

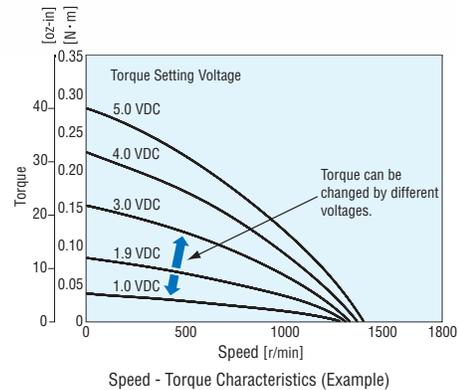
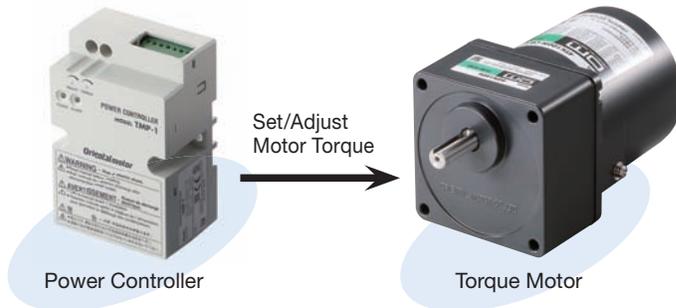
**(RoHS) RoHS-Compliant**  
**Power Controller for Torque Motors**  
**TMP-1**

A new power controller developed for Oriental Motor's torque motors that allows for easy adjustment of torque. A perfect choice for winding applications, push-motion mechanisms and other situations where torque must be adjusted.



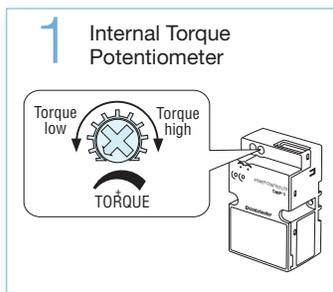
### Motor torque can be adjusted with ease

You can set/adjust motor torque using the internal torque potentiometer of the power controller, etc.

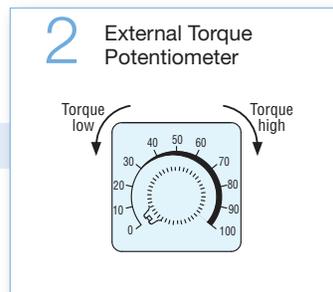


### Selectable torque setting method

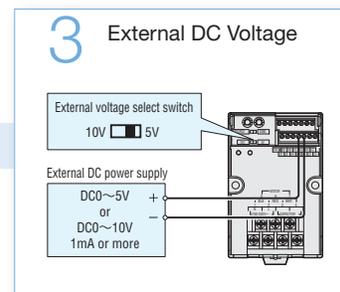
Torque can be set using one of three methods according to your needs. You can also change torque between two levels by switching between the internal potentiometer and an external potentiometer/voltage.



Built-In Potentiometer



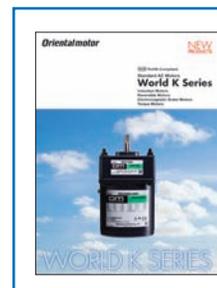
External Potentiometer  
**PAVR-20KZ** (Sold Separately)



Select 0 to 5 VDC or  
 0 to 10 VDC.

### Full Range of Functions

- Two torque levels can be set by the internal potentiometer and an external potentiometer/voltage
- Alarm output function (detection of an open thermal protector)
- Instantaneous bi-directional operation by CW/CCW signal switching
- Switching of signal input logic between sink and source



**Applicable Motors**  
 (Sold Separately)

**World K Series**

Torque Motors  
 3 W (1/250 HP) - 20 W (1/38 HP)

## Specifications of Motor and Power Controller Combinations

● 3 W (1/250 HP), 6 W (1/125 HP), 10 W (1/75 HP), 20 W (1/38 HP) (RoHS) Motor:    Power Controller:  

