Medium-duty Incremental Encoders (Metric-dimension Encoders)

TRD-N(H) series

Features

The medium duty encoder offers the greatest flexibility of choice in a very high-quality encoder, all for a very low price. Features:

- Small body with 50 mm diameter and 35 mm depth
- Splash proof (IP65 rating)
- 8 mm solid shaft or 8 mm hollow shaft
- Incremental resolution available from 3 pulses per revolution to 5,000 pulses per revolution
- Line driver or Totem-pole (push-pull) output
- Up to 200 kHz response frequency

Solid-shaft (TRD-N) model

Hollow-shaft (TRD-NH) model

Incremental Medium Duty Solid Shaft Encoders (Totem-pole Output, TRD-Nxxx-RZWD)				
Part Number	***Pulses per Revolution***	***Input Voltage***	***Output***	***Body Dia.***
TRD-N10-RZWD	10	5–30 VDC	Totem-pole (push-pull) sink/source	50 mm
TRD-N30-RZWD	30			
TRD-N40-RZWD	40			
TRD-N50-RZWD	50			
TRD-N60-RZWD	60			
TRD-N100-RZWD	100			
TRD-N120-RZWD	120			
TRD-N200-RZWD	200			
TRD-N240-RZWD	240			
TRD-N250-RZWD	250			
TRD-N300-RZWD	300			
TRD-N360-RZWD	360			
TRD-N400-RZWD	400			
TRD-N480-RZWD	480			
TRD-N500-RZWD	500			
TRD-N600-RZWD	600			
TRD-N750-RZWD	750			
TRD-N1000-RZWD	1000			
TRD-N1024-RZWD	1024			
TRD-N1200-RZWD	1200			
TRD-N2000-RZWD	2000			
TRD-N2500-RZWD	2500			
TRD-N3000-RZWD	3000			
TRD-N3600-RZWD	3600			
TRD-N5000-RZWD	5000			

Incremental Medium Duty Hollow Shaft Encoders (Totem-pole Output, TRD-NHxxx-RZWD)				
Part Number	***Pulses per Revolution***	***Input Voltage***	***Output***	***Body Dia.***
TRD-NH10-RZWD	10	5–30 VDC	Totem-pole (push-pull) sink/source	50 mm
TRD-NH30-RZWD	30			
TRD-NH40-RZWD	40			
TRD-NH50-RZWD	50			
TRD-NH60-RZWD	60			
TRD-NH100-RZWD	100			
TRD-NH120-RZWD	120			
TRD-NH200-RZWD	200			
TRD-NH240-RZWD	240			
TRD-NH250-RZWD	250			
TRD-NH300-RZWD	300			
TRD-NH360-RZWD	360			
TRD-NH400-RZWD	400			
TRD-NH480-RZWD	480			
TRD-NH500-RZWD	500			
TRD-NH600-RZWD	600			
TRD-NH750-RZWD	750			
TRD-NH1000-RZWD	1000			
TRD-NH1024-RZWD	1024			
TRD-NH1200-RZWD	1200			
TRD-NH2000-RZWD	2000			
TRD-NH2500-RZWD	2500			
TRD-NH3000-RZWD	3000			
TRD-NH3600-RZWD	3600			
TRD-NH5000-RZWD	5000			

Medium-duty Incremental Encoders

(Metric-dimension Encoders)

TRD-N(H) series

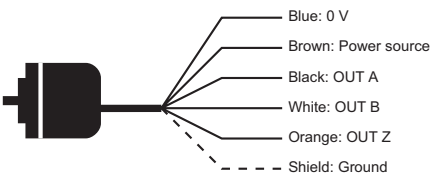
Incremental Medium Duty Solid Shaft Encoders (Line Driver Output, TRD-Nxxx-RZVWD)				
Part Number	Pulses per Revolution	Input Voltage	Output	Body Dia.
TRD-N10-RZVWD	10	5VDC	Line driver (differential)	50 mm
TRD-N30-RZVWD	30			
TRD-N40-RZVWD	40			
TRD-N50-RZVWD	50			
TRD-N60-RZVWD	60			
TRD-N100-RZVWD	100			
TRD-N120-RZVWD	120			
TRD-N200-RZVWD	200			
TRD-N240-RZVWD	240			
TRD-N250-RZVWD	250			
TRD-N300-RZVWD	300			
TRD-N360-RZVWD	360			
TRD-N400-RZVWD	400			
TRD-N480-RZVWD	480			
TRD-N500-RZVWD	500			
TRD-N600-RZVWD	600			
TRD-N750-RZVWD	750			
TRD-N1000-RZVWD	1000			
TRD-N1024-RZVWD	1024			
TRD-N1200-RZVWD	1200			
TRD-N2000-RZVWD	2000			
TRD-N2500-RZVWD	2500			
TRD-N3000-RZVWD	3000			
TRD-N3600-RZVWD	3600			
TRD-N5000-RZVWD	5000			

