for a greener tomorrow

MITSUBISHI ELECTRIC
Changes for the Better

General-Purpose AC Servo MELSERVO-J4 Series
Low-profile Direct Drive Motor
TM-RG2M Series/TM-RU2M Series

October 2017

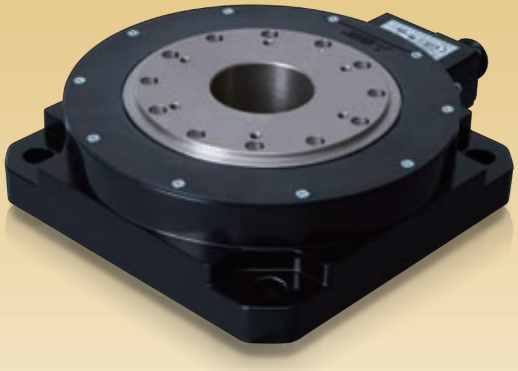
NEW

Releasing Outer Diameter of ø130 mm

New Product Release
SV1703-1E-A

New Low-profile Direct Drive Motors for Further Compact and Light Machines

TM-RU2M Series
Table Type



TM-RG2M Series
Flange Type

Thickness:
51 mm *

* For TM-RG2M004E30
(A pilot for mounting is not included.)

■ TM-RG2M Series (Flange Type)

Rated torque: 2.2 N·m, 4.5 N·m, 9 N·m in 200 V class
Motor outer diameter: ø130 mm, ø180 mm, ø230 mm
TM-RG2M series is equipped with a pilot for mounting.

■ TM-RU2M Series (Table Type)

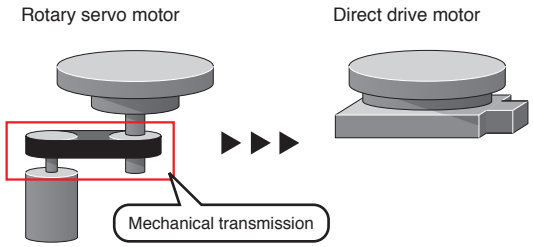
Rated torque: 2.2 N·m, 4.5 N·m, 9 N·m in 200 V class
Motor outer diameter: ø130 mm, ø180 mm, ø230 mm
TM-RU2M series is equipped with positioning pin holes for mounting.

New Low-profile Direct Drive Motors for Further Compact and Light Machines

What is a Direct Drive Motor?

A direct drive motor is a type of motor which is coupled directly to a load, whereas a rotary servo motor is coupled to a load with a mechanical transmission such as a gear, belt, etc. A direct drive system without mechanical transmission brings the following advantages to a machine.

- Machine installation space is reduced.
- Maintenance becomes easy because the replacement of mechanical transmission elements is unnecessary.
- High-accuracy positioning is achieved because the driving section is coupled directly to a load.
- Energy-conservation of a machine is improved because motions of the direct drive motor are transmitted efficiently.



New Low-profile Direct Drive Motor TM-RG2M Series and TM-RU2M Series

Low-profile direct drive motor TM-RG2M series and TM-RU2M series are launched in addition to the prior TM-RFM series.
TM-RG2M004E30 (motor outer diameter: ø180 mm) has a thickness of 51 mm* decreased by 18% and a mass of 5.5 kg decreased by 50% compared with TM-RFM006E20.
In addition, the new series has a rated speed of 300 r/min. Its increased speed improves productivity.
When high torque is needed or the load is heavy, TM-RFM series is recommended.

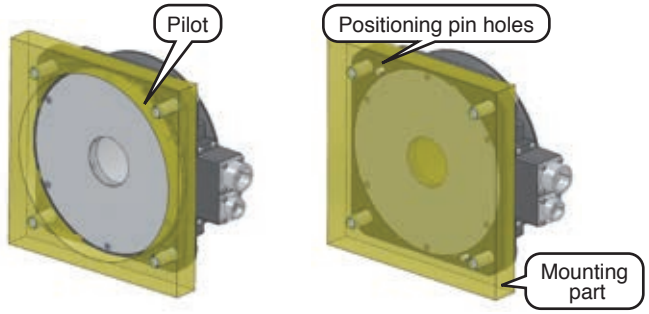
Comparison with prior TM-RFM series

	TM-RFM 006E20	NEW TM-RG2M 004E30
Motor outer diameter [mm]	ø180	ø180
Rated torque [N·m]	6	4.5
Rated speed [r/min]	200	300
Thickness * [mm]	62	51
Mass [kg]	11	5.5

* A pilot for mounting is not included.

Flange Type (with Pilot) and Table Type (with Positioning Pin Holes)

Two mounting types are selectable according to the mounting method to a machine.
TM-RG2M series: flange type (with pilot)
Position with the pilot and fix with bolts.
TM-RU2M series: table type (with positioning pin holes)
Position with the positioning pin holes and fix with bolts.



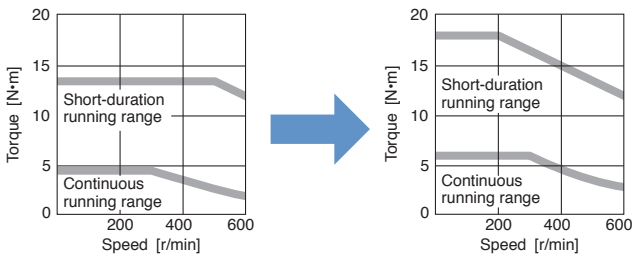
Flange type (with pilot)　　Table type (with positioning pin holes)

Refer to "Mounting of TM-RG2M/TM-RU2M Series" on p. 6 in this brochure for details.

