

# ROTARY ENCODERS

## TRD-NA Series Absolute Encoders



### Features

- Small body with  $\varnothing 50$  mm diameter and 35 mm depth
- Dust and splash proofed with reinforced aluminum diecast casing
- $\varnothing 8$  mm thick reinforced stainless steel shaft
- Accurate Gray code
- Metal slit with shock resistance of 980 m/s<sup>2</sup>

## List of Model Numbers

### NPN Output

Resolution	Direction	With cable		With relay connector	With FC connector*	
		Cable length 2 m	Cable length 5 m	Cable length 2 m	Cable length 2 m	Cable length 5 m
32 (5 bit)	CW	TRD-NA32NW	TRD-NA32NW5M	TRD-NA32NWE	-	-
	CCW	TRD-NA32RNW	TRD-NA32RNW5M	TRD-NA32RNWE	-	-
64 (6 bit)	CW	TRD-NA64NW	TRD-NA64NW5M	TRD-NA64NWE	-	-
	CCW	TRD-NA64RNW	TRD-NA64RNW5M	TRD-NA64RNWE	-	-
128 (7 bit)	CW	TRD-NA128NW	TRD-NA128NW5M	TRD-NA128NWE	-	-
	CCW	TRD-NA128RNW	TRD-NA128RNW5M	TRD-NA128RNWE	-	-
180 (8 bit)	CW	TRD-NA180NW	TRD-NA180NW5M	TRD-NA180NWE	-	-
	CCW	TRD-NA180RNW	TRD-NA180RNW5M	TRD-NA180RNWE	-	-
256 (8 bit)	CW	TRD-NA256NW	TRD-NA256NW5M	TRD-NA256NWE	-	-
	CCW	TRD-NA256RNW	TRD-NA256RNW5M	TRD-NA256RNWE	-	-
360 (9 bit)	CW	TRD-NA360NW	TRD-NA360NW5M	TRD-NA360NWE	TRD-NA360NWF	TRD-NA360NWF5M
	CCW	TRD-NA360RNW	TRD-NA360RNW5M	TRD-NA360RNWE	-	-
512 (9 bit)	CW	TRD-NA512NW	TRD-NA512NW5M	TRD-NA512NWE	-	-
	CCW	TRD-NA512RNW	TRD-NA512RNW5M	TRD-NA512RNWE	-	-
720 (10 bit)	CW	TRD-NA720NW	TRD-NA720NW5M	TRD-NA720NWE	TRD-NA720NWF	TRD-NA720NWF5M
	CCW	TRD-NA720RNW	TRD-NA720RNW5M	TRD-NA720RNWE	-	-
1024 (10 bit)	CW	TRD-NA1024NW	TRD-NA1024NW5M	TRD-NA1024NWE	-	-
	CCW	TRD-NA1024RNW	TRD-NA1024RNW5M	TRD-NA1024RNWE	-	-

Note 1 : Highest speed that can support mechanical integrity of the encoder

### PNP Output

Resolution	Direction	With cable		With relay connector
		Cable length 2 m	Cable length 5 m	Cable length 2 m
32 (5 bit)	CW	TRD-NA32PW	TRD-NA32PW5M	TRD-NA32PWE
	CCW	TRD-NA32RPW	TRD-NA32RPW5M	TRD-NA32RPWE
64 (6 bit)	CW	TRD-NA64PW	TRD-NA64PW5M	TRD-NA64PWE
	CCW	TRD-NA64RPW	TRD-NA64RPW5M	TRD-NA64RPWE
128 (7 bit)	CW	TRD-NA128PW	TRD-NA128PW5M	TRD-NA128PWE
	CCW	TRD-NA128RPW	TRD-NA128RPW5M	TRD-NA128RPWE
180 (8 bit)	CW	TRD-NA180PW	TRD-NA180PW5M	TRD-NA180PWE
	CCW	TRD-NA180RPW	TRD-NA180RPW5M	TRD-NA180RPWE
256 (8 bit)	CW	TRD-NA256PW	TRD-NA256PW5M	TRD-NA256PWE
	CCW	TRD-NA256RPW	TRD-NA256RPW5M	TRD-NA256RPWE
360 (9 bit)	CW	TRD-NA360PW	TRD-NA360PW5M	TRD-NA360PWE
	CCW	TRD-NA360RPW	TRD-NA360RPW5M	TRD-NA360RPWE
512 (9 bit)	CW	TRD-NA512PW	TRD-NA512PW5M	TRD-NA512PWE
	CCW	TRD-NA512RPW	TRD-NA512RPW5M	TRD-NA512RPWE
720 (10 bit)	CW	TRD-NA720PW	TRD-NA720PW5M	TRD-NA720PWE
	CCW	TRD-NA720RPW	TRD-NA720RPW5M	TRD-NA720RPWE
1024 (10 bit)	CW	TRD-NA1024PW	TRD-NA1024PW5M	TRD-NA1024PWE
	CCW	TRD-NA1024RPW	TRD-NA1024RPW5M	TRD-NA1024RPWE

