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Contact us

Tel: +86-755-8981 8866 Fax: +86-755-8427 6832

Email & Skype: info@chipsmall.com Web: www.chipsmall.com

Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China




⚠ Safety Precautions


- Important Notes on exporting this product or equipment containing this product;
If the end-user or application of this product is related to military affairs or weapons, its export may be controlled by "Foreign Exchange and Foreign Trade Control Law" of Japan where export license will be required before product can be exported from Japan.
- This product is designed and manufactured for use in General Purpose Industrial Equipment and it is not intended to be used in equipment or system that may cause personal injury or death.
- All servicing such as installation, wiring, operation, maintenance and etc., should be performed by qualified personnel only.
- Tighten mounting screws with an adequate torque by taking into consideration strength of the screws and the characteristics of material to which the product will be mounted. Over tightening can damage the screw and/or material; under tightening can result in loosening.
*Example: apply 2.7 N·m – 3.3 N·m torque when tightening steel screw (M5) to steel surface.
- Install safety equipment to prevent serious accidents or loss that is expected in case of failure of this product.
- Consult us before using this product under such special conditions and environments as nuclear energy control, aerospace, transportation, medical equipment, various safety equipments or equipments which require a lesser air contamination.
- We have been making the best effort to ensure the highest quality of our products, however, some applications with exceptionally large external noise disturbance and static electricity, or failure in input power, wiring and components may result in unexpected action. It is highly recommended that you make a fail-safe design and secure the safety in the operative range.
- If the motor shaft is not electrically grounded, it may cause an electrolytic corrosion to the bearing, depending on the condition of the machine and its mounting environment, and may result in the bearing noise. Checking and verification by customer is required.
- Failure of this product depending on its content may generate smoke of about one cigarette. Take this into consideration when the application of the machine is clean room related.
- Please be careful when using the product in an environment with high concentrations of sulfur or sulfuric gases, as sulfuration can lead to disconnection from the chip resistor or a poor contact connection.
- Do not input a supply voltage which significantly exceeds the rated range to the power supply of this product. Failure to heed this caution may lead to damage of the internal parts, causing smoke and/or fire and other troubles.
- The user is responsible for matching between machine and components in terms of configuration, dimensions, life expectancy, characteristics, when installing the machine or changing specification of the machine. The user is also responsible for complying with applicable laws and regulations.
- Manufacturer's warranty will be invalid if the product has been used outside its stated specifications.
- Component parts are subject to minor change to improve performance.
- Read and observe the instruction manual to ensure correct use of the product.

Repair	Consult to the dealer from whom you have purchased this product for details of repair work. When the product is incorporated to the machine you have purchased, consult to the machine manufacturer or its dealer.
URL	Electric data of this product (Instruction Manual, CAD data) can be download from the following web site; < http://industrial.panasonic.com/ww/products/motors-compressors/fa-motors >

Contact to :



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Certificate
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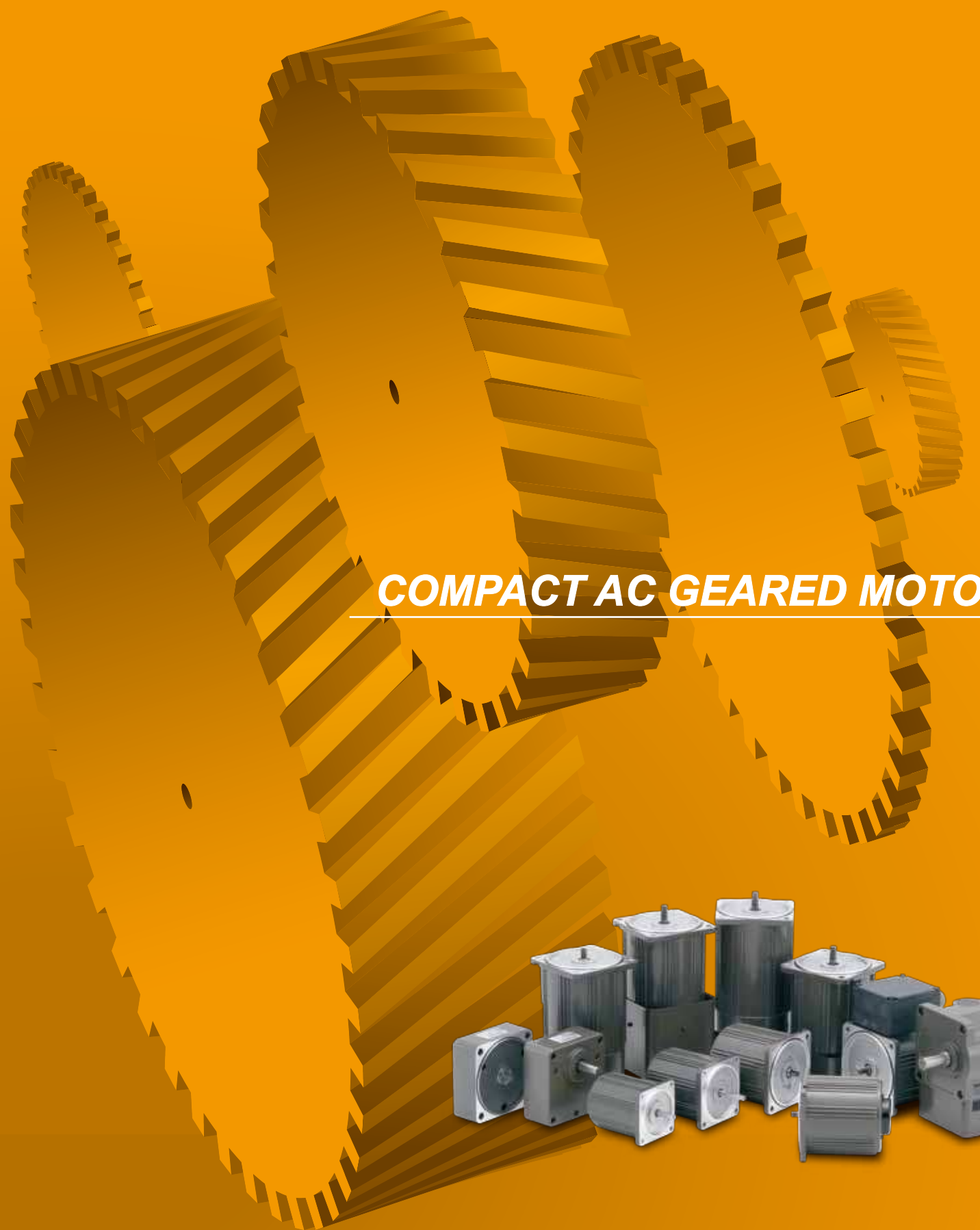
Panasonic Corporation,
Automotive & Industrial Systems Company,
Electromechanical Control Business Division,
Motor Business Unit

1-1 Morofuku 7-chome, Daito, Osaka 574-0044, Japan
Tel : +81-72-871-1212
Fax: +81-72-870-3151

The contents of this catalog apply to the products as of April 2016.

• Printed colors may be slightly different from the actual products.
• Specifications and design of the products are subject to change without notice for the product improvement.

COMPACT AC GEARED MOTOR



COMPACT AC GEARED MOTOR

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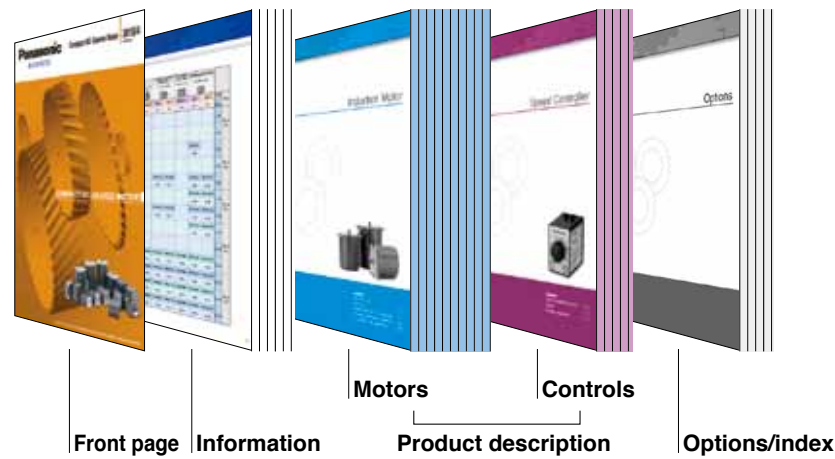
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Information contained in the catalog

Configuration and contents of catalog

Configuration

The catalog is divided into the following sections.



• **Information** ➔ A-2 to A-60
Information on product selection, terms used in this catalog, handling precautions and safety standards.

• **Product description**
<Motors> ➔ B-1 to B-456
List of motors and gear heads

<Controls> ➔ C-1 to C-56
Control related products

• **Options & index** ➔ D-1 to D-16
List of options. Index sorted by parts number. (Alphabetical order)

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• **Product list**
List of motors and gear heads
➔ A-4

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Objective product can be found by using keywords (function, specification).
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• **Product Type Contents**
List of all product families introduced in this catalog.
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• **Terminology**
Description of terms used in this catalog.
➔ A-32

• **Handling instructions**
Description of special precautions and handling techniques that must be implemented to assure product performance.
➔ A-35

• **Motor selection**
Guidance to select the most suitable motor for the application.
➔ A-46

• **Safety standard approved motor**
Outline of product safety standards referenced in this catalog.
➔ A-57

Product outline

The product is briefly described by using the following information and data.

- Overview, system block diagram, part No. description, product-specific information
- Model list
- Product information for each model

Product description / Conversion Table

Description of product

A Index

- Each series is color coded.

Motors

Controls

- Classification is made in terms of function.

B Size and output

- Indicates the size and output shown on the page.

C Footer

- Indicates the page(s) on which related products and information are found.

Product information (D to I)

- The facing page contains product specifications.

D Specification

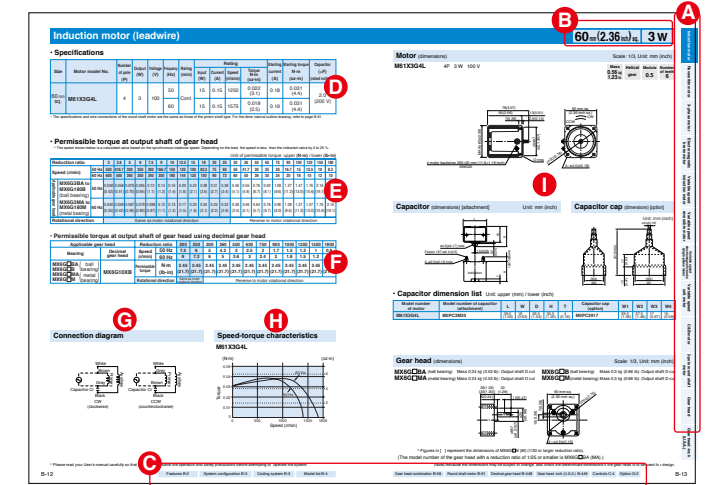
- Defines major requirements such as voltage, current and torque.
- Description is basically on pinion shaft type but almost equally applicable to round shaft.

E Permissible load torque with gear head directly connected

- Specifies the allowable load torque with gear head directly connected.

F Permissible load torque with decimal gear head used

- Specifies the allowable load torque when the decimal gear head is used.



G Wiring diagram

- Represents typical wiring for the product.

H Speed-torque curve

- Represents typical speed-torque curve of the product.

I Outline drawing

- Shows dimensions of the motor (gear head).
- Dimensions of motor-gear head combination and round shaft type are shown on different pages. See the footer.
- Fit tolerance symbol (JIS) is used in dimensions of motor "Faucet face" and "gear head" output shaft. For further information, see page A-33.

Conversion Table

To convert top row values to left column values(or vice versa), multiply by the value in the table.

(X = Y x multiply unit)

Length

Y \ X	mm	cm	m	in
mm	1	0.1	0.001	0.0393701
cm	10	1	0.01	0.393701
m	1000	100	1	39.3701
in	25.4	2.54	0.0254	1

Weight

Y \ X	g	kg	oz	lb
g	1	0.001	0.035274	0.00220462
kg	1000	1	35.274	2.20462
oz	28.3495	0.0283495	1	0.0625
lb	453.592	0.453592	16	1

Inertia

Y \ X	kg-cm ²	oz-in ²	lb-in ²
kg-cm ²	1	5.46745	0.341718
oz-in ²	0.182899	1	0.0625
lb-in ²	2.9263	16	1

Torque

Y \ X	N·m	oz-in	lb-in
N·m	1	141.6121	8.850759
oz-in	7.061541 x 10 ⁻³	1	0.0625
lb-in	1.12985 x 10 ³	16	1

Product list

Pinion shaft motor [Japanese version]

Size	Voltage (V) Output	Induction				Reversible				3-phase		Electromagnetic brake, single-phase		Electromagnetic brake, 3-phase	Variable speed induction		Voltage (V) Output	Size	
		Leadwire type		Sealed connector type		Leadwire type		Sealed connector type		Leadwire type	Sealed connector type	Leadwire type		Leadwire type	Leadwire type				
		100	200	100	200	100	200	100	200	200/220	200/220	100	200	200/220	100	200			
		Page	Page	Page	Page	Page	Page	Page	Page	Page	Page	Page	Page	Page	Page	Page			
42 mm sq. (1.65 inch sq.)	1 W	M41A1G4L				M4RA1G4L											1 W	42 mm sq. (1.65 inch sq.)	
		B-10				B-72													
60 mm sq. (2.36 inch sq.)	3 W																3 W	60 mm sq. (2.36 inch sq.)	
		M61X3G4L														M61X3GV4L			
		B-12														B-232			
60 mm sq. (2.36 inch sq.)	4 W					M6RX4G4L											4 W	60 mm sq. (2.36 inch sq.)	
						B-74													
	6 W	M61X6G4L	M61X6G4Y			M6RX6G4L	M6RX6G4Y					M6RX6GB4L	M6RX6GB4Y			M61X6GV4L	M61X6GV4Y		6 W
		B-14	B-14			B-76	B-76					B-178	B-178			B-234	B-234		
70 mm sq. (2.76 inch sq.)	10 W	M71X10G4L	M71X10G4Y			M7RX10G4L	M7RX10G4Y									M71X10GV4L	M71X10GV4Y	10 W	
		B-18	B-18			B-80	B-80									B-238	B-238		
	15 W	M71X15G4L	M71X15G4Y			M7RX15G4L	M7RX15G4Y					M7RX15GB4L	M7RX15GB4Y			M71X15GV4L	M71X15GV4Y	15 W	
		B-20	B-20			B-82	B-82					B-182	B-182			B-240	B-240		
80 mm sq. (3.15 inch sq.)	15 W	M81X15G4L	M81X15G4Y													M81X15GV4L	M81X15GV4Y	15 W	
		B-24	B-24													B-244	B-244		
	20 W					M8RX20G4L	M8RX20G4Y											20 W	
					B-86	B-86													
80 mm sq. (3.15 inch sq.)	25 W	M81X25G4L	M81X25G4Y	M81X25GK4L	M81X25GK4Y	M8RX25G4L	M8RX25G4Y	M8RX25GK4L	M8RX25GK4Y			M8MX25G4Y	M8MX25GK4Y	M8RX25GB4L	M8RX25GB4Y	M8MX25GB4Y	M81X25GV4L	M81X25GV4Y	25 W
		B-26	B-26	B-42	B-42	B-88	B-88	B-104	B-104			B-130	B-146	B-186	B-186	B-202	B-246	B-246	
	40 W	M91X40G4L	M91X40G4Y	M91X40GK4L	M91X40GK4Y	M9RX40G4L	M9RX40G4Y	M9RX40GK4L	M9RX40GK4Y			M9MX40G4Y	M9MX40GK4Y	M9RX40GB4L	M9RX40GB4Y	M9MX40GB4Y	M91X40GV4L	M91X40GV4Y	40 W
	B-30	B-30	B-46	B-46	B-92	B-92	B-108	B-108			B-134	B-150	B-190	B-190	B-206	B-250	B-250		
90 mm sq. (3.54 inch sq.)	60 W	M91Z60G4L	M91Z60G4Y	M91Z60GK4L	M91Z60GK4Y	M9RZ60G4L	M9RZ60G4Y	M9RZ60GK4L	M9RZ60GK4Y			M9MZ60G4Y	M9MZ60GK4Y	M9RZ60GB4L	M9RZ60GB4Y	M9MZ60GB4Y	M91Z60GV4L	M91Z60GV4Y	60 W
		B-34	B-34	B-50	B-50	B-96	B-96	B-112	B-112			B-138	B-154	B-194	B-194	B-210	B-254	B-254	
	90 W	M91Z90G4L	M91Z90G4Y	M91Z90GK4L	M91Z90GK4Y	M9RZ90G4L	M9RZ90G4Y	M9RZ90GK4L	M9RZ90GK4Y			M9MZ90G4Y	M9MZ90GK4Y	M9RZ90GB4L	M9RZ90GB4Y	M9MZ90GB4Y	M91Z90GV4L	M91Z90GV4Y	90 W
	B-38	B-38	B-54	B-54	B-100	B-100	B-116	B-116			B-142	B-158	B-198	B-198	B-214	B-258	B-258		