Increased Rated and Maximum Torques

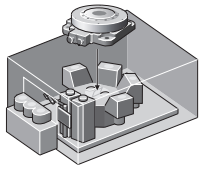
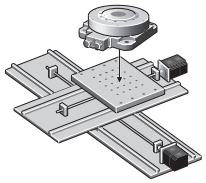
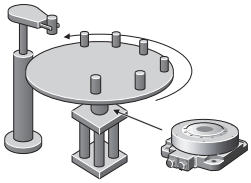
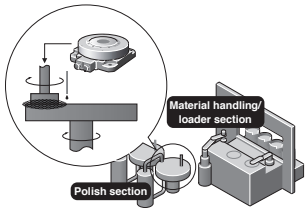
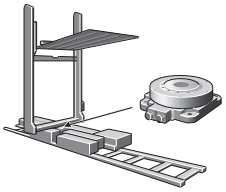
The rated and maximum torques of TM-RG2M004E30/TM-RU2M004E30 are increased when a larger-capacity servo amplifier is combined.
For example, when MR-J4-40B(-RJ) servo amplifier is used instead of MR-J4-20B(-RJ), the rated and maximum torques are increased as follows:
Rated torque: from 4.5 N·m to 6 N·m.
Maximum torque: from 13.5 N·m to 18 N·m.

* Refer to "TM-RG2M/TM-RU2M Series Torque Characteristics" on p. 6 in this brochure for torque characteristics.



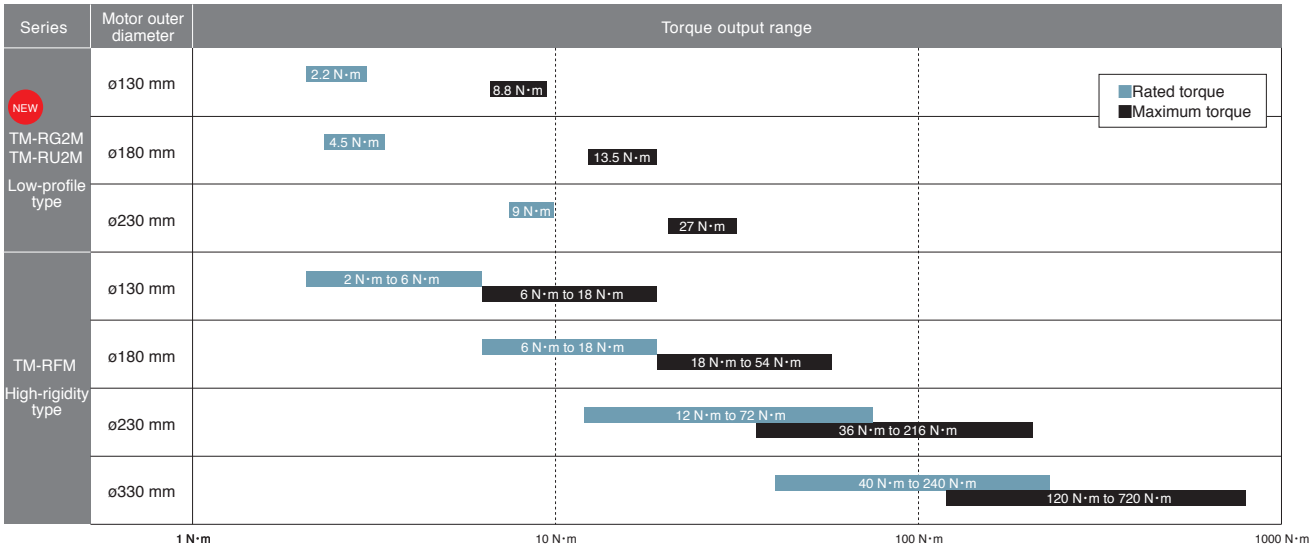
Application Examples

Suitable for low-speed and high-torque applications.

Coating and vapor deposition systems 	Spin-type cleaning systems for LCD/semiconductor 	LCD/semiconductor testing systems (XYθ tables) 
Index table for machine tools 	Rotary axis for polishing systems 	Rotary axis for material handling robots 

Product Lines

18 models with 4 different diameters are available.



Compliance with Global Standards and Regulations

Direct drive motor

European EC directive	Low voltage directive	EN 60034-1
	EMC directive	EN 61800-3 Category C3
	Machine directive	-
	RoHS directive	EN 50581
UL standard		UL 1004-1 / UL 1004-6
CSA standard		CSA C22.2 No.100
Measures for Administration of the Pollution Control of Electronic Information Products (Chinese RoHS)		Compliant (Names and the content of hazardous substances are described in Instruction Manuals.)
China Compulsory Certification (CCC)		N/A
Korea Radio Wave Law (KC)		N/A
Certification system of the Eurasian Economic Union (EAC)		Compliant

