Technical Documentation

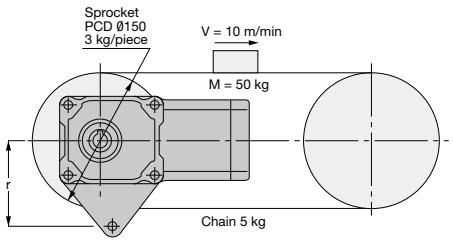
INDUCTION GEARMOTORS

Selection Process Steps and Examples

MINI Series

Selection Examples In the case of shaft mount

Application ..... Conveyor (light shock load)
Conveyor speed ..... 10 m/min
Carrying weight ..... 50 kg
Connection method ..... Chain
Operation time ..... 12 hours/day
Number of startups and stops ... 720 times/day
Power source frequency ..... 60 Hz region
Friction coefficient ..... 0.2 (estimated)



Conditions other than those shown in the selection process steps shall not be included in this calculation.

Please utilize the calculation and selection tool on our website.
(https://sentei.nissei-gtr.co.jp/english/calculation)
You may calculate the necessary power by inputting the usage conditions and the series on our website.

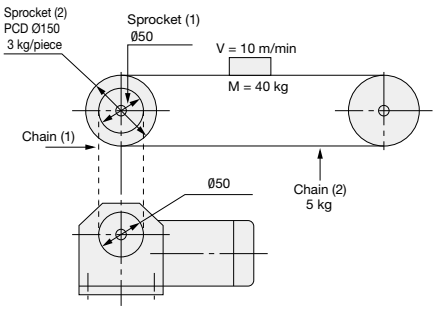
Selection Process Steps		Selection Examples
①Determining the reduction ratio	Determining the reduction ratio (i) $i = \frac{\text{Required Speed of Output Shaft}}{\text{1600 (estimated)}}$	Required Speed of Conveyor Shaft = $\frac{10 \times 1000}{150 \times \pi} \approx 21.2$ r/min Since the speed of the conveyor shaft and that of the reducer output shaft are the same: $i = \frac{21.2}{1600} \approx \frac{1}{75}$ $i = \frac{1}{80}$ (Note: The speed of the motor varies between the synchronous speed and the rated speed, depending on the level of the load.)
②Calculating the torque	Calculating the actual load torque (T_L)	$T_L = 9.8 \times (50 + 3 \times 2 + 5) \times 0.2 \times \frac{150}{2 \times 1000} = 9.0$ N·m
	With use of the service factor (Sf) in [Table-1] on page 470, calculating the equivalent output torque (T_{LE})	Using the service factor (Sf), adjust the actual load torque (T_L).
	$T_{LE} = T_L \times Sf$	$T_{LE} = 9.0 \times 1.25 \approx 11.25$ N·m
③Calculating the inertia	Calculating the actual inertia load	Calculating the actual load's moment of inertia (J_L) $J_L = \{50 \times (\frac{0.15}{2})^2\} + \{\frac{1}{2} \times 3 \times (\frac{0.15}{2})^2 \times 2\} + \{5 \times (\frac{0.15}{2})^2\}$ $= 0.33$ kg·m^2
	Calculating the inertial load on the motor shaft	Converting J_L into the motor shaft equivalent (J_ℓ) $J_\ell = J_L \times (i)^2$ $J_\ell = 0.33 \times (\frac{1}{80})^2$ ≈ 0.000052 kg·m^2
	Calculating the equivalent inertia by correction based on operation conditions	Correction coefficient = 3 based on operation conditions
		Calculating the equivalent moment of inertia J ($J_{\ell E}$) $J_{\ell E} = J_\ell \times$ (Correction Coefficient) [Table-3] on page 471 $J_{\ell E} = 0.000052 \times 3 = 0.000156$ kg·m^2
④Determining a type	Determining a right angle hollow bore, right angle shaft, or parallel shaft	Decide on the MINI series F2 type F2S (right angle hollow bore) for mounting on the shaft.

Select a model that meets the values calculated based on selection steps ① to ④ for each category.

	Category	
Calculation Result	Reduction Ratio	1/80
	Torque Calculation From the Performance Table, select a model with $T_{LE} \leq$ allowable output shaft torque (T_A).	11.25 N·m
		Select the model F2SM-12-80-T40, which meets the torque ($T_{LE} \leq T_A$).
	Inertia Calculation Based on [Table-1] on page 471, select a model that meets the condition of equivalent inertia ≤ allowable inertia.	0.000156 kg·m^2 Select a model that meets $J_{\ell E} \leq$ allowable moment of inertia J:
		Select the model F2SM-15-80-T60, which meets the inertia.
Overall Verdict	Select a model that meets all conditions based on the torque and the inertia.	**Decide on F2SM-15-80-T60.** For the torque arm, option part number TAF2S-15 is recommended. Refer to page 894. If the customer wishes to produce their own torque arm, the distance r from the center of the output shaft to the detent is $r \geq \frac{\text{Actual load torque} \times 1000}{\text{Allowable O.H.L.–Product Weight}} = \frac{11.25 \times 1000}{1274 - 9.8 \times 4} = 9.1$ Design it to 9.1 mm or more. * Refer to page 891 for the equation for calculating the torque arm.

Selection Examples Gearmotors (with Motor)

Application ..... Conveyor (light shock load)
Conveyor speed ..... 10 m/min
Carrying weight ..... 40 kg
Connection method ..... Chain (located in the center of the shaft)
Operation time ..... 12 hours/day
Number of startups and stops ... 720 times/day
Power source frequency ..... 60 Hz region
Friction coefficient ..... 0.2 (estimated)



The chain (1), the sprocket (1), and other conditions shall not be included in this calculation.

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Selection Process Steps		Selection Examples
①Determining the reduction ratio	Determining the reduction ratio (i) $i = \frac{\text{Required Speed of Output Shaft}}{\text{1600 (estimated)}}$	Required Speed of Conveyor Shaft = $\frac{10 \times 1000}{150 \times \pi} \approx 21.2$ r/min Since the diameter of the sprocket for the conveyor shaft and that of the reducer output shaft are the same: $i = \frac{21.2}{1600} \approx \frac{1}{75}$ $i = \frac{1}{80}$ (Note: The speed of the motor varies between the synchronous speed and the rated speed, depending on the level of the load.)
②Calculating the torque	Calculating the actual load torque (T_L)	$T_L = 9.8 \times (40 + 3 \times 2 + 5) \times 0.2 \times \frac{150}{2 \times 1000} = 7.5$ N·m
	With use of the service factor (Sf) in [Table 1] on page 470, calculating the equivalent output torque (T_{LE})	Using the service factor (Sf), adjust the actual load torque (T_L).
	$T_{LE} = T_L \times Sf$	$T_{LE} = 7.5 \times 1.25 \approx 9.4$ N·m
③Calculating the inertia	Calculating the actual inertial load	Calculating the actual load's moment of inertia (J_L) $J_L = \{40 \times (\frac{0.15}{2})^2\} + \{\frac{1}{2} \times 3 \times (\frac{0.15}{2})^2 \times 2\} + \{5 \times (\frac{0.15}{2})^2\}$ $= 0.27$ kg·m^2
	Calculating the inertial load on the motor shaft	Converting J_L into the motor shaft equivalent (J_ℓ) $J_\ell = J_L \times (i)^2$ $J_\ell = 0.27 \times (\frac{1}{80})^2$ ≈ 0.000042 kg·m^2
	Calculating the equivalent inertia by correction based on operation conditions	Correction coefficient = 3 based on operation conditions
		Calculating the equivalent moment of inertia J ($J_{\ell E}$) $J_{\ell E} = J_\ell \times$ (Correction Coefficient) [Table-3] on page 471 $J_{\ell E} = 0.000042 \times 3 = 0.000126$ kg·m^2
	Based on [Table-1] on page 471, select a model that meets the condition of equivalent inertia ≤ allowable inertia.	Select a model that meets $J_{\ell E} \leq$ allowable moment of inertia J: HLM-18$\frac{L}{R}$-80-T60
④Verifying the O.H.L.	Determining the Coefficient K_1 based on [Table-1] on page 473 Determining the Coefficient K_2 based on [Table-2] on page 473	$K_1 = 1$ $K_2 = 1$
	$\text{O.H.L.} = \frac{T_{LE} \times K_1 \times K_2}{R}$ * R: Pitch circle radius of the sprocket etc. to be attached to the reducer shaft	$\text{O.H.L.} = \frac{9.4 \times 1 \times 1}{\frac{50}{2 \times 1000}} = 376$ N * Please add values as needed if there are other factors that may affect the O.H.L. of the product, such as belt tension.
⑤Determining a type	Determining a right angle shaft or parallel shaft	Based on the mounting space, decide on the MINI series H type (right angle shaft).

Select a model that meets the values calculated based on selection steps ① to ⑤ for each category.

	Category	
Calculation Result	Reduction Ratio	1/80
	Torque Calculation From the Performance Table, select a model with $T_{LE} \leq$ allowable output shaft torque (T_A).	9.4 N·m
		Select the model HLM-15$\frac{L}{R}$-80-T40, which meets the torque ($T_{LE} \leq T_A$).
	Inertia Calculation Based on [Table-1] on page 471, select a model that meets the condition of equivalent inertia ≤ allowable inertia.	0.000126 kg·m^2 Select a model that meets $J_{\ell E} \leq$ allowable moment of inertia J:
		Select the model HLM-18$\frac{L}{R}$-80-T60, which meets the inertia.
	O.H.L. Verification From the Performance Table, select a model that meets O.H.L. ≤ allowable O.H.L.	376 N
		Select the model HLM-18$\frac{L}{R}$-80-T60, which meets the O.H.L. (O.H.L. ≤ allowable O.H.L.).
Overall Verdict	Select a model that meets all conditions based on the torque, the inertia, and the O.H.L.	**Decide on the HLM-18$\frac{L}{R}$-80-T60.**

Selection Examples Speed Control Gearmotors

Application ..... Conveyor (light shock load)
Conveyor speed ..... 2 to 10 m/min
Carrying weight ..... 20 kg
Connection method ..... Chain (located in the center of the shaft)
Operation time ..... 12 hours/day
Number of startups and stops ... 10 times/day
Power source frequency ..... 60 Hz region
Friction coefficient ..... 0.2 (estimated)

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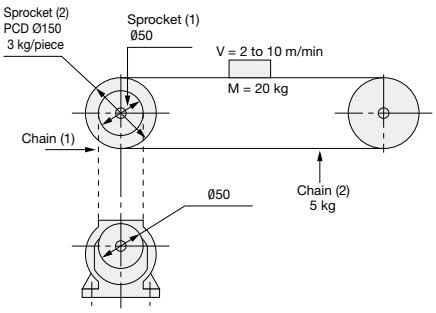
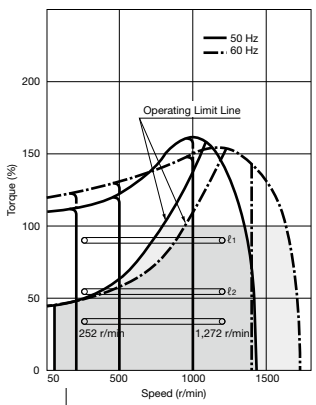
(https://sentei.nissei-gtr.co.jp/english/calculation)
You may calculate the necessary power by inputting the usage conditions and the series on our website.



The chain (1), the sprocket (1), and other conditions shall not be included in this calculation.

Selection Process Steps		Selection Examples
①Determining the reduction ratio	Determining the reduction ratio (i) $i = \frac{\text{Required Speed of Output Shaft}}{1550 \text{ (estimated)}}$	Required Rotational Speed of Conveyor Shaft = $\frac{2 \times 1000}{150 \times \pi}$ to $\frac{10 \times 1000}{150 \times \pi}$ = 4.2 to 21.2 r/min The required speed of the reducer shaft is also between 4.2 and 21.2 r/min. Using the higher speed, 21.2 r/min, calculate the reduction ratio i. $i = \frac{21.2}{1550} \approx \frac{1}{73}$ (*The value is "1300" at 50 Hz.) Choose the closest value which is matching between calculation($i = \frac{1}{73}$) and standard model lineup. In this case it is $i = \frac{1}{60}$. Reduction ratio $i = \frac{1}{60}$
②Calculating the torque	Calculating the actual load torque (T_L) With use of the service factor (Sf) in [Table-1] on page 470, calculating the equivalent output torque (T_{LE}) $T_{LE}=T_L \times Sf$ From the Performance Table, select a model with $T_{LE} \leq$ allowable output shaft torque (T_A). [Figure-1]	$T_L = 9.8 \times (20 + 3 \times 2 + 5) \times 0.2 \times \frac{150}{2 \times 1000} = 4.6$ N·m Using the service factor (Sf), correct the actual load torque (T_L). $T_{LE} = 4.6 \times 1.25 \approx 5.8$ N·m $T_{LE} \leq T_A$ and based on the load torque T = 5.8 N·m and the reduction ratio $i = \frac{1}{60}$, select one of the following: GLP-12-60-S25 GLP-15-60-S40 GLP-15-60-S60. When the speed of the motor shaft is calculated, the maximum speed is 21.2 × 60 = 1272 r/min, and the minimum speed is 4.2 × 60 = 252 r/min. Confirm that the torque load factor is under the operating limit line. [Figure-1] Considering the torque load factor of GLP-12-60-S25: $\frac{5.8}{6.66} \times 100 = 87$ % (ℓ_1) GLP-15-60-S40: $\frac{5.8}{10.8} \times 100 = 54$ % (ℓ_2) GLP-15-60-S60: $\frac{5.8}{16.7} \times 100 = 35$ % (ℓ_3) Based on the abovementioned values, select GLP-15-60-S60.



Selection Process Steps and Examples

Selection Process Steps		Selection Examples
③Calculating the inertia	Calculating the actual inertial load	Calculating the actual load's moment of inertia (J_L) $J_L = \{20 \times (\frac{0.15}{2})^2\} + \{\frac{1}{2} \times 3 \times (\frac{0.15}{2})^2 \times 2\} + \{5 \times (\frac{0.15}{2})^2\}$ $= 0.16\ kg{\cdot}m^2$
	Calculating the inertial load on the motor shaft	Converting J_L into the motor shaft equivalent (J_ℓ) $J_\ell = J_L \times (i)^2$ $J_\ell = 0.16 \times (\frac{1}{60})^2$ $\approx 0.000044\ kg{\cdot}m^2$
	Calculating the equivalent inertia by correction based on operation conditions	Correction coefficient = 2 based on operation conditions
		Calculating the equivalent moment of inertia J ($J_{\ell E}$) $J_{\ell E} = J_\ell \times$ (Correction Coefficient) [Table-3] on page 471 $J_{\ell E} = 0.000044 \times 2 = 0.000088\ kg{\cdot}m^2$
④Verifying the O.H.L.	Determining the Coefficient K_1 based on [Table-1] on page 473 Determining the Coefficient K_2 based on [Table-2] on page 473	$K_1=1$ $K_2=1$
	O.H.L.$= \frac{T_{LE} \times K_1 \times K_2}{R}$ * R: Pitch circle radius of the sprocket etc. attached to the reducer shaft	O.H.L.$= \frac{5.8 \times 1 \times 1}{\frac{50}{2 \times 1000}} = 232$ N * Please add values as needed if there are other factors that may affect the O.H.L. of the product, such as belt tension.
⑤Determining a type	Determining a right angle shaft or parallel shaft	Based on the mounting space, decide on the MINI series G type (parallel shaft).

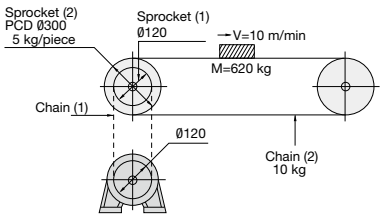
Select a model that meets the values calculated based on selection steps ① to ⑤ for each category.

	Category	
Calculation Result	Reduction Ratio	1/60
	Torque Calculation From the Performance Table, select a model with $T_{LE} \leq$ allowable output shaft torque (T_A).	5.8 N·m
		Select the model GLP-12-60-S25 and GLP-15-60-S40, or only GLP-15-60-S40. They meet the torque ($T_{LE} \leq T_A$). When the speed of the motor shaft is calculated, select GLP-15-60-S60.
	Inertia Calculation Based on [Table-1] on page 471, select a model that meets the condition of equivalent inertia ≤ allowable inertia.	$0.000088\ kg{\cdot}m^2$ Select a model that meets $J_{\ell E} \leq$ allowable moment of inertia J:
		Select the model GLP-12-60-S25, which meets the inertia.
	O.H.L. Verification From the Performance Table, select a model that meets O.H.L. ≤ allowable O.H.L.	232 N
		Select the model GLP-12-60-S25, which meets the O.H.L. (O.H.L. ≤ allowable O.H.L.).
Overall Verdict	Select a model that meets all conditions based on the torque, the inertia, and the O.H.L.	**Decide on GLP-15-60-S60.**

MID Series

Selection Examples In the case of foot mount

Application ..... Conveyor (light shock load)
Conveyor speed ..... 10 m/min
Carrying weight ..... 620 kg
Connection method ..... Chain (located in the center of the shaft)
Operation time ..... 12 hours/day
Number of startups and stops ... 720 times/day
Power source frequency ..... 60 Hz region
Friction coefficient ..... 0.2 (estimated)



The chain (1), the sprocket (1), and other conditions shall not be included in this calculation.

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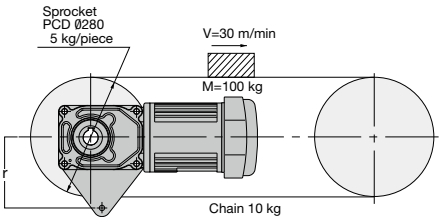
Selection Process Steps		Selection Examples
①Selecting the reduction ratio	Determining the reduction ratio (i) $i = \frac{\text{Required Speed of Output Shaft}}{\text{Power Source Frequency}} \times 30$	Required Speed of Conveyor Shaft = $\frac{10 \times 1000}{300 \times \pi} \approx 10.6$ r/min Since the diameter of the sprocket for the conveyor shaft and that of the reducer output shaft are the same: $i = \frac{10.6}{60 \times 30} \approx \frac{1}{160}$
②Calculating the torque	Calculating the actual load torque (T_L)	$T_L = 9.8 \times (620 + 2 \times 5 + 10) \times 0.2 \times \frac{300}{2 \times 1000} = 188$ N·m
	With use of the service factor (Sf) in [Table-1] on page 470, calculating the equivalent output torque (T_{LE})	Using the service factor (Sf), adjust the actual load torque (T_L).
	$T_{LE} = T_L \times Sf$	$T_{LE} = 188 \times 1.25 = 235$ N·m
③Calculating the inertia	Calculating the actual inertial load	Calculating the actual load's moment of inertia (J_L) $J_L = \{620 \times (\frac{0.3}{2})^2\} + \{\frac{1}{2} \times 5 \times (\frac{0.3}{2})^2 \times 2\} + \{10 \times (\frac{0.3}{2})^2\}$ $= 14.29$ kg·m^2
	Calculating the inertial load on the motor shaft	Converting J_L into the motor shaft equivalent (J_ℓ) $J_\ell = J_L \times (i)^2$ $J_\ell = 14.29 \times (\frac{1}{160})^2$ ≈ 0.000558 kg·m^2
	Calculating the equivalent inertia by correction based on operation conditions	Correction coefficient = 3 based on operation conditions
		Calculating the equivalent moment of inertia J ($J_{\ell E}$) $J_{\ell E} = J_\ell \times$ (Correction Coefficient)[Table-3] on page 471 $J_{\ell E} = 0.000558 \times 3 = 0.001674$ kg·m^2
④Verifying the O.H.L.	Determining the Coefficient K_1 based on [Table-1] on page 473 Determining the Coefficient K_2 based on [Table-2] on page 473	$K_1 = 1$ $K_2 = 1$
	O.H.L.= $\frac{T_{LE} \times K_1 \times K_2}{R}$ * R: Pitch circle radius of the sprocket etc. attached to the reducer shaft	O.H.L.= $\frac{235 \times 1 \times 1}{\frac{120}{2 \times 1000}} = 3917$ N * Please add values as needed if there are other factors that may affect the O.H.L. of the product, such as belt tension.
⑤Determining a type	Determining a parallel shaft, right angle shaft, or right angle hollow bore	Based on the mounting space, decide on a parallel shaft (G3 Type).

Select a model that meets the values calculated based on selection steps ① to ⑤ for each category.

	Category	
Calculation Result	Reduction Ratio	$\frac{1}{160}$
	Torque Calculation From the Performance Table, select a model with $T_{LE} \leq$ allowable output shaft torque (T_A).	235 N·m
		Select the model G3L32N160-MM04TNNTN, which meets the torque ($T_{LE} \leq T_A$).
	Inertia Calculation Based on [Table-2] on page 471, select a model that meets the condition of equivalent inertia ≤ allowable inertia.	0.001674 kg·m^2 Select a model that meets $J_{\ell E} \leq$ allowable moment of inertia J:
		Select the model G3L40N160-MD08TNNTN, which meets the inertia.
	O.H.L. Verification From the Performance Table, select a model that meets O.H.L. ≤ allowable O.H.L.	3917 N
		Select the model G3L32N160-MM04TNNTN, which meets the O.H.L. (O.H.L. ≤ allowable O.H.L.).
Overall Verdict	Select a model that meets all conditions based on the torque, the inertia, and the O.H.L.	**Decide on the G3L40N160-MD08TNNTN.**

Selection Examples In the case of shaft mount

Application ..... Conveyor (light shock load)
Conveyor speed ..... 30 m/min
Carrying weight ..... 100 kg
Connection method ..... Chain
Operation time ..... 12 hours/day
Number of startups and stops ... 720 times/day
Power source frequency ..... 60 Hz region
Friction coefficient ..... 0.2 (estimated)



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Selection Process Steps		Selection Examples
①Selecting the reduction ratio	Determining the reduction ratio (i) $i = \frac{\text{Required Speed of Output Shaft}}{\text{Power Source Frequency} \times 30}$	Required Speed of Conveyor Shaft = $\frac{30\times1000}{280\times\pi} \approx 34.1$ r/min Since the speed of the conveyor shaft and that of the reducer output shaft are the same: $i = \frac{34.1}{60 \times 30} \approx \frac{1}{50}$
②Calculating the torque	Calculating the actual load torque (T_L)	$T_L = 9.8 \times (100 + 2 \times 5 + 10) \times 0.2 \times \frac{280}{2 \times 1000} = 32.9$ N·m
	With use of the service factor (Sf) in [Table-1] on page 470, calculating the equivalent output torque (T_{LE}) $T_{LE}=T_L \times Sf$	Using the service factor (Sf), adjust the actual load torque (T_L). $T_{LE} = 32.9 \times 1.25 = 41.1$ N·m
③Calculating the inertia	Calculating the actual inertial load	Calculating the actual load's moment of inertia (J_L) $J_L = \{100\times(\frac{0.28}{2})^2\} + \{\frac{1}{2} \times 5 \times (\frac{0.28}{2})^2 \times 2\} + \{10 \times (\frac{0.28}{2})^2\}$ $= 2.25$ kg·m^2
	Calculating the inertial load on the motor shaft	Converting J_L into the motor shaft equivalent (J_ℓ) $J_\ell = J_L \times (i)^2$ $J_\ell = 2.25 \times (\frac{1}{50})^2$ $= 0.0009$ kg·m^2
	Calculating the equivalent inertia by correction based on operation conditions	Correction coefficient = 3 based on operation conditions
		Calculating the equivalent moment of inertia J ($J_{\ell E}$) $J_{\ell E} = J_\ell \times$ (Correction Coefficient) [Table-3] on page 471 $J_{\ell E} = 0.0009 \times 3 = 0.0027$ kg·m^2
④Determining a type	Determining a parallel shaft, right angle shaft, or right angle hollow bore	Decide on the MID series F3 type F3S (right angle hollow bore) for mounting on the shaft.

Select a model that meets the values calculated based on selection steps ① to ④ for each category.

	Category	
Calculation Result	Reduction Ratio	$\frac{1}{50}$
	Torque Calculation From the Performance Table, select a model with $T_{LE} \leq$ allowable output shaft torque (T_A).	41.1 N·m
		Select the model F3S25N50-MM02TNNTN, which meets the torque ($T_{LE} \leq T_A$).
	Inertia Calculation Based on [Table-2] on page 471, select a model that meets the condition of equivalent inertia ≤ allowable inertia.	0.0027 kg·m^2 Select a model that meets $J_{\ell E}$ ≤ allowable moment of inertia J:
		Select the model F3S35N50-MD08TNNTN, which meets the inertia.
Overall Verdict	Select a model that meets all conditions based on the torque and the inertia.	**Decide on the F3S35N50-MD08TNNTN.** For the torque arm, option part number TAF3S-35 is recommended. Refer to page 895 Moreover, if the customer wishes to produce a torque arm, the distance r from the center of the output shaft to the detent is $r \geq \frac{\text{Actual load torque} \times 1000}{\text{Allowable O.H.L.–Product Weight}} = \frac{41.1 \times 1000}{3480 - 9.8 \times 21} = 12.6$ Design it to 12.4 mm or more. * For the equation for calculating the torque arm, refer to page 891.

Service Factor (Sf)

The gearmotor and the reducer are designed under the condition of operation for ten hours/day under a light shock load. If you will use them under a condition of a longer operation time and a heavy shock load, adjust the load torque based on the service factor shown in the table below.

[Table-1]

Load Condition	Service Factor (Sf)			Application Example
	Operating for less than 3 hours/day	Operating for 3 to 10 hours/day	Operating for more than 10 hours/day	
Uniform load	1	1	1	Conveyors (uniform load), screens, agitators (low viscosity), water treatment machines (light load), machine tools (feed shafts), elevators, extruders, distillers
Light shock load	1	1	1.25	Conveyors (nonuniform or heavy load), agitators (high viscosity), machines for vehicles, water treatment machines (moderate load), hoists (light load), paper mills, feeders, food machines, pumps, sugar making machines, textile machines
Heavy shock load	1	1.25	1.5	Hoists (heavy load), hammer mills, metal working machines, crushers, tumblers

Allowable Moment of Inertia J

If a gearmotor with a high load inertia is intermittently operated, high torque may occur upon starting (or when stopping if the product is provided with a brake), resulting in an unexpected accident. To prevent such occurrence, set the level of the inertia of the application to be within the allowable value shown in the table below based on the connection method and the frequency of startup.

■ Allowable moment of inertia J by motor power

(Motor shaft equivalent or input shaft equivalent)

MINI Series

Unit: Moment of Inertia J (kg·m²) [Table-1]

G Type	H Type	F2 Type		Allowable Moment of Inertia J
G-12 Frame G-22 Frame (15 W, 25 W, 40 W, 60 W)	H-15 Frame H-22 Frame (15 W, 25 W, 40 W, 60 W)	F2S-12 Frame	F2F-15 Frame	0.0001
G-15 Frame G-28 Frame G-32 Frame	H-18 Frame H-28 Frame H-32 Frame	F2S-15 Frame	F2F-18 Frame	0.0002
G-18 Frame G-40 Frame	H-40 Frame	–	–	0.0006

Note 1: Motor shaft (input shaft) equivalent moment of inertia J = output shaft moment of inertia J × (reduction ratio)²
(Example: 1/400 when the reduction ratio is 1/20)

MID Series

Unit: Moment of Inertia J (kg·m²) [Table-2]

3-Phase	1-Phase	Allowable Moment of Inertia J
0.1 kW	0.1 kW	0.0008
0.2 kW	0.2 kW	0.0010
0.4 kW	0.4 kW	0.0015
0.75 kW	–	0.0030
1.5 kW	–	0.0050
2.2 kW	–	0.0070

Note 1: When using a reducer at an input speed of 1800 r/min or more, the value calculated by multiplying the abovementioned value by (1800/input r/min)² is the allowable moment of inertia J.
(Example: When the input shaft r/min is 3600, the allowable moment of inertia is 1/4.)
Note 2: Motor shaft (input shaft) equivalent moment of inertia J = output shaft moment of inertia J × (reduction ratio)²
(Example: 1/400 when the reduction ratio is 1/20)

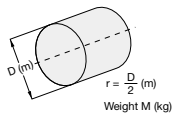
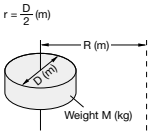
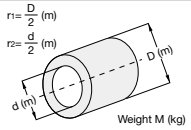
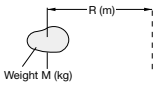
■ Correction coefficient of allowable moment of inertia J according to operating conditions

[Table-3]

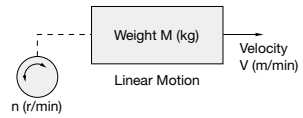
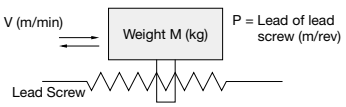
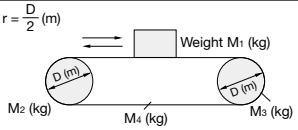
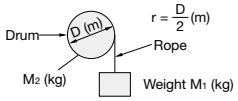
Connection Method	Frequency of Startup	Correction Coefficient
When direct coupling or without any loosening.	70 times/day or below	1
	More than 70 times/day	1.5
When there is loosening due to chain fastening.	70 times/day or below	2
	More than 70 times/day	3

Method for calculating the moment of inertia J

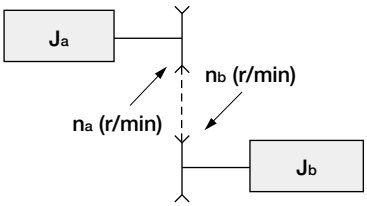
■ Rotor's moment of inertia J

When the center of rotation is aligned with the center of gravity		When the center of rotation is not aligned with the center of gravity	
	$J = \frac{1}{2} Mr^2$ (kg·m²)		$J = \frac{1}{2} Mr^2 + MR^2$ (kg·m²)
	$J = \frac{1}{2} M (r_1^2 + r_2^2)$ (kg·m²)		(When the size is negligible) $J = MR^2$ (kg·m²)

■ Moment of inertia J in case of linear motion

General case		$J = \frac{1}{4} M \cdot \left(\frac{V}{\pi \cdot n}\right)^2$ (kg·m²)
In the case of horizontal linear motion (When moving an object with a 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)
In the case of horizontal linear motion (Conveyor etc.)		$J = M_1 r^2 + \frac{1}{2} M_2 r^2 + \frac{1}{2} M_3 r^2 + M_4 r^2$ (kg·m²)
In the case of vertical linear motion (Crane, winch, etc.)		$J = M_1 r^2 + \frac{1}{2} M_2 r^2$ (kg·m²)

■ Conversion of the moment of inertia when the speed ratio is available



Convert the load's moment of inertia J_b into the equivalent value on the n_a shaft.

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

Overhung Load (O.H.L.)

An overhung load (O.H.L.) is a suspending load imposed on a shaft. When a chain, belt, gear, etc. is used to couple the reducer shaft with the application, the resulting O.H.L. must be taken into consideration.

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

- T_{LE} : Equivalent output torque acting on the reducer shaft (N·m)
- R : Pitch circle radius of the sprocket, pulley, gear, etc. to be attached to reducer shaft (m)
- K_1 : Refer to the coefficient for the connection method [Table-1].
- K_2 : Refer to the coefficient for the load point [Table-2].

■ Coefficient K_1

[Table-1]

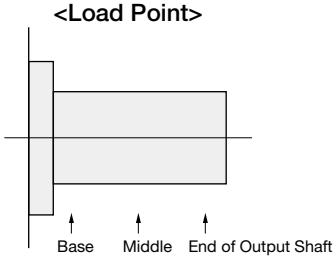
Connection method	K_1
Chain, timing belt	1.00
Gear	1.25
V Belt	1.50

■ Coefficient K_2

[Table-2]

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

<Load Point>



Thrust Load

The allowable thrust load values of right angle hollow bore models are listed in the performance table.
For other models, please contact your nearest Sales Office or the CS Center.

Overhung Load (O.H.L.)

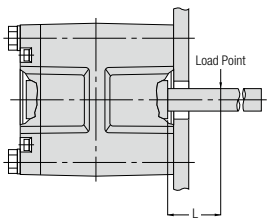
MINI Series <Right Angle Hollow Bore/F2S Type>

■ In the case of flange mount

(1) Load point of O.H.L.
The load point of the allowable O.H.L. is calculated to be 10 mm from the end of the output shaft.

(2)-1 Correcting the O.H.L. when one end of the output shaft is not borne by a pillow
If the load point L of the O.H.L. is more than 10 mm, please correct using the following formula:

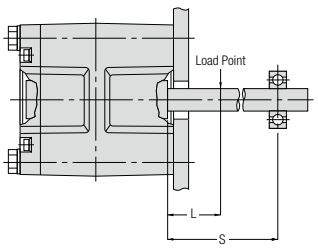
$$\text{Corrected O.H.L. (N)} = \frac{A+10}{A+L} \times \text{Allowable O.H.L. (N)}$$



(2)-2 Correcting the O.H.L. when one end of the output shaft is borne by a pillow

Please correct using the following formula:

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



■ Constant A

Frame Size	A (mm)
12	43
15	55

■ In the case of shaft mount

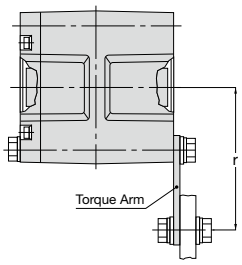
If the customer chooses to to produce a torque arm of their own

● In case of using the torque arm as shown in [Figure-1]

the distance r from the center of the output shaft to the detent can be calculated with the following formulas:

SI Units

$$r\ (\text{mm}) \geq \frac{\text{Actual load torque (N·m)} \times 1000}{\text{Allowable O.H.L. (N)} - 9.8 \times \text{Gearmotors Weight (kg)}}$$



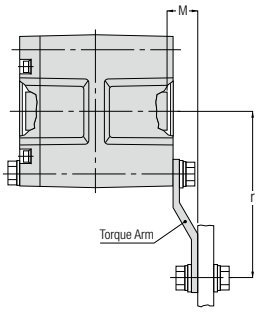
[Figure-1]

● In case of using the torque arm as shown in [Figure-2]

the distance r from the center of the output shaft to the detent can be calculated with the following formulas:

SI Units

$$r\ (\text{mm}) \geq \frac{\text{Actual load torque (N·m)} \times (A + M) \times 1000}{\{\text{Allowable O.H.L. (N)} - 9.8 \times \text{Gearmotors Weight (kg)}\} \times (A + 10)}$$



[Figure-2]

■ Constant A

Frame Size	A (mm)
12	43
15	55

Note: For the plate thickness of the torque arm, see "Torque Arms (Optional)" on page 894.

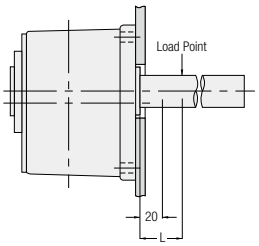
MID Series <Right Angle Hollow Bore/FS Type>

■ In the case of flange mount

(1) Load point of O.H.L.
The load point of the allowable O.H.L. is calculated to be 20 mm from the end of the output shaft.

(2)-1 Correcting the O.H.L. when one end of the output shaft is not borne by a pillow
If the load point L of the O.H.L. is more than 20 mm, Please correct using the following formula:

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



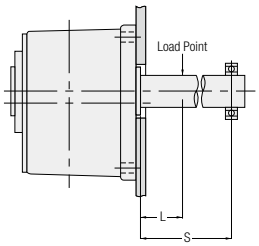
■ Constant A

Frame Size	A (mm)
25	84.5
30	91
35	98
45	113
55	150

(2)-2 Correcting the O.H.L. when one end of the output shaft is borne by a pillow

Please correct using the following formula:

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



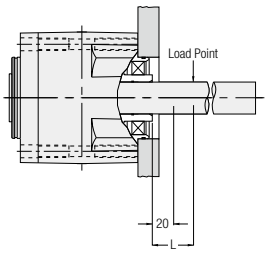
MID Series <Concentric Right Angle Hollow Bore/F3S Type>

■ In the case of flange mount

(1) Load point of O.H.L.
The load point of the allowable O.H.L. is calculated to be 20 mm from the end of the output shaft.

(2)-1 Correcting the O.H.L. when one end of the output shaft is not borne by a pillow
If the load point L of the O.H.L. is more than 20 mm, please correct using the following formula:

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



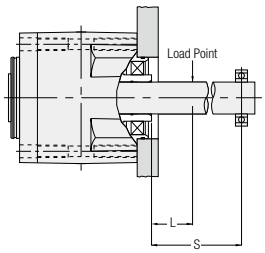
■ Constant A

Frame Size	A (mm)
20	73.5
25	90.5
30	98
35	114
45	136

(2)-2 Correcting the O.H.L. when one end of the output shaft is borne by a pillow

Please correct using the following formula:

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



Material for calculating gearmotors with a brake and gearmotors with a clutch/a brake

		Notes
Braking Time·Connection Time of Clutch (t_{tb})	$t_{tb}=t_{ab}+t_a$ (s) $t_{ab}=\frac{(J_r+J_\ell)\times n}{9.55\times(Td\pm T\ell)}$ (s)	Note 1: When the load torque becomes negative in, for example, hoisting down, $T\ell$ will be "-$T\ell$." Note 2: With regard to "+ and -" signs, "-" will be given to the clutch, and "+" will be given to the brake.
Connection Work Load (E)	Connection work load of the brake and the clutch per operation $E=\frac{(J_r+J_\ell)\times n^2}{183}\times\frac{Td}{Td\pm T\ell}$ (J)	Note 1: When the load torque becomes negative in, for example, hoisting down, $T\ell$ will be "-$T\ell$." Note 2: With regard to "+ and -" signs, "-" will be given to the clutch, and "+" will be given to the brake.
Service Life	Since the service life of the brake lining varies depending on the surface pressure, temperature, slip speed, etc., it cannot be accurately calculated. However, an approximate number of lifetime brake cycles can be estimated using the following formula: $Z=\frac{Emax}{E}$ [Number of brake cycles]	

【Explanation of Codes】

t_a ····· Braking Delay Time ····· [Tables-1 and -2] on page 511
Armature suction time of a gearmotors with clutch/brake ····· [Table-2] on page 485

J_r ····· In the case of gearmotors with brake and IP65 gearmotors with brake ····· [Tables-3 and -4] on page 478
In the case of gearmotors with clutch/brake ····· [Table-5] on page 478

J_ℓ ····· Load's moment of inertia J converted into the equivalent value on the motor shaft or reducer input shaft ($kg\cdot m^2$)

n ····· Speed of the clutch shaft or brake shaft (r/min)

Td ····· Rated Torque and dynamic friction torque to the relative speed of the clutch and the brake (N·m)
In the case of gearmotors with brake and IP65 gearmotors with brake ····· [Tables-1 and -2] on page 484, [Table-1] on page 485
In the case of gearmotors with clutch/brake ····· [Table-2] on page 485

$T\ell$ ····· Load torque converted into the equivalent value on the reducer input shaft (N·m)

Emax ····· Allowable work load of the clutch and the brake
In the case of gearmotors with brake and IP65 gearmotors with brake ····· [Table-2] on page 484, [Table-1] on page 485
In the case of gearmotors with clutch/brake ····· [Table-2] on page 485

Moment of inertia of the gearmotors

MINI Series

■ Moment of inertia J of the gearmotors (motor + reducer) by power and by frame size

<Motor shaft equivalent>

Unit: Moment of Inertia J (kg·m²) [Table-1]

Number of Phases	Type/Frame Size				Power (W)	Gearmotor/IP65 Gearmotor		Gearmotor with Brake/ IP65 Gearmotor with Brake	
	G Type	H Type	F2 Type			200 V	400 V	200 V	400 V
3-Phase	G-12 Frame G-22 Frame	H-15 Frame H-22 Frame	F2S-12 Frame	F2F-15 Frame	15	0.00005	0.00006	0.00007	0.00008
					25	0.00006	0.00006	0.00008	0.00008
					40	0.00007	0.00008	0.00009	0.00009
					60	0.00008	0.00008	0.00009	0.00009
	G-15 Frame G-28 Frame G-32 Frame	H-18 Frame H-28 Frame H-32 Frame	F2S-15 Frame	F2F-18 Frame	25	0.00008	0.00008	0.00010	0.00010
					40	0.00008	0.00008	0.00010	0.00010
					60	0.00010	0.00012	0.00012	0.00014
					90	0.00012	0.00013	0.00014	0.00014
	G-18 Frame G-40 Frame	H-40 Frame	-	-	40	0.00034	0.00034	0.00036	0.00036
					60	0.00034	0.00034	0.00036	0.00036
					90	0.00034	0.00034	0.00036	0.00036

Note: IP65 gearmotors and IP65 gearmotors with a brake are not available for 400 V.

Unit: Moment of Inertia J (kg·m²) [Table-2]

Number of Phases	Type/Frame Size				Power (W)	Gearmotor/IP65 Gearmotor		Gearmotor with Brake/ IP65 Gearmotor with Brake	
	G Type	H Type	F2 Type			100 V	200 V	100 V	200 V
1-Phase	G-12 Frame G-22 Frame	H-15 Frame H-22 Frame	F2S-12 Frame	F2F-15 Frame	15	0.00005	0.00005	0.00007	0.00007
					25	0.00006	0.00006	0.00008	0.00008
					40	0.00008	0.00008	0.00009	0.00009
					60	0.00008	0.00008	0.00009	0.00009
	G-15 Frame G-28 Frame G-32 Frame	H-18 Frame H-28 Frame H-32 Frame	F2S-15 Frame	F2F-18 Frame	25	0.00008	0.00008	0.00010	0.00010
					40	0.00010	0.00010	0.00012	0.00012
					60	0.00013	0.00013	0.00014	0.00014
					90	0.00013	0.00013	0.00014	0.00014
	G-18 Frame G-40 Frame	H-40 Frame	-	-	40	0.00034	0.00034	0.00036	0.00036
					60	0.00034	0.00034	0.00036	0.00036
					90	0.00035	0.00035	0.00036	0.00036

Note: IP65 gearmotors and IP65 gearmotors with a brake are not available for 200 V.

MID Series

■ Moment of inertia J of the gearmotors/IP65 gearmotors (motor + reducer)

<Motor shaft equivalent, common to each reduction ratio> [Table-1]

Motor Power	3-Phase 0.1 kW	3-Phase 0.2 kW	3-Phase 0.4 kW	3-Phase 0.75 kW	3-Phase 1.5 kW	3-Phase 2.2 kW
Moment of Inertia J (kg·m²)	0.00048	0.00053	0.0011	0.0032	0.0062	0.0105

[Table-2]

Motor Power	1-Phase 0.1 kW (H2, F, and F3 Type)	1-Phase 0.1 kW (G3 Type)	1-Phase 0.2 kW	1-Phase 0.4 kW
Moment of Inertia J (kg·m²)	0.00046 (Note 1)	0.00080	0.00091	0.00271

Note 1: The values are those obtained with the capacitor in operation.

■ Moment of inertia J of the gearmotors with brake/IP65 gearmotor (motor + reducer)

<Motor shaft equivalent, common to each reduction ratio> [Table-3]

Motor Power	3-Phase 0.1 kW	3-Phase 0.2 kW	3-Phase 0.4 kW	3-Phase 0.75 kW	3-Phase 1.5 kW	3-Phase 2.2 kW
Moment of Inertia J (kg·m²)	0.00054	0.00076	0.0012	0.0033	0.0067	0.0109

Note: IP65 gearmotors with a brake are not available for 1.5 kW and 2.2 kW.

[Table-4]

Motor Power	1-Phase 0.1 kW (H2, F, and F3 Type)	1-Phase 0.1 kW (G3 Type)	1-Phase 0.2 kW	1-Phase 0.4 kW
Moment of Inertia J (kg·m²)	0.00070 (Note 1)	0.00103	0.00115	0.0030

Note 1: The values are those obtained with the capacitor in operation.

