











ENCODER

TRD-MX
TRD-S/SH
TRD-2E
TRD-N/NH
TRD-J
TRD-GK
TRD-NA
TRD-K







Rotary Encoder Lineup

-  PLC
-  HMI
-  SENSOR
-  ENCODER
-  COUNTER
-  INFORMATION







- Rotary Encoder Lineup**
- Selection Guide
- Incremental Type
- Absolute Type

			Incremental Type				
							
Series			TRD-MX	TRD-S	TRD-SH	TRD-2E	
Type			Shaft type	Shaft type	Hollow Shaft type	Shaft type	
External (mm)	Dimension		φ25 x 29	φ38 x 30	φ38 x 30	φ40 x 36	
	Shaft Diameter		φ4	φ6	φ8 Other shaft diameter	φ6	
Resolution	(Pulse / Rotation)		100 to 1,024	10 to 2,500	10 to 2,500	10 to 3,600	
Connection Form	Type with Cables Taken Out from the Back		●	—	—	—	
	Connector Type		—	—	—	—	
	Type with Cable Taken Out from the Side		—	●	●	●	
Output Signal Format			2-phase A and B + Phase Z	2-phase A and B + Phase Z	2-phase A and B + Phase Z	2-phase A and B + Phase Z	
Maximum Response Frequency			100 kHz	200 kHz	200 kHz	200 kHz	
Maximum Allowable Number of Revolutions			6,000 rpm	6,000 rpm	6,000 rpm	5,000 rpm	
Supply Voltage			TRD-MX□A: 5 to 12 V DC ±10% TRD-MX□B: 12 to 24 V DC ±10% TRD-MX□V: 5 V DC ±5%	TRD-S□A: 5 to 12 V DC ±10% TRD-S□B: 12 to 24 V DC ±10% TRD-S□V: 5 V DC ±5%	TRD-SH□A: 5 to 12 V DC ±10% TRD-SH□B: 12 to 24 V DC ±10% TRD-SH□V: 5 V DC ±5%	TRD-2E□A: 5 to 12 V DC ±10% TRD-2E□B: 12 to 24 V DC ±10% TRD-2E□V: 5 V DC ±5%	
Output Format			NPN open collector output Line driver output	NPN open collector output Line driver output	NPN open collector output Line driver output	NPN open collector output Line driver output	
Shaft Allowable Load	Radial Direction		10 N	20 N	20 N	30 N	
	Thrust Direction		5 N	10 N	10 N	20 N	
Starting Torque			0.001 N·m or less	0.001 N·m or less	0.001 N·m or less	0.01 N·m or less	
Protective Structure			Dustproof type: IP50	Simple dust-proof type: IP40	Simple dust-proof type: IP40	Dust and splash-proof type: IP54	
Use Ambient Temperature			-10 to +70°C	-10 to +70°C	-10 to +70°C	-10 to +70°C	
Bracket	JT-035		—	—	—	—	
	RT-11		—	—	—	—	
Option	Metal	MU-075	●	—	—	—	
		RU-075	—	●	—	●	
		JU-100	—	—	—	—	
		RU-100	—	—	—	—	
		KU-100	—	—	—	—	
	Resin	GJ-4	●	—	—	—	
		GJ-6	—	●	—	●	
		GJ-8	—	—	—	—	
		GJ-10	—	—	—	—	
	Flat Spring	ML16P-4-4	●	—	—	—	
		ML16P-6-6	—	●	—	●	
		ML20P-8-8	—	—	—	—	
		ML25P-10-10	—	—	—	—	
		SFC-10-10	—	—	—	—	
	Cable Connector	Straight	BMCC-6	—	—	—	—
			BMCC-12	—	—	—	—
Angular		BAFC-6	—	—	—	—	
		BAFC-12	—	—	—	—	

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				Absolute Type	
					
TRD-N	TRD-NH	TRD-J	TRD-GK	TRD-NA	TRD-K
Shaft type	Hollow shaft type	Shaft type	Shaft type	Shaft type	Shaft type
φ50 x 35	φ50 x 35	φ50 x 50	φ78 x 60	φ50 x 35	φ78 x 66
φ8	φ8 Other shaft diameter	φ8	φ10	φ8	φ10
1 to 5,000	1 to 5,000	10 to 1,024	10 to 5,000 (100 to 5,000 for BZ type)	32 to 2,048	180 to 1,024
—	—	●	●	—	—
—	—	●	●	—	●
●	●	●	—	●	●
One-phase, 2-phase A and B + Phase Z	One-phase, 2-phase A and B + Phase Z	One-phase, 2-phase A and B + Phase Z	2-phase A and B, 2-phase A and B + Phase Z Direction discrimination	One-Gray binary code (Up to 11-bit)	One-Gray binary code (Up to 10-bit)
200 kHz	200 kHz	50 kHz	100 kHz	20 kHz	20 kHz
5,000 rpm	5,000 rpm	5,000 rpm	5,000 rpm	3,000 rpm	5,000 rpm
Except TRD-N□V: 4.75 to 30 V DC TRD-N□V: 5 V DC±5%	Except TRD-NH□V: 4.75 to 30 V DC TRD-NH□V: 5 V DC±5%	Except TRD-J□V: 4.75 to 30 V DC TRD-J□V: 5 V DC±5%	10 to 30 V DC	10.8 to 26.4 V DC	10.8 to 26.4 V DC
Totem-pole structure preventing partial load short circuit Line driver output	Totem-pole structure preventing partial load short circuit Line driver output	Totem-pole structure preventing partial load short circuit Line driver output	Totem-pole structure preventing load short circuit	NPN open collector output PNP open collector output	NPN open collector output
50 N	50 N	50 N	100 N	50 N	100 N
30 N	30 N	30 N	50 N	30 N	50 N
Dustproof type: 0.003 N·m or less Dustproof and waterjet- proof type: 0.02 N·m or less	Dustproof type: 0.003 N·m or less Dustproof and waterjet- proof type: 0.05 N·m or less	Dustproof type: 0.003 N·m or less Dustproof and waterjet- proof type: 0.05 N·m or less	0.1 N·m or less	0.03 N·m or less	0.1 N·m or less
Dustproof type: IP50 Dustproof and waterjet- proof type: IP65	Dustproof type: IP50 Dustproof and waterjet- proof type: IP65	Dustproof type: IP50 Dustproof and waterjet- proof type: IP65	Dustproof and waterjet- proof type: IP65	Dustproof and waterjet- proof type: IP65	Dustproof and waterjet- proof type: IP65
-10 to +70°C	-10 to +70°C	-10 to +50°C	-10 to +70°C	-10 to +60°C	-10 to +50°C
●	—	●	—	—	—
—	—	—	●	—	●
—	—	—	—	—	—
—	—	—	—	—	—
●	—	●	—	●	—
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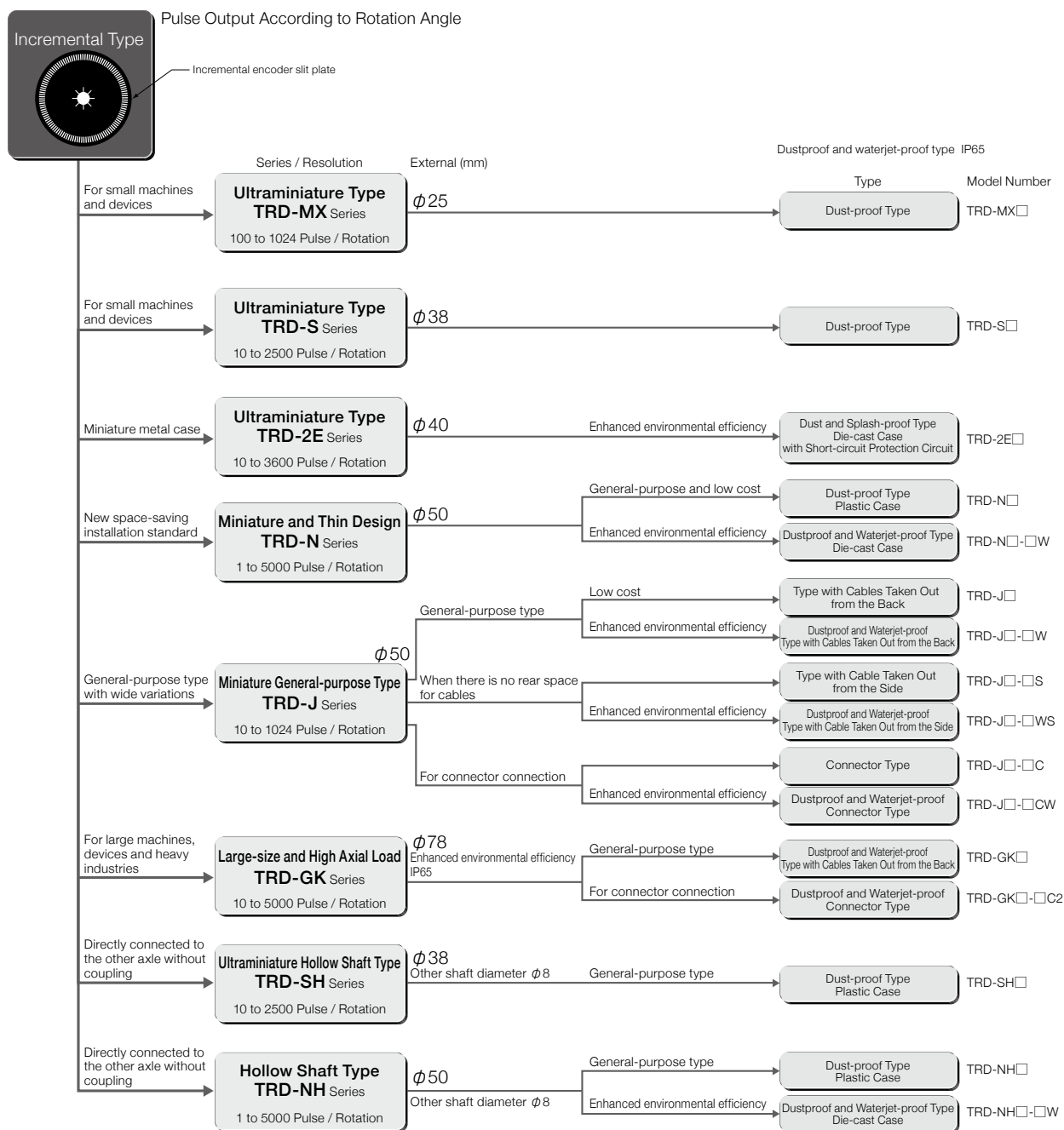
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Selection Guide

Incremental Type







- PLC
- HMI
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- ENCODER**
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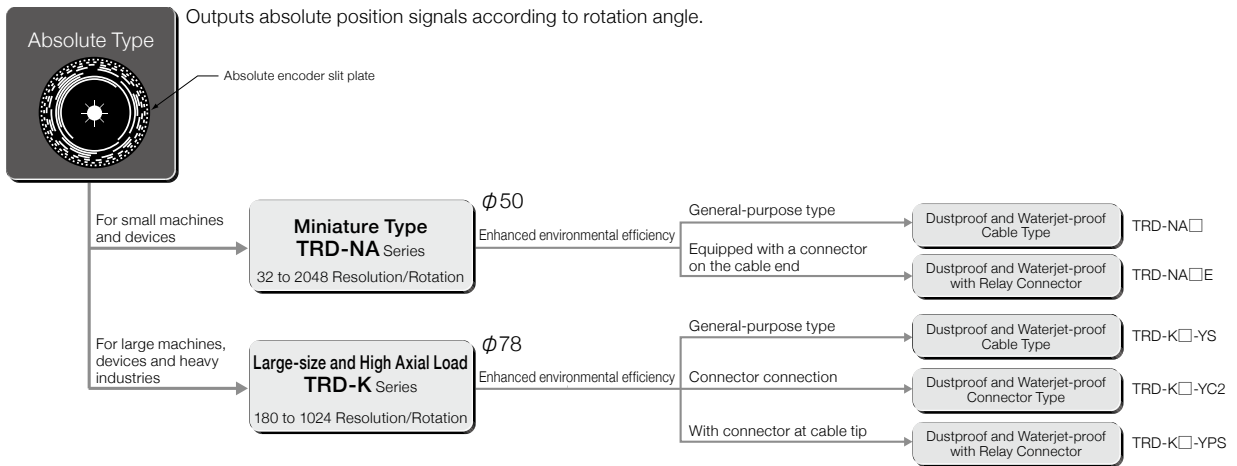


Selection Guide

Absolute Type

- PLC 
- HMI 
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- Absolute Type



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- P L C
- H M I
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TRD-MX Series

Features

φ25 Incremental Type

Ultraminiature design with outside diameter of φ25 mm/ depth of 29 mm/ shaft diameter of φ4 mm
 Small diameter lineup with resolutions up to 1,024 P/R. Line driver output is available.