Model Designation

TM-RG2M□□□

Symbol	Rated speed [r/min]
30	300

Symbol	Motor outer diameter [mm] (Frame dimensions)
C	ø130
E	ø180
G	ø230

Symbol	Rated torque [N•m]
002	2.2
004	4.5
009	9

Series	Mounting method
TM-RG2M	Flange type
TM-RU2M	Table type

Combinations of Direct Drive Motor and Servo Amplifier

Direct drive motor	Servo amplifier (Note 3)		
	MR-J4	MR-J4W2 (Note 1)	MR-J4W3 (Note 1)
TM-RG2M002C30 TM-RU2M002C30	MR-J4-20GF(-RJ) (Note 4) MR-J4-20B(-RJ) MR-J4-20B1(-RJ) MR-J4-20A(-RJ) MR-J4-20A1(-RJ)	MR-J4W2-22B MR-J4W2-44B	MR-J4W3-222B MR-J4W3-444B
TM-RG2M004E30 TM-RU2M004E30	MR-J4-20GF(-RJ) (Note 4) MR-J4-40GF(-RJ) (Note 2, 4) MR-J4-20B(-RJ) MR-J4-20B1(-RJ) MR-J4-40B(-RJ) (Note 2) MR-J4-40B1(-RJ) (Note 2) MR-J4-20A(-RJ) MR-J4-20A1(-RJ) MR-J4-40A(-RJ) (Note 2) MR-J4-40A1(-RJ) (Note 2)	MR-J4W2-22B MR-J4W2-44B (Note 2)	MR-J4W3-222B MR-J4W3-444B (Note 2)
TM-RG2M009G30 TM-RU2M009G30	MR-J4-40GF(-RJ) (Note 4) MR-J4-40B(-RJ) MR-J4-40B1(-RJ) MR-J4-40A(-RJ) MR-J4-40A1(-RJ)	MR-J4W2-44B	MR-J4W3-444B

Notes: 1. Any combination of the servo motors is available for MR-J4W2/MR-J4W3 servo amplifiers. Refer to "MELSERVO-J4 catalog (L(NA)03058)" for the combinations with rotary servo motors, linear servo motors, and direct drive motors.
2. This combination increases the rated and maximum torque.
3. Use MR-J4-B(-RJ)/MR-J4-A(-RJ)/MR-J4W2/MR-J4W3 servo amplifiers with software version C8 or later.
4. The combination with MR-J4-_GF(-RJ) will be available in the future.

TM-RG2M/TM-RU2M Series Specifications

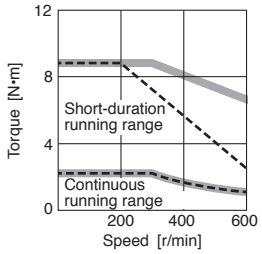
Direct drive motor model			TM-RG2M- / TM-RU2M-	002C30	004E30	009G30
Compatible servo amplifier model			MR-J4- / MR-J4W_-	Refer to "Combinations of Direct Drive Motor and Servo Amplifier" on p. 4 in this brochure.		
Motor outer diameter (frame dimensions)			[mm]	ø130	ø180	ø230
Power supply capacity *1 (Note 4)			[kVA]	0.25	0.5 <0.7>	0.9
Continuous running duty	Rated output (Note 4)		[W]	69	141 <188>	283
	Rated torque (Note 3, 4)		[N•m]	2.2	4.5 <6>	9
Maximum torque (Note 4)			[N•m]	8.8	13.5 <18>	27
Rated speed			[r/min]	300		
Maximum speed			[r/min]	600		
Permissible instantaneous speed			[r/min]	690		
Power rate at continuous rated torque (Note 4)			[kW/s]	6.1	3.4 <6.0>	5.5
Rated current (Note 4)			[A]	1.2	1.3 <1.7>	2.2
Maximum current (Note 4)			[A]	4.9	4.0 <5.3>	6.7
Regenerative braking frequency *2 (Note 4)	MR-J4-		[times/min]	1317	166 <167>	68
	MR-J4W_-		[times/min]	1317	166 <167>	68
Moment of inertia J			[× 10^{-4} kg•m^2]	7.88	60.2	147
Recommended load to motor inertia ratio (Note 1)				50 times or less	20 times or less	
Absolute accuracy (Note 6)			[s]	±15	±12.5	
Speed/position detector	Absolute/incremental *3			21-bit encoder 2097152 pulses/rev	22-bit encoder 4194304 pulses/rev	
Thermistor				Built-in		
Insulation class				155 (F)		
Structure				Totally enclosed, natural cooling (IP rating: IP40) (Note 2)		
Environment *4 *8	Ambient temperature			Operation: 0 °C to 40 °C (non-freezing), storage: -15 °C to 70 °C (non-freezing)		
	Ambient humidity			Operation: 10 %RH to 80 %RH (non-condensing), storage: 10 %RH to 90 %RH (non-condensing)		
	Ambience			Indoors (no direct sunlight); no corrosive gas, inflammable gas, oil mist, dust or splash of oil or water		
	Altitude			2000 m or less above sea level (Note 5)		
	Vibration resistance *5			X: 49 m/s^2 Y: 49 m/s^2		
Vibration rank				V10 *7		
Compliance with global standards				Refer to "Compliance with Global Standards and Regulations" on p. 3 in this brochure.		
Rotor permissible load *6	Moment load		[N•m]	15	49	65
	Axial load		[N]	770	2300	3800
Mass			[kg]	2.7	5.5	8.3

Notes: 1. Contact your local sales office if the load to motor inertia ratio exceeds the value in the table.
2. Connectors and a gap along the rotor (output shaft) are excluded.
3. When unbalanced torque is generated, such as in a vertical lift machine, be sure to use the absolute position detection system, and keep the unbalanced torque under 70% of the servo motor rated torque.
4. The value in angle brackets is applicable when the rated and maximum torques are increased with a combination with a larger-capacity servo amplifier. Refer to "Combinations of Direct Drive Motor and Servo Amplifier" on p. 4 in this brochure for the combinations.
5. Refer to "TM-RFM TM-RG2M TM-RU2M Direct Drive Motor Instruction Manual" for the restrictions when using the direct drive motors at altitude exceeding 1000 m and up to 2000 m above sea level.
6. Absolute accuracy varies according to the mounting state of load and the surrounding environment.

