern of acceleration/deceleration 1	0 : Straight line 1 : S-shape 1 2 : S-shape 2	0
F503	Pattern of acceleration/deceleration 2	0 : Straight line 1 : S-shape 1 2 : S-shape 2	0
F505	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
F441	"KA" line torque limit 1 level	0 – 150(%) [0 – 250(%)]	150
F443	Regenerative torque limit 1 level	0 – 150(%) [0 – 250(%)]	150
F444	"KA" line torque limit 2 level	0 – 150(%) [0 – 250(%)]	150
F445	Regenerative torque limit 2 level	0 – 150(%) [0 – 250(%)]	150
F601	Stall prevention trip level 1	10 – 199 (% (A)) 200 (No trip)	150
F603	Emergency stop selection	0 : Free run stop 1 : Deceleration stop	0
F605	Output phase interruption detection trip selection	0 : None 1 : At startup (Only once after power-on) 2 : At startup (Every time)	0
F608	Input phase interruption detection trip selection	0 : None 1 : With	1
F610	Low current trip/alarm selection	0 : Alarm only 1 : With trip	0
F611	Low current detection current	0 – 150(%(A))	0
F612	Low current detection time	0 – 255(s)	0
F613	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
F615	Over-torque trip/alarm selection	0 : Alarm only 1 : With trip	0
F616	Over-torque detection level	0 : No trip 1 – 200 (%)	200
F618	Over-torque detection time	0.0 – 10.0(s)	0.5
F620	Cooling fan ON/OFF control	0 : With ON/OFF control 1 : Normally ON	0
F621	Accumulated operation alarm time	0.0 – 999.9 (x 100 hrs)	610.0
F648	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.

Expansion Parameter

Panel parameter

Title	Function	Range of Use [Adjustable Range]	Standard Shipment
F701	Current/voltage unit selection	0 : % 1 : A／V	0
F702	Free unit display magnification 1	0.00: No free unit 0.01 - 200	0.00
F707	Change step width setting (1 step rotation of setting dial)	0.00: Invalid 0.01 - FH	0.00
F710	Panel initial display selection	0 : Operation frequency 1 : Output current 2 : Set frequency value 3 – 17 : — 18 : Arbitrary display by communication 19 – 33 : — 34 : Number of startups (10,000 times) 52 : Set frequency value/operation frequency	0
F720	Extension panel initial display selection		0
F711	Status monitor 1	0 : Operation frequency 1 : Output current 2 : Set frequency value 3 : Input voltage (DC unit detection) 4 : Output voltage (Command value) 5 : Input power (kW) 6 : Output power (kW) 7 : Torque 8 : Torque current 9、10 : — 11 : Braking resistor accumulated load ratio 12 : Actual output frequency 13 – 22 : — 23 : PID feedback value 24 – 26 : — 27 : driver load ratio 28 – 33 : — 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	2
F712	Status monitor 2		7
F713	Status monitor 3		1
F714	Status monitor 4		3
F715	Status monitor 5		50
F716	Status monitor 6		51
F751 – F774	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
F700	Parameter write prohibition selection	0 : Permission 1 : Panel prohibition 2 : Panel + RS485 communication prohibition	0
F730	Panel frequency setting prohibition selection (FC)	0 : Permission 1 : Prohibition	0
F733	Panel operation prohibition selection (RUN key)	0 : Permission 1 : Prohibition	0
F734	Panel emergency stop operation prohibition selection	0 : Permission 1 : Prohibition	0
F735	Panel reset operation prohibition selection	0 : Permission 1 : Prohibition	0
F736	In-operation CMCD (Command mode selection)/ FMOD (Frequency setting mode selection) change prohibition selection	0 : Permission 1 : Prohibition	1
F738	Password setting (F700)	0 : No setting 1 – 9998, 9999 : With setting	0
F739	Password reset	0 : No setting 1 – 9998, 9999 : With setting	0

Communication Parameter

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

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.

■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.

Chart Control Unit Specs - Brake Sequence Function

Features

・Motor operations at mechanical brake release or on are set. driver outputs the mechanical brake trip timing signal.
・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.

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
F341	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.
F345	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.
F340	Creep time	sec	0.00 – 10.00	0.00	
F346	Creep frequency	Hz	**F240** – 20	3	
F347	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 **F340**: 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 **F345**, 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 **F346**.
⑤ The motor drives with the creep frequency and, after the creep time, which is set with **F340**, 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 **F347** elapses, the servo lock is released.

(Note) ・The output terminal function "Brake release signal" is not output unless **F341** is set at 3 (Valid).
・With the standard shipment setting, the brake release signal (No. 68) is assigned to the output terminal OUT.

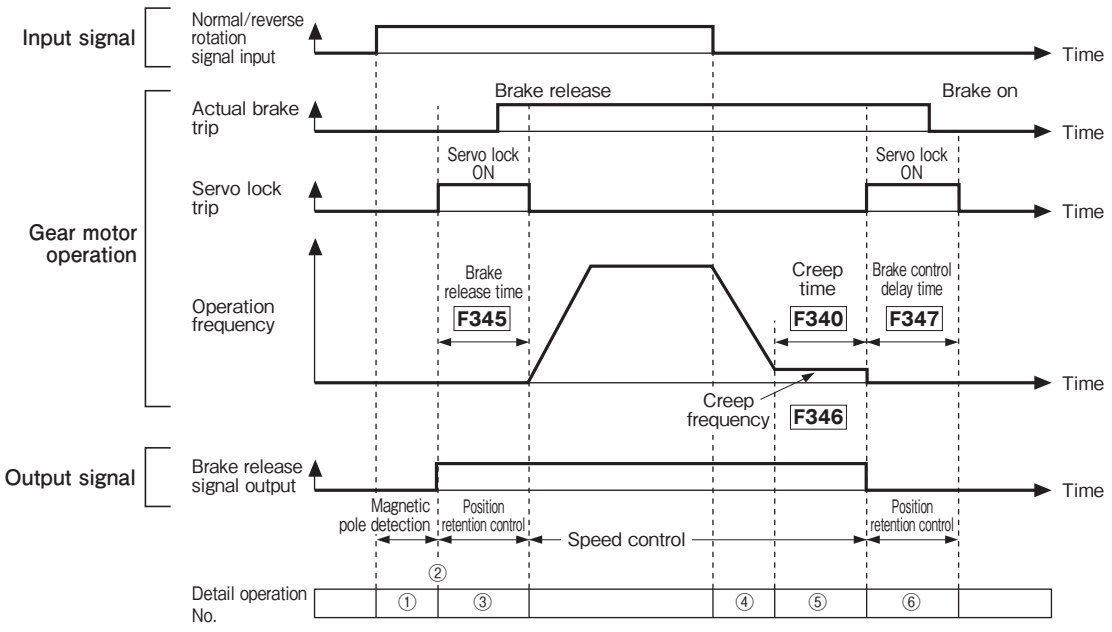


Chart Simplified servo lock function

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
F257	Servo lock function Prohibited/Permitted	—	0 : Prohibited 1 : Permitted	0 (Prohibited)	May be changed during operation.
F930	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. OFF : Servo lock is released.
71	Servo lock input signal (Inversion)	

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. OFF : It is turned OFF with the servo lock input signal OFF or when it trips.
177	Servo lock brake signal (Inversion)	
178	Servo lock trip signal	ON : On at servo lock trip OFF : Normally OFF other than the servo lock trip
179	Servo lock trip signal (Inversion)	

Detail of operation

・When the servo lock function set with **F257** is 1 (Permitted) and the brake sequence function set with **F341** is 0 (Invalid), the servo lock can trip.
・Monitor displays "Srvo" when the servo lock is tripped.
①In 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).
②Servo lock is released when the normal/reverse rotation operation command is turned ON.
③When the normal/reverse rotation operation command is OFF, the servo lock trips simultaneously as the output frequency turns to 0 Hz.
(Note) ・**F257**: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, **F108** (Normally trip function selection 2) is assigned to the input terminal function No. 70. As a result, if **F257** 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.

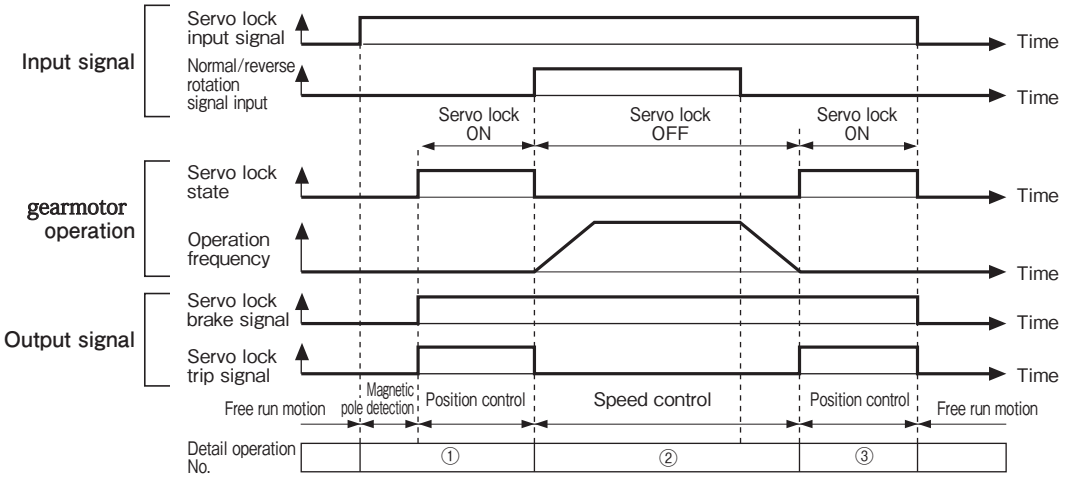


Chart Contact stop/contact thrust function

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
F382	Contact stop function Valid/Invalid	—	0 : Invalid 1 : — 2 : Valid	0	
F383	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.
F384	Contact stop limit torque	%	0 – 120	100	Rated torque ratio
F385	Contact stop detection time	sec	0.0 – 25.0	0.3	
F386	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 **F383**.
③ Upon completion of deceleration, it is changed to the mode to detect the torque set with **F384**.
④ If the torque set with **F384** continues longer than the time set with **F385**, it controls the output less than the torque set with **F386**.
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.

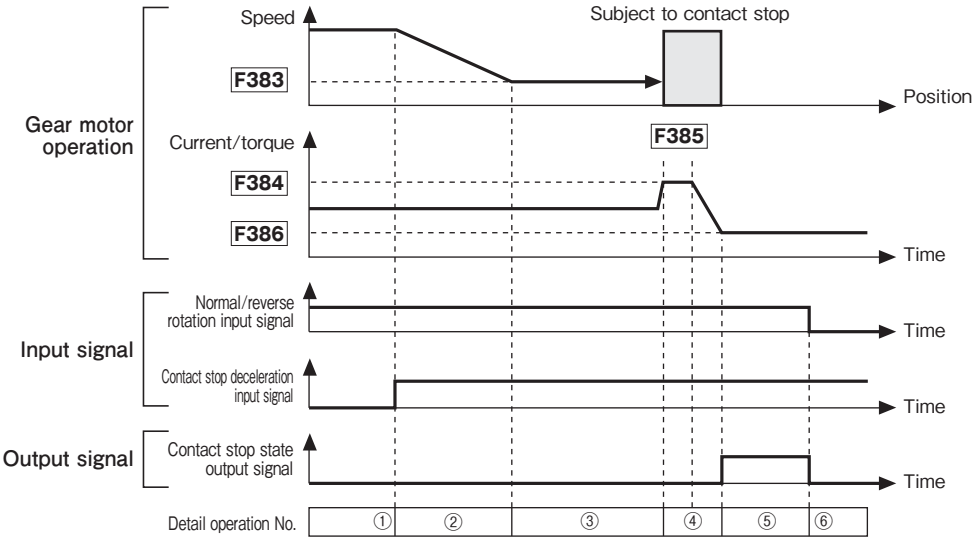


Chart Control Unit Specs - Free Unit Display Function

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
F702	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.

Display value = Frequency of monitor display or parameter × **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:

60 Hz → 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):

60 Hz → 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
F900	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.
F901	Machine ratio 1 (Denominator)	1 – 9999	1	Used to set mainly gearmotor reduction ratio, etc.
F902	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.

