

# 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.

**This edition manual is applied to products that the batch number is 136B or later.**  
PLEASE KEEP MANUAL IN A SAFE PLACE!

#### KOYO ELECTRONICS (WUXI) CO.,LTD.

Add: 21st Floor, Building 1, No.599, Jianzhuxi Road, Binhu District, Wuxi, Jiangsu, P.R.China  
Pc: 214072 Tel: (0510)85167888 Fax: (0510)85161393  
KEW-M8165E-F

### 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.

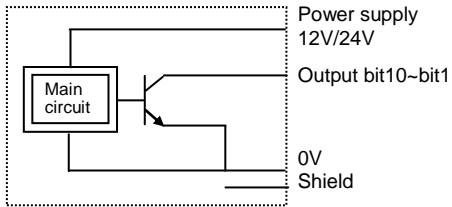
#### [Installation and wiring]

**Warning**

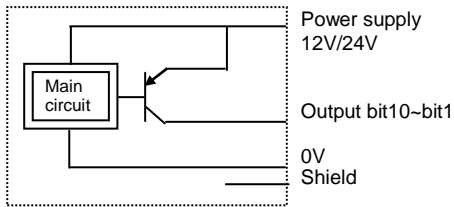
- Use only with the power supply voltage listed in the specifications. Otherwise fire, electric shock, or accidents may be caused.
- Use only with the wiring and layout specified in the specifications. Otherwise fire, electric shock, or accidents may be caused.
- Do not apply any kind of stress to the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

### Output circuit

#### 1. NPN Output



#### 2. PNP Output



### Connection

Pin number	Color of cable	Resolution					
		1024	512	256/180	128/90	64	32
1	Blue	0V	←	←	←	←	←
2	Brown	10.8~26.4V	←	←	←	←	←
3	Black	Bit1 (2 <sup>0</sup> )	Not connected	←	←	←	←
4	Red	Bit2 (2 <sup>1</sup> )	Bit1 (2 <sup>0</sup> )	Not connected	←	←	←
5	Orange	Bit3 (2 <sup>2</sup> )	Bit2 (2 <sup>1</sup> )	Bit1 (2 <sup>0</sup> )	Not connected	←	←
6	Yellow	Bit4 (2 <sup>3</sup> )	Bit3 (2 <sup>2</sup> )	Bit2 (2 <sup>1</sup> )	Bit1 (2 <sup>0</sup> )	Not connected	←
7	Green	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> )	Not connected
8	Purple	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> )	Bit1 (2 <sup>0</sup> )
9	Gray	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> )	Bit2 (2 <sup>1</sup> )
10	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> )	Bit3 (2 <sup>2</sup> )
11	Black/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> )	Bit4 (2 <sup>3</sup> )
12	Red/White	Bit10 (2 <sup>9</sup> )	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 (Home position setting Pin) To use the home position setting function, please see Note3 for detail.					
Shield		GND	←	←	←	←	←

Note1: The shielded cable isn't connected to the encoder body. The enclosure is connected with 0V line through a capacitance.

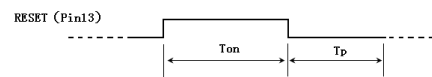
Note2: The shielded cable can not be connected with the internal signal line.

Note3: The Pin 13(RESET) is used to set the home position. Two method shows followed:

- Used a mechanical switch or a relay to connect the RESET terminal with the 0V terminal. When the switch or the relay turn OFF, the current position set to the home position. Otherwise, it needs to keep the switch or the relay ON. (or short the RESET terminal and the 0V terminal.)
- Connect the voltage signal to the RESET terminal and the 0V terminal. The current position will be set to the home position as the voltage between DC5V to DC24V range. Otherwise, it needs to keep the voltage in range of 0 to 0.8VDC.

After finished the setting, the encoder output code will reset to '0', which means the current position is the home position. In the meantime the home position LED will be lighting(for type with home position LED).

If you needn't the home position setting function, you should short the RESET terminal and the 0V terminal when you use the encoder.