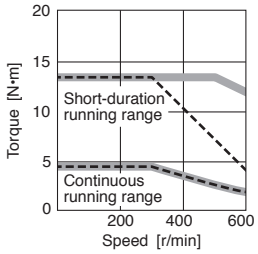
Refer to "Annotations for Direct Drive Motor Specifications" on p. 7 in this brochure for the asterisks 1 to 8.

TM-RG2M/TM-RU2M Series Torque Characteristics

TM-RG2M002C30, TM-RU2M002C30 (Note 1, 2, 3)

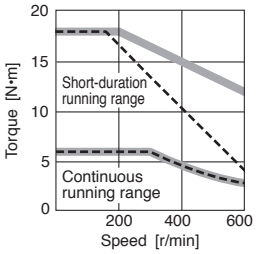


TM-RG2M004E30, TM-RU2M004E30 (Note 1, 2, 3)

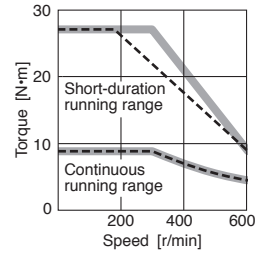


TM-RG2M004E30, TM-RU2M004E30 (Note 1, 2, 3, 4)

(when torque is increased)



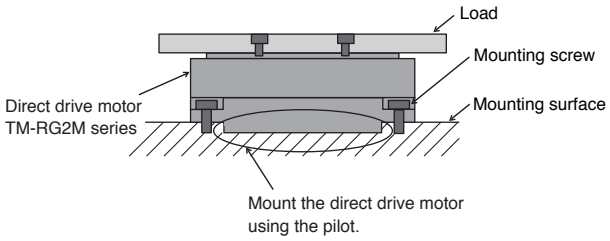
TM-RG2M009G30, TM-RU2M009G30 (Note 1, 2, 3)



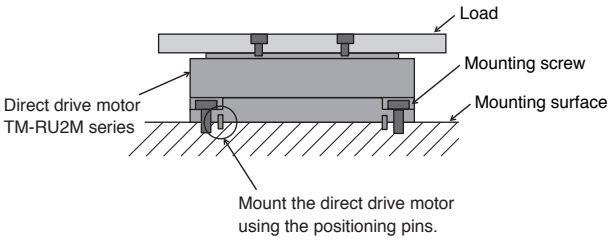
Notes: 1. ▬ : For 3-phase 200 V AC or 1-phase 230 V AC.
2. - - - - : For 1-phase 200 V AC or 1-phase 100 V AC.
3. Torque drops when the power supply voltage is below the specified value.
4. This value is applicable when the rated and maximum torques are increased with a combination with a larger-capacity servo amplifier. Refer to "Combinations of Direct Drive Motor and Servo Amplifier" on p. 4 in this brochure for the combinations.

Mounting of TM-RG2M/TM-RU2M Series

●Flange type (with pilot)



●Table type (with positioning pin holes)



Cautions when mounting the direct drive motor

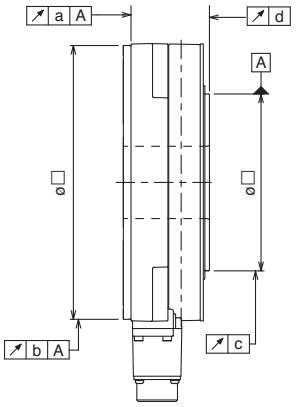
- Fix the direct drive motor securely on a high-rigid mounting surface because a machine resonance may occur if the rigidity of the mounting surface is low.
- Fix the mounting screws of the direct drive motor and a rotating table securely to ensure enough rigidity.
- To ensure heat dissipation and accuracy, mount the direct drive motor on a high-rigid mounting surface which has enough heat dissipation area without gaps between the bottom of the direct drive motor and the mounting surface.
- The flange type has a higher mounting accuracy than the table type. When a high-mounting accuracy is required, select the flange type.
  Refer to "Direct Drive Motor Machine Accuracy" on p. 7 in this brochure for the machine accuracy of each direct drive motor, and refer to the dimensions on pp. 8 to 10 in this brochure for the dimensional tolerance.

Direct Drive Motor Machine Accuracy

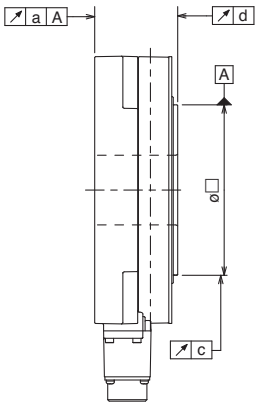
The machine accuracy related to the direct drive motor rotor (output shaft) and mounting is indicated below:

Item	Measuring position	Accuracy [mm]
Runout of flange surface about rotor (output shaft)	a	0.05
Runout of fitting outer diameter of flange surface	b	0.07
Runout of rotor (output shaft)	c	0.04
Runout of rotor (output shaft) end	d	0.02

