

# Koyo®

## Absolute Encoder Series TRD-MA

### Operation Manual

Thank you for purchasing this series TRD-MA Absolute Encoders. Please read this Operation Manual carefully before applying this product.

PLEASE KEEP MANUAL IN A SAFE PLACE!

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KEW-M8165A-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.



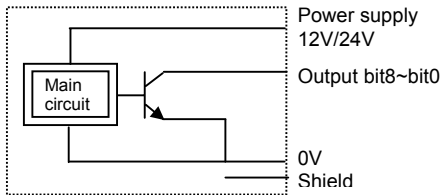
Use only with the wiring and layout specified in the specifications. Otherwise fire, electric shock, or accidents may be caused.



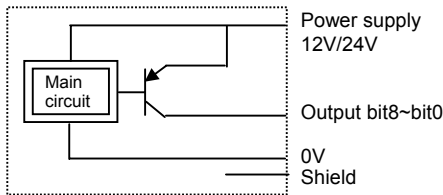
Do not apply any kind of stress to the wires. Otherwise electric shock or fire may be caused.

### Output circuit

#### 1. NPN Output



#### 2. PNP Output



### Connection

Pin number	Color of cable	Resolution				
		512	256/180	128/90	64	32
1	Blue	0V	←	←	←	←
2	Brown	10.8~26.4V	←	←	←	←
3	Black	Not connected	←	←	←	←
4	Red	Bit1 (2 <sup>0</sup> )	Not connected	←	←	←
5	Orange	Bit2 (2 <sup>1</sup> )	Bit1 (2 <sup>0</sup> )	Not connected	←	←
6	Yellow	Bit3 (2 <sup>2</sup> )	Bit2 (2 <sup>1</sup> )	Bit1 (2 <sup>0</sup> )	Not connected	←
7	Green	Bit4 (2 <sup>3</sup> )	Bit3 (2 <sup>2</sup> )	Bit2 (2 <sup>1</sup> )	Bit1 (2 <sup>0</sup> )	Not connected
8	Purple	Bit5 (2 <sup>4</sup> )	Bit4 (2 <sup>3</sup> )	Bit3 (2 <sup>2</sup> )	Bit2 (2 <sup>1</sup> )	Bit1 (2 <sup>0</sup> )
9	Gray	Bit6 (2 <sup>5</sup> )	Bit5 (2 <sup>4</sup> )	Bit4 (2 <sup>3</sup> )	Bit3 (2 <sup>2</sup> )	Bit2 (2 <sup>1</sup> )
10	White	Bit7 (2 <sup>6</sup> )	Bit6 (2 <sup>5</sup> )	Bit5 (2 <sup>4</sup> )	Bit4 (2 <sup>3</sup> )	Bit3 (2 <sup>2</sup> )
11	Black/White	Bit8 (2 <sup>7</sup> )	Bit7 (2 <sup>6</sup> )	Bit6 (2 <sup>5</sup> )	Bit5 (2 <sup>4</sup> )	Bit4 (2 <sup>3</sup> )
12	Red/White	Bit9 (2 <sup>8</sup> )	Bit8 (2 <sup>7</sup> )	Bit7 (2 <sup>6</sup> )	Bit6 (2 <sup>5</sup> )	Bit5 (2 <sup>4</sup> )
13	Blue/White	RESET	←	←	←	←
Shield		GND	←	←	←	←

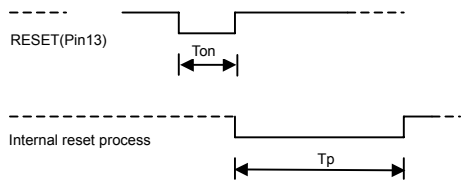
Note1: The shielded cable is connected to the encoder body. The enclosure is connected with 0V line through a capacitance.

Note2: The Pin 13(RESET) is used to set the home position (If not use the function, pin13 can be not connected.). Two method shows followed:

- Used a machine switch or a relay to connect the 0V terminal and the RESET terminal. When the switch or the relay turn ON, the current position set to the home position. Otherwise, it need to keep the switch or the relay OFF.
- Connect the voltage signal to the 0V terminal and the RESET terminal. The current position set to the home position as the voltage among 0 to 0.8V range. Otherwise, it need to keep the voltage in range of 5 to 24VDC.