Product list

Pinion shaft motor [Japanese version]

Size	Voltage (V) Output	Variable speed reversible		Variable speed electromagnetic brake, single-phase		Variable speed unit				C&B induction				C&B 3-phase		C&B variable speed induction		Voltage (V) Output	Size	
		Leadwire type		Leadwire type		US series		UX series		Leadwire type		Sealed connector type		Leadwire type	Sealed connector type	Leadwire type				
		100	200	100	200	100	200	100	200	100	200	100	200	200/220	200/220	100	200			
		Page	Page	Page	Page	Page	Page	Page	Page	Page	Page	Page	Page	Page	Page	Page	Page			
42 mm sq. (1.65 inch sq.)	1 W																	1 W	42 mm sq. (1.65 inch sq.)	
	3 W																	3 W		
60 mm sq. (2.36 inch sq.)	3 W																	3 W	60 mm sq. (2.36 inch sq.)	
	4 W	M6RX4GV4L B-274																4 W		
	6 W	M6RX6GV4L B-276	M6RX6GV4Y B-276	M6RX6GBV4L B-314	M6RX6GBV4Y B-314	MUSN606GL B-328	MUSN606GY B-328	MUXN606GL B-328	MUXN606GY B-328		M61X6H4L B-352	M61X6H4Y B-352				M61X6HV4L B-388	M61X6HV4Y B-388	6 W		
70 mm sq. (2.76 inch sq.)	10 W	M7RX10GV4L B-280	M7RX10GV4Y B-280															10 W	70 mm sq. (2.76 inch sq.)	
	15 W	M7RX15GV4L B-282	M7RX15GV4Y B-282	M7RX15GBV4L B-316	M7RX15GBV4Y B-316	MUSN715GL B-330	MUSN715GY B-330	MUXN715GL B-330	MUXN715GY B-330		M71X15H4L B-354	M71X15H4Y B-354				M71X15HV4L B-390	M71X15HV4Y B-390	15 W		
80 mm sq. (3.15 inch sq.)	15 W																	15 W	80 mm sq. (3.15 inch sq.)	
	20 W	M8RX20GV4L B-286	M8RX20GV4Y B-286															20 W		
	25 W	M8RX25GV4L B-288	M8RX25GV4Y B-288	M8RX25GBV4L B-318	M8RX25GBV4Y B-318	MUSN825GL B-332	MUSN825GY B-332	MUXN825GL B-332	MUXN825GY B-332		M81X25H4L B-356	M81X25H4Y B-356	M81X25HK4L B-364	M81X25HK4Y B-364	M8MX25H4Y B-372	M8MX25HK4Y B-372	M81X25HV4L B-392	M81X25HV4Y B-392		25 W
90 mm sq. (3.54 inch sq.)	40 W	M9RX40GV4L B-292	M9RX40GV4Y B-292	M9RX40GBV4L B-320	M9RX40GBV4Y B-320	MUSN940GL B-334	MUSN940GY B-334	MUXN940GL B-334	MUXN940GY B-334		M91X40H4L B-358	M91X40H4Y B-358	M91X40HK4L B-366	M91X40HK4Y B-366	M9MX40H4Y B-374	M9MX40HK4Y B-374	M91X40HV4L B-394	M91X40HV4Y B-394	40 W	
	60 W	M9RZ60GV4L B-296	M9RZ60GV4Y B-296			MUSN960GL B-336	MUSN960GY B-336	MUXN960GL B-336	MUXN960GY B-336		M91Z60H4L B-360	M91Z60H4Y B-360	M91Z60HK4L B-368	M91Z60HK4Y B-368	M9MZ60H4Y B-376	M9MZ60HK4Y B-376	M91Z60HV4L B-396	M91Z60HV4Y B-396	60 W	
	90 W	M9RZ90GV4L B-300	M9RZ90GV4Y B-300			MUSN990GL B-338	MUSN990GY B-338	MUXN990GL B-338	MUXN990GY B-338		M91Z90H4L B-362	M91Z90H4Y B-362	M91Z90HK4L B-370	M91Z90HK4Y B-370	M9MZ90H4Y B-378	M9MZ90HK4Y B-378	M91Z90HV4L B-398	M91Z90HV4Y B-398	90 W	

Product list

Round shaft motor [Japanese version]

Size	Voltage (V) Output	Induction				Reversible				3-phase		Electromagnetic brake, single-phase		Electromagnetic brake, 3-phase	Variable speed induction		Voltage (V) Output	Size	
		Leadwire type		Sealed connector type		Leadwire type		Sealed connector type		Leadwire type	Sealed connector type	Leadwire type		Leadwire type	Leadwire type				
		100	200	100	200	100	200	100	200	200/220	200/220	100	200	200/220	100	200			
		Page	Page	Page	Page	Page	Page	Page	Page	Page	Page	Page	Page	Page	Page	Page			
42 mm sq. (1.65 inch sq.)	1 W	M41A1S4L B-61				M4RA1S4L B-123											1 W	42 mm sq. (1.65 inch sq.)	
	3 W																3 W		
60 mm sq. (2.36 inch sq.)	3 W	M61X3S4LS B-61														M61X3SV4LS B-264	3 W	60 mm sq. (2.36 inch sq.)	
	4 W					M6RX4S4LS B-123											4 W		
	6 W	M61X6S4LS B-61	M61X6S4YS B-61			M6RX6S4LS B-123	M6RX6S4YS B-123					M6RX6SB4LS B-220	M6RX6SB4YS B-220		M61X6SV4LS B-264	M61X6SV4YS B-264	6 W		
70 mm sq. (2.76 inch sq.)	10 W	M71X10S4LS B-61	M71X10S4YS B-61			M7RX10S4LS B-123	M7RX10S4YS B-123									M71X10SV4LS B-264	M71X10SV4YS B-264	10 W	70 mm sq. (2.76 inch sq.)
	15 W	M71X15S4LS B-61	M71X15S4YS B-61			M7RX15S4LS B-123	M7RX15S4YS B-123					M7RX15SB4LS B-220	M7RX15SB4YS B-220		M71X15SV4LS B-264	M71X15SV4YS B-264	15 W		
80 mm sq. (3.15 inch sq.)	15 W	M81X15S4LS B-61	M81X15S4YS B-61													M81X15SV4LS B-264	M81X15SV4YS B-264	15 W	80 mm sq. (3.15 inch sq.)
	20 W					M8RX20S4LS B-123	M8RX20S4YS B-123											20 W	
	25 W	M81X25S4LS B-61	M81X25S4YS B-61	M81X25SK4LS B-62	M81X25SK4YS B-62	M8RX25S4LS B-123	M8RX25S4YS B-123	M8RX25SK4LS B-124	M8RX25SK4YS B-124		M8MX25S4YS B-164	M8MX25SK4YS B-165	M8RX25SB4LS B-220	M8RX25SB4YS B-220	M8MX25SB4YS B-221	M81X25SV4LS B-264	M81X25SV4YS B-264	25 W	
90 mm sq. (3.54 inch sq.)	40 W	M91X40S4LS B-61	M91X40S4YS B-61	M91X40SK4LS B-62	M91X40SK4YS B-62	M9RX40S4LS B-123	M9RX40S4YS B-123	M9RX40SK4LS B-124	M9RX40SK4YS B-124		M9MX40S4YS B-164	M9MX40SK4YS B-165	M9RX40SB4LS B-220	M9RX40SB4YS B-220	M9MX40SB4YS B-221	M91X40SV4LS B-265	M91X40SV4YS B-265	40 W	90 mm sq. (3.54 inch sq.)
	60 W	M91Z60S4LS B-62	M91Z60S4YS B-62	M91Z60SK4LS B-62	M91Z60SK4YS B-62	M9RZ60S4LS B-124	M9RZ60S4YS B-124	M9RZ60SK4LS B-124	M9RZ60SK4YS B-124		M9MZ60S4YS B-164	M9MZ60SK4YS B-165	M9RZ60SB4LS B-220	M9RZ60SB4YS B-220	M9MZ60SB4YS B-221	M91Z60SV4LS B-265	M91Z60SV4YS B-265	60 W	
	90 W	M91Z90S4LS B-62	M91Z90S4YS B-62	M91Z90SK4LS B-62	M91Z90SK4YS B-62	M9RZ90S4LS B-124	M9RZ90S4YS B-124	M9RZ90SK4LS B-124	M9RZ90SK4YS B-124		M9MZ90S4YS B-164	M9MZ90SK4YS B-165	M9RZ90SB4LS B-220	M9RZ90SB4YS B-220	M9MZ90SB4YS B-221	M91Z90SV4LS B-265	M91Z90SV4YS B-265	90 W	

Product list

Round shaft motor [Japanese version]

2-pole motor [Japanese version]

Pinion shaft motor [International standard approved]



Size		Variable speed reversible	
		Leadwire type	
Size	Voltage (V)	100	200
	Output	Page	Page
42 mm sq. (1.65 inch sq.)	1 W		
	3 W		
60 mm sq. (2.36 inch sq.)	3 W		
	4 W	M6RX4SV4LS B-306	
	6 W	M6RX6SV4LS B-306	M6RX6SV4YS B-306
70 mm sq. (2.76 inch sq.)	10 W	M7RX10SV4LS B-306	M7RX10SV4YS B-306
	15 W	M7RX15SV4LS B-306	M7RX15SV4YS B-306
80 mm sq. (3.15 inch sq.)	15 W		
	20 W	M8RX20SV4LS B-306	M8RX20SV4YS B-306
	25 W	M8RX25SV4LS B-306	M8RX25SV4YS B-306
90 mm sq. (3.54 inch sq.)	40 W	M9RX40SV4LS B-307	M9RX40SV4YS B-307
	60 W	M9RZ60SV4LS B-307	M9RZ60SV4YS B-307
	90 W	M9RZ90SV4LS B-307	M9RZ90SV4YS B-307

• Pinion shaft • Round shaft

Size		Induction		Induction		3-phase	
		Leadwire type		Leadwire type		Leadwire type	
Size	Voltage (V)	100	200	100	200	200/220	
	Output	Page	Page	Page	Page	Page	
42 mm sq. (1.65 inch sq.)	1 W						
	3 W	M41A3G2L B-8		M41A3S2L B-408			
60 mm sq. (2.36 inch sq.)	3 W						
	4 W						
	6 W						
70 mm sq. (2.76 inch sq.)	10 W						
	15 W						
80 mm sq. (3.15 inch sq.)	20 W			M81X20S2LS B-409	M81X20S2YS B-409		
	40 W			M81X40S2LS B-410	M81X40S2YS B-410	M8MX40S2YS B-420	
	60 W			M81X60S2LS B-412	M81X60S2YS B-412	M8MX60S2YS B-422	
90 mm sq. (3.54 inch sq.)	60 W			M91X60S2LS B-414	M91X60S2YS B-414	M9MX60S2YS B-424	
	90 W			M91Z90S2LS B-416	M91Z90S2YS B-416	M9MZ90S2YS B-426	
	150 W			M91ZA5S2LS B-418	M91ZA5S2YS B-418	M9MZA5S2YS B-428	

<The models with a motor model number to which "A" or "B" is suffixed are not equipped with a capacitor cap.>

Size		Induction							
		Leadwire type				Sealed connector type			
Size	Voltage (V)	100	110/115	200	220/230	100	110/115	200	220/230
	Output	Page	Page	Page	Page	Page	Page	Page	Page
42 mm sq. (1.65 inch sq.)	1 W								
	3 W								
60 mm sq. (2.36 inch sq.)	3 W								
	4 W								
	6 W	M61X6G4LG M61X6G4LGA B-16	M61X6G4DG M61X6G4DGA B-16	M61X6G4YG M61X6G4YGA B-16	M61X6G4GG M61X6G4GGG B-16				
70 mm sq. (2.76 inch sq.)	10 W								
	15 W	M71X15G4LG M71X15G4LGA B-22	M71X15G4DG M71X15G4DGA B-22	M71X15G4YG M71X15G4YGA B-22	M71X15G4GG M71X15G4GGG B-22				
80 mm sq. (3.15 inch sq.)	15 W								
	20 W								
	25 W	M81X25G4LG M81X25G4LGA B-28	M81X25G4DG M81X25G4DGA B-28	M81X25G4YG M81X25G4YGA B-28	M81X25G4GG M81X25G4GGG B-28	M81X25GK4LG M81X25GK4LGA B-44	M81X25GK4DG M81X25GK4DGA B-44	M81X25GK4YG M81X25GK4YGA B-44	M81X25GK4GG M81X25GK4GGG B-44
90 mm sq. (3.54 inch sq.)	40 W	M91X40G4LG M91X40G4LGA B-32	M91X40G4DG M91X40G4DGA B-32	M91X40G4YG M91X40G4YGA B-32	M91X40G4GG M91X40G4GGG B-32	M91X40GK4LG M91X40GK4LGA B-48	M91X40GK4DG M91X40GK4DGA B-48	M91X40GK4YG M91X40GK4YGA B-48	M91X40GK4GG M91X40GK4GGG B-48
	60 W	M91Z60G4LG M91Z60G4LGA B-36	M91Z60G4DG M91Z60G4DGA B-36	M91Z60G4YG M91Z60G4YGA B-36	M91Z60G4GG M91Z60G4GGG M91Z60G4GGB M91Z60G4GGC B-36	M91Z60GK4LG M91Z60GK4LGA B-52	M91Z60GK4DG M91Z60GK4DGA B-52	M91Z60GK4YG M91Z60GK4YGA B-52	M91Z60GK4GG M91Z60GK4GGG M91Z60GK4GGB M91Z60GK4GGC B-52
	90 W	M91Z90G4LG M91Z90G4LGA B-40	M91Z90G4DG M91Z90G4DGA B-40	M91Z90G4YG M91Z90G4YGA B-40	M91Z90G4GG M91Z90G4GGG M91Z90G4GGB M91Z90G4GGC B-40	M91Z90GK4LG M91Z90GK4LGA B-56	M91Z90GK4DG M91Z90GK4DGA B-56	M91Z90GK4YG M91Z90GK4YGA B-56	M91Z90GK4GG M91Z90GK4GGG M91Z90GK4GGB M91Z90GK4GGC B-56





* The models with a model number to which "A" or "B" is suffixed (not equipped with a capacitor cap) are not sold or available in Japan.