- Pulse number: 100, 200, 360, 500, 512, 600, 1,000, 1,024P/R
- Supply voltage: 5 to 24 V DC
- Maximum allowable number of revolutions: 6,000 rpm
- Output signal format: 2-phase output + Origin
- Output form: NPN open collector / line driver
- IP50 (Dustproof type)



Model Number List

Type	Appearance	Model Number	Supply Voltage	Output	Output Form	Pulse Number / Rotation
Shaft Type		TRD-MX□A	4.5 to 13.2 V DC	Output with 2-phase origin (Origin reverse action □)	Open collector output	100, 200, 360, 500, 512, 600, 1,000, 1,024
		TRD-MX□B	10.8 to 26.4 V DC			
		TRD-MX□V	4.75 to 5.25 V DC	Output with 2-phase origin (Origin direct action □)	Line driver output	

TRD-MX □ A

- Series classification
- Pulse number
- Form

- A:** Supply voltage 4.5 to 13.2 V DC Open collector output
- B:** Supply voltage 10.8 to 26.4 V DC Open collector output
- V:** Supply voltage 4.75 to 5.25 V DC Line driver output

Pulse and Frequencies

Pulse Number per Rotation	100	200	360	500	512	600	1,000	1,024
Maximum Response Frequency (kHz)*	10	20	36	50	50	60	100	100
Applicable Models	TRD-MX□A	●	●	●	●	●	●	●
	TRD-MX□B	●	●	●	●	●	●	●
	TRD-MX□V	●	●	●	●	●	●	●

* The electric maximum response frequency is specified by resolution (pulse number) and the maximum number of revolutions.
 Electrical maximum number of revolutions = ((Maximum response frequency/Resolution) x 60)
 Therefore, if the encoder rotates at a speed greater than the electrical maximum number of revolutions, the signals do not electrically follow.

- TRD-MX
- TRD-S/SH
- TRD-2E
- TRD-N/NH
- TRD-J
- TRD-GK

Electrical Specifications

Model Number	TRD-MX□A		TRD-MX□B		TRD-MX□V			
Power Supply	Supply Voltage	4.5 to 13.2 V DC		10.8 to 26.4 V DC		4.75 to 5.25 V DC		
	Allowable Ripple	3% rms or less						
	Consumption Current (No Load)	50 mA or lower						
Output Waveform	Signal Format	2-phase output + home position						
	Maximum Response Frequency	(Maximum 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	Not larger than 2 μs (Cable length 1 m, maximum load)						
	Output Form	NPN open collector output			Line driver output*			
	Output Logic	Negative logic (Active low)			Positive logic (Active high)			
	Output Voltage	"H"	—			2.5 V or higher		
		"L"	0.4 V or lower			0.5 V or lower		
	Output Current	Influx	Up to 30 mA			Up to 20 mA		
		Outflow	—			—		
Load Supply Voltage	30 V DC or lower							

* Equivalent to 26C31. The receiver is equivalent to 26C32.

TRD-MX Series

Specifications/Dimensions

- PLC
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- TRD-MX
- TRD-S/SH
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- TRD-J
- TRD-GK

Mechanical Specifications

Starting Torque	0.001 N·m or less (20°C)
Moment of Inertia	$1 \times 10^{-7} \text{ kg} \cdot \text{m}^2$
Shaft Allowable Load	Radial: 10 N
	Thrust: 5 N
Maximum Allowable Number of Revolutions (Note 1)	6,000 rpm
Cable	Outside diameter $\phi 5 \text{ mm}$ 5-core shielded oil-resistant vinyl chloride cable Core wire nominal cross-sectional area: 0.14 mm ² (Line driver output is 8 cores, 0.14 mm ²)
Weight	Approx. 80 g

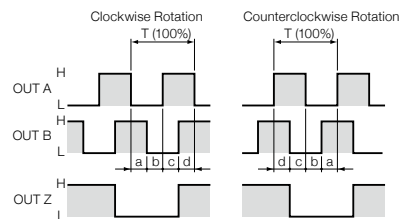
Note 1: Maximum number of revolutions that can be mechanically endured

Environmental Requirements

Use Ambient Temperature	-10 to +70°C
Storage Ambient Temperature	-25 to +85°C
Use Ambient Humidity	35 to 85% RH (No condensation)
Withstand Voltage	Excluded due to capacitor grounding
Insulation Resistance	20 MΩ or higher
Vibration Resistance (Endurance)	Displacement half amplitude: 0.75 mm, 10 to 55 Hz, 3 axial directions, each 1 h
Impact Resistance (Endurance)	490 m/s ² 11 ms, each 3 times in 3 axial directions
Protective Structure	Dustproof type: IP50

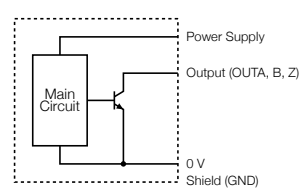
Output Waveform

Open Collector



Output Circuit

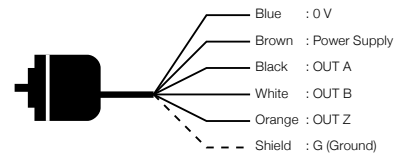
Open Collector



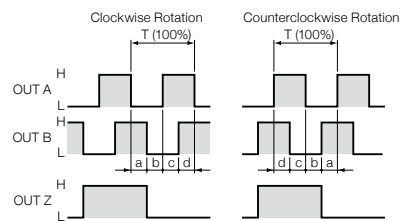
Connection Diagram

Open Collector

The shielded wire is connected to the main body.



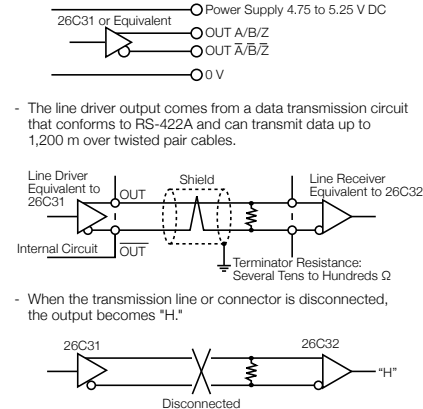
Line Driver



$a, b, c, d = 1/4T \pm 1/8T$

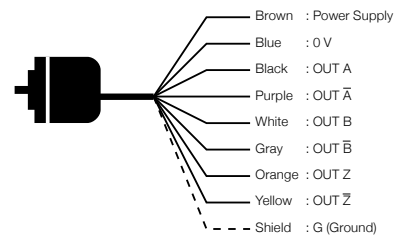
Note: Clockwise rotation when the main body is seen from the axle side is the normal rotation.

Line Driver



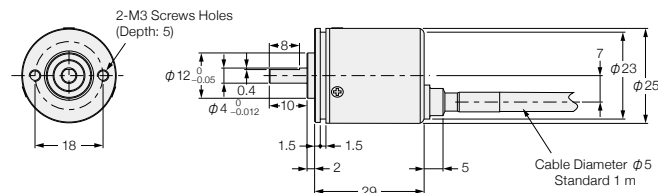
Line Driver

The shielded wire is connected to the main body.



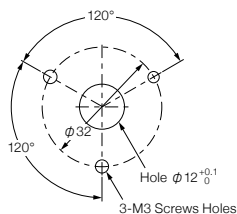
Dimensions

(Unit: mm)



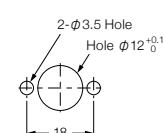
Attachment Bore Processing Dimension Diagram

(For servo mount metal fixture)



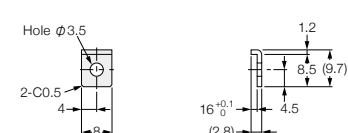
Attachment Bore Processing Dimension Diagram

(For 2 holes)



Servo Mount Metal Fixture MM-4

(Option)



- PLC
- HMI
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- ENCODER**
- COUNTER
- INFORMATION

TRD-S/SH Series

Features

φ38 Incremental Type

- Thin design with an outside diameter of φ38 mm / depth of 30 mm
- Small diameter lineup with resolutions up to 2,500 P/R
- Low price contributes to cost reduction of the system.
- IP40 protective structure



Model Number List

Type	Appearance	Model Number	Supply Voltage	Output	Output Form	Pulse Number / Rotation
Shaft Type		TRD-S□A	4.5 to 13.2 V DC	Output with 2-phase origin (Origin reverse action □)	Open collector output	10, 20, 30, 40, 50, 60, 100, 200, 250, 300, 360, 400, 500, 512, 600, 800, 1,000, 1,024, 1,200, 2,000, 2,500
		TRD-S□B	10.8 to 26.4 V DC			
		TRD-S□V	4.75 to 5.25 V DC	Output with 2-phase origin (Origin direct action □)	Line driver output	
Hollow Shaft Type		TRD-SH□A	4.5 to 13.2 V DC	Output with 2-phase origin (Origin reverse action □)	Open collector output	
		TRD-SH□B	10.8 to 26.4 V DC			
		TRD-SH□V	4.75 to 5.25 V DC	Output with 2-phase origin (Origin direct action □)	Line driver output	

TRD-S □ A

- Series classification
- S** : Shaft type
- SH** : Hollow shaft type
- Pulse number
- Form

- A**: Supply voltage 4.5 to 13.2 V DC Open collector output
- B**: Supply voltage 10.8 to 26.4 V DC Open collector output
- V**: Supply voltage 4.75 to 5.25 V DC Line driver output

Pulse and Frequencies

Pulse Number per Rotation	10	20	30	40	50	60	100	200	250	300	360	400	500	512	600	800	1,000	1,024	1,200	2,000	2,500	
Maximum Response Frequency (kHz)*	1	2	3	4	5	6	10	20	25	30	36	40	50	50	60	80	100	100	120	200	200	
Applicable Models	TRD-S□A/TRD-SH□A	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	TRD-S□B/TRD-SH□B	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	TRD-S□V/TRD-SH□V	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

* The electric maximum response frequency is specified by resolution (pulse number) and the maximum number of revolutions.
 Electrical maximum number of revolutions = ((Maximum response frequency/Resolution) x 60)
 Therefore, if the encoder rotates at a speed greater than the electrical maximum number of revolutions, the signals do not electrically follow.

Electrical Specifications

Model Number		TRD-S□A/TRD-SH□A	TRD-S□B/TRD-SH□B	TRD-S□V/TRD-SH□V	
Power Supply	Supply Voltage	4.5 to 13.2 V DC	10.8 to 26.4 V DC	4.75 to 5.25 V DC	
	Allowable Ripple	3% rms or less			
	Consumption Current (No Load)	50 mA or lower			
Output Waveform	Signal Format	2-phase output + home position			
	Maximum Response Frequency	200 kHz			
	Duty Ratio	50 ± 25%			
	Phase Difference Width	25 ± 12.5%			
	Signal Width at Home Position	100 ± 50%			
Output	Rise / Fall Time	Not larger than 1 μs (Cable length 1 m, maximum load)			
	Output Form	NPN open collector output		Line driver output*	
	Output Logic	Negative logic (Active low)		Positive logic (Active high)	
	Output Voltage	"H"	—		2.5 V or higher
		"L"	0.4 V or lower		0.5 V or lower
	Output Current	Up to 30 mA (Sink current)		Up to 20 mA	
Load Supply Voltage	30 V DC or lower			—	

* Equivalent to 26C31. The receiver is equivalent to 26C32.

TRD-S/SH Series

Specifications/Dimensions

- PLC
- HMI
- SENSOR
- ENCODER
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- INFORMATION

Mechanical Specifications

Starting Torque	0.001 N·m or less (+20°C)
Moment of Inertia	$0.3 \times 10^{-6} \text{ kg}\cdot\text{m}^2$
Shaft Allowable Load	Radial: 20 N
	Thrust: 10 N
Maximum Allowable Number of Revolutions (Note 1)	6,000 rpm
Cable	Outside diameter $\phi 5 \text{ mm}$
	5-core shielded oil-resistant vinyl chloride cable Core wire nominal cross-sectional area: 0.14 mm^2 (Line driver output is 8 cores, 0.14 mm^2)
Weight	Approx. 100 g (With 1 m cable)

Note 1: Maximum number of revolutions that can be mechanically endured

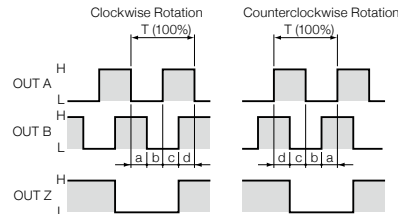
Environmental Requirements

Use Ambient Temperature	-10 to +70°C
Storage Ambient Temperature	-25 to +85°C
Use Ambient Humidity	35 to 85%RH (No condensation)
Withstand Voltage	Excluded due to capacitor grounding 60 pulses or lower: 500 V AC (50/60 Hz) 1 minute*
Insulation Resistance	50 MΩ or higher*
Vibration Resistance (Endurance)	Displacement half amplitude: 0.75 mm, 10 to 55 Hz, 3 axial directions, each 1 h
Impact Resistance (Endurance)	490 m/s ² 11 ms, each 3 times in 3 axial directions
Protective Structure	Simple Dustproof type: IP40

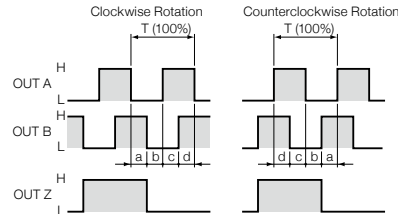
* The power supply, signal lines, and shield between the cases are excluded.