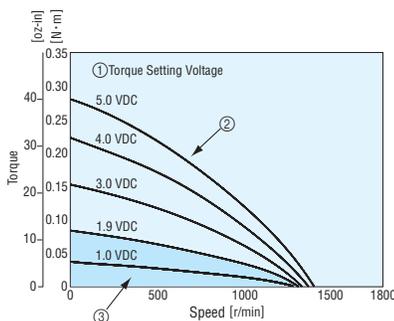
Motor Model	Rating at Locked Rotor	Voltage	Frequency	Torque Setting Voltage*	Starting Torque		Max. Output Power		Speed at Max. Output Power	Torque at Max. Output Power		Max. Input Current	Max. Input Power	Capacitor			
		VAC	Hz	VDC	mN·m	oz·in	W	HP	r/min	mN·m	oz·in	A	W	μF			
Ⓣ 2TK3GN-AW2U (2TK3A-AW2U)	5 minutes	110	60	5.0	70	9.9	3.5	1/210	900	38	5.3	0.49	53	6.0			
		115										0.51	58				
	Continuous	110	60	1.7	25	3.5	1.2	1/620	900	13	1.84	0.31	22				
		115										0.33	24				
Ⓣ 2TK3GN-CW2E (2TK3A-CW2E)	5 minutes	220	50	5.0	70	9.9	2.8	1/270	750	36	5.1	0.23	49	1.5			
		230					3	1/250		39	5.5	0.25	54				
		220	60	5.0	70	9.9	3.5	1/210	900	38	5.3	0.25	55				
		230										0.27	60				
	Continuous	220	50	2.2	18	2.5	0.8	1/930	750	10	1.42	0.15	23				
		230										0.16	26				
		220	60	1.6	25	3.5	1.2	1/620	900	13	1.84	0.16	24				
		230										0.17	27				
		Ⓣ 3TK6GN-AW2U (3TK6A-AW2U)	5 minutes	110	60	5.0	150	21	8	1/93	900	87	12.3		0.72	78	9.0
				115											0.76	86	
Continuous	110		60	1.7	55	7.8	2.6	1/290	900	28	3.9	0.48	34				
	115											0.50	37				
Ⓣ 3TK6GN-CW2E (3TK6A-CW2E)	5 minutes	220	50	5.0	140	19.8	6	1/125	750	78	11.0	0.40	81	2.5			
		230										0.44	92				
		220	60	5.0	150	21	8	1/93	900	87	12.3	0.40	87				
		230										0.42	96				
	Continuous	220	50	1.7	45	6.3	1.8	1/410	750	24	3.4	0.22	31				
		230										0.23	35				
		220	60	1.3	55	7.8	2.6	1/290	900	28	3.9	0.25	34				
		230										0.26	37				
		Ⓣ 4TK10GN-AW2U (4TK10A-AW2U)	5 minutes	110	60	5.0	210	29	12	1/62	900	130	18.4		0.91	99	11
				115											0.96	109	
Continuous	110		60	1.5	70	9.9	3.3	1/230	900	35	4.9	0.55	37				
	115											0.59	42				
Ⓣ 4TK10GN-CW2E (4TK10A-CW2E)	5 minutes	220	50	5.0	220	31	10	1/75	750	130	18.4	0.47	100	3.0			
		230										0.51	111				
		220	60	5.0	210	29	12	1/62	900	130	18.4	0.51	111				
		230										0.53	121				
	Continuous	220	50	1.6	65	9.2	2.8	1/270	750	35	4.9	0.27	38				
		230										0.29	42				
		220	60	1.3	70	9.9	3.3	1/230	900	35	4.9	0.31	43				
		230										0.33	47				
Ⓣ 5TK20GN-AW2U (5TK20A-AW2U)	5 minutes	110	60	5.0	350	49	23	1/32	900	250	35	1.22	134	14			
		115										1.29	147				
	Continuous	110	60	1.4	100	14.2	5.5	1/140	900	60	8.5	0.76	51				
		115										0.79	55				
Ⓣ 5TK20GN-CW2E (5TK20A-CW2E)	5 minutes	220	50	5.0	350	49	20	1/38	750	260	36	0.74	151	4.0			
		230										0.80	169				
		220	60	5.0	350	49	20	1/38	900	220	31	0.72	157				
		230										0.76	173				
	Continuous	220	50	1.5	85	12.0	4.5	1/170	750	60	8.5	0.40	54				
		230										0.43	60				
		220	60	1.1	100	14.2	5.5	1/140	900	60	8.5	0.39	49				
		230										0.41	54				

\* The torque setting voltage indicates the value when the external voltage selection switch is set to the "5V" position.