Incremental Medium Duty Hollow Shaft Encoders (Line Driver Output, TRD-NHxxx-RZVWD)				
Part Number	Pulses per Revolution	Input Voltage	Output	Body Dia.
TRD-NH10-RZVWD	10	5VDC	Line driver (differential)	50 mm
TRD-NH30-RZVWD	30			
TRD-NH40-RZVWD	40			
TRD-NH50-RZVWD	50			
TRD-NH60-RZVWD	60			
TRD-NH100-RZVWD	100			
TRD-NH120-RZVWD	120			
TRD-NH200-RZVWD	200			
TRD-NH240-RZVWD	240			
TRD-NH250-RZVWD	250			
TRD-NH300-RZVWD	300			
TRD-NH360-RZVWD	360			
TRD-NH400-RZVWD	400			
TRD-NH480-RZVWD	480			
TRD-NH500-RZVWD	500			
TRD-NH600-RZVWD	600			
TRD-NH750-RZVWD	750			
TRD-NH1000-RZVWD	1000			
TRD-NH1024-RZVWD	1024			
TRD-NH1200-RZVWD	1200			
TRD-NH2000-RZVWD	2000			
TRD-NH2500-RZVWD	2500			
TRD-NH3000-RZVWD	3000			
TRD-NH3600-RZVWD	3600			
TRD-NH5000-RZVWD	5000			

Wiring diagrams

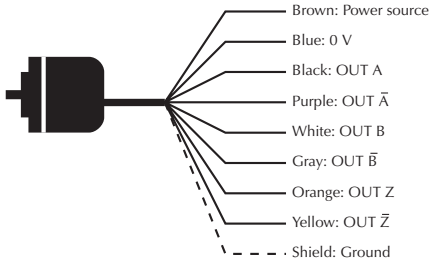
Totem-pole (push-pull) connections

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



Medium-duty Incremental Encoders

(Metric-dimension Encoders)

Specifications – TRD-N(H) series

Electrical Specifications				
Model			***TRD-N(H)xxxx-RZWD (Totem-pole)***	***TRD-N(H)xxxx-RZVWD (Line Driver)***
Power Supply	***Operating Voltage ****		5–30 VDC (nominal) * Range: 4.75–30.0 VDC	5VDC (nominal) * Range: 4.75–5.25 VDC
	Allowable Ripple		3% rms max.	
	Current Consumption		60 mA max.	
Signal Waveform			Quadrature + home position	
Max. Response Frequency			100 kHz	100kHz for ≤ 3000 ppr 200kHz for > 3000 ppr
Operating Speed			(max response frequency / resolution) x 60	
Duty Ratio			50% ±25% (square wave)	
Signal Width at Home Position			100% ±50%	
Output	***Rise/Fall Time *****		3μs max **	100 ns max **
	Output Type		Totem Pole (Push Pull)	Line Driver (26C31 or equivalent)
	Output Current		Negative logic (active low)	Positive logic (active high)
	Output Current	***"H" (inflow)***	30 mA max.	20 mA max
		"L" (outflow)	10 mA max.	
	Output Voltage	***"H"***	[(Load power volt) - 2.5V]	2.5V min
		"L"	0.4V max	0.5V max
	Load Power Voltage		35 VDC max	–

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

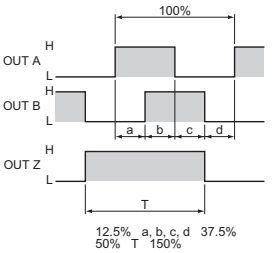
Mechanical Specifications	
Starting Torque	N (solid shaft): 0.02 N·m [0.18 lb·ft] ; NH (hollow shaft): 0.05 N·m [0.44 lb·ft]
Max. Allowable Shaft Load	Radial: 50N [11.24 lb] ; Axial: 30N [6.74 lb]
Max. Allowable Speed	Continuous: 3,000 rpm; Instantaneous: 5,000 rpm
Wire Size	24 AWG
Weight	Approx. 270g [9.52 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 *		500 VAC (50/60Hz) for one minute *	Grounded through a capacitor
Insulation Resistance	50 MΩ min. (excluding shield between power supply, signal cable and case)		
Vibration Resistance	durable for one hour along three axes at 10 to 55 Hz with 0.75 mm amplitude (excluding shield between power supply, signal cable and case)		
Shock Resistance	≤500 ppr (metal slit) = 11 ms with 981 m/s^2 applied three times along three axes ≥600 ppr (glass slit) = 11 ms with 490 m/s^2 applied three times along three axes		
Mounting Orientation	can be mounted in any orientation		
Protection	IP65		
Agency Approvals	CE, RoHS, $_{C}$UL$_{US}$ (E189395)		