Product list

Pinion shaft motor [International standard approved]



<The models with a motor model number to which "A" is suffixed are not equipped with a capacitor cap.>

Size	Voltage (V) Output	Reversible								3-phase			Electromagnetic brake, single-phase				Electromagnetic brake, 3-phase	Voltage (V) Output	Size	
		Leadwire type 				Sealed connector type 				Leadwire type 	Sealed connector type 		Leadwire type 				Leadwire type 			
		100	110/115	200	220/230	100	110/115	200	220/230	200/220/230	200/220/230	380/400	100	110/115	200	220/230	200/220/230			
		Page	Page	Page	Page	Page	Page	Page	Page	Page	Page	Page	Page	Page	Page	Page	Page			
42 mm sq. (1.65 inch sq.)	1 W																	1 W		
	3 W																	3 W		
60 mm sq. (2.36 inch sq.)	3 W																	3 W		
	4 W																	4 W		
	6 W	M6RX6G4LG M6RX6G4LGA B-78	M6RX6G4DG M6RX6G4DGA B-78	M6RX6G4YG M6RX6G4YGA B-78	M6RX6G4GG M6RX6G4GGA B-78							M6RX6GB4LG M6RX6GB4LGA B-180	M6RX6GB4DG M6RX6GB4DGA B-180	M6RX6GB4YG M6RX6GB4YGA B-180	M6RX6GB4GG M6RX6GB4GGA B-180			6 W		
70 mm sq. (2.76 inch sq.)	10 W																	10 W		
	15 W	M7RX15G4LG M7RX15G4LGA B-84	M7RX15G4DG M7RX15G4DGA B-84	M7RX15G4YG M7RX15G4YGA B-84	M7RX15G4GG M7RX15G4GGA B-84							M7RX15GB4LG M7RX15GB4LGA B-184	M7RX15GB4DG M7RX15GB4DGA B-184	M7RX15GB4YG M7RX15GB4YGA B-184	M7RX15GB4GG M7RX15GB4GGA B-184			15 W		
80 mm sq. (3.15 inch sq.)	15 W																	15 W		
	20 W																	20 W		
	25 W	M8RX25G4LG M8RX25G4LGA B-90	M8RX25G4DG M8RX25G4DGA B-90	M8RX25G4YG M8RX25G4YGA B-90	M8RX25G4GG M8RX25G4GGA B-90	M8RX25GK4LG M8RX25GK4LGA B-106	M8RX25GK4DG M8RX25GK4DGA B-106	M8RX25GK4YG M8RX25GK4YGA B-106	M8RX25GK4GG M8RX25GK4GGA B-106			M8MX25G4YG M8MX25G4YGA B-132	M8MX25GK4YG M8MX25GK4YGA B-148	M8MX25GK4CG M8MX25GK4CGA B-148	M8RX25GB4LG M8RX25GB4LGA B-188	M8RX25GB4DG M8RX25GB4DGA B-188	M8RX25GB4YG M8RX25GB4YGA B-188	M8RX25GB4GG M8RX25GB4GGA B-188	M8MX25GB4YG M8MX25GB4YGA B-204	25 W
90 mm sq. (3.54 inch sq.)	40 W	M9RX40G4LG M9RX40G4LGA B-94	M9RX40G4DG M9RX40G4DGA B-94	M9RX40G4YG M9RX40G4YGA B-94	M9RX40G4GG M9RX40G4GGA B-94	M9RX40GK4LG M9RX40GK4LGA B-110	M9RX40GK4DG M9RX40GK4DGA B-110	M9RX40GK4YG M9RX40GK4YGA B-110	M9RX40GK4GG M9RX40GK4GGA B-110			M9MX40G4YG M9MX40G4YGA B-136	M9MX40GK4YG M9MX40GK4YGA B-152	M9MX40GK4CG M9MX40GK4CGA B-152	M9RX40GB4LG M9RX40GB4LGA B-192	M9RX40GB4DG M9RX40GB4DGA B-192	M9RX40GB4YG M9RX40GB4YGA B-192	M9RX40GB4GG M9RX40GB4GGA B-192	M9MX40GB4YG M9MX40GB4YGA B-208	40 W
	60 W	M9RZ60G4LG M9RZ60G4LGA B-98	M9RZ60G4DG M9RZ60G4DGA B-98	M9RZ60G4YG M9RZ60G4YGA B-98	M9RZ60G4GG M9RZ60G4GGA B-98	M9RZ60GK4LG M9RZ60GK4LGA B-114	M9RZ60GK4DG M9RZ60GK4DGA B-114	M9RZ60GK4YG M9RZ60GK4YGA B-114	M9RZ60GK4GG M9RZ60GK4GGA B-114			M9MZ60G4YG M9MZ60G4YGA B-140	M9MZ60GK4YG M9MZ60GK4YGA B-156	M9MZ60GK4CG M9MZ60GK4CGA B-156	M9RZ60GB4LG M9RZ60GB4LGA B-196	M9RZ60GB4DG M9RZ60GB4DGA B-196	M9RZ60GB4YG M9RZ60GB4YGA B-196	M9RZ60GB4GG M9RZ60GB4GGA B-196	M9MZ60GB4YG M9MZ60GB4YGA B-212	60 W
	90 W	M9RZ90G4LG M9RZ90G4LGA B-102	M9RZ90G4DG M9RZ90G4DGA B-102	M9RZ90G4YG M9RZ90G4YGA B-102	M9RZ90G4GG M9RZ90G4GGA B-102	M9RZ90GK4LG M9RZ90GK4LGA B-118	M9RZ90GK4DG M9RZ90GK4DGA B-118	M9RZ90GK4YG M9RZ90GK4YGA B-118	M9RZ90GK4GG M9RZ90GK4GGA B-118			M9MZ90G4YG M9MZ90G4YGA B-144	M9MZ90GK4YG M9MZ90GK4YGA B-160	M9MZ90GK4CG M9MZ90GK4CGA B-160	M9RZ90GB4LG M9RZ90GB4LGA B-200	M9RZ90GB4DG M9RZ90GB4DGA B-200	M9RZ90GB4YG M9RZ90GB4YGA B-200	M9RZ90GB4GG M9RZ90GB4GGA B-200	M9MZ90GB4YG M9MZ90GB4YGA B-216	90 W

* The models with a model number to which "A" is suffixed (not equipped with a capacitor cap) are not sold or available in Japan.

Product list



Pinion shaft motor [International standard approved]



Round shaft motor [International standard approved]



<The models with a motor model number to which "A" or "B" is suffixed are not equipped with a capacitor cap.>

Size	Voltage (V) Output	Variable speed induction				Variable speed reversible				Induction								Voltage (V) Output	Size			
		Leadwire type 				Leadwire type 				Leadwire type 				Sealed connector type 								
		100 Page	110/115 Page	200 Page	220/230 Page	100 Page	110/115 Page	200 Page	220/230 Page	100 Page	110/115 Page	200 Page	220/230 Page	100 Page	110/115 Page	200 Page	220/230 Page					
42 mm sq. (1.65 inch sq.)	1 W																		1 W	42 mm sq. (1.65 inch sq.)		
	3 W																		3 W			
60 mm sq. (2.36 inch sq.)	3 W																		3 W	60 mm sq. (2.36 inch sq.)		
	4 W																		4 W			
	6 W	M61X6GV4LG M61X6GV4LGA B-236	M61X6GV4DG M61X6GV4DGA B-236	M61X6GV4YG M61X6GV4YGA B-236	M61X6GV4GG M61X6GV4GGA B-236	M6RX6GV4LG M6RX6GV4LGA B-278	M6RX6GV4DG M6RX6GV4DGA B-278	M6RX6GV4YG M6RX6GV4YGA B-278	M6RX6GV4GG M6RX6GV4GGA B-278					M61X6S4LG M61X6S4LGA B-61	M61X6S4DG M61X6S4DGA B-61	M61X6S4YG M61X6S4YGA B-61	M61X6S4GG M61X6S4GGA B-61					6 W
70 mm sq. (2.76 inch sq.)	10 W																		10 W	70 mm sq. (2.76 inch sq.)		
	15 W	M71X15GV4LG M71X15GV4LGA B-242	M71X15GV4DG M71X15GV4DGA B-242	M71X15GV4YG M71X15GV4YGA B-242	M71X15GV4GG M71X15GV4GGA B-242	M7RX15GV4LG M7RX15GV4LGA B-284	M7RX15GV4DG M7RX15GV4DGA B-284	M7RX15GV4YG M7RX15GV4YGA B-284	M7RX15GV4GG M7RX15GV4GGA B-284					M71X15S4LG M71X15S4LGA B-61	M71X15S4DG M71X15S4DGA B-61	M71X15S4YG M71X15S4YGA B-61	M71X15S4GG M71X15S4GGA B-61					15 W
80 mm sq. (3.15 inch sq.)	15 W																		15 W	80 mm sq. (3.15 inch sq.)		
	20 W																		20 W			
	25 W	M81X25GV4LG M81X25GV4LGA B-248	M81X25GV4DG M81X25GV4DGA B-248	M81X25GV4YG M81X25GV4YGA B-248	M81X25GV4GG M81X25GV4GGA B-248	M8RX25GV4LG M8RX25GV4LGA B-290	M8RX25GV4DG M8RX25GV4DGA B-290	M8RX25GV4YG M8RX25GV4YGA B-290	M8RX25GV4GG M8RX25GV4GGA B-290					M81X25S4LG M81X25S4LGA B-61	M81X25S4DG M81X25S4DGA B-61	M81X25S4YG M81X25S4YGA B-61	M81X25S4GG M81X25S4GGA B-61	M81X25SK4LG M81X25SK4LGA B-62	M81X25SK4DG M81X25SK4DGA B-62		M81X25SK4YG M81X25SK4YGA B-62	M81X25SK4GG M81X25SK4GGA B-62
90 mm sq. (3.54 inch sq.)	40 W	M91X40GV4LG M91X40GV4LGA B-252	M91X40GV4DG M91X40GV4DGA B-252	M91X40GV4YG M91X40GV4YGA B-252	M91X40GV4GG M91X40GV4GGA B-252	M9RX40GV4LG M9RX40GV4LGA B-294	M9RX40GV4DG M9RX40GV4DGA B-294	M9RX40GV4YG M9RX40GV4YGA B-294	M9RX40GV4GG M9RX40GV4GGA B-294					M91X40S4LG M91X40S4LGA B-61	M91X40S4DG M91X40S4DGA B-61	M91X40S4YG M91X40S4YGA B-61	M91X40S4GG M91X40S4GGA B-61	M91X40SK4LG M91X40SK4LGA B-62	M91X40SK4DG M91X40SK4DGA B-62	M91X40SK4YG M91X40SK4YGA B-62	M91X40SK4GG M91X40SK4GGA B-62	40 W
	60 W	M91Z60GV4LG M91Z60GV4LGA B-256	M91Z60GV4DG M91Z60GV4DGA B-256	M91Z60GV4YG M91Z60GV4YGA B-256	M91Z60GV4GG M91Z60GV4GGA M91Z60GV4GGB M91Z60GV4GGC B-256	M9RZ60GV4LG M9RZ60GV4LGA B-298	M9RZ60GV4DG M9RZ60GV4DGA B-298	M9RZ60GV4YG M9RZ60GV4YGA B-298	M9RZ60GV4GG M9RZ60GV4GGA B-298					M91Z60S4LG M91Z60S4LGA B-62	M91Z60S4DG M91Z60S4DGA B-62	M91Z60S4YG M91Z60S4YGA B-62	M91Z60S4GG M91Z60S4GGA M91Z60S4GGB M91Z60S4GGC B-62	M91Z60SK4LG M91Z60SK4LGA B-62	M91Z60SK4DG M91Z60SK4DGA B-62	M91Z60SK4YG M91Z60SK4YGA B-62	M91Z60SK4GG M91Z60SK4GGA M91Z60SK4GGB M91Z60SK4GGC B-62	60 W
	90 W	M91Z90GV4LG M91Z90GV4LGA B-260	M91Z90GV4DG M91Z90GV4DGA B-260	M91Z90GV4YG M91Z90GV4YGA B-260	M91Z90GV4GG M91Z90GV4GGA M91Z90GV4GGB M91Z90GV4GGC B-260	M9RZ90GV4LG M9RZ90GV4LGA B-302	M9RZ90GV4DG M9RZ90GV4DGA B-302	M9RZ90GV4YG M9RZ90GV4YGA B-302	M9RZ90GV4GG M9RZ90GV4GGA B-302					M91Z90S4LG M91Z90S4LGA B-62	M91Z90S4DG M91Z90S4DGA B-62	M91Z90S4YG M91Z90S4YGA B-62	M91Z90S4GG M91Z90S4GGA M91Z90S4GGB M91Z90S4GGC B-62	M91Z90SK4LG M91Z90SK4LGA B-62	M91Z90SK4DG M91Z90SK4DGA B-62	M91Z90SK4YG M91Z90SK4YGA B-62	M91Z90SK4GG M91Z90SK4GGA M91Z90SK4GGB M91Z90SK4GGC B-62	90 W





* The models with a model number to which "A" or "B" is suffixed (not equipped with a capacitor cap) are not sold or available in Japan.