Ⓣ: Contains a built-in thermal protector (automatic return type). If a motor overheats for any reason, the thermal protector is activated and the motor stops.

## How to Read Speed - Torque Characteristics

Torque characteristics are changed when the value set by the internal or external torque potentiometer or external DC voltage is changed. A characteristics example is shown below.



### ① Torque Setting Voltage

The set value when a DC power supply of 0 to 5 VDC is used with the external voltage select switch set to the "5V" position.\*

### ② Rating: 5 minutes

If the torque setting voltage is 5.0 VDC, the service rating is 5 minutes. The rated time is determined by the maximum permissible temperature of the motor.

### ③ Rating: Continuous

The range where the motor can be used continuously. The torque setting voltage that permits continuous motor operation varies from one product to another. Check the specific voltage for each product in the specification table.

\* When a DC power supply of 0 to 10 VDC is used by setting the external voltage select switch to the "10V" position, each torque setting voltage becomes twice the corresponding voltage when a DC power supply of 0 to 5 VDC is used.

## Specifications of Power Controller RoHS

Item	Specifications
Power Supply Input	Single-Phase 100/110/115 VAC ± 10% 50/60 Hz Single-Phase 200/220/230 VAC ± 10% 50/60 Hz
Power Source for Control	24 VDC ± 10%, 100 mA or more
Torque Setting Method	Select one of the following methods: <ul style="list-style-type: none"> <li>• Set using the internal torque potentiometer (TORQUE)</li> <li>• Set using the external torque potentiometer : <b>PAVR-20KZ</b> (20 kΩ , 1/4 W)</li> <li>• Set using external DC voltage: 0 to 5 VDC or 0 to 10 VDC, 1 mA or more.</li> </ul> Torque can be adjusted using the torque fine-tuning potentiometer (ADJUST).
Input Signals	Photocoupler input, Input resistance 4.7 kΩ CW input, CCW input, INT/EXT switch input, Alarm reset input
Output Signals	Open collector output: 4.5~26.4 VDC or less, 40 mA or less. Alarm output
Protective Function	When any of the following is activated, the alarm signal will be output, the alarm LED will blink, and the motor will stop. <ul style="list-style-type: none"> <li>• The built-in thermal protector of the motor has actuated (become open).</li> <li>• Improper motor cable connection or wire breakage.</li> </ul>
Motor cable length	The distance between motor and power controller can be extended up to 20 m.

## General Specifications

Item	Specifications
Insulation Resistance	100 MΩ or more when 500 VDC megger is applied between the main circuit terminals and the control circuit terminals after continuous operation under normal ambient temperature and humidity.
Dielectric Strength	Sufficient to withstand 3.0 kVAC at 50 Hz or 60 Hz applied between the main circuit terminals and the control circuit terminals for 1 minute under normal ambient temperature and humidity.
Ambient Temperature	0~+50°C (+32~+122°F) (non-freezing)
Ambient Humidity	85% or less (non-condensing)
Degree of Protection	IP20

## Safety Standards and CE Marking of Power Controller

Standards	Certification Body	Standards File No.	CE Marking
UL508	UL	E91291	Low Voltage Directives EMC Directives
EN 50178	Conform to EN Standards		
EN 60950-1			

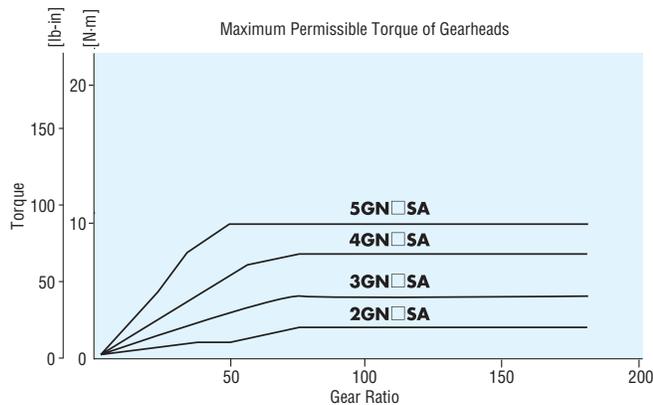
● The EMC value changes according to the wiring and layout. Therefore, the final EMC level must be checked with the power controller incorporated in the user's equipment.