●TM-RG2M Series

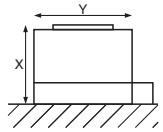


●TM-RU2M Series

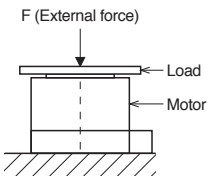


Annotations for Direct Drive Motor Specifications

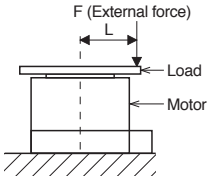
* 1. The power supply capacity varies depending on the power supply impedance.
* 2. The regenerative braking frequency shows the permissible frequency when the direct drive motor, without a load and a regenerative option, decelerates from the rated speed to a stop. When a load is connected; however, the value will be the table value/(m + 1), where m = Moment of inertia of load/Moment of inertia of direct drive motor. When the operating speed exceeds the rated speed, the regenerative braking frequency is inversely proportional to the square of (operating speed/rated speed). Take measures to keep the regenerative power [W] during operation below the permissible regenerative power [W]. Use caution, especially when the operating speed changes frequently or when the regeneration is constant (as with vertical feeds). Select the most suitable regenerative option for your system with our capacity selection software. Refer to "Regenerative Option" in "MELSERVO-J4 catalog (L(NA)03058)" for the permissible regenerative power [W] when regenerative option is used.
* 3. Be sure to connect the following options for absolute position detection system.
  • MR-J4-GF (compatible in the future): battery (MR-BAT6V1SET-A) and absolute position storage unit (MR-BTAS01)
  • MR-J4-B/MR-J4-A: battery (MR-BAT6V1SET) and absolute position storage unit (MR-BTAS01)
  • MR-J4W_: battery case (MR-BT6VCASE), battery (MR-BAT6V1) × 5 pcs, and absolute position storage unit (MR-BTAS01)
  Refer to relevant Servo Amplifier Instruction Manual for details.
* 4. In the environment where the direct drive motor is exposed to oil mist, oil and/or water, a standard specification direct drive motor may not be usable. Contact your local sales office for more details.
* 5. The vibration direction is shown in the diagram below. The numerical value indicates the maximum value of the component.
  Fretting tends to occur on the bearing when the direct drive motor stops. Thus, maintain vibration level at approximately one-half of the allowable value.



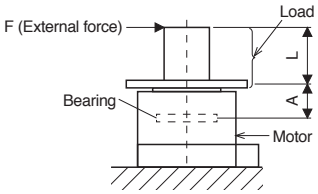
* 6. The following is calculation examples of axial and moment loads to the rotor (output shaft) of the direct drive motor. The axial and moment loads must be maintained equal to or below the permissible value.



Axial load
= F + Load mass



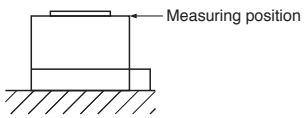
Axial load
= F + Load mass
Moment load
= F × L



Axial load = Load mass
Moment load = F × (L + A)

Motor outer diameter [mm] (Frame dimensions)	Dimension A [mm]
ø130	20.6
ø180	20.7
ø230	18.0

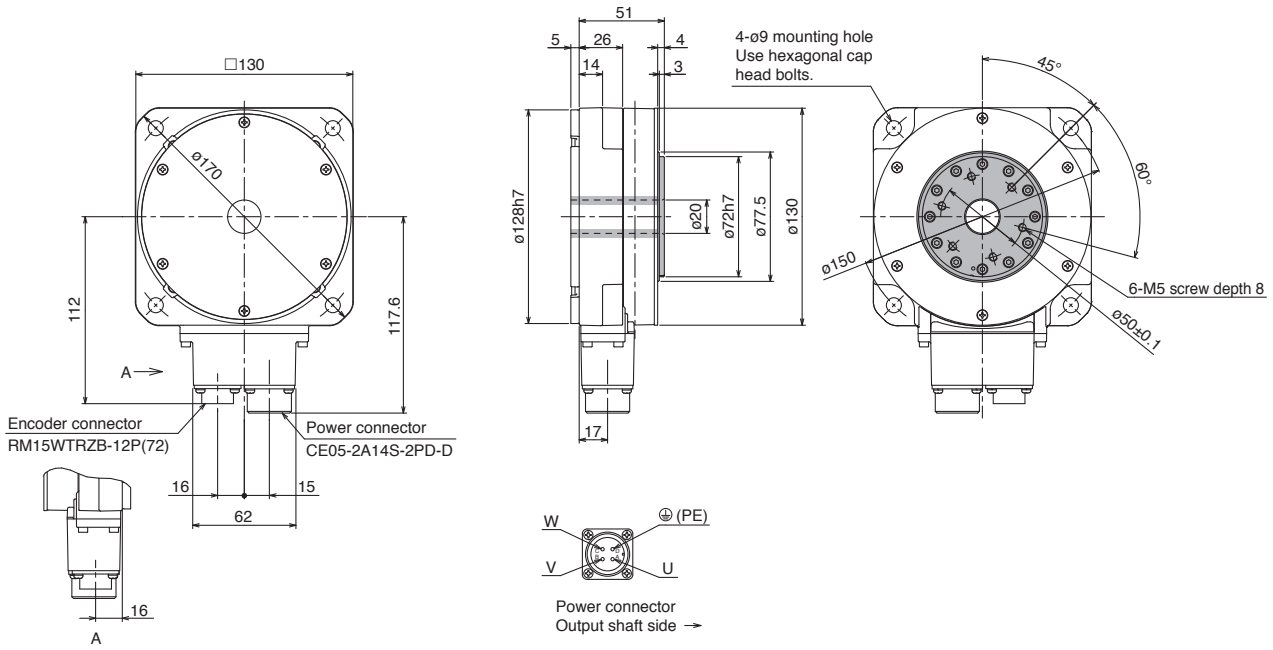
* 7. V10 indicates that the amplitude of the direct drive motor itself is 10 μm or less. The following shows mounting posture and measuring position of the direct drive motor during the measurement:



* 8. Do not place any object (such as a magnet) which generates a magnetic force near the direct drive motor. If it is unavoidable, take a measure such as mounting a shielding plate and so on to cut off the magnetic force.