After finished the setting, the home position LED lighting.

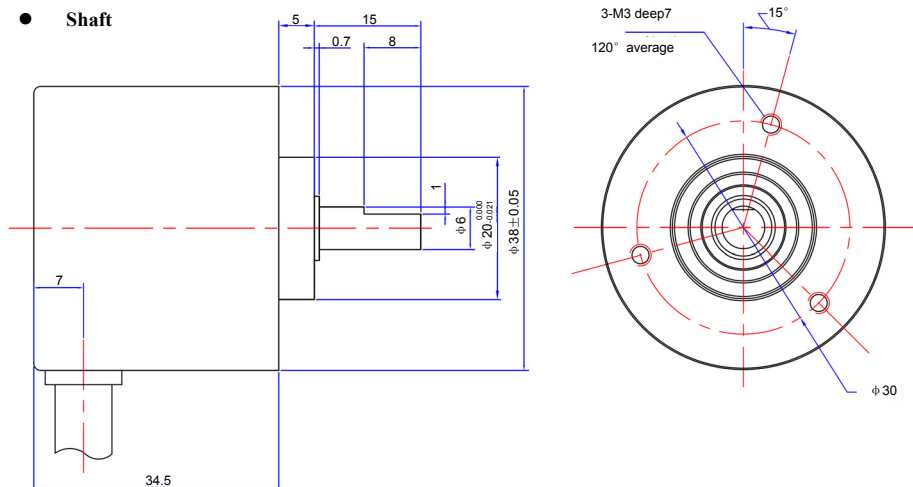
Please consider the timing of control in use. The chart is showed below.



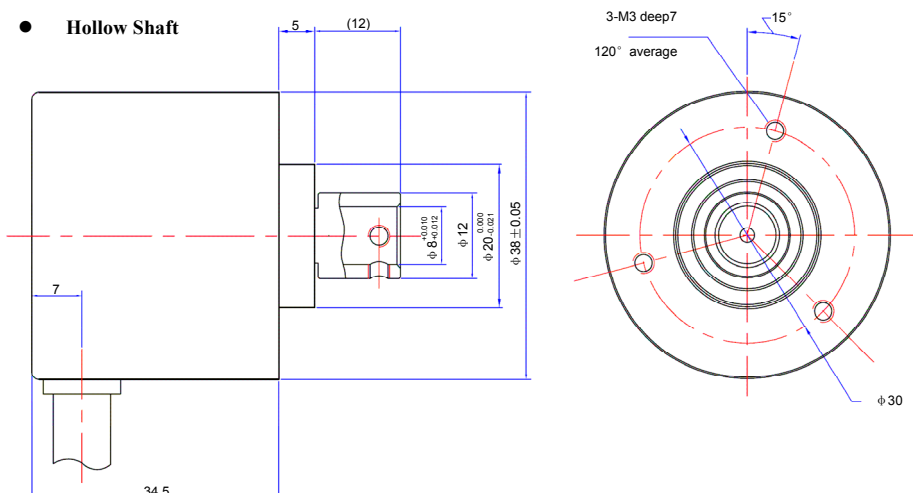
Ton express availability time of control signal, in the other words that means the minimum time of the switch or the relay turn ON (or means the time of the voltage is keeping to 0 to 0.8V range among the 0V terminal and the RESET terminal),  $T_{on} \geq 20\mu s$ ; Tp express the time of Internal Reset Process,  $T_p < 80ms$ . Internal reset process will begins at rising edge of Ton. Please attention that the encoder hasn't any output signal in the Tp process of internal reset.