■ Moment of inertia J of the gearmotors with clutch/brake (clutch/brake + reducer)

<Motor shaft equivalent> [Table-5]

Motor Power	3-Phase 0.1 kW	3-Phase 0.2 kW	3-Phase 0.4 kW	3-Phase 0.75 kW
Moment of Inertia J (kg·m²)	0.00035	0.00035	0.0085	0.0011

■ Moment of inertia J of the reducer (double shaft type)

<Input shaft equivalent> [Table-6]

4 Poles Motor Power Class	0.1 kW	0.2 kW	0.4 kW	0.75 kW	1.5 kW	2.2 kW
Moment of Inertia J (kg·m²)	0.000006	0.000007	0.000017	0.00006	0.00018	0.0003

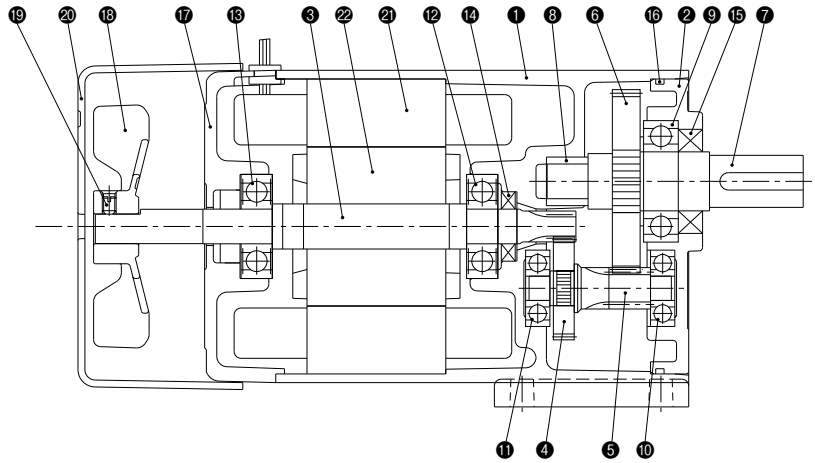
■ Moment of inertia J of the S-type reducer (double shaft type)

<Input shaft equivalent> [Table-7]

4 Poles Motor Power Class	0.1 kW	0.2 kW	0.4 kW	0.75 kW	1.5 kW	2.2 kW
Moment of Inertia J (kg·m²)	0.000023	0.000025	0.00003	0.000073	0.00019	0.0004

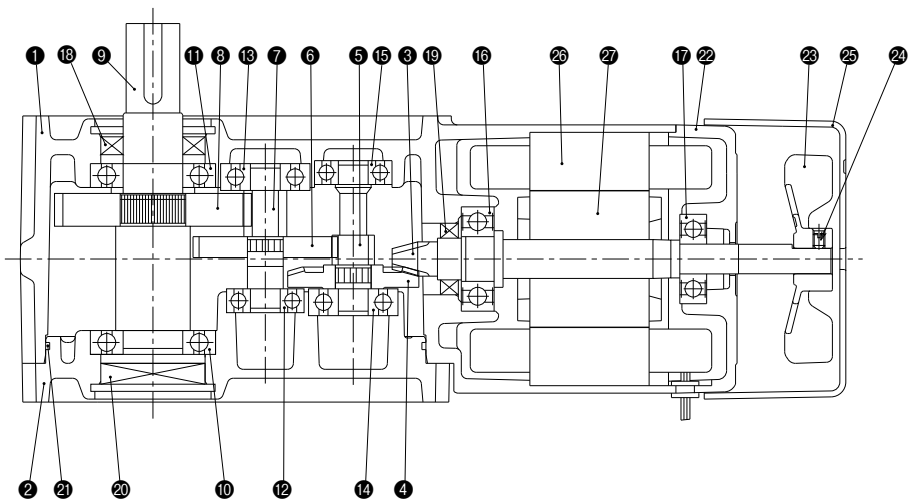
Structural Drawings

MINI Series <G Type>



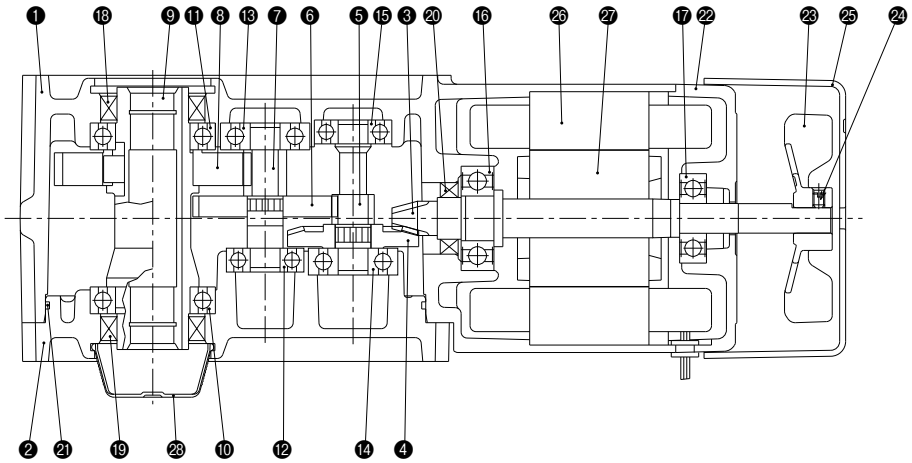
❶ Case	❻ Output Shaft Gear	⓫ Bearing	⓰ O-ring	㉑ Stator
❷ Case Cover	❼ Output Shaft	⓬ Bearing	⓱ Motor Bracket	㉒ Rotor
❸ Input Shaft	❽ Metal Bearing	⓭ Bearing	⓲ Fan	
❹ 1 Stage Gear	❾ Bearing	⓮ Oil Seal	⓳ Set Screw	
❺ 1 Stage Pinion	❿ Bearing	⓯ Oil Seal	㉔ Fan Cover	

MINI Series <F2F Type>



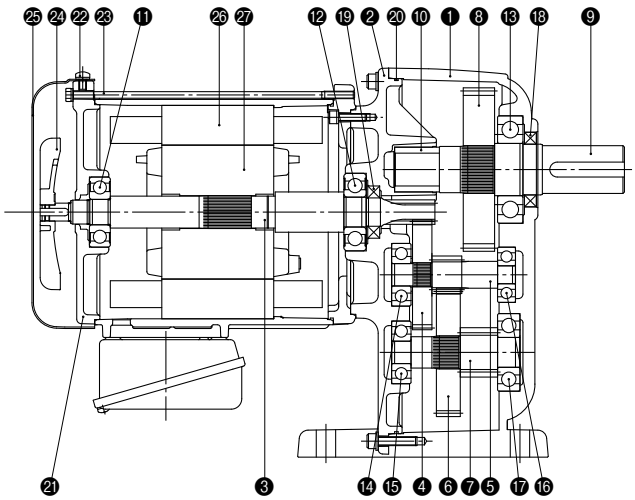
❶ Case	❻ 2 Stage Gear	⓫ Bearing	⓰ Bearing	㉑ O-ring	㉖ Stator
❷ Case Cover	❼ 2 Stage Pinion	⓬ Bearing	⓱ Bearing	㉒ Motor Bracket	㉗ Rotor
❸ Input Shaft	❽ Output Shaft Gear	⓭ Bearing	⓲ Oil Seal	㉓ Fan	
❹ 1 Stage Gear	❾ Output Shaft	⓮ Bearing	⓳ Oil Seal	㉔ Set Screw	
❺ 1 Stage Pinion	❿ Bearing	⓯ Bearing	⓴ Seal Cap	㉕ Fan Cover	

MINI Series <F2S Type>



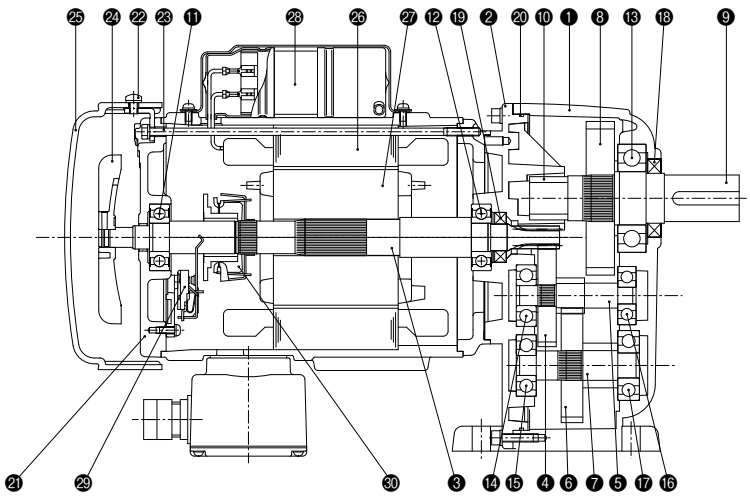
❶ Case	❻ 2 Stage Gear	⓫ Bearing	⓰ Bearing	㉑ O-ring	㉖ Stator
❷ Case Cover	❼ 2 Stage Pinion	⓬ Bearing	⓱ Bearing	㉒ Motor Bracket	㉗ Rotor
❸ Input Shaft	❽ Output Shaft Gear	⓭ Bearing	⓲ Oil Seal	㉓ Fan	㉘ Safety Cap
❹ 1 Stage Gear	❾ Output Shaft	⓮ Bearing	⓳ Oil Seal	㉔ Set Screw	
❺ 1 Stage Pinion	❿ Bearing	⓯ Bearing	⓴ Oil Seal	㉕ Fan Cover	

MID Series 3-Phase <G3 Type>



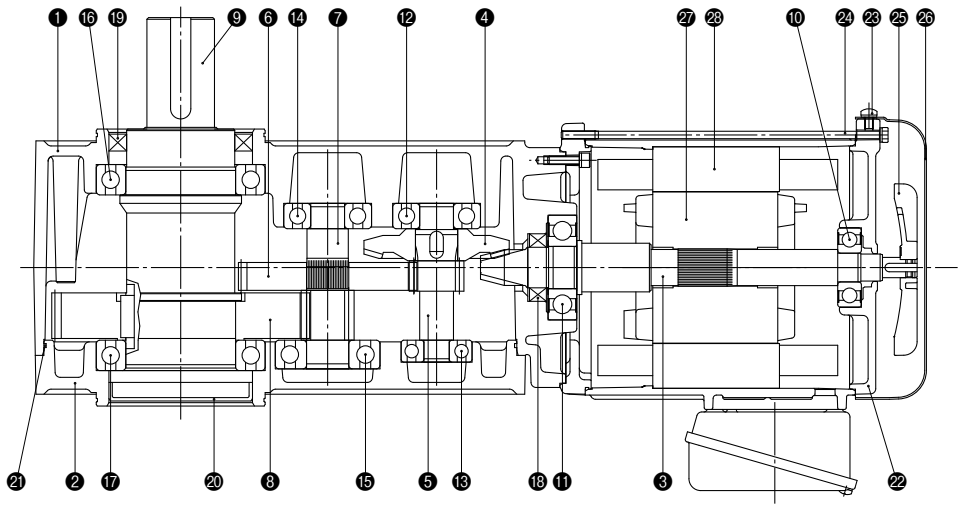
❶ Case	❻ 2 Stage Gear	⓫ Bearing	⓰ Bearing	㉑ Motor Bracket	㉖ Stator
❷ Bracket	❼ 2 Stage Pinion	⓬ Bearing	⓱ Bearing	㉒ Mounting Screw	㉗ Rotor
❸ Input Shaft	❽ Output Shaft Gear	⓭ Bearing	⓲ Oil Seal	㉓ Through Bolt	
❹ 1 Stage Gear	❾ Output Shaft	⓮ Bearing	⓳ Oil Seal	㉔ Fan	
❺ 1 Stage Pinion	❿ Metal Bearing	⓯ Bearing	⓴ O-ring	㉕ Fan Cover	

MID Series 1-Phase <G3 Type>



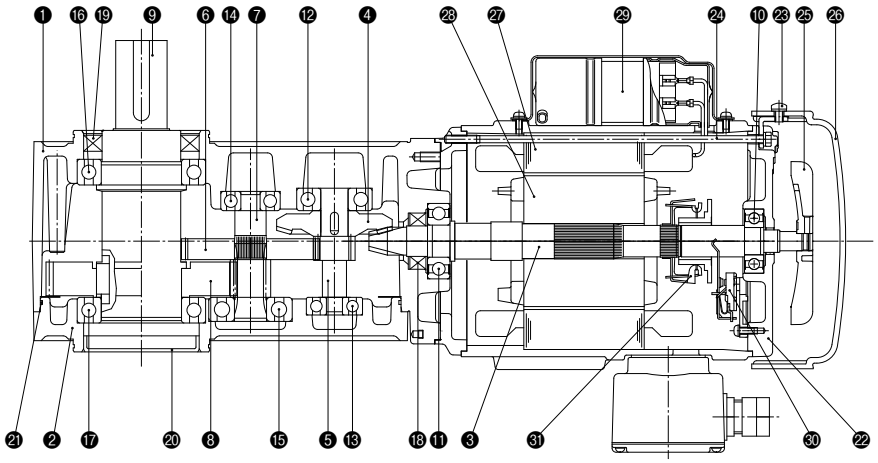
❶Case	❻2 Stage Gear	⓫Bearing	⓰Bearing	㉑Motor Bracket	㉖Stator
❷Bracket	❼2 Stage Pinion	⓬Bearing	⓱Bearing	㉒Mounting Screw	㉗Rotor
❸Input Shaft	❽Output Shaft Gear	⓭Bearing	⓲Oil Seal	㉓Through Bolt	㉘Capacitor
❹1 Stage Gear	❾Output Shaft	⓮Bearing	⓳Oil Seal	㉔Fan	㉙Centrifugal Force Switch Fixture
❺1 Stage Pinion	❿Metal Bearing	⓯Bearing	⓴O-ring	㉕Fan Cover	㉚Centrifugal Force Switch Rotating Part

MID Series 3-Phase <F3F Type>



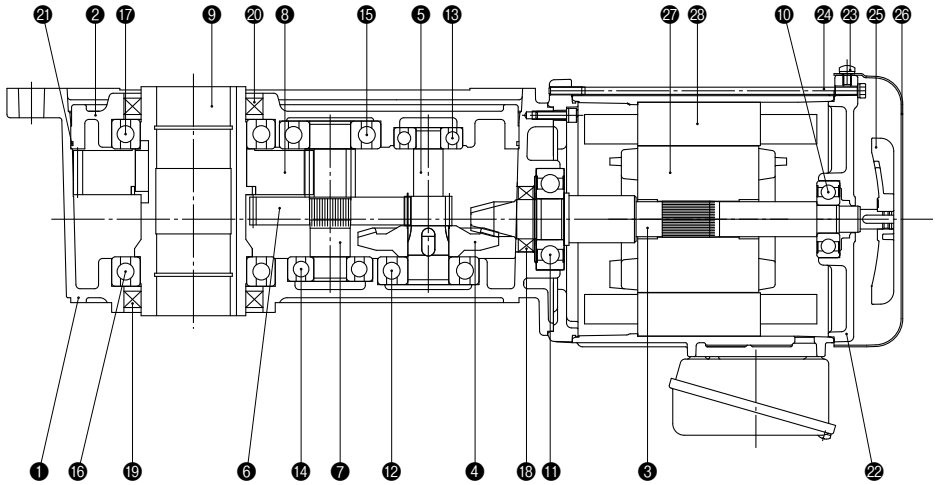
❶Case	❻2 Stage Gear	⓫Bearing	⓰Bearing	㉑O-ring	㉖Fan Cover
❷Case Cover	❼2 Stage Pinion	⓬Bearing	⓱Bearing	㉒Motor Bracket	㉗Rotor
❸Input Shaft	❽Output Shaft Gear	⓭Bearing	⓲Oil Seal	㉓Mounting Screw	㉘Stator
❹1 Stage Gear	❾Output Shaft	⓮Bearing	⓳Oil Seal	㉔Through Bolt	
❺1 Stage Pinion	❿Bearing	⓯Bearing	⓴Seal Cap	㉕Fan	

MID Series 1-Phase <F3F Type>



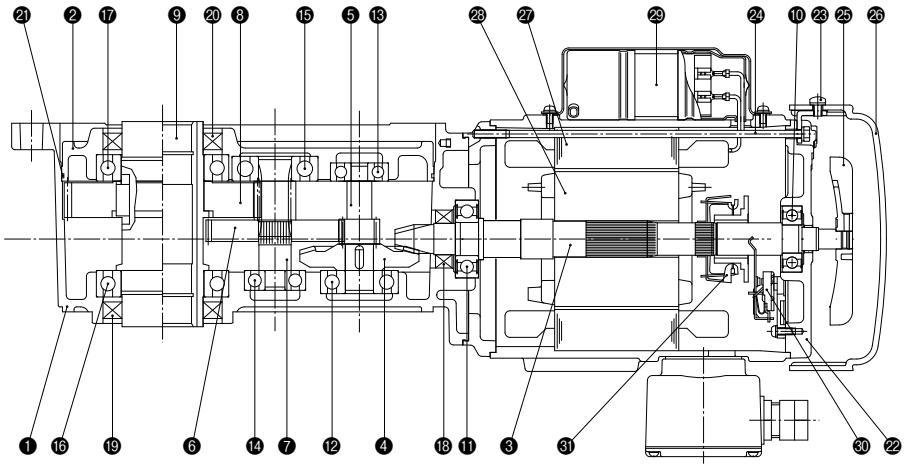
❶Case
❷Case Cover
❸Input Shaft
❹1 Stage Gear
❺1 Stage Pinion
❻2 Stage Gear
❼2 Stage Pinion
❽Output Shaft Gear
❾Output Shaft
❿Bearing
⓫Bearing
⓬Bearing
⓭Bearing
⓮Bearing
⓯Bearing
⓰Bearing
⓱Bearing
⓲Oil Seal
⓳Oil Seal
⓴Seal Cap
㉑O-ring
㉒Motor Bracket
㉓Mounting Screw
㉔Through Bolt
㉕Fan
㉖Fan Cover
㉗Stator
㉘Rotor
㉙Capacitor
㉚Centrifugal Force Switch Fixture
㉛Centrifugal Force Switch Rotating Part

MID Series 3-Phase <F Type>



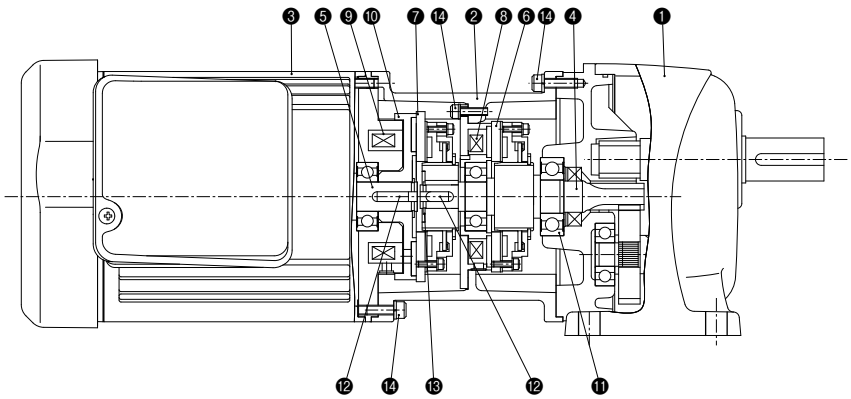
❶Case
❷Case Cover
❸Input Shaft
❹1 Stage Gear
❺1 Stage Pinion
❻2 Stage Gear
❼2 Stage Pinion
❽Output Shaft Gear
❾Output Shaft
❿Bearing
⓫Bearing
⓬Bearing
⓭Bearing
⓮Bearing
⓯Bearing
⓰Bearing
⓱Bearing
⓲Oil Seal
⓳Oil Seal
⓴Oil Seal
㉑O-ring
㉒Motor Bracket
㉓Mounting Screw
㉔Through Bolt
㉕Fan
㉖Fan Cover
㉗Rotor
㉘Stator

MID Series 1-Phase <F Type>



❶Case	❻2 Stage Gear	⓫Bearing	⓰Bearing	㉑O-ring	㉖Fan Cover	㉛Centrifugal Force Switch Rotating Part
❷Case Cover	❼2 Stage Pinion	⓬Bearing	⓱Bearing	㉒Motor Bracket	㉗Stator	
❸Input Shaft	❽Output Shaft Gear	⓭Bearing	⓲Oil Seal	㉓Mounting Screw	㉘Rotor	
❹1 Stage Gear	❾Output Shaft	⓮Bearing	⓳Oil Seal	㉔Through Bolt	㉙Capacitor	
❺1 Stage Pinion	❿Bearing	⓯Bearing	⓴Oil Seal	㉕Fan	㉚Centrifugal Force Switch Fixture	

MID Series <Gearmotor with Clutch/Brake>



❶Gearhead	❻Armature (For brake)	⓫Bearing
❷Bracket	❼Armature (For Clutch)	⓬Key
❸Motor	❽Field (For Brake)	⓭Retaining Ring
❹OSP (Spline Movable Model)	❾Field (For Clutch)	⓮Hex Head Cap Screw
❺Motor Shaft	❿Clutch Rotor	

Specifications and Structure of Gearmotors with Brake

Standard Motors

■ Brake Specifications

MINI Series

[Table-1]

Category \ Motor Power	3-Phase [200 V/400 V], 1-Phase [200 V]					1-Phase [100 V]				
	15 W	25 W	40 W	60 W	90 W	15 W	25 W	40 W	60 W	90 W
Brake Type	Power-Off (Spring Close)									
Rated Torque N·m (At 1500 to 1800 r/min)	0.37				0.54	0.37				0.54
Voltage <Average> (V)	DC90 (Rectifier A200-D90 Included)					DC45 (Rectifier A200-D90 included)				
Power (at 75 °C) (W)	12					11				
Current (at 75 °C) (A)	0.13					0.25				
Allowable Work Load Emax (J)	2.9×10^7									
Allowable Braking Frequency (times/minute)	10									

Note 1: The allowable braking frequency is an approximate value based on predicted temperature rise of the motor. The braking frequency may be increased when the motor load is light or when the motor can be sufficiently cooled. (Keep the motor surface temperature below 90 °C.)
Note 2: Please avoid continuous energization of the brake coil while the motor is inactive.
Note 3: Please use the included rectifier as the brake power supply. If you intend to use a power supply other than the attached rectifier, please contact your nearest Sales Office or the CS Center.
Note 4: The rated torque is a reference value. Not guaranteed values.
Note 5: Use the rated torque value for "Td" when calculating the braking time and connection work load of the brake per operation.
Note 6: With regard to a Three-phase 400 V motor, connect the lead wire (red) from the motor.

MID Series (3-Phase)

[Table-2]

Category \ Motor Power		0.1 kW	0.2 kW	0.4 kW	0.75 kW	1.5 kW	2.2 kW
Brake Type		Power-Off (Spring Close)					
Static Friction Torque Ts (N·m)		0.98	1.96	3.92	7.35	14.7	21.6
Dynamic Friction Torque Td (N·m)		0.78	1.57	3.14	5.88	11.8	17.2
Voltage (Average) (V)	200 V Class	DC90 (Rectifier A200-D90-UL Included)					
	400 V Class	DC180 (Rectifier A400-D180 Included)					
Power (at 75 °C) (W)	200 V Class	11	11	14	20	22	25
	400 V Class	11	11	14	20	23	27
Current (at 75 °C) (A)	200 V Class	0.12	0.12	0.15	0.22	0.24	0.28
	400 V Class	0.06	0.06	0.07	0.10	0.13	0.15
Allowable Work Load Emax	(J)	1.5×10^8	1.5×10^8	1.5×10^8	4.0×10^8	6.0×10^8	6.0×10^8
Allowable Braking Frequency (times/minute)		10					

Note 1: The allowable braking frequency is an approximate value based on predicted temperature rise of the motor. The braking frequency may be increased when the motor load is light or when the motor can be sufficiently cooled.
Note 2: Please use the included rectifier as the brake power supply. If you intend to use a power supply other than the included rectifier, please contact your nearest Sales Office or the CS Center.
Note 3: The input voltage to the rectifier must be used within the range specified below. Please note that repeated operation at a voltage beyond this range may cause a malfunction.
200 V class (A200-D90-UL): 200 V to 230 VAC 400 V class (A400-D180): 380 V to 480 VAC
Note 4: Due to the structure of the brake, the disc produces friction noise during motor operation. However, this does not affect the performance of the brake.
Note 5: Noise from the brake part may increase when operating with an inverter/VFD due to the brake structure, but there is no problem in terms of brake performance.

MID Series (1-Phase)

[Table-1]

Category \ Motor Power		0.1 kW	0.2 kW	0.4 kW
Brake Type		Power-Off (Spring Close)		
Static Friction Torque Ts (N·m)		0.98	1.96	3.92
Dynamic Friction Torque Td (N·m)		0.78	1.57	3.14
Voltage (Average) (V)	100 V Class	DC90 (Rectifier A100-D90-UL Included)		
	200 V Class	DC90 (Rectifier A200-D90-UL Included)		
Power (at 75 °C) (W)	100 V Class	15	15	26
	200 V Class	15	15	26
Current (at 75 °C) (A)	100 V Class	0.17	0.17	0.29
	200 V Class	0.17	0.17	0.29
Allowable Work Load Emax	(J)	1.5×10^8	1.5×10^8	4.0×10^8
Allowable Braking Frequency (times/minute)		6		

Note 1: The allowable braking frequency is an approximate value based on predicted temperature rise of the motor. The braking frequency may be increased when the motor load is light or when the motor can be sufficiently cooled.
Note 2: Please avoid continuous energization of the brake coil while the motor is inactive.
Note 3: Please use the included rectifier as the brake power supply. If you intend to use a power supply other than the included rectifier, please contact your nearest Sales Office or the CS Center.
Note 4: The intended service life of the contact of the centrifugal switch of the Single-phase motor is about 300,000 times.
Note 5: The static friction torque and the dynamic friction torque are reference values. Not guaranteed values.
Note 6: The input voltage to the rectifier must be used within the range specified below. Please note that repeated operation at a voltage beyond this range may cause a malfunction.
A100-D90-UL: 100 to 120 VAC
A200-D90-UL: 200 to 230 VAC

MID Series with Clutch/Brake

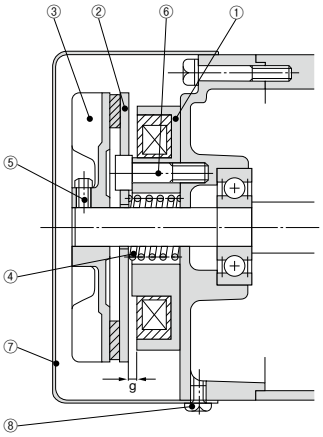
[Table-2]

Category \ Motor Power	3-Phase 0.1 kW	3-Phase 0.2 kW	3-Phase 0.4 kW	3-Phase 0.75 kW
Activation Method	Power-On (Spring Close)			
Static Friction Torque Ts (N·m)	1.96	1.96	3.92	7.35
Dynamic Friction Torque Td (N·m)	1.57	1.57	3.14	5.88
Voltage (Average) (V)	DC90 (Rectifier A200-D90 Included)			
Power (at 75 °C, clutch/brake) (W)	10/12	10/12	14/16	13/19
Current (at 75 °C, clutch/brake) (A)	0.11/0.14	0.11/0.14	0.15/0.18	0.14/0.21
Armature Suction Time ta (s)	0.010	0.010	0.015	0.020
Torque Startup Time (s)	0.020	0.020	0.050	0.070
Torque Disappearance Time (s)	0.015	0.015	0.020	0.040
Allowable Connection Work Load (per time) (J)	15	15	27	49
Allowable Work Load Emax (J)	1.2×10^8	1.2×10^8	2.2×10^8	4.3×10^8
Allowable Frequency (times/minute)	50			

Note 1: The allowable braking frequency is an approximate value and varies depending on the usage conditions etc.
Note 2: The allowable braking frequency is an approximate value limited by the rise of the motor temperature.
The braking frequency may be increased when the motor load is light or when the motor can be sufficiently cooled.
Note 3: Please avoid continuous energization of the clutch/brake coil while the motor is inactive.
Note 4: Please use the included rectifier as the clutch/brake power supply.
If you intend to use a power supply other than the included rectifier, please contact your nearest Sales Office or the CS Center.
Note 5: The input voltage to the rectifier must be used within the range specified below. Please note that repeated operation at a voltage beyond this range may cause a malfunction.
A200-D90: 200 V to 220 VAC
Note 6: The static friction torque and the dynamic friction torque are reference values. Not guaranteed values.

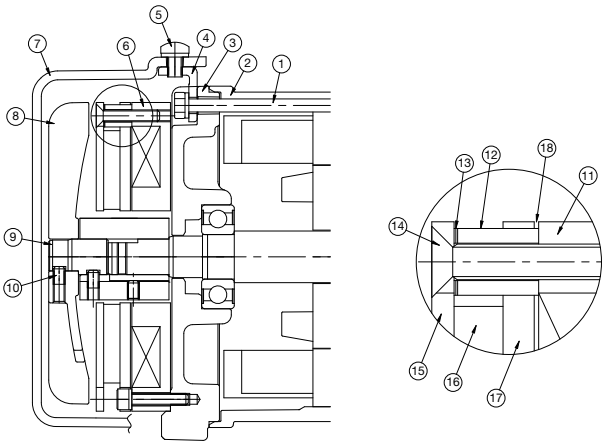
■ Brake Structural Diagram

MINI Series



①	Field
②	Armature
③	Fan Assembly
④	Spring
⑤	Hex Head Phillips Bolt
⑥	Hex Head Cap Screw
⑦	Fan Cover
⑧	Fixing Screw for Fan Cover
	g: Gap

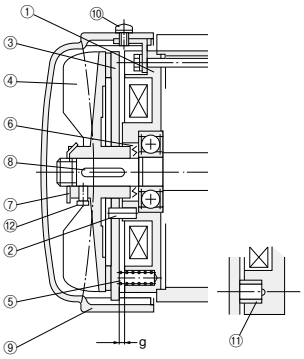
MID Series (3-Phase)



①	Through Bolt
②	Motor Frame
③	Bracket
④	Stay
⑤	Set Screw for Fan Cover
⑥	Brake
⑦	Fan Cover
⑧	Fan
⑨	Extension Shaft
⑩	Set Screw for Fan
⑪	Magnet Assembly
⑫	Collar
⑬	Shim
⑭	Flat Head Screw
⑮	Plate
⑯	Disk
⑰	Armature
⑱	g: Gap

Note: A 0.1 kW gearmotor is a totally enclosed non-ventilated type and therefore not provided with a fan.

MID Series (1-Phase)



①	Bracket with Field
②	Spring Pin
③	Armature
④	Fan Assembly
⑤	Spring 1
⑥	Spring 2
⑦	Tooth Lock Washer Nut
⑧	Key
⑨	Fan Cover
⑩	Fixing Screw for Fan Cover
⑪	Bush
* ⑫	Hex Head Phillips Bolt
	g: Gap

Note: The bolts for 0.4 kW motors are hex head cap screws.

■ Brake Gap Values

If the brake is used for an extended period of time, the gap will widen and will disable the brake release.
Adjust the gap periodically (about annually or every 1 million to 1.5 million times of use).

MINI Series

Motor Power	Suction Gap	Suitable Gap
15 W to 90 W	g: 0.8 or less	g: 0.4

MID Series (3-Phase)

[Table-1]

Motor Power	Gap (mm)			Recommended Tightening Torque [N·m]	Flat Head Screw Size
	Initial	Limitation	Adjustable		
3-Phase 0.1 kW	0.05 to 0.25	0.4	0.3	2.1 to 2.3	M4
3-Phase 0.2 kW	0.05 to 0.25	0.4	0.3	2.1 to 2.3	M4
3-Phase 0.4 kW	0.05 to 0.25	0.4	0.35	2.1 to 2.3	M4
3-Phase 0.75 kW	0.05 to 0.25	0.45	0.4	2.1 to 2.3	M4
3-Phase 1.5 kW	0.05 to 0.25	0.55	0.5	6.9 to 7.6	M6
3-Phase 2.2 kW	0.05 to 0.35	0.55	0.5	6.9 to 7.6	M6

MID Series (1-Phase)

[Table-2]

Motor Power	Suction Gap	Suitable Gap
1-Phase 0.1 kW	g: 2.3 or less	g: 1.9 ± 0.1
1-Phase 0.2 kW		
1-Phase 0.4 kW	g: 2.4 or less	g: 2.0 ± 0.1

■ Inspecting and adjusting the brake gap

MINI Series MID Series (1-Phase)

If the brake is used for an extended period of time, the friction disk of the brake will get worn, and the gap (g) will gradually increase.
If the gap (g) becomes wider than the suction gap, it will become more difficult for the magnet to attract the armature upon excitation, and the brake may be disabled from being released properly.
Operating the motor continuously in this condition would lead to the motor running along with brake applied. This may cause overheating of the motor, brake and deteriorate the functionality of the gearmotor.
In order to operate this product safely, inspect or adjust the brake gap periodically (annually or every 1 million to 1.5 million times of use).

MID Series (3-Phase)

If the disk gets worn as a result of long hours of operation and if the gap between the magnet assembly and the armature exceeds the gap limit value shown in [Table-1] above, the brake may malfunction or become unable to be released. For more information about how to inspect and adjust the amount of the gap, refer to the Instruction Manual.
Please note that you can adjust the gap only once. If the adjusted gap exceeds the gap limit again, the brake needs to be replaced. Please contact your nearest Sales Office or the CS Center.

IP65 Motors

■ Brake Specifications

MINI Series

Motor/Output Shaft Frame Size / Category	3-Phase [200 V]			3-Phase [200 V]				1-Phase [100 V]		1-Phase [100 V]		
	15 W	25 W	40 W	25 W	40 W	60 W	90 W	15 W	25 W	25 W	40 W	60 W
	G-12 H-15 F-12	G-12 H-15 F-12	G-12 H-15 F-12	G-15	G-15 G-18 H-18 F-15	G-15 G-18 H-18 F-15	G-18 H-18 F-15	G-12 H-15 F-12	G-12 H-15 F-12	G-15	G-15 G-18 H-18 F-15	G-18
Brake Type	Power-Off (Spring Close)											
Rated Torque N·m <At 1500 to 1800 r/min>	0.32			0.72				0.32		0.72		
Voltage <Average> (V)	DC90 (Rectifier A200-D90 Included)							DC45 (Rectifier A100-D45 Included)				
Power <at 75 °C> (W)	5.8			6.9				5.3		6.8		
Current <at 75 °C> (A)	0.06			0.07				0.12		0.14		
Allowable Work Load Emax J	2.5×10^7			2.9×10^7				2.5×10^7		2.9×10^7		
Allowable Braking Frequency (times/minute)	10											

Note 1: The allowable braking frequency is an approximate value based on predicted temperature rise of the motor. The braking frequency may be increased when the motor load is light or when the motor is sufficiently cooled. (Keep the motor surface temperature below 90 °C.)
Note 2: Please avoid continuous energization of the brake coil while the motor is inactive.
Note 3: Please use the included rectifier as the brake power supply. If you intend to use a power supply other than the attached rectifier, please contact your nearest Sales Office or the CS Center.
Note 4: The rated torque is a reference value. Not guaranteed values.

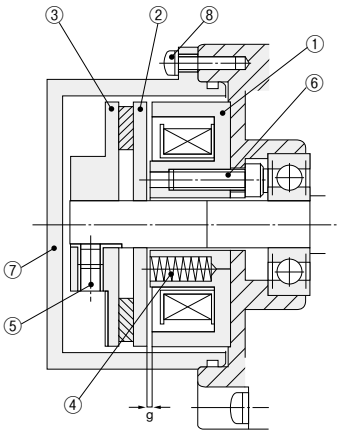
MID Series (3-Phase)

Motor Power / Category		0.1 kW	0.2 kW	0.4 kW	0.75 kW
Brake Type		Power-Off (Spring Close)			
Static Friction Torque Ts (N·m)		0.98	1.96	3.92	7.35
Dynamic Friction Torque Td (N·m)		0.78	1.57	3.14	5.88
Voltage (Average) (V)	200 V Class	DC90 (Rectifier A200-D90-UL Attached)			
	400 V Class	DC180 (Rectifier A400-D180 Attached)			
Power (at 75 °C) (W)	200 V Class	11	11	15	19
	400 V Class	12	12	14	19
Current (at 75 °C) (A)	200 V Class	0.12	0.12	0.16	0.22
	400 V Class	0.07	0.07	0.08	0.11
Allowable Work Load Emax	(J)	1.5×10^8	1.5×10^8	1.5×10^8	4.0×10^8
Allowable Braking Frequency (times/minute)		10			

Note 1: The allowable braking frequency is an approximate value based on predicted temperature rise of the motor. The braking frequency may be increased when the motor load is light or when the motor can be sufficiently cooled.
Note 2: Please avoid continuous energization of the brake coil while the motor is inactive.
Note 3: Please use the included rectifier as the brake power supply. If you intend to use a power supply other than the included rectifier, please contact your nearest Sales Office or the CS Center.
Note 4: The input voltage to the rectifier must be used within the range specified below. Please note that repeated operation at a voltage beyond this range may cause a malfunction.
200 V Class (A200-D90-UL): 200 V to 230 VAC 400 V Class (A400-D180): 380 V to 480 VAC
Note 5: Due to the structure of the brake, the disc produces friction noise during motor operation. However, this does not affect the performance of the brake.
Note 6: Noise from the brake part may increase when operating with an inverter/VFD due to the brake structure, but there is no problem in terms of brake performance.

■ Brake Structural Drawings

MINI Series



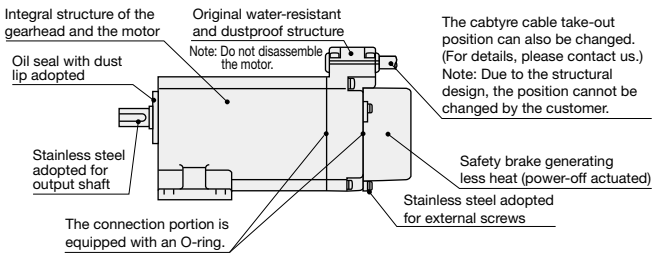
①	Field
②	Armature
③	Friction Disk Assembly
④	Spring
⑤	Set Screw
⑥	Hex Head Cap Screw
⑦	Brake Cover
⑧	Round Head Screw
	g: Gap

Properties

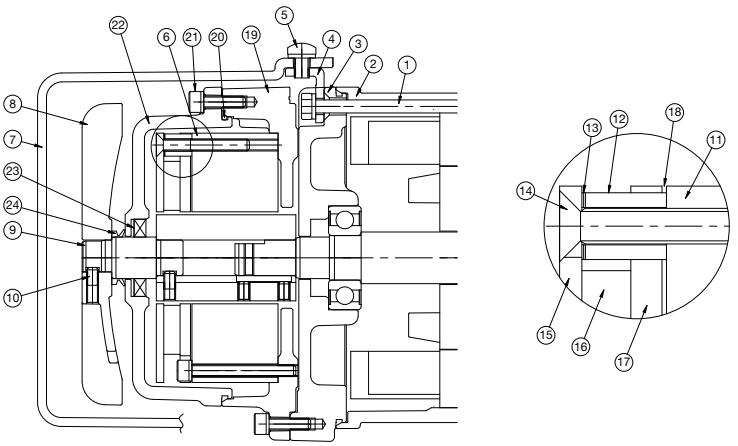
The gearmotor complies with IP65 of IEC Standards.

- This gearmotor is suitable for an environment where water spatters or water washing is periodically performed.
- IP65 is the indication showing the dustproof or water-resistant grade of the product.
- “6” in “IP65” indicates a “complete dustproof structure, and “5” indicates a “protective structure against water jets from any direction.”

Note: Not to be used underwater or in places where high water pressure is applied.



MID Series (3-Phase)



Note: An IP65 0.1 kW gearmotor is a totally enclosed non-ventilated type, and therefore, not provided with a fan cover, fan, and V-ring.

①	Through Bolt
②	Motor Frame
③	Bracket
④	Stay
⑤	Set Screw for Fan Cover
⑥	Brake
⑦	Fan Cover
⑧	Fan
⑨	Extension Shaft
⑩	Set Screw for Fan
⑪	Magnet Assembly
⑫	Collar
⑬	Shim
⑭	Flat Head Screw
⑮	Plate
⑯	Disk
⑰	Armature
⑱	g: Gap
⑲	Spacer
⑳	O-ring
㉑	Cover Fixing Bolt
㉒	Brake Cover
㉓	Oil Seal
㉔	V-ring

■ Brake Gap Values

MID Series (3-Phase)

[Table-1]

Motor Power	Gap (mm)			Recommended Tightening Torque [N·m]	Flat Head Screw Size
	Initial	Limitation	Adjustable		
3-Phase 0.1 kW	0.05 to 0.15	0.45	0.4	2.1 to 2.3	M4
3-Phase 0.2 kW	0.05 to 0.15	0.45	0.4	2.1 to 2.3	M4
3-Phase 0.4 kW	0.05 to 0.15	0.45	0.4	2.1 to 2.3	M4
3-Phase 0.75 kW	0.05 to 0.15	0.5	0.4	2.1 to 2.3	M4

■ Inspecting and adjusting the brake gap

MID Series (3-Phase)

If the disk gets worn as a result of long hours of use and the gap between the magnet assembly and the armature exceeds the gap limit value shown in [Table-1] above, the brake may malfunction or become unable to be released. For more information about how to inspect and adjust the amount of the gap, refer to the Instruction Manual.
Please note that you can adjust the gap only once. If the adjusted gap exceeds the gap limit again, the brake needs to be replaced. Please contact your nearest Sales Office or the CS Center.

Specifications of Gearmotors with Simple Brake/Motor Lead Wires

Gearmotors with Simple Brake

MINI Series

A simple brake (optional) can be mounted on a gearmotor (with a motor). If you require a simple brake on your unit, please inform us when placing an order.

- A simple brake mechanism is provided in order to reduce the costing of the motor.
- Available for both Three-phase and Single-phase gearmotors.
- The holding force values of gearmotors are as shown in the <table below>. If stronger holding force is required, please select a gearmotor with a brake.
- The values are rated values for 30 minutes.

■ Specifications (Reference Values)

Frame	Power	Holding Torque N·cm	Overrun (Running)
G-12·22 H-15·22 F2S-12 F2F-15	15 W	2.9	3 to 5
	25 W		
	40 W		
	60 W		
G-15·28·32 H-18·28·32 F2S-15 F2F-18	25 W	5.9	3 to 5
	40 W		
	60 W		
	90 W		
G-18·40 H-40	40 W	7.4	10 to 15
	60 W		
	90 W		

Note: The overrun is a value under no load.

Motor Lead Wires Specifications

■ Motor Lead Wires

Series	Number of Phases	Voltage	Motor Power	Lead Wire Specifications
MINI	1-Phase	Standard Voltage	15 W to 90 W	UL3266 AWG20
		High Voltage (200 V Class)		
	3-Phase	Standard Voltage		
		High Voltage (400 V Class)		UL3271 AWG24
MID	1-Phase	Standard Voltage	0.1 kW (Capacitor Run)	UL3266 AWG20
		High Voltage (200 V Class)		
		Standard Voltage	0.1 kW (Capacitor Start)	UL3398 AWG16
		High Voltage (200 V Class)		
		Standard Voltage	0.2 kW, 0.4 kW (Capacitor Start)	
		High Voltage (200 V Class)		
	3-Phase	Standard Voltage	0.1 kW to 2.2 kW	UL3289 AWG20
		High Voltage (400 V Class)		

Note: The specification of the lead wires of the MINI Series IP65 gearmotors with a brake is 0.5 mm^2, which is the same size as AWG20.
The specification of the lead wires of the MINI Series IP65 gearmotors is 0.75 mm^2.

■ Brake Lead Wires

Series	Number of Phases	Use of Lead Wires
MINI	3-Phase/1-Phase	UL3266 AWG20
MID	3-Phase	UL3888 AWG22
	1-Phase	UL3266 AWG20
	Clutch/Brake 3-Phase	UL3266 AWG20

Wiring Diagram of Gearmotors

MINI Series

■ 3-Phase Motor

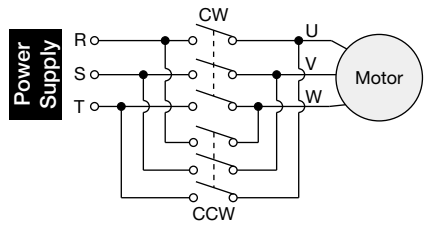
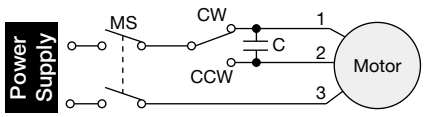


Figure - Codes	Lead Wire Type		Terminal Box Type
	200 V	400 V	Terminal Code
U	Black	Black	U
V	Gray	Brown	V
W	White	White	W

■ 1-Phase Motor



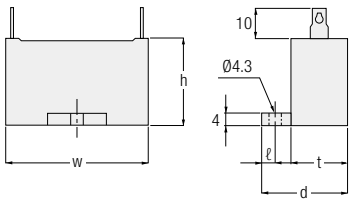
MS : Magnet Switch C: Capacitor

Figure - Codes	Lead Wire Type		Terminal Box Type
	100 V	200 V	Terminal Code
1	Blue	Brown	1
2	Black	Black	2
3	Gray	Gray	3

Note: The rotational direction of the output shaft is shown in the performance table for each model.

■ Capacitor

A capacitor is absolutely required for the operation of a Single-phase motor. Upon use, please connect the included capacitor to the product.
All Single-phase motors are connected by a reversible connection (three lead wires) and can therefore run in the CW and CCW directions as Three-phase motors do.



Withstand Voltage	Power (μF)	w	h	t	d	ℓ	Input Supply Power
220 V	2.5	31	23.5	14.5	24.5	4.5	100 V
	3.5	31	23.5	14.5	24.5		
	4.5	31	27	17	27		
	5	31	27	17	27		
	6	37	27	18	28		
	7	37	27	18	28		
	8	38	29	19	29		
	9	38	29	19	29		
	10	48	29	19	29		
	12	48	29	19	29		
	13	48	29	19	29		
	14	58	31	21	31		
	15	58	31	21	31		
	20	58	35	22	32		
	26	58	37	23.5	38.5	7	

Withstand Voltage	Power (μF)	w	h	t	d	ℓ	Input Supply Power
440 V	1.7	38	31	21	31	4.5	200 V
	2.2	48	29	19	29		
	3.2	58	31	21	31		
	6.5	58	41	29	44	7	
450 V	1	37	27	18	28	4.5	
	1.2	37	27	18	28		
	1.5	38	31	21	31		
	2	38	31	21	31		
	2.5	48	31	21	31		
	3	58	31	21	31		
	3.5	58	35	22	32		
	5	58	41	29	44	7	

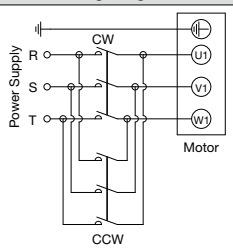
Note: For the capacitance of the capacitor, refer to each performance table.

MID Series (3-Phase)

■ Gearmotors Connection (No Brake)

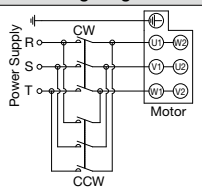
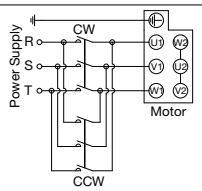
Please use the connection shown below for gearmotors without a brake.
The rotational direction of the output shaft by the connection described below is shown in the performance table for each series.
* For more information about the voltage codes, refer to page 541.
* For the wiring diagrams of gearmotors with a brake, refer to from page 499 onwards.

■ Lead Wires: 3 Lead Wires Type

Voltage Codes	Voltage/Frequency	Wiring Diagram
NN	200 V/50 Hz 200 V/60 Hz 220 V/60 Hz	
WN	380 V/50 Hz 400 V/50 Hz 400 V/60 Hz 440 V/60 Hz	
EN	415 V/50 Hz 440 V/50 Hz 480 V/60 Hz	
MA	575 V/60 Hz	

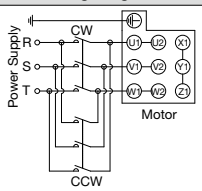
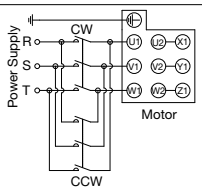
Note: Use the attached nuts for the connection.

■ Lead Wires: 6 Lead Wires Type

Voltage Codes	Voltage/Frequency	Wiring Diagram
KN (Dual Voltage) CN (Dual Voltage)	220 V/60 Hz 220 V/50 Hz 230 V/50 Hz	
	380 V/60 Hz 380 V/50 Hz	

Note: Use the attached nuts and short board for the connection.

■ Lead Wires: 9 Lead Wires Type

Voltage Codes	Voltage/Frequency	Wiring Diagram
AN (Dual Voltage)	208 V/60 Hz 230 V/60 Hz	
	460 V/60 Hz 400 V/50 Hz	

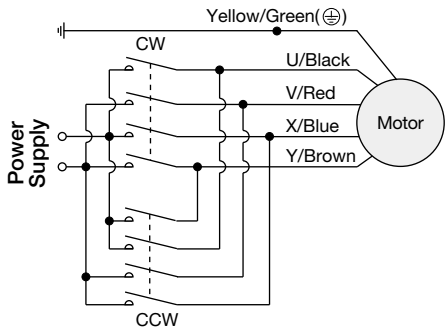
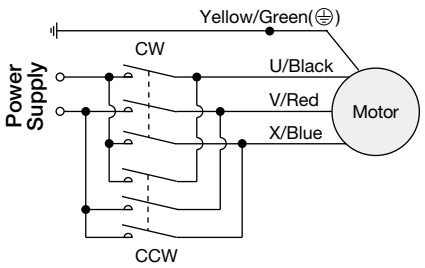
Note: Use the attached nuts and short board for the connection.

MID Series (1-Phase)

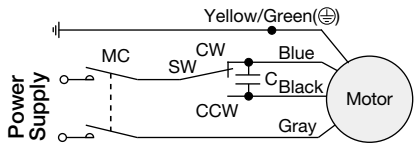
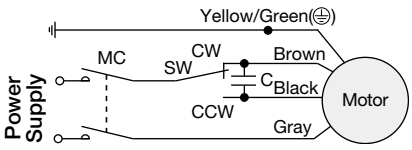
■ Gearmotors Connection

Connect the wires of a standard gearmotor as shown below.
The rotational direction of the output shaft by the connection described below is shown in the performance table for model.