### Composition of Model Number

TRD-NA [ ] [ ] [ ] W [ ] [ ]

- Series
- Resolution
- Direction  
Blank: Normal revolution (CW)  
R : Reverse revolution (CCW)
- Output type  
N: NPN open collector  
P: PNP open collector
- Protection  
W: Dust and splash proofed (IP65)
- Connection  
Blank: With cable  
E : With relay connector at cable end  
F : With FC connector at cable end
- Cable length  
Blank: 2 m  
5M : 5 m

# ROTARY ENCODERS

## TRD-NA Series

### Electrical Specifications

Model Number		TRD-NA□□NW	TRD-NA□□PW	
Power voltage	Power source	10.8 to 26.4 VDC	←	
	Allowable ripple	3% rms max.	←	
	Current consumption	70 mA max.	100 mA max.	
Output code		Gray binary* 1	←	
Max. response frequency		20 kHz* 2	←	
Precision		(360 / resolution x 2)°	←	
Direction		Normal (CW) or reverse (CCW)* 3	←	
Output	Output type	Open collector NPN Output	Open collector PNP Output	
	Output logic	Negative (low active)	Positive (high active)	
	Residual voltage	0.4 V max.	1.5 V max.	0.5 V max.
	Inflow current	16 mA	32 mA	30 mA
	Load power voltage	30 VDC max.	←	←
Rise / Fall time		2.0 μs (at 1 kΩ load resistance) max.	3.0 μs (at 1 kΩ load resistance) max.	

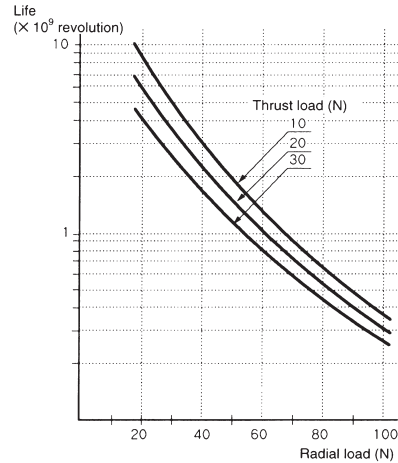
\*1 38 Gray codes at 180 resolution, 76 Gray codes at 360 resolution, and 152 Gray codes at 720 resolution  
 \*2 Maximum revolution speed = (Maximum response frequency / Resolution) x 60 The encoder does not respond to revolution faster than the maximum speed.  
 \*3 When viewed from the shaft, CW is clockwise direction and CCW is anti-clockwise direction.

### Mechanical Specifications

Initial torque	0.03N·m (+20°C) max.
Moment of inertia	2 x 10 <sup>-6</sup> kg·m <sup>2</sup>
Allowable load	Radial: 50N
	Thrust: 30N
Maximum allowable speed (Note 1)	3000 rpm (continuous)
	5000 rpm (instantaneous)
Cable	External diameter ø7 mm
	12-core oil-proofed shielded vinyl chloride cable Nominal section area of core: 0.14 mm <sup>2</sup>
Weight	Approx. 300 g (with 2m cable)

Note 1: Highest speed that can support mechanical integrity of the encoder.