Display value = Motor shaft speed × 1/**F901** × 1/**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:

60 Hz → 1800 **F901** = 1 **F902** = 1.0 **F900** = 4

(1800×1/1×1/1.0=1800)

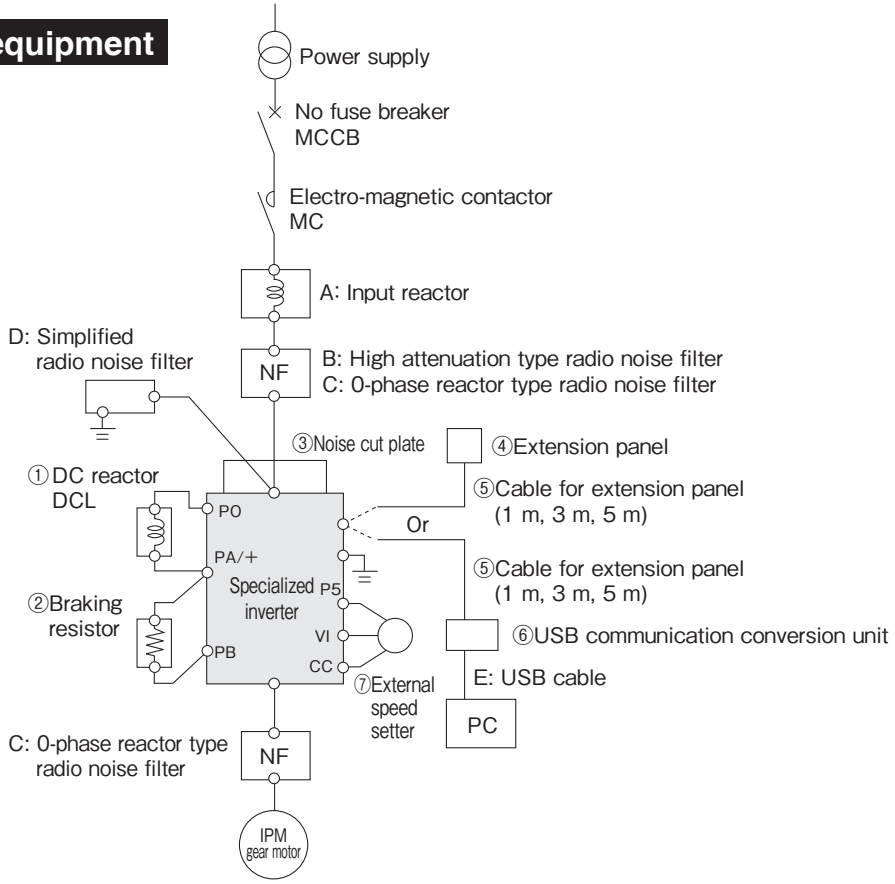
Example 2) Gearmotor output shaft speed display

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:

60 Hz → 144 **F901** = 1 **F902** = 12.5 **F900** = 3

(1800×1/1×1/12.5=144)

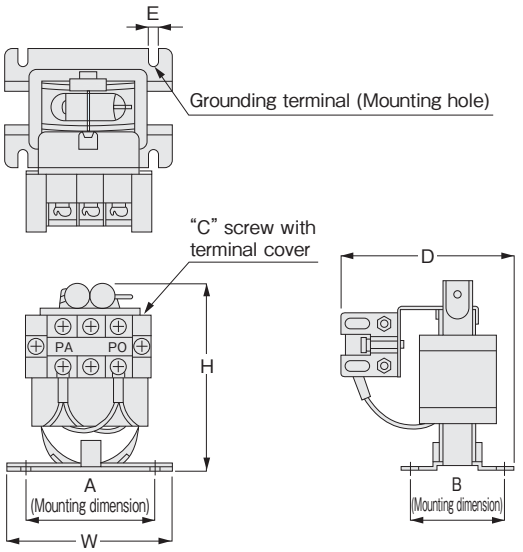
Control Unit Option - **Peripheral equipment**

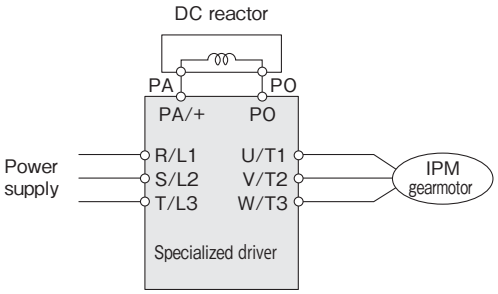


No.	Name		Function, Etc.	Stock
①	DC reactor		Used to reduce the harmonic at the driver power supply side and to improve the input power factor.	○
②	Braking resistor		Used when sudden deceleration and stop are required frequently or it is necessary to short-cut the deceleration time for a load of higher 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.)
2. Not in our product line. Customer is requested to procure commercial A-B connection type products compliant to USB1.1/2.0.
3. ① – ⑥ are the products of Toshiba Schneider driver Corp.

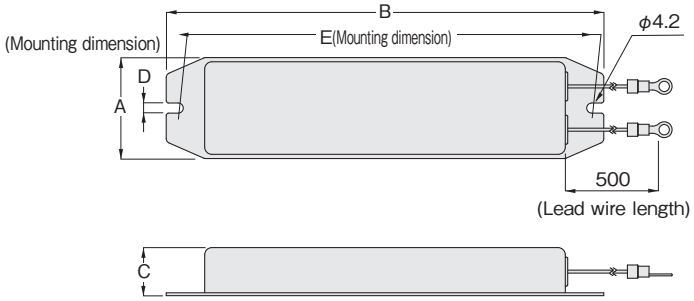
DC reactor

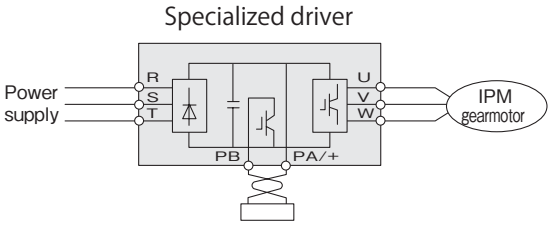




Reactor Model	Rated Current (A)	Applicable driver Power	Dimensions (mm)							Approx. Weight (kg)
			W	H	D	A	B	C	E	
OP-DCL2-2002	1.8	0.1kW、0.2kW	63	79	72	48	32	M3.5	4.5	0.4
OP-DCL2-2004	4	0.4kW	72	92	75	57	42	M3.5	4.5	0.6
OP-DCL2-2007	6	0.75kW	72	94	80	57	42	M3.5	4.5	0.7
OP-DCL2-2015	9.5	1.5kW	75	99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



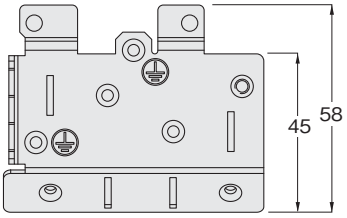


Braking Resistor Model	Rating	Continuous Allowable Power	Applicable driver Power	Dimensions (mm)					Approx. weight (kg)
				A	B	C	D	E	
OP-PBR-2007	120W-200Ω	90W	0.1kW~0.75kW	42	182	20	4.2	172	0.28
OP-PBR-2022	120W-75Ω	90W	1.5kW~2.2kW						

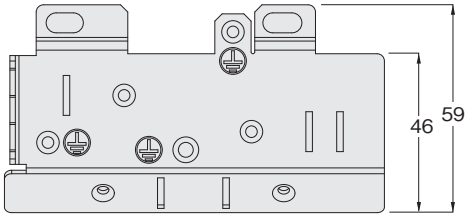
(Note) The braking resistor shown above has a built-in thermal fuse.

EMC Plate

●For 0.1 kW – 0.75 kW
Model : OP-EMP007Z (Approx. weight 0.3 kg)

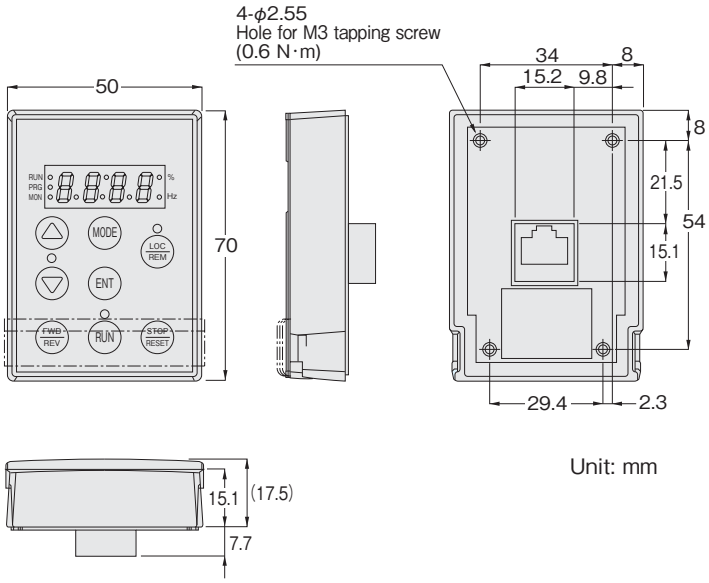


●For 1.5 kW, 2.2 kW
Model : OP-EMP008Z (Approx. weight 0.4 kg)



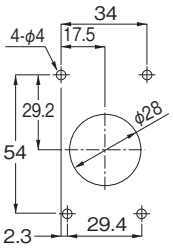
Extension Panel

●Extension panel
Model : OP-RKP007Z

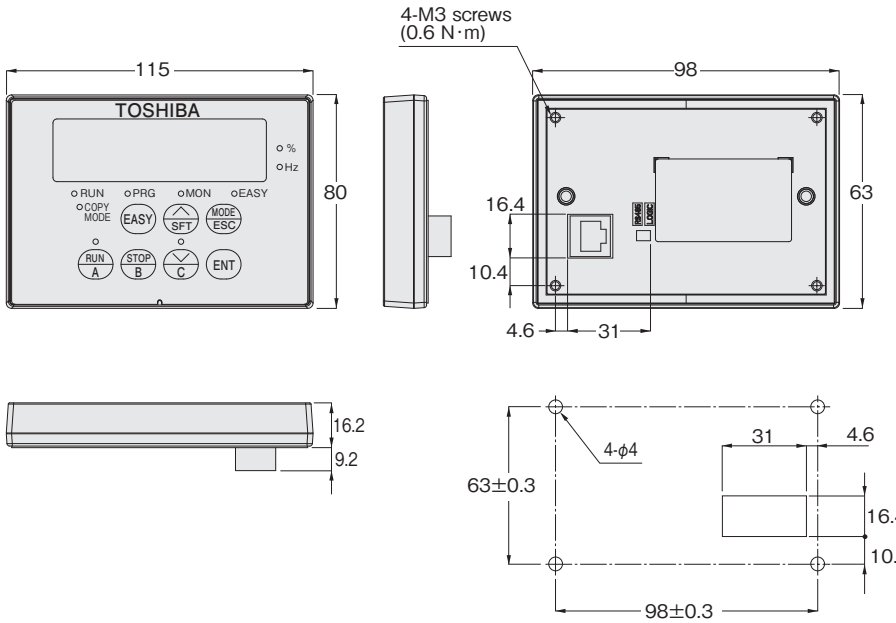


Unit: mm

Panel cutting dimensions



●Extension panel with parameter writer function
Model: OP-RKP002Z



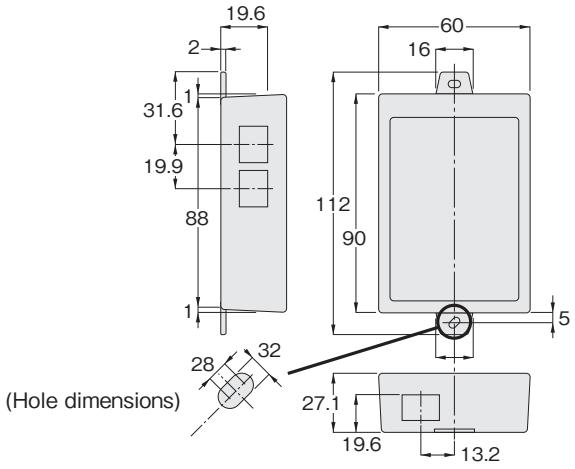
Extension Panel Cable

●For extension panel (Model: OP-RKP007Z)
Model : OP-CAB0071 (1 m)
Model : OP-CAB0073 (3 m)
Model : OP-CAB0075 (5 m)