Output Waveform

Open Collector



Line Driver

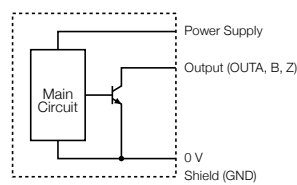


$$a, b, c, d = 1/4T \pm 1/8T$$

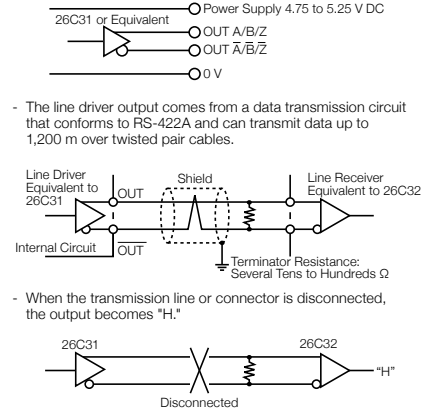
Note: Clockwise rotation when the main body is seen from the axle side is the normal rotation.

Output Circuit

Open Collector



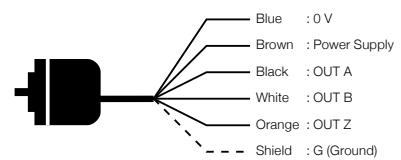
Line Driver



Connection Diagram

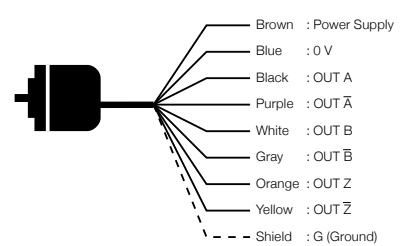
Open Collector

The shielded wire is connected to the main body.



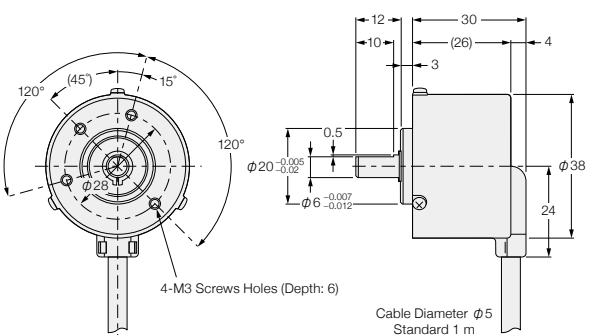
Line Driver

The shielded wire is connected to the main body.

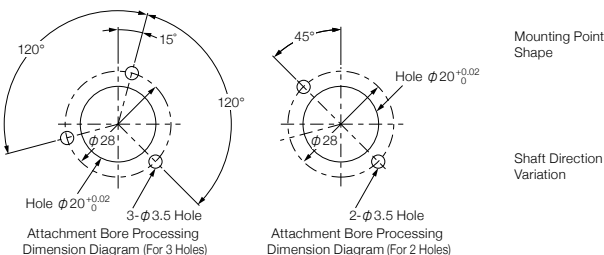
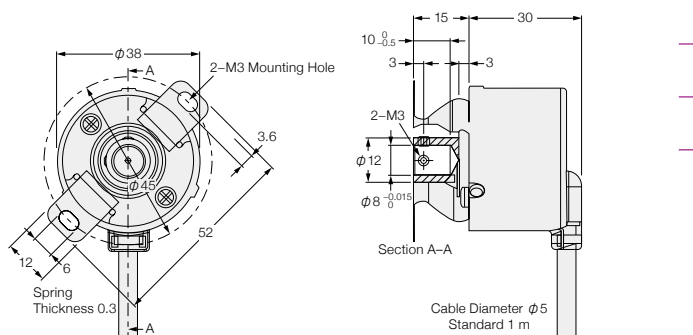


Dimensions (Unit: mm)

TRD-S□A/TRD-S□B/TRD-S□V



TRD-SH□A/TRD-SH□B/TRD-SH□V



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TRD-2E Series

Features

φ40 Incremental Type

- Small design with an outside diameter of φ40 mm / depth of 36 mm
- Equipped with short-circuit protection circuit, reverse connection protection circuit (For resolutions up to 2,500 P/R)
- Realizes IP54 protective structure.



Model Number List

Type	Appearance	Model Number	Supply Voltage	Output	Output Form	Pulse Number / Rotation
Shaft Type		TRD-2E□A	4.5 to 13.2 V DC	Output with 2-phase origin (Origin reverse action □)	Open collector output	10, 20, 30, 40, 50, 60, 100, 200, 240, 250, 300, 360, 400, 500, 600, 1,000, 1,024, 1,200, 2,000, 2,500, 3,600
		TRD-2E□B	10.8 to 26.4 V DC			
		TRD-2E□V	4.75 to 5.25 V DC	Output with 2-phase origin (Origin direct action □)	Line driver output	

TRD-2E □ **A**

- Series classification
- Pulse number
- Form

- A:** Supply voltage 4.5 to 13.2 V DC Open collector output
- B:** Supply voltage 10.8 to 26.4 V DC Open collector output
- V:** Supply voltage 4.75 to 5.25 V DC Line driver output

Pulse and Frequencies

Pulse Number per Rotation	10	20	30	40	50	60	100	200	240	250	300	360	400	500	600	1,000	1,024	1,200	2,000	2,500	3,600	
Maximum Response Frequency (kHz)*	0.8	1.6	2.5	3.3	4.1	5.0	8.3	16	20	20	25	30	33	41	50	83	85	100	166	200	200	
Applicable Models	TRD-2E□A	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	TRD-2E□B	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	TRD-2E□V	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

* The electric maximum response frequency is specified by resolution (pulse number) and the maximum number of revolutions.
 Electrical maximum number of revolutions = ((Maximum response frequency/Resolution) x 60)
 Therefore, if the encoder rotates at a speed greater than the electrical maximum number of revolutions, the signals do not electrically follow.

Electrical Specifications

Model Number		TRD-2E□A	TRD-2E□B	TRD-2E□V	
Power Supply	Supply Voltage*	A: 4.5 to 13.2 V DC	10.8 to 26.4 V DC	4.75 to 5.25 V DC	
	Allowable Ripple	3% rms or less			
	Consumption Current (No Load)	50 mA or lower			
Output Waveform	Signal Format	2-phase output + home position			
	Maximum Response Frequency	200 kHz			
	Maximum Response Number of Revolutions	(Maximum Response Frequency/Resolution) x 60			
	Duty Ratio	50 ± 25%			
	Signal Width at Home Position	100 ± 50%			
Output	Rise / Fall Time	Not larger than 1 μs (Cable length 1 m, maximum load)			
	Output Form	NPN open collector output		Line driver output (Equivalent to 26C31)	
	Output Logic	Negative logic (Active low)		Positive logic (Active high)	
	Output Current	Sink	Up to 30 mA		Up to 20 mA
		Source	—		Up to 20 mA
	Output Voltage	"H"	—		2.5 V or higher
		"L"	0.4 V or lower		0.5 V or lower
	Load Supply Voltage	30 V DC or lower		—	
Short-circuit Protection	Between output and power supply		—		

* To be supplied by Class II source.

- Rotary Encoder Lineup
- Selection Guide
- Incremental Type**
- Absolute Type

- TRD-MX
- TRD-S/SH
- TRD-2E**
- TRD-N/NH
- TRD-J
- TRD-GK

TRD-2E Series

Specifications/Dimensions

- PLC
- HMI
- SENSOR
- ENCODER
- COUNTER
- INFORMATION

- Rotary Encoder Lineup
- Selection Guide
- Incremental Type
- Absolute Type

- TRD-MX
- TRD-S/SH
- TRD-2E
- TRD-N/NH
- TRD-J
- TRD-GK

Mechanical Specifications

Starting Torque	0.01 N·m or less (+20°C)
Moment of Inertia	$0.3 \times 10^{-6} \text{ kg}\cdot\text{m}^2$
Shaft Allowable Load	Radial: 30N
	Thrust: 20N
Maximum Allowable Number of Revolutions (Note 1)	5,000 rpm
Cable	Outside diameter $\phi 5 \text{ mm}$ 5-core shielded oil-resistant vinyl chloride cable (Line driver output is 8 cores) Core wire nominal cross-sectional area: 0.14 mm^2
Weight	Approx. 110 g (With 1 m cable)

Note 1: Maximum number of revolutions that can be mechanically endured

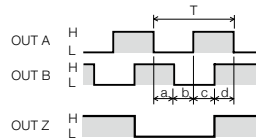
Environmental Requirements

Use Ambient Temperature	-10 to +70°C
Storage Ambient Temperature	-25 to +85°C
Use Ambient Humidity	35 to 85% RH (No condensation)
Withstand Voltage	Excluded due to capacitor grounding*
Insulation Resistance	50 MΩ or higher*
Vibration Resistance (Endurance)	Displacement half amplitude: 0.75 mm, 10 to 55 Hz, 3 axial directions, each 1 h
Impact Resistance (Endurance)	490m/s ² 11 ms, each 3 times in 3 axial directions
Protective Structure	Dustproof type·Splash-proof type: IP54

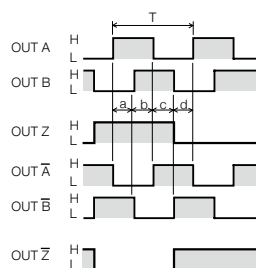
* The power supply, signal lines, and shield between the cases are excluded.

Output Waveform

Open Collector



Line Driver



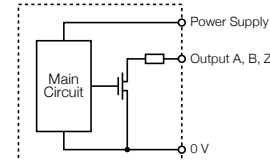
$a, b, c, d = 1/4T \pm 1/8T$

Note: Clockwise rotation when the main body is the axle side is the normal rotation.

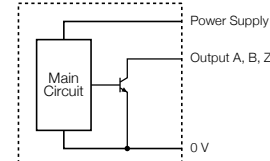
Output Circuit

Open Collector

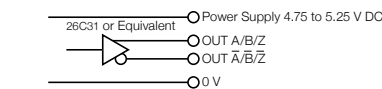
(Equipped with short-circuit protection circuit, up to 2,500 P/R)



(Not equipped with short-circuit protection circuit, 2,500 P/R or higher)



Line Driver



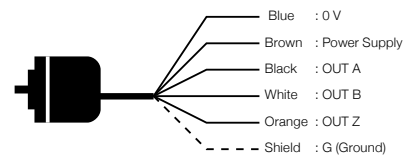
- When the transmission line or connector is disconnected, the output becomes "H."



Connection Diagram

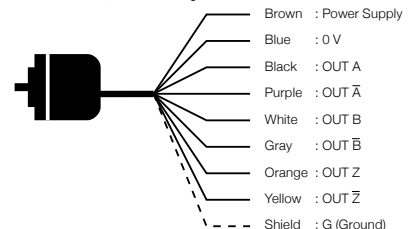
Open Collector

The shielded wire is not connected to the main body for resolutions up to 2,500 P/R. Shielded wire is connected to FG (frame ground) for resolutions of 2,500 P/R or higher.

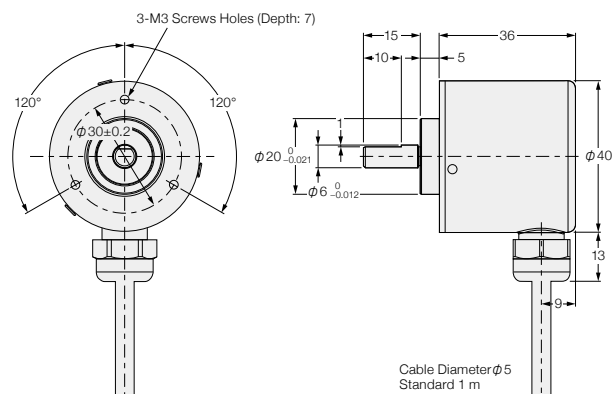


Line Driver

The shielded wire is not connected to the main body for resolutions up to 2,500 P/R. Shielded wire is connected to FG (frame ground) for resolutions of 2,500 P/R or higher.



Dimensions (Unit: mm)



- PLC
- HMI
- SENSOR
- ENCODER**
- COUNTER
- INFORMATION

TRD-N/NH Series

Features

φ50 Incremental Type

- Thin design with an outside diameter of φ50 mm / depth of 35 mm
- Protective structure selectable according to environment of use
Aluminum die-cast case for dustproof and waterjet-proof type (IP65)
- A wide range of resolution (1 to 5,000 P/R).
- Uses robust φ8 mm stainless steel shaft.
- Wide power range of 4.75 to 30 V DC
- Installation using a servo mount convenient for origin adjustment is possible.



