

Koyo®

SSI Output Absolute Encoder Series TRD-MB

Operation Manual

Thank you for purchasing the TRD-MB series SSI Output Absolute Encoder. Please read this Operation Manual carefully before applying this product.

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KEW-M8173B-E

Safety Consideration

Warning This indicates contents which can cause large accidents leading to loss of life or severe injury when the indication is disregarded and wrong handling is executed.

Caution This indicates contents which can cause injury or material damage when the indication is disregarded and wrong handling is executed.

Explanation of the pictograms

- This symbol indicates a general prohibition.
- This symbol indicates a compulsory item or an instruction.

[Operating environment and conditions]

Warning

- Do not use in a combustible or explosive atmosphere. Otherwise personal injury or fire may be caused.
- Do not use this product for applications related to human safety. Use is assumed in an application where an accident or incorrect use will not immediately cause danger to humans.

[Operating environment and conditions]

Caution

- Use and store the equipment within the scope of the environment (vibrations, impact, temperature, humidity, etc.) specified in the specifications. Otherwise fire or product damage may be caused.
- Understand the product first before use it.

[Installation and wiring]

Warning

- Use only with the power supply voltage listed in the specifications. Otherwise fire, electric shock, or accidents may be caused.
- Use only with the wiring and layout specified in the specifications. Otherwise fire, electric shock, or accidents may be caused.
- Do not apply any kind of stress to the wires. Otherwise electric shock or fire may be caused.

Connection

Wire color	Function
Brown	5V
Blue	0V
White	Clock+
Gray	Clock-
Black	Data+
Purple	Data-
Yellow	Zero

*1 The yellow wire is used to set the zero position.
1. When the encoder is operating normally, the zero position setting wire should be connected to the 0V power wire.
2. Zero position setting steps: first rotate the encoder to the desired zero position, then connect the zero position setting wire to the 5V power wire for at least 100ms, then disconnect, and the setting is complete.
Note: If the encoder does not have the zero setting function, it does not have the yellow wire.

Composition of model number

TRD-**MB**4096**SS**-5M

- Outside diameter
Blank: $\phi 25$
38: $\phi 38$
- Shaft Type
Blank: solid shaft
H: hollow shaft (except for TRD-MB**)
- Resolution
Blank: Positive (CW)
R: Reverse (CCW)
- Count increases direction
Blank: Positive (CW)
R: Reverse (CCW)
- Output mode
SS: SSI single mode
SF: SSI continuous mode
- Cable length
Blank: Cable length is standard length
5M: Cable length is 5m

Electrical specifications

Item	Specification	Remark		
Output circuit	Line driver	SN65LBC179 or equivalent		
Power supply	Operating voltage	5V±0.25V DC		
	Allowable ripple	Max. 3%rms		
	Current consumption	Max. 50mA		
Output code	binary code	SSI serial output		
Clock frequency	33kHz~4MHz			
Input signal	Clock	V _{IH}	2.1V	The clock pulse signal outputs to the encoder.
		V _{IL}	0.9V	
Output signal	Data	V _{OH}	2.0V	The position data outputs from the encoder.
		V _{OL}	0.5V	
		I _O	15mA	

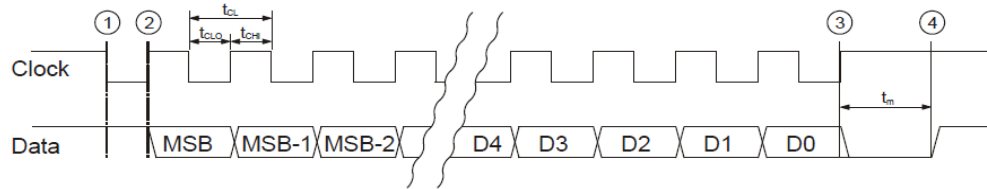
Resolution and Speed

Resolution	Maximum rotating speed (rpm)					
	4096	2048	1024	512	256	128
Output Mode SS	300	800	2000	4000	Mechanically permissible maximum rotating speed	
Output Mode SF	1000	2000	4000	Mechanically permissible maximum rotating speed		

Note: When the maximum rotating speed exceeds the upper limit, the electrical signal may be lost.