Product list

Round shaft motor [International standard approved]



<The models with a motor model number to which "A" is suffixed are not equipped with a capacitor cap.>

Size	Voltage (V) Output	Reversible								3-phase			Electromagnetic brake, single-phase				Electromagnetic brake, 3-phase	Voltage (V) Output	Size		
		Leadwire type 				Sealed connector type 				Leadwire type 	Sealed connector type 		Leadwire type 				Leadwire type 				
		100	110/115	200	220/230	100	110/115	200	220/230	200/220/230	200/220/230	380/400	100	110/115	200	220/230	200/220/230				
		Page	Page	Page	Page	Page	Page	Page	Page	Page	Page	Page	Page	Page	Page	Page	Page				
42 mm sq. (1.65 inch sq.)	1 W																	1 W	42 mm sq. (1.65 inch sq.)		
	3 W																	3 W			
60 mm sq. (2.36 inch sq.)	3 W																	3 W	60 mm sq. (2.36 inch sq.)		
	4 W																	4 W			
	6 W	M6RX6S4LG M6RX6S4LGA	M6RX6S4DG M6RX6S4DGA	M6RX6S4YG M6RX6S4YGA	M6RX6S4GG M6RX6S4GGA								M6RX6SB4LG M6RX6SB4LGA	M6RX6SB4DG M6RX6SB4DGA	M6RX6SB4YG M6RX6SB4YGA	M6RX6SB4GG M6RX6SB4GGA				6 W	
		B-123	B-123	B-123	B-123								B-220	B-220	B-220	B-220					
70 mm sq. (2.76 inch sq.)	10 W																	10 W	70 mm sq. (2.76 inch sq.)		
	15 W	M7RX15S4LG M7RX15S4LGA	M7RX15S4DG M7RX15S4DGA	M7RX15S4YG M7RX15S4YGA	M7RX15S4GG M7RX15S4GGA								M7RX15SB4LG M7RX15SB4LGA	M7RX15SB4DG M7RX15SB4DGA	M7RX15SB4YG M7RX15SB4YGA	M7RX15SB4GG M7RX15SB4GGA				15 W	
		B-123	B-123	B-123	B-123									B-220	B-220	B-220	B-220				
80 mm sq. (3.15 inch sq.)	15 W																	15 W	80 mm sq. (3.15 inch sq.)		
	20 W																	20 W			
	25 W	M8RX25S4LG M8RX25S4LGA	M8RX25S4DG M8RX25S4DGA	M8RX25S4YG M8RX25S4YGA	M8RX25S4GG M8RX25S4GGA	M8RX25SK4LG M8RX25SK4LGA	M8RX25SK4DG M8RX25SK4DGA	M8RX25SK4YG M8RX25SK4YGA	M8RX25SK4GG M8RX25SK4GGA				M8MX25S4YG M8MX25S4YGA	M8MX25SK4YG M8MX25SK4YGA	M8MX25SK4CG M8MX25SK4CGA	M8RX25SB4LG M8RX25SB4LGA	M8RX25SB4DG M8RX25SB4DGA	M8RX25SB4YG M8RX25SB4YGA		M8RX25SB4GG M8RX25SB4GGA	M8MX25SB4YG M8MX25SB4YGA
		B-123	B-123	B-123	B-123	B-124	B-124	B-124	B-124				B-164	B-165	B-165	B-220	B-220	B-220	B-220	B-221	
90 mm sq. (3.54 inch sq.)	40 W	M9RX40S4LG M9RX40S4LGA	M9RX40S4DG M9RX40S4DGA	M9RX40S4YG M9RX40S4YGA	M9RX40S4GG M9RX40S4GGA	M9RX40SK4LG M9RX40SK4LGA	M9RX40SK4DG M9RX40SK4DGA	M9RX40SK4YG M9RX40SK4YGA	M9RX40SK4GG M9RX40SK4GGA				M9MX40S4YG M9MX40S4YGA	M9MX40SK4YG M9MX40SK4YGA	M9MX40SK4CG M9MX40SK4CGA	M9RX40SB4LG M9RX40SB4LGA	M9RX40SB4DG M9RX40SB4DGA	M9RX40SB4YG M9RX40SB4YGA	M9RX40SB4GG M9RX40SB4GGA	M9MX40SB4YG M9MX40SB4YGA	40 W
		B-123	B-123	B-123	B-123	B-124	B-124	B-124	B-124				B-164	B-165	B-165	B-220	B-220	B-220	B-220	B-221	
	60 W	M9RZ60S4LG M9RZ60S4LGA	M9RZ60S4DG M9RZ60S4DGA	M9RZ60S4YG M9RZ60S4YGA	M9RZ60S4GG M9RZ60S4GGA	M9RZ60SK4LG M9RZ60SK4LGA	M9RZ60SK4DG M9RZ60SK4DGA	M9RZ60SK4YG M9RZ60SK4YGA	M9RZ60SK4GG M9RZ60SK4GGA				M9MZ60S4YG M9MZ60S4YGA	M9MZ60SK4YG M9MZ60SK4YGA	M9MZ60SK4CG M9MZ60SK4CGA	M9RZ60SB4LG M9RZ60SB4LGA	M9RZ60SB4DG M9RZ60SB4DGA	M9RZ60SB4YG M9RZ60SB4YGA	M9RZ60SB4GG M9RZ60SB4GGA	M9MZ60SB4YG M9MZ60SB4YGA	60 W
		B-124	B-124	B-124	B-124	B-124	B-124	B-124	B-124				B-164	B-165	B-165	B-220	B-220	B-220	B-220	B-221	
	90 W	M9RZ90S4LG M9RZ90S4LGA	M9RZ90S4DG M9RZ90S4DGA	M9RZ90S4YG M9RZ90S4YGA	M9RZ90S4GG M9RZ90S4GGA	M9RZ90SK4LG M9RZ90SK4LGA	M9RZ90SK4DG M9RZ90SK4DGA	M9RZ90SK4YG M9RZ90SK4YGA	M9RZ90SK4GG M9RZ90SK4GGA				M9MZ90S4YG M9MZ90S4YGA	M9MZ90SK4YG M9MZ90SK4YGA	M9MZ90SK4CG M9MZ90SK4CGA	M9RZ90SB4LG M9RZ90SB4LGA	M9RZ90SB4DG M9RZ90SB4DGA	M9RZ90SB4YG M9RZ90SB4YGA	M9RZ90SB4GG M9RZ90SB4GGA	M9MZ90SB4YG M9MZ90SB4YGA	90 W
		B-124	B-124	B-124	B-124	B-124	B-124	B-124	B-124				B-164	B-165	B-165	B-220	B-220	B-220	B-220	B-221	

* The models with a model number to which "A" is suffixed (not equipped with a capacitor cap) are not sold or available in Japan.

Product list

Round shaft motor [International standard approved]



2-pole round shaft motor [International standard approved]



Size	Voltage (V) Output	Variable speed induction				Variable speed reversible				
		Leadwire type								
		100	110/115	200	220/230	100	110/115	200	220/230	
		Page	Page	Page	Page	Page	Page	Page	Page	
42 mm sq. (1.65 inch sq.)	1 W									
	3 W									
60 mm sq. (2.36 inch sq.)	3 W									
	4 W									
	6 W	M61X6SV4LG M61X6SV4LGA	M61X6SV4DG M61X6SV4DGA	M61X6SV4YG M61X6SV4YGA	M61X6SV4GG M61X6SV4GGA	M6RX6SV4LG M6RX6SV4LGA	M6RX6SV4DG M6RX6SV4DGA	M6RX6SV4YG M6RX6SV4YGA	M6RX6SV4GG M6RX6SV4GGA	
		B-264	B-264	B-264	B-264	B-306	B-306	B-306	B-306	
70 mm sq. (2.76 inch sq.)	10 W									
	15 W	M71X15SV4LG M71X15SV4LGA	M71X15SV4DG M71X15SV4DGA	M71X15SV4YG M71X15SV4YGA	M71X15SV4GG M71X15SV4GGA	M7RX15SV4LG M7RX15SV4LGA	M7RX15SV4DG M7RX15SV4DGA	M7RX15SV4YG M7RX15SV4YGA	M7RX15SV4GG M7RX15SV4GGA	
		B-264	B-264	B-264	B-264	B-306	B-306	B-306	B-306	
80 mm sq. (3.15 inch sq.)	15 W									
	20 W									
	25 W	M81X25SV4LG M81X25SV4LGA	M81X25SV4DG M81X25SV4DGA	M81X25SV4YG M81X25SV4YGA	M81X25SV4GG M81X25SV4GGA	M8RX25SV4LG M8RX25SV4LGA	M8RX25SV4DG M8RX25SV4DGA	M8RX25SV4YG M8RX25SV4YGA	M8RX25SV4GG M8RX25SV4GGA	
		B-264	B-264	B-264	B-264	B-306	B-306	B-306	B-306	
90 mm sq. (3.54 inch sq.)	40 W	M91X40SV4LG M91X40SV4LGA	M91X40SV4DG M91X40SV4DGA	M91X40SV4YG M91X40SV4YGA	M91X40SV4GG M91X40SV4GGA	M9RX40SV4LG M9RX40SV4LGA	M9RX40SV4DG M9RX40SV4DGA	M9RX40SV4YG M9RX40SV4YGA	M9RX40SV4GG M9RX40SV4GGA	
			B-265	B-265	B-265	B-265	B-307	B-307	B-307	B-307
	60 W	M91Z60SV4LG M91Z60SV4LGA	M91Z60SV4DG M91Z60SV4DGA	M91Z60SV4YG M91Z60SV4YGA	M91Z60SV4GG M91Z60SV4GGA M91Z60SV4GGB M91Z60SV4GGC	M9RZ60SV4LG M9RZ60SV4LGA	M9RZ60SV4DG M9RZ60SV4DGA	M9RZ60SV4YG M9RZ60SV4YGA	M9RZ60SV4GG M9RZ60SV4GGA	
		B-265	B-265	B-265	B-265	B-307	B-307	B-307	B-307	
	90 W	M91Z90SV4LG M91Z90SV4LGA	M91Z90SV4DG M91Z90SV4DGA	M91Z90SV4YG M91Z90SV4YGA	M91Z90SV4GG M91Z90SV4GGA M91Z90SV4GGB M91Z90SV4GGC	M9RZ90SV4LG M9RZ90SV4LGA	M9RZ90SV4DG M9RZ90SV4DGA	M9RZ90SV4YG M9RZ90SV4YGA	M9RZ90SV4GG M9RZ90SV4GGA	
		B-265	B-265	B-265	B-265	B-307	B-307	B-307	B-307	

<The models with a motor model number to which "A" or "B" is suffixed are not equipped with a capacitor cap.>


Size	Voltage (V) Output	Induction				3-phase
		Leadwire type				
		100	110/115	200	220/230	200/220/230
		Page	Page	Page	Page	Page
42 mm sq. (1.65 inch sq.)	1 W					
	3 W					
60 mm sq. (2.36 inch sq.)	3 W					
	4 W					
	6 W					
70 mm sq. (2.76 inch sq.)	10 W					
	15 W					
80 mm sq. (3.15 inch sq.)	20 W					
	40 W	M81X40S2LG M81X40S2LGA	M81X40S2DG M81X40S2DGA	M81X40S2YG M81X40S2YGA	M81X40S2GG M81X40S2GGA	M8MX40S2YG M8MX40S2YGA
		B-411	B-411	B-411	B-411	B-421
	60 W	M81X60S2LG M81X60S2LGA	M81X60S2DG M81X60S2DGA	M81X60S2YG M81X60S2YGA	M81X60S2GG M81X60S2GGA	M8MX60S2YG M8MX60S2YGA
		B-413	B-413	B-413	B-413	B-423
90 mm sq. (3.54 inch sq.)	60 W	M91X60S2LG M91X60S2LGA	M91X60S2DG M91X60S2DGA	M91X60S2YG M91X60S2YGA	M91X60S2GG M91X60S2GGA	M9MX60S2YG M9MX60S2YGA
		B-415	B-415	B-415	B-415	B-425
	90 W	M91Z90S2LG M91Z90S2LGA	M91Z90S2DG M91Z90S2DGA	M91Z90S2YG M91Z90S2YGA	M91Z90S2GG M91Z90S2GGA	M9MZ90S2YG M9MZ90S2YGA
		B-417	B-417	B-417	B-417	B-427
	150 W	M91ZA5S2LG M91ZA5S2LGA	M91ZA5S2DG M91ZA5S2DGA	M91ZA5S2YG M91ZA5S2YGA	M91ZA5S2GG M91ZA5S2GGA	M9MZA5S2YG M9MZA5S2YGA
		B-419	B-419	B-419	B-419	B-429

* The models with a model number to which "A" or "B" is suffixed (not equipped with a capacitor cap) are not sold or available in Japan.


Product list

Gear head


Ball bearing

Size	Reduction ratio	Ball bearing 	Hinge	
		Page		
42 mm sq. (1.65 inch sq.)				
60 mm sq. (2.36 inch sq.)	1/3, 1/3.6, 1/5, 1/6, 1/7.5, 1/9, 1/10, 1/12.5, 1/15, 1/18, 1/20, 1/25, 1/30, 1/36, 1/50, 1/60, 1/75, 1/90, 1/100, 1/120, 1/150, 1/180	MX6G3BA – MX6G180B B-13		
70 mm sq. (2.76 inch sq.)	1/3, 1/3.6, 1/5, 1/6, 1/7.5, 1/9, 1/10, 1/12.5, 1/15, 1/18, 1/20, 1/25, 1/30, 1/36, 1/50, 1/60, 1/75, 1/90, 1/100, 1/120, 1/150, 1/180	MX7G3BA – MX7G180B B-19		
80 mm sq. (3.15 inch sq.)	1/3, 1/3.6, 1/5, 1/6, 1/7.5, 1/9, 1/10, 1/12.5, 1/15, 1/18, 1/20, 1/25, 1/30, 1/36, 1/50, 1/60, 1/75, 1/90, 1/100, 1/120, 1/150, 1/180	MX8G3B – MX8G180B B-25		
90 mm sq. (3.54 inch sq.)	40 W	1/3, 1/3.6, 1/5, 1/6, 1/7.5, 1/9, 1/10, 1/12.5, 1/15, 1/18, 1/20, 1/25, 1/30, 1/36, 1/50, 1/60, 1/75, 1/90, 1/100, 1/120, 1/150, 1/180	MX9G3B – X9G180B B-31	
		1/3, 1/3.6, 1/5, 1/6, 1/7.5, 1/9, 1/10, 1/12.5, 1/15, 1/18, 1/20, 1/25, 1/30, 1/36, 1/50, 1/60, 1/75, 1/90, 1/100, 1/120, 1/150, 1/180, 1/200	MZ9G3B – MZ9G200B B-35	
	Common to 60 W, 90 W	1/3, 1/3.6, 1/5, 1/6, 1/7.5, 1/9, 1/10, 1/12.5, 1/15, 1/18, 1/20, 1/25, 1/30, 1/36, 1/50, 1/60, 1/75, 1/90, 1/100, 1/120, 1/150, 1/180, 1/200	MY9G3B – MY9G200B B-35	○
		1/3, 1/3.6, 1/5, 1/6, 1/7.5, 1/9, 1/10, 1/12.5, 1/15, 1/18, 1/20, 1/25, 1/30, 1/36, 1/50, 1/60, 1/75, 1/90, 1/100, 1/120, 1/150, 1/180, 1/200	B-35	


Metal bearing

Size	Reduction ratio	Metal bearing 	Hinge
		Page	
42 mm sq. (1.65 inch sq.)			
60 mm sq. (2.36 inch sq.)	1/3, 1/3.6, 1/5, 1/6, 1/7.5, 1/9, 1/10, 1/12.5, 1/15, 1/18, 1/20, 1/25, 1/30, 1/36, 1/50, 1/60, 1/75, 1/90, 1/100, 1/120, 1/150, 1/180	MX6G3MA – MX6G180M B-13	
70 mm sq. (2.76 inch sq.)	1/3, 1/3.6, 1/5, 1/6, 1/7.5, 1/9, 1/10, 1/12.5, 1/15, 1/18, 1/20, 1/25, 1/30, 1/36, 1/50, 1/60, 1/75, 1/90, 1/100, 1/120, 1/150, 1/180	MX7G3MA – MX7G180M B-19	
80 mm sq. (3.15 inch sq.)	1/3, 1/3.6, 1/5, 1/6, 1/7.5, 1/9, 1/10, 1/12.5, 1/15, 1/18, 1/20, 1/25, 1/30, 1/36, 1/50, 1/60, 1/75, 1/90, 1/100, 1/120, 1/150, 1/180	MX8G3M – MX8G180M B-25	
90 mm sq. (3.54 inch sq.)	40 W	1/3, 1/3.6, 1/5, 1/6, 1/7.5, 1/9, 1/10, 1/12.5, 1/15, 1/18, 1/20, 1/25, 1/30, 1/36, 1/50, 1/60, 1/75, 1/90, 1/100, 1/120, 1/150, 1/180	MX9G3M – MX9G180M B-31
		Common to 60 W, 90 W	