Model Number List

Type	Appearance	Model Number	Output	Pulse Number / Rotation
Dustproof type ABS plastic cover		TRD-N□-S	1-phase output	1, 3, 4, 5, 10, 20, 30, 60, 100, 120, 200, 300, 360, 500, 600, 1,000
		TRD-N□-RZ	Output with 2-phase origin (Origin direct action □)	3, 4, 5, 10, 20, 30, 40, 50, 60, 100, 120, 200, 240, 250, 300, 360, 400, 480, 500, 600, 750, 1,000, 1,200, 2,000, 2,500, 3,600, 4,096, 5,000
		TRD-N□-RZL	Output with 2-phase origin (Origin reverse action □)	
		TRD-N□-RZV	Output with 2-phase origin (Origin direct action □)	
Dustproof and Waterjet-proof Type Aluminium die-cast cover		TRD-N□-SW	1-phase output	1, 3, 4, 5, 10, 20, 30, 60, 100, 120, 200, 300, 360, 500, 600, 1,000
		TRD-N□-RZW	Output with 2-phase origin (Origin direct action □)	3, 4, 5, 10, 20, 30, 40, 50, 60, 100, 120, 200, 240, 250, 300, 360, 400, 480, 500, 600, 750, 1,000, 1,200, 2,000, 2,500, 3,600, 4,096, 5,000
		TRD-N□-RZWL	Output with 2-phase origin (Origin reverse action □)	
		TRD-N□-RZVW	Output with 2-phase origin (Origin direct action □)	
Dustproof Hollow Shaft Type ABS plastic cover		TRD-NH□-S	1-phase output	1, 3, 4, 5, 10, 20, 30, 60, 100, 120, 200, 300, 360, 500, 600, 1,000
		TRD-NH□-RZ	Output with 2-phase origin (Origin direct action □)	3, 4, 5, 10, 20, 30, 40, 50, 60, 100, 120, 200, 240, 250, 300, 360, 400, 480, 500, 600, 750, 1,000, 1,200, 2,000, 2,500, 3,600, 4,096, 5,000
		TRD-NH□-RZL	Output with 2-phase origin (Origin reverse action □)	
		TRD-NH□-RZV	Output with 2-phase origin (Origin direct action □)	
Dustproof, Waterjet-proof Hollow Shaft Type Aluminium die-cast cover		TRD-NH□-SW	1-phase output	1, 3, 4, 5, 10, 20, 30, 60, 100, 120, 200, 300, 360, 500, 600, 1,000
		TRD-NH□-RZW	Output with 2-phase origin (Origin direct action □)	3, 4, 5, 10, 20, 30, 40, 50, 60, 100, 120, 200, 240, 250, 300, 360, 400, 480, 500, 600, 750, 1,000, 1,200, 2,000, 2,500, 3,600, 4,096, 5,000
		TRD-NH□-RZWL	Output with 2-phase origin (Origin reverse action □)	
		TRD-NH□-RZVW	Output with 2-phase origin (Origin direct action □)	

- TRD-MX
- TRD-S/SH
- TRD-2E
- TRD-N/NH**
- TRD-J
- TRD-GK

TRD-N □ -RZ W L - □

- Series classification
N : Shaft type
NH: Hollow shaft type
- Pulse number
- Signal format
S : 1-phase output
RZ : Output with 2-phase origin (Origin direct action)
RZV: Line driver output
- Protective structure
Blank: Dustproof type (IP50)
W : Dustproof, waterjet-proof type (IP65)
- Origin reverse action symbol
If the signal type is RZ, models with "L" produce the origin reverse action.
- (Special specifications products)

TRD-N/NH Series

Specifications/Dimensions

- PLC
- HMI
- SENSOR
- ENCODER
- COUNTER
- INFORMATION

Pulse and Frequencies

Pulse Number per Rotation	1	3	4	5	10	20	30	40	50	60	100	120	200	240	250	300	360	400	480	500	600	750	1,000	1,200	2,000	2,500	3,600	4,096	5,000		
Maximum Response Frequency (kHz)*1	0.08	0.25	0.33	0.41	0.8	1.6	2.5	3.3	4.1	4.9	8.3	9.9	16	19	20	24	29	33	39	41	49	62	83	100	100	100	100	100	100	100	
Applicable Models	TRD-N□-S□	●	●	●	●	●	●			●	●	●	●			●	●			●	●		●								
	TRD-NH□-S□	●	●	●	●	●	●			●	●	●	●			●	●			●	●		●								
	TRD-N□-RZ□		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	TRD-NH□-RZ□		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	TRD-N□-RZ□L		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	TRD-NH□-RZ□L		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	TRD-N□-RZV□		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
TRD-NH□-RZV□		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	

*1 The electric maximum response frequency is specified by resolution (pulse number) and the maximum number of revolutions.
 Electrical maximum number of revolutions = ((Maximum response frequency/Resolution) x 60)
 Therefore, if the encoder rotates at a speed greater than the electrical maximum number of revolutions, the signals do not electrically follow.
 *2 The totem-pole output is 100 kHz and the line driver output is 200 kHz.

Electrical Specifications

Model Number		TRD-N□-S□ TRD-NH□-S□	TRD-N□-RZV□ TRD-NH□-RZV□	TRD-N□-RZ□/TRD-N□-RZ□L TRD-NH□-RZ□/TRD-NH□-RZ□L	
Power Supply	Supply Voltage	4.75 to 30 V DC	4.75 to 5.25 V DC	4.75 to 30 V DC	
	Allowable Ripple	3% rms or less	3% rms or less	3% rms or less	
	Consumption Current (No Load)	40 mA or lower	60 mA or lower	60 mA or lower	
Output Waveform	Signal Format	1-phase output	2-phase output + home position	2-phase output + home position	
	Duty Ratio	50±25%	50±25%	50±25%	
	Signal Width at Home Position	—	100±50%	100±50%	
Output	Rise / Fall Time*	Not larger than 3 μs	Not larger than 2 μs	Not larger than 3 μs	
	Output Form	Totem-pole output	Line driver output	Totem-pole output	
	Output Current	Source "H"	Up to 10 mA	—	Up to 10 mA
		Sink "L"	Up to 30 mA	—	Up to 30 mA
	Output Voltage	"H"	[(Supply Voltage) - 2.5 V] or more	2.5 V or higher	[(Supply Voltage) - 2.5 V] or more
		"L"	0.4 V or lower	0.5 V or lower	0.4 V or lower
Load Supply Voltage	35 V DC or lower	—	35 V DC or lower		

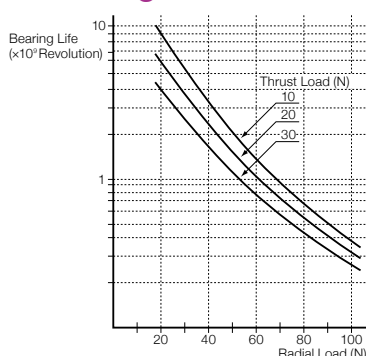
* Cable 0.5 m or shorter, maximum load

Mechanical Specifications

Starting Torque	Dustproof type: 0.003 N·m or less (+20°C)/Dustproof and waterjet-proof type (W type): 0.02 N·m or less (+20°C)/Hollow shaft type: 0.05 N·m or less (+20°C)
Moment of Inertia	2 x 10 ⁻⁶ kg·m ²
Shaft Allowable Load	Radial: 50 N
	Thrust: 30 N
Maximum Allowable Number of Revolutions (Note 1)	5,000 rpm (However, 3,000 rpm (continuously) and 5,000 rpm (instantaneously) for dustproof and waterjet-proof type)
Cable	Outside diameter φ6 mm 5-core shielded oil-resistant cable Core wire nominal cross-sectional area: 0.3 mm ² (Line driver output is 8 cores, 0.14 mm ²)
Weight	Approx. 150 g (Approx. 200 g for dustproof and waterjet-proof type)

Note 1: Maximum number of revolutions that can be mechanically endured

Bearing Life



Environmental Requirements

Use Ambient Temperature	-10 to +70°C
Storage Ambient Temperature	-25 to +85°C
Use Ambient Humidity	35 to 85% RH (No condensation)
Withstand Voltage	500 V AC (50/60 Hz) 1 minute RZV series Excluded due to capacitor grounding (The signal lines, and shield between the cases are excluded)
Insulation Resistance	50 MΩ or higher
Vibration Resistance (Endurance)	Displacement half amplitude: 0.75 mm, 10 to 55 Hz, 3 axial directions, each 1 h
Impact Resistance (Endurance)	Up to 500P/R (Metal slit) 981 m/s ² 11 ms, each 3 times in 3 axial directions 600 P/R or higher (Glass slit) 490 m/s ² 11 ms, each 3 times in 3 axial directions
Protective Structure	Dustproof type: IP50 Dustproof and Waterjet-proof type: IP65

- TRD-MX
- TRD-S/SH
- TRD-2E
- TRD-N/NH
- TRD-J
- TRD-GK

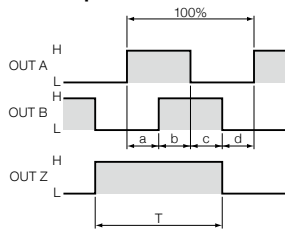
TRD-N/NH Series

Specifications

- P L C
- H M I
- SENSOR
- ENCODER
- COUNTER
- INFORMATION

Output Waveform

Totem-pole

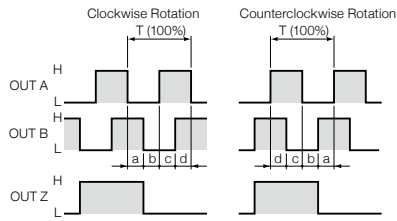


$$12.5\% \leq a, b, c, d \leq 37.5\%$$

$$50\% \leq T \leq 150\%$$

Note: Clockwise (normal) rotation when the main body is seen from the axle side
: Z-phase logic is reverse for the RZL and RZWL types.

Line Driver



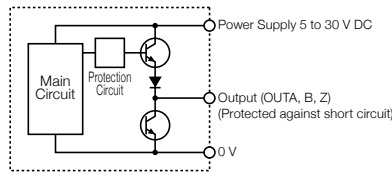
$$12.5\% \leq a, b, c, d \leq 37.5\%$$

$$50\% \leq T \leq 150\%$$

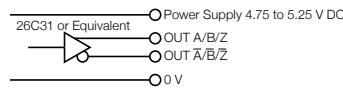
Note: Clockwise rotation when the main body is seen from the axle side is the normal rotation.

Output Circuit

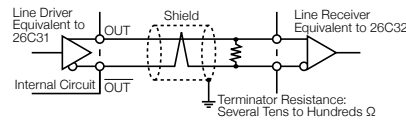
Totem-pole



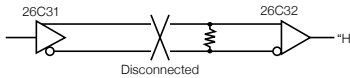
Line Driver



- The line driver output comes from a data transmission circuit that conforms to RS-422A and can transmit data up to 1,200 m over twisted pair cables.



- When the transmission line or connector is disconnected, the output becomes "H".

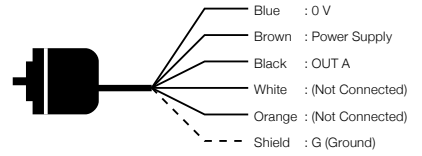


Connection Diagram

Totem-pole

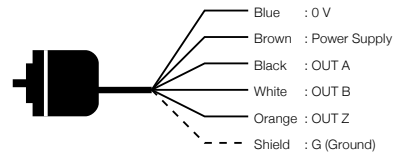
《1-phase output》

The shielded wire is connected to the main body.



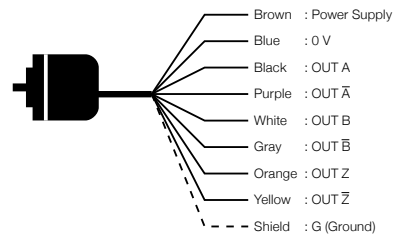
《Output with 2-phase origin》

The shielded wire is connected to the main body.

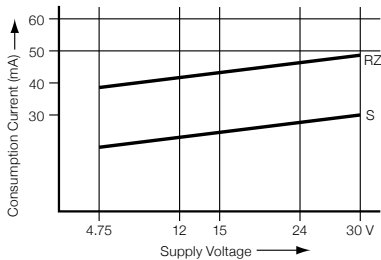


Line Driver

The shielded wire is connected to the main body.



Electrical Characteristics (Typical)



- Rotary Encoder Lineup
- Selection Guide
- Incremental Type
- Absolute Type

- TRD-MX
- TRD-S/SH
- TRD-2E
- TRD-N/NH
- TRD-J
- TRD-GK

TRD-N/NH Series

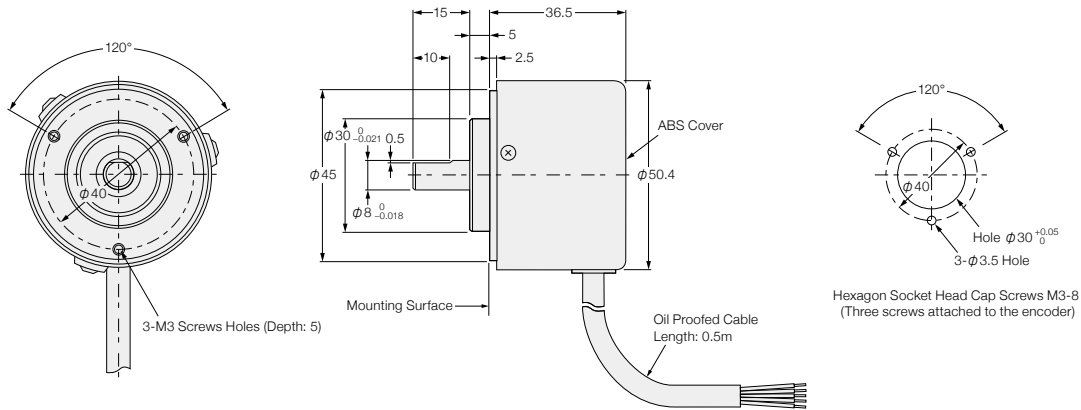
Dimensions

- PLC
- HMI
- SENSOR
- ENCODER**
- COUNTER
- INFORMATION

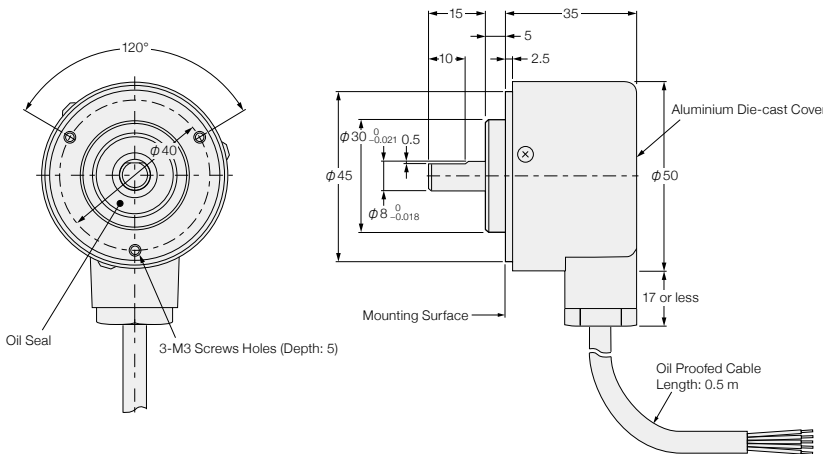
- Rotary Encoder Lineup
- Selection Guide
- Incremental Type**
- Absolute Type