Brief description of SSI PROTOCOL

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Clock period	t _{CL}	0.25		2 x t _m	μs	
Clock high	t _{CHI}	0.1		t _m	μs	
Clock low	t _{CLO}	0.1		t _m	μs	
Monoflop time	t _m	15	19	25	μs	



SSI timing diagram with monoflop timeout

The users obtain the current position data by sending a continuous clock signal to the encoder. At the first falling edge (position ①), the encoder stores the current location information. At the first rising edge (position ②), the most significant bit of data is outputted through the data line (Data). At each subsequent rising edge of the clock signal, the next bit of data is outputted through the data line (Data). While reading the data, the t_{CHI} and t_{CLO} should be less than t_m. After reading a complete position data (point ③), the data line (Data) outputs low.

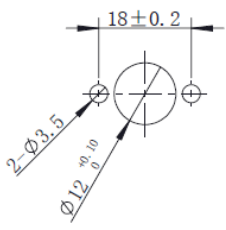
SS mode: After reading the previous position data, if you want to read the previous position data again, you need to continue to transmit the clock signal to the encoder. In this case, between two adjacent output data, the encoder outputs low for one clock cycle; if you want to read the new position data, you need to wait t_m time (the data line (Data) outputs high) for encoder to response.

SF mode: After reading the previous position data, if you want to continuously read the new position data, you need to continue to transmit the clock signal to the encoder. In this case, between two adjacent output data, the encoder outputs low for one clock cycle.

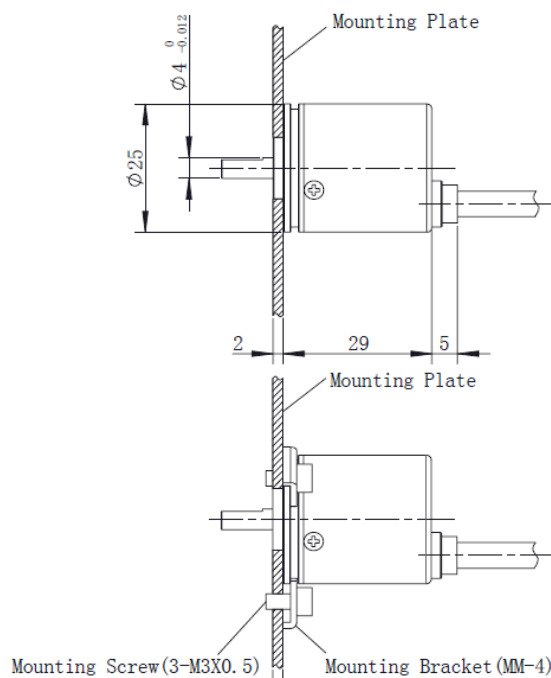
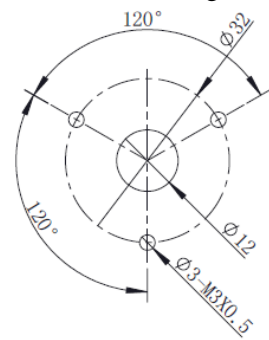
External dimensions and mounting

TRD-MB**

Two-hole mounting

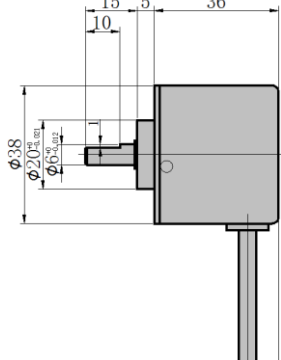
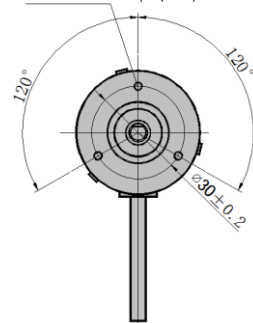


Bracket mounting



TRD-38MB**

3-M3 Screw Hole (Depth 7)