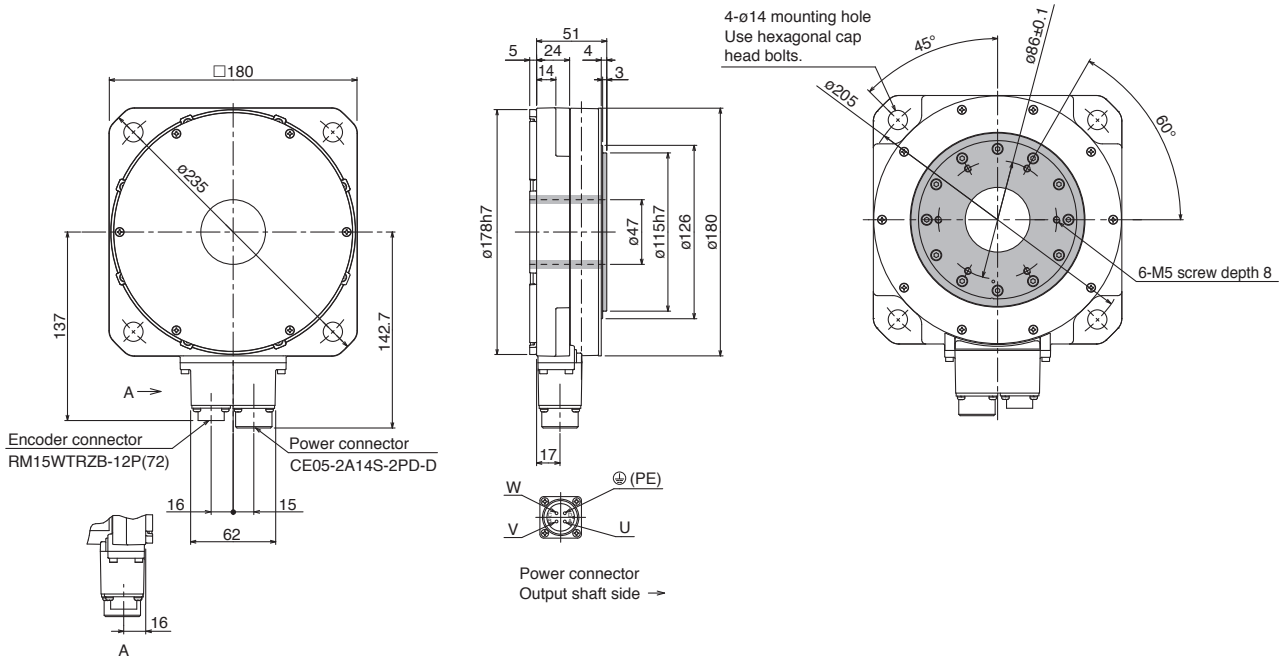
TM-RG2M Series Dimensions (Note 1, 2)

●TM-RG2M002C30



[Unit: mm]

●TM-RG2M004E30

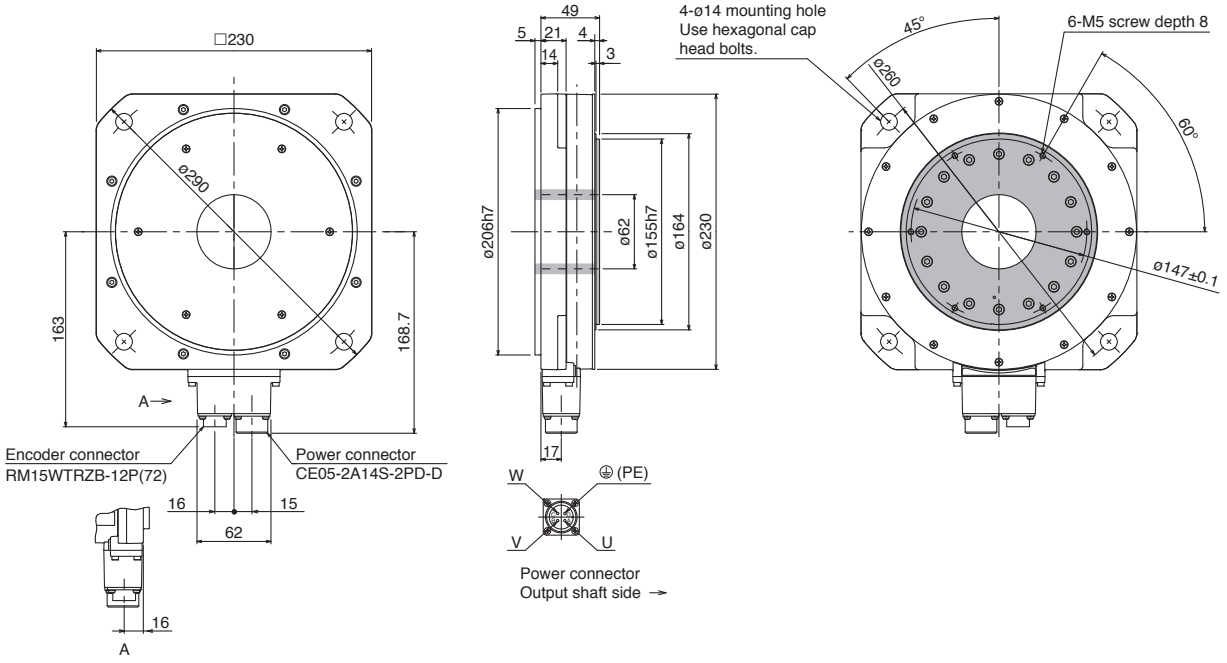


[Unit: mm]

Notes: 1. For dimensions without tolerance, general tolerance applies.
2. ▒ indicates rotor.