■ 1-Phase Motors (Capacitor Start)/Common through G3, H2, F, and F3 Type

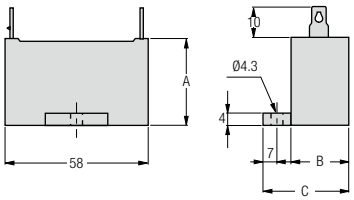
Standard Voltage Motor power: 0.1 kW (G3 Type only), 0.2 kW, 0.4 kW	High Voltage (200 V Class) Motor power: 0.1 kW (G3 Type only), 0.2 kW, 0.4 kW
	

■ 1-Phase Motors (Capacitor Run)/H2, F, and F3 Type

Standard Voltage Motor power: 0.1 kW (Except for G3 Type)	High Voltage (200 V Class) Motor power: 0.1 kW (Except for G3 Type)
	

Note: A capacitor is required for a Single-phase motor (capacitor run). Connect the included capacitor to use the motor. Refer to the figure below.
SW: CW/CCW Switch C: Capacitor MC: Magnetic Contactor

■ Capacitor



Voltage	Withstand Voltage	Power	Approx. Weight	Dimension Diagram (mm)		
				A	B	C
100 V	250 V	30 µF	100 g	50	35	50
200 V	450 V	7 µF	100 g	41	29	44

Wiring Diagram of Gearmotors with Brake

Connection Types and How to Select

Connection	How to Select	Inverter	Lifting Operation	Reduced Wiring	Braking Delay Time
(1) AC Switching (B)	This is the simplest method, and the motor can run simply by connecting the power supply line. This connection method requires fewer wires.	× (Unusable)	× (Unusable)	◎	△
(2) DC Switching	This connection method is optimal for applications requiring sudden braking, mainly for lifting operation, since it offers the shortest braking delay time.	○ (Usable)	◎ (Optimal)	△	◎
(3) AC Switching (A)	This connection method can separate the circuit between the motor and the brake and is optimal for driving with an inverter.	◎ (Optimal)	○ (Usable)	○	○

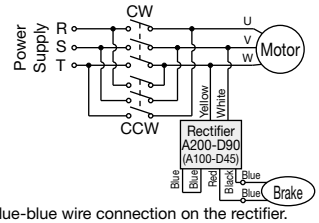
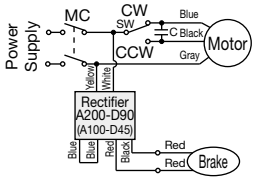
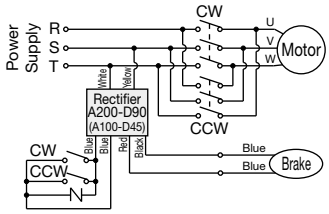
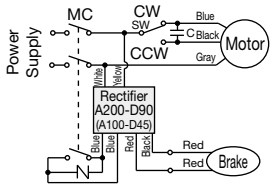
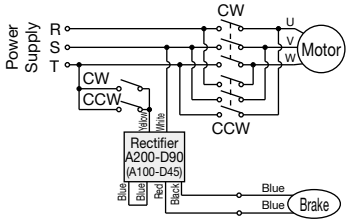
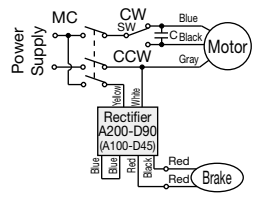
Note: The braking delay time is the time from the moment of turning off the switch to the start of braking, and is different from the braking time.
For the braking delay times caused by the different connection methods, refer to [Table-1] on page 511.
If you require braking time information, refer to the material for calculating braking times on page 476.

MINI Series

■ Precautions for Wiring

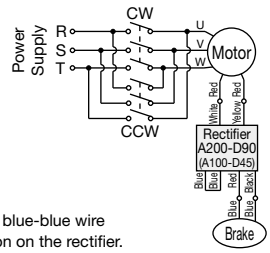
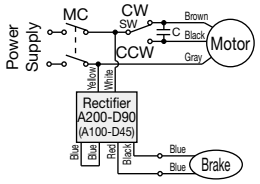
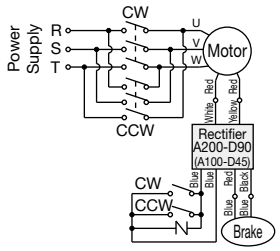
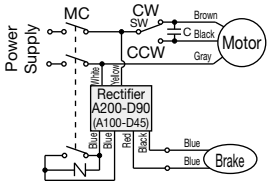
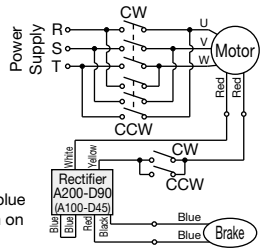
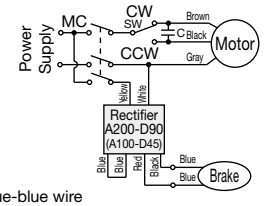
- Please utilize DC switching when using the gearmotor for vertical operation (lifting).
- For a DC switching connection, please connect a surge suppressor (optional) between the contacts. For surge suppressors (optional), refer to page 531.
- In the case of a Single-phase 100 V gearmotor, the input voltage of rectifier A200-D90 (A100-D45) is 100 VAC, and the output voltage is 45 VDC.
- Use switches of 110 VDC with a contact point rating of DC13 to block the inductive load of the DC coil when using DC switching connection. For more details, please contact your nearest Sales Office or the CS Center.
  * Contact rating class DC13 is a specification applicable to coil loads and a type defined in JIS C 8201-5-1 (Low-voltage switchgear and control gear).
- Please note that the rectifier contains a diode which will become unusable if it is shorted out due to, for example, improper wiring.
- For connection methods for Three-phase High Voltage (400 V Class) and special voltages exceeding 220 V, connect the separate 200 V terminal (red lead wire) drawn out of the motor to the input lead wire (white/yellow) of the rectifier. The separate 200 V terminal drawn out of the motor cannot be used when using an inverter.
- For information and precautions involving the connection for using an inverter, refer to page 533.

■ Standard Voltage

Connection	3-phase 15 to 90 W	1-phase 15 to 90 W
(1) AC Switching (B)	 Short the blue-blue wire connection on the rectifier.	 Short the blue-blue wire connection on the rectifier.
(2) DC Switching	 Short the blue-blue wire connection on the rectifier.	 Short the blue-blue wire connection on the rectifier.
(3) AC Switching (A)	 Short the blue-blue wire connection on the rectifier.	 Short the blue-blue wire connection on the rectifier.

SW: CW/CCW Switch C: Capacitor MC: Magnetic Contactor –N–: Surge Suppressor (optional)

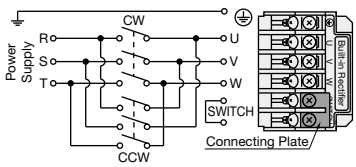
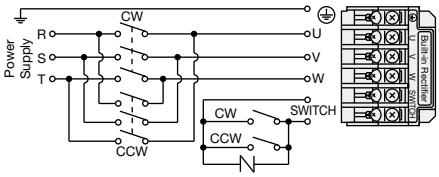
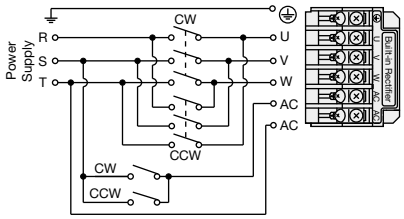
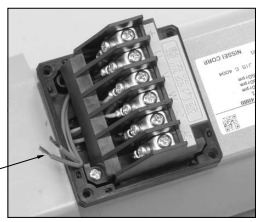
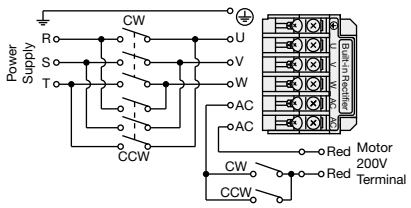
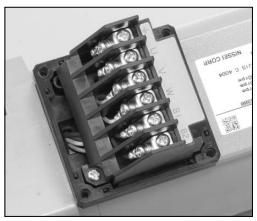
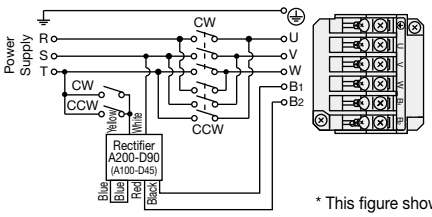
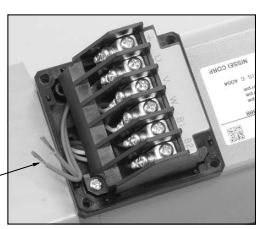
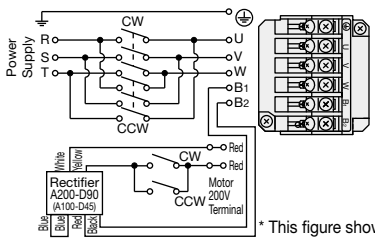
■ High Voltage

Connection	3-phase 15 W to 90 W (400 V Class)	1-phase 15 W to 90 W (200 V Class)
(1) AC Switching (B)	 Short the blue-blue wire connection on the rectifier.	 Short the blue-blue wire connection on the rectifier.
(2) DC Switching		
(3) AC Switching (A)	 Short the blue-blue wire connection on the rectifier.	 Short the blue-blue wire connection on the rectifier.

SW: CW/CCW Switch C: Capacitor MC: Magnetic Contactor –N–: Surge Suppressor (optional)

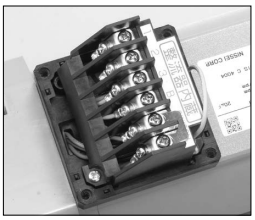
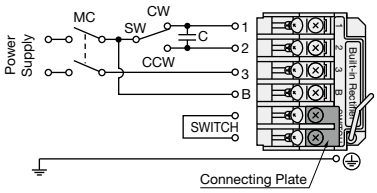
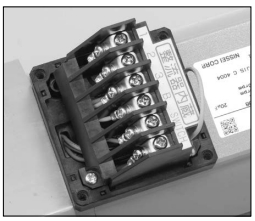
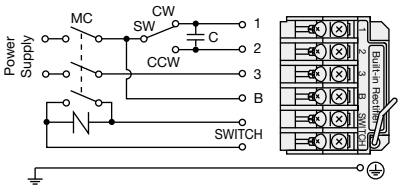
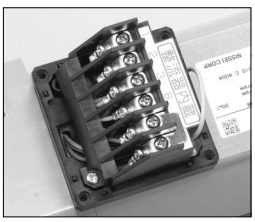
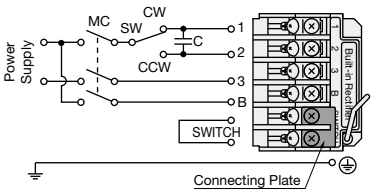
Wiring Diagram of Gearmotors with Brake

■ C Type Terminal Box (3-Phase)

Connection	3-Phase		
AC Switching (B)	Standard Voltage / High Voltage (400 V Class)		
DC Switching	Standard Voltage / High Voltage (400 V Class)		
AC Switching (A) Custom Specifications	Standard Voltage		
	High Voltage (400 V Class) Motor 200V Terminal		
Separate Rectifier Custom Specifications	Standard Voltage		 * This figure shows AC switching (A).
	High Voltage (400 V Class) Motor 200V Terminal		 * This figure shows AC switching (A).

-N-: Surge Suppressor (optional)

■ C Type Terminal Box (1-Phase)

Connection	1-Phase		
AC Switching (B)	Standard Voltage / High Voltage (200 V Class)		
DC Switching	Standard Voltage / High Voltage (200 V Class)		
AC Switching (A)	Standard Voltage / High Voltage (200 V Class)		

SW: CW/CCW Switch C: Capacitor MC: Magnetic Contactor -N- : Surge Suppressor (optional)

Note 1: Adopt DC switching when using the gearmotor for vertical operation (lifting).
Note 2: For a DC switching connection, connect a surge suppressor (optional) between the contacts. For surge suppressors (optional), refer to page 531.
Note 3: Use switches of 110 VDC with a contact point rating of DC13 to block the inductive load of the DC coil when using DC switching connection.
Please contact us for more details.
* Contact rating class DC13 is a specification applicable to coil loads and a type defined in JIS C 8201-5-1 (Low-voltage switchgear and control gear).
Note 4: Please note that the rectifier contains a diode and will become unusable if it is shorted due to, for example, improper wiring.
Note 5: For connection methods for Three-phase High Voltage(400 V Class) and special voltages exceeding 220 V, connect the separate 200 V terminal (red lead wire) drawn out of the motor to the lead wire (white/yellow) of the rectifier.
The separate 200 V terminal drawn out of the motor cannot be used when using an inverter.
For information and precautions involving the connection for using an inverter, refer to page 533.

MID Series (3-Phase)

■ Gearmotors Connection (Brakemotor)

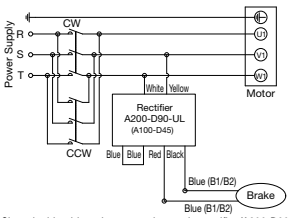
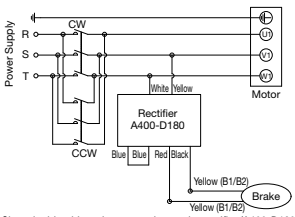
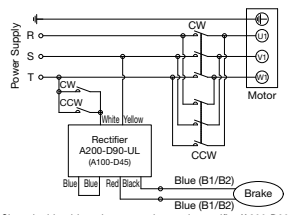
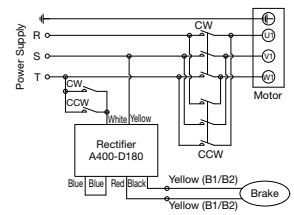
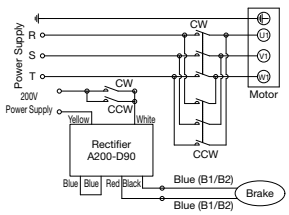
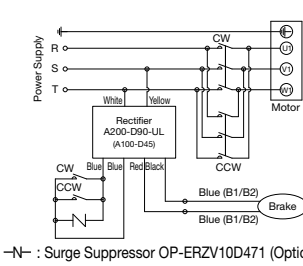
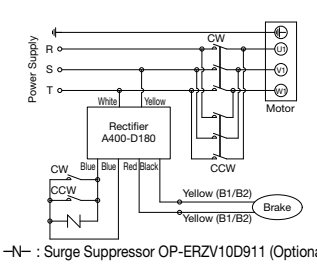
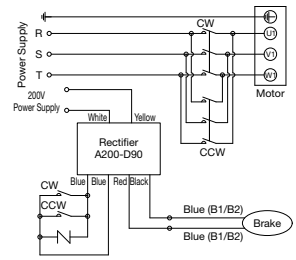
Connect the wires of a gearmotor with a brake as shown below. The rotational direction of the output shaft by the connection described below is shown in the performance table for each series.

* For more information about the voltage codes, refer to page 541.
* For the wiring diagrams of gearmotors without a brake, refer to page 493.

■ Precautions for Wiring

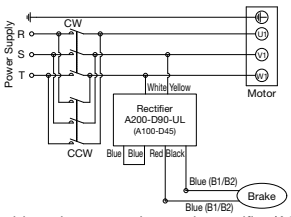
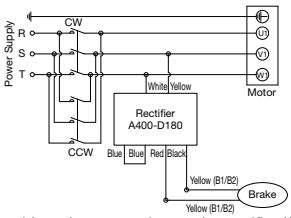
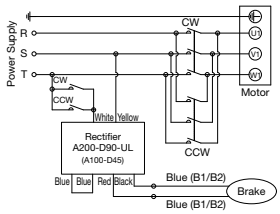
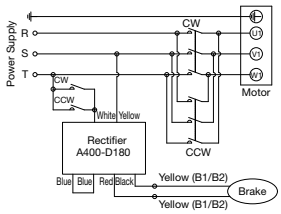
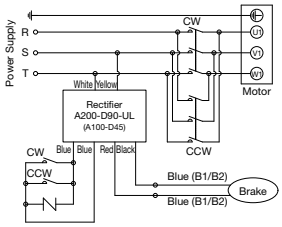
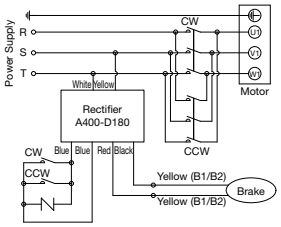
- Be sure to adopt “DC switching” when using the gearmotor for vertical operations (lifting).
- For a DC switching connection, please connect a surge suppressor (optional) between the contacts. For surge suppressors (optional), refer to page 531.
  (The varistor voltage is 423 V to 517 V in the case of a 200 V class brake or 820 V to 1000 V in the case of a 400 V class brake.)
- The brake voltage is 90 VDC in the case of a 200 V class brake and 180 VDC in the case of a 400 V class brake.
- The brake lead wires are the blue lead wires in the case of a 200 V class brake or the yellow lead wires in the case of a 400 V class brake.
- When adopting a DC switching connection, use a contactor with a contact capacity for 110 VDC <220 VDC> or contact rating class DC13 in order to shut down the inductive load (DC coil). Please contact us for more details.
  * Contact rating class DC13 is a specification applicable to coil loads and a type defined in JIS C 8201-5-1 (Low-voltage switchgear and control gear). * The items in < > are for 400 V class brakes.
- The rectifier contains a diode and will become unusable if it is shorted due to, for example, improper wiring. Please be cautious.
- For information and precautions involving the connection for using an inverter, refer to page 533.

■ Lead Wires: 3 Lead Wires Type

Voltage Codes	NN	WN	EN	MA
Voltage/ Frequency	200 V/50 Hz, 200 V/60 Hz, 220 V/60 Hz	380 V/50 Hz, 400 V/50 Hz 400 V/60 Hz, 440 V/60 Hz	415 V/50 Hz, 440 V/50 Hz 480 V/60 Hz	575 V/60 Hz
AC Switching (B)	 Short the blue-blue wire connection on the rectifier (A200-D90-UL).	 Short the blue-blue wire connection on the rectifier (A400-D180).		
AC Switching (A)	 Short the blue-blue wire connection on the rectifier (A200-D90-UL).	 Short the blue-blue wire connection on the rectifier (A400-D180).		 Short the blue-blue wire connection on the rectifier (A200-D90-UL).
DC Switching	 –N– : Surge Suppressor OP-ERZV10D471 (Optional)	 –N– : Surge Suppressor OP-ERZV10D911 (Optional)		 –N– : Surge Suppressor OP-ERZV10D471 (Optional)

Note: Use the included nuts for the connection.

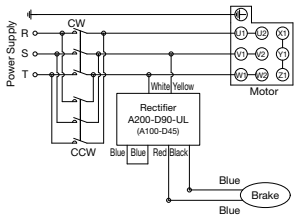
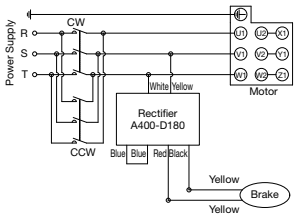
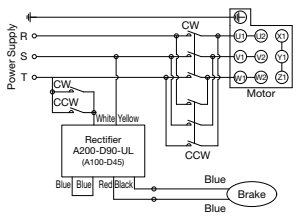
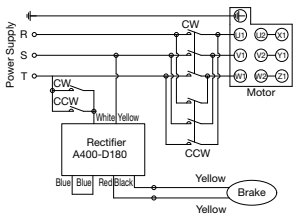
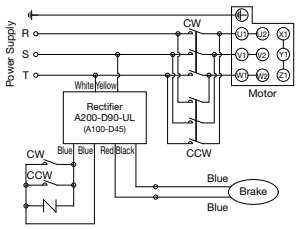
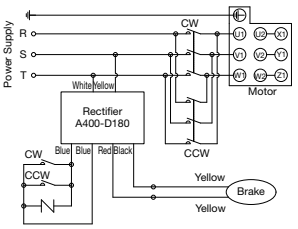
■ Lead Wires: 6 Lead Wires Type

Voltage Codes	KN (Dual Voltage) CN (Dual Voltage)	
Voltage/ Frequency	220 V/60 Hz, 220 V/50 Hz, 230 V/50 Hz	380 V/60 Hz, 380 V/50 Hz
AC Switching (B)	 Short the blue-blue wire connection on the rectifier (A200-D90-UL).	 Short the blue-blue wire connection on the rectifier (A400-D180).
AC Switching (A)	 Short the blue-blue wire connection on the rectifier (A200-D90-UL).	 Short the blue-blue wire connection on the rectifier (A400-D180).
DC Switching	 –N– : Surge Suppressor OP-ERZV10D471 (Optional)	 –N– : Surge Suppressor OP-ERZV10D911 (Optional)

Note: Use the included nuts for the connection.
Note: The B1 and B2 terminals are within the terminal box.

Wiring Diagram of Gearmotors with Brake

■ Lead Wires: 9 Lead Wires Type

Voltage Codes	AN (Dual Voltage)	
Voltage/ Frequency	208 V/60 Hz, 230 V/60 Hz	460 V/60 Hz, 400 V/50 Hz
AC Switching (B)	 Short the blue-blue wire connection on the rectifier (A200-D90-UL).	 Short the blue-blue wire connection on the rectifier (A400-D180).
AC Switching (A)	 Short the blue-blue wire connection on the rectifier (A200-D90-UL).	 Short the blue-blue wire connection on the rectifier (A400-D180).
DC Switching	 –N– : Surge Suppressor OP-ERZV10D471 (Optional)	 –N– : Surge Suppressor OP-ERZV10D911 (Optional)

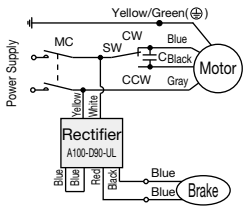
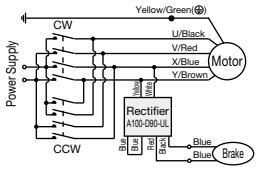
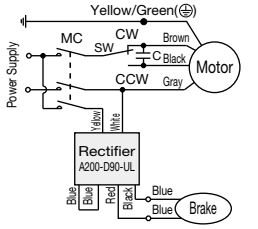
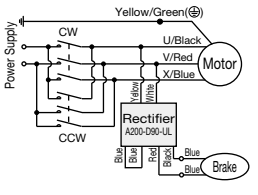
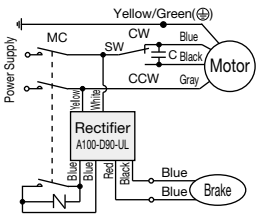
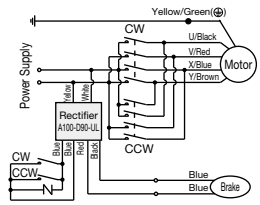
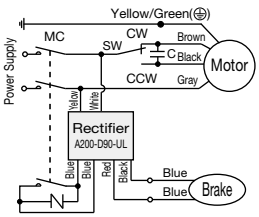
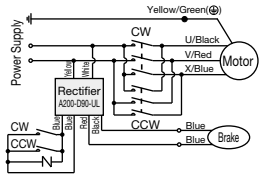
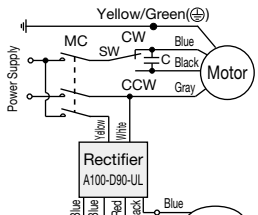
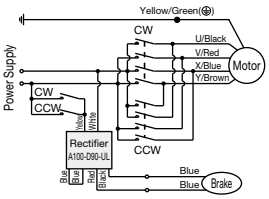
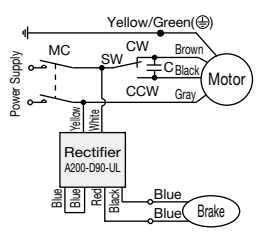
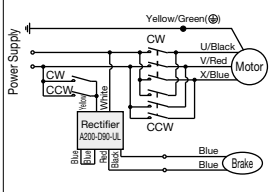
Note: Use the included nuts and short board for the connection.
Note: The brake lead wires are drawn into the terminal box, but are not fixed to the terminal block.

MID Series (1-Phase)

■ Precautions for Wiring

- Please utilize DC switching when using the gearmotor for vertical operation (lifting).
- For a DC switching connection, please connect a surge suppressor (optional) between the contacts. For surge suppressors (optional), refer to page 531.
- When adopting a DC switching connection, use a contactor with a contact capacity for 110 VDC or contact rating class DC13 in order to shut down the inductive load (DC coil).
  Please contact us for more details.
  * Contact rating class DC13 is a specification applicable to coil loads and a type defined in JIS C 8201-5-1 (Low-voltage switchgear and control gear).
- Please note that the rectifier contains a diode which will become unusable if it is shorted out due to, for example, improper wiring.

■ Connection Method

	Standard Voltage		High Voltage (200 V Class)	
	Capacitor Run Brake Lead Wires: Blue 0.1 kW (H2, F, F3 Types)	Capacitor Start Brake Lead Wires: Blue 0.1 kW (G3 type), 0.2 kW, 0.4 kW	Capacitor Run Brake Lead Wires: Blue 0.1 kW (H2, F, F3 Types)	Capacitor Start Brake Lead Wires: Blue 0.1 kW (G3 type), 0.2 kW, 0.4 kW
AC Switching (B)	 Short the blue-blue wire connection on the rectifier.	 Short the blue-blue wire connection on the rectifier.	 Short the blue-blue wire connection on the rectifier.	 Short the blue-blue wire connection on the rectifier.
DC Switching				
AC Switching (A)	 Short the blue-blue wire connection on the rectifier.	 Short the blue-blue wire connection on the rectifier.	 Short the blue-blue wire connection on the rectifier.	 Short the blue-blue wire connection on the rectifier.

SW: CW/CCW Switch C: Capacitor MC: Magnetic Contactor -N- : Surge Suppressor (optional)

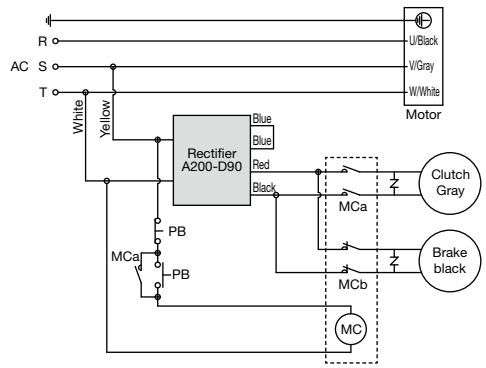
MID Series (Clutch/Brake)

A DC voltage of 90 V is required to operate the clutch/brake. Connect the wires of the attached rectifier A200-D90 and two surge suppressors for spark quenching (OP-ERZV10D471) according to the connection method described below. For the dimensions of the rectifier, refer to page 531.

■ Precautions for Wiring

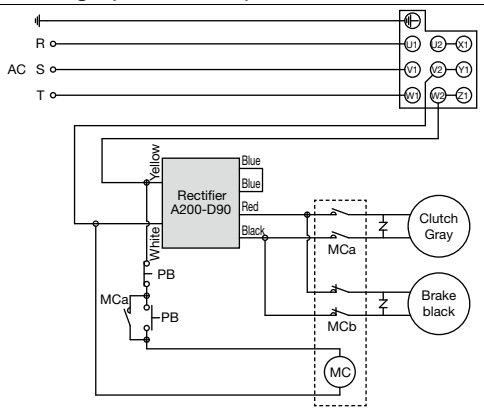
- For the protection of the rectifier, install a fuse (capacity: 1 A) on the input or output side of the circuit.
- Please note that the rectifier contains a diode and will become unusable if it is shorted due to, for example, improper wiring.
- With regard to the relay for the clutch/brake circuit, use a contactor with a contact capacity for 110 VDC or contact rating class DC13 in order to shut down the inductive load (DC coil). Please contact us for more details.
  * Contact rating class DC13 is a specification applicable to coil loads and a type defined in JIS C 8201-5-1 (Low-voltage switchgear and control gear).
- The clutch/brake is not available for 400 V.

Standard Voltage



MC: Relay Coil
MCa: Magnetic Contactor a Contact
MCb: Magnetic Contactor b Contact
PB: Pushbutton
-⋀-: Surge Suppressor (Accessory OP-ERZV10D471)

High Voltage (400 V Class)



MC: Relay Coil
MCa: Magnetic Contactor a Contact
MCb: Magnetic Contactor b Contact
PB: Pushbutton
-⋀- : Surge Suppressor (Accessory OP-ERZV10D471)

Wiring Diagram of Built-in Rectifier of Gearmotors with Brake

MID Series (3-Phase)

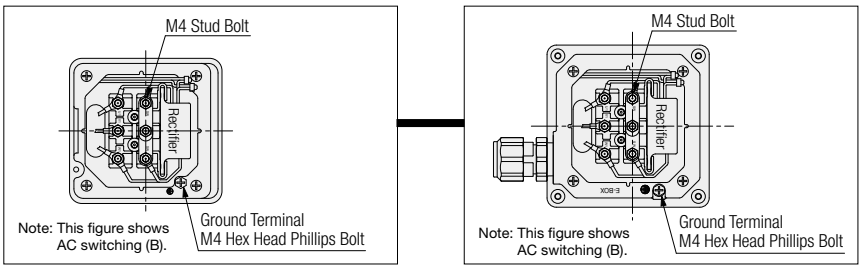
■ Built-in Rectifier

A rectifer can be installed and pre-wired within the terminal box of the product upon request. Please feel free to request when placing an order. For the purchasing codes of each connection type, please refer to the table below.

■ Target Products

- Standard Voltage / High Voltage (400 V Class)
- Special Voltage * However, power supply code M (575 V/60 Hz) is not supported.

● T-Type terminal box (steel plate) ● E-Type terminal box (aluminum)



Note: For the connections, refer to page 505.
For the option code for each brake connection for a built-in rectifier, refer to the description below.

Standard terminal boxes for gearmotors with a brake are provided with a rectifier separately.
If you desire a built-in rectifier, we may wire the rectifier for you. You may instruct the connection according to the following procedure:

Type Type Code for Ordering (Example) (Use this code to specify the connection.)	
AC Switching B (AC Switching B)	AB
AC Switching A (AC Switching A)	AA
DC Switching (DC Switching)	DC

The option code for brake connection will be indicated in the option code slot on the nameplate.

■ Description of Type Codes

X **AA**

Option Code for Brake Connection
(AA indicates AC switching (A) for the brake connection.)

Option (X)

Connection	Connection Types and Specifications and How to Select	Inverter Operation	Lifting Operation	Reduced Wiring	Braking Delay Time	Ordering Code
AC Switching (B)	This is the simplest method with a built-in rectifier, and the motor can run simply by connecting the power supply line. Moreover, a DC switching connection is also possible by removing the connection plate.	× (Unusable)	× (Unusable)	◎	△	AB
AC Switching (A)	Although this connection method uses a built-in rectifier, it allows a separate circuit between the motor and the brake. Making it optimal for use with inverters.	◎ (Optimal)	○ (Usable)	○	○	AA
DC Switching	This connection method is optimal for applications requiring sudden braking, mainly for lifting operation, since it offers the shortest braking delay time.	× (Unusable)	◎ (Optimal)	△	◎	DC

Note: Add the ordering code to the end of the part number. Example: G3L28N15-MD08TNNTB2X AB (When using AC switching (B))

Note 1: The braking delay time is the time from the moment of turning off the switch to the start of braking, and is different from the braking time.
For the braking delay times by different connection methods, refer to page 511.
If you require braking time information, refer to the material for calculating braking times on page 476.

Note 2: When using an inverter, be sure to instruct under “AC switching (A)” at the time of placing an order. Please note that “AC switching (B)” and “DC Switching” cannot be used with an inverter. In addition, for precautions about the use of an inverter, refer to page 533.

Wiring Diagram of Built-in Rectifier of Gearmotors with Brake

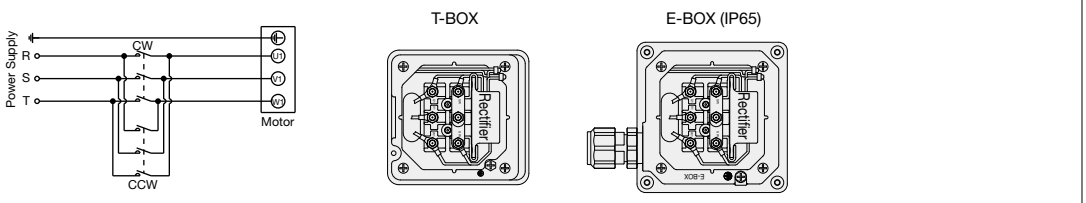
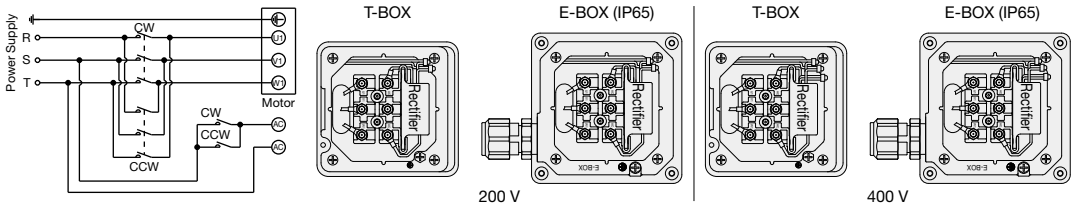
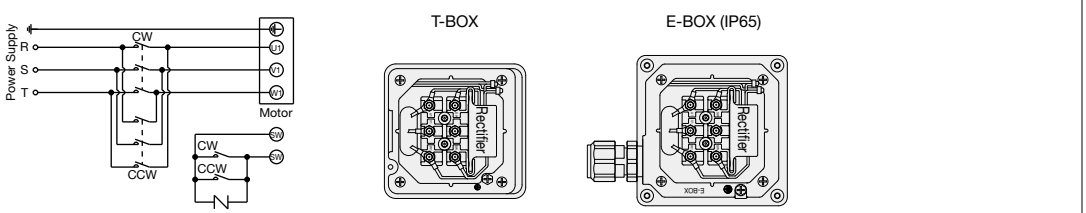
■ Rated Currents

The motor performance tables on pages 562 to 565 show the rated current of the motor alone. When a rectifier is built into the terminal box, the value of the current flowing to the brake must be considered. For more details, please contact your nearest Sales Office or the CS Center.

■ Precautions for Wiring

- The SW terminal or AC terminal are within the terminal box.
- Be sure to adopt “DC switching” when using the gearmotor for vertical operations (lifting).
- For a DC switching connection, please connect a surge suppressor (optional) between the contacts. For surge suppressors (optional), refer to page 531.
  (The varistor voltage is 423 V to 517 V in the case of a 200 V class brake or 820 V to 1000 V in the case of a 400 V class brake.)
- The brake voltage is 90 VDC in the case of a 200 V class brake and 180 VDC in the case of a 400 V class brake.
- The brake lead wires are the blue for 200 V class brake and yellow for 400 V class brake. The connection terminals on the terminal block are B1 and B2.
- When adopting a DC switching connection, use a contactor with a contact capacity for 110 VDC <220 VDC> or contact rating class DC13 in order to shut down the inductive load (DC coil). Please contact us for more details.
  * Contact rating class DC13 is a specification applicable to coil loads and a type defined in JIS C 8201-5-1 (Low-voltage switchgear and control gear).
  * The items in < > are for 400 V class brakes.
- The rectifier contains a diode and will become unusable if it is shorted due to, for example, improper wiring. Please be cautious
- For information and precautions involving the connection for using an inverter, refer to page 533.
- Please note that the power supply that can be used for type codes (supply voltage) “K,” and “C,” (types that show both 200 V class and 400 V class voltages on the nameplate) is different depending on the brake voltage type.
  A gearmotor with a 200 V class brake (brake model B2, J2, or V2: blue lead wires) can also be used with a 200 V class voltage. It cannot be operated with a 400 V class voltage.
  A gearmotor with a 400 V class brake (brake model B4, J4, or V4: yellow lead wires) can also be used with a 400 V class voltage. It cannot be operated with a 200 V class voltage.

■ Types and Connection Methods

Connection	3-Phase: 200 V Class/400 V Class
AC Switching (B)	 Note: The rectifier models are “A200-D90-UL” for the 200 V class and “A400-D180” for the 400 V class.
AC Switching (A)	 Note: The rectifier models are “A200-D90-UL” for the 200 V class and “A400-D180” for the 400 V class.
DC Switching	 Note: The rectifier models are “A200-D90-UL” for the 200 V class and “A400-D180” for the 400 V class.

-N-: Surge Suppressor (optional)

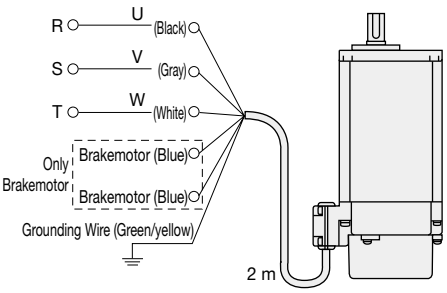
Wiring Diagram of IP65 Gearmotors

MINI Series

Lead Wires and Connections

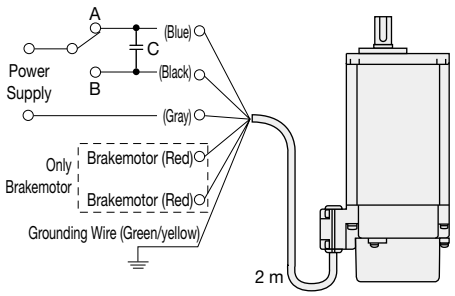
Note: For more information about brakemotor, refer to page 507.

● 3-Phase Motor



The rotational direction will be reversed by switching two of the U, V, and W wires.

● 1-Phase Motor



To reverse the rotational direction, switch A and B.

C: Capacitor

Note 1: A voltage that is almost double the motor supply voltage is applied between both terminals of the capacitor for Single-Phase motor. To ensure safety, please be sure to insulate the terminals.
Note 2: When stripping the sheath of the cabtyre cable, take care not to damage the wire inside.
Note 3: Please note that the cable is not a flexible cable (robot cable).
Note 4: When using the motor in a place where it will be exposed to water during operation, it is recommended to use an electrical leakage breaker to ensure safety.

■ Capacitor

A capacitor is absolutely required for the operation of a Single-phase motor. Upon use, please connect the included capacitor to the product.

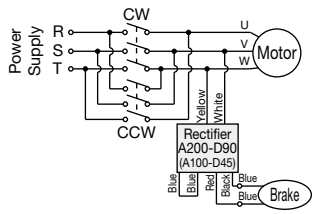
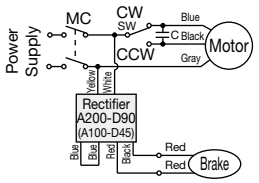
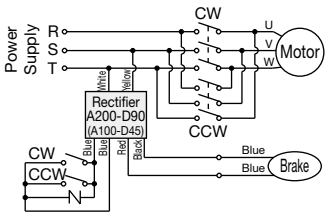
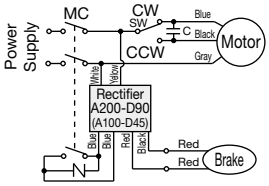
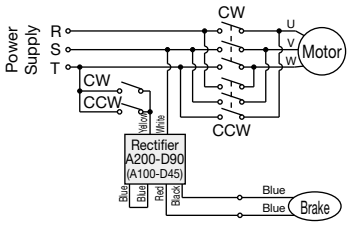
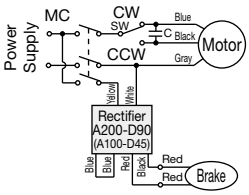
All Single-phase motors are connected by a reversible connection (three lead wires) and can therefore run in the CW and CCW directions as Three-phase motors do.

For the capacity of the capacitor, refer to the performance table. For the shape and dimensions of the capacitor, refer to page 492.

MINI Series

■ Precautions for Wiring

- Please utilize DC switching when using the gearmotor for vertical operation (lifting).
- For a DC switching connection, please connect a surge suppressor (optional) between the contacts. For surge suppressors (optional), refer to page 531.
- In the case of a Single-phase 100 V gearmotor, the input voltage of rectifier A200-D90 (A100-D45) is 100 VAC, and the output voltage is 45 VDC.
- Use switches of 110 VDC with a contact point rating of DC13 to block the inductive load of the DC coil when using DC switching connection.
  For more details, please contact your nearest Sales Office or the CS Center.
  When using noncontact relays, use ones equivalent to a rated voltage of 240 VAC (a half-wave rectification load can open and close).
  * Contact rating class DC13 is a specification applicable to coil loads and a type defined in JIS C 8201-5-1 (Low-voltage switchgear and control gear).
- Please note that the rectifier contains a diode which will become unusable if it is shorted out due to, for example, improper wiring.
- For information and precautions involving the connection for using an inverter, refer to page 533.

Connection	3-phase 15 W to 90 W	1-phase 15 W to 90 W
(1) AC Switching (B)	 Short the blue-blue wire connection on the rectifier.	 Short the blue-blue wire connection on the rectifier.
(2) DC Switching	 Short the blue-blue wire connection on the rectifier.	 Short the blue-blue wire connection on the rectifier.
(3) AC Switching (A)	 Short the blue-blue wire connection on the rectifier.	 Short the blue-blue wire connection on the rectifier.

SW: CW/CCW Switch C: Capacitor MC: Magnetic Contactor -N- : Surge Suppressor (optional)

Wiring Diagram of IP65 Gearmotors with Brake

MID Series (3-Phase)

■ Gearmotors Connection (Brakemotors)

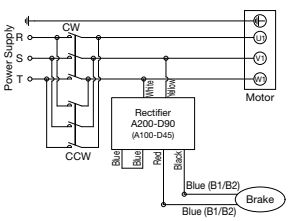
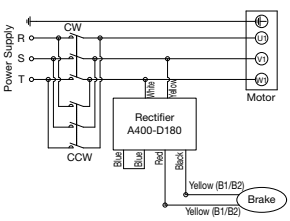
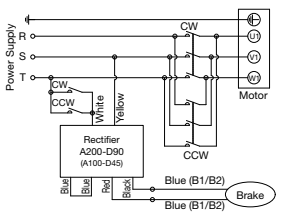
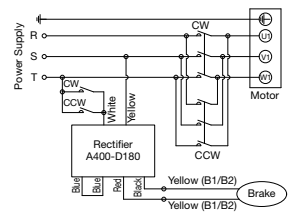
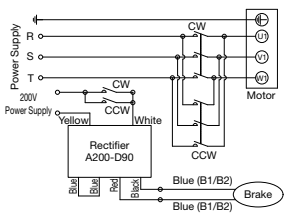
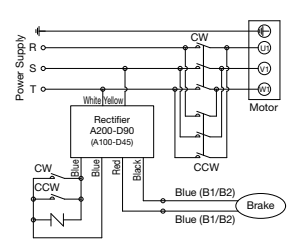
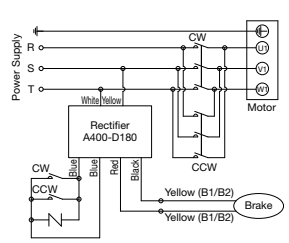
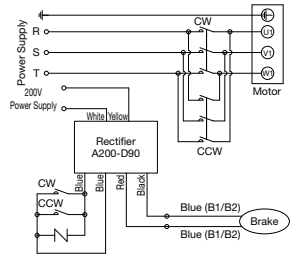
Connect the wires of a gearmotor with a brake as shown below. The rotational direction of the output shaft by the connection described below is shown in the performance table for each series.

* For more information about the voltage codes, refer to page 541.
* For the wiring diagrams of gearmotors without a brake, refer to page 493.

■ Precautions for Wiring

- Be sure to adopt “DC switching” when using the gearmotor for vertical operations (lifting).
- For a DC switching connection, please connect a surge suppressor (optional) between the contacts. For surge suppressors (optional), refer to page 531.
  (The varistor voltage is 423 V to 517 V in the case of a 200 V class brake or 820 V to 1000 V in the case of a 400 V class brake.)
- The brake voltage is 90 VDC in the case of a 200 V class brake and 180 VDC in the case of a 400 V class brake.
- The brake lead wires are the blue lead wires in the case of a 200 V class brake or the yellow lead wires in the case of a 400 V class brake.
- When adopting a DC switching connection, use a contactor with a contact capacity for 110 VDC <220 VDC> or contact rating class DC13 in order to shut down the inductive load (DC coil).
  Please contact us for more details.
  * Contact rating class DC13 is a specification applicable to coil loads and a type defined in JIS C 8201-5-1 (Low-voltage switchgear and control gear). * The items in < > are for 400 V class brakes.
- The rectifier contains a diode and will become unusable if it is shorted due to, for example, improper wiring. Please be cautious.
- For information and precautions involving the connection for using an inverter, refer to page 533.

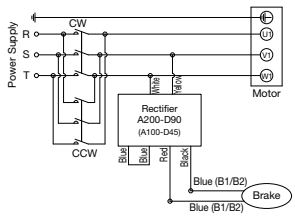
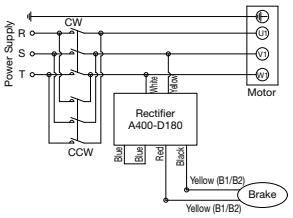
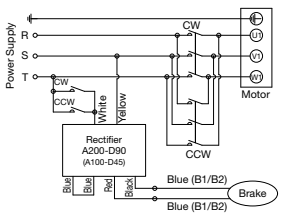
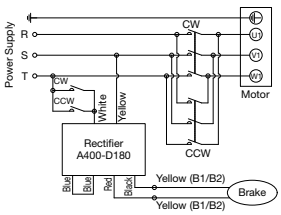
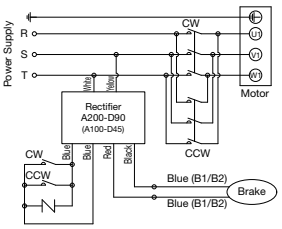
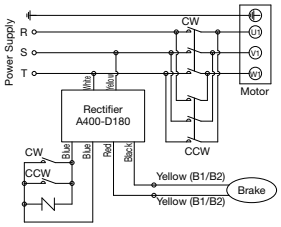
■ Lead Wires: 3 Lead Wires Type

Voltage Codes	NN	WN	EN	MA
Voltage/ Frequency	200 V/50 Hz, 200 V/60 Hz, 220 V/60 Hz	380 V/50 Hz, 400 V/50 Hz 400 V/60 Hz, 440 V/60 Hz	415 V/50 Hz, 440 V/50 Hz 480 V/60 Hz	575 V/60 Hz
AC Switching (B)	 Short the blue-blue wire connection on the rectifier (A200-D90-UL).	 Short the blue-blue wire connection on the rectifier (A400-D180).		
AC Switching (A)	 Short the blue-blue wire connection on the rectifier (A200-D90-UL).	 Short the blue-blue wire connection on the rectifier (A400-D180).		 Short the blue-blue wire connection on the rectifier (A200-D90-UL).
DC Switching	 –N– : Surge Suppressor OP-ERZV10D471 (Optional)	 –N– : Surge Suppressor OP-ERZV10D911 (Optional)		 –N– : Surge Suppressor OP-ERZV10D471 (Optional)

Note: Use the included nuts for the connection.

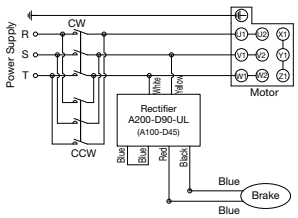
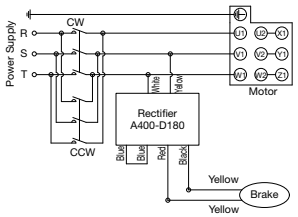
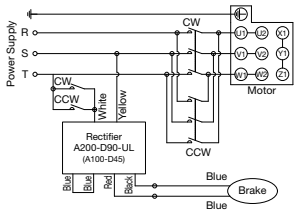
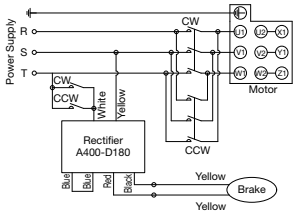
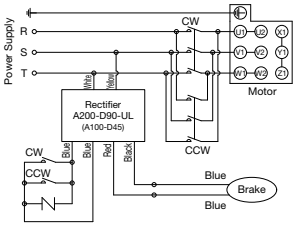
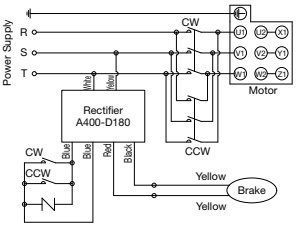
Wiring Diagram of IP65 Gearmotors with Brake

■ Lead Wires: 6 Lead Wires Type

Voltage Codes	KN (Dual Voltage) CN (Dual Voltage)	
Voltage/ Frequency	220 V/60 Hz, 220 V/50 Hz, 230 V/50 Hz	380 V/60 Hz, 380 V/50 Hz
AC Switching (B)	 Short the blue-blue wire connection on the rectifier (A200-D90-UL).	 Short the blue-blue wire connection on the rectifier (A400-D180).
AC Switching (A)	 Short the blue-blue wire connection on the rectifier (A200-D90-UL).	 Short the blue-blue wire connection on the rectifier (A400-D180).
DC Switching	 –N– : Surge Suppressor OP-ERZV10D471 (Optional)	 –N– : Surge Suppressor OP-ERZV10D911 (Optional)

Note: Use the included nuts for the connection.
Note: The B1 and B2 terminals are within the terminal box.