## Output Torque of Gearmotor

Due to the speed - torque characteristics, torque motors can be operated over a wide speed range, from locked rotor condition to the maximum speed. The permissible torque when a gearhead and a decimal gearhead are directly connected can be calculated according to the following formula, using the speed and torque determined from the speed - torque characteristics.

Speed of gearhead output shaft  $N_G = \text{Motor speed} \times 1/\text{gearhead gear ratio}$   
 Output torque of gearhead  $T_G = \text{Motor torque} \times \text{Gearhead gear ratio} \times \text{Gearhead efficiency}$

The output torque of the gearhead must be lower than the maximum permissible torque.



Gearhead Model	Gearhead Gear Ratio	Gearhead Efficiency
<b>2GN-SA</b>	<b>3 ~ 18</b>	81%
<b>3GN-SA</b>	<b>25 ~ 36</b>	73%
<b>4GN-SA</b>	<b>50 ~ 180</b>	66%

- Gearheads and decimal gearheads are sold separately.
- Enter the gear ratio in the box (□) within the model name.

## How to Use as a Brake

A torque motor operates at a speed balanced with the load according to the motor's speed - torque characteristics, when not receiving a force that rotates it in the reverse direction.

If the torque motor is to be used as a brake, rotate the motor in the reverse direction using a torque greater than the motor starting torque. As the torque motor rotates in the reverse direction, it generates a certain level of braking force. Fig. 1 shows an example of speed-brake torque characteristics in an application. In a braking application, a large braking force can be obtained from just above 0 r/min. This feature is suitable for applications where tension must be applied even when the motor is at standstill.

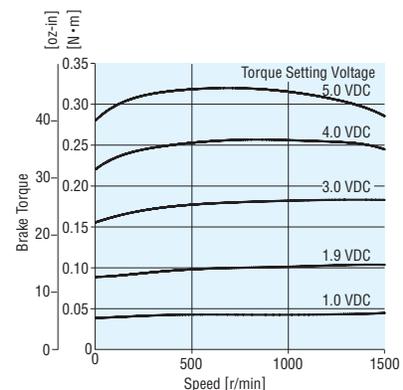


Fig.1 Speed-Brake Torque Characteristics (Example)

## ■ Features of Torque Motor and Application Examples

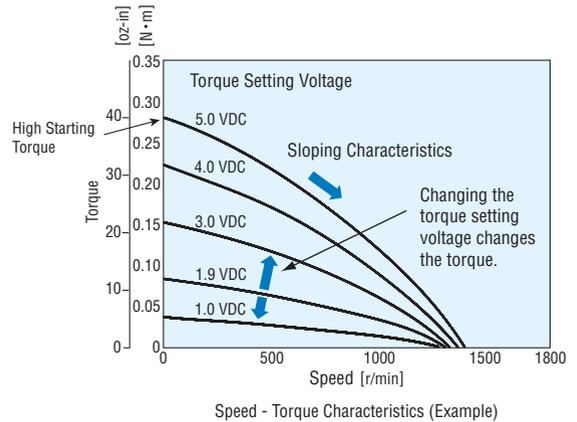
Torque motors have different features than induction motors and reversible motors.

The features specific to torque motors and examples of how these features can be applied are explained.

### ● Features of Torque Motor

- Torque can be adjusted by changing the voltage applied to the motor.
- High starting torque and sloping characteristics.
- Usable over the entire range of speed - torque characteristics.
- Provides stable torque in a locked state or at low speed.
- Functions as a brake when the motor can be rotated in the reverse direction.
- If the load is constant, the speed can be changed by adjusting the applied voltage.
- If the applied voltage is constant, the speed changes when the load changes.

With the power controller **TMP-1**, the applied voltage, and consequently the torque, can be changed by adjusting the torque setting voltage or each torque potentiometer.

