Light-duty Incremental Encoders (Metric-dimension Encoders)

TRD-MX series

Features

A light-duty incremental rotary encoder that is a cost-effective encoder for small applications; has the following features:

- Small body with 25 mm diameter and 29 mm depth
- 4 mm diameter solid shaft
- Resolution available from 100 pulses per revolution to 1024 pulses per revolution
- Open collector output (4.5–13.2 or 10.8–26.4 VDC), or line driver output (4.75–5.25 VDC)
- Up to 100 kHz response frequency
- Two-meter cable with tinned ends
- IP50 environmental rating
- Mounting bracket and couplings are available

TRD-MXxxxx-AD/BD models

TRD-MXxxxx-VD models

Light-duty Solid-shaft Incremental Encoders (NPN Open-collector Output, TRD-MXxxxAD/BD)				
Part Number	***Pulses per Revolution***	***Input Voltage***	***Output***	***Body Dia.***
TRD-MX100AD	100	4.5–13.2 VDC	NPN Open Collector	25 mm
TRD-MX360AD	360			
TRD-MX500AD	500			
TRD-MX1000AD	1000			
TRD-MX1024AD	1024			
TRD-MX100BD	100	10.8–26.4 VDC		
TRD-MX360BD	360			
TRD-MX500BD	500			
TRD-MX1000BD	1000			
TRD-MX1024BD	1024			

Light-duty Solid-shaft Incremental Encoders (Line Driver Output, TRD-MXxxxVD)				
Part Number	***Pulses per Revolution***	***Input Voltage***	***Output***	***Body Dia.***
TRD-MX100VD	100	4.75–5.25 VDC	Line Driver	25 mm
TRD-MX360VD	360			
TRD-MX500VD	500			
TRD-MX1000VD	1000			
TRD-MX1024VD	1024			

Accessories

Accessories for TRD-MX Series Encoders	
Part Number	***Description***
MM-4D	Servo mounting clamp for TRD-MX series encoders
MT-030D	Right-angle mounting bracket for TRD-MX series encoders

MM-4D

MT-030D

Couplings

For encoders with a solid shaft, please select a coupling that fits your encoder. All couplings are typically in stock, and ready to ship.

See the "Encoder Couplings" section for more information.

Couplings

Light-duty Incremental Encoders (Metric-dimension Encoders)

Specifications – TRD-MX series

Electrical Specifications (Metric-dimension Light-duty TRD-MX)					
Model			**TRD-MXxxxAD (open collector)**	**TRD-MXxxxBD (open collector)**	**TRD-MXxxxVD (line driver)**
Power Supply	**Operating Voltage ***		5–12 VDC (nominal) * 4.5–13.2 VDC	12–24 VDC (nominal) * 10.8–26.4 VDC	5VDC (nominal) * 4.75–5.25 VDC
	Allowable Ripple		3% rms max		
	Current Consumption		50 mA max (no load)		
	Circuit Protection Required		Limit current to 100 mA or less		–
Output Waveform	**Signal Waveform**		Quadrature + home position		
	Max. Response Frequency		100 kHz		
	Operating Speed		(max response frequency / resolution) x 60 Hz		
	Duty Ratio (Symmetry)		50% ±25%		
	Index Signal Width (at Home Position)		100% ±50%		
Output	**Rise/Fall Time ******		2µs ** (sink current < 30 mA)		0.1 µs max ** (source current < 20 mA)
	Output Type		Open collector (NPN sinking)		Line driver (26C31 or equivalent)
	Output Logic		Negative logic (active low)		Positive logic (active high)
	Output Current	**Inflow**	30 mA max		20 mA max
		Outflow	–		
	Output Voltage	**H**	–		2.5V min (source current < 20 mA)
		L	0.4V max (sink current < 30 mA)		0.5V max (source current < 20 mA)
	Load Power Voltage		30 VDC max		–
	Short-circuit Protection		–		–

To be supplied by Class II source.
****Cable length ≤2m or less. Maximum load.***