■ Lead Wires: 9 Lead Wires Type

Voltage Codes	AN (Dual Voltage)	
Voltage/ Frequency	208 V/60 Hz, 230 V/60 Hz	460 V/60 Hz, 400 V/50 Hz
AC Switching (B)	 Short the blue-blue wire connection on the rectifier (A200-D90-UL).	 Short the blue-blue wire connection on the rectifier (A400-D180).
AC Switching (A)	 Short the blue-blue wire connection on the rectifier (A200-D90-UL).	 Short the blue-blue wire connection on the rectifier (A400-D180).
DC Switching	 –N– : Surge Suppressor OP-ERZV10D471 (Optional)	 –N– : Surge Suppressor OP-ERZV10D911 (Optional)

Note: Use the included nuts and short board for the connection.
Note: The brake lead wires are drawn into the terminal box, but are not fixed to the terminal block.

Braking Delay Time: ta

The length of time (in seconds) it takes for the brake to activate after the motor is turned off.
(different from the braking time.)

■ Standard Motor

[Table-1]

Series	Number of Phases	Motor Power	DC Switching	AC Switching (A)	AC Switching (B)
MINI	3-Phase	15 W to 90 W	0.005 to 0.015	0.03 to 0.10	0.1 to 0.2
	1-Phase				
MID	3-Phase	0.1 kW to 0.75 kW	0.005 to 0.020	0.05 to 0.15	0.15 to 0.25
		1.5 kW to 2.2 kW	0.015 to 0.030	0.15 to 0.30	0.5 to 0.6
	1-Phase	0.1 kW to 0.2 kW	0.005 to 0.015	0.03 to 0.10	0.1 to 0.2
		0.4 kW	0.005 to 0.015	0.08 to 0.20	0.2 to 0.4

■ IP65 Motor

[Table-2]

Series	Number of Phases	Motor Power	DC Switching	AC Switching (A)	AC Switching (B)
MINI	3-Phase	15 W to 90 W	0.01 to 0.02	0.05 to 0.15	0.1 to 0.2
	1-Phase				
MID	3-Phase	0.1 kW to 0.75 kW	0.005 to 0.015	0.03 to 0.13	0.1 to 0.3

Terminal Box

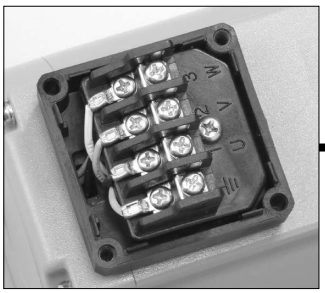
A terminal box can be mounted. If required, please inform us when placing an order.

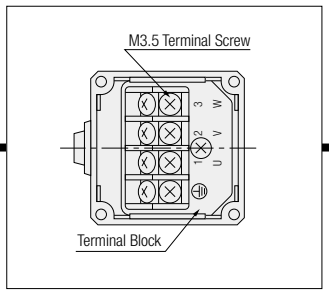
Standard Gearmotors

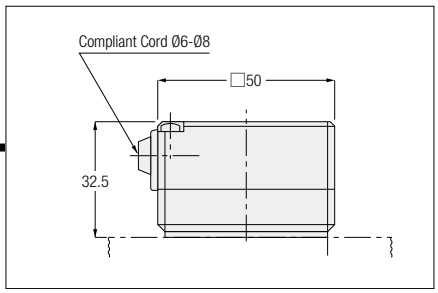
MINI Series

■ T Type Terminal Box

3-Phase 200 V and 400 V/1-Phase 100 V and 200 V

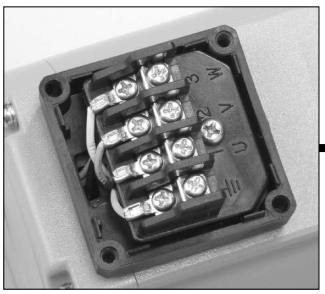


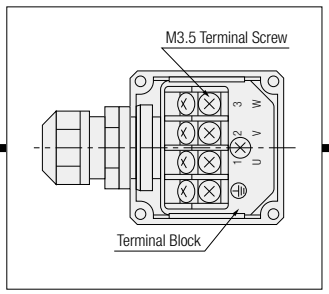


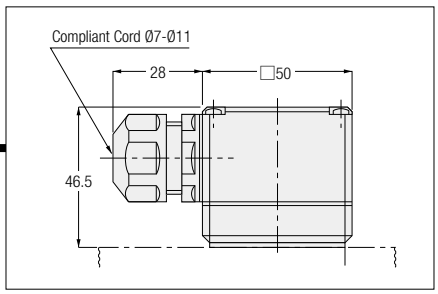


■ K Type Terminal Box

3-Phase 200 V and 400 V/1-Phase 100 V and 200 V





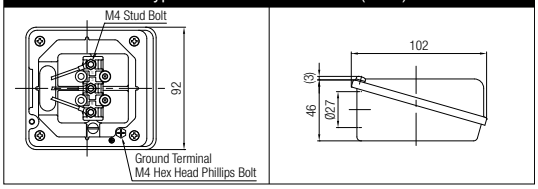


MID Series (3-Phase)

■ Lead Wires: 3 Lead Wires Type

Terminal Box Details and Demensions

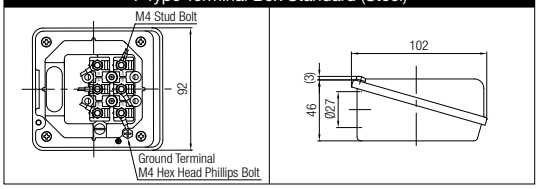
T Type Terminal Box Standard (Steel)



■ Lead Wires: 6 Lead Wires Type

Terminal Box Details and Demensions

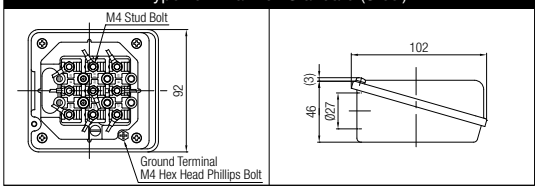
T Type Terminal Box Standard (Steel)



■ Lead Wires: 9 Lead Wires Type

Terminal Box Details and Demensions

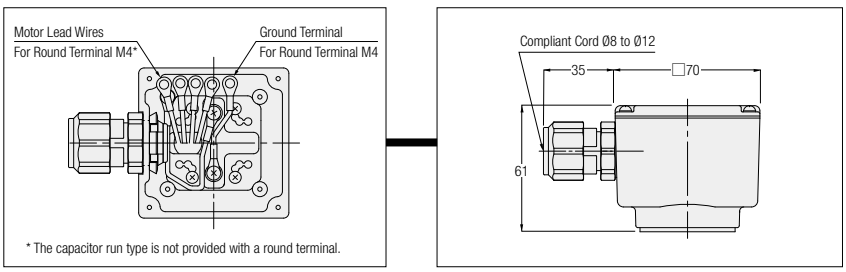
T Type Terminal Box Standard (Steel)



MID Series (1-Phase)

■ A Type Terminal Box (Aluminum)

1-Phase/Standard Voltage and High Voltage (200 V Class): 0.1 kW to 0.4 kW



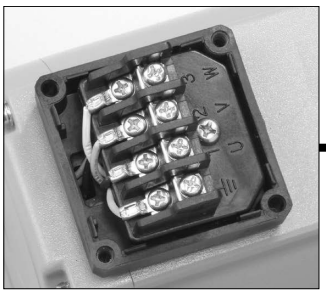
Note: The figure is a representative figure, and the shape of the terminals may differ.

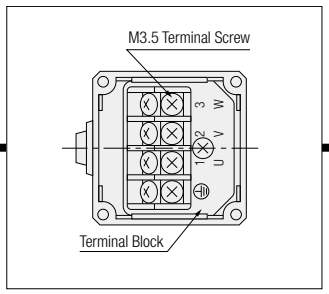
Gearmotors with Brake

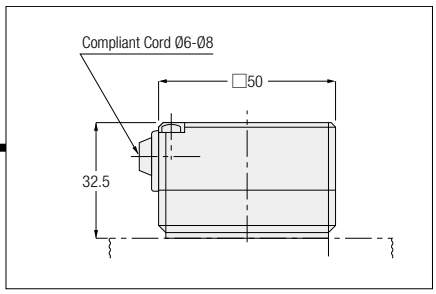
MINI Series

■ T Type Terminal Box

3-Phase 200 V and 400 V/1-Phase 100 V and 200 V

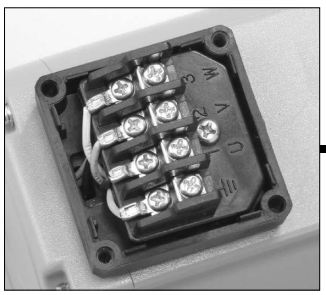


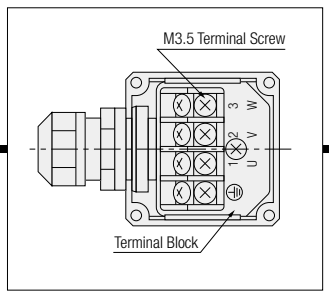


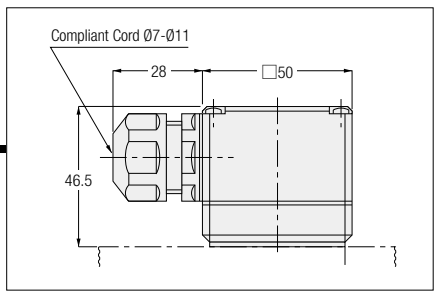


■ K Type Terminal Box

3-Phase 200 V and 400 V/1-Phase 100 V and 200 V

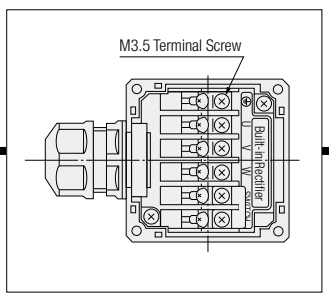


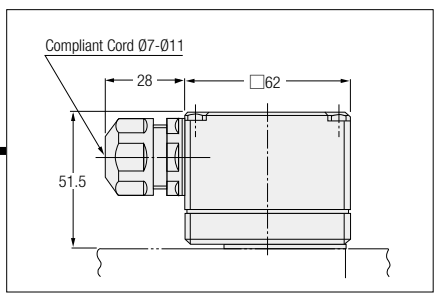




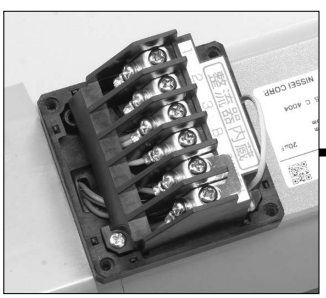
■ C Type Terminal Box (With Built-in Rectifier)

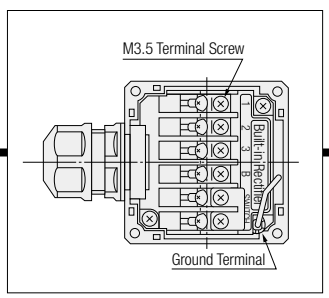
3-Phase 200 V and 400 V

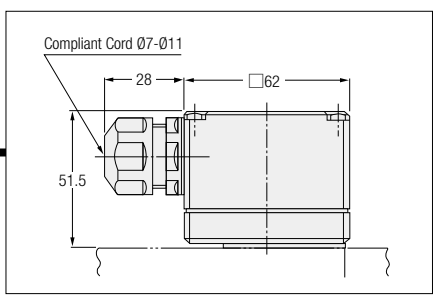




1-Phase 100 V and 200 V



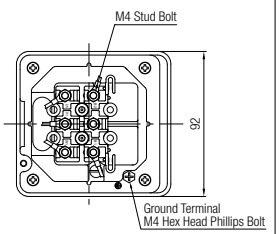
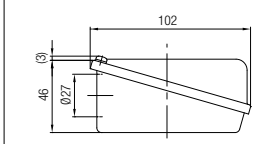
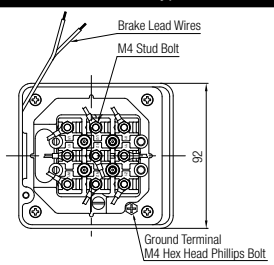
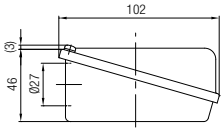




MID Series (3-Phase)

■ Terminal Box Structure and Outline Dimensions (Brakemotor)

The brake lead wires are drawn into the terminal box. The rectifier is not built in.
A rectifier can be contained in the switchboard or wired according to your specifications. A rectifier is included with the motor. Please select a connection method from the wiring diagram on page 499 to 501 to connect the wires of the rectifier.

Gearmotor with Brake Terminal Box Details and Dimensions	
Type Codes (Supply Voltage) N, W, K, C, E, M	Type Code (Supply Voltage) A
T Type Terminal Box Standard (Steel)	T Type Terminal Box Standard (Steel)
 The brake lead wires are fixed to the terminal block (B1/B2).	
 The brake lead wires are not fixed to the terminal block.	

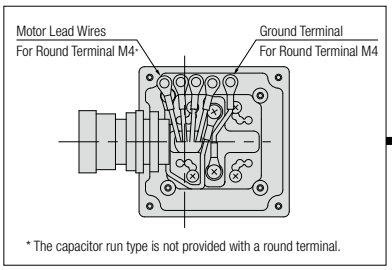
Note: For more information about the type codes (supply voltage), refer to page 541.

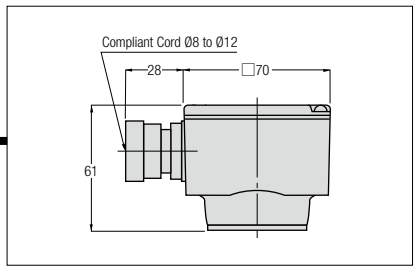
Note: When the type code (supply voltage) is “K” or “C,” please note that the available power supply is different depending on the brake voltage type.
A gearmotor with a 200 V class brake (brake model B2, J2, or V2: blue lead wires) can also be used with a 200 V class voltage. It cannot be operated with a 400 V class voltage.
A gearmotor with a 400 V class brake (brake model B4, J4, or V4: yellow lead wires) can also be used with a 400 V class voltage. It cannot be operated with a 200 V class voltage.

MID Series (1-Phase)

■ A Type Terminal Box (Aluminum)

1-Phase/Standard Voltage and High Voltage (200 V Class): 0.1 kW to 0.4 kW



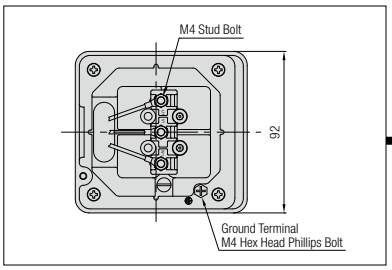


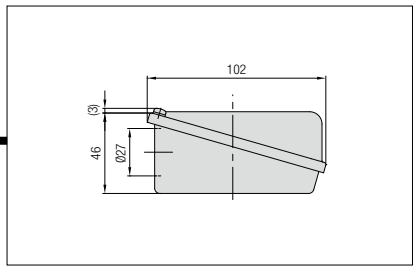
Note: The figure is a representative figure, and the shape of the terminals may differ.

MID Series (Clutch/Brake)

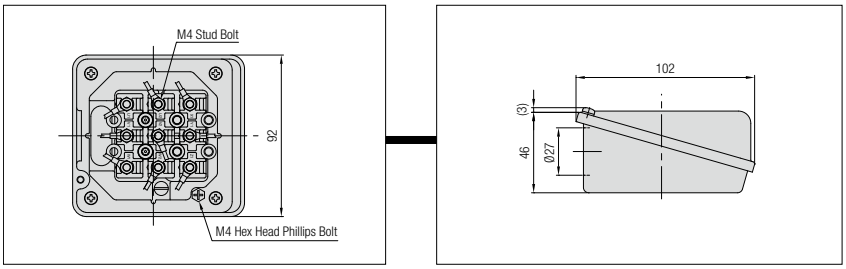
■ T Type Terminal Box (Steel Plate)

3-Phase/Standard Voltage: 0.1 kW to 0.75 kW





3-Phase/High Voltage (400 V Class): 0.1 kW to 0.75 kW

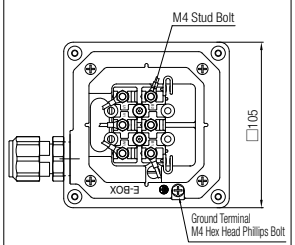
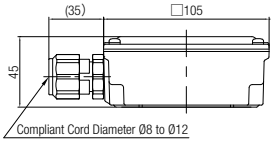
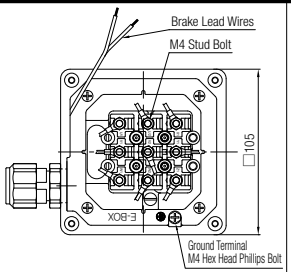
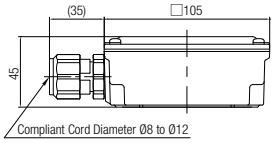


IP65 Gearmotors

MID Series

■ Terminal Box Structure and Outline Dimensions (Brakemotor)

The brake lead wires are drawn into the terminal box. The rectifier is not built in.
A rectifier can be contained in the switchboard or wired according to your specifications. A rectifier is included with the motor. Please select a connection method from the wiring diagram on page 508 to 510 to connect the wires of the rectifier.

Gearmotor with Brake Terminal Box Details and Dimensions	
Type Codes (Supply Voltage) N, W, K, C, E, M	Type Code (Supply Voltage) A
E Type Terminal Box IP65 (Aluminum)	E Type Terminal Box IP65 (Aluminum)
  The brake lead wires are fixed to the terminal block (B1/B2).	  The brake lead wires are not fixed to the terminal block.

Note: For more information about the type codes (supply voltage), refer to page 541.

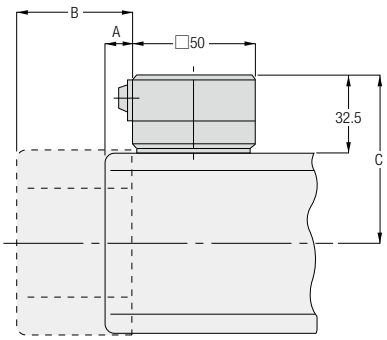
Note 1: When the type code (supply voltage) is “K” or “C,” please note that the available power supply is different depending on the brake voltage type.
A gearmotor with a 200 V class brake (brake model B2, J2, or V2: blue lead wires) can also be used with a 200 V class voltage.
It cannot be operated with a 400 V class voltage.
A gearmotor with a 400 V class brake (brake model B4, J4, or V4: yellow lead wires) can also be used with a 400 V class voltage.
It cannot be operated with a 200 V class voltage.

Terminal Box Dimensions and Positions

MINI Series

Standard gearmotors are not provided with a terminal box.
A terminal box can be mounted if required. Please inform us when placing an order.

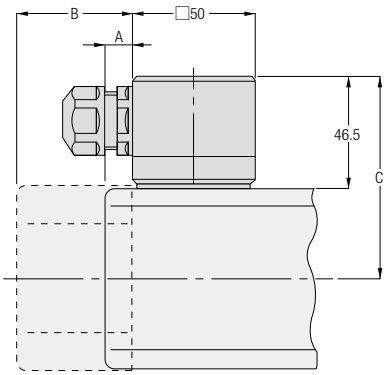
■ T Type Terminal Box



Type	Frame Size	A	B	C
G	12, 22	11.5	49.5	70.5
H	15, 22			
F2 (F2S)	12			
F2 (F2F)	15			
G	15, 28, 32	11.5	48	77.5
H	18, 28, 32			
F2 (F2S)	15			
F2 (F2F)	18			
G	18, 40	11.5	48.5	85.5
H	40			

Note 1: The A Type is not provided with a fan. The dimensions of the B Type are those of a gearmotor with a fan.

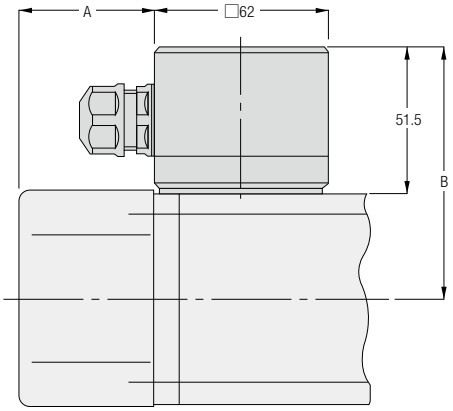
■ K Type Terminal Box



Type	Frame Size	A	B	C
G	12, 22	11.5	49.5	84.5
H	15, 22			
F2 (F2S)	12			
F2 (F2F)	15			
G	15, 28, 32	11.5	48	91.5
H	18, 28, 32			
F2 (F2S)	15			
F2 (F2F)	18			
G	18, 40	11.5	48.5	99.5
H	40			

Note 1: The A Type is not provided with a fan. The dimensions of the B Type are those of a gearmotor with a fan.

■ C Type Terminal Box (Only Gearmotors with Brake)

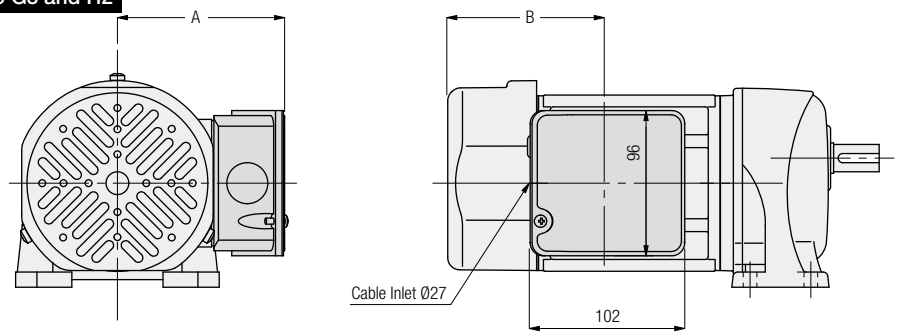


Type	Frame Size	A	B
G	12, 22	49.5	89.5
H	15, 22		
F2 (F2S)	12		
F2 (F2F)	15		
G	15, 28, 32	48	96.5
H	18, 28, 32		
F2 (F2S)	15		
F2 (F2F)	18		
G	18, 40	48.5	104.5
H	40		

MID Series (3-Phase) <G3 Type, H2 Type>

A terminal box is provided as a standard item.

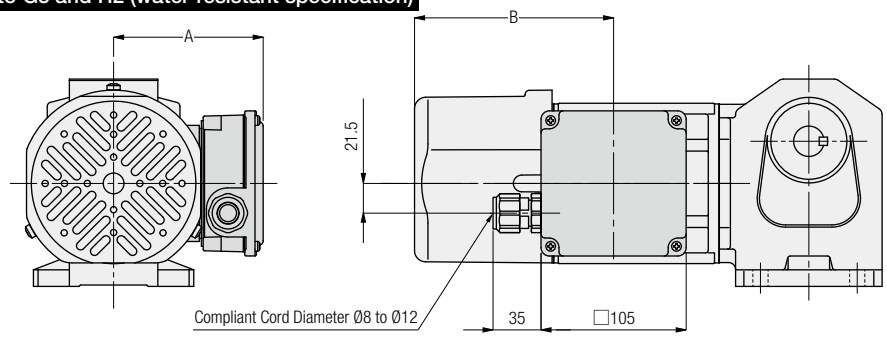
Common to G3 and H2



Motor Power	Box Type	Common through all Series			Positional Change of the Terminal Box
		A	B		
			Non-Brake	Brakemotor	
0.1 kW	T	110	52.5	92.5	90 ° Division
0.2 kW	T	110	52.5	103	90 ° Division
0.4 kW	T	117	85.5	105.5	90 ° Division
0.75 kW	T	132	89.5	109.5	90 ° Division
1.5 kW	T	139	108.5	137.5	90 ° Division
2.2 kW	T	149	109	138	90 ° Division

Note 1: The figure above illustrates the standard position of the terminal box. If you want to change the position of the terminal box, please inform us when placing an order. Refer to page 524.
Note 2: The figure is a representative figure, and the shape of the motor may differ.

Common to G3 and H2 (water-resistant specification)



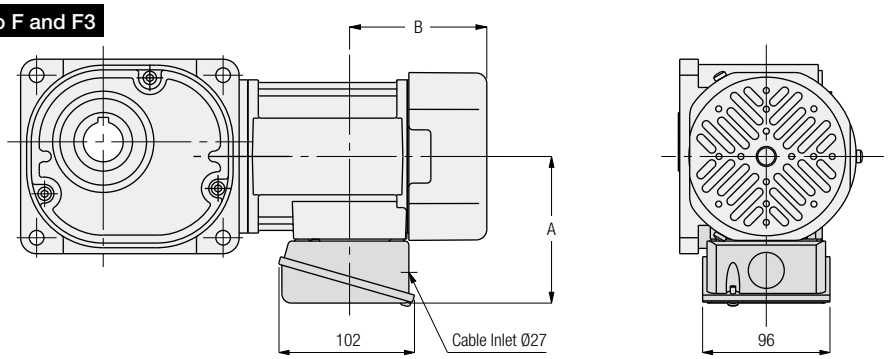
Motor Power	Box Type	Common through all Series			Positional Change of the Terminal Box
		A	B		
			Non-Brake	Brakemotor	
0.1 kW	E	108.5	53.5	115	90 ° Division
0.2 kW	E	108.5	53.5	144	90 ° Division
0.4 kW	E	115.5	85.5	146.5	90 ° Division
0.75 kW	E	130.5	89.5	150.5	90 ° Division
1.5 kW	E	137.5	108.5	–	90 ° Division
2.2 kW	E	147.5	109	–	90 ° Division

Note 1: The figure above illustrates the standard position of the terminal box. If you want to change the position of the terminal box, please inform us when placing an order. Refer to page 524.
Note 2: The figure is a representative figure, and the shape of the motor may differ.

MID Series (3-Phase) <F Type, F3 Type>

A terminal box is provided as a standard item.

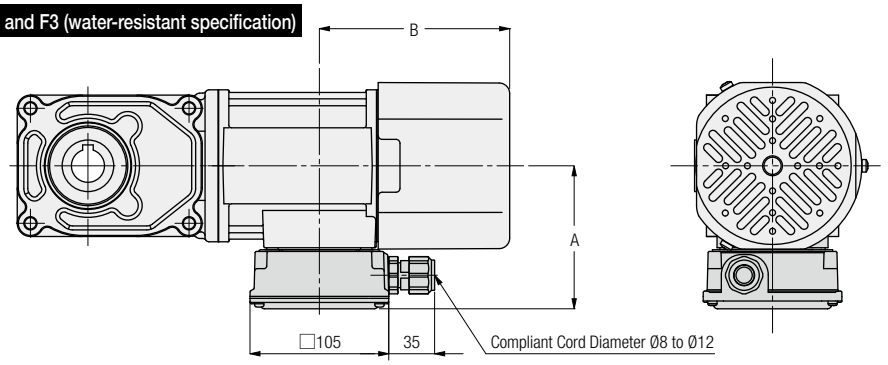
Common to F and F3



Motor Power	Box Type	Common through all Series			Positional Change of the Terminal Box
		A	B		
			Non-Brake	Brakemotor	
0.1 kW	T	110	52.5	92.5	90 ° Division
0.2 kW	T	110	52.5	103	90 ° Division
0.4 kW	T	117	85.5	105.5	90 ° Division
0.75 kW	T	132	89.5	109.5	90 ° Division
1.5 kW	T	139	108.5	137.5	90 ° Division
2.2 kW	T	149	109	138	90 ° Division

Note 1: The figure above illustrates the standard position of the terminal box. If you want to change the position of the terminal box, please inform us when placing an order. Refer to page 525.
Note 2: The figure is a representative figure, and the shape of the motor may differ.

Common to F and F3 (water-resistant specification)



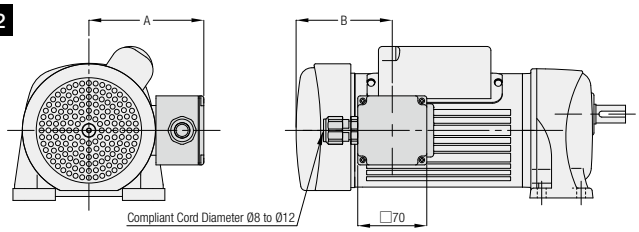
Motor Power	Box Type	Common through all Series			Positional Change of the Terminal Box
		A	B		
			Non-Brake	Brakemotor	
0.1 kW	E	108.5	53.5	115	90 ° Division
0.2 kW	E	108.5	53.5	144	90 ° Division
0.4 kW	E	115.5	85.5	146.5	90 ° Division
0.75 kW	E	130.5	89.5	150.5	90 ° Division
1.5 kW	E	137.5	108.5	–	90 ° Division
2.2 kW	E	147.5	109	–	90 ° Division

Note 1: The figure above illustrates the standard position of the terminal box. If you want to change the position of the terminal box, please inform us when placing an order. Refer to page 525.
Note 2: The figure is a representative figure, and the shape of the motor may differ.

MID Series (1-Phase) <G3 Type, H2 Type>

A terminal box is provided as a standard item.

Common to G3 and H2

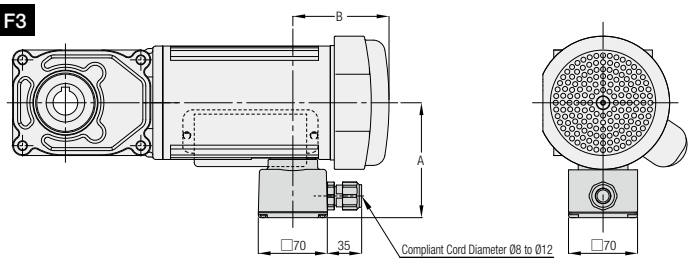


Motor Power	Box Type	Common through all Series			Positional Change of the Terminal Box
		A	B		
			Non-Brake	Brakemotor	
0.1 kW	A	116.5	50 (85) (Note 1)	100.5 (87.5) (Note 1)	90 ° Division
0.2 kW	A	116.5	87	97.5	90 ° Division
0.4 kW	A	131.5	110.5	119	90 ° Division

Note 1: The values in the parentheses are those of the H2 Type.
Note 2: The figure above illustrates the standard position of the terminal box. If you want to change the position of the terminal box, please inform us when placing an order. Refer to page 526.
Note 3: The figure is a representative figure, and the shape of the motor and that of the fan cover may differ.

MID Series (1-Phase) <F Type, F3 Type>

Common to F and F3



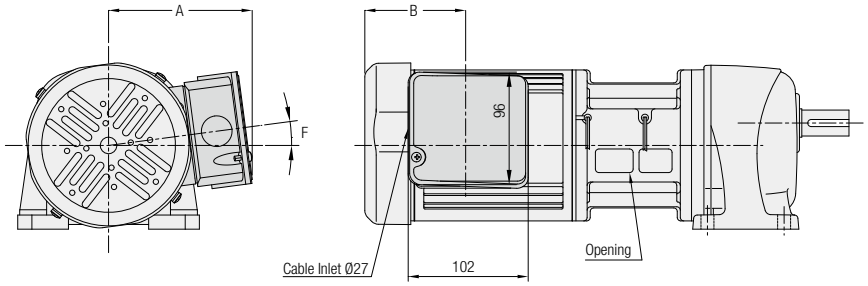
Motor Power	Box Type	Common through all Series			Positional Change of the Terminal Box
		A	B		
			Non-Brake	Brakemotor	
0.1 kW	A	116.5	85	87.5	90 ° Division
0.2 kW	A	116.5	87	97.5	90 ° Division
0.4 kW	A	131.5	110.5	119	90 ° Division

Note 1: The figure above illustrates the standard position of the terminal box. If you want to change the position of the terminal box, please inform us when placing an order. Refer to page 527.
Note 1: The figure is a representative figure, and the shape of the motor and that of the fan cover may differ.

MID Series (Clutch/Brake) <G3 Type, H2 Type>

A terminal box is provided as a standard item.

Common to G3 and H2



Motor Power	Box Type	Common through all Series			Positional Change of the Terminal Box
		A	B	F	
0.1 kW	T	110	52.5	0 °	90 ° Division
0.2 kW	T	110	52.5	0 °	90 ° Division
0.4 kW	T	121	85.5	7.5 °	90 ° Division
0.75 kW	T	136	89.5	7.5 °	90 ° Division

Note 1: The figure above illustrates the standard position of the terminal box. If you require a change the position of the terminal box, please inform us upon placing an order. Refer to page 526.
Note 2: The figure is a representative figure, and the shape of the motor and that of the fan cover may differ.
Note 3: If the position of the terminal box is changed, the clutch lead wire will be set in the same position and direction as the terminal box. Make sure no foreign substances etc. enter the opening of the clutch brake.

Positional Change of the Terminal Box

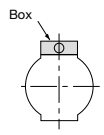
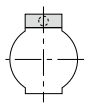
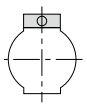
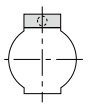
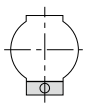
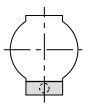
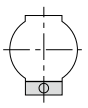
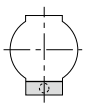
How to instruct change of: Lead wire type, position of the terminal box or the cabtyre cable

If you want to use lead wires, a terminal box, and cabtyre cables (water-resistant specification) in positions other than the standard mounting positions, you may order the change with the appropriate code shown in the table below.

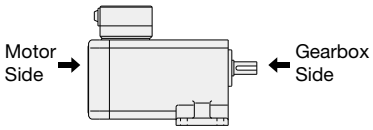
Model name example:GLM-12-20-T25 ⇒ T (Lower) Hole (Load-side) GLM-12-20-T25XT6X3

MINI Series

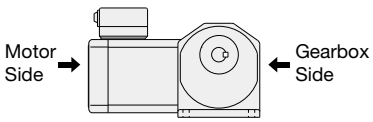
■ Order Method

Standard Specification		Water Resistant Specification	
Lead Wire Type/With Terminal Box		Cabtyre Cable Type	
Change of the lead wire box position		Changes of the cable position and the cable lead-in position	
 Standard	 Hole (Load-side)	 Standard	 Hole (Load-side)
Standard	H3	Standard	H3
 T (Lower)	 T (Lower) Hole (Load-side)	 T (Lower)	 T (Lower) Hole (Load-side)
T6	T6 H3	T6	T6 H3

● G Type



● H Type



Note 1: All diagrams are viewed from the motor side of the gearmotor.
Note 2: No option specification required for standard models.
Note 3: It is not necessary to designate the position of the T shaft for F2S (right angle hollow bore) and for F2F (right angle shaft) because they are symmetrical in design. (double flange mount).

● Definition of Designations

- "T" represents the lead wire, terminal box, or cabtyre cable.
- "Hole" represents a cabtyre cable inlet.

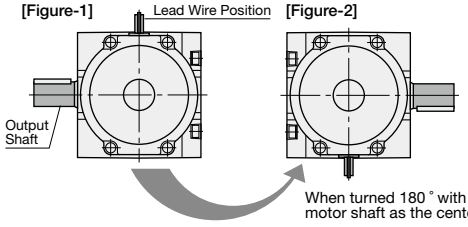
Regarding changes of the lead wire type and the position of the terminal box of the F2 Type F2F (right angle shaft)

The L shaft of the F2F (concentric right angle shaft) is as shown in [Figure-1]. The F2 type is designed for concentric flange mounting on both sides, and the output shaft can therefore be positioned on the right side as shown in [Figure-2] by rotating the gearmotor to 180 °. In this case, however, the lead wires will be in the lower position. If you want to set the lead wires in the upper position for the convenience of use, you may place an order for the lead wire at the lower position (option code "T6") for a standard product [Figure-1]. By rotating the gearmotor to 180 ° in this state, the output shaft will be positioned on the right side with the lead wires in the upper position. This also applies to gearmotors with a terminal box.

Figure when viewed from the motor side

When the output shaft is an L shaft and the lead wires are in the upper position, the output shaft is on the left side when viewed from the motor side.

[Figure-1] Lead Wire Position [Figure-2]



Method for Ordering a Positional Change of the Terminal Box

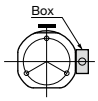
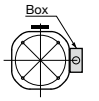
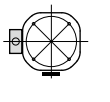
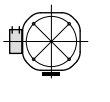
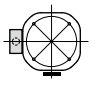
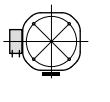
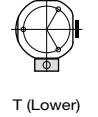
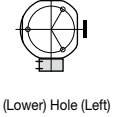
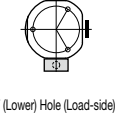
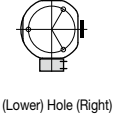
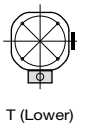
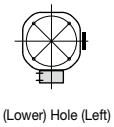
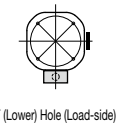
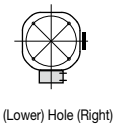
MID Series (3-Phase) <G3 Type, H2 Type>

If you use the terminal box in a position other than the standard position, you may order the change with the appropriate code shown in the table below.

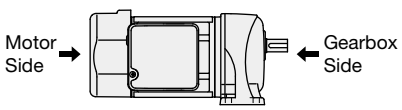
Model name example: Standard specification G3L28N30-MM04TNNTB2 ⇒ T (Upper) Hole (Right) G3L28N30-MM04TNNTB2XTZH6

* The specifications marked with ▲ do not support some models. For more information, please see the precautions of Positional Change of the Terminal Box on page 528.

■ Order Method

	Motor Power 3-Phase 0.1 kW/0.2 kW				Motor Power 3-Phase 0.4 kW to 2.2 kW			
Design	 Standard	 Hole (Lower)	 Hole (Load-side)	 Hole (Upper)	 Standard	 Hole (Lower)	 Hole (Load-side)	 Hole (Upper)
Option Code	Standard	H6	H3 ▲	HZ	Standard	H6	H3	HZ
Design	 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)
Option Code	TZ	TZ H6	TZ H3 ▲	TZ HZ	TZ	TZ H6	TZ H3	TZ HZ
Design	 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)
Option Code	T9	T9 H6	T9 H3 ▲	T9 HZ	T9	T9 H6	T9 H3	T9 HZ
Design	 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)
Option Code	T6 ▲	T6 H6 ▲	T6 H3 ▲	T6 HZ ▲	T6 ▲	T6 H6 ▲	T6 H3 ▲	T6 HZ ▲

Note 1: All diagrams are viewed from the motor side of the gearmotor.
Note 2: No option specification required for standard models.
Note 3: Please note that structurally, the terminal box's position cannot be changed by the customer. If you require a change in position of the terminal box, be sure to place an order with the appropriate code shown in the figure above. However, the hole positions of the terminal box may be changed.
Note 4: For only 0.2 kW G3 Type with frame size 28, the terminal box will be displaced by 17 degrees from the center in the clockwise direction when its position is "TZ (upper)" or "T6 (lower)." Please note that the terminal box will not be positioned on the top or bottom face.
Note 5: The bold line ▬ indicates the attachment position of the nameplate. Please note that depending on the mounting position/orientation, the nameplate may be difficult to see. If the attachment position is inconvenient, the nameplate may be attached at a different position upon request. For more details, please contact your nearest Sales Office or the CS Center.



- The gearbox side hole and the motor side hole will always be set in the positions "3" and "9," respectively, regardless of the position of the terminal box.

● Definition of Designations

- "T" represents the terminal box.
- "Hole" represents the power supply inlet hole.

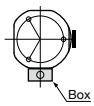
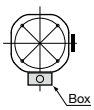
MID Series (3-Phase) <F Type, F3 Type>

If you use the terminal box in a position other than the standard position, you may order the change with the appropriate code shown in the table below.

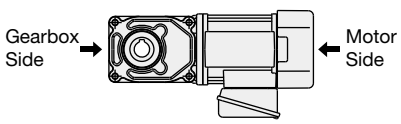
Model name example: Standard specification F3S25N30-MM02TNNTB2 ⇒ T (Upper) Hole (Right) F3S25N30-MM02TNNTB2XTZH6

*The specifications marked with ▲ do not support some F Type models. Please note that for some models of the F3 Type, the cable outlet is close to the mounting surface, and must be checked in advance. For more information, please see the precautions of Positional Change of the Terminal Box on page 528.

■ Order Method

	Motor Power 3-Phase 0.1 kW/0.2 kW				Motor Power 3-Phase 0.4 kW to 2.2 kW			
Design	 Standard	 Hole (Left)	 Hole (Load-side)	 Hole (Right)	 Standard	 Hole (Left)	 Hole (Load-side)	 Hole (Right)
Option Code	Standard	H6	H3	HZ	Standard	H6	H3	HZ
Design	 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)
Option Code	T3	T3 H6	T3 H3 ▲	T3 HZ	T3	T3 H6	T3 H3	T3 HZ
Design	 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)
Option Code	TZ	TZ H6	TZ H3	TZ HZ	TZ	TZ H6	TZ H3	TZ HZ
Design	 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)
Option Code	T9	T9 H6	T9 H3 ▲	T9 HZ	T9	T9 H6	T9 H3	T9 HZ

Note 1: All diagrams are viewed from the motor side of the gearmotor.
Note 2: No option specification required for standard models.
Note 3: Please note that structurally, the terminal box's position cannot be changed by the customer. If you require a change in position of the terminal box, be sure to place an order with the appropriate code shown in the figure above. However, the hole positions of the terminal box may be changed.
Note 4: The bold line ▬ indicates the attachment position of the nameplate. Please note that depending on the mounting position/orientation, the nameplate may be difficult to see. If the attachment position is inconvenient, the nameplate may be attached at a different position upon request. For more details, please contact your nearest Sales Office or the CS Center.



- The gearbox side hole and the motor side hole will always be set in the positions "3" and "9," respectively, regardless of the position of the terminal box.

● Definition of Designations

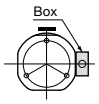
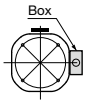
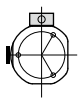
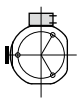
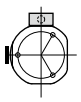
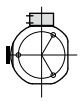
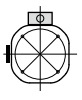
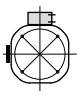
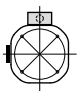
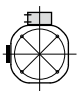
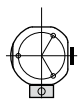
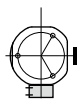
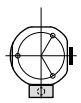
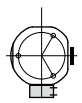
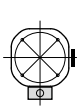
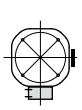
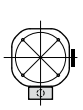
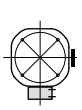
- "T" represents the terminal box.
- "Hole" represents the power supply inlet hole.

MID Series (Clutch/Brake, 1-Phase) <G3 Type, H2 Type>

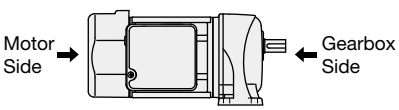
If you use the terminal box in a position other than the standard position, you may order the change with the appropriate code shown in the table below.

Model name example: Standard specification G3L28N30-EM04TNJTN ⇒ T (Upper) Hole (Right) G3L28N30-EM04TNJTN<u>XTZH6</u>

■ Order Method

	Motor Power 3-Phase 0.1 kW/0.2 kW 1-Phase 0.1 kW/0.2 kW				Motor Power 3-Phase 0.4 kW/0.75 kW 1-Phase 0.4 kW			
Design	 Standard	 Hole (Lower)	 Hole (Load-side)	 Hole (Upper)	 Standard	 Hole (Lower)	 Hole (Load-side)	 Hole (Upper)
Option Code	Standard	H6	H3	HZ	Standard	H6	H3	HZ
Design	 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)
Option Code	TZ	TZ H6	TZ H3	TZ HZ	TZ	TZ H6	TZ H3	TZ HZ
Design	 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)
Option Code	T9	T9 H6	T9 H3	T9 HZ	T9	T9 H6	T9 H3	T9 HZ
Design	 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)
Option Code	T6	T6 H6	T6 H3	T6 HZ	T6	T6 H6	T6 H3	T6 HZ

Note 1: All diagrams are viewed from the motor side of the gearmotor.
Note 2: No option specification required for standard models.
Note 3: Please note that structurally, the terminal box's position cannot be changed by the customer. If you require a change in position of the terminal box, be sure to place an order with the appropriate code shown in the figure above. However, the hole positions of the terminal box may be changed.
Note 4: For only 0.2 kW G3 Type with frame size 28, the terminal box will be displaced by 17 degrees from the center in the clockwise direction when its position is "TZ (upper)" or "T6 (lower)." Please note that the terminal box will not be positioned on the top or bottom face.
Note 5: The bold line ▬ indicates the attachment position of the nameplate. Please note that depending on the mounting position/orientation, the nameplate may be difficult to see. If the attachment position is inconvenient, the nameplate may be attached at a different position upon request. For more details, please contact your nearest Sales Office or the CS Center.
Note 6: Single-phase capacitor start type rotates alongside with the terminal box. Check the device etc. for interference in advance. For more details, please contact your nearest Sales Office or the CS Center.



- The gearbox side hole and the motor side hole will always be set in the positions "3" and "9," respectively, regardless of the position of the terminal box.

● Definition of Designations

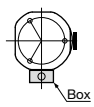
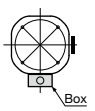
- "T" represents the terminal box.
- "Hole" represents the power supply inlet hole.

MID Series (Clutch/Brake, 1-Phase) <F Type, F3 Type>

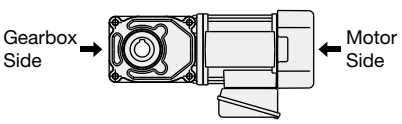
If you use the terminal box in a position other than the standard position, you may order the change with the appropriate code shown in the table below.

Model name example: Standard specification F3S25N30-MM02CNJAB2 ⇒ T (Upper) Hole (Right) F3S25N30-MM02CNJAB2XTZH6

■ Order Method

	Motor Power 3-Phase 0.1 kW/0.2 kW 1-Phase 0.1 kW/0.2 kW				Motor Power 3-Phase 0.4 kW/0.75 kW 1-Phase 0.4 kW			
Design								
	Standard	Hole (Left)	Hole (Load-side)	Hole (Right)	Standard	Hole (Left)	Hole (Load-side)	Hole (Right)
Option Code	Standard	H6	H3	HZ	Standard	H6	H3	HZ
Design								
	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)
Option Code	T3	T3 H6	T3 H3	T3 HZ	T3	T3 H6	T3 H3	T3 HZ
Design								
	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)
Option Code	TZ	TZ H6	TZ H3	TZ HZ	TZ	TZ H6	TZ H3	TZ HZ
Design								
	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)
Option Code	T9	T9 H6	T9 H3	T9 HZ	T9	T9 H6	T9 H3	T9 HZ

Note 1: All diagrams are viewed from the motor side of the gearmotor.
Note 2: No option specification required for standard models.
Note 3: Please note that structurally, the terminal box's position cannot be changed by the customer. If you require a change in position of the terminal box, be sure to place an order with the appropriate code shown in the figure above.
However, the hole positions of the terminal box may be changed.
Note 4: The bold line ▬ indicates the attachment position of the nameplate. Please note that depending on the mounting position/orientation, the nameplate may be difficult to see. If the attachment position is inconvenient, the nameplate may be attached at a different position upon request. For more details, please contact your nearest Sales Office or the CS Center.
Note 5: Single-phase capacitor start type rotates alongside with the terminal box. Check the device etc. for interference in advance. For more details, please contact your nearest Sales Office or the CS Center.