Mechanical specifications

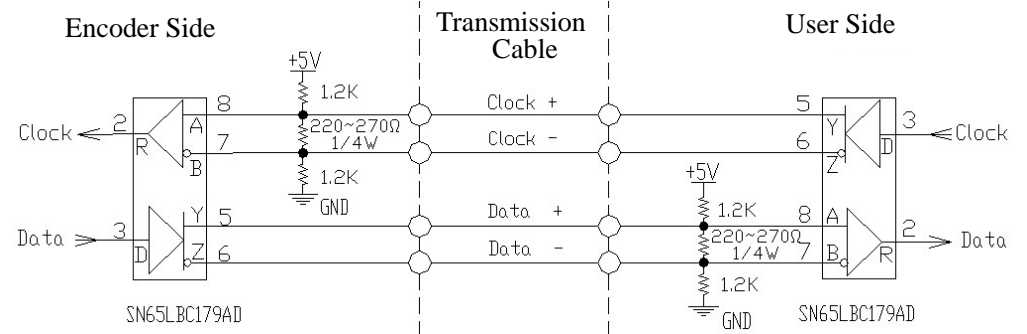
Model	TRD-MB**	TRD-38MB**
Starting torque	≤ 0.01N·m (+20°C)	≤ 0.1N·m (+20°C)
Max. allowable shaft load	Radial	10N
	Thrust	5N
Max. allowable speed	6000rpm	5000rpm
Cable	Material	Oil resistant PVC cable
	Outer diameter	Approx. φ 5mm (8 cores)
	Length	0.5m (Standard) / 1.0m (Standard)
	Specification	Nominal cross-sectional area is 0.14mm ² , AWG26
Weight	50g	111g

Environmental requirements

Model	TRD-MB**	TRD-38MB**
Ambient temperature	Operation	-25~+85°C
	Store	-40~+100°C
Ambient humidity	35~85%RH (non-condensing)	
Withstand voltage	AC500V (50/60Hz) for 1 min※1	
Insulation resistance	min. 20MΩ	
Vibration resistance	10 to 55Hz with 0.75mm amplitude Durable for 1h along 3 axes	
Shock resistance	11ms with 490m/s ² Applied 3 times 3 axes	
Protection construction	IP50	

※1 A capacitor of 0.01μF/630V is connected between 0V and FG wire. A capacitor of 0.01μF/630V is also connected between Vcc and FG wire.

Reference output circuit

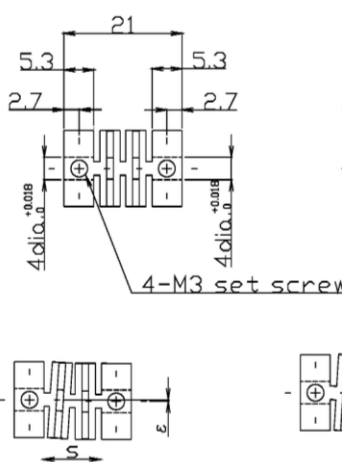


Cautions for use

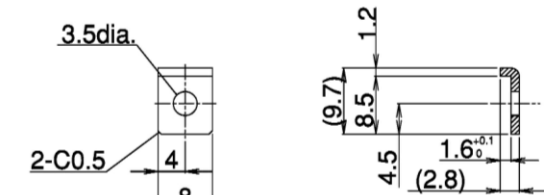
- Do not wire the cable in parallel with other power lines and do not share a duct with other cables.
- Use capacitors or surge absorption elements to remove the sparks caused by relays and switches in the control panel as far as possible.
- Be sure to connect all wires properly, as wrong wiring can damage the internal circuitry.
- Erroneous data may be caused at the time of power ON and power OFF. After power ON, wait for at least 0.5 sec. before use.
- Do not disassemble the product. Do not expose the product for a long time to water, even if it is a dust-resistant, jet-proof type. Wipe off any water getting onto the product.
- As the rotary encoder is composed of precision parts, its parts will be impaired when it is subjected to shocks. Use sufficient care for handling and mounting.

Options(Only Suitable for TRD-MB** Series)

Coupling(GJ-4)



Mounting bracket(MM-4)



Type No.	Material	α	ε	s
GJ-4	PBT resin	5° MAX	0.5mmMAX	0.12mmMAX