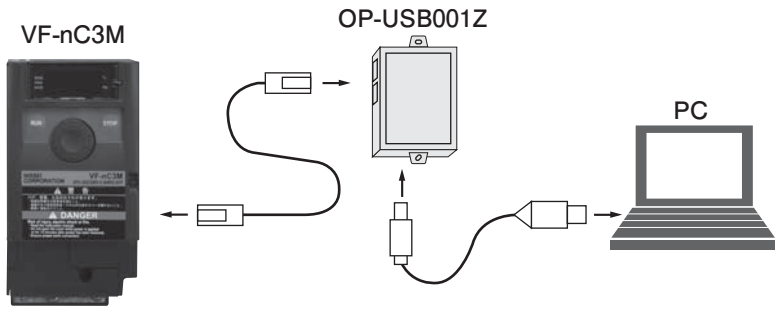
●For extension panel with parameter write function (Model: OP-RKP002Z)
●For UBS communication conversion unit (Model: OP-USB001Z)
Model: OP-CAB0011 (1 m)
Model: OP-CAB0013 (3 m)
Model: OP-CAB0015 (5 m)

USB Communication Conversion Unit

Model : OP-USB001Z



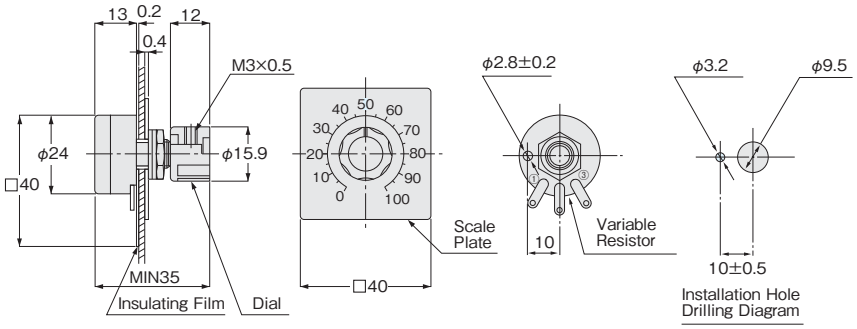
Unit: mm



(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℃ - 40℃	−10℃ - 40℃
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

❶ "H_7" fit is recommended for the hole for couplings, sprockets, pulleys, gears etc., when attaching to the reducer.
❷ 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.
❸ 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.
❹ 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

❶ 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.
❷ Do not use the equipment in explosive atmosphere. It could cause explosion, ignition, fire, electric shock, injury or damage on the equipment.
❸ 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.
❹ Take care not wet the brake with water, oil or grease. It could reduce the brake torque, resulting in drop or runaway.
❺ Connect wires properly and securely to the input power supply, motor and driver. Otherwise it could damage devices.
❻ 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.
❼ 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.
❽ 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.
❾ Use motors and inverters in the specified combinations. Otherwise it could cause damage on devices or fire.
❿ 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.
⓫ When any error has occurred, stop operation immediately. There is risk of injury or fire.
⓬ Keep combustible objects away from the periphery. They could catch fire.
⓭ Avoid touching revolving section of motor. There is risk of injury.
⓮ Operate the equipment within the allowable ranges of the load torque, load inertia moment and O.H.L.
⓯ 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-0 or NLGI-0.

CAUTION FOR USE (DRIVER)

■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 inverters' 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 inverters 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 inverters' protective circuit has operated.
(4)Avoid frequent starts and stops by turning ON or OFF theelectromagnetic 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”)

brother
at your side

Technical Section

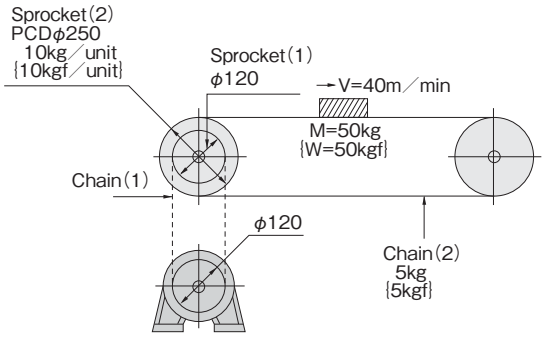
Table of Contents

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: $i = \frac{\text{Required rotating speed for output shaft}}{\text{Rated motor rotation speed}}$	Required Rotation Speed of Conveyor Shaft $= \frac{40\times1000}{250\times\pi} \fallingdotseq 50.9$ rpm Since the diameter of the sprocket for the conveyor shaft and that of the reducer output shaft are the same, we obtain; $i = \frac{50.9}{1800} \fallingdotseq \frac{1}{30}$	
Check Torque	Calculate Actual Load Torque(T_L)	$T_L=9.8\times(50+2\times10+5)\times0.2\times\frac{250}{2\times1000}=18.4$N·m	$T_L=(50+2\times10+5)\times0.2\times\frac{250}{2\times1000}=1.9$kgf·m
	Calculate equivalent torque(T_{LE}) of output shaft from service factor: (sf given in Table-1 on page T42) $T_{LE}=T_L\times Sf$	Adjust Actual Load Torque(T_L) using a Service Factor (Sf).	
		$T_{LE}=18.4\times1.25=23$N·m	$T_{LE}=1.9\times1.25=2.4$kgf·m
	Choose the allowable torque(T_A) of output shaft from the performance table, which should be greater than T_{LE}	Select an appropriate model of $T_{LE}\leqq T_A$ G3L22N30N-IPM020NT	
Check Inertia	Calculate Actual Load Inertia	Calculate Actual Load Inertia Moment(J_L) $J_L=\{50\times(\frac{0.25}{2})^2\}+\{\frac{1}{2}\times10\times(\frac{0.25}{2})^2\times2\}+\{5\times(\frac{0.25}{2})^2\}$ $=1.02$kg·m^2	Calculate Actual Load GD^2(GD_L^2) $GD_L^2=(50\times0.25^2)+(\frac{1}{2}\times10\times0.25^2\times2)+(5\times0.25^2)$ $=4.06$kgf·m^2
	Calculate Load Inertia converted to Motor Shaft	Convert J_L into the equivalent value at the motor shaft(J_ℓ) $J_\ell=J_L\times(i)^2$ $J_\ell=1.02\times(\frac{1}{30})^2$ $\fallingdotseq0.001128$kg·m^2	Convert GD_L^2 into the equivalent value at the motor shaft (GD_ℓ^2) $GD_\ell^2=GD_L^2\times(i)^2$ $GD_\ell^2=4.06\times(\frac{1}{30})^2$ $\fallingdotseq0.00451$kgf·m^2
	Select a model of which actual load inertia moment ≦ 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〉	$K_1=1$ $K_2=1$	
	$O.H.L.=\frac{T_{LE}\times K_1\times K_2}{R}$ ＊R: Pitch Circle Radius of sprocket, etc. equipped to reducer shaft	$O.H.L.=\frac{23\times1\times1}{\frac{120}{2\times1000}}=384$N	$O.H.L.=\frac{2.4\times1\times1}{\frac{120}{2\times1000}}=40$kgf
	Select O.H.L.≦Allowable O.H.L. from the performance table	Select the model which satisfy O.H.L.≦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).

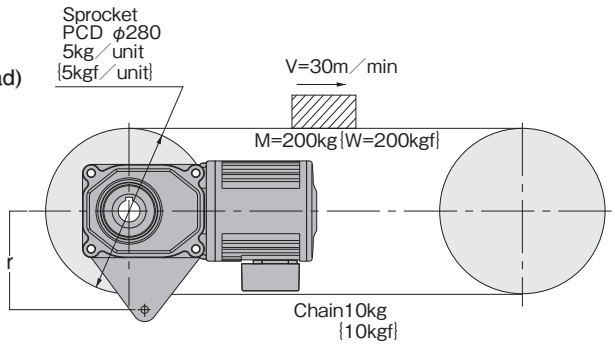
GEARMOTOR SELECTION PROCESS EXAMPLES

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: $i = \frac{\text{Required rotating speed for output shaft}}{\text{Rated motor rotation speed}}$	Required Rotation Speed of Conveyor Shaft$= \frac{30\times1000}{280\times\pi} \fallingdotseq 34.1$ rpm Since the rotation speed of the conveyor shaft and that of the reducer's output shaft are the same. $i = \frac{34.1}{1800} \fallingdotseq \frac{1}{50}$	
Check Torque	Calculate Actual Load Torque(T_L)	$T_L=9.8\times(200+2\times5+10)\times0.2\times\frac{280}{2\times1000}=60.4$N·m	$T_L=(200+2\times5+10)\times0.2\times\frac{280}{2\times1000}=6.16$kgf·m
	Calculate equivalent torque(T_{LE}) of output shaft from service factor: (sf given in Table-1 on page T42) $T_{LE}=T_L\times Sf$	Adjust Actual Load Torque(T_L) using a Service Factor (Sf).	
		$T_{LE}=60.4\times1.25=75.5$N·m	$T_{LE}=6.16\times1.25=7.7$kg f·m
	Choose the allowable torque(T_A) of output shaft from the performance table, which should be greater than T_{LE}	Select an appropriate model of $T_{LE}\leqq T_A$ F3S30N50N-IPM040NT	
Check Inertia	Calculate Actual Load Inertia	Calculate Actual Load Inertia Moment(J_L) $J_L=\{200\times(\frac{0.28}{2})^2\}+\{\frac{1}{2}\times5\times(\frac{0.28}{2})^2\times2\}+\{10\times(\frac{0.28}{2})^2\}$ $=4.21$kg·m^2	Calculate Actual Load GD^2 (GD_L^2) $GD_L^2=(200\times0.28^2)+(\frac{1}{2}\times5\times0.28^2\times2)+(10\times0.28^2)$ $=16.86$kgf·m^2
	Calculate Load Inertia converted to Motor Shaft	Convert J_L into the equivalent value at the motor shaft (J_ℓ) $J_\ell=J_L\times(i)^2$ $J_\ell=4.21\times(\frac{1}{50})^2$ $=0.001686$kg·m^2	Convert GD_L^2 into the equivalent value at the motor shaft (GD_ℓ^2) $GD_\ell^2=GD_L^2\times(i)^2$ $GD_\ell^2=16.86\times(\frac{1}{50})^2$ $\fallingdotseq0.00674$kgf·m^2
	Select a model of which actual load inertia moment ≦ 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.** $r \geqq \frac{\text{Actual Load Torque}\times1000}{\text{Allowable O.H.L.}-\text{mass of Reducer}} = \frac{75.5\{7.7\}\times1000}{3480\{355\}-9.8\times15.5\{15.5\}}=22.7$ *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 (J_A) Allowable (GD^2)

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^2}

(Motor shaft Equivalent)

Unit: Inertia Moment J (kg·m²) {GD^2(kgf·m²)} 〈Table-2〉

3-Phase	Allowable Inertia Moment J (J_A) {AllowableGD^2}
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)^2
(Motor shaft equivalent GD^2 = Output shaft GD^2×(reduction ratio)^2)
(Example: In case the reduction ratio is 1/20, the answer is 1/400.)