- The gearbox side hole and the motor side hole will always be set in the positions "3" and "9," respectively, regardless of the position of the terminal box.

● Definition of Designations

- "T" represents the terminal box.
- "Hole" represents the power supply inlet hole.

Precautions about the Positional Change of the Terminal Box

MID Series (3-Phase)

■ Specifications that do not allow the position of the terminal box to be changed

The specifications shown below do not allow the position of the terminal box and the direction of the holes to be changed. Please take note.
For more information, please contact your nearest Sales Office or the CS Center.

Option Code	Mounting Type	Frame Size	Motor Power	Terminal Box Type
H3 Hole (Load-side)	G3L	28	0.2 kW	T-BOX/E-BOX
	G3L	32	0.4 kW	E-BOX
	G3F	28	0.2 kW	T-BOX/E-BOX
	G3F	32	0.4 kW	E-BOX
	G3K	28	0.2 kW	T-BOX/E-BOX
	G3K	32	0.4 kW	E-BOX
	H2F	22	0.1 kW	T-BOX/E-BOX
	H2F	22	0.2 kW	E-BOX
	FS	30	0.1 kW	E-BOX
	FS	35	0.1 kW	E-BOX
	FS	45	0.2 kW	E-BOX
T3H3 T (Right) Hole (Load-side)	F3S	20	0.2 kW	E-BOX
T6 T (Lower)	G3L	28	0.2 kW	T-BOX/E-BOX
	G3L	32	0.4 kW	E-BOX
T6H3 T (Lower) Hole (Load-side)	G3L	18	0.1 kW	T-BOX/E-BOX
	G3L	18	0.2 kW	T-BOX/E-BOX
	G3L	22	0.1 kW	T-BOX/E-BOX
	G3L	22	0.2 kW	E-BOX
	G3L	28	0.1 kW	T-BOX/E-BOX
	G3L	28	0.2 kW	T-BOX/E-BOX
	G3L	28	0.4 kW	E-BOX
	G3L	32	0.1 kW	T-BOX/E-BOX
	G3L	32	0.2 kW	E-BOX
	G3L	32	0.4 kW	T-BOX/E-BOX
	G3L	40	0.2 kW	E-BOX
	G3F	28	0.1 kW	E-BOX
	G3F	28	0.2 kW	T-BOX/E-BOX
	G3F	32	0.1 kW	E-BOX
	G3F	32	0.2 kW	E-BOX
	G3F	32	0.4 kW	E-BOX
	G3F	40	0.2 kW	E-BOX
	G3K	28	0.1 kW	E-BOX
	G3K	28	0.2 kW	T-BOX/E-BOX

Option Code	Mounting Type	Frame Size	Motor Power	Terminal Box Type
T6H3 T (Lower) Hole (Load-side)	G3K	32	0.1 kW	E-BOX
	G3K	32	0.2 kW	E-BOX
	G3K	32	0.4 kW	E-BOX
	H2L	22	0.1 kW	T-BOX/E-BOX
	H2L	22	0.2 kW	E-BOX
	H2L	28	0.1 kW	E-BOX
	H2L	28	0.2 kW	T-BOX/E-BOX
	H2L	32	0.1 kW	E-BOX
	H2L	32	0.2 kW	E-BOX
	H2L	32	0.4 kW	E-BOX
	H2L	40	0.2 kW	E-BOX
T6H6 T (Lower) Hole (Left)	G3L	28	0.2 kW	E-BOX
	G3L	32	0.4 kW	E-BOX
T6HZ T (Lower) Hole (Right)	G3L	28	0.2 kW	E-BOX
	G3L	32	0.4 kW	E-BOX
T9H3 T (Left) Hole (Load-side)	G3L	22	0.1 kW	E-BOX
	G3L	28	0.2 kW	T-BOX/E-BOX
	G3L	32	0.4 kW	E-BOX
	G3F	28	0.2 kW	T-BOX/E-BOX
	G3F	32	0.4 kW	E-BOX
	G3K	28	0.2 kW	T-BOX/E-BOX
	G3K	32	0.4 kW	E-BOX
	FS	25	0.1 kW	T-BOX/E-BOX
	FS	30	0.2 kW	E-BOX
	FF	22	0.1 kW	T-BOX/E-BOX
TZH3 T (Upper) Hole (Load-side)	G3L	28	0.2 kW	T-BOX/E-BOX
	G3L	32	0.4 kW	E-BOX
	G3F	22	0.1 kW	E-BOX
	G3F	28	0.2 kW	T-BOX/E-BOX
	G3F	32	0.4 kW	E-BOX
	G3K	28	0.2 kW	T-BOX/E-BOX
	G3K	32	0.4 kW	E-BOX
	H2L	28	0.2 kW	E-BOX

Precautions about the positional change of the terminal box and the manual release lever

MID Series Manual Release Device

■ Specifications that do not allow the position of the terminal box to be changed

Option Code	Mounting Type	Frame Size	Motor Power	Terminal Box Type
T9R6 T (Left) Manual (Lower)	G3L	28	0.4 kW	T-BOX
	H2L	28	0.4 kW	T-BOX

MID Series (3-Phase)

■ Specifications that need to be checked in advance when changing the position of the terminal box

With regard to the model specifications shown below, the cable outlet is located near the mounting surface. Please check the mounting position, the area around the lead wire outlet, etc. in advance.
For more information, please contact your nearest Sales Office or the CS Center.

Option Code	Mounting Type	Frame Size	Motor Power	Terminal Box Type
T3H3 T (Right) Hole (Load-side)	FS	25	3-Phase 0.1 kW	T-BOX/E-BOX
	FF	22	3-Phase 0.1 kW	T-BOX/E-BOX
	F3S	20	3-Phase 0.1 kW	T-BOX/E-BOX
	F3S	25	3-Phase 0.1 kW	T-BOX/E-BOX
	F3F	18	3-Phase 0.1 kW	T-BOX/E-BOX
	F3F	22	3-Phase 0.1 kW	T-BOX/E-BOX
T9H3 T (Left) Hole (Load-side)	F3S	20	3-Phase 0.1 kW	T-BOX/E-BOX
	F3S	25	3-Phase 0.1 kW	T-BOX/E-BOX
	F3F	18	3-Phase 0.1 kW	T-BOX/E-BOX
	F3F	22	3-Phase 0.1 kW	T-BOX/E-BOX
	F3S	20	3-Phase 0.2 kW	T-BOX/E-BOX
	F3S	25	3-Phase 0.2 kW	T-BOX/E-BOX
	F3F	18	3-Phase 0.2 kW	T-BOX/E-BOX
	F3F	22	3-Phase 0.2 kW	T-BOX/E-BOX

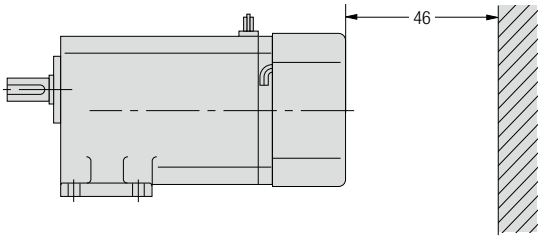
Dimensions Required for Removing the Fan Cover and the Brake Cover

Each of the figures below shows the space required to adjust the gap of the brake in the installed state, and the dimension required to remove the fan cover or the brake cover.

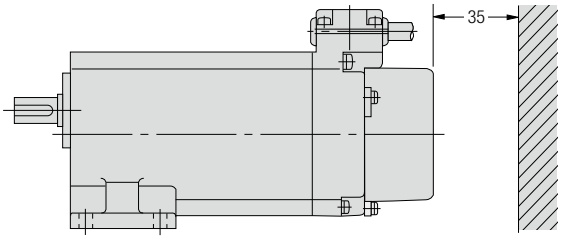
* Keep a distance of 20 mm or more between the motor and the wall surface to secure air ventilation.

MINI Series

■ Indoor Specification

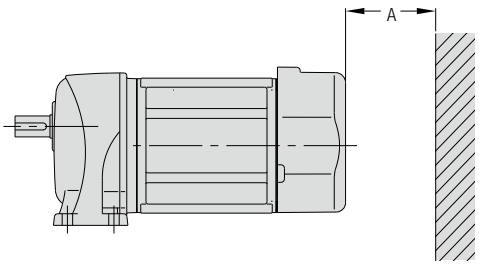


■ Water-resistant Specification



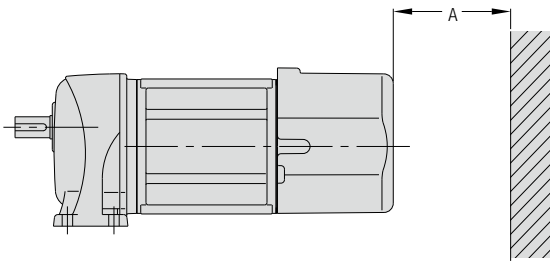
MID Series

■ Indoor Specification



Type	3-Phase						1-Phase			
	0.1 kW	0.2 kW	0.4 kW	0.75 kW	1.5 kW	2.2 kW	100 W	100 W	200 W	400 W
G3	44	59	56	59	90	90	–	59	59	59
H2	44	59	56	59	90	90	44	–	59	59
F	44	59	56	59	90	90	44	–	59	59
F3	44	59	56	59	90	90	44	–	59	59

■ Water-resistant Specification



Type	3-Phase			
	0.1 kW	0.2 kW	0.4 kW	0.75 kW
All Models	44	85	96	117

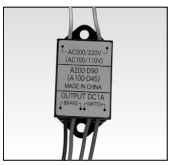
Rectifier and Surge Suppressor of Gearmotors with Brake

The rectifier included with the product is required to operate the brake of a gearmotor with a brake. For rectifier types and supporting voltages, refer to the information shown below.
Since the braking delay time is different among connection methods, select the most appropriate connection method from among those on page 495 for the application.
The rectifier contains a surge suppressor, however, if you still experience issues with electrical noises, please add another surge suppressor or a noise filter.

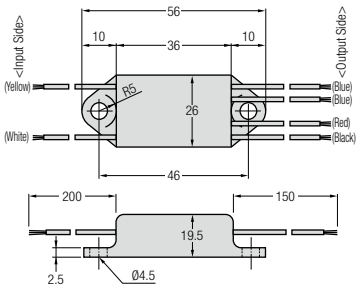
Series	Number of Phases	Voltage	Rectifier		Surge Suppressor (Option)
			Model	Input voltage range	
MINI	3-Phase	Standard Voltage	A200-D90 (A100-D45)	200 V to 220 VAC (100 V to 110 VAC)	OP-ERZV10D471 (For 200 V Class Brake)
		High Voltage (200 V Class)			
	1-Phase	Standard Voltage			
		High Voltage (200 V Class)			
MID	3-Phase	Standard Voltage	A200-D90-UL	200 V to 230 VAC	OP-ERZV10D471 (For 200 V Class Brake)
		High Voltage (400 V Class)	A400-D180	380 V to 480 VAC	OP-ERZV10D911 (For 400 V Class Brake)
	1-Phase	Standard Voltage	A100-D90-UL	100 V to 120 VAC	OP-ERZV10D471 (For 100 or 200 V Class Brake)
		High Voltage (200 V Class)	A200-D90-UL	200 V to 230 VAC	
	3-Phase Clutch/Brake	Standard Voltage	A200-D90 (A100-D45)	200 V to 220 VAC (100 V to 110 VAC)	OP-ERZV10D471 (For 200 V Class Brake)

■ Rectifier

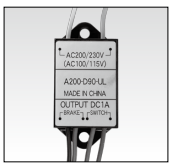
● A200-D90 (A100-D45)



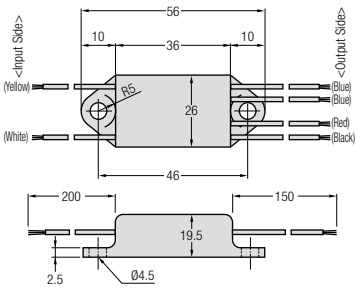
Approx. Weight 40 g



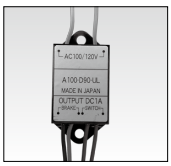
● A200-D90-UL



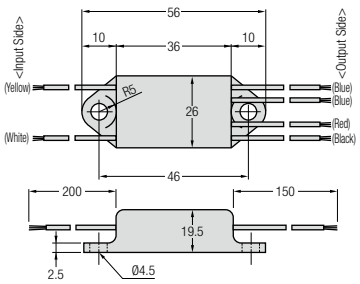
Approx. Weight 40 g



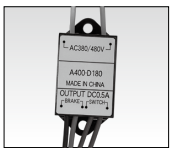
● A100-D90-UL



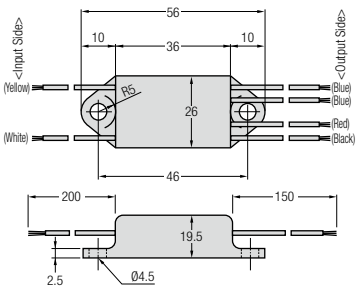
Approx. Weight 40 g



● A400-D180

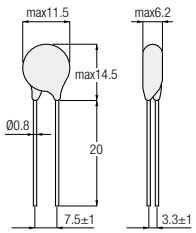


Approx. Weight 40 g

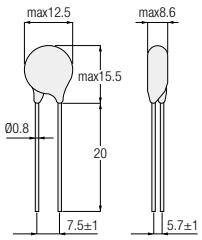


■ Surge Suppressor

● OP-ERZV10D471



● OP-ERZV10D911

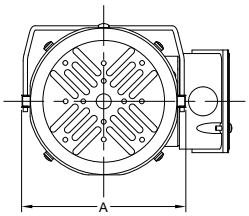


Use a surge suppressor for the contact of a brake DC switching connection to extinguish sparks.

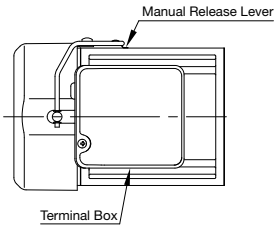
Manual Brake Release Lever (optional)

You can install a manual brake release lever if you desire.
The terminal box and the manual release lever remain in the same positional relationship.
* Water-resistant models (IP65) cannot be equipped with a manual brake release device.

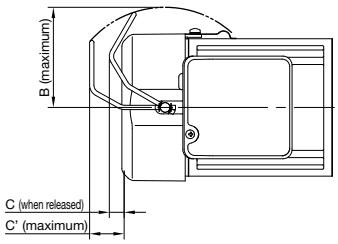
G3 and H2 Types



● During operation

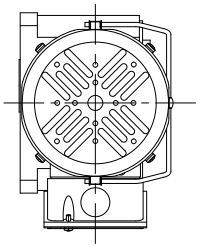


● When releasing the brake



Note 1: Rotate the manual release lever attached to the lever clasp on the top of the fan cover to the rear of the motor by about 60 ° degrees to release the brake.
Note 2: Do not release the brake by 90 ° degrees or more.

F and F3 Types



* The diagram above is a representative diagram. The F3 Type is designed for flange mounting on both sides, and the shape of the gearhead is different.

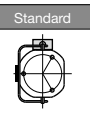
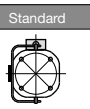
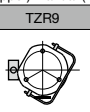
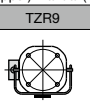
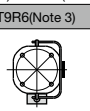
Dimensions by Motor Power Common to G3, H2, F, and F3 Types

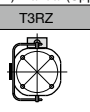
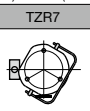
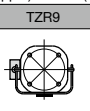
Motor Power	0.1 kW	0.2 kW	0.4 kW	0.75 kW	1.5 kW	2.2 kW
A	143	143	153	175	199	213
B	86.5	86.5	93	103.5	117	125.5
C (when released)	16	5.5	10.5	19	0	4.5
C' (maximum)	34.5	24	30	42.5	31	42

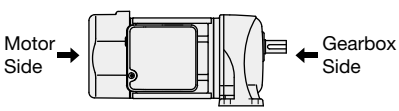
Note 1: The manual release lever and the terminal box remain in the same positional relationship. Thus, when the position of the terminal box is changed, the position of the manual release lever will also change. Refer to the schematic diagram below.
Note 2: For changes of the position of the manual release lever, refer to the table below.
Note 3: Dimension A is the outermost diameter of the retaining ring.

■ Positional Change of the Terminal Box and the Manual Release Lever

Refer to the schematic diagram below for the positional relationship with the manual release lever when the position of the terminal box is changed.
In this case, the option code that indicates the position of the manual release lever will be displayed on the nameplate.

G3 Type, H2 Type	
3-Phase 0.1 kW to 0.2 kW	3-Phase 0.4 kW to 2.2 kW
	
Standard	Standard
	
T (Upper) Manual (Left)	T (Upper) Manual (Left)
TZR9	TZR9
	
T (Left) Manual (Lower-right)	T (Left) Manual (Lower)
T9R4	T9R6(Note 3)
	
T (Lower) Manual (Upper-right)	T (Lower) Manual (Right)
T6R1	T6R3

F Type, F3 Type	
3-Phase 0.1 kW to 0.2 kW	3-Phase 0.4 kW to 2.2 kW
	
Standard	Standard
	
T (Right) Manual (Upper)	T (Right) Manual (Upper)
T3RZ	T3RZ
	
T (Upper) Manual (Lower-left)	T (Upper) Manual (Left)
TZR7	TZR9
	
T (Left) Manual (Lower-right)	T (Left) Manual (Lower)
T9R4	T9R6



Note 1: All diagrams are viewed from the motor side of the gearmotor.
The bold line ━ indicates the attachment position of the nameplate. Please note that depending on the mounting position/orientation, the nameplate may be difficult to see.
Note 2: If the attachment position is inconvenient, it can be changed in advance upon request. For more details, please contact your nearest Sales Office or the CS Center.
Note 3: The position of the terminal box of some models cannot be changed because the manual release lever protrudes from the mounting surface. For applicable types, refer to page 528.

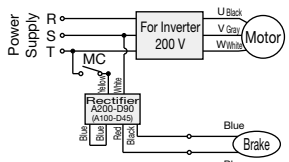
Combination of Gearmotors and Inverter/VFD

MINI Series

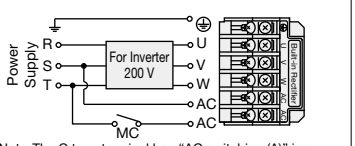
1. Usable Frequency Range
   In general, please use the motor within the range of 5 Hz to 120 Hz.
   (1) Precautions for high-speed operation over 60 Hz
   When the motor runs at frequencies over 60 Hz, vibration and noise levels will increase.
   The circumferential velocity also increases, which may result in shorter service life of the oil seal.
   (2) Precautions for low-speed operation
   During low-speed operation the cooling effect of the motor decreases. Please note that it may cause an unusual temperature rise. (Please keep the motor surface temperature below 90 °C.)
2. Torque Characteristics of the motor (Operating Limit)
   The torque characteristics of the motor greatly vary depending on the type of the inverter used with the motor, as well as the control method with said inverter.
3. Brakemotor
   When wiring the brake, please bypass the inverter (supply the power from the primary side of the inverter).
   The rectifier may be damaged.
   Otherwise the brake may malfunction due to voltage fluctuation.
   Please refer to the wiring diagram shown below.

AC Switching (A)

3-Phase Standard Voltage

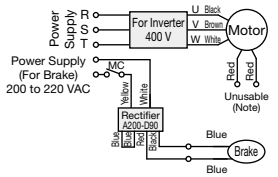


3-Phase Standard Voltage (C Type Terminal Box with Built-in Rectifier)

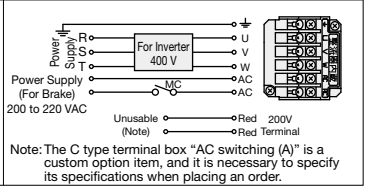


Note: The C type terminal box "AC switching (A)" is a custom option item, and it is necessary to specify its specifications when placing an order.

3-Phase High Voltage (400 V Class)



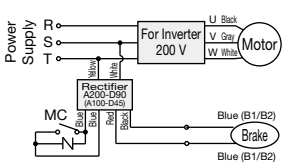
3-Phase High Voltage (400 V Class) (C Type Terminal Box with Built-in Rectifier)



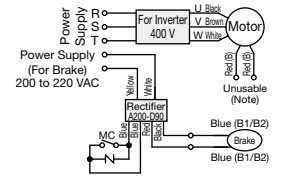
Note: The C type terminal box "AC switching (A)" is a custom option item, and it is necessary to specify its specifications when placing an order.

DC Switching

3-Phase Standard Voltage



3-Phase High Voltage (400 V Class)



MC: Magnetic Contactor -N-: Surge Suppressor (optional)

Note 1: For Three-phase High Voltage (400 V Class) and special voltages exceeding 220 V, there are two 200 V terminals (red lead wires) extending out from the motor as brake power supply, however, these 200 V terminals cannot be used when using the motor with an inverter.

Note 2: Prepare a 200 V power supply separately for the input lead wire (white and yellow/AC terminal) of the rectifier.
For safety, be sure to insulate the 200 V terminals (red lead wires).

Note 3: For a DC switching connection, connect a surge suppressor (optional) between the contacts. For surge suppressors (optional), refer to page 531.

Note 4: Use switches of 110 VDC with a contact point rating of DC13 to block the inductive load of the DC coil when using DC switching connection. For more details, please contact your nearest Sales Office or the CS Center.
* Contact rating class DC13 is a specification applicable to coil loads and a type defined in JIS C 8201-5-1 (Low-voltage switchgear and control gear).

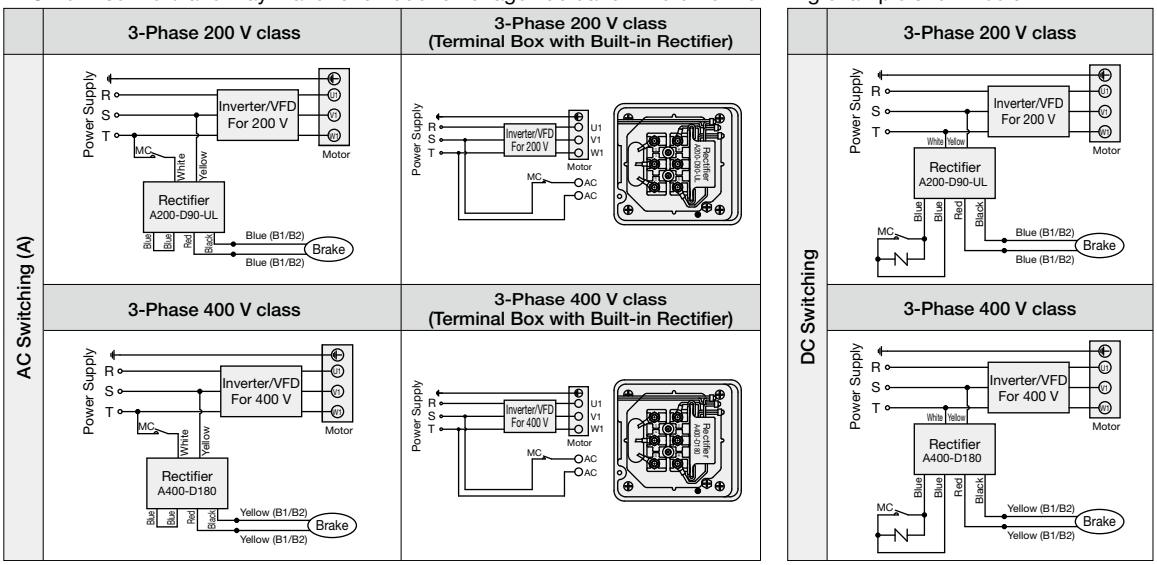
Note 5: The rectifier contains a diode and will become unusable if it is shorted due to, for example, improper wiring.

4. Motor Protection
   Due to their small rated current, depending on the inverter used, a MINI series gearmotor may not be fully protected with the internal thermal setting alone. In such a case, please set up an additional external safeguard function on the outside of the motor.
5. When driving a 400 V class motor with an inverter
   A surge voltage may occur between the terminals of the motor and deteriorate the insulation of the motor.
   In general, there are two methods to suppress surge voltages: via suppressing the rise of the voltage (output reactor) and suppressing the crest value (output filter).
   (1) Output reactor
   If the wiring length is relatively short, surge voltages can be reduced by installing an AC reactor on the output side of the inverter and suppressing the rise of the voltage. However, if the wiring length is long, suppressing the crest value of the surge voltage may become difficult.
   (2) Output filter
   Suppress the crest value of the terminal voltage of the motor by installing a filter on the output side of the inverter.

Please note that the explanation above is general information. We recommend that you consult with the inverter manufacturer for more information.

MID Series (3-Phase)

1. Usable Frequency Range
   In general, please use the motor within the range of 5 Hz to 120 Hz.
   Please use the gearmotors with a clutch/brake within the range of 5 Hz to 60 Hz.
   (1) Precautions for high-speed operation over 60 Hz
   When the motor runs at frequencies over 60 Hz, vibration and noise levels will increase. The circumferential velocity also increases, which may result in shorter service life of the oil seal.
   (2) Precautions for low-speed operation
   Please note that during low-speed operation, the cooling effect of the motor decreases and an unusual temperature rise may consequently occur.
2. Torque Characteristics of the motor (Operating Limit)
   The torque characteristics of the motor greatly vary depending on the type of the inverter used with the motor, as well as the control method with said inverter.
3. Gearmotors with a brake
   When wiring the brake, bypass the inverter. (The power will be supplied from the primary side of the inverter.) Otherwise the brake may malfunction due to voltage fluctuation. Refer to the wiring example shown below.



MC: Magnetic Contactor -N-: Surge Suppressor (optional)

Note 1: The B1 and B2 terminals or the AC terminal are provided in the terminal box.
Note 2: For a DC switching connection, connect a surge suppressor (optional) between the contacts. For surge suppressors (optional), refer to page 531.
Note 3: Use switches of 110 VDC <220 VDC> with a contact point rating of DC13 to block the inductive load of the DC coil when using DC switching connection. Please contact us for more details.
* Contact rating class DC13 is a specification applicable to coil loads and a type defined in JIS C 8201-5-1 (Low-voltage switchgear and control gear).
* The items in < > are for motors with a 400 V class brake (brake lead wires: yellow).

4. When running a 400 V class motor with an inverter
   A surge voltage may occur between the terminals of the motor and deteriorate the insulation of the motor.
   In general, there are two methods to suppress surge voltages: via suppressing the rise of the voltage (output reactor) and suppressing the crest value (output filter).
   (1) Output reactor
   If the wiring length is relatively short, surge voltages can be reduced by installing an AC reactor on the output side of the inverter and suppressing the rise of the voltage.
   However, if the wiring length is long, suppressing the crest value of the surge voltage may become difficult.
   (2) Output filter
   Suppress the crest value of the terminal voltage of the motor by installing a filter on the output side of the inverter.

Please note that the explanation above is general information. We recommend that you consult with the inverter manufacturer for more information.

Global Standards Conformance

We offer gearmotors that suit global directives, standards, and systems.

■ Gearmotors safety standards

Country Name	U.S.A.					Canada					Europe (EU)				China			
Standard	UL					CSA					EN				GB			
Series	MINI		MID			MINI		MID			MINI		MID		MINI		MID	
Number of Phases	1-Phase	3-Phase	1-Phase (Capacitor Run)	1-Phase (Capacitor Start)	3-Phase	1-Phase	3-Phase	1-Phase (Capacitor Run)	1-Phase (Capacitor Start)	3-Phase	1-Phase	3-Phase	1-Phase	3-Phase	1-Phase	3-Phase	1-Phase	3-Phase
Standard No.	UL1004-1 UL1004-3	UL1004-1	UL1004-1 UL1004-3	UL1004-1	UL1004-1	C22.2 No. 100 C22.2 No. 77	C22.2 No. 100	C22.2 No. 100 C22.2 No. 77	C22.2 No. 100	C22.2 No. 100	EN60034-1	EN60034-1	EN60034-1 EN60034-5	EN60034-1 EN60034-5	GB/T12350-2022		-	GB/ T12350-2022
UL File No.	XEWR2. E141674	PRGY2. E172621	XEWR2. E141674	PRGY2. E172621	PRGY2. E172621	XEWR8. E141674	PRGY8. E172621	XEWR8. E141674	PRGY8. E172621	PRGY8. E172621	-				-			

● UL Standards

UL is the abbreviation of “Underwriters Laboratories Inc.,” which is a private testing organization established in 1894 by the Association of American Fire Insurance with the aim of protecting human lives and assets from fires, disasters, and other accidents. This organization performs testing and certification of all kinds of products, parts, and materials. The UL Standards are safety standards which is permitted by most of the states of the United States.

● CSA Standards

In Canada, the use of the CSA Standards is stipulated by law.
UL is authorized as a certification organization for the CSA Standards, and when products are certified to be compliant with relevant CSA Standards, UL will permit the display of the “cUL” mark on them.
Only products displaying the “cUL” mark will be permitted to be used in Canada.

● EU Directives/EN Standards

All machines exported to Europe are required to display “CE marking”.
In order to display “CE marking,” products are obligated to conform to EU Directives.
In principle, conformity to EN Standards is a prerequisite for certifying conformity to EU Directives
Our CE Markings are self declaring compliance with EU Directives.

● GB Standards (CCC mark)

After China joined the WTO (World Trade Organization), the China Compulsory Certification started operating in August 2003. The CCC unified all of the certification systems for products distributed in the country and obligates all items distributed on the Chinese market to bear the CCC mark.
Our induction motor with a power of 0.75 kW or less are subject to the CCC.
When exporting target gearmotors in the form of single units to China, the gearmotors themselves must be CCC-certified Product.
However, if the gearmotors are contained as part of devices and the complete devices can obtain CCC, the gearmotors are not always required to be CCC-certified.

■ Efficiency regulation compliance of low-voltage 3-phase induction motors

Country Name		U.S.A.	Canada	Europe (EU)		China	South Korea
Law		EISA	EEAct	COMMISSION REGULATION (EU) 2019/1781		High efficiency standard values and high efficiency grades of motors	Energy consumption efficiency Grade display system
Standard		NEMA MG1-12-12	CSA C390	IEC60034-1:2017		GB18613-2020	KS C 4202
Our Product Range	Power Range	0.75 kW/1 HP to 2.2 kW/3 HP	0.75 kW/1 HP to 2.2 kW/3 HP	0.2 kW to 0.4 kW	0.75 kW to 2.2 kW	0.75 kW to 2.2 kW	0.75 kW to 2.2 kW
	Number of Motor Poles	4	4	4	4	4	4
	Efficiency Class	IE3	IE3	IE2	IE3	Class 3	IE3

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

Overseas Supply Voltage

MINI Series

■ Gearmotors/Gearmotors with Brake

● UL

Number of Phases	Motor Power	Voltage (V)/Frequency (Hz)
3-Phase	15 W to 90 W	200 V/50 Hz, 200 V/60 Hz, 220 V/60 Hz **208 V/60 Hz, 230 V/60 Hz** 380 V/50 Hz, 400 V/50 Hz, 400 V/60 Hz 440 V/60 Hz **460 V/60 Hz** **480 V/60 Hz**(*)
1-Phase	15 W to 90 W	100 V/50 Hz, 100 V/60 Hz **115 V/60 Hz** **120 V/60 Hz** 200 V/50 Hz, 200 V/60 Hz **220 V/60 Hz** **230 V/60 Hz**

Note 1: The voltages marked with (*) are not available for some models with motor powers of 15 W and 25 W. Please contact us for more details.
Note 2: With regard to the voltages and frequencies in bold letters, an "X" will be added to the end of the product name
Note 3: For voltages not listed above, please contact your nearest Sales Office or the CS Center.

● CCC

Number of Phases	Motor Power	Voltage (V)/Frequency (Hz)
3-Phase	15 W to 90 W	200 V/50 Hz, 200 V/60 Hz, 220 V/60 Hz **220 V/50 Hz, 230 V/50 Hz** 380 V/50 Hz, 400 V/50 Hz, 400 V/60 Hz 440 V/60 Hz
1-Phase	15 W to 90 W	100 V/50 Hz, 100 V/60 Hz 200 V/50 Hz, 200 V/60 Hz **220 V/50 Hz, 230 V/50 Hz**

Note 1: With regard to the voltages and frequencies in bold letters, an "X" will be added to the end of the product name
Note 2: For voltages not listed above, please contact your nearest Sales Office or the CS Center.
Note 3: The standard power supplies in China are 220 V/50 Hz or 380 V/50 Hz in general.

● CE

Number of Phases	Motor Power	Voltage (V)/Frequency (Hz)
3-Phase	15 W to 90 W	200 V/50 Hz, 200 V/60 Hz, 220 V/60 Hz **220 V/50 Hz** **230 V/50 Hz** 380 V/50 Hz, 400 V/50 Hz, 400 V/60 Hz 440 V/60 Hz **415 V/50 Hz**(*) **420 V/50 Hz**(*) **440 V/50 Hz**(*)
1-Phase	15 W to 90 W	100 V/50 Hz, 100 V/60 Hz 200 V/50 Hz, 200 V/60 Hz **220 V/50 Hz** **230 V/50 Hz**

Note 1: The voltages marked with (*) are not available for some models with motor powers of 15 W and 25 W. Please contact us for more details.
Note 2: With regard to the voltages and frequencies in bold letters, an "X" will be added to the end of the product name
Note 3: For voltages not listed above, please contact your nearest Sales Office or the CS Center.

■ IP65 Gearmotors/IP65 Gearmotors with Brake

● UL

Number of Phases	Motor Power	Voltage (V)/Frequency (Hz)
3-Phase	15 W to 90 W	200 V/50 Hz, 200 V/60 Hz, 220 V/60 Hz **208 V/60 Hz, 230 V/60 Hz**
1-Phase	15 W to 60 W	100 V/50 Hz, 100 V/60 Hz **115 V/60 Hz** **200 V/50 Hz, 200 V/60 Hz** **220 V/60 Hz** **230 V/60 Hz**

Note 1: With regard to the voltages and frequencies in bold letters, an "X" will be added to the end of the product name
Note 2: For voltages not listed above, please contact your nearest Sales Office or the CS Center.

● CE

Number of Phases	Motor Power	Voltage (V)/Frequency (Hz)
3-Phase	15 W to 90 W	200 V/50 Hz, 200 V/60 Hz, 220 V/60 Hz **220 V/50 Hz** **230 V/50 Hz** (Note 3)
1-Phase	15 W to 60 W	100 V/50 Hz, 100 V/60 Hz **200 V/50 Hz, 200 V/60 Hz** **220 V/50 Hz** **230 V/50 Hz** (Note 3)

Note 1: With regard to the voltages and frequencies in bold letters, an "X" will be added to the end of the product name
Note 2: For voltages not listed above, please contact your nearest Sales Office or the CS Center.
Note 3: Depending on the motor power, some models may not be available

MID Series

Voltage and Certification Code	Description	Voltage/Frequency	Compatible Standard
NN	Standard Voltage (Same as Japanese Domestic Type)	200 V/50 Hz, 200 V/60 Hz, 220 V/60 Hz	CE/UL/CCC
WN	High Voltage (400 V Class) (Same as Japanese Domestic Type)	380 V/50 Hz, 400 V/50 Hz, 400 V/60 Hz, 440 V/60 Hz	CE/UL/CCC
KN	Special voltage (dual voltage) for South Korea	220 V/60 Hz, 380 V/60 Hz	CE/UL/CCC
CN	Special voltage (dual voltage) for China	220 V/50 Hz, 230 V/50 Hz, 380 V/50 Hz	CE/UL/CCC
AN	Special voltage (dual voltage) for Europe/North America	208 V/60 Hz, 230 V/60 Hz, 460 V/60 Hz, 400 V/50 Hz	CE/UL/CCC
EN	Special voltage for Europe/North America	415 V/50 Hz, 440 V/50 Hz, 480 V/60 Hz	CE/UL/CCC
MA	Special voltage for North America	575 V/60 Hz	UL

Global Standards of Each Country

1. U.S.A.

● Safety Certification

<Applicable Standard and UL File>

Number of Phases	Applicable Standard	Acquired UL File	Our Corresponding Power	Power Supply/Certification Model						
				NN	WN	KN	CN	AN	EN	MA
3-Phase	UL1004-1 (Standard for Rotating Electrical Machines – General Requirements)	PRGY2. E172621	0.1 kW to 0.4 kW	c UL us						
			0.75 kW to 2.2 kW	ENERGY				ENERGY c UL us		

● High Efficiency Regulation

Number of Phases	Applicable Standard	Acquired UL File	Our Corresponding Power	Power Supply/Certification Model						
				NN	WN	KN	CN	AN	EN	MA
3-Phase	NEMA MG1-12-12	ZWKG. E172621	0.75 kW to 2.2 kW	CC303B						

2. Canada

● Safety Certification

<Applicable Standard and UL File>

Number of Phases	Applicable Standard	Acquired UL File	Our Corresponding Power	Power Supply/Certification Model						
				NN	WN	KN	CN	AN	EN	MA
3-Phase	C22.2 No.100 (Motors and Gearmotors)	PRGY8. E172621	0.1 kW to 0.4 kW	c UL us						
			0.75 kW to 2.2 kW					ENERGY c UL us		

● High Efficiency Regulation

Number of Phases	Applicable Standard	Acquired UL File	Our Corresponding Power	Power Supply/Certification Model						
				NN	WN	KN	CN	AN	EN	MA
3-Phase	CSA C390	ZYKH. E172621	0.75 kW to 2.2 kW					ENERGY c UL us		

3. Europe

● Safety Certification

Number of Phases	EU Directive	Applicable Standard	Our Corresponding Power	Power Supply/Certification Model						
				NN	WN	KN	CN	AN	EN	MA
3-Phase	Low Voltage Directive 2014/35/EU Low Voltage Command	EN60034-1: Rotating electrical machines - Part 1 - Ratings and characteristics EN60034-5: Rotating electrical machines - Part 5 - Classification of degrees of protection provided by the integral design of rotating electrical machines (IP code)	0.1 kW to 2.2 kW	CE						

● High Efficiency Regulation

Number of Phases	EU regulations	Our Corresponding Power	Power Supply/Certification Model						
			NN	WN	KN	CN	AN	EN	MA
3-Phase	COMMISSION REGULATION (EU) 2019/1781	0.2 kW to 2.2 kW	CE						

4. China

● Safety Certification

Number of Phases	Applicable Standard	Our Corresponding Power	Power Supply/Certification Model						
			NN	WN	KN	CN	AN	EN	MA
3-Phase	GB/T12350-2022 Small power motor safety requirements	0.1 kW to 0.75 kW	CCC						

● High Efficiency Regulation

Number of Phases	Applicable Standard	Our Corresponding Power	Power Supply/Certification Model						
			NN	WN	KN	CN	AN	EN	MA
3-Phase	GB18613-2020 Minimum allowable values of energy efficiency and values of efficiency grades for motors	0.75 kW to 2.2 kW							

5. South Korea

● High Efficiency Regulation

Number of Phases	Applicable Standard	Our Corresponding Power	Power Supply/Certification Model						
			NN	WN	KN	CN	AN	EN	MA
3-Phase	KS C 4202	0.75 kW to 2.2 kW							

Global Standard Gearmotors Model and Type Code

MINI Series

MINI Series global standard gearmotors (15 W to 90 W) are classified with codes as shown below. Place orders or make inquiries with these codes. Please note that the specifications of these gearmotors are different from domestic specifications.

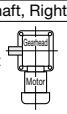
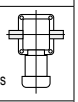
Mounting Type	Frame Size	Shaft Arrangement	Reduction Ratio		Standards	Number of Phases	Motor Type Ⓐ	Motor Type Ⓑ	Power	Voltage Frequency	Terminal Box	Option	Option Code
GL	12	N	015	-	U	T	M	L	15	N	C		
HL	40	L	12X	-	Y	S	B	Y	90	W	C	X	HZ
F2S	15	N	120	-	Y	T	WB	R	40	N	N		
F2F	18	T	240	-	C	S	M	R	60	W	T		
①	②	③	④		⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬

①Mounting Type	GL	: G Type (Parallel Shaft), Foot Mount Type
	GF	: G Type (Parallel Shaft), Flange Mount Type
	GK	: G Type (Parallel Shaft), Small Flange Mount Type
	HL	: H Type (Right Angle Shaft), Foot Mount Type
	HF	: H Type (Right Angle Shaft), Flange Mount Type (Frame Size Up to 22)
	F2S	: F2 Type (Concentric Right Angle Hollow Bore)
	F2F	: F2 Type (Concentric Right Angle Shaft)
②Frame Size and Output Shaft Diameter	Output Shaft Diameter (internal diameter for right angle hollow bore types, and outer diameter for other types)	
③Shaft Arrangement Only HL, HF, and F2F For models other than those mentioned above, "N" will be indicated. (The F2F is not provided with an R shaft.)	L: Viewing from the input shaft, output shaft would be on the left side 	R: Viewing from the input shaft, output shaft would be on the right side 	T: Viewing from the input shaft, the output shaft would be on the both sides 
④Reduction Ratio (All reduction ratios are indicated with three digits.)	005: 1/5 to 18X: 1/1800 (10 → 010, 1200 → 12X)		
⑤Standard	U	: UL Standard Product (UL, cUL)
	Y	: Product with CE Marking
	C	: CCC-certified Product
⑥Number of Phases	T	: 3-Phase
	S	: 1-Phase
⑦Motor Type Ⓐ (Note 1)	M	: With Motor
	B	: Brakemotor
	WM	: With IP65 Motor (Note 1)
	WB	: With IP65 Brakemotor (Note 1)
⑧ ⑨Motor Type Ⓑ and Power (Note 2)	L15	: 15 W G-12, G-22, H-15, H-22, F2S-12, F2F-15
	L25	: 25 W G-12, G-22, H-15, H-22, F2S-12, F2F-15
	R25	: 25 W G-15, G-28, H-28
	R40	: 40 W G-15, G-28, G-32, H-18, H-28, H-32, F2S-15, F2F-18
	Y40	: 40 W G-18
	R60	: 60 W G-15, G-28, G-32, H-18, H-28, H-32, F2S-15, F2F-18
	Y60	: 60 W G-18
	R90	: 90 W G-15, G-28, G-32, H-18, H-28, H-32, F2S-15, F2F-18
	Y90	: 90 W G-18, G-40, H-40
⑩Voltage/Frequency	N	: Standard Voltage 3-Phase: 200 V/50 Hz, 200 V/60 Hz, 220 V/60 Hz 1-Phase: 100 V/50 Hz, 100 V/60 Hz
	W	: High Voltage 3-Phase: 380 V/50 Hz, 400 V/50 Hz, 400 V/60 Hz, 440 V/60 Hz 1-Phase: 200 V/50 Hz, 200 V/60 Hz
⑪Terminal Box (Note 3)	UL	C : C Type Terminal Box without Terminal Block, Made of Resin
		A : A Type Terminal Box without Terminal Block, Made of Aluminum
		N : Without Terminal Box (Flying Leads, Water-Resistant Cabtyre Cable)
	CE CCC	T : T Type Terminal Box
		K : K Type Terminal Box
		C : C Type Terminal Box with Built-in Rectifier, Dedicated to Brakemotor
		A : A Type Terminal Box (non-compliant with CCC Standard)
		Z : Z Type Terminal Box (non-compliant with CCC Standard)
		N : Without Terminal Box (Flying Leads, Water-Resistant Cabtyre Cable)
⑫Option	Blank: Standard Specification	
	X	: Special Specification Code
⑬Option Code (Note 4)	Terminal Box/Lead Wire Position Codes Please refer to the list of option codes on page 523 for details.	

Note 1: Water-resistant type CCC-compliant products are not available.
Note 2: Please note that models are classified by type and frame size.
Note 3: Specifications are different among certification standards. Be sure to read page 536 and examine the specifications.
Note 4: The option code will not be shown in the product nomenclature on the nameplate. But it will be shown in the Option code row of the nameplate.
Note 5: Some frame sizes are different from domestic standard products. For details, please refer to the standard motor model lineup on pages 546 to 549.
Note 6: Safety certification standard is obtained by the motor unit model. [Example] GL12N015-UTML15NC → Registered model UTML15NC
Note 7: For conversions from domestic models, please refer to the conversion table on page 541.

MID Series

Gearhead Type					Motor Type							Brake Specifications	Option	
Mounting Type	Frame Size	Shaft Arrangement	Reduction Ratio		Motor Type	Motor Specifications	Power	Number of Phases	Supply Voltage	Standards	Terminal Box	Brake Specifications	Option	Option Code
G3L	18	N	5	-	M	M	02	T	M	A	T	N		
H2F	22	H	25	-	W	M	01	T	W	N	E	V4	X	AA
FF	32	L	80	-	M	M	04	T	C	N	T	B4		
F3S	30	N	7	-	M	D	08	T	A	N	T	B2	X	T9HZ
①	②	③	④		⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭

①Mounting Type	G3L : G3 Type (Parallel Shaft), Foot Mount Type G3F : G3 Type (Parallel Shaft), Flange Mount Type G3K : G3 Type (Parallel Shaft), Small Flange Mount Type H2L : H2 Type (Right Angle Shaft), Foot Mount Type H2F : H2 Type (Right Angle Shaft), Flange Mount Type FS : F Type (Right Angle Hollow Bore) FF : F Type (Right Angle Shaft) F3S : F3 Type (Concentric Right Angle Hollow Bore) F3F : F3 Type (Concentric Right Angle Shaft)					
②Frame Size and Output Shaft Diameter	Solid Shaft: OD Hollow Bore Shaft: ID					
③Shaft Arrangement	Shaft Arrangement		Parallel Shaft Right Angle Hollow Bore Concentric Right Angle Hollow Bore	Right Angle Shaft, Right Angle Shaft, Concentric Right Angle Shaft		
				Viewing from the input shaft, output shaft would be on the left side 	Viewing from the input shaft, output shaft would be on the right side 	Viewing from the input shaft, the output shaft would be on the both sides 
	Material	Carbon Steel	N	L	R	T
		Stainless Steel	S	H	M	B
④Reduction Ratio	5: 1/5 to 15X: 1/1500					
⑤Motor Type	M : Standard Induction Motor (IP40 or IP44) W : IP65 Induction Motor					
⑥Motor Specifications (Note 1)	M : IE1 Efficiency Ins. F (0.1 kW) IE2 Efficiency Ins. F (0.2 kW to 0.4 kW) D : IE3 Efficiency Ins. F (0.75 kW to 2.2 kW)					
⑦Motor Power	01 : 3-Phase 0.1 kW 02 : 3-Phase 0.2 kW 04 : 3-Phase 0.4 kW 08 : 3-Phase 0.75 kW 15 : 3-Phase 1.5 kW 22 : 3-Phase 2.2 kW					
⑧Number of Phases	T : 3-Phase					
⑨Voltage	N : 200 V/50 Hz, 200 V/60 Hz, 220 V/60 Hz W : 380 V/50 Hz, 400 V/50 Hz, 400 V/60 Hz, 440 V/60 Hz K : 220 V/60 Hz, 380 V/60 Hz C : 220 V/50 Hz, 230 V/60 Hz, 380 V/50 Hz A : 208 V/60 Hz, 230 V/60 Hz, 460 V/60 Hz, 400 V/50 Hz E : 415 V/50 Hz, 440 V/50 Hz, 480 V/60 Hz M : 575 V/60 Hz					
⑩Standards	N : CE, UL, CCC A : UL * Supply Voltage: M (575 V/60 Hz) only					
⑪Terminal Box	T : T Type Terminal Box (Steel Plate) E : E Type Terminal Box (Aluminum) (IP65 Induction Motor) N : No Terminal Box (Lead wire type)					
⑫Brake Specifications	Corresponding Motor Type (Refer to ⑥.)		Brake Specification			
	M : Induction Standard Motor		N : No Brake			
			B2 : 200 V Class Brake			
			B4 : 400 V Class Brake			
			J2 : 200 V Brake Motor with Manual Brake Release Lever (optional)			
			J4 : 400 V Brake Motor with Manual Brake Release Lever (optional)			
	W : Induction IP65 Motor		N : No Brake			
			V2 : IP65 200 V Class Brake			
			V4 : IP65 400 V Class Brake			
⑬Option	Blank : Standard Specification X : Special Specification Code					
⑭Option Code	Built-in Rectifier Connection Code For details, please refer to the list of option codes on page 504.					
	Terminal Box Position Code For details, please refer to the list of option codes on page 524.					
	Please refer to the option code list on page 900 for codes used for other special options.					