TM-RG2M Series Dimensions (Note 1, 2)

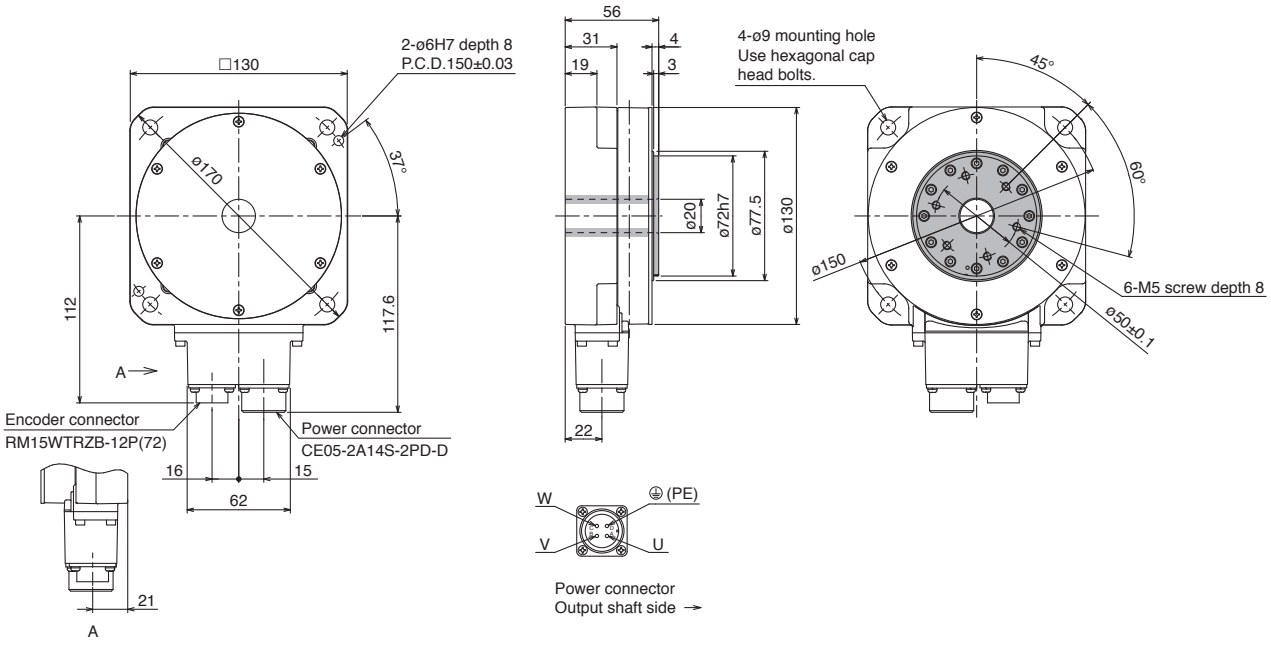
●TM-RG2M009G30



[Unit: mm]

TM-RU2M Series Dimensions (Note 1, 2)

●TM-RU2M002C30

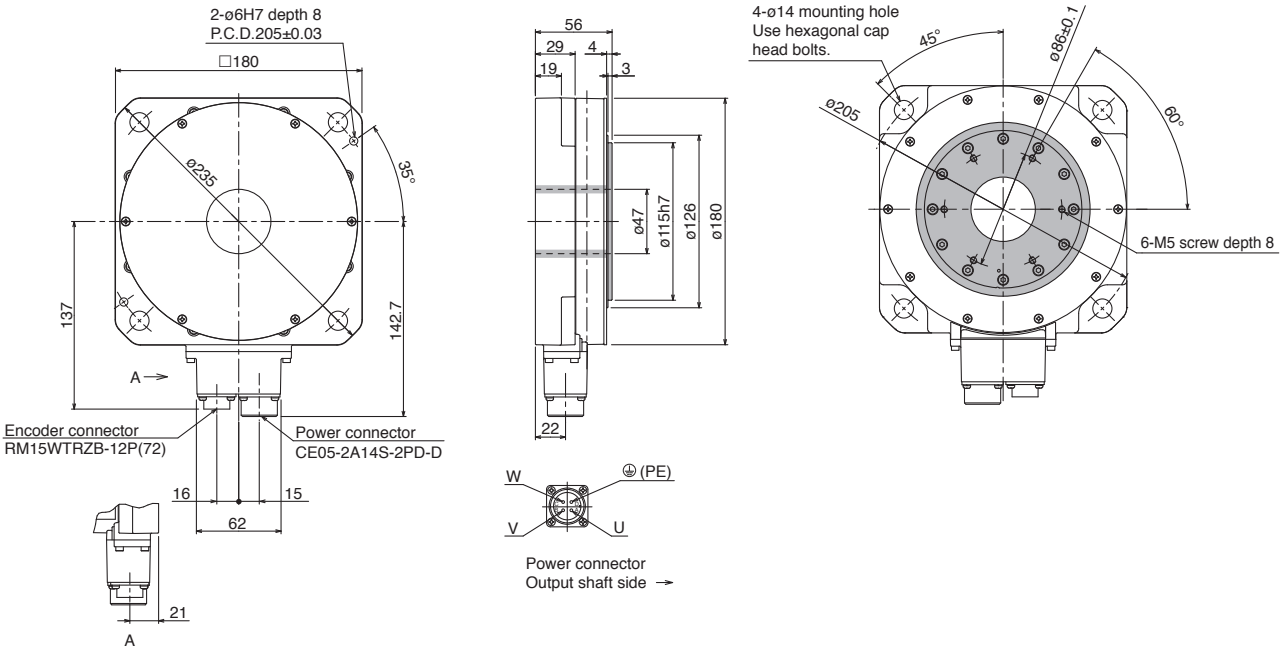


[Unit: mm]

Notes: 1. For dimensions without tolerance, general tolerance applies.
2. ▒▒ indicates rotor.