CALCULATION OF INERTIA MOMENT

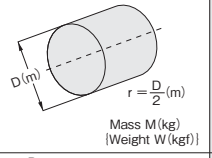
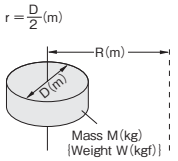
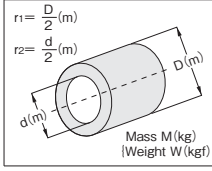
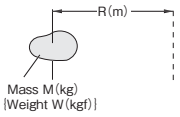
Calculation of Inertia Moment J {GD² (Flywheel Effect)}

The conversion between the inertia moment J (kg·m²)-(SI units) and the gravimetric units GD² (kg·m²) are calculated as follows:

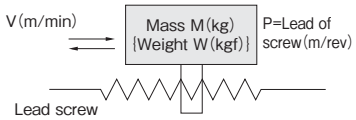
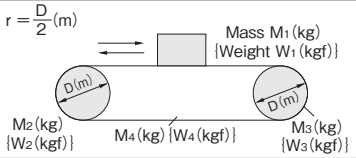
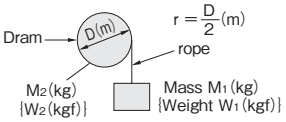
$$J = \frac{GD^2}{4}$$

G : Gravity (kgf)
D : Rotation Diameter (m)
J : Inertia Moment (kg·m²)

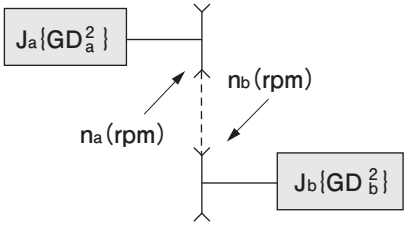
■Inertia Moment in Rotation J {GD²}

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		SI Unit	Gravimetric Unit
	$J = \frac{1}{2} Mr^2$ (kg·m²)	$GD^2 = \frac{1}{2} WD^2$ {kgf·m²}		$J = \frac{1}{2} Mr^2 + MR^2$ (kg·m²)	$GD^2 = \frac{1}{2} WD^2 + 4WR^2$ {kgf·m²}
	$J = \frac{1}{2} M(r_1^2 + r_2^2)$ (kg·m²)	$GD^2 = \frac{1}{2} W(D^2 + d^2)$ {kgf·m²}		(when you can ignore size) $J = MR^2$ (kg·m²)	(when you can ignore size) $GD^2 = 4WR^2$ {kgf·m²}

■Inertia Moment in Linear Motion J {GD²}

		SI Unit	Gravimetric Unit
Ordinary Use		$J = \frac{1}{4} M \cdot \left(\frac{V}{\pi \cdot n}\right)^2$ (kg·m²)	$GD^2 = W \cdot \left(\frac{V}{\pi \cdot n}\right)^2$ {kgf·m²}
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·m²)	$GD^2 = W \cdot \left(\frac{P}{\pi}\right)^2 = W \cdot \left(\frac{V}{\pi \cdot n}\right)^2$ {kgf·m²}
Horizontal Linear Motion (conveyors, etc.)		$J = M_1r^2 + \frac{1}{2} M_2r^2 + \frac{1}{2} M_3r^2 + M_4r^2$ (kg·m²)	$GD^2 = W_1D^2 + \frac{1}{2} W_2D^2 + \frac{1}{2} W_3D^2 + W_4D^2$ {kgf·m²}
Vertical Linear Motion (cranes, winches, etc.)		$J = M_1r^2 + \frac{1}{2} M_2r^2$ (kg·m²)	$GD^2 = W_1D^2 + \frac{1}{2} W_2D^2$ {kgf·m²}

■Conversion of Inertia Moment when Speed Ratio is available



The inertia moment Jb (GD_b^2) of the load can be converted into the equivalent value at the na 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 {GD²} 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·m²) {GD²(kgf·m²)}	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 {GD²} 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·m²) {GD²(kgf·m²)}	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·m²) {GD²(kgf·m²)}	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_{LE} : 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_1 : Factor for the connecting method (Refer to Table-6)
- K_2 : 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_1

〈Table-6〉

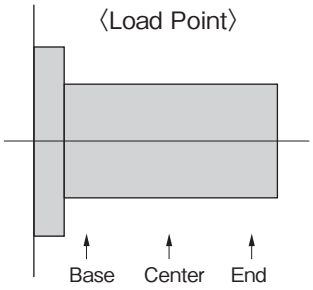
Connecting Method	K_1
Chain, Timing Belt	1.00
Gear	1.25
V-Belt	1.50

■Factor K_2

〈Table-7〉

Load Point	K_2
Base of the Shaft	0.75
Middle of the shaft	1.00
End of the shaft	1.50

〈Load Point〉



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

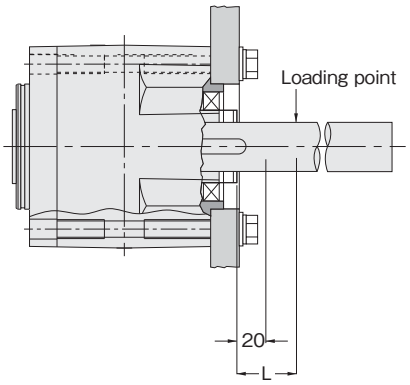
If the length of the load point (L) becomes greater than 20mm, it can be corrected using the following formula:

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

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

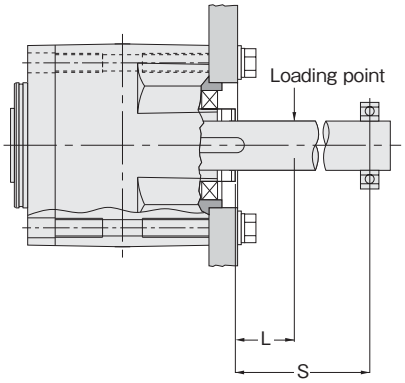
〈Table-8-2〉

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



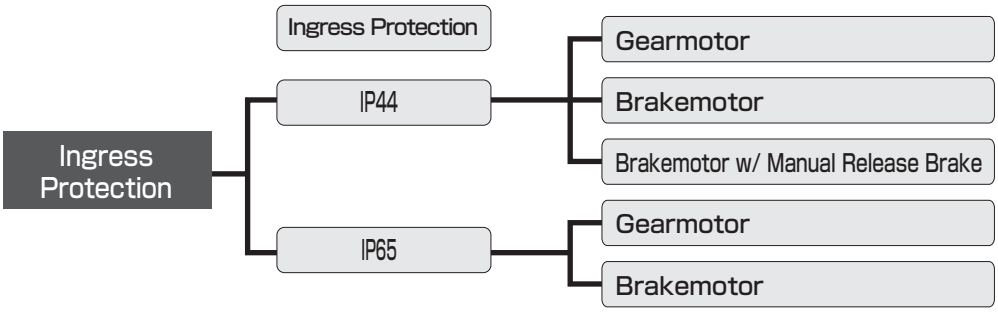
(2)-2 O.H.L Corrections when one end can take a pillow block bearing

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



TYPES, TERMINAL BOX

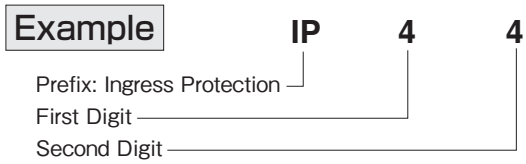
IPM Gearmotor Types



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



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 ϕ50 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 ϕ12 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 ϕ1 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°has no harmful effect.
3	Structure with which vertically dripping water at an angle up to 60°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.

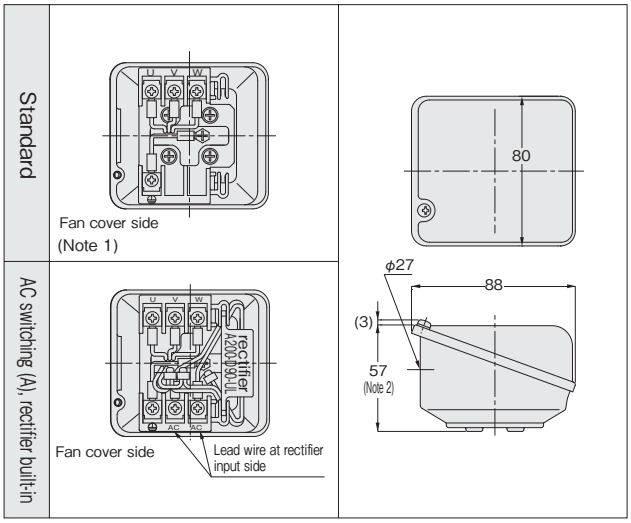
(Note) 1. Motors rated as IP44 are not waterproof. Take proper care in order to protect against the splashing of liquids such as oil or water.

Type and Specification of Terminal Box

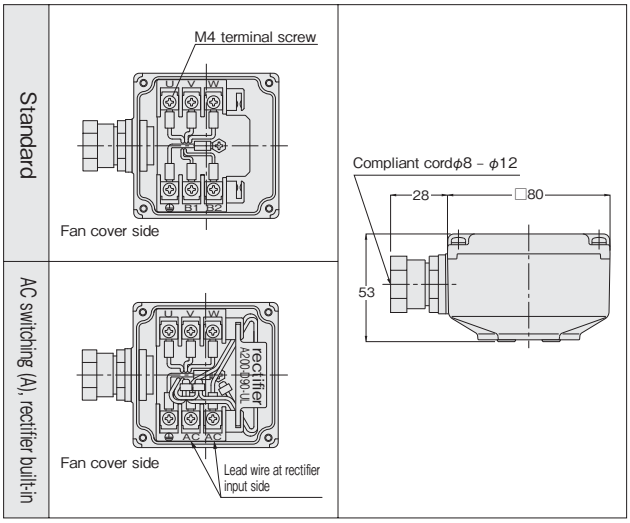
Motor Specification			Terminal Box Specification								Gearmotor with Brake, Built-in Rectifier	
Motor Type	Brake	Protection	Type	Code	Standard or Optional Specification							
					0.1kW	0.2kW	0.4kW	0.75kW	1.5kW	2.2kW	Adaptation	Designation
M	None	IP44	Steel plate	T	△	△	△	○	○	○	—	—
B·J	With	IP44	Steel 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-IPB020N**TX-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

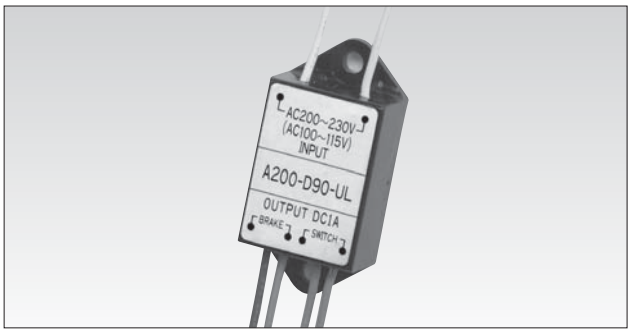


(Note) 1. When a brake motor is attached, the brake lead wires are taken out loosely form the brake unit.
2. For the T terminal box, when the optional manual brake release device is attached for models 0.75 kW or less, add 9.5 mm to the height because a spacer is used. (Type T = 66.5 mm)

CONNECTION AND RECTIFIER

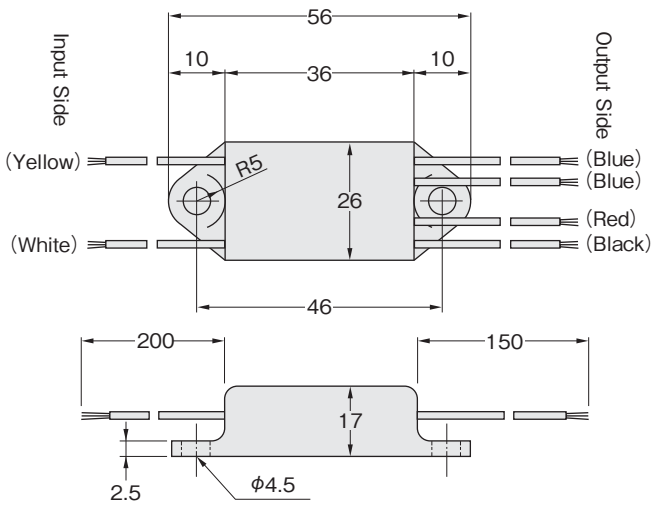
■Rectifier

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.



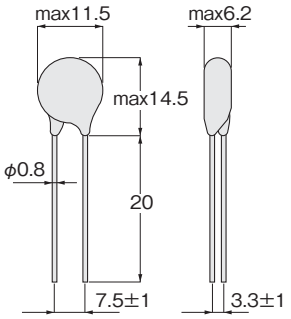
■A200—D90—UL Dimension Diagram

〈Approximate weight: 40g〉(A100—D45)



■Surge Suppressor (Option) OP-ERZV10D471

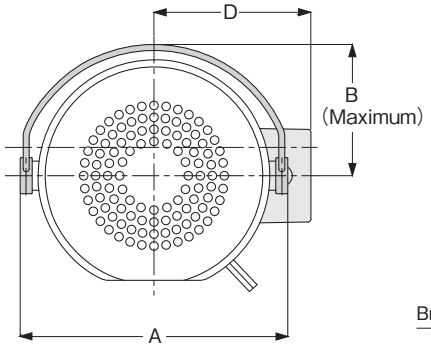
Use this to extinguish sparks on SWs on the power supply line.