**** Voltage withstand is good for power supply, signal, and case; not good for shield wire.***

Channel timing chart

Output Signal Timing Chart - Totem Pole Models



The above waveforms apply to normal (clockwise) revolution viewed from the shaft. OUT Z phase is reversed on the RZL and RZWL models.

Accessories

Couplings

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

See the "Encoder Couplings" section for more information.

Mounting Flange & Brackets

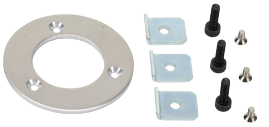
Mounting Accessories	
Part #	***Description***
JT-035D	Mounting Bracket: Metal; for use with all TRD-N/NH/NA encoders
NM-9D*	Mounting Clamp: Metal; for use with all TRD-N/NA encoders *
NF-55D*	Mounting Flange Kit: includes aluminum flange & NM-9D clamp; for use with all TRD-N/NA encoders *

**** Order NF-55D (flange & clamp) for new installations. Order NM-9D (clamp) for replacement parts only.***

JT-035D

NM-9D

NF-55D



How to read the timing charts

Totem Pole 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.

Medium-duty Absolute Encoders (Metric-dimension Encoders)

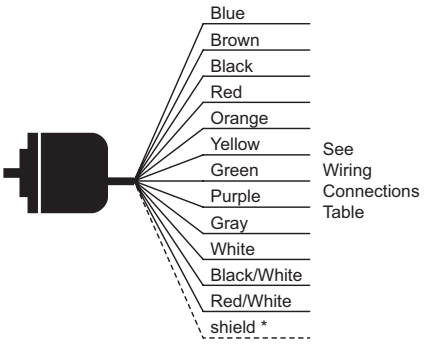
TRD-NA series

Features

Why use an absolute encoder? When power is cycled using an incremental encoder, any positioning information is lost until **home** position is triggered. An absolute encoder uses gray code to describe each position, so position data is not lost when power is cycled. Features include:

- Small body with 50 mm diameter and 35 mm depth
- Splash proof (IP65 rating)
- 8 mm solid shaft
- Absolute resolution available from 32 pulses per revolution to 1024 pulses per revolution
- Open collector output
- Up to 20 kHz response frequency

Standard shaft (TRD-NA) model



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

Absolute Medium Duty Solid Shaft Encoders				
Part Number	***Resolution***	***Input Voltage***	***Output***	***Body Dia.***
TRD-NA32NWD	5 bit gray code, 32 pulses per revolution	10–26 VDC	NPN open collector	50 mm
TRD-NA64NWD	6 bit gray code, 64 pulses per revolution			
TRD-NA128NWD	7 bit gray code, 128 pulses per revolution			
TRD-NA180NWD	8 bit gray code, 180 pulses per revolution			
TRD-NA256NWD	8 bit gray code, 256 pulses per revolution			
TRD-NA360NWD	9 bit gray code, 360 pulses per revolution			
TRD-NA512NWD	9 bit gray code, 512 pulses per revolution			
TRD-NA720NWD	10 bit gray code, 720 pulses per revolution			
TRD-NA1024NWD	10 bit gray code, 1024 pulses per revolution			