Dimensions (Unit: mm)

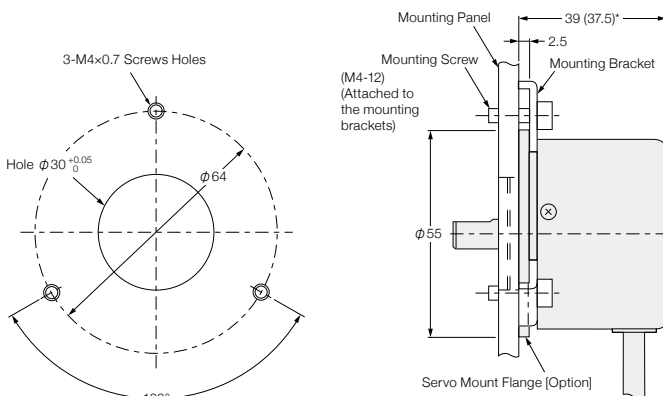
TRD-N Series [Dustproof Type: S/RZ/RZL/RZV]



TRD-N Series [Dustproof and Waterjet-proof Type : SW/RZW/RZWL/RZVW]

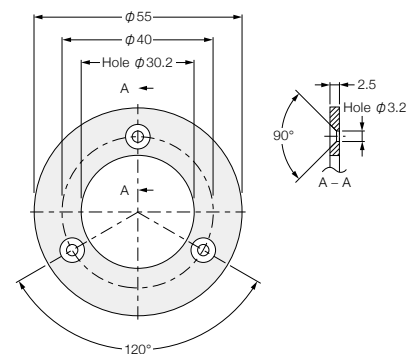


TRD-N Series [Servo Mount Metal Mounting State Diagram]

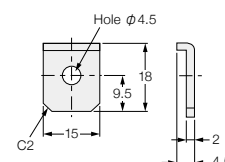


* Data in parenthesis is for the dustproof and waterjet-proof types.

Servo Mount Flange NF-55 (Option)



Servo Mount Metal Fixture Attached to the optional flange



TRD-MX

TRD-S/SH

TRD-2E

TRD-N/NH

TRD-J

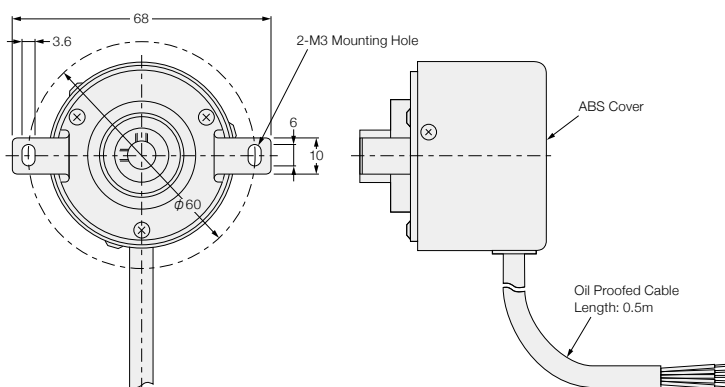
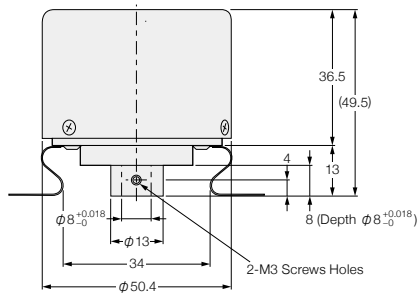
TRD-GK

- P L C
- H M I
- SENSOR
- ENCODER
- COUNTER
- INFORMATION

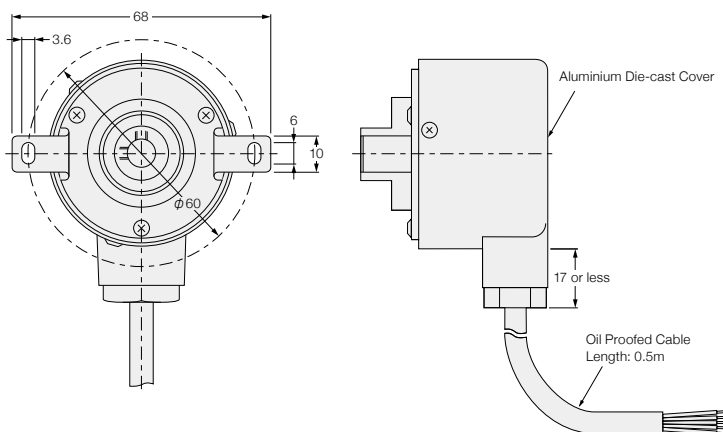
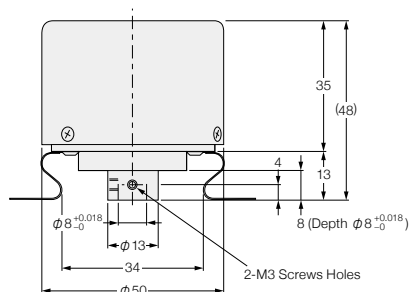
TRD-N/NH Series

Dimensions

TRD-NH Series [Dustproof Type: S/RZ/RZL/RZV]









TRD-NH Series [Dustproof and Waterjet-proof Type: SW/RZW/RZWL/RZVW]



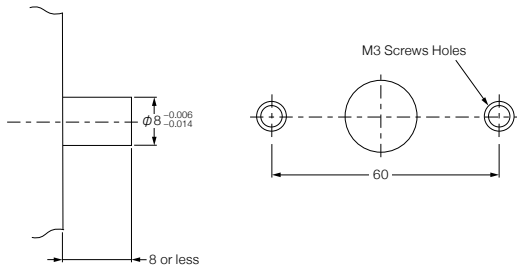
- TRD-MX
- TRD-S/SH
- TRD-2E
- TRD-N/NH
- TRD-J
- TRD-GK

TRD-N/NH Series

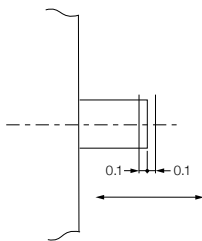
Dimensions

- PLC 
- HMI 
- SENSOR 
- ENCODER** 
- COUNTER 
- INFORMATION 

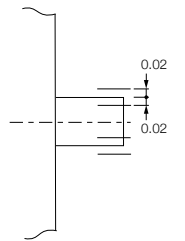
Mounting Point Shape



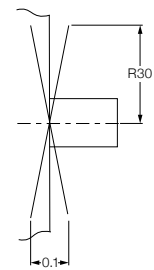
Shaft Direction Variation



Shaft Angle Direction Variation



Degree of Mounting Surface Angle Over Shaft.



- Rotary Encoder Lineup
- Selection Guide
- Incremental Type**
- Absolute Type

- TRD-MX
- TRD-S/SH
- TRD-2E
- TRD-N/NH**
- TRD-J
- TRD-GK

- PLC
- HMI
- SENSOR
- ENCODER**
- COUNTER
- INFORMATION

TRD-J Series

Features

φ50 Incremental Type

- Long service-life with a φ50 mm miniature case and φ8 mm-thick shaft.
- Realizes 1,024 pulses with a metal slit board that resists vibrations and impacts.
- Wide power range of 4.75 to 30 V DC.
- Totem-pole output suitable for cable extension



Model Number List

Type	Appearance	Model Number	Output	Pulse Number / Rotation
Type with Cables Taken Out from the Back		TRD-J□-S	1-phase output	10* 30 40 50 60 100 120 200 240 300 360 400 500 600 750 1,000 1,024
		TRD-J□-RZ	Output with 2-phase origin (Origin direct action □)	
		TRD-J□-RZL	Output with 2-phase origin (Origin reverse action □)	
		TRD-J□-RZV	Output with 2-phase origin (Line driver)	
Dustproof and Waterjet-proof Type		TRD-J□-SW	1-phase output	
		TRD-J□-RZW	Output with 2-phase origin (Origin direct action □)	
		TRD-J□-RZWL	Output with 2-phase origin (Origin reverse action □)	
		TRD-J□-RZVW	Output with 2-phase origin (Line driver)	
Connector Type		TRD-J□-SC	1-phase output	
		TRD-J□-RZC	Output with 2-phase origin (Origin direct action □)	
		TRD-J□-RZCL	Output with 2-phase origin (Origin reverse action □)	
		TRD-J□-RZVC	Output with 2-phase origin (Line driver)	
Dustproof and Waterjet-proof Connector Type		TRD-J□-SCW	1-phase output	
		TRD-J□-RZCW	Output with 2-phase origin (Origin direct action □)	
		TRD-J□-RZCWL	Output with 2-phase origin (Origin reverse action □)	
		TRD-J□-RZVCW	Output with 2-phase origin (Line driver)	
Type with Cables Taken Out from the Side <small>Note 1</small>		TRD-J□-SS	1-phase output	
		TRD-J□-RZS	Output with 2-phase origin (Origin direct action □)	
		TRD-J□-RZSL	Output with 2-phase origin (Origin reverse action □)	
		TRD-J□-RZVS	Output with 2-phase origin (Line driver)	
Dustproof and Waterjet-proof Type with Cables Taken Out from the Side <small>Note 1</small>		TRD-J□-SWS	1-phase output	
		TRD-J□-RZWS	Output with 2-phase origin (Origin direct action □)	
		TRD-J□-RZWSL	Output with 2-phase origin (Origin reverse action □)	
		TRD-J□-RZVWS	Output with 2-phase origin (Line driver)	

* 10 pulses are only for the 1-phase output type.



Note 1: Made-to-order product. Consult with us about delivery dates.

TRD-J □ - RZ V W L - □

- Series classification
- Pulse number
- Signal format
S : 1-phase output
RZ: Output with 2-phase origin (Origin direct action)
- Output format
Blank: Totem-pole output
V : Line driver output
- Connection method
Blank: Type with cables taken out from the back
W : Dustproof and waterjet-proof type
C : Connector type
CW : Dustproof and waterjet-proof connector type
S : Type with cables taken out from the side
WS : Dustproof and waterjet-proof type with cables taken out from the side
- Origin reverse action symbol
If the signal type is RZ, models with "L" produce the origin reverse action.
- (Special specifications products)

TRD-J Series

Specifications

P L C H M I SENSOR ENCODER COUNTER INFORMATION Rotary Encoder
Lineup

Selection Guide

Incremental
Type

Absolute Type

TRD-MX

TRD-S/SH

TRD-2E

TRD-N/NH

TRD-J

TRD-GK

Pulse and Frequencies

Pulse Number per Rotation	10	30	40	50	60	100	120	200	240	300	360	400	500	600	750	1,000	1,024
Maximum Response Frequency (kHz)*	0.5	1.5	2	2.5	3	5	6	10	12	15	18	20	25	30	37.5	50	51.2
Applicable Models	TRD-J□-S□	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	TRD-J□-RZ□		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	TRD-J□-RZV□		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

* The electric maximum response frequency is specified by resolution (pulse number) and the maximum number of revolutions.

Electrical maximum number of revolutions = (Maximum response frequency/Resolution) x 60

Therefore, if the encoder rotates at a speed greater than the electrical maximum number of revolutions, the signals do not electrically follow.

Electrical Specifications

Model Number		TRD-J□-S□	TRD-J□-RZ□	TRD-J□-RZV□	
Power Supply	Supply Voltage	4.75 to 30 V DC	4.75 to 30 V DC	4.75 to 5.25 V DC	
	Allowable Ripple	3% rms or less	3% rms or less	3% rms or less	
	Consumption Current (No Load)	40 mA or lower (See the figure on consumption current characteristics.)	60 mA or lower (See the figure on consumption current characteristics.)	130 mA or lower	
Output Waveform	Signal Format	1-phase output	2-phase output + home position	2-phase output + home position	
	Duty Ratio	50±25%	50±25%	50±25%	
	Signal Width at Home Position	—	50 to 150%	50 to 150%	
Output	Rise / Fall Time*1	Not larger than 3 μs	Not larger than 3 μs	Not larger than 2 μs	
	Output Form	Totem-pole output	Totem-pole output	Line driver output*2	
	Output Current	Source "H"	Up to 10 mA	Up to 10 mA	—
		Sink "L"	Up to 30 mA	Up to 30 mA	—
	Output Voltage	"H"	[(Supply Voltage) - 2.5 V] or more	[(Supply Voltage) - 2.5 V] or more	2.5 V or higher
		"L"	0.4 V or lower	0.4 V or lower	0.5 V or lower
	Output Standard	TTL5 V	10 TTL	10 TTL	—
Load Supply Voltage		30 V DC or lower	30 V DC or lower	—	

*1: Cable 0.5 m or shorter, maximum load

*2: Equivalent to 26LS31
(Output signal is TTL-compatible.)