Ball bearing and metal bearing

Size	Reduction ratio	Ball bearing and metal bearing 	Hinge	
		Page		
42 mm sq. (1.65 inch sq.)	1/3, 1/3.6, 1/5, 1/6, 1/7.5, 1/9, 1/12.5, 1/15, 1/18, 1/25, 1/30, 1/36, 1/50, 1/60, 1/75, 1/90, 1/100, 1/120, 1/150, 1/180	M4GA3F – M4GA180F B-9		
60 mm sq. (2.36 inch sq.)				
70 mm sq. (2.76 inch sq.)				
80 mm sq. (3.15 inch sq.)				
90 mm sq. (3.54 inch sq.)	40 W			
	Common to 60 W, 90 W			

High torque gear head

Size	Reduction ratio		Hinge
		Page	
90 mm sq. (3.54 inch sq.)	1/50, 1/60, 1/75, 1/90, 1/100, 1/120, 1/150, 1/180, 1/200	MR9G50B – MR9G200B B-444	
	1/50, 1/60, 1/75, 1/90, 1/100, 1/120, 1/150, 1/180, 1/200	MP9G50B – MP9G200B B-444	○


Right-angle gear head

Size	Reduction ratio		Hinge
		Page	
90 mm sq. (3.54 inch sq.)	40 W	1/3, 1/3.6, 1/5, 1/6, 1/7.5, 1/9, 1/12.5, 1/15, 1/18, 1/25, 1/30, 1/36, 1/50, 1/60, 1/75, 1/90, 1/100, 1/120, 1/150, 1/180	MX9G3RMX9G180R B-446
		1/3, 1/3.6, 1/5, 1/6, 1/7.5, 1/9, 1/12.5, 1/15, 1/18, 1/25, 1/30, 1/36, 1/50, 1/60, 1/75, 1/90, 1/100, 1/120, 1/150, 1/180, 1/200	MZ9G3R – MZ9G200R B-446
	Common to 60 W, 90 W		

* For C&B motor, use gear head dedicated to C&B motor, shown on page A-21.


Product list

Decimal gear head


Size	Reduction ratio	 Page	Applicable gear head
60 mm sq. (2.36 inch sq.)	1/10	MX6G10XB B-448	MX6G*BA MX6G*B
70 mm sq. (2.76 inch sq.)	1/10	MX7G10XB B-448	MX7G*BA MX7G*B
80 mm sq. (3.15 inch sq.)	1/10	MX8G10XB B-448	MX8G*B
90 mm sq. (3.54 inch sq.)	40 W	MX9G10XB B-448	MX9G*B
	Common to 60 W, 90 W	MZ9G10XB B-448	MZ9G*B MY9G*B MR9G*B MP9G*B

Gear head

Gear head-Inch (U.S.A.)

Size	Reduction ratio	Ball bearing  Page	Hinge
42 mm sq. (1.65 inch sq.)			
60 mm sq. (2.36 inch sq.)	1/3, 1/3.6, 1/5, 1/6, 1/7.5, 1/9, 1/10, 1/12.5, 1/15, 1/18, 1/20, 1/25, 1/30, 1/36, 1/50, 1/60, 1/75, 1/90, 1/100, 1/120, 1/150, 1/180	MX6G3BU – MX6G180BU B-451	
70 mm sq. (2.76 inch sq.)	1/3, 1/3.6, 1/5, 1/6, 1/7.5, 1/9, 1/10, 1/12.5, 1/15, 1/18, 1/20, 1/25, 1/30, 1/36, 1/50, 1/60, 1/75, 1/90, 1/100, 1/120, 1/150, 1/180	MX7G3BU – MX7G180BU B-451	
80 mm sq. (3.15 inch sq.)	1/3, 1/3.6, 1/5, 1/6, 1/7.5, 1/9, 1/10, 1/12.5, 1/15, 1/18, 1/20, 1/25, 1/30, 1/36, 1/50, 1/60, 1/75, 1/90, 1/100, 1/120, 1/150, 1/180	MX8G3BU – MX8G180BU B-451	
90 mm sq. (3.54 inch sq.)	40 W	MX9G3BU – MX9G180BU B-451	
	Common to 60 W, 90 W	MZ9G3BU – MZ9G200BU B-451	

Gear head for C&B motor

Size	Reduction ratio	Ball bearing  Page	Hinge
42 mm sq. (1.65 inch sq.)			
60 mm sq. (2.36 inch sq.)	1/3, 1/3.6, 1/5, 1/6, 1/7.5, 1/9, 1/10, 1/12.5, 1/15, 1/18, 1/20, 1/25, 1/30, 1/36, 1/50, 1/60, 1/75, 1/90, 1/100, 1/120, 1/150, 1/180	MX6G3H – MX6G180H B-353	
70 mm sq. (2.76 inch sq.)	1/3, 1/3.6, 1/5, 1/6, 1/7.5, 1/9, 1/10, 1/12.5, 1/15, 1/18, 1/20, 1/25, 1/30, 1/36, 1/50, 1/60, 1/75, 1/90, 1/100, 1/120, 1/150, 1/180	MX7G3H – MX7G180H B-355	
80 mm sq. (3.15 inch sq.)	1/3, 1/3.6, 1/5, 1/6, 1/7.5, 1/9, 1/10, 1/12.5, 1/15, 1/18, 1/20, 1/25, 1/30, 1/36, 1/50, 1/60, 1/75, 1/90, 1/100, 1/120, 1/150, 1/180	MX8G3H – MX8G180H B-357	
90 mm sq. (3.54 inch sq.)	40 W	MX9G3H – MX9G180H B-359	
	Common to 60 W, 90 W	MY9G3H – MY9G200H B-361	○

Selection by keywords

Motor selection guide

Variable speed	Protection of leadwires	Brake	Braking frequency	Operation mode	No. of phases	Type	Page
Constant	Leadwire protection not required	No brake required to stop		Continuous run required	Single-phase 2-pole	2-pole round-shaft motor (induction)	B-406
				Continuous run not required	Single-phase 4-pole	Induction motor (4-pole)	B- 4
				Continuous run required	3-phase	3-phase motor	B-126
				Continuous run not required	Single-phase	Reversible motor	B- 64
		Brake required to stop Brake to be kept applied	Low braking frequency	Continuous run required	3-phase	3-phase motor with electromagnetic brake	B-202
			Low braking frequency	Continuous run not required	Single-phase	Single-phase motor with electromagnetic brake	B-178
			Low braking frequency	Normal/reverse rotation	Single-phase	Reversible motor	B- 64
			High braking frequency	One-directional rotation only	3-phase	3-phase motor with brake unit	B-130 + C-31
	Leadwire protection required	No brake required		Continuous run required	Single-phase	Induction motor with sealed connector	B- 42
				Continuous run not required	3-phase	3-phase motor with sealed connector	B-146
				Continuous run required	Single-phase	Reversible motor with sealed connector	B-104
				Continuous run not required	Single-phase	Reversible motor with sealed connector	B-104
		Brake required Continuous application not required	Low braking frequency	Normal/reverse rotation	3-phase	3-phase motor with brake unit and sealed connector	B-146 + C-31
			High braking frequency	One-directional rotation only	Single-phase	C&B induction motor with sealed connector	B-364
			High braking frequency	One-directional rotation only	3-phase	C&B 3-phase motor with sealed connector	B-380
			High braking frequency	One-directional rotation only	3-phase	C&B 3-phase motor with sealed connector	B-380
Variable	No brake required to stop		Continuous run required	Single-phase	Variable speed induction	B-232 + C- 1	
			Continuous run not required	3-phase	3-phase motor (200 V) with inverter	B-130 + C-27	
			Continuous run not required	Single-phase	Variable speed reversible	B-274 + C- 1	
			Short-time run only (30-minutes rating)	Single-phase	Variable speed with electromagnetic brake	B-314 + C- 1	
	Brake required to stop Brake to be kept applied		Low braking frequency	Variable speed reversible	B-274 + C- 1		
			High braking frequency	3-phase motor (200 V) with inverter	B-130 + C-27		
			High braking frequency	C&B motor (variable speed induction motor)	B-388 + C- 1		
			High braking frequency	C&B motor (variable speed induction motor)	B-388 + C- 1		

Selection by keywords

Gear head selection guide

Size	Output	Gear type	Hinge	Bearing	Part No.	
42 mm sq. (1.65 inch sq.)	1 W to 3 W	Normal load gear	Without hinge	Ball bearing and metal	M4G□F	
		Normal load gear		Ball bearing	MX6G□B(A)	
60 mm sq. (2.36 inch sq.)	3 W to 6 W	Normal load gear		Metal	MX6G□M(A)	
		Decimal gear		Ball bearing	MX6G10XB	
		for C&B motor		Ball bearing	MX6G□H	
		Inch sized (U.S.A.)		Ball bearing	MX6G□BU	
70 mm sq. (2.76 inch sq.)	10 W to 15 W	Normal load gear		Ball bearing	MX6G□B(A)	
		Decimal gear		Metal	MX7G□M(A)	
		for C&B motor		Ball bearing	MX7G10XB	
		Inch sized (U.S.A.)		Ball bearing	MX7G□H	
80 mm sq. (3.15 inch sq.)	15 W to 25 W	Normal load gear		Ball bearing	MX7G□BU	
		Decimal gear		Ball bearing	MX7G□B(A)	
		for C&B motor		Metal	MX7G□M(A)	
		Inch sized (U.S.A.)		Ball bearing	MX7G10XB	
90 mm sq. (3.54 inch sq.)	40 W	Normal load gear		Ball bearing	MX7G□H	
		Right-angle gear		Ball bearing	MX7G□BU	
		Decimal gear		Ball bearing	MX8G□B	
		for C&B motor		Metal	MX8G□M	
90 mm sq. (3.54 inch sq.)	60 W or larger	Permissible torque 19.6 N·m (173 lb-in)		With hinge	Ball bearing	MX8G10XB
		Right-angle gear		Without hinge	Ball bearing	MX8G□H
		Decimal gear		With hinge	Ball bearing	MX8G□BU
		for C&B motor		Without hinge	Ball bearing	MX9G□B
90 mm sq. (3.54 inch sq.)	60 W or larger High torque type	Permissible torque 29.4 N·m (260 lb-in)		With hinge	Metal	MX9G□M
		Right-angle gear		Without hinge	Ball bearing	MX9G□R
		Decimal gear	With hinge	Ball bearing	MX9G10XB	
		for C&B motor	Without hinge	Ball bearing	MX9G□H	
90 mm sq. (3.54 inch sq.)	60 W or larger High torque type	Permissible torque 29.4 N·m (260 lb-in)	With hinge	Ball bearing	MX9G□BU	
		Right-angle gear	Without hinge	Ball bearing	MY9G□B	
		Decimal gear	With hinge	Ball bearing	MZ9G□B	
		for C&B motor	Without hinge	Ball bearing	MZ9G□R	
90 mm sq. (3.54 inch sq.)	60 W or larger High torque type	Permissible torque 29.4 N·m (260 lb-in)	With hinge	Ball bearing	MZ9G10XB	
		Right-angle gear	Without hinge	Ball bearing	MY9G□H	
		Decimal gear	With hinge	Ball bearing	MZ9G□BU	
		for C&B motor	Without hinge	Ball bearing	MP9G□B	
90 mm sq. (3.54 inch sq.)	60 W or larger High torque type	Permissible torque 29.4 N·m (260 lb-in)	With hinge	Ball bearing	MR9G□B	
		Right-angle gear	Without hinge	Ball bearing	MR9G□B	

• Gear heads are described on the respective page where the applicable motors are also described.

Control device selection guide

Power supply	Application	Type	Voltage	Part No.	Applicable motor	Page				
Single-phase	Speed change (Speed controller)	Separate type	Volume control type (pot.) International standard approved (MGSD)	100 V~120 V	MGSD*1	3 W to 90 W	C- 6			
				200 V~240 V	MGSD B2					
			High-performance type (EX)	100 V	DV113*					
				200 V	DV123*					
		Instantaneous stop (Brake unit)	Contactless (MB48X)	Unit type	Volume control type (pot.) (US)	100 V	Unit model No. MUSN***L Controller No. DVUS***L	6 W to 90 W	Unit motor B-323 Unit controller C- 21	
						200 V	Unit model No. MUSN***Y Controller No. DVUS***Y			
				Digital display type (UX)	100 V	Unit model No. MUXN***L Controller No. DVUX***L				
					200 V	Unit model No. MUXN***Y Controller No. DVUX***Y				
				Inverter	Input single-phase 100 V Output 3-phase 200 V	M1G*A1V1X	25 W to 90 W			C- 27
					Input single-phase 100 V Output 3-phase 200 V	M1G*A2V1X				
		3-phase	Instantaneous stop (Brake unit)	Contactless (MB48X)	For induction motor	100 V	DVMB48XZ	1 W to 90 W	C- 33	
						200 V				
For reversible motor	100 V									
	200 V									
Contacting	For electromagnetic brake motor			100 V	DZ9102	3 W to 90 W	C- 36			
				200 V						
	Popular type (SD)			100 V						
				200 V						
Contacting	Popular type (SD)	High-performance type (EX)	100 V	DZ9113	3 W to 90 W	C- 36				
			200 V	DZ9213						
3-phase	Instantaneous stop (Brake unit)	Contacting	Popular type (SD)	3-phase 200 V	DZ9302	25 W to 90 W	C- 36			

Motor

Induction motor B-1

- Motor suitable for one-directional continuous running <Single-phase>
- Continuous rating
- A wide selection for various applications
- Best suitable for normal load
- IP20



Reversible motor B-63

- Offer super instant reverse characteristics <Single-phase>
- 30-minute rating
- Provided with internal simple braking mechanism
- Minimum overrun
- IP20



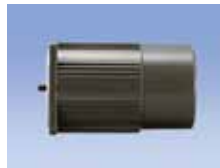
3-phase motor B-125

- Induction motor running with 3-phase supply system
- Continuous rating
- IP20



Electromagnetic brake motor B-167

- Provided with internal off brake mechanism <Single-phase motor, 3-phase motor>
- High braking and load holding torque
- IP20



Variable speed motor B-223

- Provided with internal tachometer generator
- When used with a speed controller, enables stepless speed change device
- Speed change, braking, normal/reverse, slow start, slowdown—can be operated in various modes
- Divided into 4 variations—induction, reversible, electromagnetic brake and unit <Single-phase>
- IP20



Safety standard approved motor

- Support UL, CE and CCC standards <Applicable motor>
- Induction, reversible, 3-phase, electromagnetic brake



C&B motor B-341

- Provided with clutch and brake mechanism
- Suitable for application requiring high-frequency start/stop
- IP20



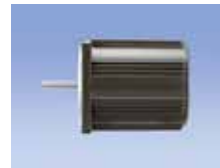
Sealed connector

- Leadwires are protected against dust, water and mechanical damage
- Motor live parts are enclosed in drip-proof and dust-proof terminal box
- Compact design, earth terminal and sealed connector for easier piping
- IP54: Pinion shaft Induction motor* (25 W to 90 W)
3-phase motor (25 W to 90 W)
- IP40: Pinion shaft Reversible motor* (25 W to 90 W)
Round shaft Induction motor* (60 W to 90 W)
Reversible motor* (60 W to 90 W)
3-phase motor (60 W to 90 W)
- IP20: Round shaft Induction motor* (25 W to 40 W)
Reversible motor* (25 W to 40 W)
3-phase motor (25 W to 40 W)
*: <Single-phase>



Round shaft motor

- Best suitable for machine requiring no speed reduction *1
- Continuous rating
- Lineup of 2-pole type and 4-pole type
- IP20
4-pole motors are described on pages for pinion motor
2-pole motor B-406
*1: <Single-phase induction motor, 3-phase motor>



Motor line-up compliant with China's energy efficiency standards.