Note 1: For CCC Standard, 0.2 kW and 0.4 kW are certified under limited duty cycle. Please be cautious upon selecting the product.

Details of Global Standard Models

MINI Series

■ Product models compliant with global standards

- Product models compliant with global standards are different from domestic standard specifications. When placing an order for a product, it is required to order under the global standard model. Select a product of domestic specifications of equivalent items (power, reduction ratio, motor type, etc.) from this catalog, and convert the model into the corresponding product model compliant with global standards by referring to the figure shown below.
- Although the dimensions, performance, etc. of a product model compliant with global standards are the same as those of a product of domestic specifications, the frame sizes (output shaft diameters) of some models are changed, and their dimensions are different from those of products of domestic dimensions. Please refer to page 544 for the applicable models.

■ Major precautions about model conversion

- The model is expressed by separating the reducer unit and the motor unit.
- All reduction ratios are displayed with three digits, unlike the conventional form. [Example] 5 → 005, 1200 → 12X

● **Example of Part Number Conversion**

Domestic Specification

Part Number	Motor Type		Frame Size	Shaft Arrangement		Reduction Ratio		Number of Phases	Power	Option		Option	Option Code
GL	M	–	12		–	015	–	T	15		T		
HL	MN	–	40	L	–	1200	–	S	90	W	C	X	HZ
F2S	B	–	15		–	120	–	T	40		C	X	T6
F2F	M	–	18	T	–	240	–	S	60	W	T		

Standard Product Type

	Part Number	Frame Size	Shaft Arrangement	Reduction Ratio		Standards	Number of Phases	Motor Type Ⓐ	Motor Type Ⓑ	Power	Voltage Frequency	Terminal Box	Option	Option Code
CCC	GL	12	N	015	–	C	T	M	L	15	N	T		
UL	HL	40	L	12X	–	U	S	B	Y	90	W	C	X	HZ
CCC	F2S	15	N	120	–	C	T	B	R	40	N	C	X	T6
CE	F2F	18	T	240	–	Y	S	M	R	60	W	T		

MID Series

■ Models compliant with global standards are classified as shown below by supply voltage.

(Model example)

Reducer Unit (common to all standards)					Motor Unit (Each standard is classified with a combination of a supply voltage code and a certification code.)							
Mounting Type	Frame Size	Shaft Arrangement	Reduction Ratio		Motor Type	Motor Specifications	Power	Number of Phases	Power Supply Voltage	Standard	Terminal Box	Brake
G3L	22	N	30	–	M	M	04	T	N	N	T	N
									W	N		
									K	N		
									C	N		
									A	N		
									E	N		
									M	A		

■ Details of compliance with standards

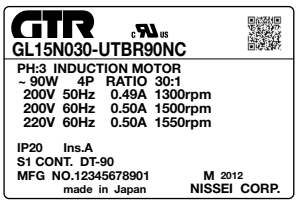
Voltage and Certification Code	Description	Voltage/Frequency	Compatible Standard
NN	Standard Voltage (Same as Japanese Domestic Type)	200 V/50 Hz, 200 V/60 Hz, 220 V/60 Hz	CE/UL/CCC
WN	High Voltage (400 V Class) (Same as Japanese Domestic Type)	380 V/50 Hz, 400 V/50 Hz, 400 V/60 Hz, 440 V/60 Hz	CE/UL/CCC
KN	Special voltage (dual voltage) for South Korea	220 V/60 Hz, 380 V/60 Hz	CE/UL/CCC
CN	Special voltage (dual voltage) for China	220 V/50 Hz, 230 V/50 Hz, 380 V/50 Hz	CE/UL/CCC
AN	Special voltage (dual voltage) for Europe/North America	208 V/60 Hz, 230 V/60 Hz, 460 V/60 Hz, 400 V/50 Hz	CE/UL/CCC
EN	Special voltage for Europe/North America	415 V/50 Hz, 440 V/50 Hz, 480 V/60 Hz	CE/UL/CCC
MA	Special voltage for North America	575 V/60 Hz	UL

Nameplate

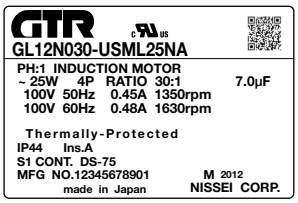
MINI Series

● UL

3-Phase

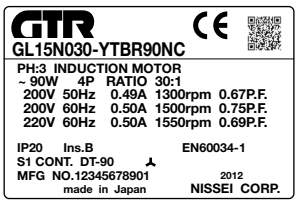


1-Phase

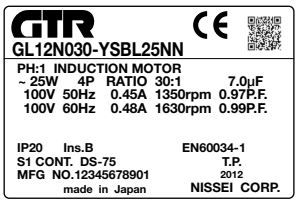


● CE

3-Phase

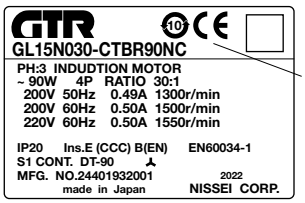


1-Phase



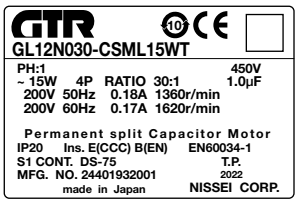
● CCC

3-Phase



CE Marking will be displayed.
A seal (CCC) will also be displayed besides the nameplate.

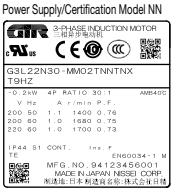
1-Phase



MID Series

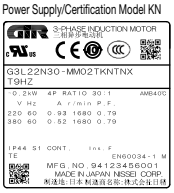
● 0.1 kW

Power Supply/Certification Model NN



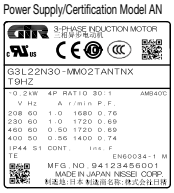
Power Supply/Certification Model WN

Power Supply/Certification Model KN

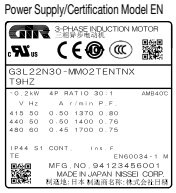


Power Supply/Certification Model CN

Power Supply/Certification Model AN



Power Supply/Certification Model EN

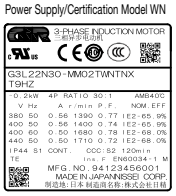


Power Supply/Certification Model MA

● 0.2 kW, 0.4 kW

Power Supply/Certification Model NN

Power Supply/Certification Model WN



Power Supply/Certification Model KN

Power Supply/Certification Model CN

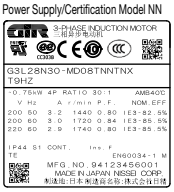
Power Supply/Certification Model AN

Power Supply/Certification Model EN

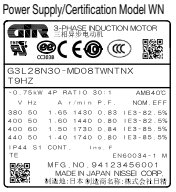
Power Supply/Certification Model MA

● 0.75 kW to 2.2 kW

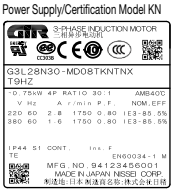
Power Supply/Certification Model NN



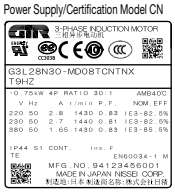
Power Supply/Certification Model WN



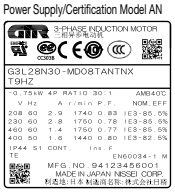
Power Supply/Certification Model KN



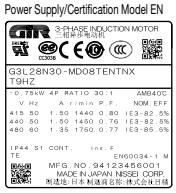
Power Supply/Certification Model CN



Power Supply/Certification Model AN



Power Supply/Certification Model EN



Power Supply/Certification Model MA

Global Standard Gearmotors Specifications/Terminal Box

MINI Series

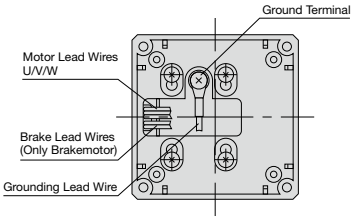
■ Specifications of terminal box <UL>

● Indoor specifications

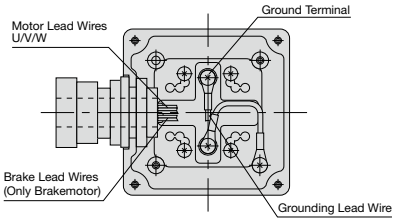
Power	Specifications	Flying Leads	Terminal Box Type	
			C-BOX	A-BOX
15 W to 90 W	No Brake	○	○	○
	Brakemotor	○	○	○

Note 1: The C Type terminal box is made of plastic, and the A Type terminal box is made of aluminum. Please select either one if you require a gearmotor with a terminal box.
Note 2: Neither the C Type terminal box nor the A Type terminal box is provided with a terminal block. In the case of a gearmotor with a brake, the brake lead wires are drawn into the terminal box.
Note 3: When the voltage exceeds 220 V, the 200 V terminal (red lead wire) is separately drawn out of the motor.
Note 4: For water-resistant types, a cabtyre cable is used as is the case with gearmotors of domestic specifications.

<C Type Terminal Box (Resin)>
3-Phase and 1-Phase 15 W to 90 W



<A Type Terminal Box (Aluminum)>
3-Phase and 1-Phase 15 W to 90 W



■ Terminal Box Specifications <CE, CCC>

Power	Specifications	Flying Leads	Terminal Box Type				
			T Type	K Type	C Type	A Type	Z Type
15W to 90W	No Brake	○	○	○	×	○	×
	Brakemotor	○	○	○	○	○	○

Note 1: The specifications of both gearmotors with flaying leads and gearmotors with a terminal box are the same as domestic standard specifications. Please refer to page 545 for details.
Note 2: When the voltage exceeds 220 V, the 200 V terminal (red lead wire) is separately drawn out of the motor.
Note 3: For water-resistant types, a cabtyre cable is used as is the case with gearmotors of domestic specifications.
Note 4: Gearmotors with a 400 V class voltage are not available with flying leads. Designate a gearbox with a terminal box.
Note 5: A Type and Z Type terminal boxes are not compliant with the CCC Standard.

■ Please note that products described below will differ in frame size (output shaft diameter and mounting dimensions) from that of the domestic model.

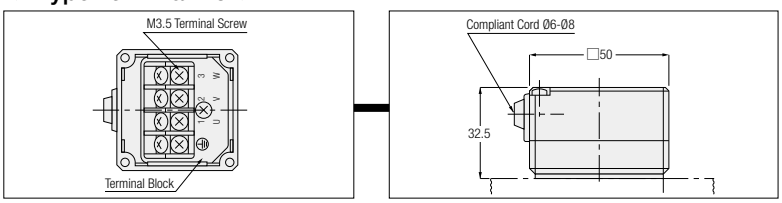
Type	Motor Designation	Reduction Ratio	Domestic Specification Frame Size	Global Standard Product Frame Size
G	T40, T40W, S40, S40W	5, 7.5, 10, 15, 20, 25, 30, 40, 50, 60	12	15
		300, 375, 450	22	28
	T60	5, 7.5, 10, 15, 20, 25, 30	12	15
		300, 375, 450	22	28
	T60W, S60, S60W	300, 375, 450	22	28
H	T40, T40W, S40, S40W	10, 15, 20, 25, 30, 40, 50, 60, 80, 100, 120	15	18
		300, 375, 450	22	28
	T60	10, 15, 20, 25, 30, 40, 50, 60	15	18
		300, 375, 450	22	28
	T60W, S60, S60W	300, 375, 450	22	28
F2S	T40, T40W, S40, S40W	10, 15, 20, 25, 30, 40, 50, 60, 80, 100, 120	12	15
	T60	10, 15, 20, 25, 30, 40, 50, 60	12	15
F2F	T40, T40W, S40, S40W	10, 15, 20, 25, 30, 40, 50, 60, 80, 100, 120	15	18
	T60	10, 15, 20, 25, 30, 40, 50, 60	15	18

Note 1: The frame size represents the internal diameter of the output shaft in the case of the F2S and external diameter of the output shaft for the rest.
Note 2: Please refer to the standard gearmotor model lineup on pages 546 to 549 as well.
If you have any questions, please contact your nearest Sales Office or the CS Center.

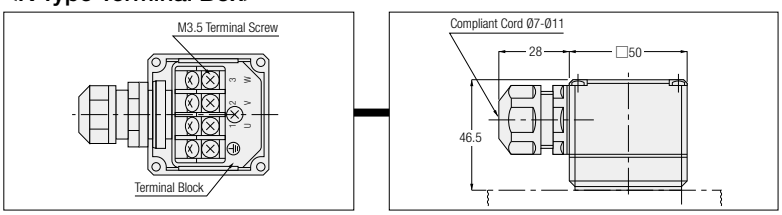
■ CE, CCC

● Types and Structures

<T Type Terminal Box>

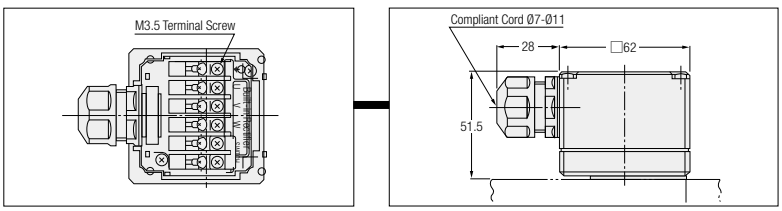


<K Type Terminal Box>

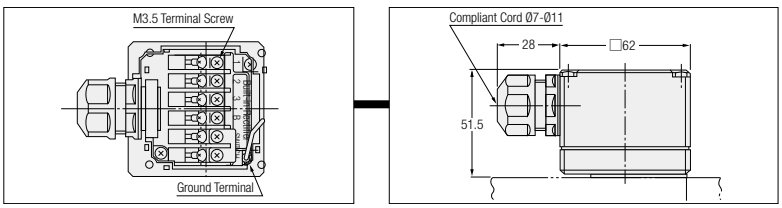


<C Type Terminal Box (with Built-in Rectifier)>

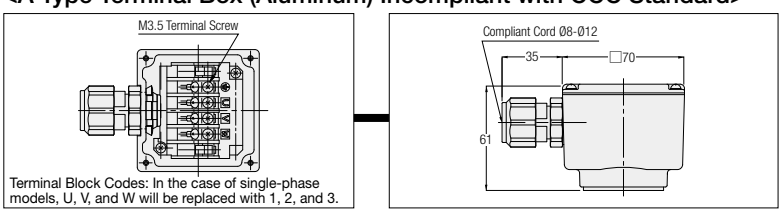
3-Phase



1-Phase

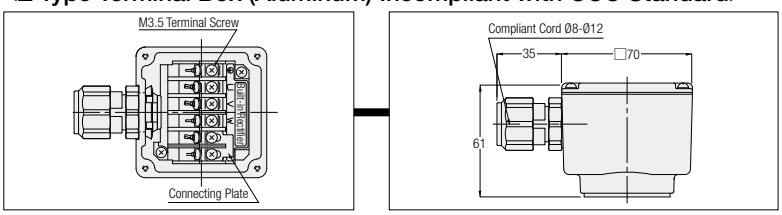


<A Type Terminal Box (Aluminum) Incompliant with CCC Standard>



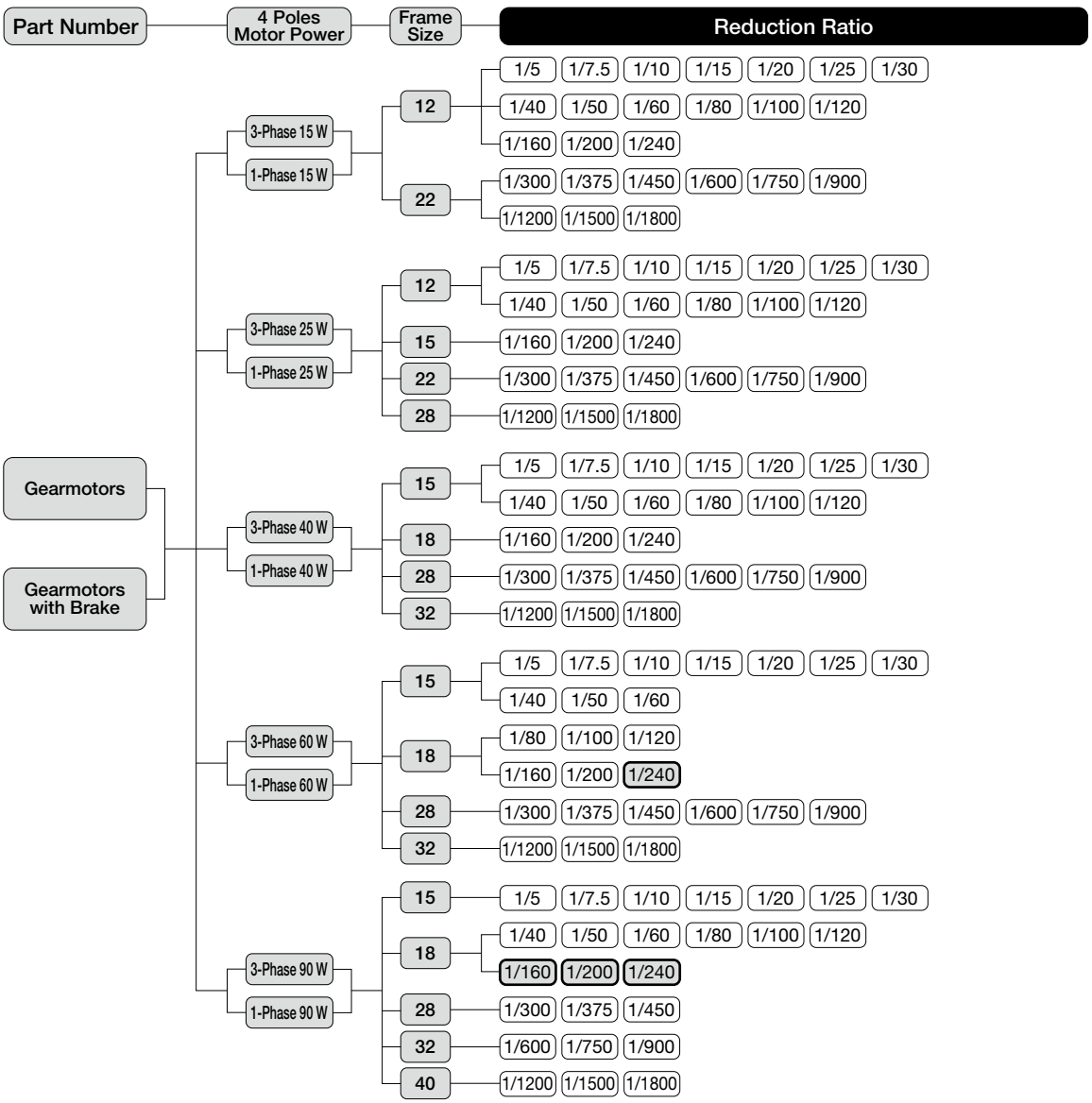
Terminal Block Codes: In the case of single-phase models, U, V, and W will be replaced with 1, 2, and 3.

<Z Type Terminal Box (Aluminum) Incompliant with CCC Standard>



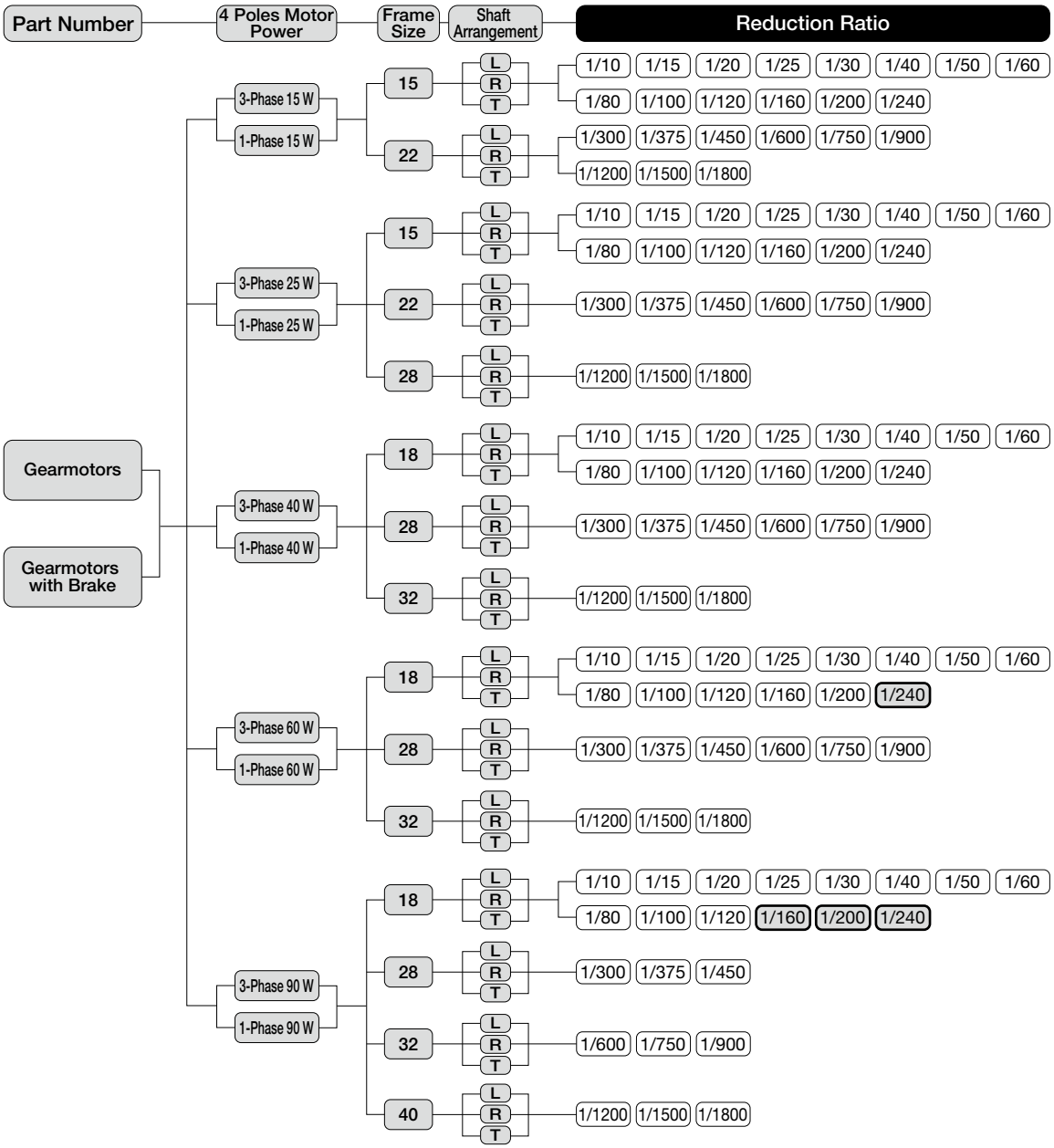
Global Standard Gearmotors Model Lineup

MINI Series <G Type>



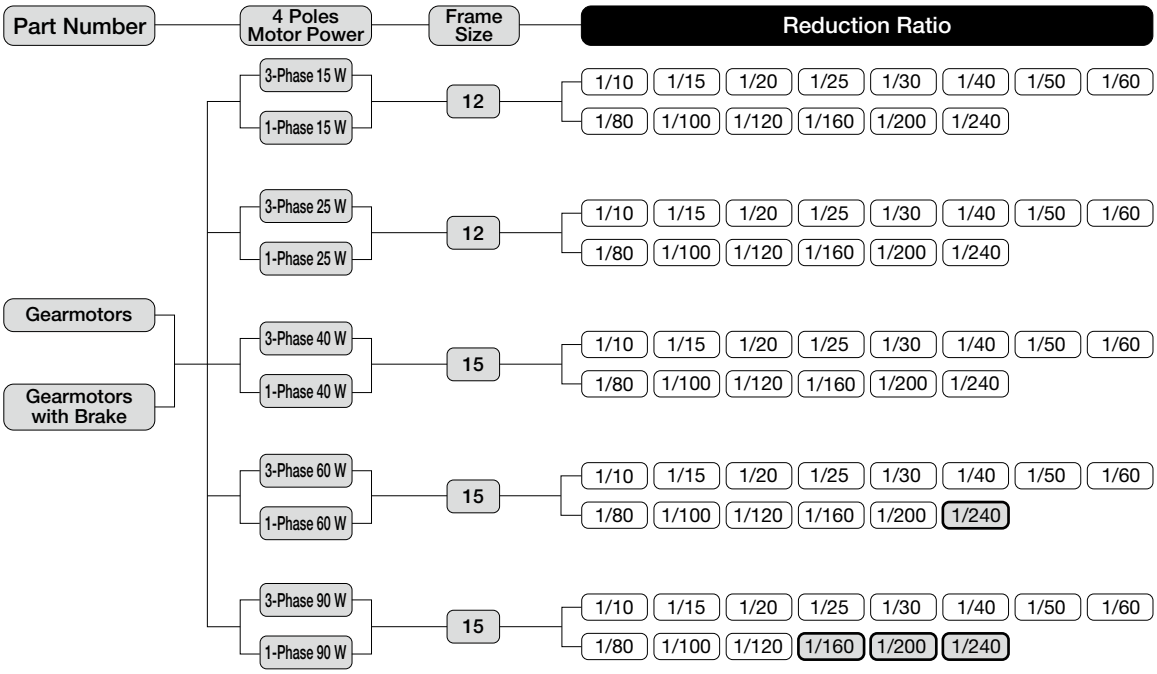
Note 1: The G Type is available in three types: Foot mount type, Flange mount type, and Small flange mount type with a frame size between 22 and 32.
Note 2: ⬭ indicates a limited torque type. Please make sure to check the allowable output shaft torque in the performance table.

MINI Series <H Type>



Note 1: The frame sizes of flange mount types are 15, 18, and 22. (Frame sizes 28, 32, and 40 are not available.)
Note 2: ⬭ indicates a limited torque type. Please make sure to check the allowable output shaft torque in the performance table.

MINI Series <Concentric Right Angle Hollow Bore/F2S Type>



Note: ⬭ indicates a limited torque type. Please make sure to check the allowable output shaft torque in the performance table.

MINI Series <Concentric Right Angle Shaft/F2F Type>

Part Number	4 Poles Motor Power	Frame Size	Shaft Arrangement	Reduction Ratio
Gearmotors Gearmotors with Brake	3-Phase 15 W 1-Phase 15 W	15	L T	1/10 1/15 1/20 1/25 1/30 1/40 1/50 1/60 1/80 1/100 1/120 1/160 1/200 1/240
	3-Phase 25 W 1-Phase 25 W	15	L T	1/10 1/15 1/20 1/25 1/30 1/40 1/50 1/60 1/80 1/100 1/120 1/160 1/200 1/240
	3-Phase 40 W 1-Phase 40 W	18	L T	1/10 1/15 1/20 1/25 1/30 1/40 1/50 1/60 1/80 1/100 1/120 1/160 1/200 1/240
	3-Phase 60 W 1-Phase 60 W	18	L T	1/10 1/15 1/20 1/25 1/30 1/40 1/50 1/60 1/80 1/100 1/120 1/160 1/200 **1/240**
	3-Phase 90 W 1-Phase 90 W	18	L T	1/10 1/15 1/20 1/25 1/30 1/40 1/50 1/60 1/80 1/100 1/120 **1/160** **1/200** **1/240**

Note: ⬭ indicates a limited torque type. Please make sure to check the allowable output shaft torque in the performance table.

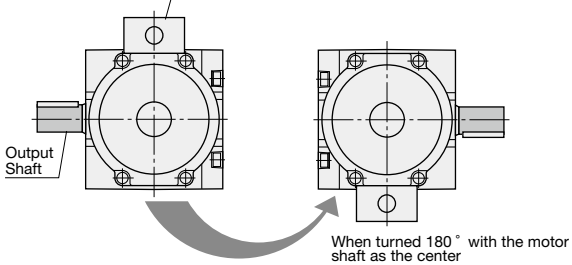
■ F2F (right angle shaft) shaft arrangement

The L shaft of the F2F (concentric right angle shaft) is as shown in [Figure-1]. The F2 type is designed for concentric flange mounting on both sides, and the output shaft can therefore be positioned on the right side as shown in [Figure-2] by rotating the gearmotor to 180 °. In this case, however, the terminal box will be on the lower side. If you wish to set the terminal box in the upper position for the convenience of use, place an order for the terminal box lower side (option code “T6”) for a standard product [Figure-1]. By rotating the gearmotor to 180 ° in this state, the output shaft will be positioned on the right side with the terminal box in the upper position. Please refer to page 523 for positional changes of terminal boxes.

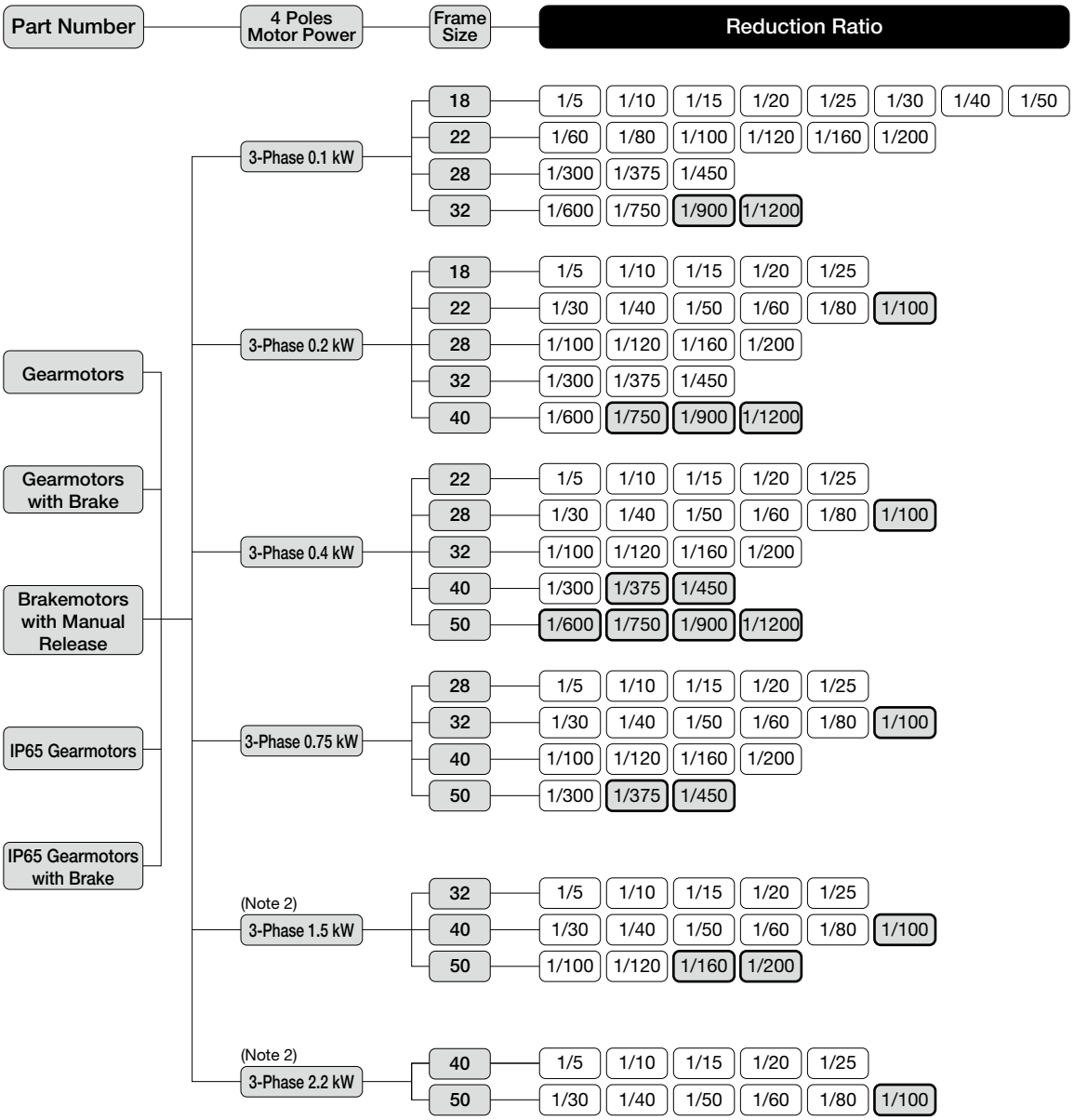
Figure when viewed from the motor side

When the output shaft is an L shaft, it is on the left side when viewed from the motor side with the terminal box in the upper position.

[Figure-1] Terminal Box [Figure-2]

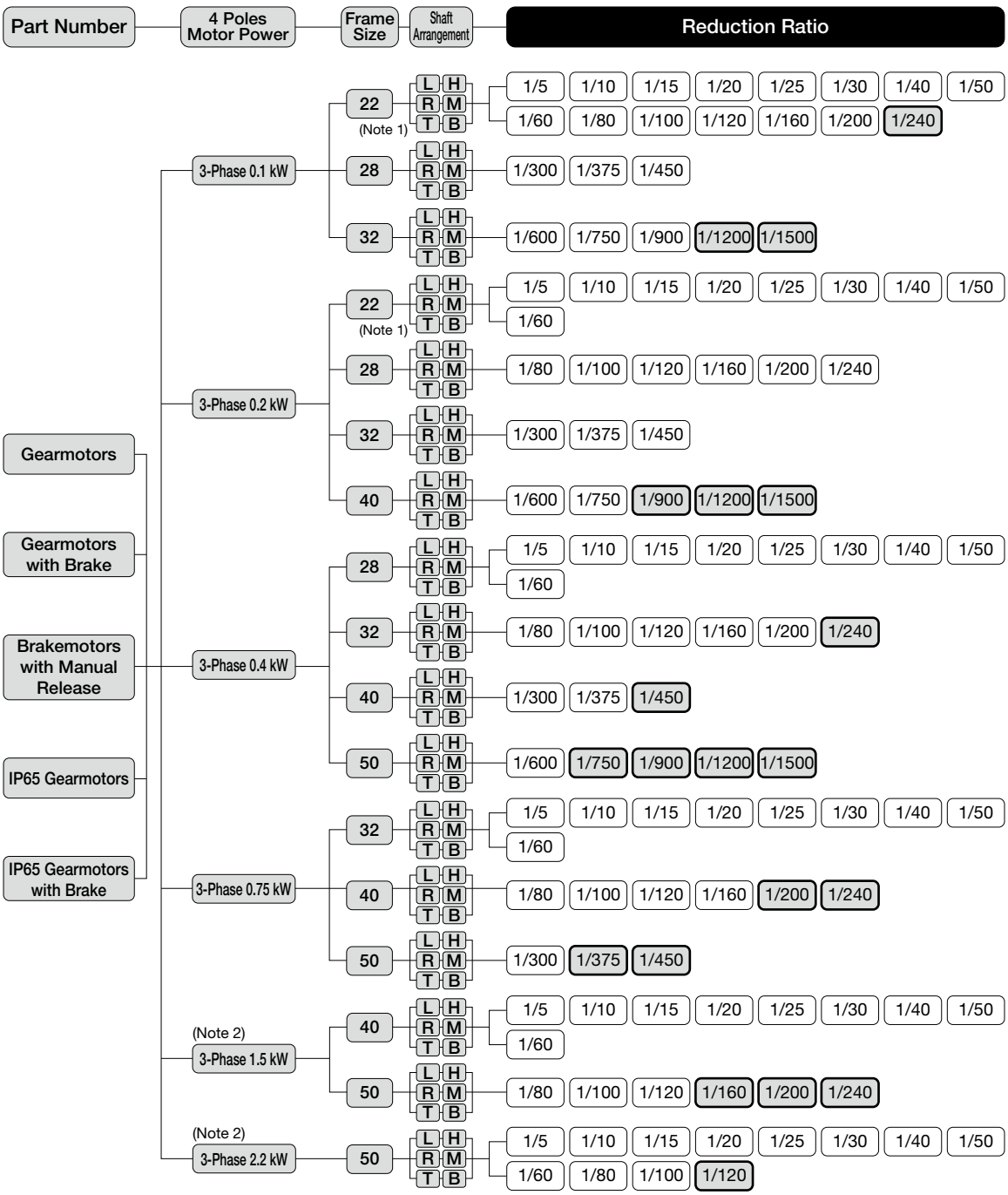


MID Series <G3 Type>



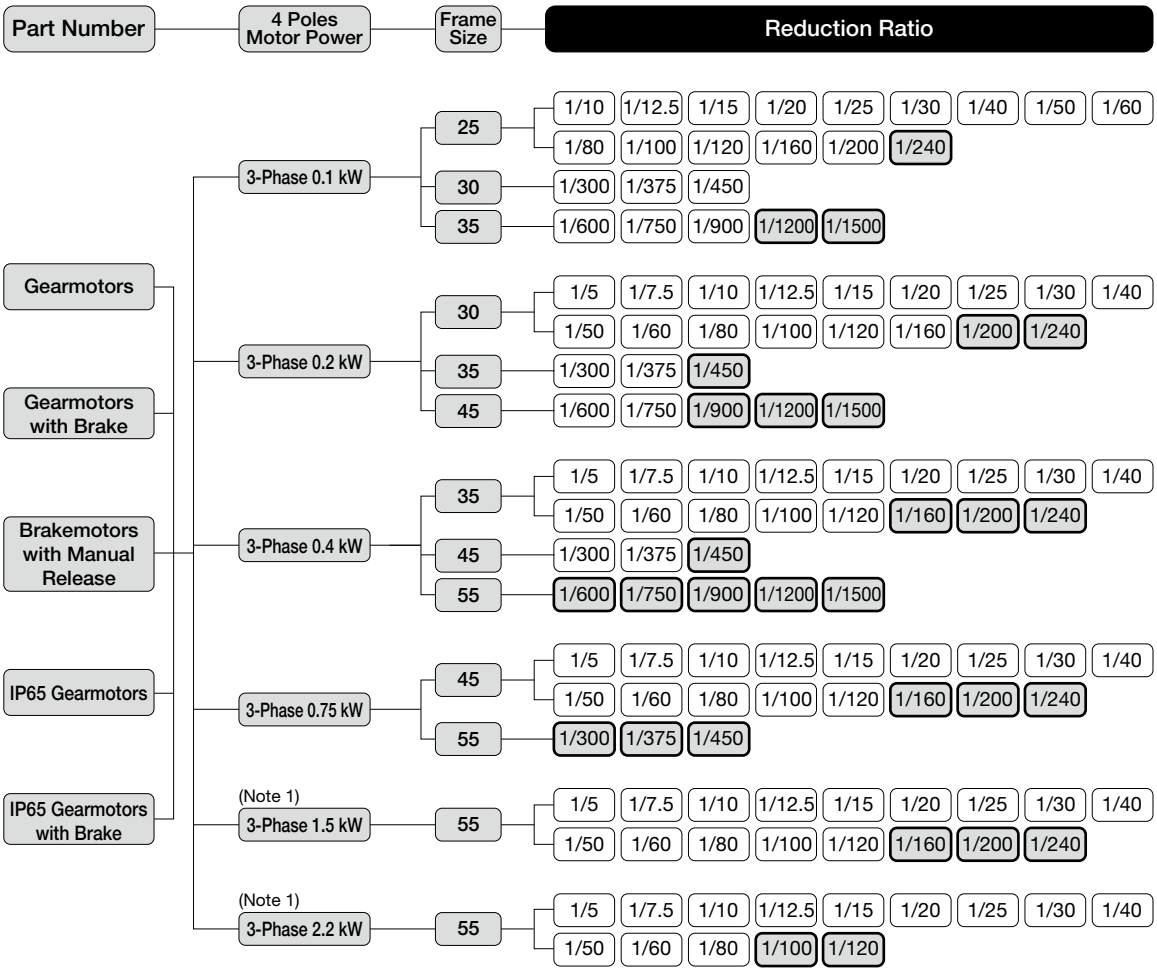
Note 1: The G3 Type is available in three types: Foot mount, Flange mount, and Small flange mount.
Please note that small flange mount (G3K) is available only for frame sizes 18 to 32.
Note 2: IP65 gearmotors with a brake are not available for 1.5 kW and 2.2 kW.
Note 3: ▭ indicates a limited torque type. Please make sure to check the allowable output shaft torque in the performance table.

MID Series <H2 Type>



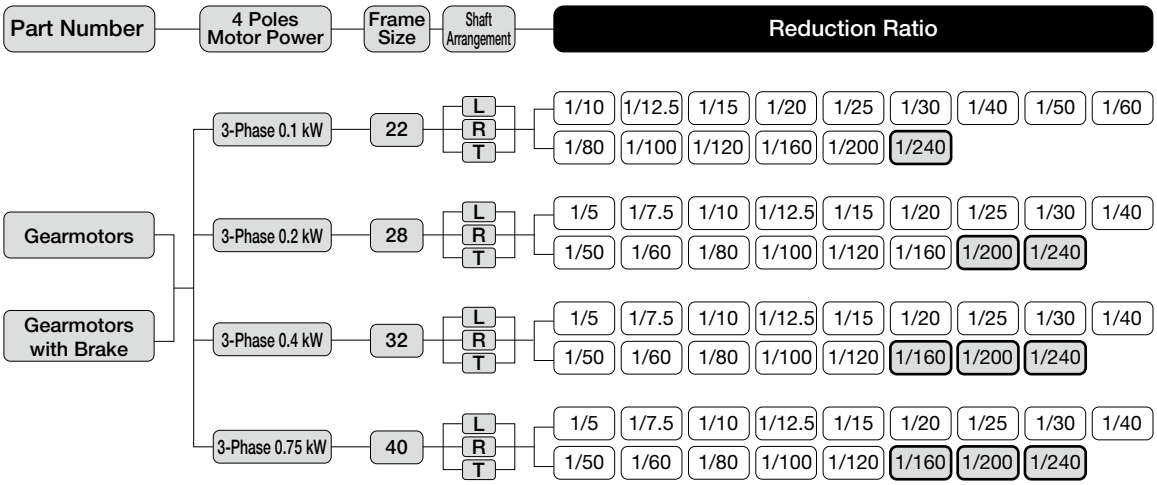
Note 1: The flange mount type (H2F) is also available for frame size 22 only.
Note 2: IP65 gearmotors with a brake are not available for 1.5 kW and 2.2 kW.
Note 3: Shaft arrangement H, M, and B (stainless steel) are IP65 gearmotors and IP65 gearmotors with a brake.
Note 4: ▭ indicates a limited torque type. Please make sure to check the allowable output shaft torque in the performance table.

MID Series <Right Angle Hollow Bore/FS Type>



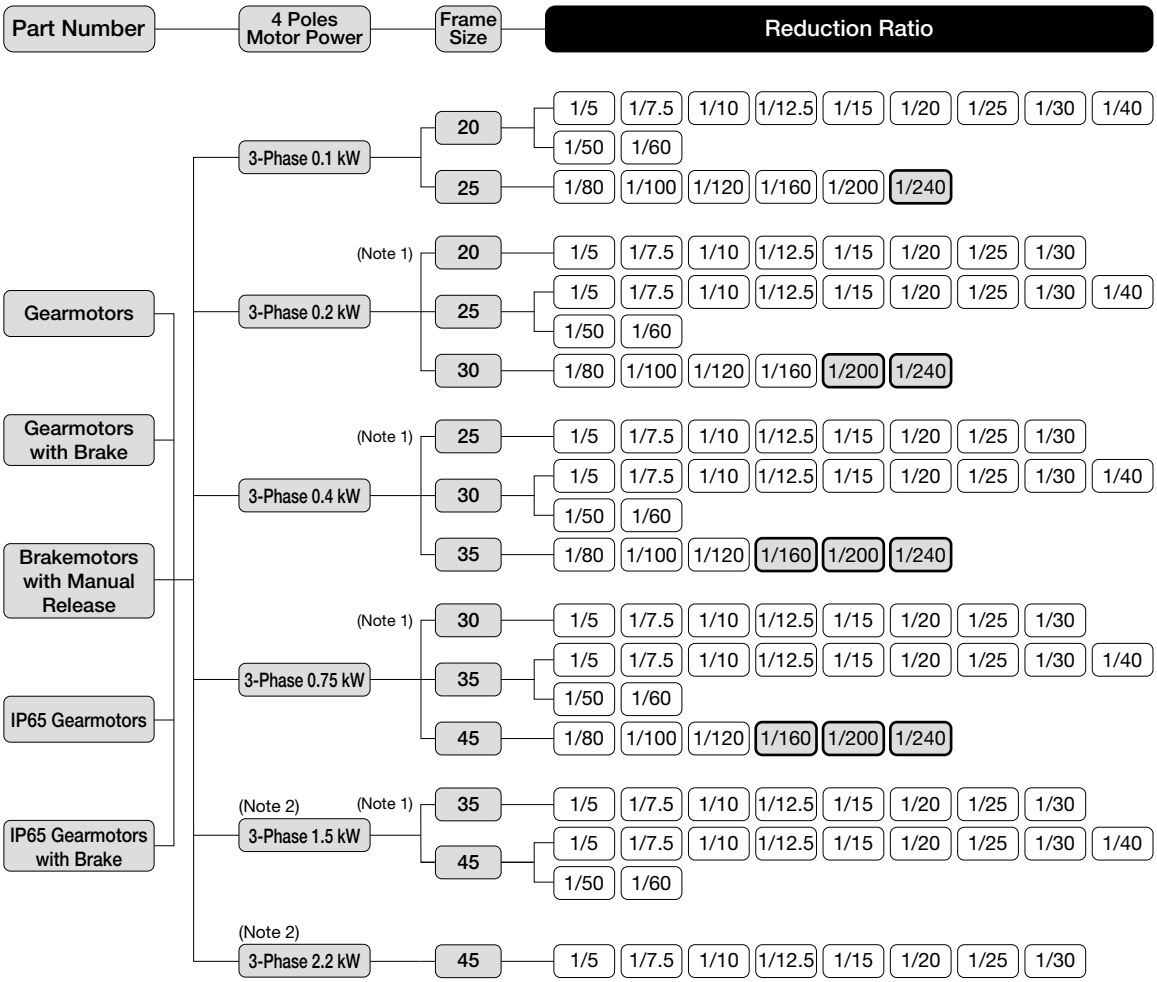
Note 1: IP65 gearmotors with a brake are not available for 1.5 kW and 2.2 kW.
Note 2: ▭ indicates a limited torque type. Please make sure to check the allowable output shaft torque in the performance table.