Mechanical Specifications

Starting Torque	0.003 N·m or less (+20°C) (However, 0.02N·m or lower for dustproof and waterjet-proof type)
Moment of Inertia	2 x 10 ⁻⁶ kg·m ²
Shaft Allowable Load	Radial: 50 N
	Thrust: 30 N
Maximum Allowable Number of Revolutions (Note 1)	5,000 rpm (However, 3,000 rpm (continuously) for dustproof and waterjet-proof type)
Bearing Life	5 x 10 ³ rounds (Calculated value at the maximum load)
Cable	Outside diameter ϕ 5 mm (W type is ϕ 6mm) 5-core shielded oil-resistant vinyl chloride cable Core wire nominal cross-sectional area: 0.3 mm ² (Line driver output is 8 cores, 0.14 mm ²)
Weight	220 g or less (With 0.5 m cable)

Note 1: Maximum number of revolutions that can be mechanically endured

Environmental Requirements

Use Ambient Temperature	-10 to +50°C
Storage Ambient Temperature	-25 to +85°C
Use Ambient Humidity	35 to 85% RH (No condensation)
Withstand Voltage	500 V AC 1 minute*
Insulation Resistance	50 MΩ or higher*
Vibration Resistance (Endurance)	Displacement half amplitude: 0.75 mm, 10 to 55 Hz, 3 axial directions, each 1 h
Impact Resistance (Endurance)	490 m/s ² 11 ms, each 3 times in 3 axial directions
Protective Structure	Dustproof type: IP50 Dustproof and Waterjet-proof type: IP65

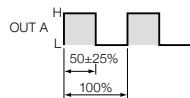
* The power supply, signal lines, and shield between the cases are excluded.

TRD-J Series Specifications

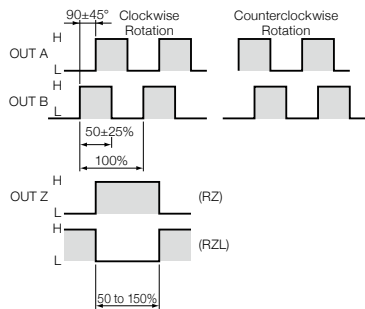
- PLC
- HMI
- SENSOR
- ENCODER
- COUNTER
- INFORMATION

Output Waveform

Totem-pole (1-phase output)

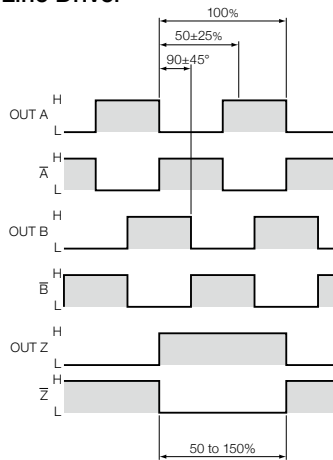


Output with 2-phase origin



Note: Clockwise rotation when the main body is seen from the axle side is the normal rotation.

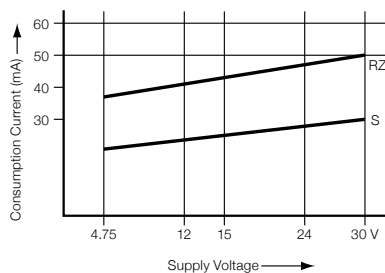
Line Driver



Note: Clockwise rotation when the main body is seen from the axle side is the normal rotation.

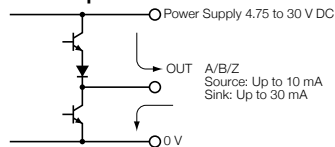
Electrical Characteristics (Typical)

Consumption Current Characteristics

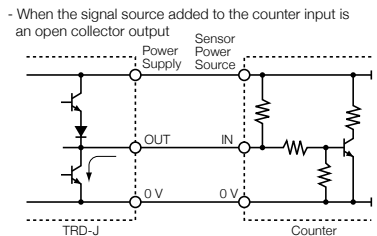
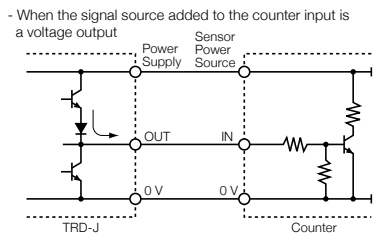


Output Circuit

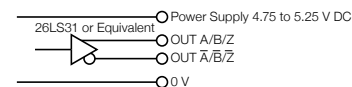
Totem-pole



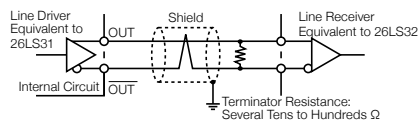
The totem-pole output supports both voltage output and open collector output.



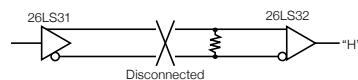
Line Driver



The line driver output comes from a data transmission circuit that conforms to RS-422A and can transmit data up to 1,200 m over twisted pair cables.



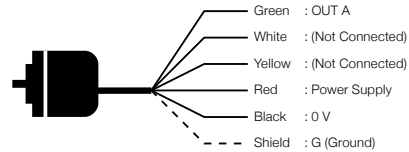
- When the transmission line or connector is disconnected, the output becomes "H."



Connection Diagram

Totem-pole (1-phase output)

The shielded wire is connected to the main body.



Connector <Pin Assignment Figure>

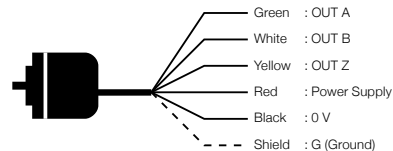


*Figure Seen from Wiring Side (Back side)

- Pin Code
- A: OUT A
 - B: (Not Connected)
 - C: (Not Connected)
 - D: Power Supply
 - E: 0 V
 - F: (Not Connected)

Output with 2-phase origin

The shielded wire is connected to the main body.



Connector <Pin Assignment Figure>

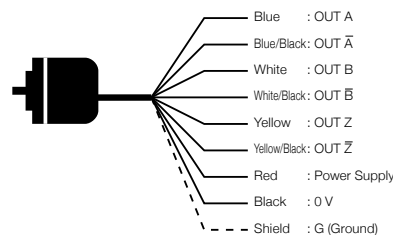


*Figure Seen from Wiring Side (Back side)

- Pin Code
- A: OUT A
 - B: OUT B
 - C: OUT Z
 - D: Power Supply
 - E: 0 V
 - F: (Not Connected)

Line Driver

The shielded wire is connected to the main body.



Connector <Pin Assignment Figure>



*Figure Seen from Wiring Side (Back side)

- Pin Code
- A: OUT A
 - B: OUT A-bar
 - C: OUT B
 - D: OUT B-bar
 - E: OUT Z
 - F: OUT Z-bar
 - G: Power Supply
 - H: 0 V

TRD-J Series

Dimensions

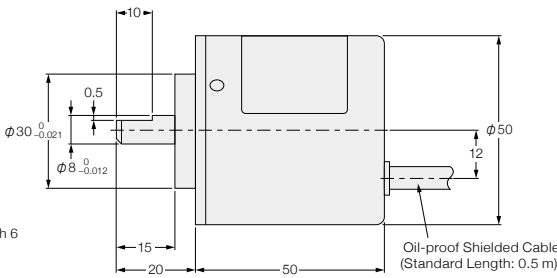
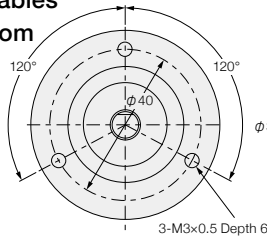
- PLC
- HMI
- SENSOR
- ENCODER**
- COUNTER
- INFORMATION

- Rotary Encoder Lineup
- Selection Guide
- Incremental Type**
- Absolute Type

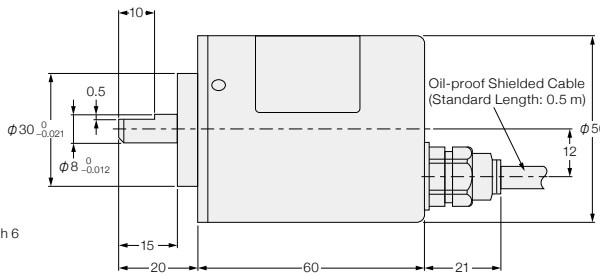
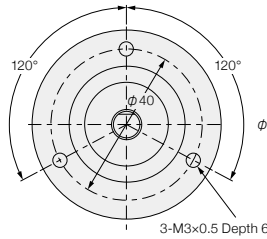
Dimensions

(Unit: mm)

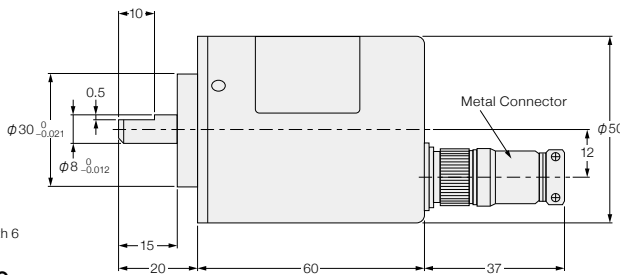
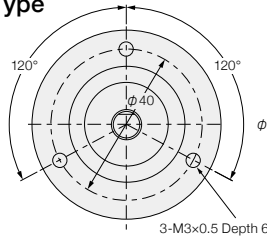
Type with Cables Taken out from the Back



Dustproof and Waterjet-proof Type (W type)



Connector Type (C type)

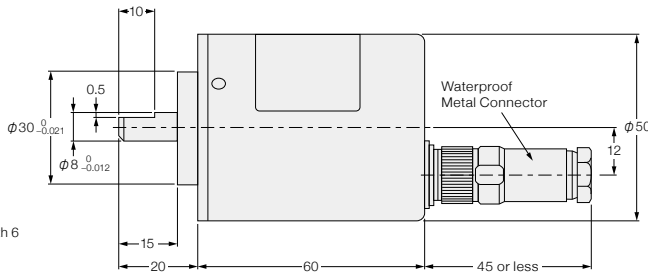
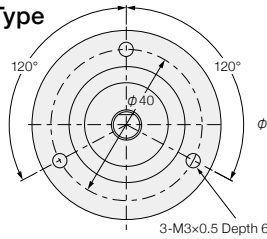


Model numbers of connectors

- Totem-pole output (S□/RZ□)
Body : R03-R6F
Cable : R03-PB6M (Provided)
- Line driver output (RZV□)
Body : R03-R8F
Cable : R03-PB8M (Provided)
(Made by Tajima Musen)

* Connecting wire cross-section: 0.3mm² or less
Diameter of cable duct: φ6.2

Dustproof and Waterjet-proof Type Connector Type (CW type)

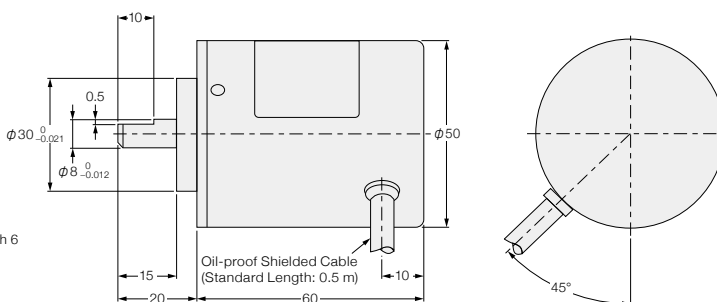
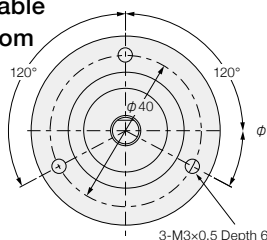


Model numbers of connectors

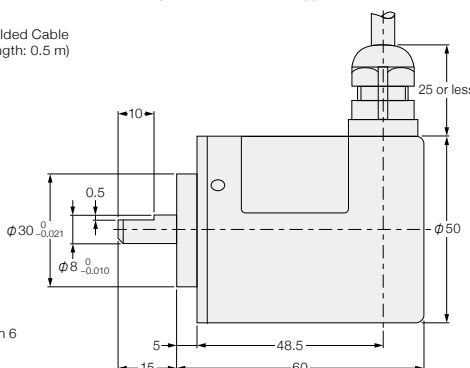
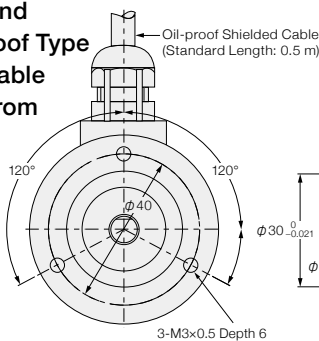
- Totem-pole output (S□/RZ□)
Body : R04-R6F
Cable : R04-P6M (Provided)
- Line driver output (RZV□)
Body : R04-R8F
Cable : R04-P8M (Provided)
(Made by Tajima Musen)

* Connecting wire cross-section: 0.3mm² or less
Diameter of cable duct: φ6.2

Type with Cable Taken out from the Side (S type)



Dustproof and Waterjet-proof Type with Cable Taken Out from the Side (WS type)



The specifications and prices described in this catalog were valid when the catalog was issued. For the latest information, contact our sales persons or see our website.