- 3-phase motor (25 W to 90 W)
Induction motor (15 W to 90 W) <Single-phase>
Variable speed induction motor (15 W to 90 W) *
- 2-pole round-shaft motor (40 W to 150 W) *1
- * Model name attached with Ⓢ mark in the model list page B-4, B-6, B-128, B-228, B-230, B-231, B-407 are compliant products.
* : <Single-phase>
*1: <Single-phase induction motor, 3-phase motor>

Gear head

Gear head

- Typical life expectancy
Ball bearing type..... 10000 hours
Metal bearing type 2000 hours
Gear head for C&B motor 5000 hours
- * Described on pages where associated motors are described.



Right-angle gear head B-446

- Motor shaft and gear head output shaft are perpendicular to each other



Gear head-Inch (U.S.A.) B-450

- These gearheads are designed according to "inch" system.
- Reduction ratios are from 1/3 to 1/200.



Decimal gear head B-448

- Reduction ratio 1/10
- Can be placed between standard motor and gear head



High torque gear head B-444

- Permissible shaft torque 29.4 N·m (260 lb-in) (60 W or larger)



Outline of motor family

Options (speed controller, brake unit)

Special (produced to custom order) For details, contact our Help Desk.

Speed controller

Separate type C-6

MGSD type

- UL-, CE-approved international type
- Wide range of input power voltage
Single-phase 100 V system:
100 V to 120 V
Single-phase 200 V system:
200 V to 240 V



EX type

- Single-phase 100 V, 200 V
- Soft-start/soft-down and external speed setter



Unit motor B-323 + C-21

- Quick connection of motor and controller
- Simplified operation with volume type control (US)
<Single-phase 100 V, 200 V>
- Digital display, PC performs various functions (UX)
<Single-phase 100 V, 200 V>



Inverter C-27

- Speed controller for 3-phase motor
- Inverter control
<Single-phase 100 V input, 200 V input>



Brake unit

Contactless MB48X type C-33

- Single-phase contactless instant control
- For: Induction motor
Reversible motor
Electromagnetic brake motor
- Wide range of input supply :
Single-phase 100 V to 230 V
- 48 mm × 48 mm (1.89 inch × 1.89 inch) square DIN type
- 11 pin



Contacting type C-36

- Basic type of instant control
- Single-phase 100 V, 200 V
3-phase 200 V
- Rectangular type
- 8 pin

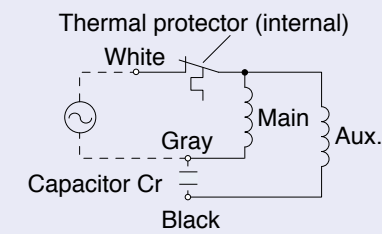


Example: Built-in thermal protector (70 mm sq. (2.76 inch sq.) or larger)

- Thermal protector is internally wired.
- The current is turned off as the temperature of motor winding exceeds the operation temperature of the thermal protector.
- Thermal protector automatically recovers as the motor winding temperature decreases. To prevent unexpected restart of the motor, turn off the motor, check safety, and then turn on the motor.

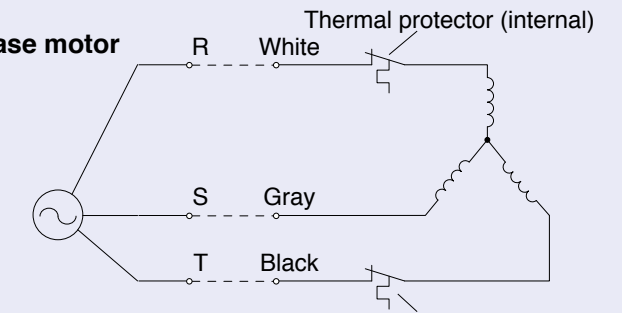
[Wiring diagram]

• Single-phase motor



CW (clockwise) connection

• 3-phase motor



CCW (counterclockwise) connection

Rating

There are limits of operation in terms of temperature rise to assure the motor performance. Rating is divided into continuous rating and short-time rating.

This defines not only the running limit against the output, but also limiting conditions such as voltage, frequency and rotational speed. These conditions are called as rated voltage, rated frequency and rated speed.

Continuous rating and short-time rating

A time rating is used to express the time during which the motor can normally output the rated power. Continuous rating indicates that the motor can provide the rated power during this period. The short-time rating indicates that the motor will reliably operate to produce the rated output for the relatively short time specified.

Output

Output represents a work which the motor can carry out in a unit time. This is determined by the rotational speed and the torque of the motor. The rated output of the motor, P0 is described in wattage

P0 (W) as;

• SI units

$$P0 = 0.1047 \times T \times N$$

T : Torque (N·m)

N : Rotational speed (r/min)

• Gravitational system of units

$$P0 = 1.027 \times T \times N$$

T : Torque (kgf·m)

N : Rotational speed (r/min)

Rated output

An optimum output performance which the motor can generate at the rated voltage and frequency. A rotational speed and torque with which the rated output is generated is called the rated speed and torque. In general, an output is referred to as the rated output.

Starting torque (see (1) in the figure)

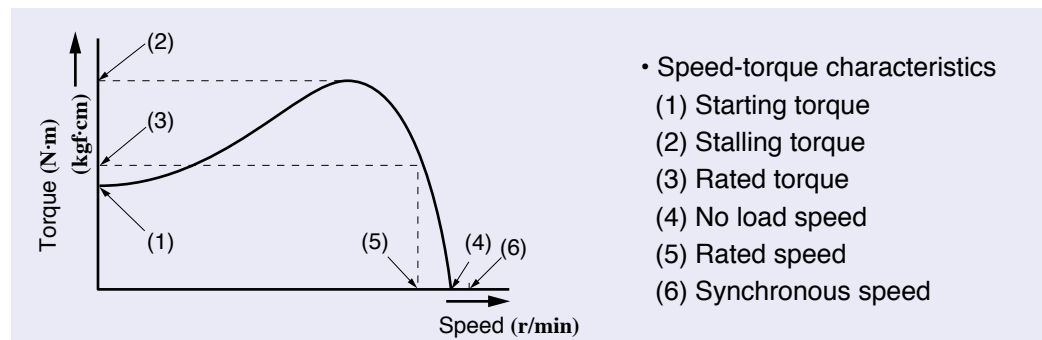
A torque which the motor generates at starting. The motor will not start if a larger load than this starting torque is applied to the motor.

Stalling torque (see (2) in the figure)

A maximum torque which the motor can generate at constant voltage and frequency. The motor will stall if a larger load than this torque is applied to the motor.

Rated torque (see (3) in the figure)

A torque of the motor generates the rated output continuously at rated voltage and frequency. This is usually referred to as a torque at the rated speed.



No load speed (see (4) in the figure)

Motor speed with no load applied. In the case of induction and reversible motor, this speed becomes a few percent lower (approx. 20 to 60 r/min) than a synchronous speed.

Rated rotational speed (see (5) in the figure)

Motor speed at which the motor generates the rated output. This is the most optimum speed.

Synchronous speed (see (6) in the figure)

An inherent speed determined by the number of poles of the motor and frequency of the power source. This is described in the following formula.

$$N_s = \frac{120}{P} f \text{ (r/min)}$$

where, N_s : Synchronous speed (r/min)

f : Frequency (Hz)

P : Number of poles

120 : Constant

For example of 4-pole motor and power source frequency is 50 Hz, then,

$$N_s = \frac{120 \times 50}{4} = 1500 \text{ (r/min)}$$

Slippage

Slippage can be described in the following formula as one of the rotational speed.

$$S = \frac{N_s - N}{N_s} \text{ or } N = N_s (1 - S)$$

where, N_s : Synchronous speed (r/min)

N : Discretionary no load speed (r/min)

when an induction motor with 4-pole, 50 Hz runs with a slippage, $S = 0.1$, then,

$$N = N_s (1 - S) = 1500 (1 - 0.1) = 1350 \text{ (r/min)}$$

Overrun

Revolutions that the motor makes from when the power source is turned off till the motor stops, and is described in the number of revolutions.

Fit tolerance

Fit tolerance symbol (JIS) is applied to dimensions of motor "Faucet face" and "Gear head" output shaft. The value of tolerance depends on the basic dimension. See the table right.

Classification of standard dimension		Shaft tolerance (unit: mm)
Over	Equal to or below	Shaft tolerance class: h7
-	3	0
		-0.01
3	6	0
		-0.012
6	10	0
		-0.015
10	18	0
		-0.018
18	30	0
		-0.021
30	50	0
		-0.025
50	80	0
		-0.03
80	120	0
		-0.035

Gear reduction ratio

A ratio of the gear head with which the gear head reduces the motor speed. Panasonic offers two groups of gear reduction ratio: one is for 3, 5, 7.5, 12.5, 15 ... and the other is 3.6, 6, 9, 15, 18 which are 1.2 times the previous group so that you can obtain approx. the same output speed for both 50 and 60 Hz. When it is necessary to fine adjust the speed smoothly use a variable speed motor and controller.

Maximum permissible torque

Maximum load torque which can be applied to the output shaft. This is determined by the mechanical strength such as material of gear head, gear teeth and bearing and the size of gear head as well as the reduction ratio.

Transmission efficiency

Efficiency with which motor torque is increased by the gear head, and described in %. This efficiency is determined by the bearing, friction of the gear tooth and resistance of lubricating oil. In general, this efficiency is approx. 90% per stage of the gear.

For example, 81 % for 2 stage configuration, and then decreases to 75 %, 70 %, 65 % as the number of stages increases. (In the case of metal gear head, this efficiency is approx. 85 % per stage of the gear.)

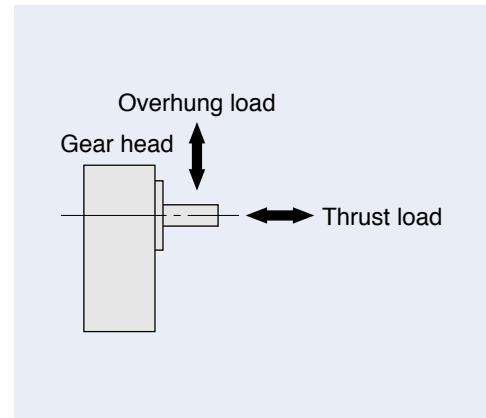
Service factor

Coefficient which is used to estimate the service life of the gear head.

This value is generally derived from experience and based on type of the load and operating conditions.

Overhung load

A vertical load applied to the output shaft of the gear head. This load is produced when the mated machine is being connected through a chain belt and the like but not produced if a coupling is used instead. Maximum value of the overhung load which is applicable to the shaft is called as "permissible overhung load". This value varies depending on the type of gear head and the distance from the edge of the shaft. This value refers to the load such as belt tension.



Thrust load

An axial load applied to the output shaft of the gear head. Maximum value of the thrust load which is applicable to the shaft is called as "permissible thrust load". This value varies depending on the type of the gear head.

Heat generation and insulation

When a current runs through the motor, heat is generated as well. This heat generation is caused by an electrical loss and mechanical loss. An electrical loss consists of (1) copper loss which is generated in the charged part due to the resistance of the coil or conductor, and (2) iron loss which is generated in the iron portion of the motor due to the resistance of the iron portion while the magnetic flux crosses them. Mechanical loss is caused by friction loss of the bearing and brake lining.

Part of this heat generation accumulated to the motor and other is dissipated to outside of the motor through radiation, convection and conduction. The difference between the generated heat and dissipated heat makes the motor temperature rise, and is called heat run or temperature rise of the motor.

The hottest part on the motor is winding. Insulation used to protect the winding must be kept at a temperature below its maximum allowable temperature. Panasonic small geared motor is provided with the heat resistance class 120 (E) insulation when it is used in Japan, or class 130 (B) insulation when used outside Japan.

The class 120 (E) insulation will withstand temperature up to 120 °C.

• Type and temperature of insulation

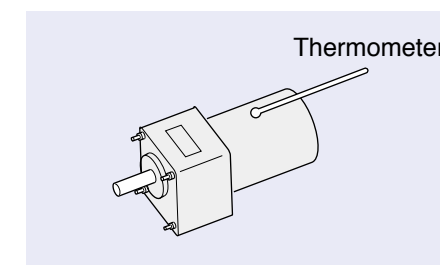
Type and temperature of insulation	Winding insulation material maximum allowable temperature	Winding temperature limit
90 (Y)	90 °C	—
105 (A)	105 °C	60 K (deg)
120 (E)	120 °C	75 K (deg)
130 (B)	130 °C	80 K (deg)
155 (F)	155 °C	100 K (deg)

When the heat resistance class 120 (E) insulation is used, the reduced maximum temperature limit on the motor frame 90 °C, at the 40 °C room temperature (max. temperature specified by JIS). This motor frame temperature will decrease to 70 °C at 20 °C room temperature. The maximum temperature limit is 50 K (deg) when measured on the frame.

Measurement of temperature rise

There are two methods to measure the temperature rise of the motor. One is to use a thermometer or thermocouple which is fixed on the center of the motor frame. The other method determines the temperature by measuring winding resistance as described below.

• Thermometer method



• Resistance method

Measure the winding resistance before and after the running, and then determine the temperature rise from the following formula.

$K\theta$: Temperature rise at the motor winding K (deg)

$$K\theta = \left(\frac{R2}{R1} - 1 \right) (235 + t1) + (t1 - t2)$$

$R1$: Winding resistance before running (W)

$R2$: Winding resistance after running (W)

$t1$: Room temperature before running (°C)

$t2$: Room temperature after running (°C)

Note: This method applies only to copper winding.

Temperature rise of capacitor-run induction motor and 3-phase motor

In the case of capacitor-run induction motor, temperature rise of the motor becomes highest at no load running. This means that the electrical loss becomes the maximum under no load condition and heat generation becomes larger than the loss at full load. This is because of the increase of current at primary and auxiliary winding due to the action of phase advance capacitor, and in addition to this, loss is generated to the armature by the reversed field due to the unbalance of the current.

In the case of 3-phase motor, heat generation at no load is much smaller than that of capacitor-run induction motor. However, temperature rise becomes larger as the load is increased due to the increase of input loss.