MID Series <Right Angle Shaft/FF Type>



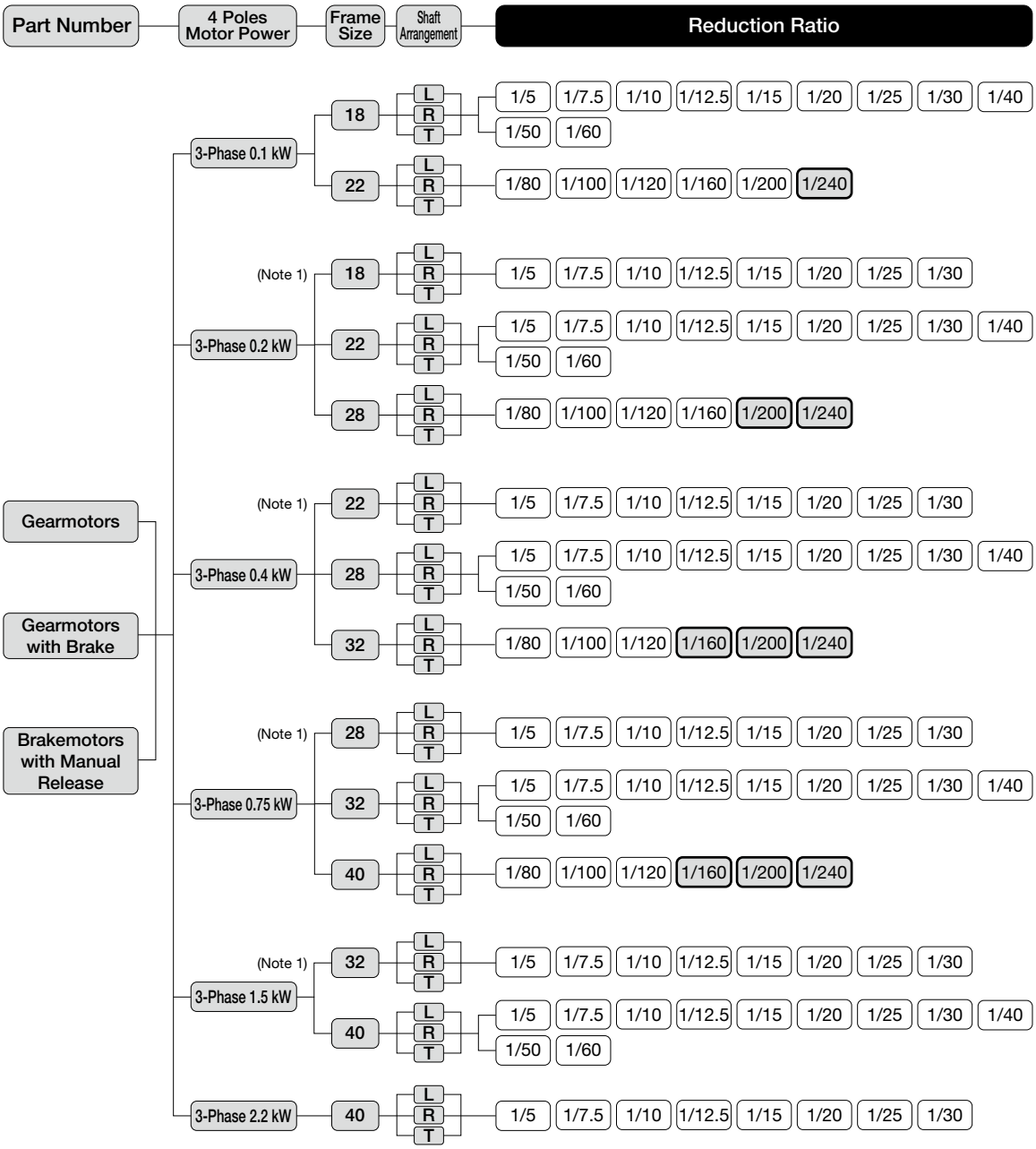
Note 1: Please note that water-resistant specification of right angle shafts is not available.
Note 2: ▭ indicates a limited torque type. Please make sure to check the allowable output shaft torque in the performance table.

MID Series <Concentric Right Angle Hollow Bore/F3S Type>



Note 1: Small frame size type
Note 2: IP65 gearmotors with a brake are not available for 1.5 kW and 2.2 kW.
Note 3: ▭ indicates a limited torque type. Please make sure to check the allowable output shaft torque in the performance table.

MID Series <Concentric Right Angle Shaft/F3F Type>



Note 1: Small frame size type
Note 2: Please note that water-resistant specification of concentric right angle shaft is not available.
Note 3: ▭ indicates a limited torque type. Please make sure to check the allowable output shaft torque in the performance table.

Global Standard Gearmotors Model, Motor Characteristics Table

MINI Series <G Type>

■ 3-Phase Standard Voltage (Indoor Specifications)

Power (W)	Voltage (V)	Frequency (Hz)	Frame Size	Rated Current (A)	Rated Speed (r/min)	Startup Current (A)
15	200/200/220	50/60/60	12	0.13/0.13/0.13	1350/1550/1610	0.30/0.29/0.27
			22	0.13/0.13/0.13	1350/1550/1610	0.30/0.29/0.27
25	200/200/220	50/60/60	12	0.18/0.18/0.19	1320/1520/1590	0.44/0.42/0.46
			15	0.17/0.17/0.17	1310/1520/1580	0.42/0.40/0.42
			22	0.18/0.18/0.19	1320/1520/1590	0.44/0.42/0.46
			28	0.17/0.17/0.17	1310/1520/1580	0.42/0.40/0.42
40	200/200/220	50/60/60	15	0.28/0.26/0.27	1320/1540/1590	0.64/0.61/0.75
			18	0.20/0.21/0.21	1370/1590/1640	0.68/0.64/0.71
			28	0.28/0.26/0.27	1320/1540/1590	0.64/0.61/0.75
			32	0.28/0.26/0.27	1320/1540/1590	0.64/0.61/0.75
60	200/200/220	50/60/60	15	0.36/0.35/0.36	1300/1520/1570	1.04/0.97/1.07
			18	0.30/0.32/0.31	1370/1620/1650	1.10/1.03/1.14
			28	0.36/0.35/0.36	1300/1520/1570	1.04/0.97/1.07
			32	0.36/0.35/0.36	1300/1520/1570	1.04/0.97/1.07
90	200/200/220	50/60/60	15	0.49/0.50/0.50	1300/1500/1550	1.25/1.33/1.38
			18	0.44/0.46/0.44	1360/1580/1630	1.59/1.50/1.66
			28	0.49/0.50/0.50	1300/1500/1550	1.25/1.33/1.38
			32	0.49/0.50/0.50	1300/1500/1550	1.25/1.33/1.38
			40	0.44/0.46/0.44	1360/1580/1630	1.59/1.50/1.66

■ 3-Phase High Voltage (400 V Class) (Indoor Specifications)

Power (W)	Voltage (V)	Frequency (Hz)	Frame Size	Rated Current (A)	Rated Speed (r/min)	Startup Current (A)
15	380/400/400/440	50/50/60/60	12	0.11/0.12/0.10/0.11	1400/1400/1700/1700	0.27/0.29/0.27/0.30
			22	0.11/0.12/0.10/0.11	1400/1400/1700/1700	0.27/0.29/0.27/0.30
25	380/400/400/440	50/50/60/60	12	0.11/0.12/0.11/0.12	1350/1400/1600/1650	0.27/0.28/0.26/0.29
			15	0.09/0.09/0.09/0.09	1300/1350/1550/1600	0.20/0.21/0.20/0.22
			22	0.11/0.12/0.11/0.12	1350/1400/1600/1650	0.27/0.28/0.26/0.29
			28	0.09/0.09/0.09/0.09	1300/1350/1550/1600	0.20/0.21/0.20/0.22
40	380/400/400/440	50/50/60/60	15	0.13/0.14/0.13/0.14	1300/1350/1550/1600	0.33/0.35/0.33/0.37
			18	0.10/0.10/0.10/0.10	1350/1400/1600/1650	0.32/0.34/0.32/0.35
			28	0.13/0.14/0.13/0.14	1300/1350/1550/1600	0.33/0.35/0.33/0.37
			32	0.13/0.14/0.13/0.14	1300/1350/1550/1600	0.33/0.35/0.33/0.37
60	380/400/400/440	50/50/60/60	15	0.17/0.17/0.17/0.17	1300/1350/1550/1600	0.43/0.46/0.43/0.47
			18	0.16/0.16/0.16/0.16	1350/1400/1600/1650	0.48/0.51/0.49/0.54
			28	0.17/0.17/0.17/0.17	1300/1350/1550/1600	0.43/0.46/0.43/0.47
			32	0.17/0.17/0.17/0.17	1300/1350/1550/1600	0.43/0.46/0.43/0.47
90	380/400/400/440	50/50/60/60	15	0.26/0.26/0.26/0.26	1300/1350/1550/1600	0.70/0.74/0.69/0.77
			18	0.23/0.23/0.24/0.24	1350/1350/1600/1650	0.73/0.78/0.74/0.81
			28	0.26/0.26/0.26/0.26	1300/1350/1550/1600	0.70/0.74/0.69/0.77
			32	0.26/0.26/0.26/0.26	1300/1350/1550/1600	0.70/0.74/0.69/0.77
			40	0.23/0.23/0.24/0.24	1350/1350/1600/1650	0.73/0.78/0.74/0.81

■ 1-Phase Standard Voltage (Indoor Specifications)

Power (W)	Voltage (V)	Frequency (Hz)	Frame Size	Rated Current (A)	Rated Speed (r/min)	Startup Current (A)	Capacitor (μF)
15	100/100	50/60	12	0.35/0.33	1390/1680	0.73/0.66	5
			22	0.35/0.33	1390/1680	0.73/0.66	5
25	100/100	50/60	12	0.45/0.48	1350/1630	0.86/0.79	7
			15	0.45/0.45	1370/1640	1.01/0.93	7
			22	0.45/0.48	1350/1630	0.86/0.79	7
			28	0.45/0.45	1370/1640	1.01/0.93	7
40	100/100	50/60	15	0.61/0.66	1380/1630	1.47/1.34	10
			18	0.62/0.65	1440/1720	2.18/2.00	10
			28	0.61/0.66	1380/1630	1.47/1.34	10
			32	0.61/0.66	1380/1630	1.47/1.34	10
60	100/100	50/60	15	0.90/1.00	1380/1650	2.13/1.95	15
			18	0.85/1.00	1430/1700	2.60/2.41	15
			28	0.90/1.00	1380/1650	2.13/1.95	15
			32	0.90/1.00	1380/1650	2.13/1.95	15
90	100/100	50/60	15	1.30/1.40	1350/1600	2.90/2.70	20
			18	1.20/1.40	1400/1680	3.32/3.10	20
			28	1.30/1.40	1350/1600	2.90/2.70	20
			32	1.30/1.40	1350/1600	2.90/2.70	20
			40	1.20/1.40	1400/1680	3.32/3.10	20

■ 1-Phase High Voltage (200 V Class) (Indoor Specifications)

Power (W)	Voltage (V)	Frequency (Hz)	Frame Size	Rated Current (A)	Rated Speed (r/min)	Startup Current (A)	Capacitor (μF)
15	200/200	50/60	12	0.18/0.17	1360/1620	0.35/0.32	1.0
			22	0.18/0.17	1360/1620	0.35/0.32	1.0
25	200/200	50/60	12	0.24/0.23	1340/1600	0.48/0.44	1.5
			15	0.23/0.23	1340/1600	0.49/0.44	1.5
			22	0.24/0.23	1340/1600	0.48/0.44	1.5
			28	0.23/0.23	1340/1600	0.49/0.44	1.5
40	200/200	50/60	15	0.29/0.34	1340/1610	0.64/0.61	2.5
			18	0.31/0.34	1430/1700	1.01/0.92	2.5
			28	0.29/0.34	1340/1610	0.64/0.61	2.5
			32	0.29/0.34	1340/1610	0.64/0.61	2.5
60	200/200	50/60	15	0.42/0.47	1370/1640	1.07/0.98	3.5
			18	0.42/0.48	1420/1690	1.34/1.25	3.5
			28	0.42/0.47	1370/1640	1.07/0.98	3.5
			32	0.42/0.47	1370/1640	1.07/0.98	3.5
90	200/200	50/60	15	0.62/0.67	1340/1600	1.46/1.36	5
			18	0.62/0.69	1400/1680	1.72/1.57	5
			28	0.62/0.67	1340/1600	1.46/1.36	5
			32	0.62/0.67	1340/1600	1.46/1.36	5
			40	0.62/0.69	1400/1680	1.72/1.57	5

MINI Series <H Type>

■ 3-Phase Standard Voltage (Indoor Specifications)

Power (W)	Voltage (V)	Frequency (Hz)	Frame Size	Rated Current (A)	Rated Speed (r/min)	Startup Current (A)
15	200/200/220	50/60/60	15	0.13/0.13/0.13	1350/1550/1610	0.30/0.29/0.27
			22	0.13/0.13/0.13	1350/1550/1610	0.30/0.29/0.27
25	200/200/220	50/60/60	15	0.18/0.18/0.19	1320/1520/1590	0.44/0.42/0.46
			22	0.18/0.18/0.19	1320/1520/1590	0.44/0.42/0.46
			28	0.17/0.17/0.17	1310/1520/1580	0.42/0.40/0.42
40	200/200/220	50/60/60	18	0.28/0.26/0.27	1320/1540/1590	0.64/0.61/0.75
			28	0.28/0.26/0.27	1320/1540/1590	0.64/0.61/0.75
			32	0.28/0.26/0.27	1320/1540/1590	0.64/0.61/0.75
60	200/200/220	50/60/60	18	0.36/0.35/0.36	1300/1520/1570	1.04/0.97/1.07
			28	0.36/0.35/0.36	1300/1520/1570	1.04/0.97/1.07
			32	0.36/0.35/0.36	1300/1520/1570	1.04/0.97/1.07
90	200/200/220	50/60/60	18	0.49/0.50/0.50	1300/1500/1550	1.25/1.33/1.38
			28	0.49/0.50/0.50	1300/1500/1550	1.25/1.33/1.38
			32	0.49/0.50/0.50	1300/1500/1550	1.25/1.33/1.38
			40	0.44/0.46/0.44	1360/1580/1630	1.59/1.50/1.66

■ 3-Phase High Voltage (400 V Class) (Indoor Specifications)

Power (W)	Voltage (V)	Frequency (Hz)	Frame Size	Rated Current (A)	Rated Speed (r/min)	Startup Current (A)
15	380/400/400/440	50/50/60/60	15	0.11/0.12/0.10/0.11	1400/1400/1700/1700	0.27/0.29/0.27/0.30
			22	0.11/0.12/0.10/0.11	1400/1400/1700/1700	0.27/0.29/0.27/0.30
25	380/400/400/440	50/50/60/60	15	0.11/0.12/0.11/0.12	1350/1400/1600/1650	0.27/0.28/0.26/0.29
			22	0.11/0.12/0.11/0.12	1350/1400/1600/1650	0.27/0.28/0.26/0.29
			28	0.09/0.09/0.09/0.09	1300/1350/1550/1600	0.20/0.21/0.20/0.22
40	380/400/400/440	50/50/60/60	18	0.13/0.14/0.13/0.14	1300/1350/1550/1600	0.33/0.35/0.33/0.37
			28	0.13/0.14/0.13/0.14	1300/1350/1550/1600	0.33/0.35/0.33/0.37
			32	0.13/0.14/0.13/0.14	1300/1350/1550/1600	0.33/0.35/0.33/0.37
60	380/400/400/440	50/50/60/60	18	0.17/0.17/0.17/0.17	1300/1350/1550/1600	0.43/0.46/0.43/0.47
			28	0.17/0.17/0.17/0.17	1300/1350/1550/1600	0.43/0.46/0.43/0.47
			32	0.17/0.17/0.17/0.17	1300/1350/1550/1600	0.43/0.46/0.43/0.47
90	380/400/400/440	50/50/60/60	18	0.26/0.26/0.26/0.26	1300/1350/1550/1600	0.70/0.74/0.69/0.77
			28	0.26/0.26/0.26/0.26	1300/1350/1550/1600	0.70/0.74/0.69/0.77
			32	0.26/0.26/0.26/0.26	1300/1350/1550/1600	0.70/0.74/0.69/0.77
			40	0.23/0.23/0.24/0.24	1350/1350/1600/1650	0.73/0.78/0.74/0.81

■ 1-Phase Standard Voltage (Indoor Specifications)

Power (W)	Voltage (V)	Frequency (Hz)	Frame Size	Rated Current (A)	Rated Speed (r/min)	Startup Current (A)	Capacitor (μF)
15	100/100	50/60	15	0.35/0.33	1390/1680	0.73/0.66	5
			22	0.35/0.33	1390/1680	0.73/0.66	5
25	100/100	50/60	15	0.45/0.48	1350/1630	0.86/0.79	7
			22	0.45/0.48	1350/1630	0.86/0.79	7
			28	0.45/0.45	1370/1640	1.01/0.93	7
40	100/100	50/60	18	0.61/0.66	1380/1630	1.47/1.34	10
			28	0.61/0.66	1380/1630	1.47/1.34	10
			32	0.61/0.66	1380/1630	1.47/1.34	10
60	100/100	50/60	18	0.90/1.00	1380/1650	2.13/1.95	15
			28	0.90/1.00	1380/1650	2.13/1.95	15
			32	0.90/1.00	1380/1650	2.13/1.95	15
90	100/100	50/60	18	1.30/1.40	1350/1600	2.90/2.70	20
			28	1.30/1.40	1350/1600	2.90/2.70	20
			32	1.30/1.40	1350/1600	2.90/2.70	20
			40	1.20/1.40	1400/1680	3.32/3.10	20

■ 1-Phase High Voltage (200 V Class) (Indoor Specifications)

Power (W)	Voltage (V)	Frequency (Hz)	Frame Size	Rated Current (A)	Rated Speed (r/min)	Startup Current (A)	Capacitor (μF)
15	200/200	50/60	15	0.18/0.17	1360/1620	0.35/0.32	1.0
			22	0.18/0.17	1360/1620	0.35/0.32	1.0
25	200/200	50/60	15	0.24/0.23	1340/1600	0.48/0.44	1.5
			22	0.24/0.23	1340/1600	0.48/0.44	1.5
			28	0.23/0.23	1340/1600	0.49/0.44	1.5
40	200/200	50/60	18	0.29/0.34	1340/1610	0.64/0.61	2.5
			28	0.29/0.34	1340/1610	0.64/0.61	2.5
			32	0.29/0.34	1340/1610	0.64/0.61	2.5
60	200/200	50/60	18	0.42/0.47	1370/1640	1.07/0.98	3.5
			28	0.42/0.47	1370/1640	1.07/0.98	3.5
			32	0.42/0.47	1370/1640	1.07/0.98	3.5
90	200/200	50/60	18	0.62/0.67	1340/1600	1.46/1.36	5
			28	0.62/0.67	1340/1600	1.46/1.36	5
			32	0.62/0.67	1340/1600	1.46/1.36	5
			40	0.62/0.69	1400/1680	1.72/1.57	5

MINI Series <Concentric Right Angle Hollow Bore/F2S Type>

■ 3-Phase Standard Voltage (Indoor Specifications)

Power (W)	Voltage (V)	Frequency (Hz)	Frame Size	Rated Current (A)	Rated Speed (r/min)	Startup Current (A)
15	200/200/220	50/60/60	12	0.13/0.13/0.13	1350/1550/1610	0.30/0.29/0.27
25	200/200/220	50/60/60	12	0.18/0.18/0.19	1320/1520/1590	0.44/0.42/0.46
40	200/200/220	50/60/60	15	0.28/0.26/0.27	1320/1540/1590	0.64/0.61/0.75
60	200/200/220	50/60/60	15	0.36/0.35/0.36	1300/1520/1570	1.04/0.97/1.07
90	200/200/220	50/60/60	15	0.49/0.50/0.50	1300/1500/1550	1.25/1.33/1.38

■ 3-Phase High Voltage (400 V Class) (Indoor Specifications)

Power (W)	Voltage (V)	Frequency (Hz)	Frame Size	Rated Current (A)	Rated Speed (r/min)	Startup Current (A)
15	380/400/400/440	50/50/60/60	12	0.11/0.12/0.10/0.11	1400/1400/1700/1700	0.27/0.29/0.27/0.30
25	380/400/400/440	50/50/60/60	12	0.11/0.12/0.11/0.12	1350/1400/1600/1650	0.27/0.28/0.26/0.29
40	380/400/400/440	50/50/60/60	15	0.13/0.14/0.13/0.14	1300/1350/1550/1600	0.33/0.35/0.33/0.37
60	380/400/400/440	50/50/60/60	15	0.17/0.17/0.17/0.17	1300/1350/1550/1600	0.43/0.46/0.43/0.47
90	380/400/400/440	50/50/60/60	15	0.26/0.26/0.26/0.26	1300/1350/1550/1600	0.70/0.74/0.69/0.77

■ 1-Phase Standard Voltage (Indoor Specifications)

Power (W)	Voltage (V)	Frequency (Hz)	Frame Size	Rated Current (A)	Rated Speed (r/min)	Startup Current (A)	Capacitor (μF)
15	100/100	50/60	12	0.35/0.33	1390/1680	0.73/0.66	5
25	100/100	50/60	12	0.45/0.48	1350/1630	0.86/0.79	7
40	100/100	50/60	15	0.61/0.66	1380/1630	1.47/1.34	10
60	100/100	50/60	15	0.90/1.00	1380/1650	2.13/1.95	15
90	100/100	50/60	15	1.30/1.40	1350/1600	2.90/2.70	20

■ 1-Phase High Voltage (200 V Class) (Indoor Specifications)

Power (W)	Voltage (V)	Frequency (Hz)	Frame Size	Rated Current (A)	Rated Speed (r/min)	Startup Current (A)	Capacitor (μF)
15	200/200	50/60	12	0.18/0.17	1360/1620	0.35/0.32	1.0
25	200/200	50/60	12	0.24/0.23	1340/1600	0.48/0.44	1.5
40	200/200	50/60	15	0.29/0.34	1340/1610	0.64/0.61	2.5
60	200/200	50/60	15	0.42/0.47	1370/1640	1.07/0.98	3.5
90	200/200	50/60	15	0.62/0.67	1340/1600	1.46/1.36	5

MINI Series <Concentric Right Angle Shaft/F2F Type>

■ 3-Phase Standard Voltage (Indoor Specifications)

Power (W)	Voltage (V)	Frequency (Hz)	Frame Size	Rated Current (A)	Rated Speed (r/min)	Startup Current (A)
15	200/200/220	50/60/60	15	0.13/0.13/0.13	1350/1550/1610	0.30/0.29/0.27
25	200/200/220	50/60/60	15	0.18/0.18/0.19	1320/1520/1590	0.44/0.42/0.46
40	200/200/220	50/60/60	18	0.28/0.26/0.27	1320/1540/1590	0.64/0.61/0.75
60	200/200/220	50/60/60	18	0.36/0.35/0.36	1300/1520/1570	1.04/0.97/1.07
90	200/200/220	50/60/60	18	0.49/0.50/0.50	1300/1500/1550	1.25/1.33/1.38

■ 3-Phase High Voltage (400 V Class) (Indoor Specifications)

Power (W)	Voltage (V)	Frequency (Hz)	Frame Size	Rated Current (A)	Rated Speed (r/min)	Startup Current (A)
15	380/400/400/440	50/50/60/60	15	0.11/0.12/0.10/0.11	1400/1400/1700/1700	0.27/0.29/0.27/0.30
25	380/400/400/440	50/50/60/60	15	0.11/0.12/0.11/0.12	1350/1400/1600/1650	0.27/0.28/0.26/0.29
40	380/400/400/440	50/50/60/60	18	0.13/0.14/0.13/0.14	1300/1350/1550/1600	0.33/0.35/0.33/0.37
60	380/400/400/440	50/50/60/60	18	0.17/0.17/0.17/0.17	1300/1350/1550/1600	0.43/0.46/0.43/0.47
90	380/400/400/440	50/50/60/60	18	0.26/0.26/0.26/0.26	1300/1350/1550/1600	0.70/0.74/0.69/0.77

■ 1-Phase Standard Voltage (Indoor Specifications)

Power (W)	Voltage (V)	Frequency (Hz)	Frame Size	Rated Current (A)	Rated Speed (r/min)	Startup Current (A)	Capacitor (μF)
15	100/100	50/60	15	0.35/0.33	1390/1680	0.73/0.66	5
25	100/100	50/60	15	0.45/0.48	1350/1630	0.86/0.79	7
40	100/100	50/60	18	0.61/0.66	1380/1630	1.47/1.34	10
60	100/100	50/60	18	0.90/1.00	1380/1650	2.13/1.95	15
90	100/100	50/60	18	1.30/1.40	1350/1600	2.90/2.70	20

■ 1-Phase High Voltage (200 V Class) (Indoor Specifications)

Power (W)	Voltage (V)	Frequency (Hz)	Frame Size	Rated Current (A)	Rated Speed (r/min)	Startup Current (A)	Capacitor (μF)
15	200/200	50/60	15	0.18/0.17	1360/1620	0.35/0.32	1.0
25	200/200	50/60	15	0.24/0.23	1340/1600	0.48/0.44	1.5
40	200/200	50/60	18	0.29/0.34	1340/1610	0.64/0.61	2.5
60	200/200	50/60	18	0.42/0.47	1370/1640	1.07/0.98	3.5
90	200/200	50/60	18	0.62/0.67	1340/1600	1.46/1.36	5

MID Series

■ 3-Phase Standard Voltage 3 Rating [Model (Supply Voltage): N]

Typical Motor Characteristics

Motor Power	Voltage	Frequency	Rated Speed	Current Characteristics		Torque Characteristics		Efficiency
				Rated Current	Startup Current	Startup Torque	Breakdown Torque	
	V	Hz	r/min	A	A	%	%	%
0.1 kW	200	50	1410	0.61	2.39	215	258	–
	200	60	1690	0.54	2.27	190	238	–
	220	60	1710	0.54	2.52	245	300	–
0.2 kW IE2	200	50	1400	1.1	4.70	215	248	65.9
	200	60	1680	1.0	4.35	195	225	68.0
	220	60	1700	1.0	4.85	238	279	68.0
0.4 kW IE2	200	50	1400	2.1	9.50	220	265	73.5
	200	60	1680	1.8	8.60	190	234	72.0
	220	60	1700	1.8	9.60	236	289	72.0
0.75 kW IE3	200	50	1440	3.2	19.1	246	305	82.5
	200	60	1720	3.0	16.6	190	261	85.5
	220	60	1740	2.9	18.6	224	321	85.5
1.5 kW IE3	200	50	1450	6.4	43.5	243	338	85.3
	200	60	1740	6.0	36.0	190	283	86.5
	220	60	1750	5.7	40.3	221	348	86.5
2.2 kW IE3	200	50	1450	8.8	58.5	236	337	86.7
	200	60	1740	8.4	47.0	180	278	89.5
	220	60	1750	7.9	52.5	222	336	89.5

■ 3-Phase High Voltage (400 V Class) 4 Rating [Model (Supply Voltage): W]

Typical Motor Characteristics

Motor Power	Voltage	Frequency	Rated Speed	Current Characteristics		Torque Characteristics		Efficiency
				Rated Current	Startup Current	Startup Torque	Breakdown Torque	
	V	Hz	r/min	A	A	%	%	%
0.1 kW	380	50	1400	0.31	1.12	180	224	–
	400	50	1410	0.31	1.18	199	250	–
	400	60	1690	0.28	1.12	180	233	–
	440	60	1720	0.28	1.22	217	285	–
0.2 kW IE2	380	50	1390	0.56	2.29	192	230	65.9
	400	50	1400	0.56	2.38	220	257	65.9
	400	60	1680	0.5	2.29	214	239	68.0
	440	60	1710	0.5	2.48	258	294	68.0
0.4 kW IE2	380	50	1390	1.0	4.35	194	225	73.5
	400	50	1400	1.0	4.65	216	258	73.5
	400	60	1680	0.9	4.30	184	232	72.0
	440	60	1710	0.9	4.75	221	286	72.0
0.75 kW IE3	380	50	1430	1.65	9.00	221	276	82.5
	400	50	1440	1.6	9.60	249	308	82.5
	400	60	1730	1.5	8.30	193	263	85.5
	440	60	1740	1.4	9.30	243	323	85.5
1.5 kW IE3	380	50	1440	3.3	21.7	206	302	85.3
	400	50	1450	3.2	23.1	231	337	85.3
	400	60	1740	3.0	18.6	190	280	86.5
	440	60	1750	2.9	20.7	219	335	86.5
2.2 kW IE3	380	50	1440	4.5	30.0	209	306	86.7
	400	50	1450	4.4	32.0	234	341	86.7
	400	60	1740	4.2	25.0	180	270	89.5
	440	60	1750	3.9	28.0	210	331	89.5

■ 3-Phase Special Voltage (Dual Voltage) for South Korea [Model Name (Supply Voltage): K]

Typical Motor Characteristics

Motor Power	Voltage	Frequency	Rated Speed	Current Characteristics		Torque Characteristics		Efficiency
				Rated Current	Startup Current	Startup Torque	Breakdown Torque	
	V	Hz	r/min	A	A	%	%	%
0.1 kW	220	60	1680	0.52	1.90	171	214	–
	380	60	1680	0.30	1.10	167	213	–
0.2 kW IE2	220	60	1680	0.93	3.70	196	232	68.0
	380	60	1680	0.52	2.20	196	229	68.0
0.4 kW IE2	220	60	1670	1.7	7.10	199	209	72.0
	380	60	1670	1.0	4.00	197	208	72.0
0.75 kW IE3	220	60	1750	2.8	17.9	230	319	85.5
	380	60	1750	1.6	10.8	219	314	85.5
1.5 kW IE3	220	60	1760	5.6	43.2	230	347	86.5
	380	60	1760	3.2	24.3	217	335	86.5
2.2 kW IE3	220	60	1760	7.8	56.4	205	307	89.5
	380	60	1760	4.5	32.3	196	308	89.5

■ 3-Phase Special Voltage (Dual Voltage) for China [Model (Supply Voltage): C]

Typical Motor Characteristics

Motor Power	Voltage	Frequency	Rated Speed	Current Characteristics		Torque Characteristics		Efficiency
				Rated Current	Startup Current	Startup Torque	Breakdown Torque	
	V	Hz	r/min	A	A	%	%	%
0.1 kW	220	50	1400	0.55	1.94	180	224	–
	230	50	1410	0.54	2.03	197	245	–
	380	50	1400	0.31	1.12	180	224	–
0.2 kW IE2	220	50	1400	0.99	3.97	192	230	65.9
	230	50	1410	0.98	4.15	210	251	65.9
	380	50	1390	0.56	2.29	192	230	65.9
0.4 kW IE2	220	50	1390	1.8	7.53	194	225	73.5
	230	50	1400	1.8	7.88	212	246	73.5
	380	50	1390	1.0	4.35	194	225	73.5
0.75 kW IE3	220	50	1430	2.8	15.6	221	276	82.5
	230	50	1440	2.7	16.3	242	302	82.5
	380	50	1430	1.65	9.00	221	276	82.5
1.5 kW IE3	220	50	1450	5.6	37.6	206	302	85.3
	230	50	1460	5.6	39.3	225	330	85.3
	380	50	1440	3.3	21.7	206	302	85.3
2.2 kW IE3	220	50	1460	7.9	52.0	209	306	86.7
	230	50	1470	7.7	54.3	228	334	86.7
	380	50	1440	4.5	30.0	209	306	86.7

■ 3-Phase Special Voltage (Dual Voltage) for North America/Europe [Model (Supply Voltage): A]

Typical Motor Characteristics

Motor Power	Voltage	Frequency	Rated Speed	Current Characteristics		Torque Characteristics		Efficiency
				Rated Current	Startup Current	Startup Torque	Breakdown Torque	
	V	Hz	r/min	A	A	%	%	%
0.1 kW	208	60	1690	0.54	2.35	200	263	–
	230	60	1730	0.57	2.62	243	329	–
	460	60	1730	0.29	1.26	231	310	–
	400	50	1410	0.31	1.21	230	260	–
0.2 kW IE2	208	60	1680	1.0	4.78	223	275	68.0
	230	60	1720	1.0	5.16	270	330	68.0
	460	60	1720	0.50	2.56	262	328	68.0
	400	50	1400	0.56	2.44	270	300	65.9
0.4 kW IE2	208	60	1680	1.8	8.90	204	257	72.0
	230	60	1720	1.8	9.76	251	311	72.0
	460	60	1720	0.9	4.73	239	297	72.0
	400	50	1400	1.0	4.78	250	290	73.5
0.75 kW IE3	208	60	1740	2.9	18.3	190	271	85.5
	230	60	1750	2.8	19.6	230	337	85.5
	460	60	1750	1.4	10.2	235	336	85.5
	400	50	1440	1.6	10.0	237	300	82.5
1.5 kW IE3	208	60	1750	5.9	42.3	190	302	86.5
	230	60	1760	5.7	45.3	237	374	86.5
	460	60	1760	2.9	23.0	245	382	86.5
	400	50	1450	3.2	24.3	250	350	85.3
2.2 kW IE3	208	60	1750	8.3	60.8	180	298	89.5
	230	60	1770	7.9	65.2	226	369	89.5
	460	60	1770	4.0	34.8	246	380	89.5
	400	50	1470	4.5	36.3	250	350	86.7

■ 3-Phase Special Voltage for North America/Europe [Model (Supply Voltage): E]

Typical Motor Characteristics

Motor Power	Voltage	Frequency	Rated Speed	Current Characteristics		Torque Characteristics		Efficiency
				Rated Current	Startup Current	Startup Torque	Breakdown Torque	
	V	Hz	r/min	A	A	%	%	%
0.1 kW	415	50	1390	0.30	1.06	205	238	–
	440	50	1420	0.29	1.12	230	268	–
	480	60	1720	0.26	1.17	244	304	–
0.2 kW IE2	415	50	1370	0.50	1.75	189	213	65.9
	440	50	1400	0.50	1.86	212	239	65.9
	480	60	1700	0.45	2.00	239	267	68.0
0.4 kW IE2	415	50	1390	0.96	3.96	246	254	73.5
	440	50	1410	0.95	4.20	277	286	73.5
	480	60	1680	0.82	4.20	286	304	72.0
0.75 kW IE3	415	50	1440	1.50	9.10	250	314	82.5
	440	50	1450	1.50	9.65	281	353	82.5
	480	60	1750	1.35	9.70	265	359	85.5
1.5 kW IE3	415	50	1460	3.0	19.8	233	317	85.3
	440	50	1470	3.0	21.0	262	356	85.3
	480	60	1760	2.7	18.5	190	290	86.5
2.2 kW IE3	415	50	1460	4.3	33.1	247	353	86.7
	440	50	1470	4.3	35.5	283	401	86.7
	480	60	1770	3.8	29.8	203	310	89.5

■ 3-Phase Special Voltage for North America [Model (Supply Voltage): M]

Typical Motor Characteristics

Motor Power	Voltage	Frequency	Rated Speed	Current Characteristics		Torque Characteristics		Efficiency
				Rated Current	Startup Current	Startup Torque	Breakdown Torque	
	V	Hz	r/min	A	A	%	%	%
0.1 kW	575	60	1700	0.20	0.87	200	273	–
0.2 kW IE2	575	60	1710	0.40	1.78	229	275	68.0
0.4 kW IE2	575	60	1700	0.68	3.51	249	289	72.0
0.75 kW IE3	575	60	1750	1.10	6.60	218	294	85.5
1.5 kW IE3	575	60	1760	2.2	15.3	247	336	86.5
2.2 kW IE3	575	60	1760	3.3	24.4	258	359	89.5

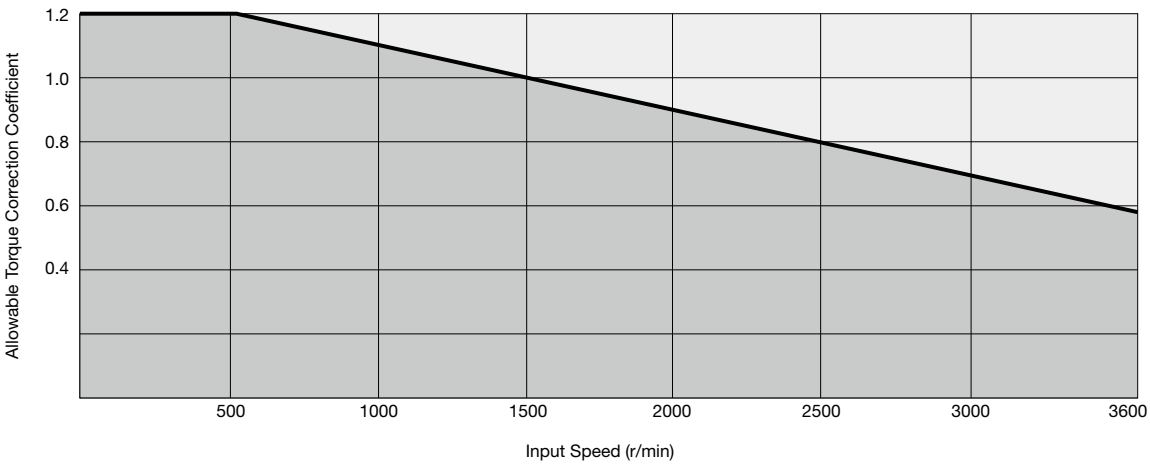
Reducers (Double Shaft Type)

This is an independent GTR reducer unit (without the motor). You may order this unit in cases of:
- When only a reducer is required
- When driving a reducer with a special motor or a non-electric drive method
- When the input speed is different from the motor rated speed

Relationship between the input speed and the allowable output shaft torque

The allowable output shaft torque in the performance table is the value when the input speed is 1500 r/min. If using a reducer at a different speed, the value calculated by multiplying the input speed by the allowable torque correction coefficient shown in the figure below is the allowable output shaft torque.

■ Allowable Torque Correction Coefficient by the Input Speed of the Reducer



Note 1: Also with regard to the O.H.L., the value calculated by multiplying the input speed by the allowable torque correction coefficient shown in the figure above is the allowable output shaft torque.
Note 2: When using a reducer at an input speed of 1800 r/min or more, the value calculated by multiplying the allowable moment of inertia J shown in [Table-2] on page 471 by (1800/input r/min)^2 is the allowable moment of inertia J.

■ Example

When using the model H2L-32L-40-075 at an input speed of 2500 r/min, the allowable output shaft torque, allowable input/output shaft O.H.L., and allowable output shaft moment of inertia J of this model are as shown below.
Based on the figure above, the allowable torque correction coefficient at an input speed of 2500 r/min is 0.8, and the corrected values would be as below.

Allowable output shaft torque = 172 × 0.8 = 138 N·m
Allowable Input Shaft O.H.L. = 392 × 0.8 = 314 N
Allowable Output Shaft O.H.L. = 3430 × 0.8 = 2744 N

Moreover,

The output shaft allowable moment of inertia
J is 0.003 × (1800/2500)^2× 40^2≈ 2.5 kg·m^2

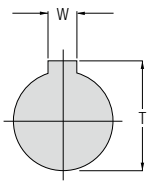
S-Type Reducers

GTR gearmotors are equipped with motors produced in-house. If you desire to mount another motor or a special motor (outdoor motor), please use this S-Type reducer.
The motor can be mounted if their size of a flange matches to JEM1401-1991 standard.
- We request customer to prepare and mount the motor for the S-Type by their own.
- The color of the motor attached to the S-Type reducer depends on the color in which the motor manufacturer specifies for the specific motor.
- When using a motor with special motor torque characteristics, such as a servo motor, select a reducer model with care. Consider the low-backlash reducer for servo motor GTR-AR as well.

Motor mounting procedure

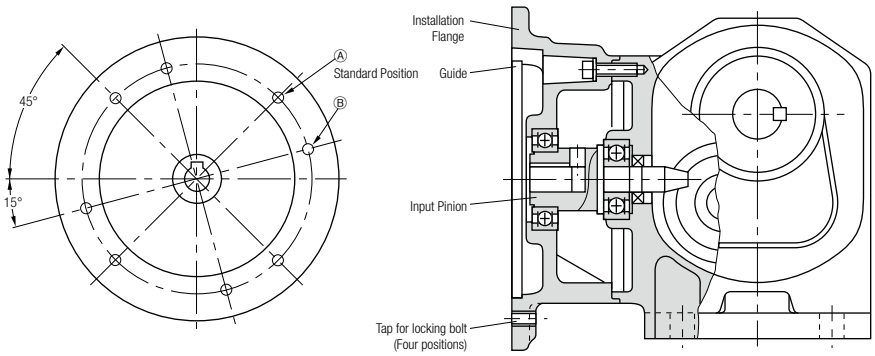
1. Check if the key is set correctly in the input pinion. (4 poles motor power class: 0.1 kW to 0.2 kW)
2. Align the position of the key with the flat surface area of the motor shaft or with the key groove, and insert the key.
3. Confirm that the motor guide portion is completely inserted, and tighten it with four bolts.

● Detailed Dimensions of Input Pinion Key Groove



4 Poles Motor Power Class	W		T	
	Reference Dimension	Dimensional Tolerance	Reference Dimension	Dimensional Tolerance
0.1 kW	5	+0.05 +0.01	13	+0.1 0
0.2 kW	5	+0.05 +0.01	13	+0.1 0
0.4 kW	5	+0.05 +0.01	16	+0.2 0
0.75 kW	6	+0.05 +0.01	21.5	+0.2 0
1.5 kW	8	+0.05 +0.01	27	+0.2 0
2.2 kW	8	+0.05 +0.01	31	+0.2 0

Note: Please be sure to read the notes on page 583.

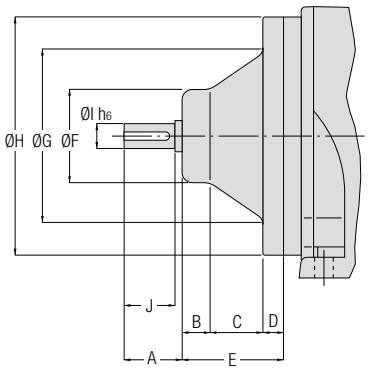


Note: In the case of a reducer with a 4 poles motor power class of 0.4 kW and frame size 40 or 50, please note that the tightening bolt tap is in position Ⓑ. (Except for the F3 Type)
For precautions about the attachment of a motor to an S-Type reducer, refer to page 583.

Detailed Dimensions of Double Shaft Type/ S-Type Reducers Input Shaft

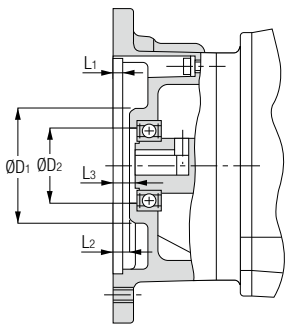
MID Series

■ G3 Type Double Shaft Type



Dimension / Motor Power Class	A	B	C	D	E	F	G	H	I	J	Key
0.1 kW	28	13.5	25.5	10	49	45	80	115	12	25	4 × 4 × 22
0.2 kW	28	13.5	25.5	10	49	45	80	115	12	25	4 × 4 × 22
0.4 kW	32	13.5	27.5	12.5	53.5	52	92	128	15	30	5 × 5 × 27
0.75 kW	37	17	28.5	11	56.5	64	108	142	20	35	6 × 6 × 32
1.5 kW	42	21	42.5	11	74.5	74	129	165	25	40	8 × 7 × 35
2.2 kW	48	26	41.5	13	80.5	90	130	165	30	45	8 × 7 × 40

■ G3 Type S-Type Reducer

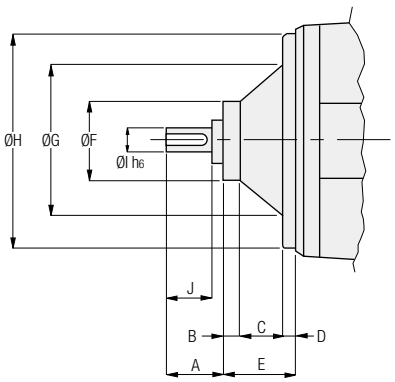


Dimension / Motor Power Class	L_1	L_2	L_3	D_1	D_2
0.1 kW	4.5	5.5	8.5	59	39
0.2 kW	4.5	5.5	8.5	59	39
0.4 kW	4.5	5.5	8.5	59	39
0.75 kW	4.5	5.5	10	67	47
1.5 kW	4.5	6.5	12.5	88	62
2.2 kW	5	7	13	96	70

Note 1: Each dimension represents a reference dimension. In particular, the L_2, D_1, and D_2 areas are black scale, and provide them with a sufficient allowance.

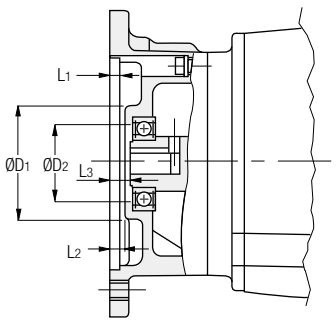
Detailed Dimensions of Double Shaft Type/S-Type Reducers Input Shaft

■ H2 Type Double Shaft Type



Dimension / Motor Power Class	A	B	C	D	E	F	G	H	I	J	Key
0.2 kW Frame sizes 22 to 28	28	10	22	8	40	43	80	114.5	12	25	4 × 4 × 22
0.2 kW Frame sizes 32 to 40	28	13.5	25.5	10	49	45	80	115	12	25	4 × 4 × 22
0.4 kW	32	10	26.5	10	46.5	48	92	127	15	30	5 × 5 × 27
0.75 kW	37	17	25.5	10	52.5	62	105	142	20	35	6 × 6 × 32
1.5 kW	42	21	42.5	11	74.5	74	129	165	25	40	8 × 7 × 35
2.2 kW	48	26	41.5	13	80.5	90	130	165	30	45	8 × 7 × 40

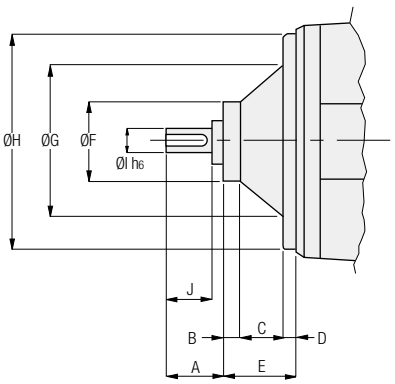
■ H2 Type S-Type Reducer



Dimension / Motor Power Class	L_1	L_2	L_3	D_1	D_2
0.1 kW	4.5	5.5	8.5	59	39
0.2 kW	4.5	5.5	8.5	59	39
0.4 kW	4.5	5.5	8.5	59	39
0.75 kW	4.5	5.5	10	67	47
1.5 kW	4.5	6.5	12.5	88	62
2.2 kW	5	7	13	96	70

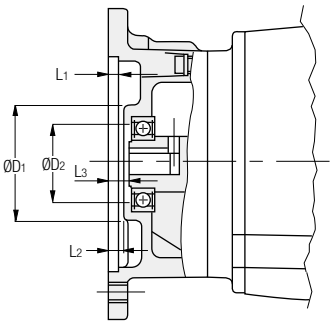
Note 1: Each dimension represents a reference dimension. In particular, the L_2, D_1, and D_2 areas are black scale, and provide them with a sufficient allowance.

■ F/F3 Type Double Shaft Type



Dimension / Motor Power Class	A	B	C	D	E	F	G	H	I	J	Key
0.1 kW	28	10	22	8	40	43	80	114.5	12	25	4 × 4 × 22
0.2 kW	28	10	22	8	40	43	80	114.5	12	25	4 × 4 × 22
0.4 kW	32	10	26.5	10	46.5	48	92	127	15	30	5 × 5 × 27
0.75 kW	37	17	25.5	10	52.5	62	105	142	20	35	6 × 6 × 32
1.5 kW	42	21	42.5	11	74.5	74	129	165	25	40	8 × 7 × 35
2.2 kW	48	26	41.5	13	80.5	90	130	165	30	45	8 × 7 × 40

■ F/F3 Type S-Type Reducer



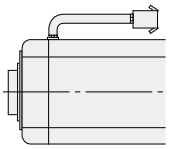
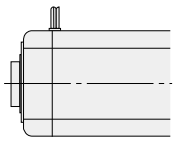
Dimension / Motor Power Class	L_1	L_2	L_3	D_1	D_2
0.1 kW	4.5	5.5	8.5	59	39
0.2 kW	4.5	5.5	8.5	59	39
0.4 kW	4.5	5.5	8.5	59	39
0.75 kW	4.5	5.5	10	67	47
1.5 kW	4.5	6.5	12.5	88	62
2.2 kW	5	7	13	96	70

Note 1: Each dimension represents a reference dimension. In particular, the L_2, D_1, and D_2 areas are black scale, and provide them with a sufficient allowance.