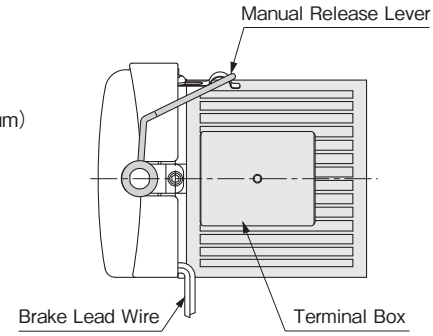
MANUAL RELEASE DEVICE

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.

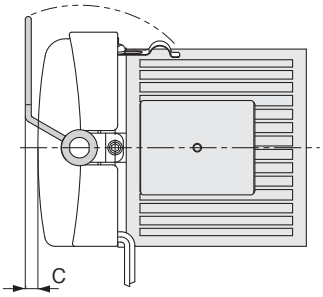
G3·H2



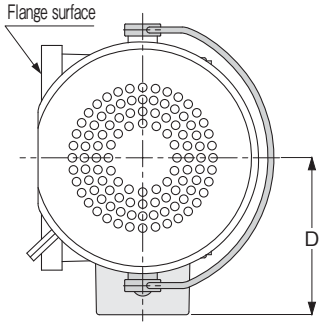
●During Operation



●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

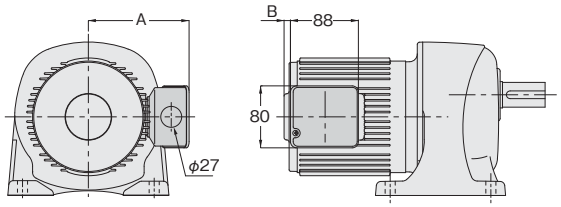
Motor Power	0.1kW	0.2kW	0.4kW	0.75kW	1.5kW、2.2kW
A	156	156	156	180	213
B	83	83	83	102	124
C	8	0	0	2	6
D	91.5	91.5	97.5	141	142

(Note) 1. The lead wire or terminal box and the manual release lever are basically on the same
2. 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)

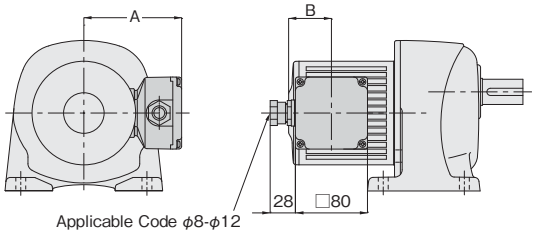
Common to G3 and H2 (IP44)



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°

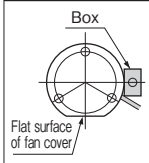
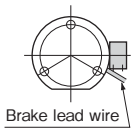
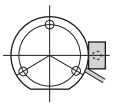
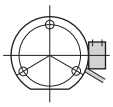
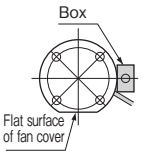
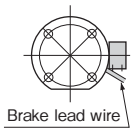
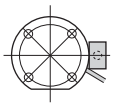
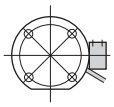
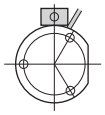
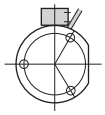
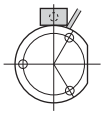
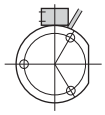
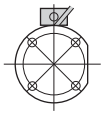
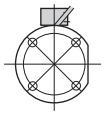
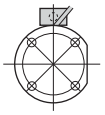
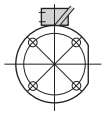
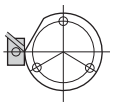
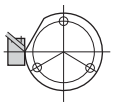
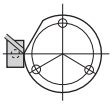
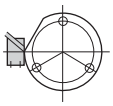
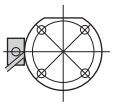
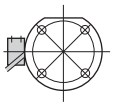
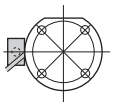
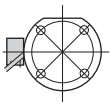
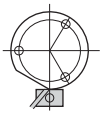
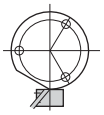
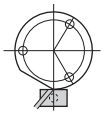
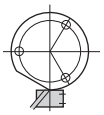
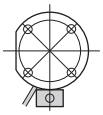
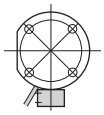
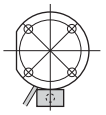
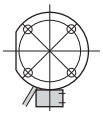
(Note) 1. The figures above illustrate standard terminal box positions.
For optional positions, refer to page T53, and specify the appropriate codes when ordering
2. The figure above is only a reference.

TERMINAL BOX MEASURE AND POSITION

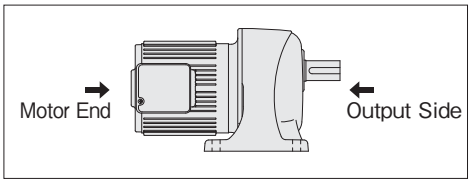
Terminal Box Positions (G3 & H2)

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	 Hole(lower)	 Hole(Load-side)	 Hole(upper)	 Standard	 Hole(lower)	 Hole(Load-side)	 Hole(upper)
Standard	H6	H3	HZ	Standard	H6	H3	HZ
 T(upper)	 T(upper) Hole(right)	 T(upper) Hole(Load-side)	 T(upper) Hole(left)	 T(upper)	 T(upper) Hole(right)	 T(upper) Hole(Load-side)	 T(upper) Hole(left)
TZ	TZ H6	TZ H3	TZ HZ	TZ	TZ H6	TZ H3	TZ HZ
 T(left)	 T(left) Hole(upper)	 T(left) Hole(Load-side)	 T(left) Hole(lower)	 T(left)	 T(left) Hole(upper)	 T(left) Hole(Load-side)	 T(left) Hole(lower)
T9	T9 H6	T9 H3	T9 HZ	T9	T9 H6	T9 H3	T9 HZ
 T(lower)	 T(lower) Hole (left)	 T (lower) Hole(Load-side)	 T (lower) Hole(right)	 T(lower)	 T(lower) Hole(left)	 T(lower) Hole(Load-side)	 T (lower) Hole(right)
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.



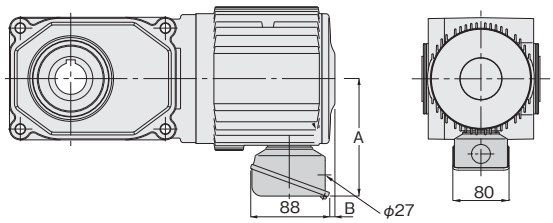
●Meanings
1) "T" indicates "Terminal Box".
2) "H" indicates the supply inlet hole.

TERMINAL BOX MEASURE AND POSITION

Gearmotor · Gearmotor with Brake in common

Terminal Box Dimensions (F3S)

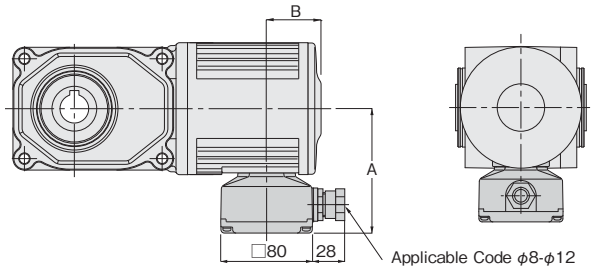
F3S (IP44)



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.

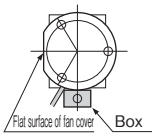
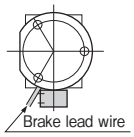
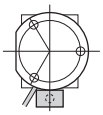
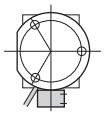
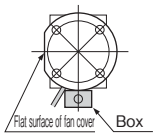
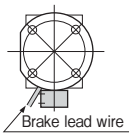
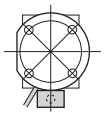
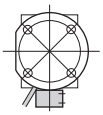
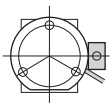
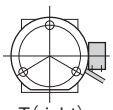
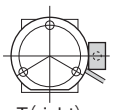
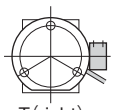
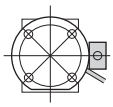
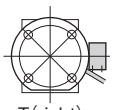
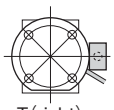
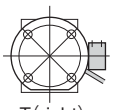
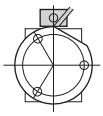
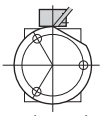
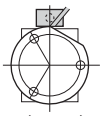
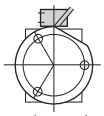
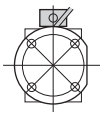
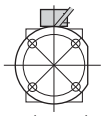
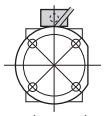
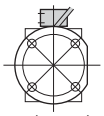
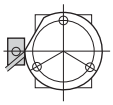
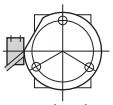
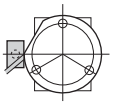
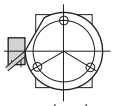
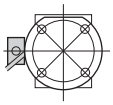
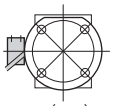
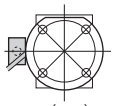
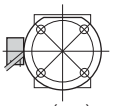
TERMINAL BOX MEASURE AND POSITION

Gearmotor・Gearmotor with Brake in common

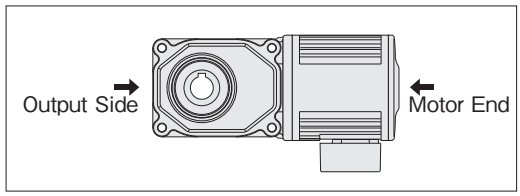
Terminal Box Dimensions (F3S)

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	 Hole(left)	 Hole(load side)	 Hole(right)	 Standard	 Hole(left)	 Hole(load side)	 Hole(right)
Standard	H6	H3	HZ	Standard	H6	H3	HZ
 T(right)	 T(right) Hole(lower)	 T(right) Hole(load side)	 T(right) Hole(upper)	 T(right)	 T(right) Hole(lower)	 T(right) Hole(load side)	 T(right) Hole(upper)
T3	T3 H6	T3 H3	T3 HZ	T3	T3 H6	T3 H3	T3 HZ
 T(upper)	 T(upper) Hole(right)	 T(upper) Hole(load side)	 T(upper) Hole(left)	 T(upper)	 T(upper) Hole(right)	 T(upper) Hole(load side)	 T(upper) Hole(left)
TZ	TZ H6	TZ H3	TZ HZ	TZ	TZ H6	TZ H3	TZ HZ
 T(left)	 T(left) Hole(upper)	 T(left) Hole(load side)	 T(left) Hole(lower)	 T(left)	 T(left) Hole(upper)	 T(left) Hole(load side)	 T(left) Hole(lower)
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.

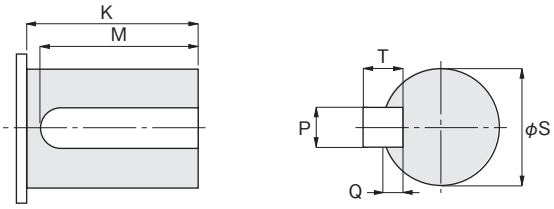


●Meanings
1) "T" indicates "Terminal Box".
2) "H" indicates the supply inlet hole.