### Service Life of Bearing

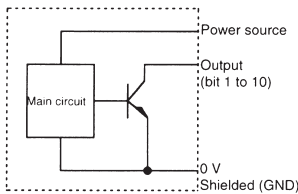


### Environmental Requirements

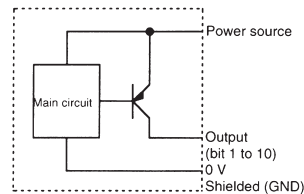
Ambient temperature	Operating temperature: -10 to +60°C Storage temperature: -25 to +85°C
Operating / Storage humidity	25 to +85%RH (with no condensation)
Withstand voltage	Removed for capacitor earth
Insulation resistance	10 MΩmin.
Vibration resistance	Durable for 1 hour along 3 axes at 10 to 55 Hz with 0.75mm amplitudes
Shock resistance	11 ms with 980 m/s <sup>2</sup> applied 3 times along 3 axes
Protection	IP65: Dust and splash proofed

### Output Circuit

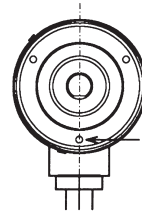
TRD-NA□□NW (NPN 出力)



TRD-NA□□PW (PNP 出力)



### Home Position



Align the downward notch of the shaft with the hole on the cable side.

### Terminal Assignment

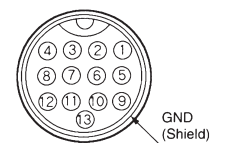
GND (shielded cable) is not connected to the encoder body. The enclosure is grounded through 0 V line.

Color of core cable	Connector pin number	1024/720 Resolution	512/360 Resolution	256/180 Resolution	128 Resolution	64 Resolution	32 Resolution
Blue	1	0V	←	←	←	←	←
Brown	2	+12 / 24V	←	←	←	←	←
Black	3	bit 1 (2 <sup>n</sup> )	Not connected	←	←	←	←
Red	4	bit 2 (2 <sup>n</sup> )	bit 1 (2 <sup>n</sup> )	Not connected	←	←	←
Orange	5	bit 3 (2 <sup>n</sup> )	bit 2 (2 <sup>n</sup> )	bit 1 (2 <sup>n</sup> )	Not connected	←	←
Yellow	6	bit 4 (2 <sup>n</sup> )	bit 3 (2 <sup>n</sup> )	bit 2 (2 <sup>n</sup> )	bit 1 (2 <sup>n</sup> )	Not connected	←
Green	7	bit 5 (2 <sup>n</sup> )	bit 4 (2 <sup>n</sup> )	bit 3 (2 <sup>n</sup> )	bit 2 (2 <sup>n</sup> )	bit 1 (2 <sup>n</sup> )	Not connected
Purple	8	bit 6 (2 <sup>n</sup> )	bit 5 (2 <sup>n</sup> )	bit 4 (2 <sup>n</sup> )	bit 3 (2 <sup>n</sup> )	bit 2 (2 <sup>n</sup> )	bit 1 (2 <sup>n</sup> )
Gray	9	bit 7 (2 <sup>n</sup> )	bit 6 (2 <sup>n</sup> )	bit 5 (2 <sup>n</sup> )	bit 4 (2 <sup>n</sup> )	bit 3 (2 <sup>n</sup> )	bit 2 (2 <sup>n</sup> )
White	10	bit 8 (2 <sup>n</sup> )	bit 7 (2 <sup>n</sup> )	bit 6 (2 <sup>n</sup> )	bit 5 (2 <sup>n</sup> )	bit 4 (2 <sup>n</sup> )	bit 3 (2 <sup>n</sup> )
Black / White	11	bit 9 (2 <sup>n</sup> )	bit 8 (2 <sup>n</sup> )	bit 7 (2 <sup>n</sup> )	bit 6 (2 <sup>n</sup> )	bit 5 (2 <sup>n</sup> )	bit 4 (2 <sup>n</sup> )
Red / White	12	bit 10 (2 <sup>n</sup> )	bit 9 (2 <sup>n</sup> )	bit 8 (2 <sup>n</sup> )	bit 7 (2 <sup>n</sup> )	bit 6 (2 <sup>n</sup> )	bit 5 (2 <sup>n</sup> )
-	13	Not connected	←	←	←	←	←
Shield	-	GND	←	←	←	←	←

(<sup>n</sup>) In parentheses is the bit corresponding to binary code.