Speed Control Gearmotors

Controller

■ Specifications

Type	U Type		P Type					
Product Name	SCU-100	SCU-200	SCP-101L	SCP-201L	SCP-102L	SCP-202L	SCP-103L	SCP-203L
Properties	The controller contains a speed control circuit, a capacitor, a speed setting device, and all other necessary items and can therefore be operated simply by connecting the lead wire with a connector. However, only the variable speed function is available.		The controller is an eight-pin plug-in type and can set the speed of the gearmotor with the speed setting volume on the front side. In addition to the variable speed function, instant stop, slow start/slow down, and parallel operation functions are available and can be selected according to the application.					
Shape								
Motor Power	15 W to 90 W							
1-phase supply voltage (Note 1) (Note 2)	100 V to 115 V (100) 200 V to 230 V (200)		100 V to 120 V (101, 102, 103) 200 V to 240 V (201, 202, 203)					
Variable speed range	50 to 1400 r/min (50 Hz), 50 to 1700 r/min (60 Hz)							
Speed fluctuation rate	±3 %							
Instant stop	×		○		○		○	
Slow start/ Slow down	×		×		○		○	
Parallel operation	×		×		×		○	
Lowering operation	×		×		×		×	
Remote operation distance	5 m		50 m		50 m		200 m	
Outline	Operation box type		Plug-in type (eight-pin)					
Ambient temperature	–10 °C to + 40 °C							

Note 1: The Single-phase supply voltage is the supply voltage of the controller. When using the controller with a voltage other than 100 V or 200 V, select a motor suitable for the voltage as well.

Note 2: The allowable variation range of the supply voltage is ±10 %. If the voltage is low, the rated torque may not be obtained, or rotations my become unstable.

Note 3: Please note that speed control is not available in lowering operation.

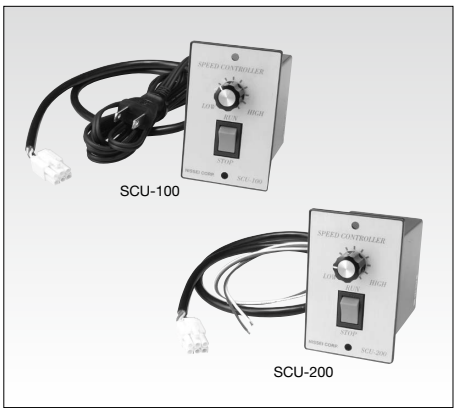
Note 4: The remote operation distance of the P Type controller means the length of the conductor connecting the controller and the motor when the power line (pin Nos. ①, ②, and ⑧) and the signal line (pin Nos.③, ④, ⑤, ⑥, and ⑦) are separately connected.

Note 5: The motor shaft speed is set to the maximum level of 1400 r/min (U Type: the volume of the speed controller is set to the HIGH position, P Type: the volume of the external speed setting device is set to the 100 position) by the factory before shipment. To change the speed change range, adjust the knob of the internal speed setting device (trimmer resistor).
In the case of a U Type controller, remove the capacitor on the back side. (Refer to page 572.)

Note 6: Please note that if you purchase only a controller for repairs etc., it may be necessary to set the maximum speed. Be sure to use the controller at a motor shaft speed of 1400 r/min or below (50 Hz) or 1700 r/min or below (60 Hz).

U Type

■ SCU-100/SCU-200



■ Function

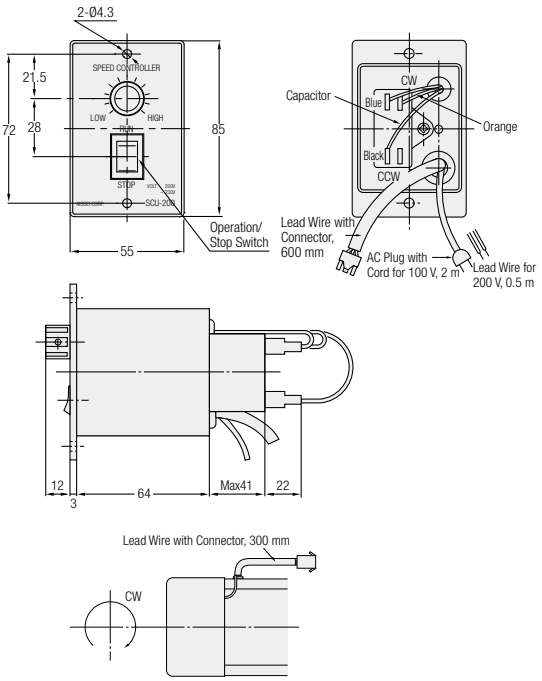
- Only variable speed function
- Separate type/*Connect with a lead wire with a connector.
  *AV plug with a cord attached (however, 100 V only)
- For 1-Phase 100 V and 200 V
- Motor power/15 W to 90 W
- The controller contains a speed control circuit, a capacitor, a speed setting device, and all other necessary items. However, please note that if you purchase only a controller for repairs, a capacitor is not included.

*The controller is provided with a 600 mm lead wire with a connector. However, if you want to use it at a farther distance from the speed control gearmotor, use an optional extension cord with a connector. It can be used up to 5 m away from the gearmotor.
Four types of extension cords, 1 m, 2 m, 3 m, and 4 m, are available. (Refer to the options on page 580.)

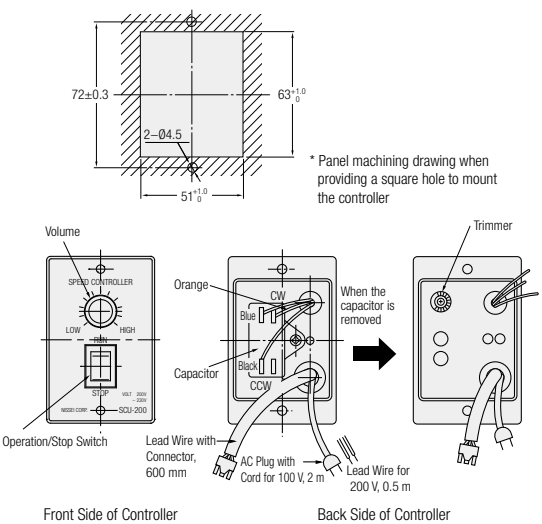
■ Connection method

1. Connect the motor and the connector of the controller, and connect the AC plug with a cord (200 V: lead wire) to the power supply.
2. Before connecting the power supply, set the RUN/STOP switch to STOP.
3. To switch the rotational direction, connect the orange lead wire of the capacitor to the unused terminal. (Before performing this operation, be sure to turn off the power.)
4. Do not run and stop the controller by turning on and off the switch of the power supply. This may damage the controller in some cases.

● Outline Drawings



● Panel machining drawing



P Type

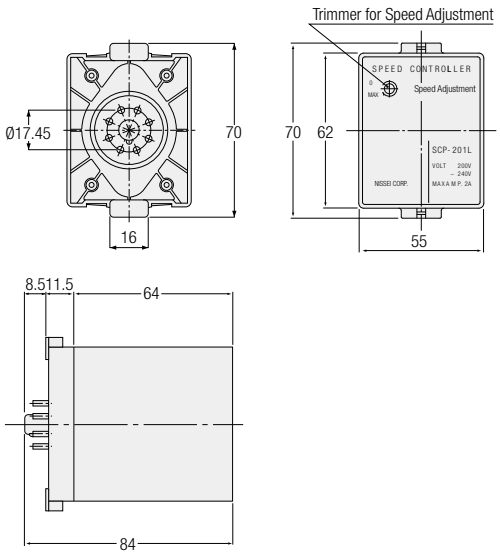
■ SCP-101L/SCP-201L

* The photo shows SCP-101L.

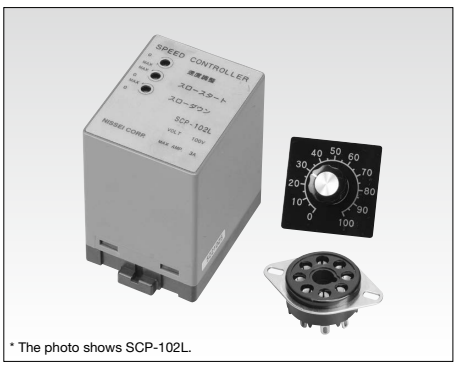
■ Function

- With variable speed and instant stop functions
- Completely separate type
- The motor speed can be adjusted with the built-in speed setting device or the speed setting volume on the front side of the controller.
- Eight-pin plug-in type
- For Single-phase 100 V and 200 V
- Motor power: 15 W to 90 W
- Instant stops are possible via electronic brake.
- External speed setting device (OP-RV24B20K) attached

● Outline Drawings



■ SCP-102L/SCP-202L

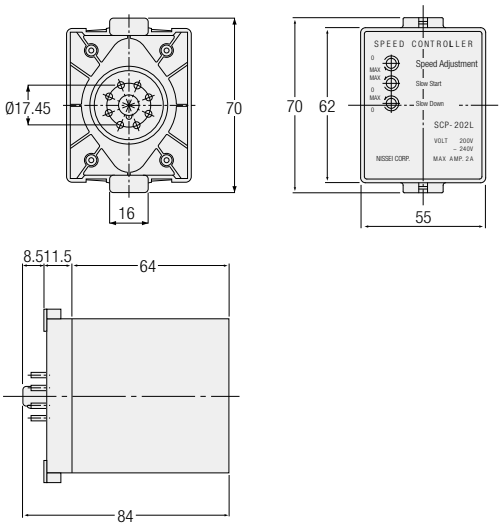


* The photo shows SCP-102L.

■ Function

- With variable speed, instant stop, and slow start/slow down functions
- Completely separate type
- The motor speed can be adjusted with the built-in speed setting device or the speed setting volume on the front side of the controller.
- Eight-pin plug-in type
- For Single-phase 100 V and 200 V
- Motor power: 15 W to 90 W

● Outline Drawings



- Instant stops are possible via electronic brake.
- External speed setting device (OP-RV24B20K) attached
- Slow starts and slowdowns are possible. (The speed linearly changes with respect to time. Range of 0.5 to 10 seconds/1000 r/min)

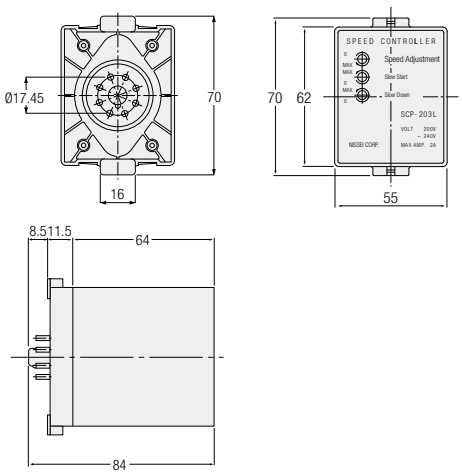
■ SCP-103L/SCP-203L

* The photo shows the SCP-103L.

■ Function

- With variable speed, instant stop, slow start/slow down, and parallel operation functions
- Completely separate type
- The motor speed can be adjusted with the built-in speed setting device or the speed setting volume on the front side of the controller.
- Eight-pin plug-in type
- For Single-phase 100 V and 200 V
- Motor power: 15 W to 90 W

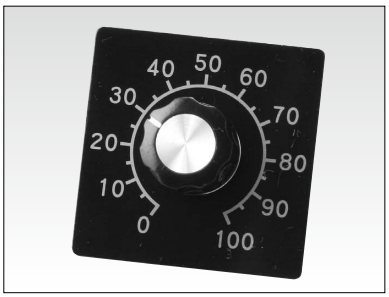
● Outline Drawings

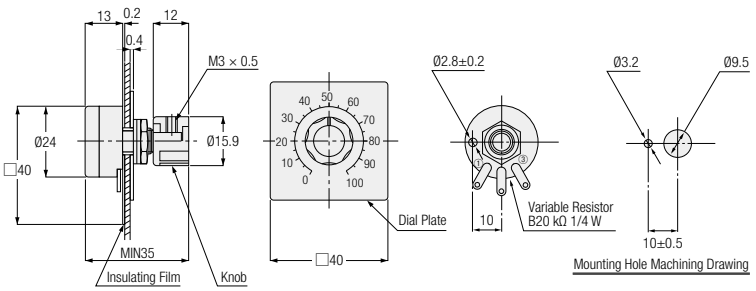


- Instant stops are possible via electronic brake.
- External speed setting device (OP-RV24B20K) attached
- Slow starts and slowdowns are possible. (The speed linearly changes with respect to time. Range of 0.5 to 10 seconds/1000 r/min)
- Parallel operation can be performed.

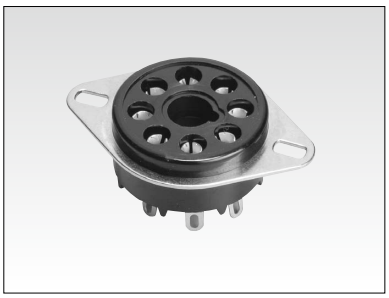
P Type standard accessories

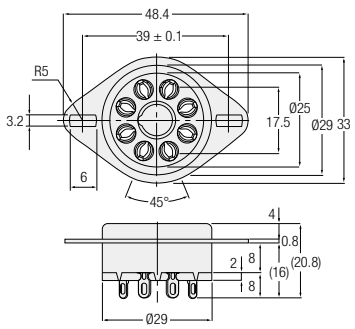
● External speed setting device





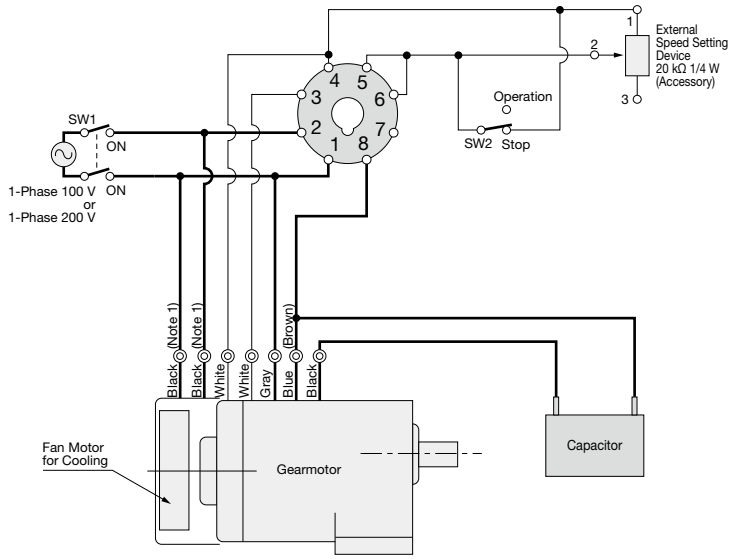
● Back side connection socket





Wiring Diagram

■ Unidirectional operation, speed change, slow start/slow down



Function	Unidirectional operation, speed change	
	——	Slow Start Slow Down
Motor Power	15 W to 90 W	15 W to 90 W
Applicable model	SCP-101L	SCP-102L SCP-103L
	SCP-201L	SCP-202L SCP-203L

	Power	Remarks
SW1	125 VAC/5 A or more 250 VAC/5 A or more	Power switch
SW2	20 VDC 10 mA	Operation/Stop

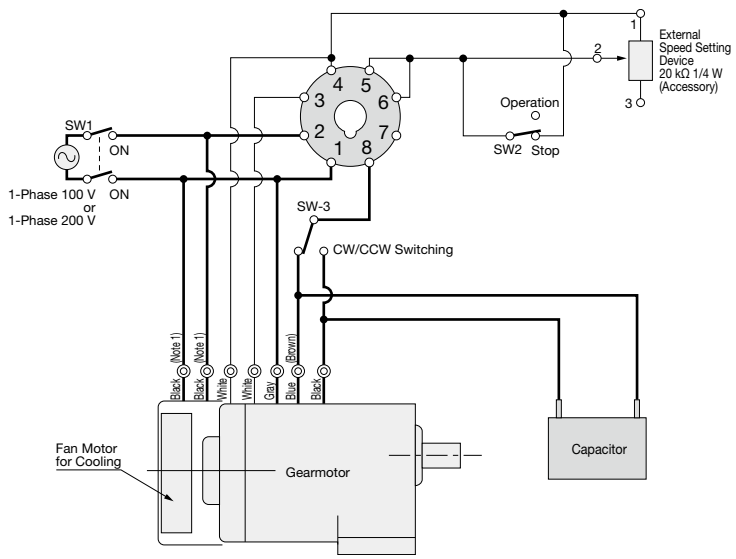
Note 1: The fan motor lead wire is attached only to a gearmotor with a motor power of 60 W or 90 W.
Note 2: (Brown) means 200 V.
Note 3: The slow start/slow down function becomes enabled when SW2 is turned on and off.
Note 4: Do not start and stop the controller by operating SW1. This may damage the controller in some cases.

● Rotational Direction

To change the rotational direction, switch between “Blue (Brown)” and “Black.”

- When changing the speed with the controller without using the external speed setting device, remove the external speed setting device in the circuit, and run and stop the gearmotor with SW2.

■ CW/CCW run, speed change, slow start/slow down



Function	CW/CCW run, speed change	
	——	Slow Start Slow Down
Motor Power	15 W to 90 W	15 W to 90 W
Applicable model	SCP-101L	SCP-102L SCP-103L
	SCP-201L	SCP-202L SCP-203L

	Power	Remarks
SW1	125 VAC/5 A or more 250 VAC/5 A or more	Power switch
SW2	20 VDC 10 mA	Operation/Stop
SW3	125 VAC/5 A or more 250 VAC/5 A or more	CW/CCW Operation

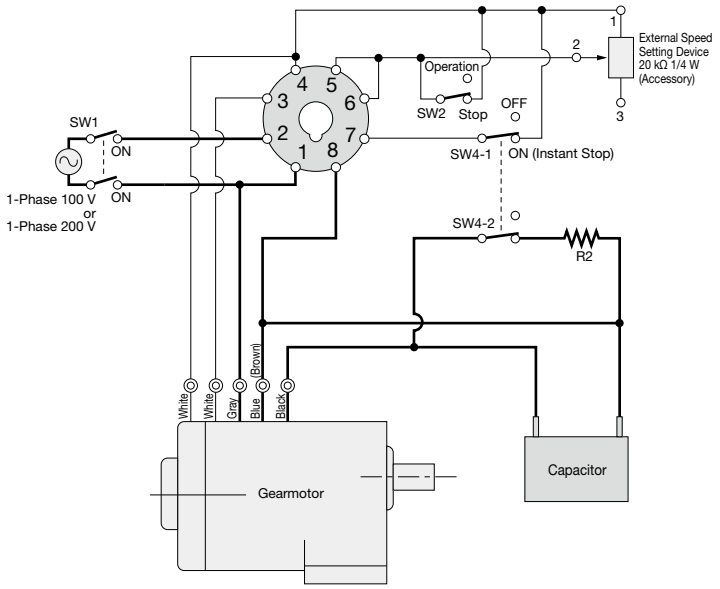
Note 1: The fan motor lead wire is attached only to a gearmotor with a motor power of 60 W or 90 W.
Note 2: (Brown) means 200 V.
Note 3: The slow start/slow down function becomes enabled when SW2 is turned on and off.
Note 4: Do not start and stop the controller by operating SW1. This may damage the controller in some cases.

● Rotational Direction

Before switching the rotational direction (SW3), be sure to stop the motor.

- When changing the speed with the controller without using the external speed setting device, remove the external speed setting device in the circuit, and run and stop the gearmotor with SW2.

■ Unidirectional operation, speed change, instant stop, slow start/slow down (15 W to 25 W)



Function	Unidirectional operation, speed change	
	Instant stop	
	——	Slow Start Slow Down
Motor Power	15 W to 25 W	15 W to 25 W
Applicable model	SCP-101L	SCP-102L SCP-103L
	SCP-201L	SCP-202L SCP-203L

	Power	Remarks
SW1	125 VAC/5 A or more 250 VAC/5 A or more	Power switch
SW2	20 VDC 10 mA	Operation/Stop
SW4-1	20 VDC 10 mA	For instant stop The switches shall be operated in synchronization with each other.
SW4-2	125 VAC/5 A or more 250 VAC/5 A or more	
R2	10 Ω·10 W	Option (OP-TRH10)

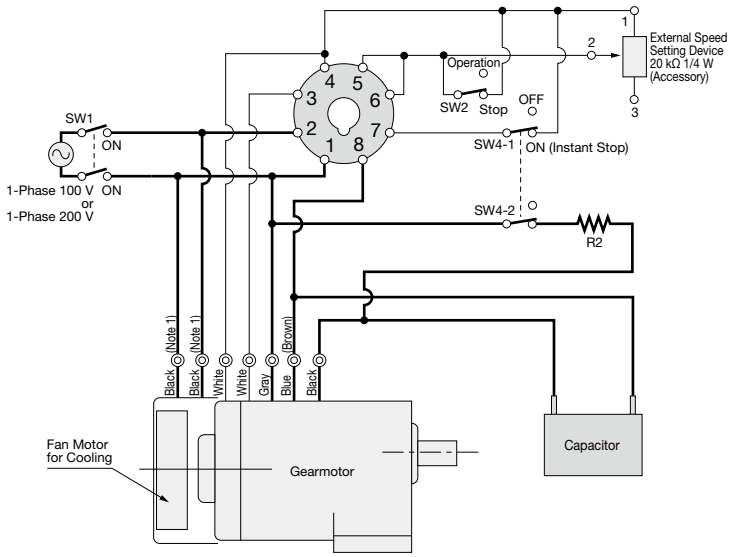
Note 1: (Brown) means 200 V.
Note 2: The slow start/slow down function becomes enabled when SW2 is turned on and off.
Note 3: To protect the contact SW4-2, use a CR method (resistance: 120 Ω, capacitor: 0.1 μF/500 V).
Note 4: Do not start and stop the controller by operating SW1. This may damage the controller in some cases.

● Rotational Direction

To change the rotational direction, switch between "Blue (Brown)" and "Black."

- When changing the speed with the controller without using the external speed setting device, remove the external speed setting device in the circuit, and run and stop the gearmotor with SW2.

■ Unidirectional operation, speed change, instant stop, slow start/slow down (40 W to 90 W)



Function	Unidirectional operation, speed change	
	Instant stop	
	——	Slow Start Slow Down
Motor Power	40 W to 90 W	40 W to 90 W
Applicable model	SCP-101L	SCP-102L SCP-103L
	SCP-201L	SCP-202L SCP-203L

	Power	Remarks
SW1	125 VAC/5 A or more 250 VAC/5 A or more	Power switch
SW2	20 VDC 10 mA	Operation/Stop
SW4-1	20 VDC 10 mA	For instant stop The switches shall be operated in synchronization with each other.
SW4-2	125 VAC/5 A or more 250 VAC/5 A or more	
R2	10 Ω·10 W	Option (OP-TRH10)

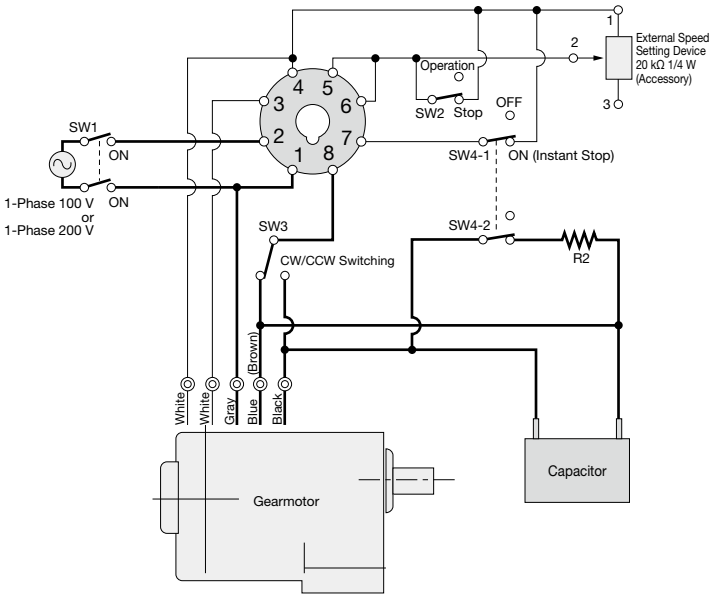
Note 1: The fan motor lead wire is attached only to a gearmotor with a motor power of 60 W or 90 W.
Note 2: (Brown) means 200 V.
Note 3: The slow start/slow down function becomes enabled when SW2 is turned on and off.
Note 4: To protect the contact SW4-2, use a CR method (resistance: 120 Ω, capacitor: 0.1 μF/500 V).
Note 5: Do not start and stop the controller by operating SW1. This may damage the controller in some cases.

● Rotational Direction

To change the rotational direction, switch between "Blue (Brown)" and "Black."

- When changing the speed with the controller without using the external speed setting device, remove the external speed setting device in the circuit, and run and stop the gearmotor with SW2.

■ CW/CCW operation, speed change, instant stop, slow start/slow down (15 W to 25 W)



Function	CW/CCW run, speed change	
	Instant stop	
	——	Slow Start Slow Down
Motor Power	15 W to 25 W	15 W to 25 W
Applicable model	SCP-101L	SCP-102L SCP-103L
	SCP-201L	SCP-202L SCP-203L

	Power	Remarks
SW1	125 VAC/5 A or more 250 VAC/5 A or more	Power switch
SW2	20 VDC 10 mA	Operation/Stop
SW3	125 VAC/5 A or more 250 VAC/5 A or more	CW/CCW Operation
SW4-1	20 VDC 10 mA	For instant stop The switches shall be operated in synchronization with each other.
SW4-2	125 VAC/5 A or more 250 VAC/5 A or more	
R2	10 Ω·10 W	Option (OP-TRH10)

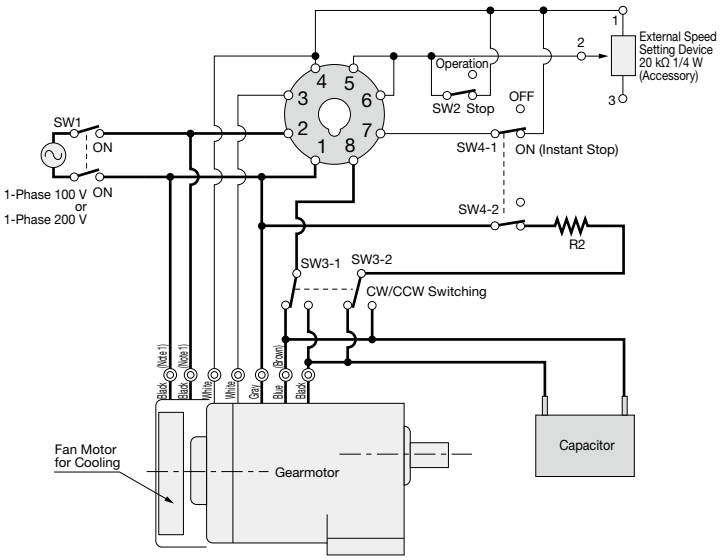
Note 1: (Brown) means 200 V.
Note 2: The slow start/slow down function becomes enabled when SW2 is turned on and off.
Note 3: To protect the contact SW4-2, use a CR method (resistance: 120 Ω, capacitor: 0.1 μF/500 V).
Note 4: Do not start and stop the controller by operating SW1. This may damage the controller in some cases.

● Rotational Direction

Before switching the rotational direction (SW3), be sure to stop the motor.

- When changing the speed with the controller without using the external speed setting device, remove the external speed setting device in the circuit, and run and stop the gearmotor with SW2.

■ CW/CCW operation, speed change, instant stop, slow start/slow down (40 W to 90 W)



Function	CW/CCW run, speed change	
	Instant stop	
	——	Slow Start Slow Down
Motor Power	40 W to 90 W	40 W to 90 W
Applicable model	SCP-101L	SCP-102L SCP-103L
	SCP-201L	SCP-202L SCP-203L

	Power	Remarks
SW1	125 VAC/5 A or more 250 VAC/5 A or more	Power switch
SW2	20 VDC 10 mA	Operation/Stop
SW3-1	125 VAC/5 A or more 250 VAC/5 A or more	CW/CCW Operation The switches shall be operated in synchronization with each other.
SW3-2	125 VAC/5 A or more 250 VAC/5 A or more	
SW4-1	20 VDC 10 mA	For instant stop The switches shall be operated in synchronization with each other.
SW4-2	125 VAC/5 A or more 250 VAC/5 A or more	
R2	10 Ω·10 W	Option (OP-TRH10)

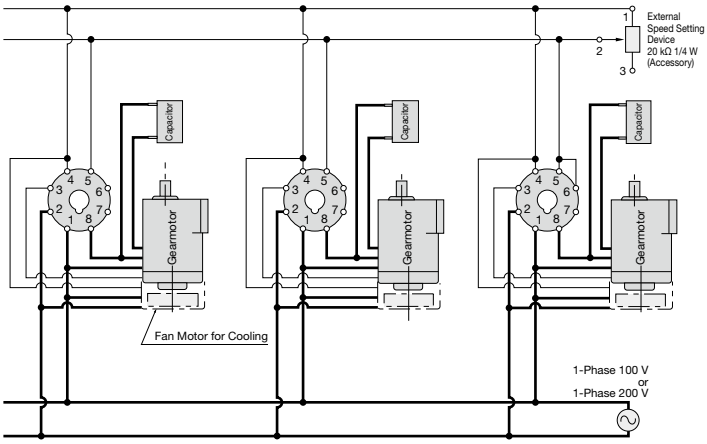
Note 1: The fan motor lead wire is attached only to a gearmotor with a motor power of 60 W or 90 W.
Note 2: (Brown) means 200 V.
Note 3: The slow start/slow down function becomes enabled when SW2 is turned on and off.
Note 4: To protect the contact SW4-2, use a CR method (resistance: 120 Ω, capacitor: 0.1 μF/500 V).
Note 5: Do not start and stop the controller by operating SW1. This may damage the controller in some cases.

● Rotational Direction

Before switching the rotational direction (SW3), be sure to stop the motor.

- When changing the speed with the controller without using the external speed setting device, remove the external speed setting device in the circuit, and run and stop the gearmotor with SW2.

■ Parallel operation

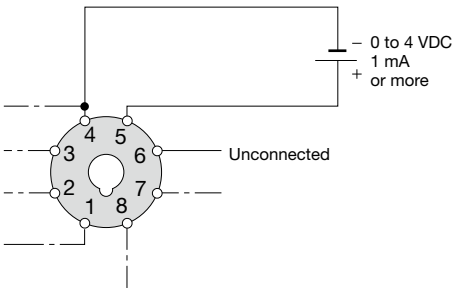


Note 1: Short terminals 5 and 6 on any one of the controllers.

Function	Unidirectional operation, speed change
	Slow start/Slow down
	Parallel operation
Motor Power	15 W to 90 W
Applicable model	SCP-103L
	SCP-203L

Note 1: The dashed line indicates a 60 W or 90 W gearmotor.

■ Changing the speed by the external DC voltage



Note 1: Do not connect the DC power supply with incorrect polarity.
Note 2: The connections indicated by the dotted line are based on "Wiring diagrams ① to ⑦." However, do not connect anything to pin ⑥.
Note 3: Be sure to insulate the output of the DC power supply from the AC input.

Precautions for Connection

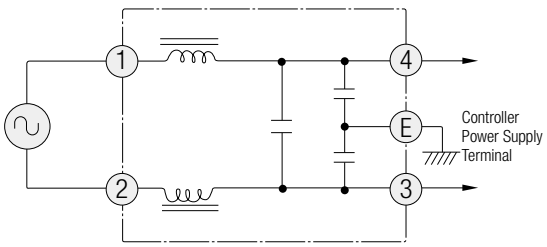
■ Countermeasures against noise

The gearmotor does not malfunction due to incoming noise under regular usage conditions.
However, the control of the gearmotor occasionally becomes unstable near high-voltage equipment or in a place where high electric power is frequently turned on and off. As a countermeasure against incoming noise, connecting a noise filter is very effective.
In addition, phase control by a TRIAC may cause radio noise interference. Also in this case, it is recommended to connect a noise filter.

■ Capacitor

A capacitor is indispensable for the operation of a speed control gearmotor. Upon use, please connect the included capacitor to the product.
All Single-phase motors are connected by a reversible connection (three lead wires) and can therefore run in the CW and CCW directions as Three-phase motors do.
For the capacity of the capacitor, refer to the performance table.
For the shape and dimensions of the capacitor, refer to page 492.

● Connection diagram



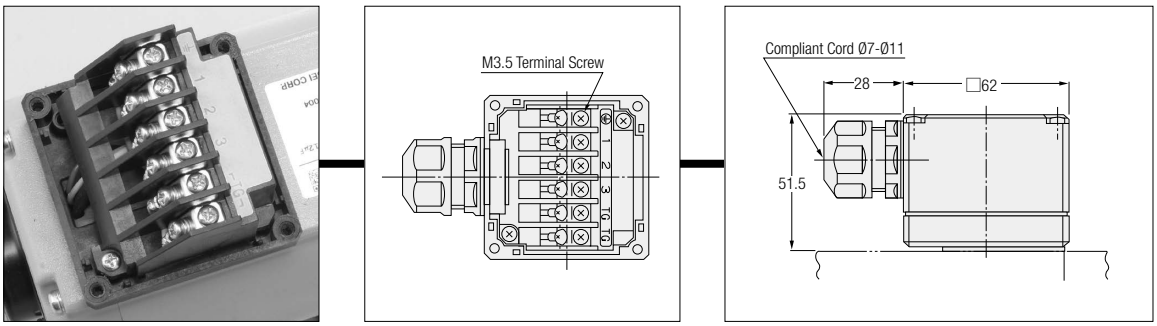
Terminal Box (Option)

The P Type speed control gearmotor can be equipped with a terminal box. If you need one, please inform us when placing an order.

■ Types and structures (limited to P Type)

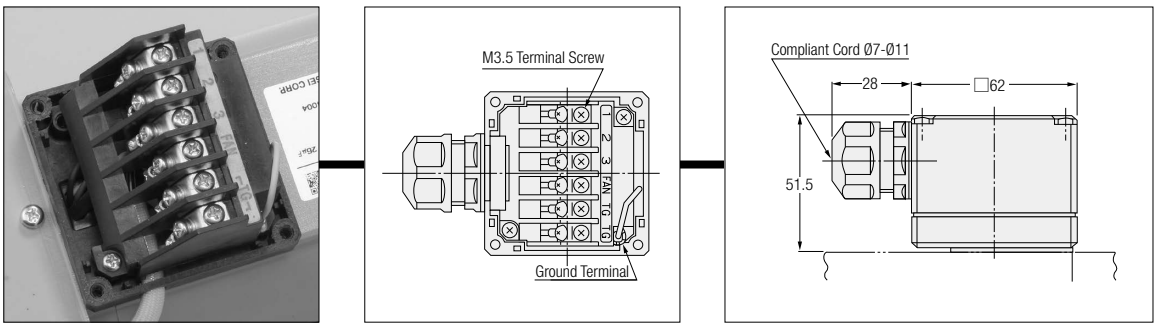
● For the connection method of C Type terminal boxes, refer to the table shown below.

1-Phase 100 V and 200 V (15 W to 40 W)



● For the connection method of C Type terminal boxes, refer to the table shown below.

1-Phase 100 V and 200 V (60 W, 90 W)



Note: The forced fan lead wire is drawn in from outside the terminal box and connected to a terminal.

● Method of connecting the wires of a gearmotor with a C Type terminal box

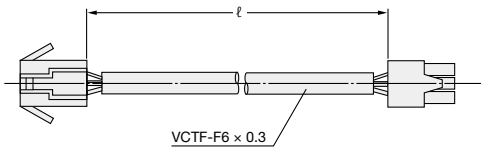
Refer to the table shown below as well as the wiring diagram on pages 575 to 578.

Terminal Code	Connection Method	Remarks
⏚	Grounding	(Note 1)
1	Same as blue (brown) in the wiring diagram	
2	Same as black in the wiring diagram	
3	Same as gray in the wiring diagram	
FAN	Connect to pin No. 2 of the controller.	Only 60 W or 90 W gearmotor
TG	Same as white in the wiring diagram	

Note 1: In the case of a 60 W or 90 W gearmotor, connect this terminal to the green lead wire on the back side of the terminal block.

Speed Control Gearmotors Options

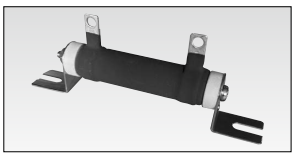
■ Extension cord with connector

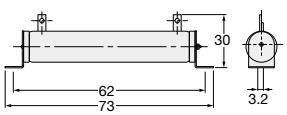


Product Name	ℓ (m)
OP-C1	1
OP-C2	2
OP-C3	3
OP-C4	4

- Use the cord for the extension of the U Type cord.
- Connect a lead wire not longer than 5m between the controller and the gearmotor.

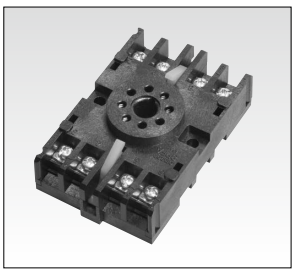
■ External resistor for instant stop/OP-TRH10

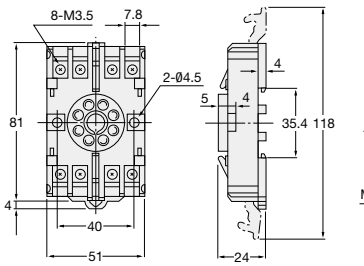


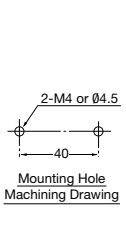


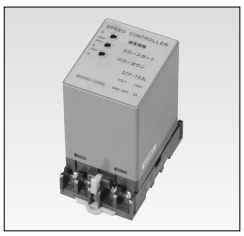
- Use this resistor when using the instant stop function.

■ Front side connection socket/OP-8PFA



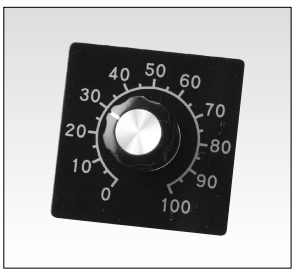


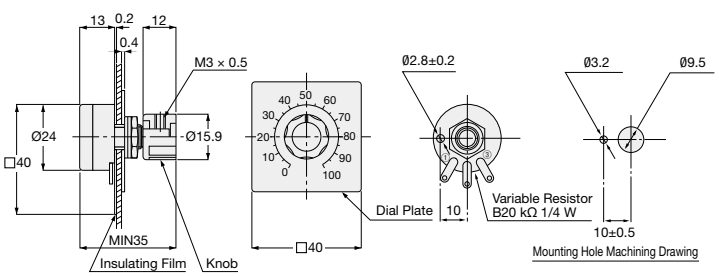




When a front side connection socket is attached (photo: SCP-103L)

■ External speed setting device/OP-RV-24B20K





- This device (one set) is attached to the P Type controller as a standard item, and use it for multistep speed changes.

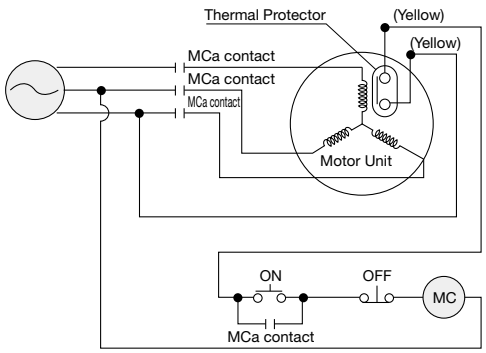
Thermal Protector (Optional)

A thermal protector can be attached to prevent the motor from burning.
However, please note that a thermal protector cannot be installed to the listed models below.

Type	Frame Size	Motor Power
G	12	3-phase: 40 W, 60 W 1-phase: 40 W, 60 W
	22	
H	15	
	22	
F2 (F2S)	12	
F2 (F2F)	15	

All thermal protectors are of a signal wire extraction type.
For built-in types, please contact us.

● Example of use of a thermal protector (3-phase induction motor)



(MC) : Relay Coil
MCa : Electro Magnetic Contactor a Contact

Note The ON-OFF switch is to turn on and off the motor. When the temperature of the motor rises, the contacts of the thermal protector will open, and the power supply will be turned off through the (MC). When the temperature of the motor lowers, the contacts of the thermal protector will automatically close again, but this wiring example will not permit the motor to run unless the ON pushbutton is pressed.

For more information, please contact your nearest Sales Office or the CS Center.

Precautions for Use

■ **Before using our products, carefully read the Detailed Instruction Manual.**

Installation Location

	Standard Specification	Water-resistant Specification
Ingress Protection Rating	Differs depending on the model.	IP65
Ambient temperature	-10 °C to 40 °C	-10 °C to 40 °C
Ambient Humidity	85 % max (No condensation)	100 % max (No condensation)
Altitude	1,000 m max	1,000 m max
Installation Environment	A well ventilated place free from corrosive gas, explosive, vapor, and/or chemicals. Not to be exposed to direct rain. Not to be exposed to direct sunlight. The brake should not be exposed to water, powders, oil/greases, or oil mist. Models with water protection rating IPX0 shall not be exposed directly to water.	A place free from corrosive gas, explosive gas, and/or vapor. Not to be exposed to direct strong rain, and winds. Not to be exposed to direct sunlight. Not to be used underwater, environments with exposure to high pressure water splashes, and exposure to cleansing chemicals.

Note 1: The ambient temperature for capacitor run type Single-phase motors is 0 °C to 40 °C.

Installation Surface

Fasten the gearmotor to a vibration-free, machined, flat surface using four bolts. For the installation of a right angle hollow bore type on a shaft, refer to pages 885 to 888.

Installation Orientation

All models adopt a grease lubrication method and can therefore be installed in any orientation.

Connection with Application

1. H_7 fit is recommended for a hole for a coupling, sprocket, pulley, gear, etc. to be attached to the reducer shaft.
2. In direct coupling, accurately align the center of the reducer shaft and that of the mating shaft.
3. In chain, belt, or gear engagement, keep the reducer shaft and the mating shaft parallel accurately to each other, and install the device so that the line connecting the centers of both gears is perpendicular to the shafts.
4. When attaching a coupling or application to the output shaft, do not apply strong impacts via hammer or similar tool. The bearing may get damaged and cause an abnormal sound, vibrations, or damage.

Precautions for Operation

1. Be sure to operate the motor with the load torque, the load moment of inertia J, and the O.H.L. kept within the allowable values.
2. CW and CCW rotations by plucking adversely affects the gearmotor and the application. To prevent it, temporarily stop the gearmotor, and then start it in the reverse direction.
3. Do not touch the gearmotor during energization and for a while after the power supply is turned off, because it is hot. You may suffer burns or injuries.
4. When running a Single-phase motor in the reverse direction, be sure to stop the motor and then start it in the reverse rotation. Failure to follow this precaution may put the gearmotor out of control because the rotational direction remains unchanged.
5. Do not perform an impact stop to the Single-phase motor. Failure to follow this precaution may cause the motor to run in the reverse rotational direction and go out of control.
6. Take care to keep the surface temperature of the MINI Series motor and reducer below 90 °C.
7. Take care to keep the surface temperature of the MID Series motor below the value calculated by adding the temperature rise value shown in the table below to the ambient temperature.

Motor Power [kW]	Temperature Rise [°CUP]	Ambient temperature At 25°C [°C]
0.1	50	75
0.2	70	95
0.4	60	85
0.75	30	55
1.5	40	65
2.2	50	75

Note 1: The ambient temperature is -10 °C to 40 °C.
Note 2: The temperature rise is the value under a 100 % load. If you are concerned about a temperature rise, please contact your nearest Sales Office or the CS Center.

Rated Currents

The rated current values shown in the motor specifications on pages 562 to 565 are the rated current values of motors alone. With regard to gearmotors with a brake, it is necessary to consider the current value flowing through the brake as needed. For more details, please contact your nearest Sales Office or the CS Center.

Lubrication

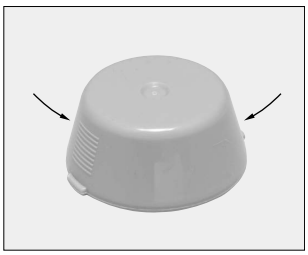
All models utilize grease lubrication and are shipped from our factory with specified amounts of high-grade grease sealed. The grease used is a grease containing an extreme pressure additive equivalent to Class NLGI-0 or Class 0.

When using an inverter (frequency conversion device) to convert the speed of the GTR gearmotors

①Please note that when the gearmotor is used in combination with an inverter and runs at low speed, it may cause an unusual temperature rise. Moreover, a gearmotor with a brake may malfunction due to a voltage fluctuation. To prevent this, wire the brake by bypassing the inverter.
For more information, refer to Combination of Gearmotor and Inverter/VFD on page 533.

②Electric erosion of bearing due to inverter operation.
When a gearmotor is driven in combination with an inverter, the bearing causes electric erosion, although very rare, depending on the state of the grease sealed in the bearing, the wiring method, the operating conditions, etc.
Please consult us if you require advice on potential solutions.

Attaching and detaching the F2 Type safety cap



Attach and detach the safety cap by lightly pushing the portion indicated by the arrow. (Do not strongly push it.)

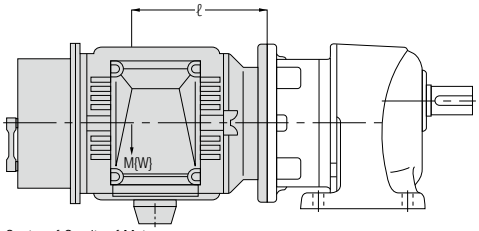
MID Series 1-Phase Capacitor Run Type

A thermal protector can be installed on a capacitor run type motor. If the motor reaches the specified temperature, the thermal protector will be activated to stop the motor. (Operating temperature of a built-in thermal protector: 120±5 °C) In such a case, only motors with a brake will stop and will not retain the load because the brake remains released. Be sure to implement safety measures. Failure to follow this precaution may result in damage to the device.
The built-in thermal protector is an automatic restoration type, and the motor will automatically restart as it cools down.
Be sure to turn off the power before inspection/ maintenance work. Failure to follow this precaution may result in injury due to a sudden start of the motor.
In addition, do not energize the brake coil continuously when the motor is inactive.

Precautions about the attachment of a motor to an S-Type reducers

1. Wipe rust, dust, rust preventive oil, etc. clean off the motor shaft.
2. When inserting the motor, do not hit the motor unit or the reducer unit, or utilize the clamping force of the bolts. If the motor is forcedly inserted, the excessive load may be applied to the motor shaft, and this may result in damaged bearing or an unusual sound, etc.
3. No input pinion key material is attached to the S-Type reducer. Thus, use the motor-side key material. However, a key material is included with 0.1 kW and 0.2 kW motors.
   The included key is designed for transition fit.
   Beware of the dropping of the key when installing the motor.
4. If the mass (weight) of the motor to be attached to the S-Type reducer is heavy, it may impose an excessive burden on the installation flange, resulting in a problem. Use the table shown below as a guideline.

Note 1: If a motor exceeding the moment limitation is installed, the case and other parts may get damaged, and the motor may drop.
Note 2: Failures attributable to the installation of a motor exceeding the moment limitation are excluded from the coverage of our warranty.



ℓ: Center of Gravity of Motor
M: Motor Weight
{W: Motor Weight}

Power Class 4 poles Motor	Moment Limitation ℓ × M
0.1, 0.2 kW	27 N·m or less
0.4 kW	31 N·m or less
0.75 kW	34 N·m or less
1.5 kW	83 N·m or less
2.2 kW	93 N·m or less