Mechanical Specifications (Metric-dimension Light-duty TRD-MX)	
Starting Torque	0.001 N·m [0.009 lb·in] max @ 20 °C [68 °F]
Max. Allowable Shaft Load	Axial: 5N [1.1 lb]; Radial: 10N [2.2 lb]
Max. Allowable Speed	6000 rpm (highest speed that can support the mechanical integrity of encoder)
Wire Size	26 AWG, shielded, oil-resistant PVC
Weight	approx 120g [0.3 lb]

Environmental Specifications (Metric-dimension Light-duty TRD-MX)	
Ambient Temperature	-10 to 70 °C [14 to 158 °F]
Storage Temperature	-25 to 85 °C [-13 to 185 °F]
Operating Humidity	35–85% RH (non-condensing)
Withstand Voltage *	630V grounded through capacitor (a 630V cap is connected between 0V & FG lines)
Insulation Resistance	20 MΩ min
Vibration Resistance	durable for one hour along three axes @ 10 to 55 Hz with 0.75 mm half-amplitude
Shock Resistance	490 m/s^2 (11 ms applied 3-times, each X, Y, Z)
Mounting Orientation	can be mounted in any orientation
Protection	IP50
Agency Approvals	CE, RoHS, $_{c}UL_{US}$ (E189395)

Withstand voltage is good for power supply, signal, and case; not good for shield wire.

Light-duty Incremental Encoders (Metric-dimension Encoders)

Specifications – TRD-MX series

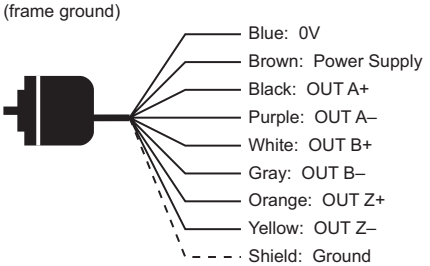
Wiring Diagrams

Open Collector Connections

Cable shield is connected to the encoder body (frame ground)

Line Driver Connections

Cable shield is connected to the encoder body (frame ground)



How to read the timing charts

Open Collector Models

Out A and Out B are 90 degrees out of phase. Like any quadrature encoder, four unique logic states are created internally to the encoder. This is based on the rising edge to rising edge (one cycle) on channel A or B that indicates one set of bars on the internal encoder disk has passed by the optical sensor.

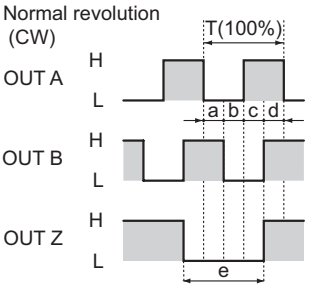
OUT Z is the absolute reference added to an incremental encoder and is also known as home position. It signifies a full rotation of the encoder shaft. It pulses once per revolution.

Line Driver Models

Channel A (OUT A and A-not) and Channel B (OUT B and B-not) are also 90 degrees out of phase on line driver encoders. OUT Z is the same as on open collector models, and is the absolute reference (home position). It signifies one full rotation of the encoder shaft. It pulses once per revolution.

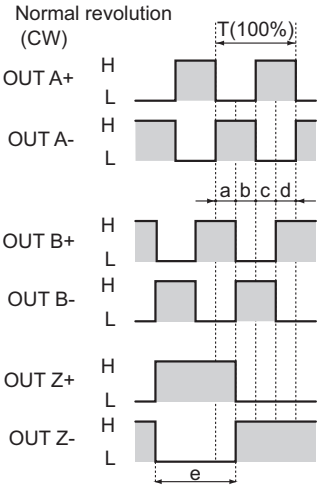
Channel Timing Charts

Open Collector Models (TRD-MXxxxAD/BD)



a, b, c, d = 0.25T ±0.125T; e = 1T ±0.125T
"Normal" means clockwise revolution viewed from the shaft

Line Driver Models (TRD-MXxxxVD)