Temperature rise/cooling curve and running condition

Figure 1 shows the temperature rise and cooling curve indicating relation of time lapse and motor running.

- T0** : Start running
- T30** : 30 minutes after starting
- T ∞** : Temperature rise saturates
- T ∞ h** : Stop running
- TE** : Natural cooling to the same temperature as ambient temperature

During the time between T0 and TE, temperature θ varies as follows.

- $\theta 0$: Ambient temperature
- $\theta 30$: Temperature after 30 minutes running
- $\theta \infty$: Saturated temperature
- $\theta \infty - \theta 0$ shows the temperature rise.

Typical Panasonic motors have the following time characteristics.

- T ∞** : 2.5 to 3 (h)
- TE - T ∞** : 3 to 4 (h)

(1) Induction motor

Induction motor is rated at continuous running, and is designed so as the temperature rise, $\theta \infty - \theta 0$ of the winding is lower than 75 K (deg) (in case heat resistance class is 120 (E)) or 80 K (deg) (in case 130 (B)) international standard approved model). Therefore, the temperature does not rise beyond this when it is running continuously longer than T ∞ hours.

(2) Reversible motor

Reversible motor is 30-minute rating, and is designed so as the temperature rise, $\theta 30 - \theta 0$ of the winding after minute running is lower than 75 K (deg). (in case heat resistance class is 120 (E)) or 80 K (deg) (in case 130 (B)) international standard approved model.

Therefore, the motor may be burned out if it is used longer than 30 minutes continuously.

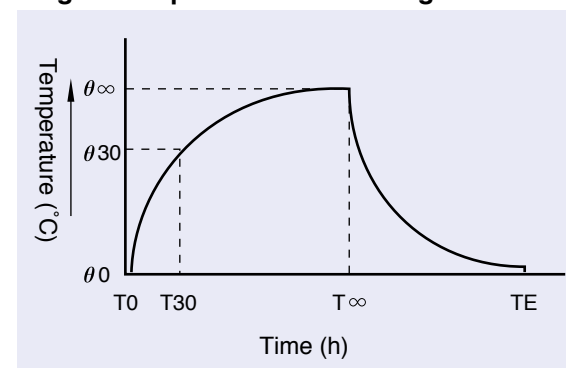
(3) Special conditions

Normal working conditions for these motors are -10 °C to +40 °C, and under 85 % RH. Special attention is required when using these motors under the following conditions A to E.

A. Under -10 °C environment

Output torque of the motor might be reduced since the viscosity of the grease of the gear head or motor bearing increases. Condensation may occur when the motor is subjected to a sudden drop in the temperature. If it occurs, rust will be generated and have an adverse effect to the service life.

• Fig. 1 Temperature rise/cooling curve



B. Over +40 °C environment

Motor winding temperature gets very hot, and will result in deterioration of insulation and may result in burnout. Also, lubricating grease of the bearing may leak out to shorten the life of the bearing, and may result in the motor lock, and then result in burnout.

C. Over 85% RH environment

This may deteriorate the winding insulation. When the products are transported by air cargo or vessel and are subjected to high temperature and humidity, pack the products in air-tight and take a necessary treatment such as insertion of drying agents.

D. Poor-ventilation environment

Same effect may appear as the above (B) condition.

If the motor is enclosed, environmental temperature gets very high, and then may shorten the service life drastically. Make a good ventilation environment by installing a vent so that the environmental temperature is kept 40 °C or less.

E. Other unfavorable environment

Operation under these conditions must be avoided:

Place where the product is subjected to; dust, water/oil/coolant splash, explosive/flammable or corrosive gas (H₂S, SO₂, NO₂, Cl₂, etc.).

(4) In the case of international standard approved model

- When using a pinion shaft motor, use it with the gear head attached.
- When using a round shaft motor, provide a means so that the heat dissipates over the machine and equipment.

<Reference>

The table below shows size and material of heat sinks.

Motor size (model No.)	Size	Material	
60 mm sq. (2.36 inch sq.) (M6.....)	100 x 100 x 5 mm (3.94 x 3.94 x 0.20 inch)	Aluminum	
70 mm sq. (2.76 inch sq.) (M7.....)	120 x 120 x 5 mm (4.72 x 4.72 x 0.20 inch)	Aluminum	
80 mm sq. (3.15 inch sq.) (M8.....)	135 x 135 x 5 mm (5.31 x 5.31 x 0.20 inch)	Aluminum	
90 mm sq. (3.54 inch sq.)	(M9*X.....)	165 x 165 x 5 mm (6.50 x 6.50 x 0.20 inch)	Aluminum
	(M9*Z.....)	195 x 195 x 5 mm (7.68 x 7.68 x 0.20 inch)	Aluminum

* The temperature of the winding should be 80 K (deg) or below when measured using resistance method after rated operation with heat sink attached.

Operation environment standard

(1) Reference

Temperature rise of winding should be limited to:

- 75 K (deg): Japanese version
- 80 K (deg): International standard approved version

(2) Measurement method

Run the motor in the worst operation pattern (in terms of temperature rise) and measure the highest motor frame temperature with a thermometer. The reading should be 90 °C or below when the ambient temperature is 40 °C.

Of course, ambient temperature will become higher if ventilation is not enough. In that case, measure the temperature at a point close to the motor.

Handling instructions

Temperature rise of motor

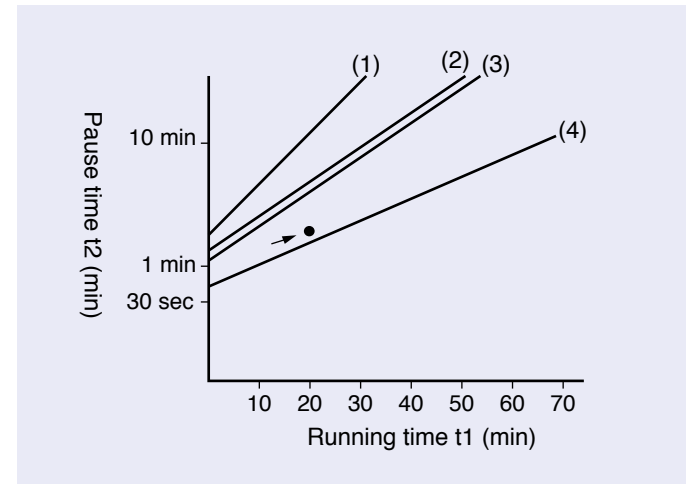
Temperature rise of reversible motor

Reversible motor is 30-minute rating when it is running alone. However, when it is used with the gear head, continuous running time will be extended thanks to heat radiation effect of the gear head. The table below shows which motor can operate continuously under such condition. When these motors are operated intermittently, the temperature rise will be saturated at certain value depending on the cycle of intermittent running.

Continuous running of reversible motor

Size	Motor model No.	Continuous running with gear head	
		50 Hz	60 Hz
60 mm sq. (2.36 inch sq.)	M6RX4G4L	○	○
	M6RX6G4L	○	○
70 mm sq. (2.76 inch sq.)	M7RX10G4L	○	×
	M7RX15G4L	○	×
80 mm sq. (3.15 inch sq.)	M8RX20G4L	○	×
	M8RX25G4L	○	×
90 mm sq. (3.54 inch sq.)	M9RX40G4L	×	×
	M9RX60G4L	×	×
	M9RX90G4L	×	×

Fig. 2 Usable range of reversible motor (intermittent)



*○: Continuous running is possible ×: Continuous running is not possible

Figure 2 shows the limit curve for continuous intermittent running for the reversible motors. Horizontal axis shows the running time t_1 and vertical axis shows the pause time t_2 . The motor can be operated for a continuous intermittent running in the range of these lines.

In this figure, each line represents as below:

- (1) Motor alone running at 60 Hz
- (2) Motor alone running at 50 Hz
- (3) Motor with gear head running at 60 Hz
- (4) Motor with gear head running at 50 Hz

For example, if you want to make continuous intermittent running of the motor alone with a cycle of $t_1 = 20$ min and $t_2 = 2$ min, the line under the crossing point of $t_1 = 20$ and $t_2 = 2$ is line (4). Hence, you can only make a continuous intermittent running with motor with gear head at 50 Hz under these conditions. If you want to run the motor alone and at 60 Hz for 20 minutes, you need to have the following pause time.

- (1) 10.1 minutes for the motor alone at 60 Hz
- (2) 4.6 minutes for the motor alone at 50 Hz
- (3) 3.8 minutes for the motor with gear head at 60 Hz

If you fix the pause time to 2 minutes and want to see how long you can run the motor continuously, find the crossing point of t_1 and each line while $t_2 = 2$ (constant), and each value becomes as below.

- (1) 2.5 minutes of running time for the motor alone at 60 Hz
- (2) 7 minutes of running time for the motor alone at 50 Hz
- (3) 10 minutes of running time for the motor with gear head at 60 Hz
- (4) 27.5 minutes of running time for the motor with gear head at 50 Hz

Impedance protect

Impedance protect is a means to prevent burning of a motor if it becomes failure i.e. in lock state, even if it is not provided with a safety device such as thermal protector. This is because the amount of current will not increase during locking state. It is blocked by the impedance produced by thin wire coil. Without this impedance protect, the motor temperature rises to 75 K (deg) or more during locking state and winding coil may be burned. Panasonic geared motors of 4-pole, 6 W or smaller are provided with the impedance protect and conform to UL standard UL2111.

The impedance protect should be activated only when its burning protection feature is absolutely necessary. This implies that the motor must be used under the maximum permissible temperature. The expected motor life decreases by the factor if 1/2, 1/4 and so on as the temperature increases in step of 8 °C beyond the maximum permissible temperature.

* UL standard specifies the impedance protect value to 125 K (deg) at winding for Japanese version and 135 K (deg) for international version.

Thermal protector

The thermal protector is a safety device which automatically turns off the motor current as the motor winding temperature exceeds the preset temperature and turns on the current again as the temperature drops below the preset temperature.

Fig. 3 Operation of thermal protector

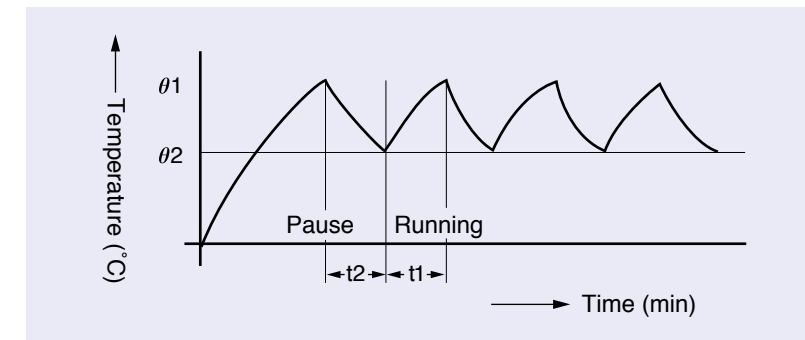


Figure 3 illustrates on/off cycle of the thermal protector. On Panasonic motors, threshold temperature is set as shown below.

Motors conforming to international standards

θ_1 (open) 130 °C ± 5 °C

θ_2 (closed) 90 °C ± 15 °C

Japanese version, variable speed 90 W motors

θ_1 (open) 120 °C ± 5 °C

θ_2 (closed) 77 °C ± 15 °C

These settings and time t_1 and t_2 vary depending on operating environment and loads.


For compact geared motor with thermal protector, refer to the separate Panasonic international motor catalog.


Handling instructions

Safety Precautions

The following explanations are for things that must be observed in order to prevent harm to people and damage to property.

- Misuses that could result in harm or damage are shown as follows, classified according to the degree of potential harm or damage.

 **Danger** Indicates great possibility of death or serious injury.

 **Caution** Indicates the possibility of injury or property damage.

- The following indications show things that must be observed.




Indicates something that must not be done.



Indicates something that must be done.

Danger

	Don't expose the equipment to water, corrosive environment or flammable gas or close to flammable material.	Will cause fire.
	Don't place a flammable object close to the speed controller and motor.	
	Don't use the product in a place subject to excessive vibration or shock.	Will cause electric shock, personal injury or fire.
	Don't use cables soaked in water or oil.	Will cause electric shock, malfunction or damage.
	Don't attempt to carry out wiring or manual operation with wet hand.	Will cause electric shock, personal injury or fire.
	Don't damage cables or subject cables to excessive stress such as strong pressure, heavy object and clamping load.	Will cause electric shock, malfunction or damage.
	Don't make soldering joint on a round pin of the speed controller.	Will cause fire.
	Don't drive the 380/400 VAC 3-phase motor from the inverter.	Will cause electric shock, personal injury, fire, malfunction or damage.
	Don't touch potentially hot motor casing.	Will cause burn injury.
	Never touch rotating member of the motor.	Will cause personal injury.
Never remove the speed setting knob from the controller.	Will cause electric shock or personal injury such as skin burn.	


Danger

	Installation area should be free from excessive dust, and from splashing water and oil.	Failure to heed this precaution will result in electric shock, fire, malfunction or damage.
	Install the unit to a nonflammable construction (e.g. metal).	Installation on a flammable material may cause fire.
	Wiring work should be done by a qualified electrician.	Wiring work done by an inexperienced person will cause electric shock.
	Correctly run and arrange wiring.	Wrong wiring will cause personal injury or electric shock.
	After correctly connecting cables, insulate the live parts with insulator.	Incorrect wiring will result in short circuit, electric shock, fire or malfunction.
	Ground the motor to the earth.	Floating ground circuit will cause electric shock.
	Correctly run wirings to the external speed setter and tachogenerator.	Incorrect wiring will result in short circuit, electric shock, personal injury, etc.
	Install the product in the control board to make its terminal block inaccessible.	Failure to heed this requirement will result in electric shock, personal injury, fire, malfunction or damage.
	Securely install and fix the equipment to prevent bodily injury or fire in case of earthquake.	Failure to heed these requirements will result in electric shock, personal injury or fire, malfunction or damage.
	Provide emergency stop circuit externally for instantaneous interruption of operation and power supply.	
Install overcurrent protection device, ground-fault circuit interrupter, overtemperature protecting device, and emergency stop device.	Failure to heed these requirements will result in electric shock, personal injury or fire.	
After an earthquake, first verify safety.		
Turn off power upon power interruption or activation of overtemperature protecting device.	Unpredictable restarting will cause personal injury.	
Before transferring, wiring or checking, disconnect the power source from the motor system for safe isolation.	Energized circuit will cause electric shock.	