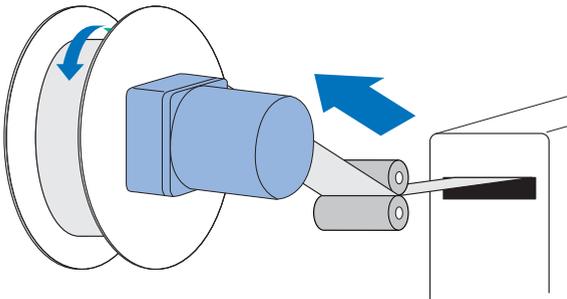


### ● Examples of Torque Motor Application

Shown below are representative examples of utilizing the features of a torque motor.

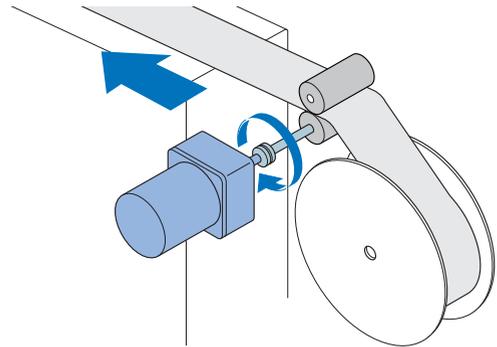
#### ◇ Winding

The sloping characteristics of a torque motor are ideal for applications where the work is wound at a constant speed and tension.



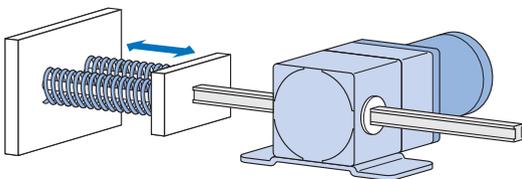
#### ◇ Tensioning (Braking)

The braking force of a torque motor can be used to tension the material as it is wound to remove slack.



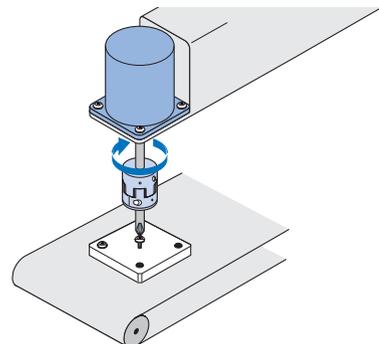
#### ◇ Push Motion

Since a torque motor provides stable torque in a locked state or near-locked operation at low speed, it is suitable for push-motion operation.\*



#### ◇ Tightening

Since a torque motor provides stable torque in a locked state or near-locked operation at low speed, it is suitable for applications where screws, etc., are tightened.\*

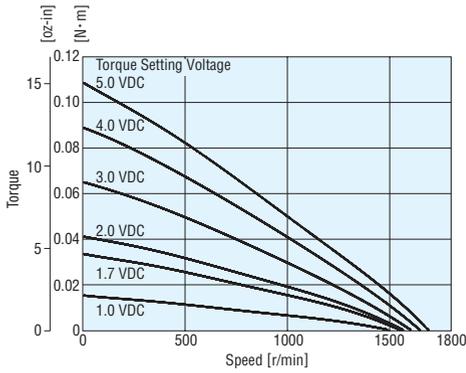


\* The output torque increases when the motor is locked. If a gearhead or linear head is used with a torque motor, do not hit any mechanical stops. The impact generated when the work contacts the mechanical stop may damage the gearhead or linear head.

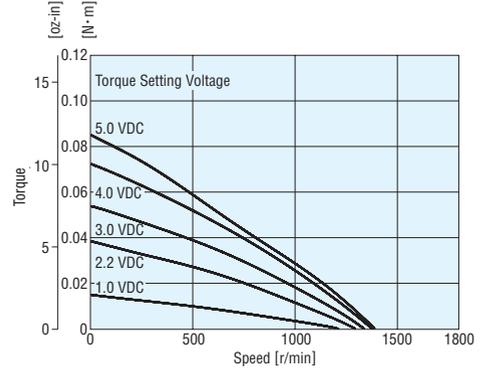
## Speed - Torque Characteristics (Reference Values)

The torque setting voltage indicates the value when the external voltage selection switch is set to the "5V" position. The characteristics are applicable for the motors only.