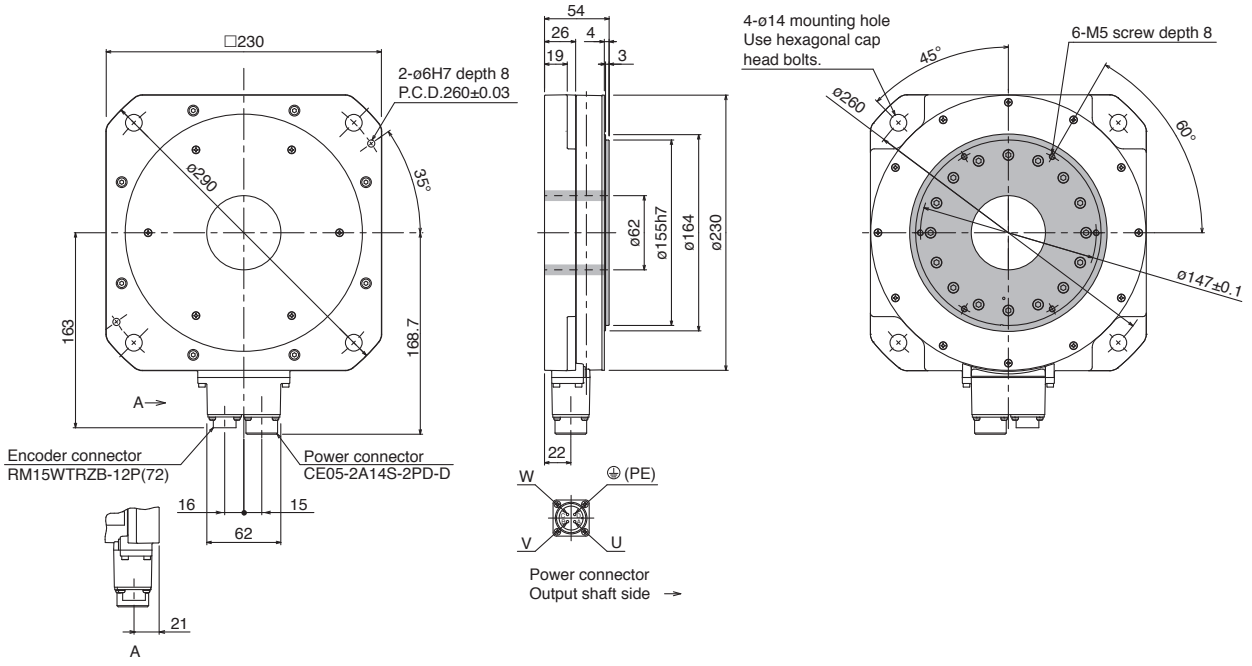
TM-RU2M Series Dimensions (Note 1, 2)

●TM-RU2M004E30



[Unit: mm]

●TM-RU2M009G30



[Unit: mm]

Notes: 1. For dimensions without tolerance, general tolerance applies.
2. ▒ indicates rotor.

Selection Example in HIV Wires

The following are examples of wire sizes when 600 V grade heat-resistant polyvinyl chloride insulated wires (HIV wires) with a length of 30 m are used.

Direct drive motor model	Wire size [mm²]
	For power and grounding (U, V, W, ⏚)
TM-RG2M002C30, TM-RG2M004E30,TM-RG2M009G30 TM-RU2M002C30, TM-RU2M004E30, TM-RU2M009G30	0.75 (AWG 18)

Optional Connector Set

Refer to "MELSERVO-J4 catalog (L(NA)03058)" for the optional connector set to be used to connect.

Related Material

Related materials are listed below:

Catalog

Catalog name	Document No.
Servo Amplifiers & Motors MELSERVO-J4 Catalog	L(NA)03058

Manual (Instruction Manual)

Manual name	Manual No.
TM-RFM TM-RG2M TM-RU2M Direct Drive Motor Instruction Manual	SH-030112ENG
MR-J4-_B_(-RJ) Servo Amplifier Instruction Manual	SH-030106ENG
MR-J4W2-_B MR-J4W3-_B MR-J4W2-0303B6 Servo Amplifier Instruction Manual	SH-030105ENG
MR-J4-_A_(-RJ) MR-J4-03A6(-RJ) Servo Amplifier Instruction Manual	SH-030107ENG
MELSERVO-J4 Servo Amplifier Instruction Manual (Trouble Shooting)	SH-030109ENG

General-Purpose AC Servo MELSERVO-J4 Series
Low-profile Direct Drive Motor TM-RG2M Series/TM-RU2M Series

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ISO 14001 JACO CERTIFICATION ORGANIZATION FOR ENVIRONMENT AND QUALITY・JAPAN AUDIT AND
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UKAS MANAGEMENT SYSTEMS
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ISO 9001
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BUREAU VERITAS 1828

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008

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Specifications are subject to change without notice.