- PLC
- HMI
- SENSOR
- ENCODER**
- COUNTER
- INFORMATION

TRD-GK Series

Features



φ78 Incremental Type

- A stronger spindle means high axial load (radial 100 N / thrust 50 N) and a long service-life (bearing life 1.2×10^{10} turns).
- Dustproof and waterjet-proof type
- Totem-pole output that enables cable extension
- Installation using a servo mount convenient for origin adjustment is possible.



- Rotary Encoder Lineup
- Selection Guide
- Incremental Type**
- Absolute Type

Model Number List

Type	Appearance	Model Number	Output	Pulse Number / Rotation
Dustproof and Waterjet-proof Type with Cables Taken Out from the Back		TRD-GK□-R	2-phase output	10, 12, 15, 50, 60
		TRD-GK□-RZ	Output with 2-phase origin (Origin direct action □□)	30, 100, 120, 200, 240, 250, 300, 360, 400, 500, 600, 800, 1,000, 1,200, 1500, 1,800, 2,000, 2,500, 3,600, 5,000
		TRD-GK□-RZL	Output with 2-phase origin (Origin reverse action □□)	30, 100, 120, 200, 240, 250, 300, 360, 400, 500, 600, 800, 1,000, 1,200, 1500, 1,800, 2,000, 2,500, 3,000, 3,600, 4,000, 5,000
		TRD-GK□-BZ	Direction discrimination output Output with origin (Origin direct action □□)	30, 60, 100, 120, 200, 240, 250, 300, 360, 400, 500, 600, 800, 1,000, 1,200, 1500, 1,800, 2,000, 2,500, 3,000, 3,600, 4,000, 5,000
Dustproof and Waterjet-proof Type Connector Type		TRD-GK□-RC2	2-phase output	10, 12, 15, 50, 60
		TRD-GK□-RZC2	Output with 2-phase origin (Origin direct action □□)	30, 100, 120, 200, 240, 250, 300, 360, 400, 500, 600, 800, 1,000, 1,200, 1500, 1,800, 2,000, 2,500, 3,600, 5,000
		TRD-GK□-RZC2L	Output with 2-phase origin (Origin reverse action □□)	30, 100, 120, 200, 240, 250, 300, 360, 400, 500, 600, 800, 1,000, 1,200, 1500, 1,800, 2,000, 2,500, 3,000, 3,600, 4,000, 5,000
		TRD-GK□-BZC2	Direction discrimination output Output with origin (Origin direct action □□)	30, 60, 100, 120, 200, 240, 250, 300, 360, 400, 500, 600, 800, 1,000, 1,200, 1500, 1,800, 2,000, 2,500, 3,000, 3,600, 4,000, 5,000

TRD-GK □ - RZ C2 L - □

- Series classification
- Pulse number
- Signal format
 - R** : 2-phase output
 - RZ** : Output with 2-phase origin (Origin direct action)
 - BZ** : Direction distinction circuit
- Connection form
 - Blank: Type with cables taken out from the back
 - C2** : Connector type
- Origin reverse action symbol
 - If the signal type is RZ, models with "L" produce the origin reverse action.
- (Special specifications products)

- TRD-MX
- TRD-S/SH
- TRD-2E
- TRD-N/NH
- TRD-J
- TRD-GK**

TRD-GK Series

Specifications

- PLC
- HMI
- SENSOR
- ENCODER
- COUNTER
- INFORMATION

Pulse and Frequencies

Pulse Number per Rotation	10	12	15	30	50	60	100	120	200	240	250	300	360	400	500	600	800	1,000	1,200	1,500	1,800	2,000	2,500	3,000	3,600	4,000	5,000
Maximum Response Frequency (kHz)*	0.83	1	1.25	2.5	4.17	5	8.33	10	16.7	20	20.8	25	30	33.3	41.7	50	66.7	83.3	100	100	100	100	100	100	100	100	100
Applicable Models	TRD-GK□-R□	●	●	●		●	●																				
	TRD-GK□-RZ□				●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	TRD-GK□-BZ□				●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

* The electric maximum response frequency is specified by resolution (pulse number) and the maximum number of revolutions.
 Electrical maximum number of revolutions = ((Maximum response frequency/Resolution) x 60)
 Therefore, if the encoder rotates at a speed greater than the electrical maximum number of revolutions, the signals do not electrically follow.

Electrical Specifications

Model Number		TRD-GK□-R□/RZ□	TRD-GK□-BZ□	
Power Supply	Supply Voltage	10 to 30 V DC	10 to 30 V DC	
	Allowable Ripple	3% rms or less	3% rms or less	
	Consumption Current (No Load)	Below 16 V DC: 50 mA or lower / 16 V DC or higher: 70 mA or lower	Below 16 V DC: 50 mA or lower / 16 V DC or higher: 70 mA or lower	
Output Waveform	Signal Format	R: 2-phase output/RZ: 2-phase output + home position	Direction discrimination output + home position	
	Duty Ratio	50±25%	10 to 60% (2001P or more: 50±25%)	
	Signal Width at Home Position	400 P or lower : 25 to 150% / 500 P or higher: 1*±30** (However, 1,800P, 3,600P, 5,000P: 50 to 150%)	400 P or lower : 25 to 150% / 500 P or higher: 1*±30' (However, 60P, 3,600P: 100 to 300% 1,800P: 50 to 150%)	
Output	Rise / Fall Time	Not larger than 3 μs (Cable length 2 m or less, maximum load)	Not larger than 3 μs (Cable length 2 m or less, maximum load)	
	Output Form	Totem-pole output	Totem-pole output	
	Output Current	Source "H"	Up to 30 mA	Up to 30 mA
		Sink "L"	Up to 30 mA	Up to 30 mA
	Output Voltage	"H"	[(Supply Voltage) - 4 V] or more	[(Supply Voltage) - 4 V] or more
		"L"	2 V or lower	2 V or lower
Load Supply Voltage	35 V DC or lower	35 V DC or lower		

* There is no origin signal for the R type

Mechanical Specifications

Starting Torque	0.1 N·m or less (+20°C)
Moment of Inertia	1 x 10 ⁻⁵ kg·m ²
Shaft Allowable Load	Radial: 100 N
	Thrust: 50 N
Maximum Allowable Number of Revolutions (Note 1)	5,000 rpm
Bearing Life	1.2 x 10 ¹⁰ rounds (Calculated value at the maximum load)
Cable	Outside diameter φ6 mm 5-core shielded oil-resistant vinyl chloride cable Core wire nominal cross-sectional area: 0.3 mm ²
Weight	Type with cables taken out from the back: Approx. 600 g or less (With 2 m cable) Connector type: Approx. 500 g

Note 1: Maximum number of revolutions that can be mechanically endured

Environmental Requirements

Use Ambient Temperature	-10 to +70°C
Storage Ambient Temperature	-25 to +85°C
Use Ambient Humidity	35 to 85% RH (No condensation)
Withstand Voltage	500 V AC 1 minute*
Insulation Resistance	50 MΩ or higher*
Vibration Resistance (Endurance)	Displacement half amplitude: 10 to 55 Hz
	500 P or less: 0.75 mm 600 P or more: 0.35 mm 3 axial directions, each 1 h
Impact Resistance (Endurance)	500 P or less: 980 m/s ² 11 ms
	600 P or more: 294 m/s ² 11 ms Each 3 times in 3 axial directions
Protective Structure	IP65 (Dustproof and waterjet-proof type)

* The power supply, signal lines, and shield between the cases are excluded.

- Rotary Encoder Lineup
- Selection Guide
- Incremental Type
- Absolute Type

- TRD-MX
- TRD-S/SH
- TRD-2E
- TRD-N/NH
- TRD-J
- TRD-GK

TRD-GK Series

Specifications

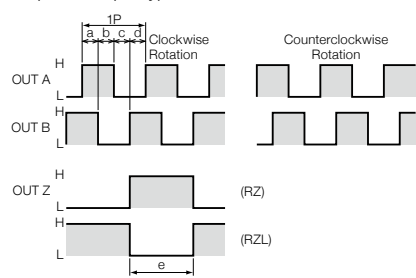
- PLC
- HMI
- SENSOR
- ENCODER
- COUNTER
- INFORMATION

- Rotary Encoder Lineup
- Selection Guide
- Incremental Type
- Absolute Type

Output Waveform

Totem-pole

《2-phase output type》

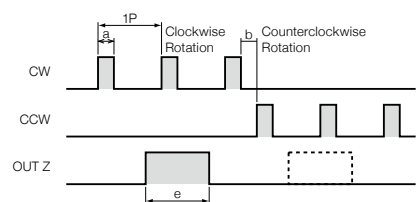


a, b, c, d = $(1/4 \pm 1/8) P$
 e: 400 pulses or less 25 to 150%
 500 pulses or more $1^\circ \pm 30'$
 (At 1,800, 3,600, 5000 pulses only: 50 to 150%)

* OUT Z (origin output) is generated when passing the origin position regardless of rotational direction.
 * There is no OUT Z for the R type.

Note: Clockwise rotation when the main body is seen from the axle side is the normal rotation.
 Phase advancing of OUT A and OUT B differs only for 3600th and 5000th pulse.

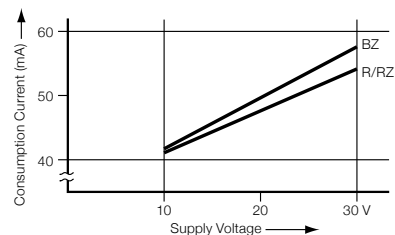
《Direction discrimination output type》



a = $(1/4 \pm 1/8) P$ b $\geq 1/4 P$
 e: 400 pulses or less 25 to 150%
 500 pulses or more $1^\circ \pm 30'$
 (At 60, 3,600 P: 100 to 300%, 1,800 P: 50 to 150%)

* OUT Z (origin output) is generated when passing the origin position regardless of rotational direction.

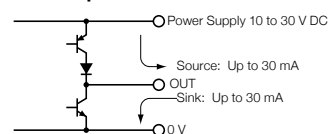
Electrical Characteristics (Typical)



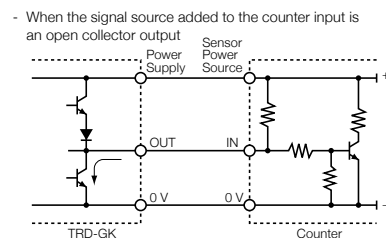
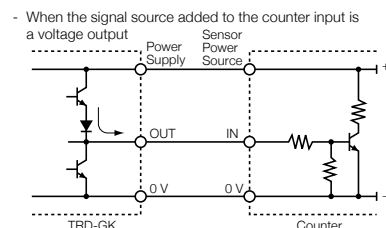
- TRD-MX
- TRD-S/SH
- TRD-2E
- TRD-N/NH
- TRD-J
- TRD-GK

Output Circuit

Totem-pole



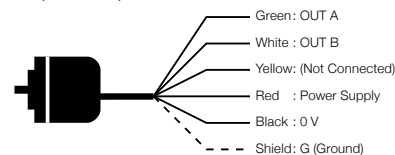
The totem-pole output supports both voltage output and open collector output.



Connection Diagram

Totem-pole

《2-phase output》



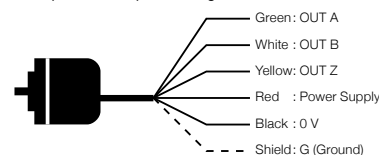
Connector
 <Pin Assignment Figure>



* Figure Seen from Wiring Side (Back side)

- Pin Code
- 1: OUT A
 - 2: OUT B
 - 3: (Not Connected)
 - 4: Power Supply
 - 5: 0 V
 - 6: Shield

《Output with 2-phase origin》



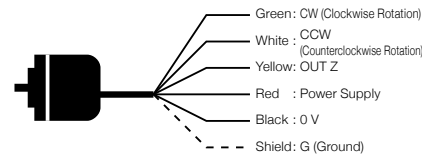
Connector
 <Pin Assignment Figure>



* Figure Seen from Wiring Side (Back side)

- Pin Code
- 1: OUT A
 - 2: OUT B
 - 3: OUT Z
 - 4: Power Supply
 - 5: 0 V
 - 6: Shield

《Direction discrimination output》



Connector
 <Pin Assignment Figure>



* Figure Seen from Wiring Side (Back side)

- Pin Code
- 1: CW
 - 2: CCW
 - 3: OUT Z
 - 4: Power Supply
 - 5: 0 V
 - 6: Shield

TRD-GK Series

Dimensions

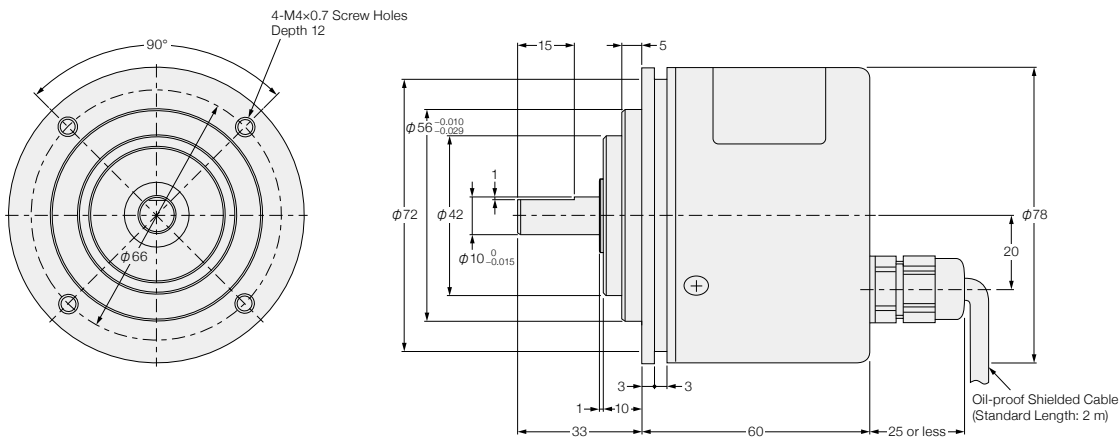
- PLC
- HMI
- SENSOR
- ENCODER**
- COUNTER
- INFORMATION