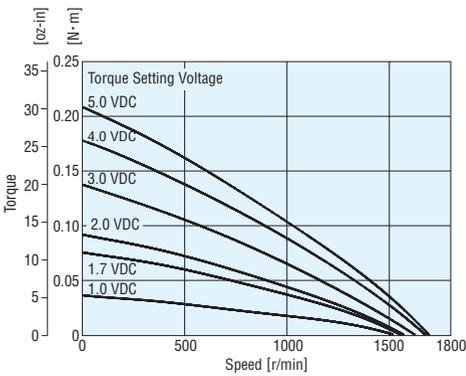
**2TK3GN-AW2U, 2TK3A-AW2U (115V 60Hz)**



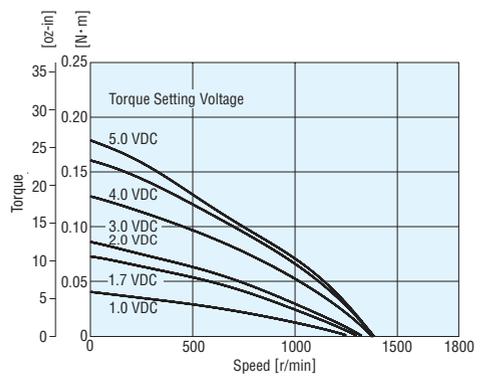
**2TK3GN-CW2E, 2TK3A-CW2E (230V 50Hz)**



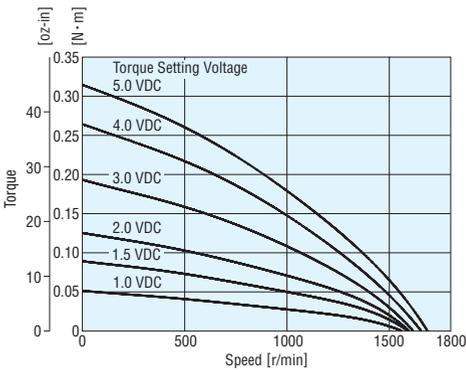
**3TK6GN-AW2U, 3TK6A-AW2U (115V 60Hz)**



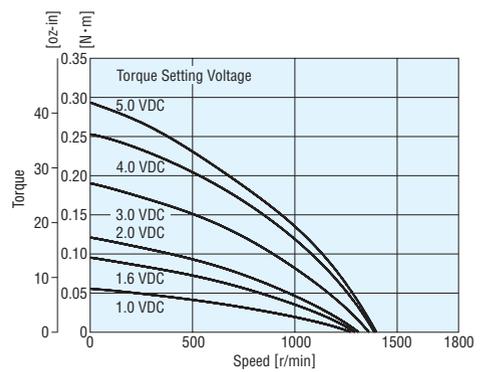
**3TK6GN-CW2E, 3TK6A-CW2E (230V 50Hz)**



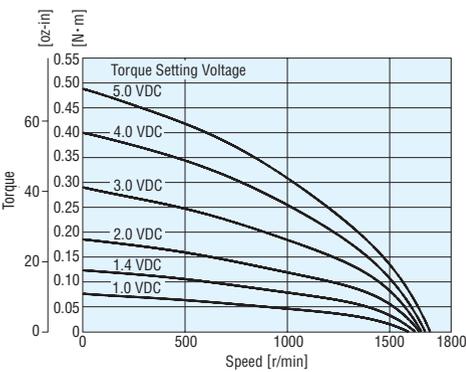
**4TK10GN-AW2U, 4TK10A-AW2U (115V 60Hz)**



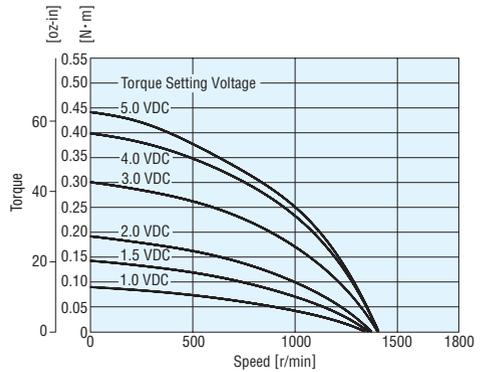
**4TK10GN-CW2E, 4TK10A-CW2E (230V 50Hz)**