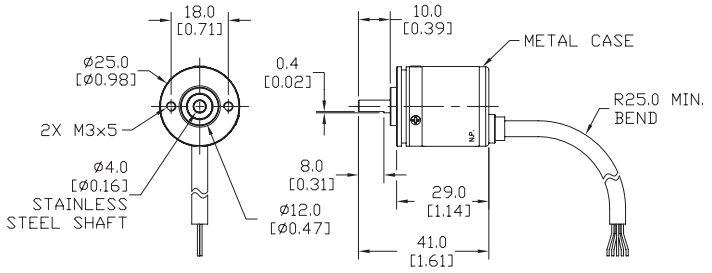


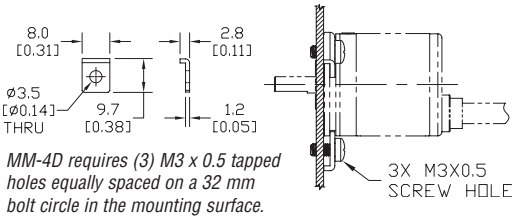
a, b, c, d = 0.25T ±0.125T; e = 1T ±0.125T
"Normal" means clockwise revolution viewed from the shaft

Dimensions – TRD-MX series

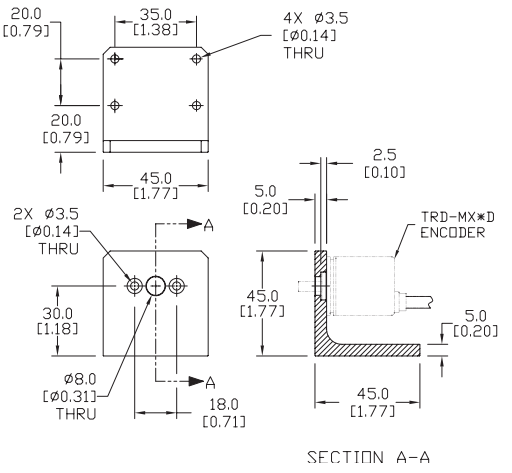
Dimensions = mm [in]

TRD-MXxxxxD





MM-4D requires (3) M3 x 0.5 tapped holes equally spaced on a 32 mm bolt circle in the mounting surface.



Light-duty Incremental Encoders (Metric-dimension Encoders)

TRD-S(H) series

Features

A light-duty encoder is a cost-effective encoder for small applications and has the following features:

- Small body with 38 mm diameter and 30 mm depth
- Dust proof (IP40 rating)
- 6 mm solid shaft or 8 mm hollow shaft
- Resolution available from 100 pulses per revolution to 2500 pulses per revolution
- Open collector or line driver output
- Up to 200 kHz response frequency
- Two-meter cable, tinned ends

Solid-shaft (TRD-S) model

Hollow-shaft (TRD-SH) model

Light Duty Solid Shaft Incremental Encoders (NPN Open Collector and Line Driver models)

Part Number	Pulses per Revolution	Input Voltage	Output	Body Diameter
TRD-S100-BD	100	12–24 VDC	NPN open collector	38mm
TRD-S200BD	200			
TRD-S250BD	250			
TRD-S300BD	300			
TRD-S360-BD	360			
TRD-S400BD	400			
TRD-S500-BD	500			
TRD-S600BD	600			
TRD-S800BD	800			
TRD-S1000-BD	1000			
TRD-S1024-BD	1024			
TRD-S1200BD	1200			
TRD-S2000BD	2000			
TRD-S2500-BD	2500			
TRD-S100-VD	100	5VDC	Line driver (differential)	
TRD-S200VD	200			
TRD-S250VD	250			
TRD-S300VD	300			
TRD-S360-VD	360			
TRD-S400VD	400			
TRD-S500-VD	500			
TRD-S600VD	600			
TRD-S800VD	800			
TRD-S1000-VD	1000			
TRD-S1024-VD	1024			
TRD-S1200VD	1200			
TRD-S2000VD	2000			
TRD-S2500-VD	2500			

Light Duty Hollow Shaft Incremental Encoders (NPN Open Collector and Line Driver models)