MSB

Pin out of connector



Rear view

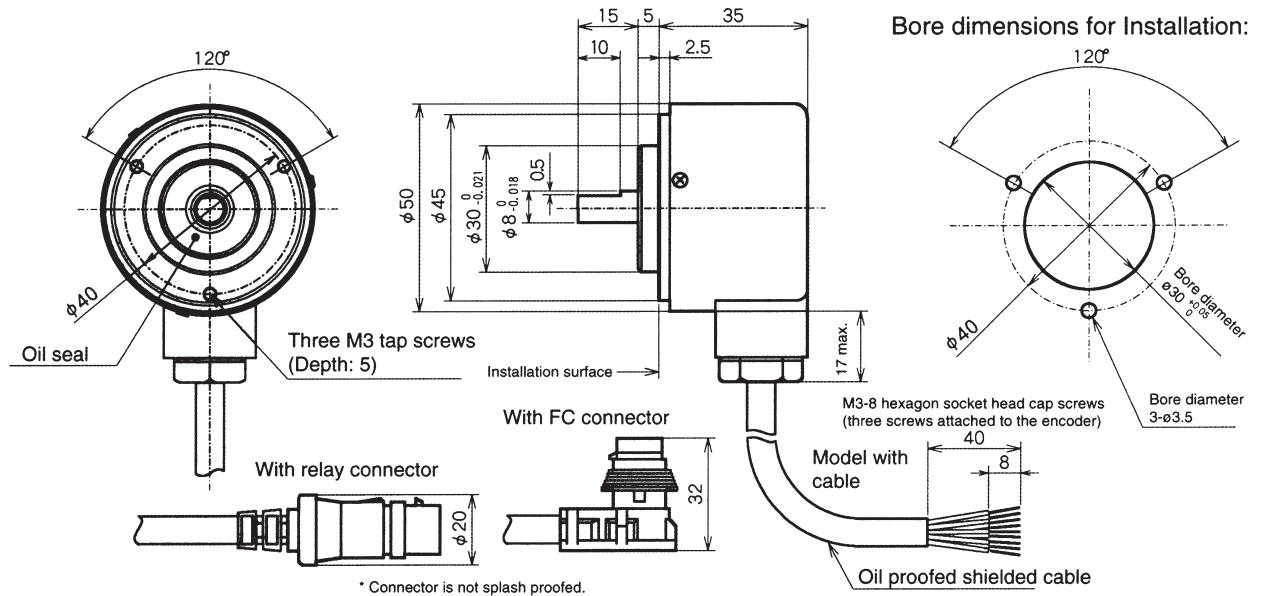


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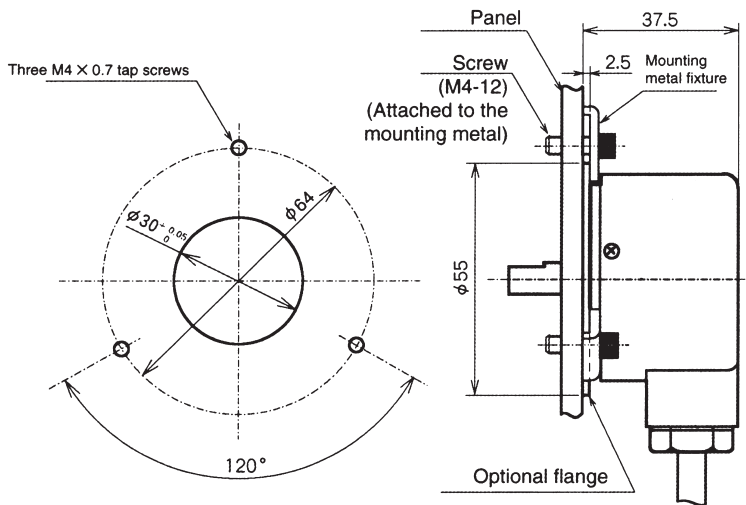
## TRD-NA Series

### External Dimensions

(in mm)



### Servo Mount Metal Fixture



### Flange NF-55 (Option)