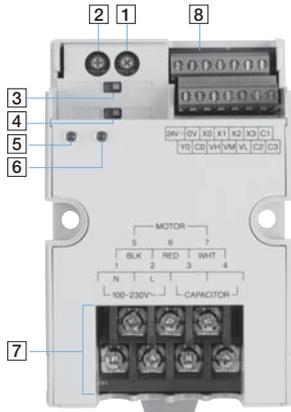
**5TK20GN-AW2U, 5TK20A-AW2U (115V 60Hz)**



**5TK20GN-CW2E, 5TK20A-CW2E (230V 50Hz)**



## Name and Function of each Part of the Power Controller



No.	Name	Description
1	Internal torque potentiometer (TORQUE)	Sets the motor torque.
2	Torque fine-tuning potentiometer (ADJUST)	Fine-tunes the variation in the motor torque with respect to the set torque.
3	Sink/source input select switch	Switches between the sink logic and source logic for the input circuit.
4	External voltage select switch	Switches between 5 V and 10 V according to the external DC power supply used when external DC voltage is used to set torque.
5	POWER LED (green)	Lights while the AC power is supplied.
6	ALARM LED (red)	Blinks while an alarm is present. (The alarm output turns OFF.)

### Main Circuit Terminals

Terminal No.	Terminal Name	Name	Description
1	N	AC power supply connection terminal	Connects the AC power supply. N: Neutral/L: Live
2	L		
3	CAPACITOR	Capacitor connection terminal	Connects the capacitor.
4			
5	BLK	Motor connection terminal	Connects the motor. BLK: Black/RED: Red/WHT: White
6	RED		
7	WHT		

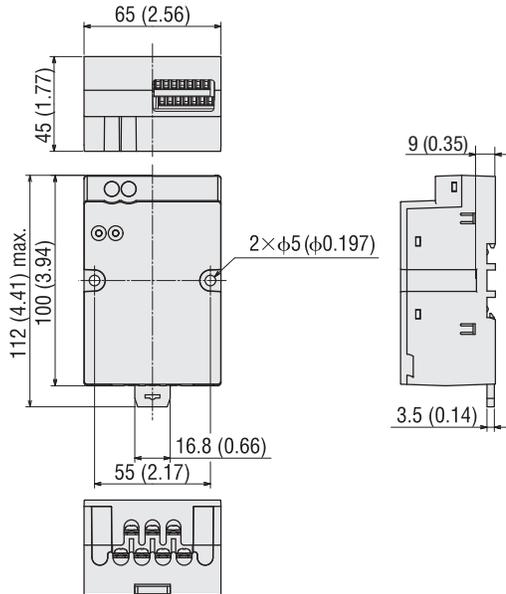
### Control Circuit Terminals

Terminal Name	Name	Description
24V ---	+24VDC	Connects the 24 VDC power for control circuit.
0V	0V	
X0	CW input	These inputs control the rotation direction and RUN/STOP mode of the motor. If both inputs turn ON simultaneously, the motor stops.
X1	CCW input	
X2	INT/EXT switch input	Switches between the internal and external torque settings.
X3	Alarm reset input	Resets alarms.
C1	IN-COM0	The polarity changes depending on whether the sink or source logic is applied. (Sink: 0 V/Source: 24 V)
Y0	Alarm output	These terminals output an alarm signal. Once generated, alarms will not be cleared unless reset. (4.5 to 26.4 VDC, 40 mA or less)
C0	OUT-COM	
VH	VH input	These inputs allow torque to be set using the external torque potentiometer or external DC voltage.
VM	VM input	
VL	VL input	
C2	IN-COM1	If an external power supply is used by applying the source logic, connect these terminals to the GND line of the external power supply. (Input signal common: 0 V)
C3		

## Dimensions

Unit = mm (inch)

Mass : 0.18kg (0.40 lb.)



## Accessory (Sold separately)

### External Torque Potentiometer

Use this potentiometer if motor torque must be set externally from the power controller.

Model: **PAVR-20KZ** (RoHS)  
(20 kΩ, 1/4 W, with a linear resistance vs. angle curve)



This product is manufactured at a plant certified with the international standards ISO 9001 (for quality assurance) and ISO 14001 (for systems of environmental management).

Specifications are subject to change without notice.  
This catalog was published in May, 2008.

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