### External dimensions

#### Shaft



#### Hollow Shaft



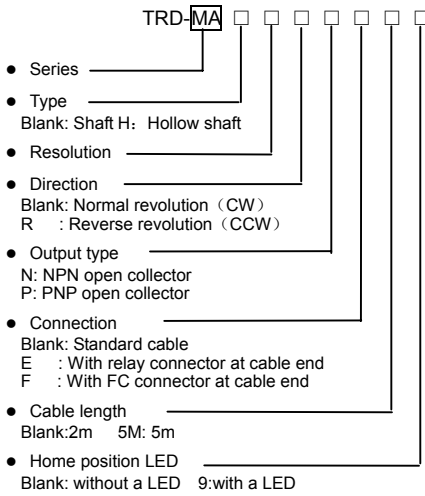
### Mechanical specifications

Starting torque	Max. 0.01N · m (+20°C)
Shaft moment of inertia	0.3 × 10 <sup>-6</sup> kg · m <sup>2</sup>
Max. allowable shaft load	Radial 20N
	Thrust 30N
Max. allowable speed	3000rpm
Cable	Material Oil-resistant PVC(with shielded cable)
	Nominal core cross section 0.14mm <sup>2</sup>
	External diameter Approx. 7.0mm
Weight	Approx. 150g(cable length 2m)

### Environmental requirements

Ambient temperature	Operation temperature: -20 ~ +75°C Storage temperature: -25 ~ +85°C
Ambient humidity	35 ~ 85%RH (non-condensing)
Withstand voltage	AC500V 1minute
Insulation resistance	10MΩ min.
Vibration resistance	Durable for 1h along 3 axes at 10 to 55Hz with 0.75mm amplitudes
Shock resistance	11ms with 490m/s <sup>2</sup> applied 3 times 3 axes
Protection construction	Dust proof: IP50 (magnetoconductivity cast-iron casing)

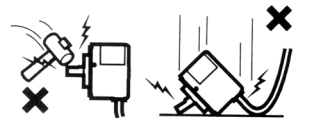
### Composition of model number



- Series: TRD-MA
- Type: Blank: Shaft H: Hollow shaft
- Resolution: Blank: Normal revolution (CW) R: Reverse revolution (CCW)
- Direction: Blank: Normal revolution (CW) R: Reverse revolution (CCW)
- Output type: N: NPN open collector P: PNP open collector
- Connection: Blank: Standard cable E: With relay connector at cable end F: With FC connector at cable end
- Cable length: Blank: 2m 5M: 5m
- Home position LED: Blank: without a LED 9: with a LED

### Electrical specifications

Type No.	TRD-MA		
Power supply	Operating voltage	10.8V ~ 26.4V DC	
	Allowable ripple	3%rms Max.	
	Current consumption	50mA Max. (without load)	
Output waveform	Signal format	Binary gray code	
	Max. response frequency	30kHz	
	Operating speed	(Maximum response frequency/Pulse) × 60 (The encoder can not respond to revolution over the maximum speed.)	
	Precision	(360/resolution) °	
Output	Direction	Output code increments in positive of CW. Output code decrements in negative of CCW (CW means clockwise revolution viewed from the shaft.)	
	Rising/falling time	2μs Max.	
	Output type	open collector output(NPN)   open collector output(PNP)	
	Output logic	Negative logic (low active)   Positive logic (high active)	
	Residual voltage	I <sub>o</sub> =16mA	0.4V Max.
		I <sub>o</sub> =32mA	1.5V Max.
	Inflow current	32mA Max.	
Load power supply voltage	DC30V Max.		



### 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.
- Use a specified coupling for connecting the encoder shaft and the shaft of a machine to be controlled. Do not squeeze the shaft into the coupling.
- The service life of the bearing is largely affected by the amount of load to the shaft. Try to reduce the load as much as possible.
- Do not disassemble the product.
- As the rotary encoder is composed of precision parts, its function will be impaired when it is subjected to shocks. Use sufficient care for handling and mounting.

### Options

Type No.	Material	α	ε	s
RU-075	Aluminum alloy (7075)	5° MAX	0.25mmMAX	0.12mmMAX
GJ-6	Glass-fiber reinforced polyacetal resin	5° MAX	0.5mmMAX	0.12mmMAX