OUTPUT SHAFT DIMENSION DIAGRAMS

G3, H2

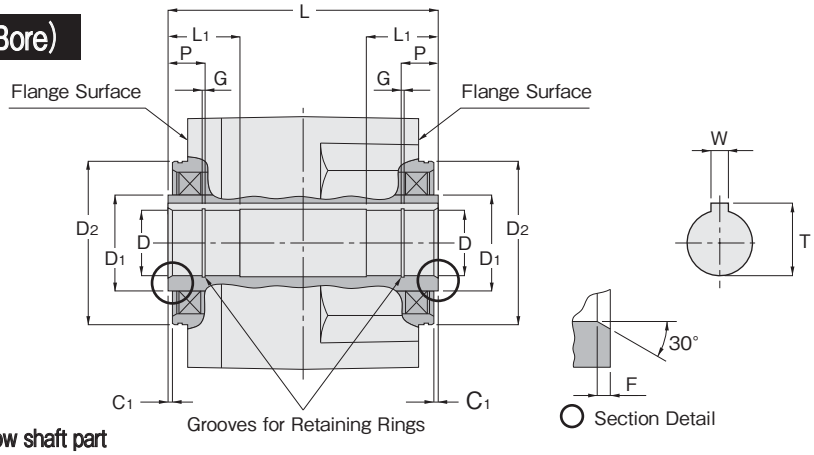
Tap[1]



Dimension / Frame Number	K	M	S (h_6)		Key P (h_9)		Key T		Q	Size × Pitch × Effective Depth
18	30	27	18	$^{0}_{-0.011}$	6	$^{0}_{-0.030}$	6	$^{0}_{-0.030}$	3.5	M 6×1.0×15 ℓ
22	40	35	22	$^{0}_{-0.013}$						M 8×1.25×20 ℓ
28	45	40	28		8	$^{0}_{-0.036}$	7	$^{0}_{-0.090}$	4	
32	55	50	32	$^{0}_{-0.016}$	10		8		5	M 10×1.5×25 ℓ
40	65	60	40		12	$^{0}_{-0.043}$				
50	75	70	50		14		9		5.5	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_8)	D_1	D_2 (h_7)	W	T	L	L_1	P	C_1	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)

Figure1

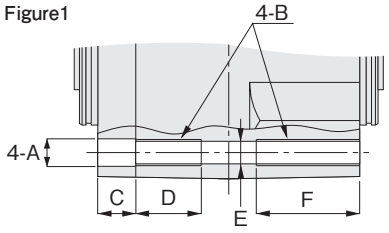
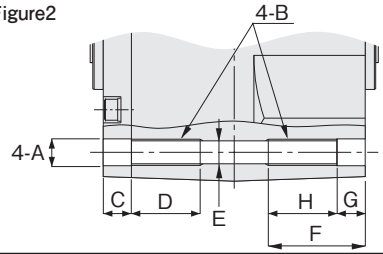


Figure2



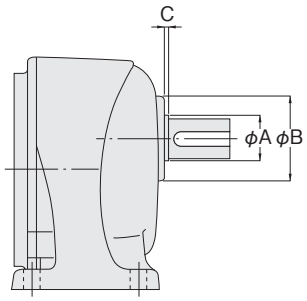
Frame No.	Reduction Ratio	Motor Power	Shape	A	B	C	D	E	F	G	H
20	1／ 5~1／ 60	0.1 kW	Figure1	ϕ10.5	M10×P1.5	12	25	ϕ8.6	37	—	—
25	1／ 5~1／ 60	0.2 kW		ϕ10.5	M10×P1.5	14.5	25	ϕ8.6	39.5	—	—
	1／ 80~1／ 240	0.1 kW		ϕ10.5	M10×P1.5	14.5	25	ϕ8.6	39.5	—	—
30	1／ 5~1／ 60	0.4 kW		ϕ10.5	M10×P1.5	15.5	25	ϕ8.6	40.5	—	—
	1／ 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									
35	1／ 5~1／ 60	0.75kW		ϕ12.5	M12×P1.75	18	30	ϕ10.6	48	—	—
	1／ 80~1／ 240	0.4 kW		ϕ16.5	M16×P2	18	40	ϕ14	58	—	—
35	1／ 300~1／ 375	0.2 kW									
	1／ 450~1／ 750	0.1 kW									
45	1／ 5~1／ 60	1.5 kW		ϕ16.5	M16×P2	23	40	ϕ14	63	—	—
	1／ 5~1／ 30	2.2 kW									
	1／ 80~1／ 240	0.75kW		ϕ20.5	M20×P2.5	23	50	ϕ17.5	73	—	—
45	1／ 300~1／ 375	0.4 kW									
	1／ 450~1／ 750	0.2 kW									
	1／ 900~1／1200	0.1 kW									
50	1／ 40~1／ 60	2.2 kW	Figure2	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									

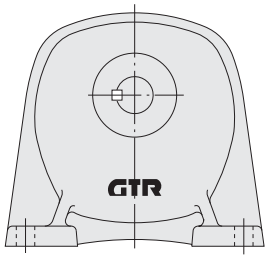
(Note) When attaching the mounting bolts, it is recommended to have the engagement of the bolt with thread D or F be at least two times the screw size (bolt diameter).
(i.e. For an M10, 20mm or more of the thread engagement with D or F is recommended.

OUTPUT SHAFT DIMENSION DIAGRAMS

G3

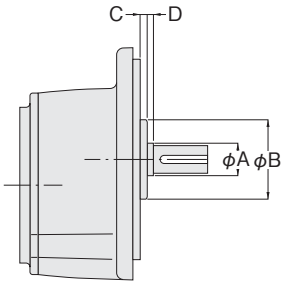
G3L (Foot Mount)

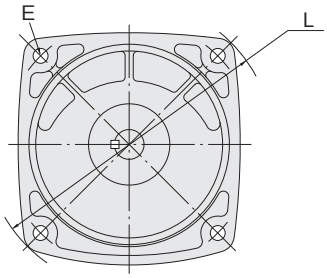




Frame Number \ Dimension	A	B	C
18	20	43	2
22	24	50	2
28	30	60	2
32	34	68	3
40	42	90	3
50	53	105	3

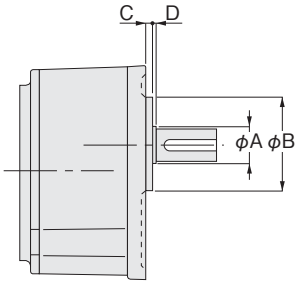
G3F (Flange Mount)

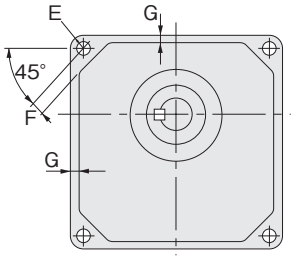




Frame Number \ Dimension	A	B	C	D	E	L
40	42	100	−2	3	19	ϕ350
50	53	120	0	3	20	ϕ412

G3K (Small Flange Mount)



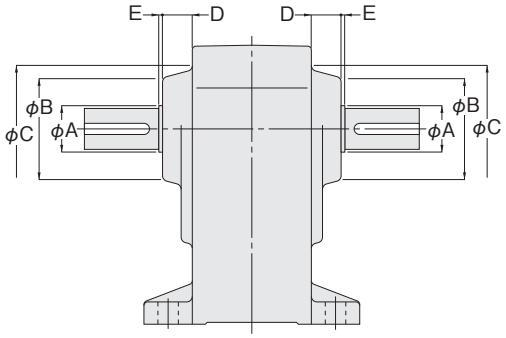


Frame Number \ Dimension	A	B	C	D	E	F	G
18	20	50h7	4	2	9	9	5
22	24	60h7	5	2	9	9	5
28	30	80h7	5	2	11	11	7
32	34	88h7	5	3	13	13	8

OUTPUT SHAFT DIMENSION DIAGRAMS

H2

H2L (Foot Mount)



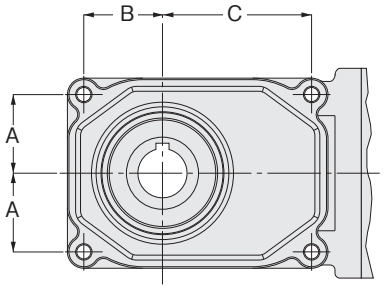
Dimension / Frame Number	A	B	C	D	E
22	25	55	63.5	16	2
28	30	67	76	16	2
32	35	78	88	17	3
40	45	92	104	21	2
50	55	110	122	22	3

F3S FRAME NUMBERS

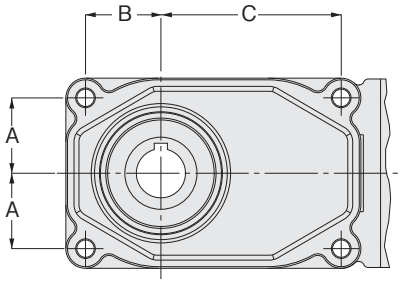
■F3S reducers have two different model formats with the same frame numbers.

Figure

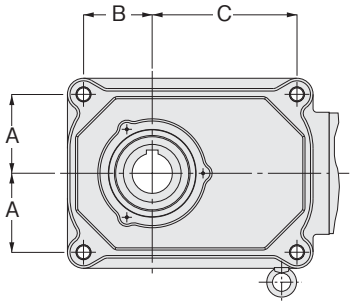
〈Figure-1〉



〈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

❶ 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.

❷ 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

❸ 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.

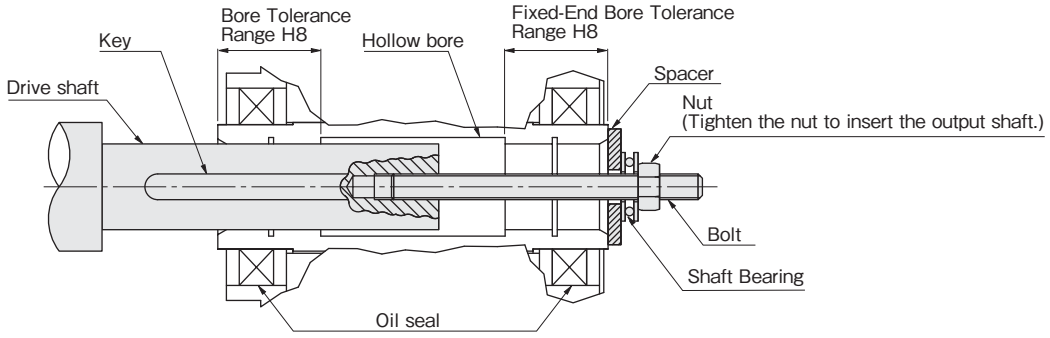


Figure-1

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

❹ 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)

❺ 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

❶ When there are steps on the drive shaft

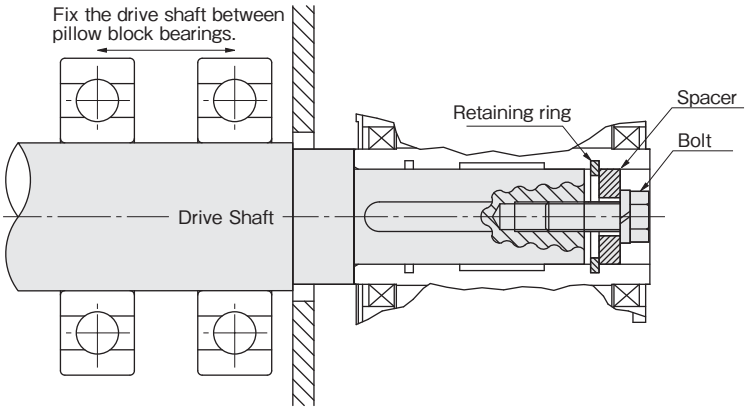


Figure-2: Attachment Using a Spacer and Retaining Ring

(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

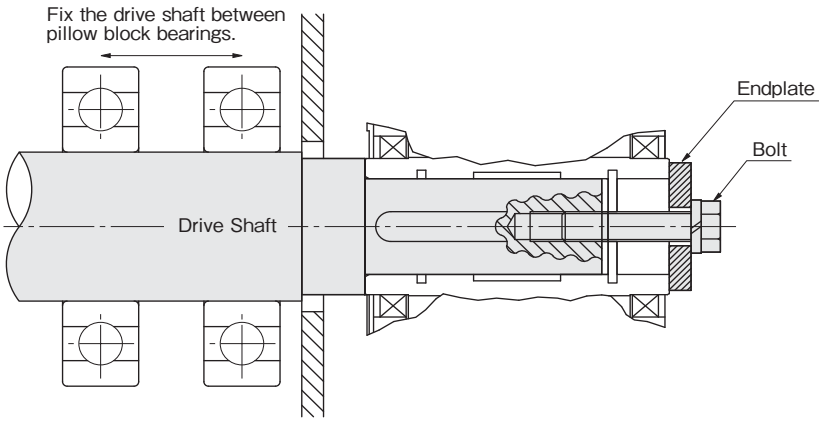


Figure-3: Attachment Using an Endplate
(Customers need to provide their own endplates and bolts.)