Wiring Connections							
Wire Color	***Connector Pin No.***	***Resolution***					
		1024 / 720	***512 / 360***	***256 / 180***	***128***	***64***	***32***
Blue	1	0V	0V	0V	0V	0V	0V
Brown	2	12/24V	12/24V	12/24V	12/24V	12/24V	12/24V
Black	3	bit 0 (2^0)	no connection	no connection	no connection	no connection	no connection
Red	4	bit 1 (2^1)	bit 0 (2^0)	no connection	no connection	no connection	no connection
Orange	5	bit 2 (2^2)	bit 1 (2^1)	bit 0 (2^0)	no connection	no connection	no connection
Yellow	6	bit 3 (2^3)	bit 2 (2^2)	bit 1 (2^1)	bit 0 (2^0)	no connection	no connection
Green	7	bit 4 (2^4)	bit 3 (2^3)	bit 2 (2^2)	bit 1 (2^1)	bit 0 (2^0)	no connection
Purple	8	bit 5 (2^5)	bit 4 (2^4)	bit 3 (2^3)	bit 2 (2^2)	bit 1 (2^1)	bit 0 (2^0)
Gray	9	bit 6 (2^6)	bit 5 (2^5)	bit 4 (2^4)	bit 3 (2^3)	bit 2 (2^2)	bit 1 (2^1)
White	10	bit 7 (2^7)	bit 6 (2^6)	bit 5 (2^5)	bit 4 (2^4)	bit 3 (2^3)	bit 2 (2^2)
Black/ White	11	bit 8 (2^8)	bit 7 (2^7)	bit 6 (2^6)	bit 5 (2^5)	bit 4 (2^4)	bit 3 (2^3)
Red/ White	12	bit 9 (2^9) (MSB)	bit 8 (2^8) (MSB)	bit 7 (2^7) (MSB)	bit 6 (2^6) (MSB)	bit 5 (2^5) (MSB)	bit 4 (2^4) (MSB)
–	13	no connection	no connection	no connection	no connection	no connection	no connection
Shield*	–	GND	GND	GND	GND	GND	GND

**** GND (shielded cable) is not connected to encoder body; the enclosure is grounded through the 0VDC line.***

Note: Numbers in parentheses ( ) are the bits corresponding to binary code.

Medium-duty Absolute Encoders (Metric-dimension Encoders)

Specifications – TRD-NA series

Electrical Specifications		
Model		***TRD-NAxxxx-NWD***
Power Supply	***Operating Voltage ****	12–24 VDC (nominal) * Range: 10.8–26.4 VDC
	Allowable Ripple	3% rms max.
	Current Consumption	70 mA max.
Output Code		Gray binary (38 gray codes at 180 resolution, 76 at 360 resolution, and 152 at 720 resolution)
Max. Response Frequency		20 kHz (Maximum revolution speed = (max. response frequency / resolution) x 60). (The encoder does not respond to revolution faster than the maximum speed.)
Accuracy		$\frac{360}{\text{Resolution x 2}}$ = degree of accuracy
Direction of Rotation		Normal (CW) or reversed (CCW) (When viewed from the shaft, CW is clockwise direction, and CCW is counterclockwise direction)
Rise/Fall Time		2µs max. (at 1kW load resistance and when cable length is 2m or less)
Output	***Output Type***	NPN open collector
	Output Logic	Negative logic (active low)
	Sinking Current	32 mA max.
	Residual Voltage	16 mA or less: 0.4V max. 16 mA → 32 mA: 1.5V max.
	Load Power Voltage	35 VDC max.
**** To be supplied by Class II source***		

Mechanical Specifications	
Starting Torque	0.03 N·m [0.02 lb·ft]
Max. Allowable Shaft Load	Radial: 50N [11.24 lbs] ; Axial: 30N [6.74 lbs]
Max. Allowable Speed	Continuous: 3,000 rpm, instantaneous: 5,000 rpm; (highest speed that can support the mechanical integrity of encoder)
Wire Size	26 AWG
Weight	Approx. 300g (10.58 oz) with 2m cable

Environmental Specifications	
Ambient Temperature	-10 to 60 °C [14 to 140 °F]
Storage Temperature	-25 to 85 °C [-13 to 185 °F]
Operating Humidity	25–85% RH (with no condensation)
Insulation Resistance	10MΩ min.
Vibration Resistance	Durable for one hour along three axes at 10 to 55 Hz with 0.75 mm amplitude
Shock Resistance	11 ms with 980 m/s^2 applied three times along three axes
Mounting Orientation	Can be mounted in any orientation
Protection	IP65
Agency Approvals	CE, RoHS, $_{C}UL_{US}$ (E189395)

Accessories

Couplings

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

See the "Encoder Couplings" section for more information.