Handling instructions

Safety Precautions

Caution

	Don't move the motor by holding cables or motor shaft.	Failure to heed these precautions cause bodily injury.
	Don't drop or cause topple over of something during transportation or installation.	Failure to heed this instruction will result in personal injury or malfunction.
	Don't step on the product. Don't place heavy object on the product.	Failure to heed this instruction will result in electric shock, personal injury, malfunction or damage.
	Don't use the equipment under direct sunshine.	Failure to heed these instructions will cause personal injury or fire.
	Don't use the equipment in highly intensive electric field.	
	Don't use the equipment in an environment where electro-static voltage potentials may be produced.	Induced malfunction will cause personal injury.
	Don't block the motor air opening by an object.	Failure to heed this instruction will result in electric shock or fire.
	Don't apply excessive shock to the product.	Excessive shock will cause failure.
	Don't apply excessive shock to the motor shaft.	
	Don't turn off and on power so frequently.	Failure to heed this instruction will result in personal injury, fire, malfunction or damage.
	Don't put the machine into unstable operation.	Failure to heed these precautions cause bodily injury.
	Don't energize the C&B motor clutch and brake at the same time.	Failure to heed this instruction will result in fire, electric shock, or malfunction.
	Don't use smaller variable transformer or transformer.	
	Don't pull cables with an excessive force.	Failure to heed this instruction will result in electric shock, personal injury or fire.
	Don't lock the motor shaft while the motor is running.	Locked motor will cause fire, electric shock, or malfunction.
	Once power failure occurs, don't come close to the machine that will unexpectedly start upon recovery of the power. Provide secure mechanism so that the restarting of the machine will not cause personal injury.	Failure to heed these precautions cause bodily injury.
	Don't operate the product outside its ratings stated on the nameplate and instruction manual.	Failure to heed this instruction will result in personal injury, electric shock, fire, malfunction or damage.
	Never attempt to perform modification, disassembly or repair.	Failure to heed this instruction will result in fire, electric shock or personal injury.

Caution

	Perform installation by taking into consideration the mass of the body and rated output of the product.	Incorrect installation or mounting will cause personal injury or malfunction.
	Exactly follow the installing method and direction specified.	
	Don't place any obstacle object around the motor and peripheral, which blocks air passage.	Temperature rise will cause burn injury or fire.
	Adjust the motor and speed controller ambient environmental condition to match their operating temperature and humidity.	Incorrect installation or mounting will cause personal injury or malfunction.
	Connect a ground-fault interrupter, circuit breaker and relay to the brake control relay in series so that they are turned off upon emergency stop.	Missing of one of these devices will cause malfunction.
	Provide protection device against slippage of brake or gear head, or grease leakage from gear head.	Lack of protection will cause personal injury, damage or pollution.
	Always install a safety system that will back up the braking system failing to operate due to power interruption or voltage drop.	Lack of protection will cause personal injury, damage or malfunction.
	Use the speed controller in combination with the specified motor.	Incorrect combination will cause fire.
	Level of input voltage to a peripheral block should correspond to the motor rated voltage.	Operation from a voltage outside the rated voltage will cause electric shock, personal injury or fire.
	Test-run the securely fixed motor without load to verify normal operation, and then connect it to the mechanical system.	Operation with a wrong model or wrong wiring connection will result in personal injury.
	Maintenance must be performed by an experienced personnel.	Wrong wiring will cause personal injury or electric shock.
	Always keep power disconnected when the power is not necessary for a long time.	Improper operation will cause personal injury.
Scraps must be treated as industrial waste.		

Operating instruction

• Before running the motor


Check the following points:

- Correct wiring to the power source?
- Secure grounding to earth?
- Appropriate fuse and circuit breaker?
- No loose connection to the machine? No loose tightening bolts?
- No oil or grease leakage nor blot?

• Trial running

Make a trial run:

- (1) Without a load, turn on the motor and gear head to verify the rotational direction and speed, and check for abnormal state, i.e. vibration, noise, etc. Install the motor and gear head on the machine.

	Check rotating direction	Unexpected operation or movement will cause malfunction or personal injury.
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- (2) Turn on power and verify that the motor runs smoothly and the bearing and gear head produce no abnormal sounds.

• While motor is running

Check the load:

- Measure the current flow rate and adjust the load so that the current value is well below the rating described on the nameplate.
- When the reduction ratio of the gear head is 1/50 or more, the torque will exceed the permissible shaft torque even if the measured current value is lower than nameplate rating. If this is the case, decrease the load.

Check the temperature rise of the motor:

- Temperature rise will saturate by 3 hours after starting the motor. For the reversible motor and single-phase induction motor with electromagnetic brake, observe the time rating of 30 minutes.
- Keep the frame temperature 90 °C or below when the ambient temperature is 40 °C.

• At power failure:

- Immediately turn off main power switch.
- Unexpected accident may occur when the power recovers while the switch is in on position; or the motor may not start if the load is too heavy and the winding may burn.

• While the motor is running:

- Do not touch the motor since it gets very hot. (Or it may result in burn injury.)
- Turn off the motor as the system shows unexpected behavior. (Consult the local agent as necessary.)

• Other precautions:

Check the starting voltage:

With the geared motor installed on the machine, check the starting voltage of the motor using a variable transformer and voltmeter. The voltage should be lower than the value shown below.

- (1) Reversible motor: 70 % of the rated voltage
- (2) Induction motor: 80 % of the rated voltage

- The machine may not start if the voltage fluctuates. The machine may not start because of change in the static friction torque due to the aging or temperature, or fluctuation of the motor.

Inspection and maintenance

Periodically perform check and maintenance to assure safe and reliable operation.

• Practical considerations for maintenance

- To secure safety during maintenance operation, turning off/on of power supply must be done by the personnel who is responsible for the current maintenance work.
- Do not touch the motor while it is still running or immediately after it stops. (Motor is hot.)
- Before starting the megger testing of the motor (to measure the insulation resistance), completely disconnect it from associated devices and components. Otherwise, the megger tester will damage the devices under test.

• Daily check

- Perform the daily check to prevent potential problems.
- Perform appropriate corrections upon finding any failure or defective.

Check item	Checking method	Description
Change in voltage	Voltmeter	Rated voltage $\pm 2\%$ to 3% . Although the specification assures normal operation within $\pm 10\%$ deviation, the motor performance and life are not secured.
Load current	Ammeter	As indicated on the nameplate
Ambient temperature	Thermometer	$-10\text{ }^\circ\text{C}$ to $+40\text{ }^\circ\text{C}$
Temperature rise	Thermometer	$90\text{ }^\circ\text{C}$ or below on frame surface (ambient temperature $40\text{ }^\circ\text{C}$)
Noise	Auditory perception	No increase in abnormal sound or noise level
Vibration	Vibrometer/feeling	No abnormal vibration
Deposition of powder dust	Visual	Flow of cooling air is not disturbed by dust and powder
Oil leakage	Visual	No oil or grease from joint to gear head or from output shaft
Insulation resistance	Insulating-resistance tester	Connect the 500 V megger across motor lead and earth terminal. The reading should be $50\text{ M}\Omega$ or more.
Grease leakage	Visual	Check exterior and peripheral of motor and gear head for coat of grease or oil. If the leakage will affect the application, use cover as necessary for protection.
Foundation bolt	Torque wrench	Check bolts for loosening and retighten as necessary.

• Periodic check (once/1 to 2 month)

- Motor: dust accumulation
- Casing: deformation or corrosion
- Insulation resistance: $1\text{ M}\Omega$ or more (across frame and leads)

Operating conditions

Ambient temperature	$-10\text{ }^\circ\text{C}$ to $+40\text{ }^\circ\text{C}$
Ambient humidity	85 %RH or less
Altitude	1000 m or lower
Vibration	4.9 m/s^2 or less
Operating voltage	Nameplate rating $\pm 10\%$ *
Operating voltage	50 Hz or 60 Hz as specified on the nameplate

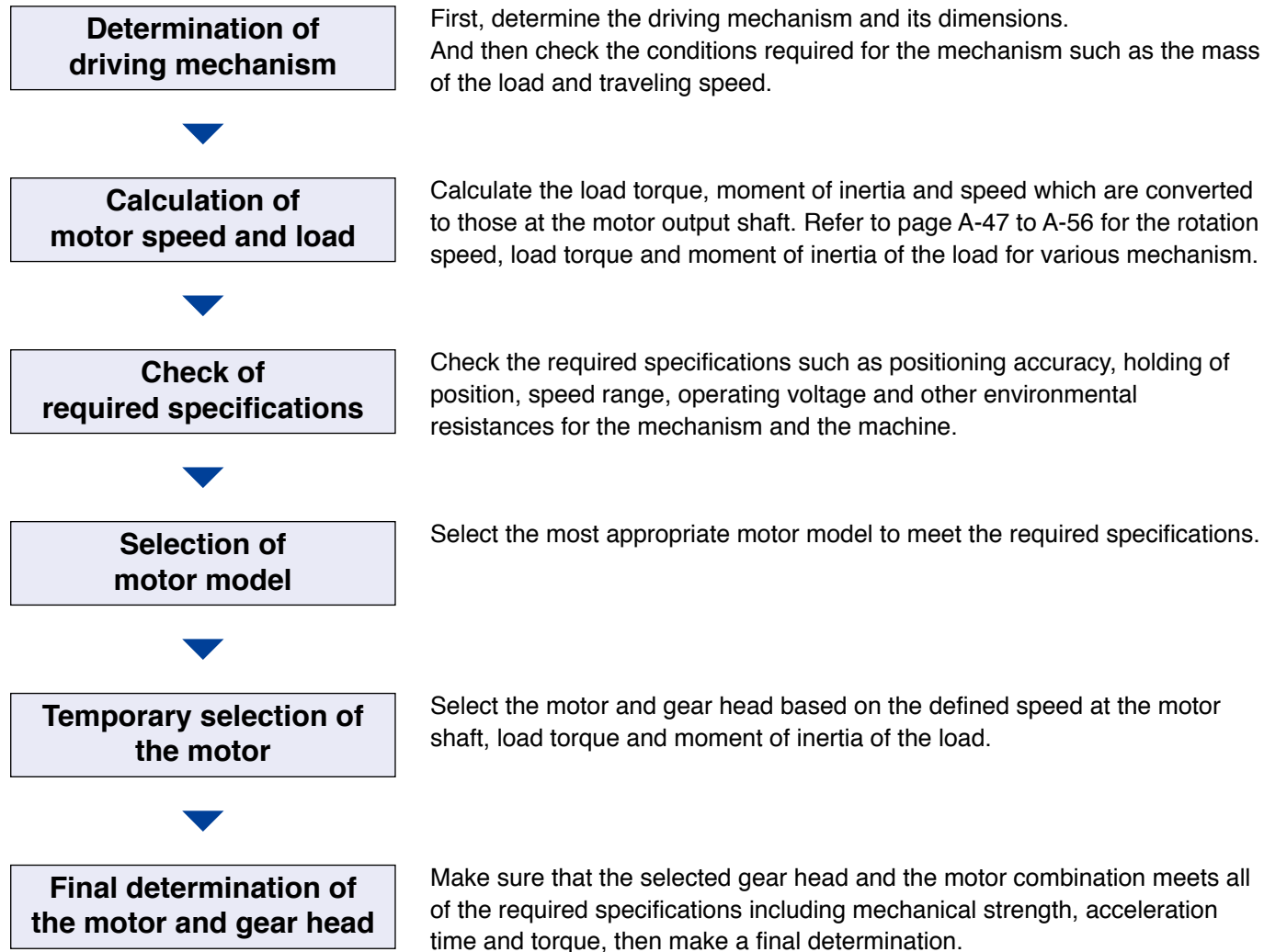
* $\pm 10\%$ is not a guaranteed value for continuous running condition.

Installation requirements

Install the geared motor at the optimal location as described below for prolonged service life.

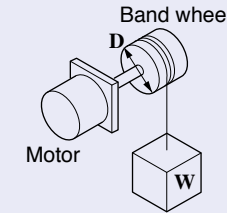
- (1) Indoor free from rain and direct sunlight
- (2) Free from vibration 4.9 m/s^2 or more; shock, dust, iron powder or oil mist; splash of water, oil and grinding fluid; and away from flammable materials, corrosive gas (H_2S , SO_2 , NO_2 , Cl_2 , etc.) or flammable gas.
- (3) Well ventilated dry and clean location containing negligible amount of oil or dust, and away from heat source i.e. oven.
- (4) Location that allows easier access for checking and cleaning of the unit.
- (5) Don't use the motor in a closed environment where the motor temperature increases, shortening the life.

Selecting procedure



Checking of load torque

Hoisting application



• **SI units**

$$T = \frac{1}{2} D \cdot W \text{ (N}\cdot\text{m)}$$

D : Diameter of drum (m)

W : Load (N)

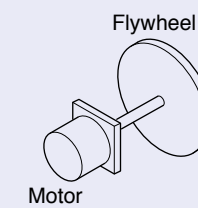
• **Gravitational system of units**

$$T = \frac{1}{2} D \cdot W \text{ (kgf}\cdot\text{m)}$$

D : Diameter of drum (m)

W : Load (kgf)

Flywheel application



• **SI units**

$$T = \frac{J}{9.55 \times 10^4} \cdot \frac{N}{t} \text{ (N}\cdot\text{m)}$$

N : Rotating speed (r/min)

J : Inertia (kg·cm²)

t : Time (s)

• **Gravitational system of units**

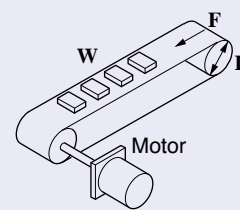
$$T = \frac{GD^2}{3750000} \cdot \frac{N}{t} \text{ (kgf}\cdot\text{m)}$$

N : Rotating speed (r/min)

GD² : Flywheel effect (kgf·cm²)

t : Time (s)

Belt conveyor application



• **SI units**

$$T = \frac{1}{2} D (F + \mu Wg) \text{ (N}\cdot\text{m)}$$

D : Diameter of roll (m)

W : Mass of load (kg)

g : Gravitational acceleration 9.8 (m/s²)

μ : Friction coefficient

F : External force (N)

• **Gravitational system of units**

$$T = \frac{1}{2} D (F + \mu W) \text{ (kgf}\cdot\text{m)}$$

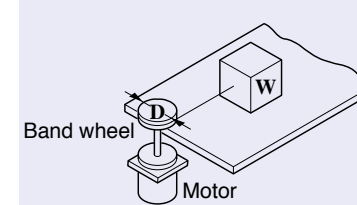
D : Diameter of roll (m)

W : Weight of load (kgf)

μ : Friction coefficient

F : External force (kgf)

Horizontal travel on contact face



• **SI units**

$$T = \frac{1}{2} D \cdot \mu Wg \text{ (N}\cdot\text{m)}$$

D : Diameter of drum (m)

W : Mass (kg)

g : Gravitational acceleration 9.8 (m/s²)

μ : Friction coefficient

• **Gravitational system of units**

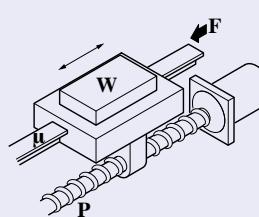
$$T = \frac{1}{2} D \cdot \mu W \text{ (kgf}\cdot\text{m)}$$

D : Diameter of drum (m)

W : Weight (kgf)

μ : Friction coefficient

Ball screw drive



• **SI units**

$$T = \frac{1}{2\pi} P (F + \mu Wg) \text{ (N}\cdot\text{m)}$$

F : External force (N)

W : Mass of load (kg)

μ : Friction coefficient of sliding surfaces (approx. 0.05 to 0.2)

g : Gravitational acceleration 9.8 (m/s²)

P : Lead of ball screw (m)

• **Gravitational system of units**

$$T = \frac{1}{2\pi} P (F + \mu W) \text{ (kgf}\cdot\text{m)}$$

F : External force (kgf)

W : Weight of load (kgf)

μ : Friction coefficient of sliding surfaces (approx. 0.05 to 0.2)

P : Lead of ball screw (m)