❷ When there are no steps on the drive shaft

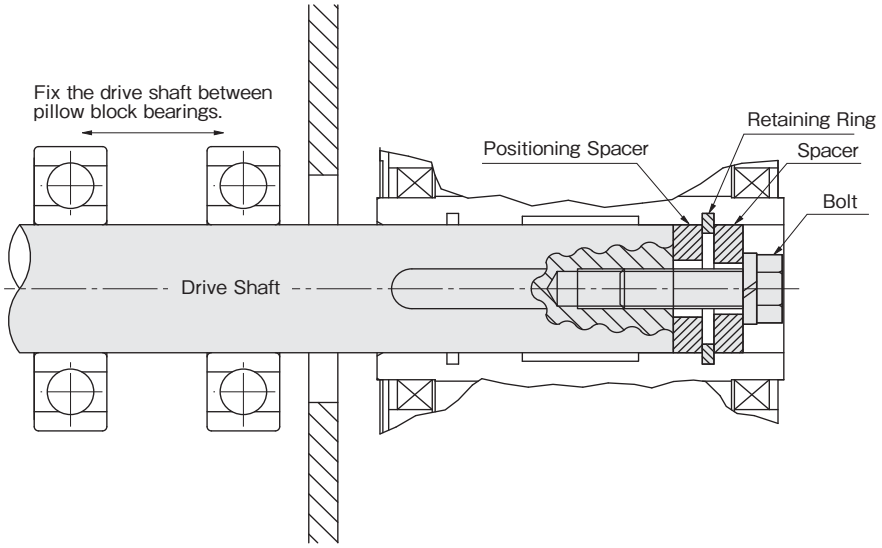
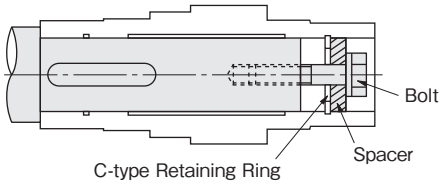


Figure-4: Attachment Using a Space and Retaining Ring
(Customers need to provide their own spacers, positioning spacers, bolts and retaining rings.)

(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 space 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

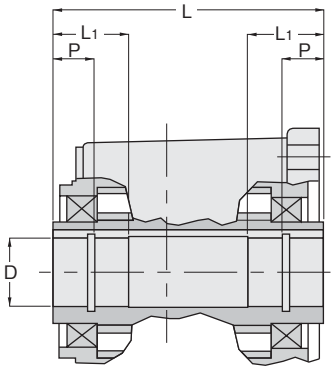


Recommended Sizes for the Fixing Elements of the Drive Shaft (mm)

	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.

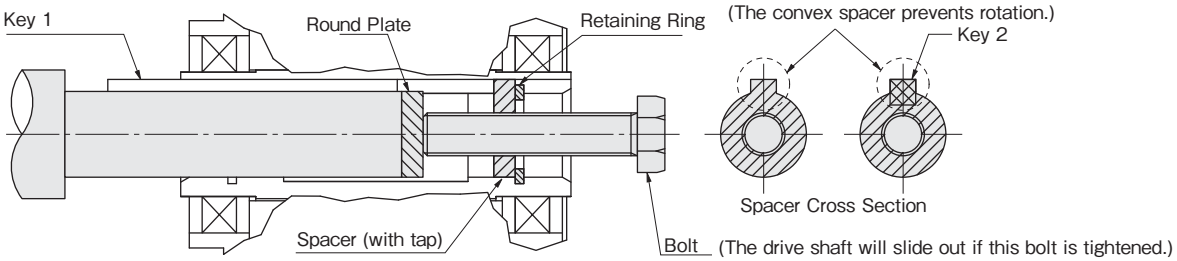


Figure 5

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

INSTALLATION AND REMOVAL OF HOLLOW BORE

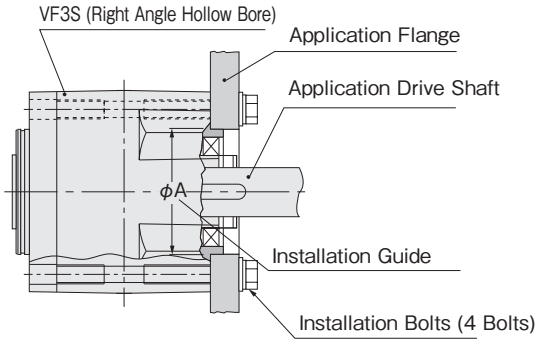
How to Install the Reducer

Merits and demerits of flange mounted and torque arm mounted.

	Advantages	Disadvantages
Flange Installation	·Can be installed directly on the device. ·Saves space.	·Centering with the application is required
Torque Arm Installation	·Makes centering with the application easy. ·Fastening to the application only requires one detent.	·Requires a torque arm. ·Requires space for installing a torque arm.

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 ϕA 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

❶ 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.)

❷ 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

❶ 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)

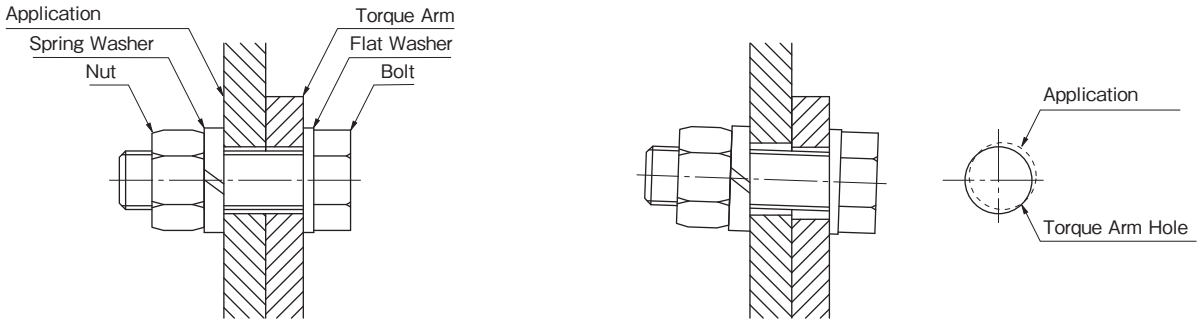


Figure 6: Fastening the Detent

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.

❷ 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.

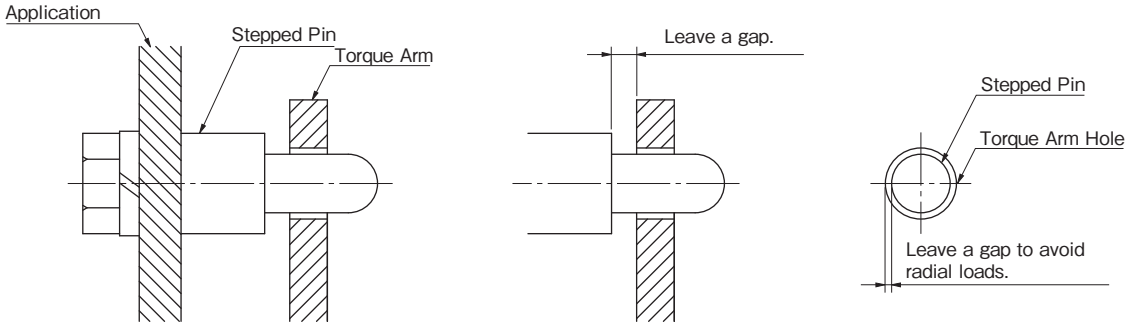
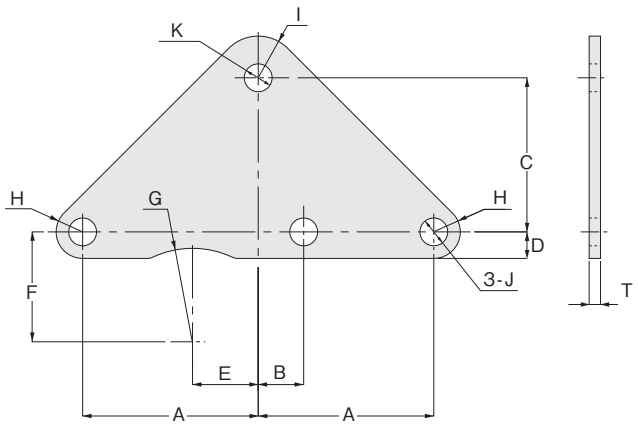


Figure 7: Example of Stepped Pin Usage

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	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

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

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

Gravimetric Unit

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

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

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

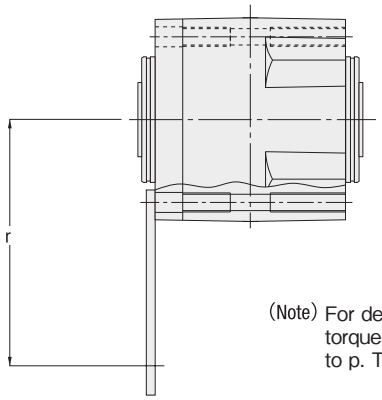
Gravimetric Unit

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

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

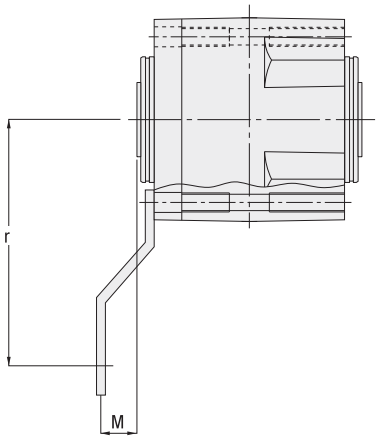
Ratio	A (mm)
20	68.5
25	84.5
30	91
35	98
45	113
55	150

〈Figure 8〉



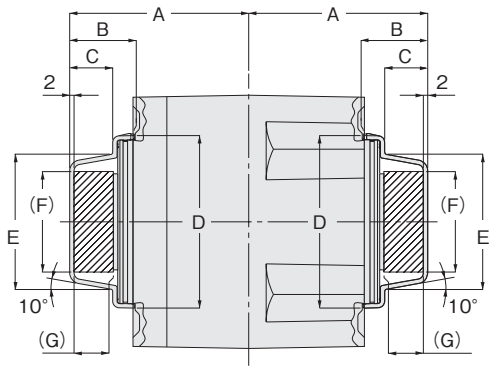
(Note) For details on the torque arm plate, refer to p. T67

〈Figure 9〉



DETAILED DIAGRAM FOR HOLLOW SHAFT SAFETY CAP

F3S



The shaded area represents empty space.

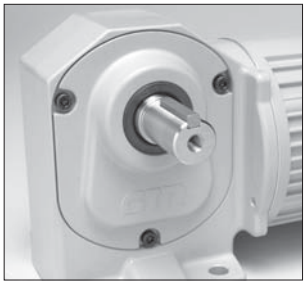
Frame Number	A	B	C	D	E	F	G
20	64	25.5	15.7	ϕ57	ϕ40	ϕ26	14
25	79	29.5	19.7	ϕ70	ϕ53	ϕ37.5	18
30	82	29.5	19.7	ϕ79	ϕ62	ϕ46.5	18
35	95	33.5	23.7	ϕ89	ϕ72	ϕ55	22
45	108	33.5	23.7	ϕ104	ϕ87	ϕ70	22
50	120	43	41	ϕ141	ϕ127.5	ϕ104	32
55	143	43	41	ϕ141	ϕ127.5	ϕ104	32

OPTIONS

Tapped Output Shafts

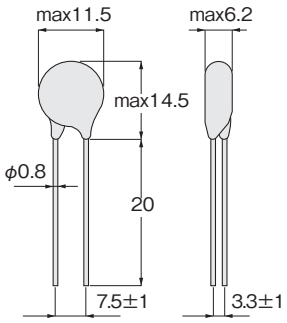
Tapped output shafts are available with the dimensions given in the table below. Carbon steel G3 models have a tap on the shaft, but optional stainless steel shafts do not. H2 models do not have a tap as standard. If a tap is required, be sure to mention this when requesting a quote.