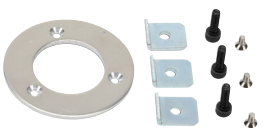
Mounting Bracket & Clamps

Mounting Accessories	
Part #	***Description***
JT-035D	Mounting Bracket: Metal; for use with all TRD-N/NH/NA encoders
NM-9D*	Mounting Clamp: Metal; for use with all TRD-N/NA encoders *
NF-55D*	Mounting Flange Kit: includes aluminum flange & NM-9D clamp; for use with all TRD-N/NA encoders *
**** Order NF-55D (flange & clamp) for new installations. Order NM-9D (clamp) for replacement parts only.***	

JT-035D

NM-9D

NF-55D

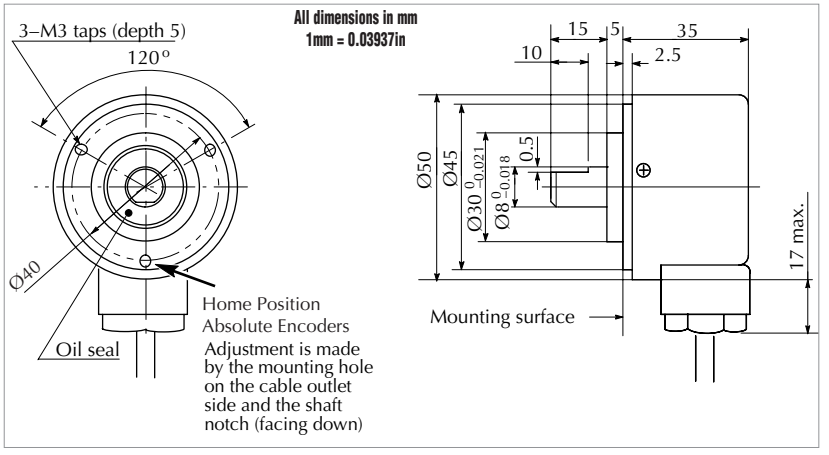


Medium-duty Absolute and Incremental Encoders (Metric-dimension Encoders)

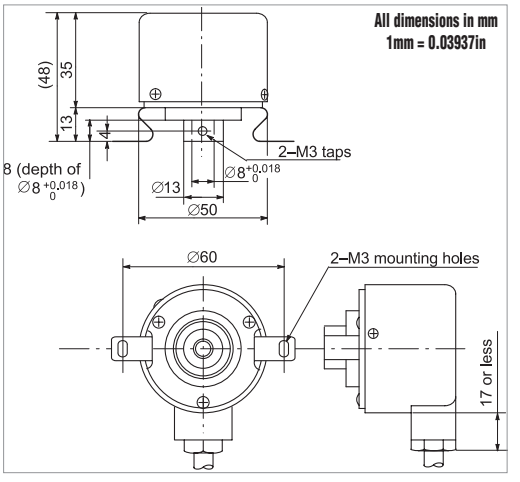
Dimensions – TRD-N(H) & TRD-NA series

The following are the external dimensions of both incremental and absolute medium duty encoders and optional mounting accessories.

Solid-shaft Incremental and Absolute Encoders (TRD-N, TRD-NA)

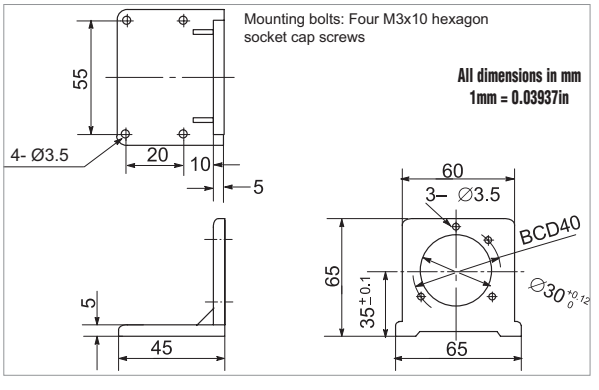


Hollow-shaft Incremental Encoders only (TRD-NH)

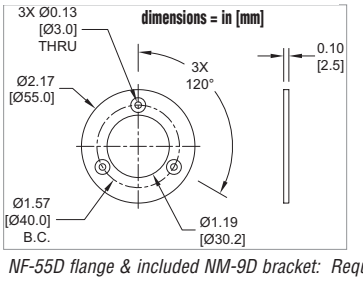


Optional Mounting Flange and Brackets for Medium-duty Encoders

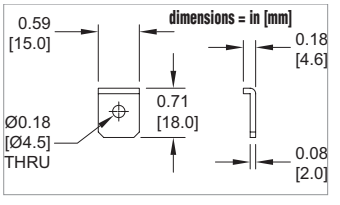
JT-035D (bracket)



NF-55D (flange)



NM-9D (clamp)(included with NF-55D)



NF-55D flange & included NM-9D bracket: Requires (3) M4 x 0.7 tapped holes equally spaced on a 64 mm bolt circle in the mounting surface.