Part Number	Pulses per Revolution	Input Voltage	Output	Body Diameter
TRD-SH100-BD	100	12–24 VDC	NPN open collector	38mm
TRD-SH200BD	200			
TRD-SH250BD	250			
TRD-SH300BD	300			
TRD-SH360-BD	360			
TRD-SH400BD	400			
TRD-SH500-BD	500			
TRD-SH600BD	600			
TRD-SH800BD	800			
TRD-SH1000-BD	1000			
TRD-SH1024BD	1024			
TRD-SH1200BD	1200			
TRD-SH2000BD	2000			
TRD-SH2500-BD	2500			
TRD-SH100-VD	100	5VDC	Line driver (differential)	
TRD-SH200VD	200			
TRD-SH250VD	250			
TRD-SH300VD	300			
TRD-SH360-VD	360			
TRD-SH400VD	400			
TRD-SH500-VD	500			
TRD-SH600VD	600			
TRD-SH800VD	800			
TRD-SH1000-VD	1000			
TRD-SH1024VD	1024			
TRD-SH1200VD	1200			
TRD-SH2000VD	2000			
TRD-SH2500-VD	2500			

Light-duty Incremental Encoders (Metric-dimension Encoders)

Specifications – TRD-S(H) series

Electrical Specifications				
Model			***TRD-Sxxxx-BD TRD-SHxxxxBD (open collector)***	***TRD-Sxxxx-VD TRD-SHxxxxVD (line driver)***
Power Supply	***Operating Voltage ****		12–24 VDC (nominal) * Range: 10.8–26.4 VDC	5VDC (nominal) * Range: 4.75–5.25 VDC
	Allowable Ripple		3% max.	150 mA max.
	Current Consumption		50 mA max.	
Signal Waveform			Quadrature + home position	
Max. Response Frequency			200kHz	
Operating Speed			(max response frequency / resolution) x 60	
Duty Ratio			50% ±25%	
Phase Difference Width			25% ±12.5%	
Signal Width at Home Position			100 ±50%	
Output	***Rise/Fall Time***		1µs max. (when cable length is 1m)	–
	Output Type		NPN open collector output, sinking	Line driver output (26C31 or equivalent)
	Output Logic		Negative logic (active low)	Negative logic (active high)
	Output Voltage	***H***	–	2.5 V min.
		L	0.4 V max.	0.5 V max.
	Current		30mA max.	20 mA max.
	Load Power Voltage		35 VDC max.	–
	Short-Circuit Protection		Between output and power supply	–

**** To be supplied by Class II source***

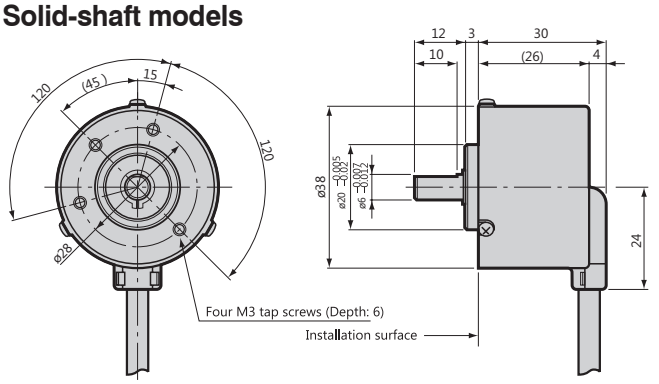
Mechanical Specifications	
Starting Torque	0.001 Nm (0.00074 ft/lb) max
Max. Allowable Shaft Load	Radial: 20N (4.5 lb); Axial: 10N (2.25 lb)
Max. Allowable Speed	6000 rpm (highest speed that can support the mechanical integrity of encoder)
Wire Size	AWG26
Mounting Orientation	can be mounted in any orientation
Weight	approx. 150g (5.3 oz) with 2m cable

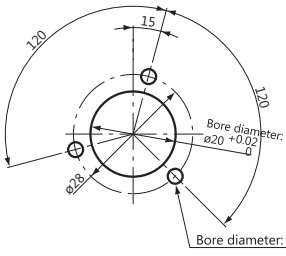
Environmental Specifications	
Ambient Temperature	-10 to 70°C; 14 to 158°F
Storage Temperature	-25 to 85°C; -13 to 185°F
Operating Humidity	35–85% RH
Withstand Voltage	500VAC (50/60Hz) for one minute
Insulation Resistance	50MΩ min.
Vibration Resistance	durable for one hour along three axes at 10 to 55 Hz with 0.75 amplitude
Shock Resistance	11 ms with 490 m/s^2 applied three times along three axes
Protection	IP40