【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 6×1.0×15ℓ	●	None	None	None
22、28	M 8×1.25×20ℓ	●	●	●	▲
32、40	M 10×1.5×25ℓ	●	●	●	▲
50	M 12×1.75×30ℓ	●	●	●	▲

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

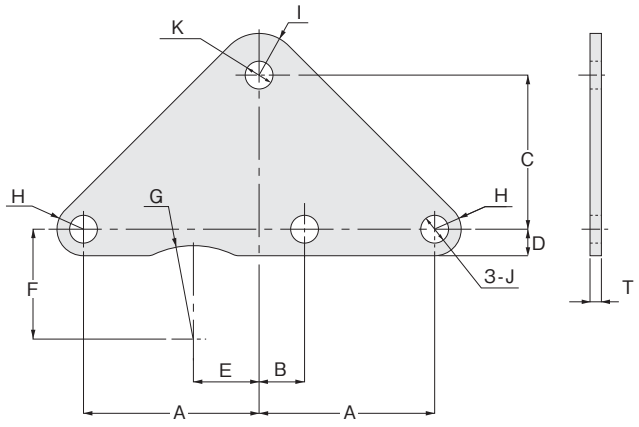
Refer to (P. T49).

Driver Options

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

OPTIONS

F3S Torque Arm



Specifications

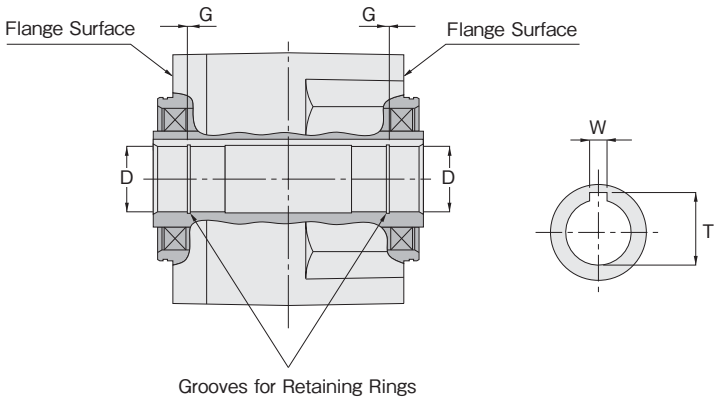
Corresponding Frame No.	Product Name	Motor Power	Corresponding Reduction Ratio	A	B	C	D	E	F	G	H	I	J	K	T	Weight (kg)
20	TAF3S-20-2	0.1 kW	1/ 5~1/ 60	53.5	23.5	52	10.5	—	—	—	R10.5	R11	ϕ11	ϕ9	3.2	0.1
25	TAF3S-25-2	0.2 kW	1/ 5~1/ 60	60	27	61	10.5	16.5	43.5	R37	R10.5	R15	ϕ11	ϕ9	3.2	0.2
	TAF3S-25-3	0.1 kW	1/ 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.

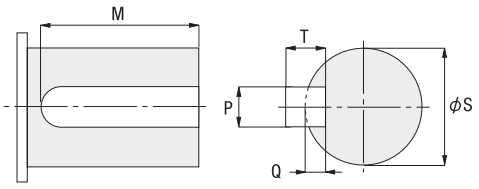


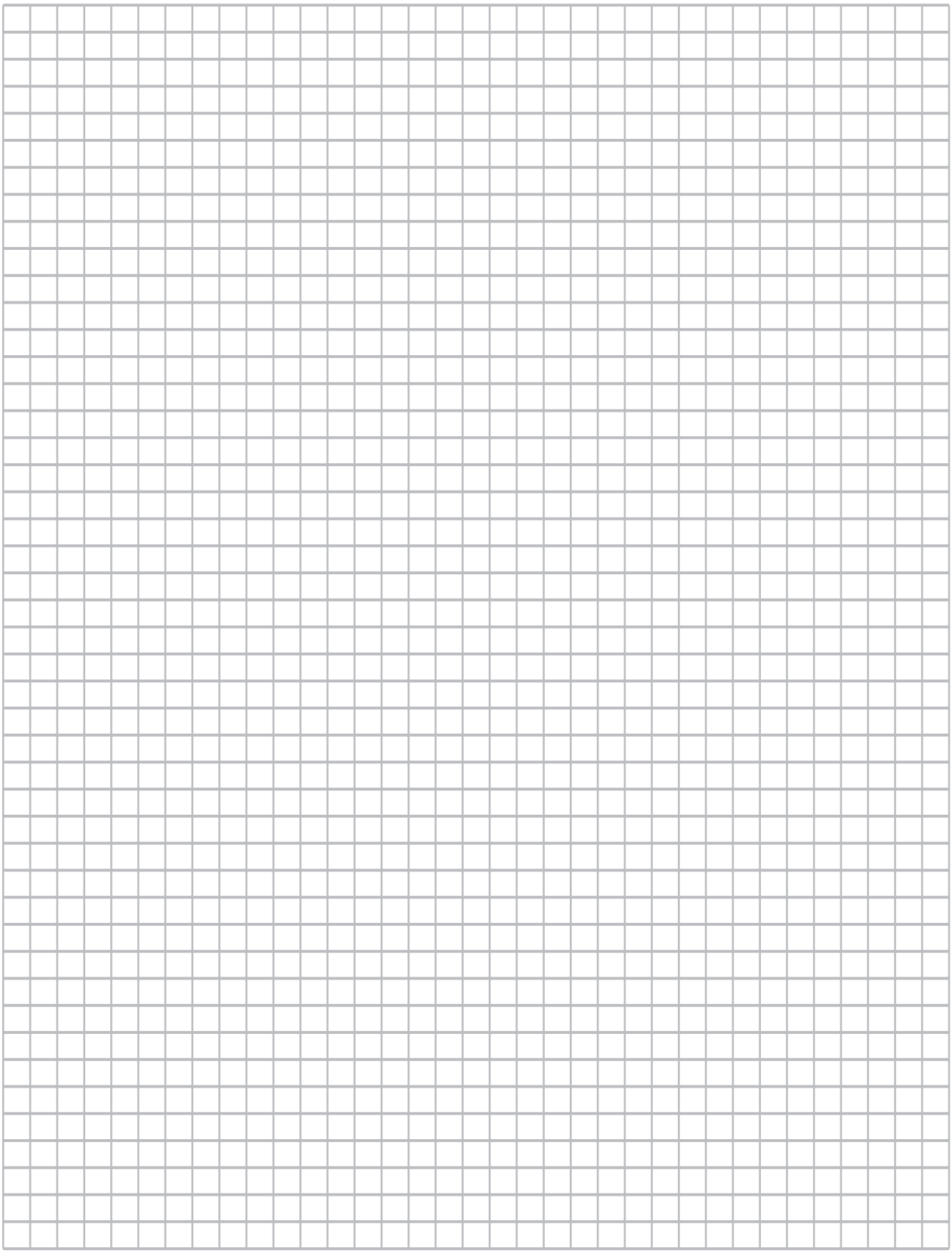
Frame No.	D (H8)	W	T	G
F3S20	17 mm	5 mm	19.3 mm	1.15 mm
	0.7500 in	0.1875 in	0.8380 in	0.0390 in
F3S25	20 mm	6 mm	38.3 mm	1.15 mm
	0.7500 in	0.1875 in	0.8380 in	0.0390 in
	1.0000 in	0.2500 in	1.1140 in	0.0460 in
F3S30	20 mm	6 mm	43.3 mm	1.15 mm
	25 mm	8 mm	43.3 mm	1.35 mm
	1.0000 in	0.2500 in	1.1140 in	0.0460 in
	1.2500 in	0.2500 in	1.3660 in	0.0560 in
F3S35	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
	1.3750 in	0.3125 in	1.5200 in	0.0560 in
	1.4375 in	0.3750 in	1.6060 in	0.0560 in

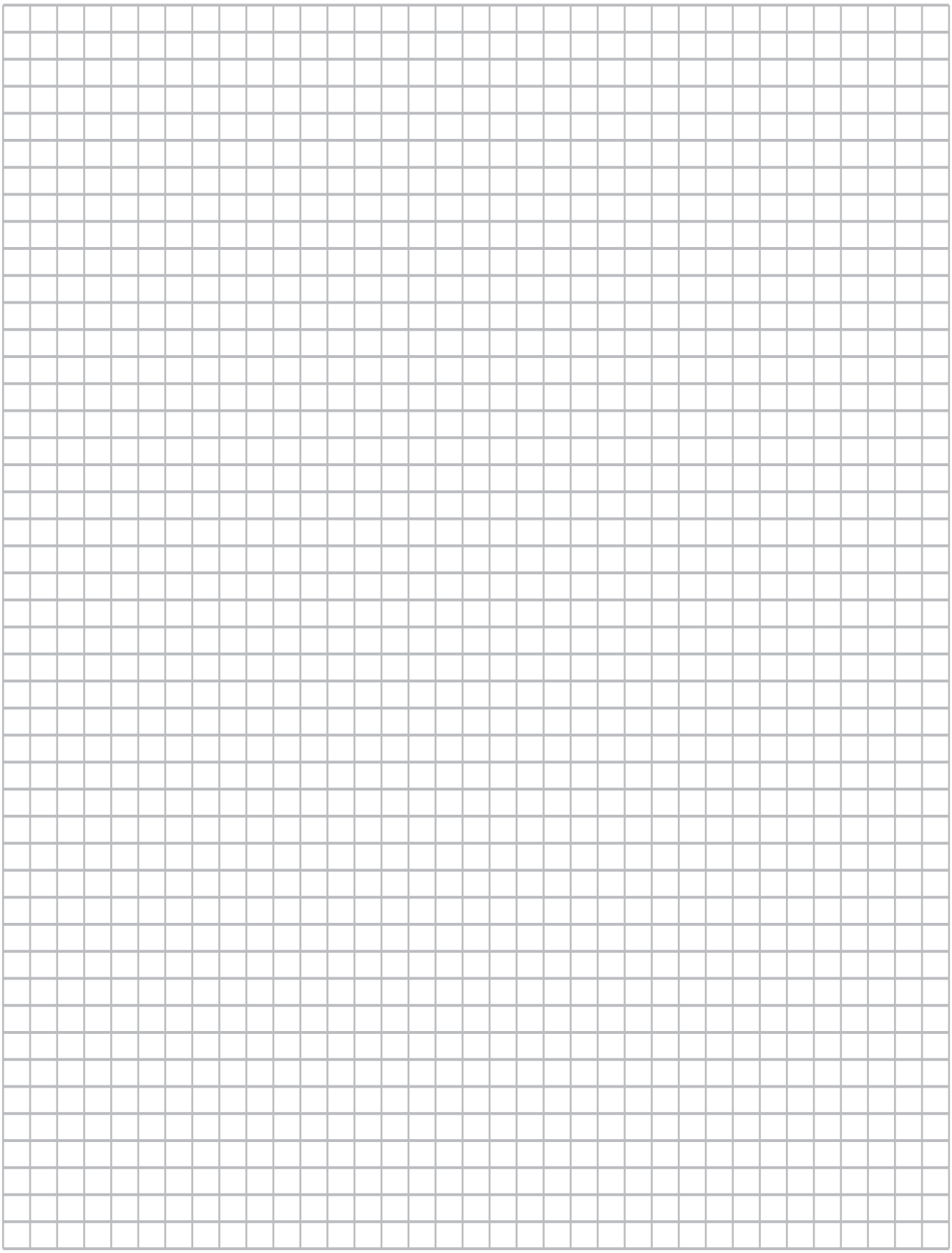
Frame No.	D (H8)	W	T	G
F3S45	30 mm	8 mm	33.3 mm	1.35 mm
	35 mm	10 mm	38.3 mm	1.75 mm
	40 mm	12 mm	43.3 mm	1.95 mm
	1.3750 in	0.3125 in	1.5200 in	0.0560 in
	1.5000 in	0.3750 in	1.6690 in	0.0560 in
	1.6875 in	0.3750 in	1.8580 in	0.0680 in
F3S50	40 mm	12 mm	43.3 mm	1.95 mm
	45 mm	14 mm	48.8 mm	1.95 mm
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

Optional G3 and H2 Shaft Diameters

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







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