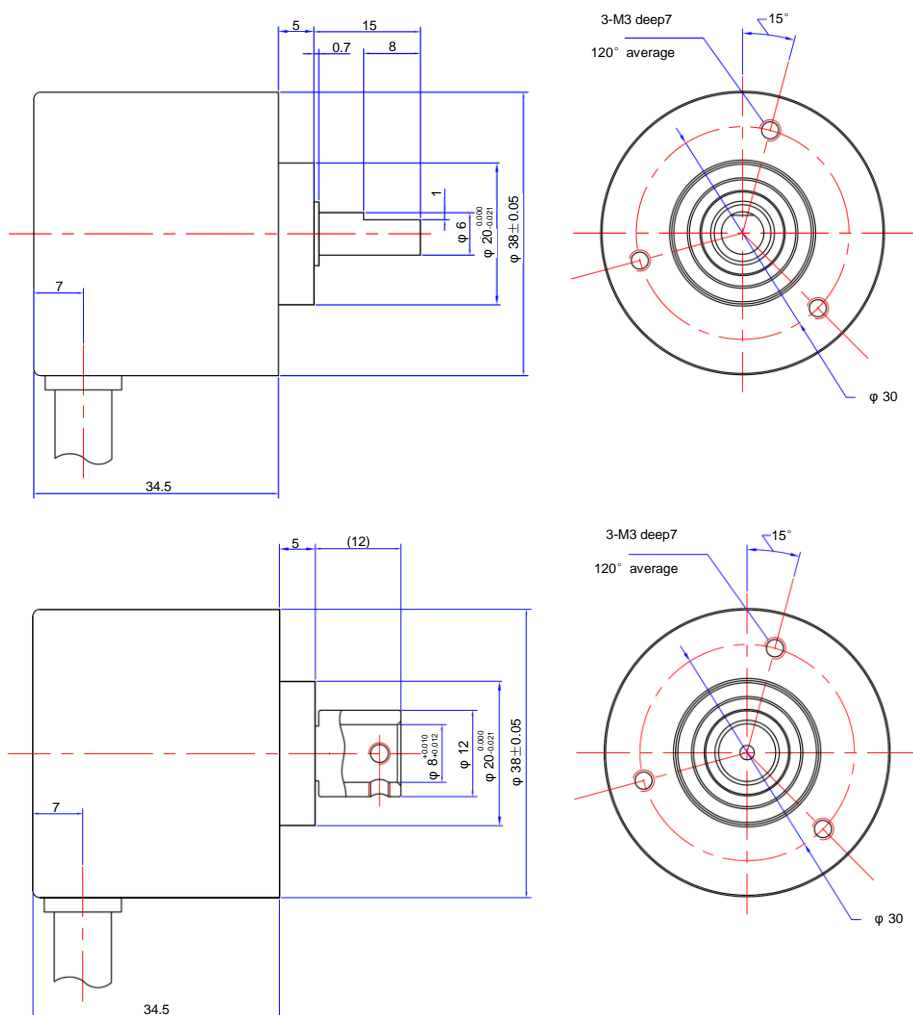


The timing chart of RESET signal for home position setting is showed left:

**Ton**: denotes effective time of control signal, it means the minimum time of the switch or the relay turn OFF (or means the time of the voltage is kept to DC5V to DC24V range among the 0V terminal and the RESET terminal). Ton > 120ms.

**Tp**: denotes the time of Reset Process after received the effective RESET signal. Tp < 80ms.

### External dimensions



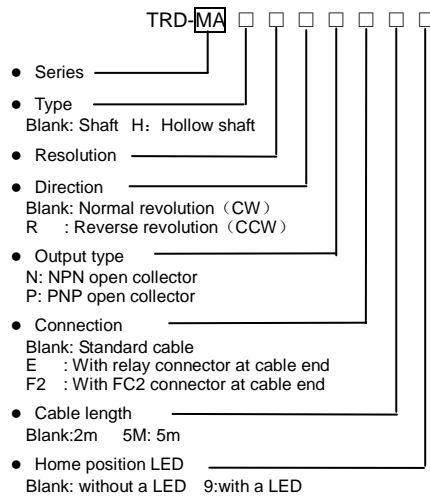
### Mechanical specifications

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 proofed:IP50 (magnetic permeability cast-iron casing)

### Composition of model number



### 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	
	Electric Max. allowable speed	(Maximum response frequency/Pulse)×60 (The encoder can not respond to revolution faster than the electric maximum allowable speed.)	
	Precision	(360/resolution) °	
Output	Direction	Output code increments in positive direction of CW. Output code decrements in negative direction 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

**RU-075**      **GJ-6**

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