Light-duty Incremental Encoders (Metric-dimension Encoders)

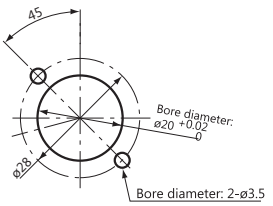
Dimensions – TRD-S(H) series

Solid-shaft models



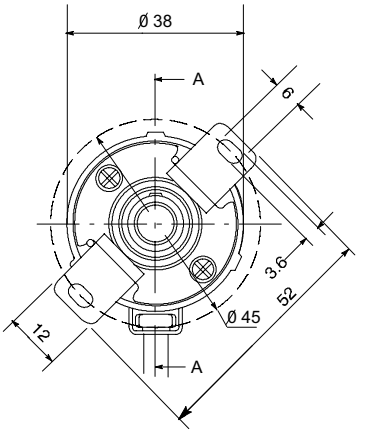


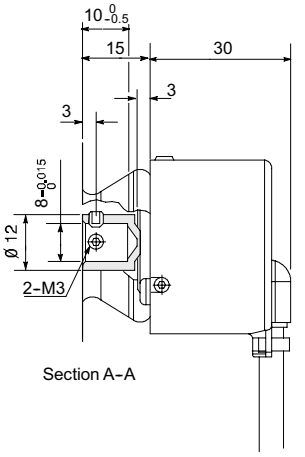
Mounting hole panel cutout (3 holes)



Mounting hole panel cutout (2 holes)

Hollow-shaft models





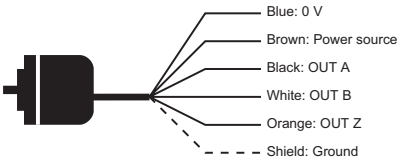
Section A–A

All dimensions in mm
1mm = 0.03937in

Wiring diagrams

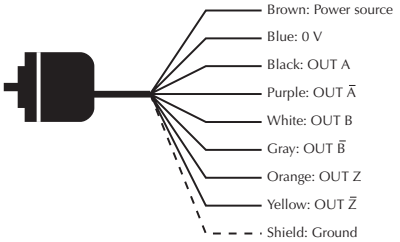
Open collector connections

Cable shield is not connected to the encoder body; enclosure is grounded through the 0V wire



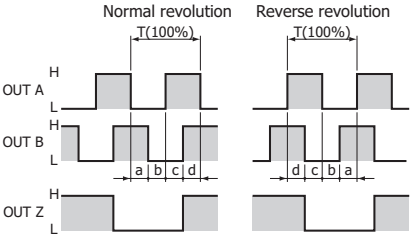
Line driver connections

Cable shield is not connected to the encoder body; enclosure is grounded through the 0V wire

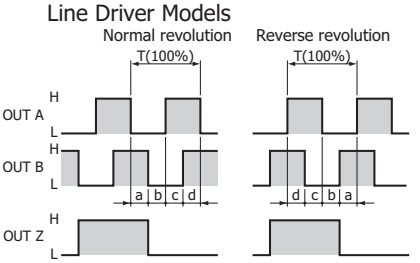


Channel timing charts

Open Collector Models



Line Driver Models



a, b, c, =1/4T±1/8T
"Normal" means clockwise revolution viewed from the shaft.

How to read the timing charts

Open Collector Models

Out A and Out B are 90 degrees out of phase. Like any quadrature encoder, four unique logic states are created internally to the encoder. This is based on the rising edge to rising edge (one cycle) on channel A or B that indicates one set of bars on the internal encoder disk has passed by the optical sensor.

OUT Z is the absolute reference added to an incremental encoder and is also known as home position. It signifies a full rotation of the encoder shaft.

Line Driver Models

Channel A (OUT A and A-not) and Channel B (OUT B and B-not) are also 90 degrees out of phase on line driver encoders. OUT Z is the same as on open collector models, and is the absolute reference (home position). It signifies one full rotation of the encoder shaft.