- Rotary Encoder Lineup
- Selection Guide
- Incremental Type**
- Absolute Type

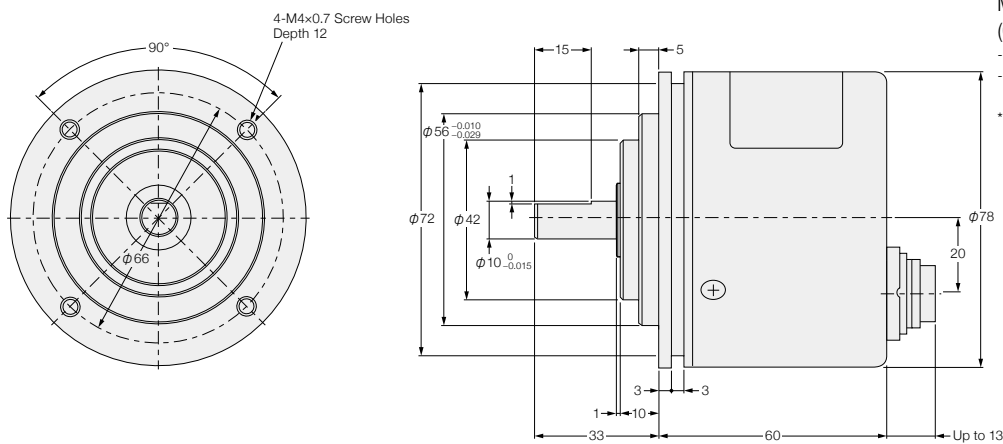
- TRD-MX
- TRD-S/SH
- TRD-2E
- TRD-N/NH
- TRD-J
- TRD-GK**

Dimensions (Unit: mm)

Type with Cables Taken Out from the Back



Connector Type (C2 type)

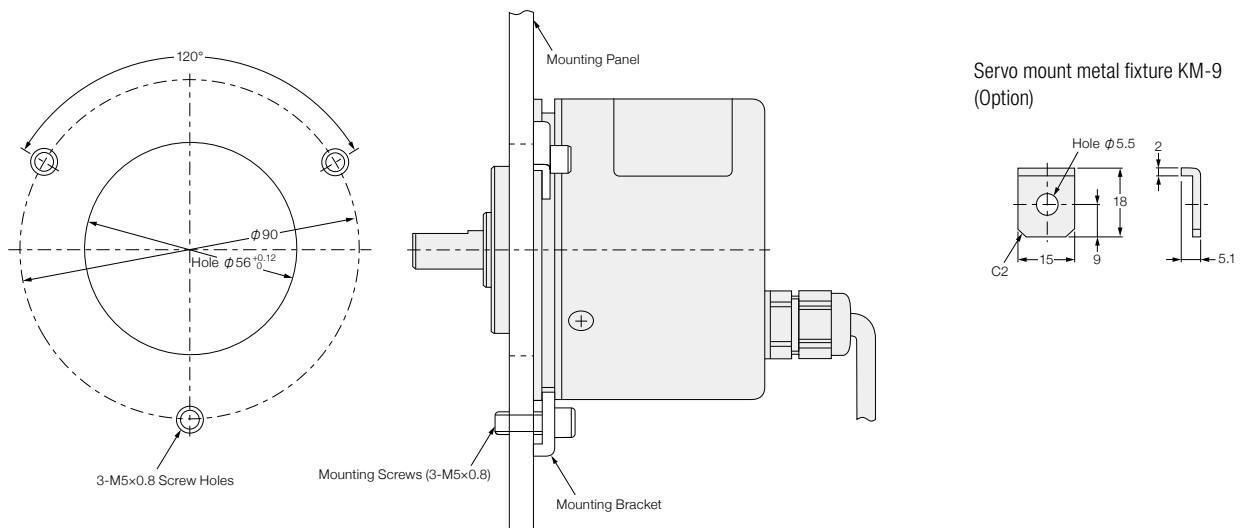


Model numbers of connectors (Option)

- Straight: BMCC-6
- Angular: BAFC-6

* For details, see the page on options.

Servo Mount Metal Mounting State Diagram



The specifications and prices described in this catalog were valid when the catalog was issued. For the latest information, contact our sales persons or see our website.

- PLC
- HMI
- SENSOR
- ENCODER
- COUNTER
- INFORMATION

TRD-NA Series

Features

φ50 Absolute Type

- Ultracompact design with an outside diameter of φ50 mm / depth of 35 mm
- Thoroughly strengthened dustproof and waterjet-proof type with robust aluminum die-cast cover
- High axial load due to the strengthened spindle of φ8 mm stainless steel shaft.
- Gray code output that eliminates reading errors
- Use of a metal slit board delivers an impact resistance of 980 m/s².

(2,048 pulses for glass slit board)



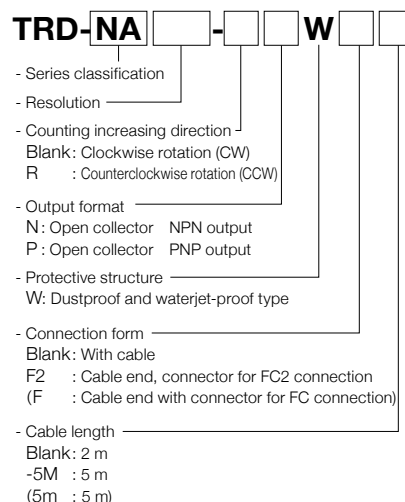
Model Number List

NPN Output

Resolution	Output Increasing Rotation Direction	With Cable		With Relay Connector	With the connector for FC2 connection (For FC)	
		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-NA360NWF2 (TRD-NA360NWF)	TRD-NA360NWF2-5M (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-NA720NWF2 (TRD-NA720NWF)	TRD-NA720NWF2-5M (TRD-NA720NWF5M)
	CCW	TRD-NA720RNW	TRD-NA720RNW5M	TRD-NA720RNWE	—	—
1,024 (10-bit)	CW	TRD-NA1024NW	TRD-NA1024NW5M	TRD-NA1024NWE	—	—
	CCW	TRD-NA1024RNW	TRD-NA1024RNW5M	TRD-NA1024RNWE	—	—
2,048 (11-bit)	CW	TRD-NA2048NW	TRD-NA2048NW5M	TRD-NA2048NWE	—	—
	CCW	TRD-NA2048RNW	TRD-NA2048RNW5M	TRD-NA2048RNWE	—	—

PNP Output

Resolution	Output Increasing Rotation 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
1,024 (10-bit)	CW	TRD-NA1024PW	TRD-NA1024PW5M	TRD-NA1024PWE
	CCW	TRD-NA1024RPW	TRD-NA1024RPW5M	TRD-NA1024RPWE



TRD-NA Series Specifications

- PLC
- HMI
- SENSOR
- ENCODER
- COUNTER
- INFORMATION

- Rotary Encoder Lineup
- Selection Guide
- Incremental Type
- Absolute Type

Electrical Specifications

Model Number	TRD-NA□NW		TRD-NA□PW	
Power Supply	Supply Voltage	10.8 to 26.4 V DC		
	Allowable Ripple	3% rms or less		
	Consumption Current*4	70 mA or lower (2,048 pulses: 100 mA or lower)	100 mA or lower	
Output Code	Gray binary*1		←	
Maximum Response Frequency	20 kHz*2		←	
Precision	(360/ (Resolution x 2))°		←	
Rotation Direction	Clockwise rotation (CW) or counterclockwise rotation (CCW)*3		←	
Output	Output Form	NPN open collector output		
	Output Logic	Negative logic (Active low)		
	Residual Voltage	0.4 V or lower	1.5 V or lower	0.5 V or lower
	Inflow-Outflow Current	16 mA	32 mA	30 mA
	Load Supply Voltage	30 V DC or lower		←
Rise / Fall Time*5	Not larger than 2.0 μs (Load resistance 1kΩ)		Not larger than 3.0 μs (Load resistance 1kΩ)	

*1: Excess 38 gray code for 180 resolution, excess 76 gray code for 360 resolution, and excess 152 gray code for 720 resolution
 *2: Electrical maximum number of revolutions = ((Maximum response frequency/Resolution) x 60)
 Therefore, if the encoder rotates at a speed greater than the electrical maximum number of revolutions, the signals do not electrically follow.
 *3: CW means clockwise seen from the shaft side. CCW means counterclockwise seen from the shaft side. *4: No load *5: Cable length 2 m, maximum load

Mechanical Specifications

Starting Torque	0.02 N·m or less (+20°C)
Moment of Inertia	2 x 10 ⁻⁶ kg·m ²
Shaft Allowable Load	Radial: 50 N
	Thrust: 30 N
Maximum Allowable Number of Revolutions (Note 1)	3,000 rpm (Continuously)
	5,000 rpm (Instantaneously)
Cable	Outside diameter ϕ 7 mm
	12-core shielded oil-resistant vinyl chloride cable (1,024 or less)
	13-core shielded oil-resistant vinyl chloride cable (2,048) Core wire nominal cross-sectional area: 0.14 mm ²
Weight	Approx. 300 g (With 2 m cable)

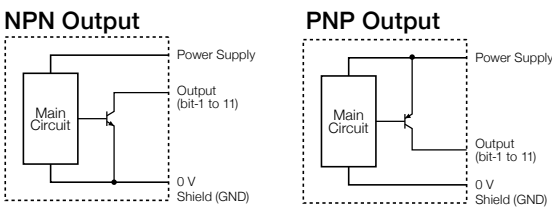
Note 1: Maximum number of revolutions that can be mechanically endured

Environmental Requirements

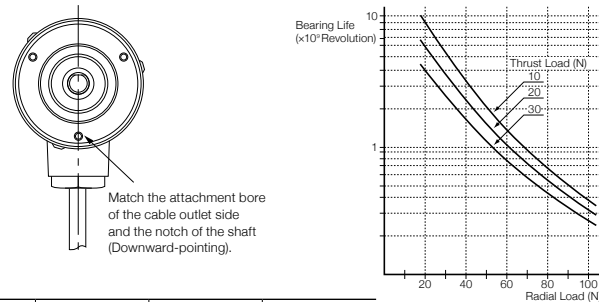
Use Ambient Temperature	-10 to +60°C
Storage Ambient Temperature	-25 to +85°C
Use / Storage Ambient Humidity	25 to 85% RH (No condensation)
Withstand Voltage	Excluded due to capacitor grounding*
Insulation Resistance	10 MΩ or higher*
Vibration Resistance (Endurance)	Displacement half amplitude: 0.75 mm or less, 10 to 55 Hz, 3 axial directions, each 1 h
Impact Resistance (Endurance)	980 m/s ² 11 ms, each 3 times in 3 axial directions
Protective Structure	IP65 (Dustproof and waterjet-proof type)

* The power supply, signal lines, and shield between the cases are excluded.

Output Circuit



Home Position Bearing Life

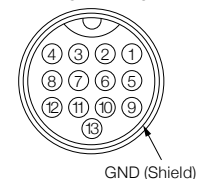


Connection

Cable Type Core Wire Color	Connector Type Pin No.	2,048 Resolution	1,024/720 Resolution	512/360 Resolution	256/180 Resolution	128 Resolution	64 Resolution	32 Resolution
Blue	1	0 V	0 V	←	←	←	←	←
Brown	2	+12/24 V	+12/24 V	←	←	←	←	←
Black	3	bit 1 (2 ⁿ)	bit 1 (2 ⁿ)	Not connected	←	←	←	←
Red	4	bit 2 (2 ⁿ)	bit 2 (2 ⁿ)	bit 1 (2 ⁿ)	Not connected	←	←	←
Orange	5	bit 3 (2 ⁿ)	bit 3 (2 ⁿ)	bit 2 (2 ⁿ)	bit 1 (2 ⁿ)	Not connected	←	←
Yellow	6	bit 4 (2 ⁿ)	bit 4 (2 ⁿ)	bit 3 (2 ⁿ)	bit 2 (2 ⁿ)	bit 1 (2 ⁿ)	Not connected	←
Green	7	bit 5 (2 ⁿ)	bit 5 (2 ⁿ)	bit 4 (2 ⁿ)	bit 3 (2 ⁿ)	bit 2 (2 ⁿ)	bit 1 (2 ⁿ)	Not connected
Purple	8	bit 6 (2 ⁿ)	bit 6 (2 ⁿ)	bit 5 (2 ⁿ)	bit 4 (2 ⁿ)	bit 3 (2 ⁿ)	bit 2 (2 ⁿ)	bit 1 (2 ⁿ)
Gray	9	bit 7 (2 ⁿ)	bit 7 (2 ⁿ)	bit 6 (2 ⁿ)	bit 5 (2 ⁿ)	bit 4 (2 ⁿ)	bit 3 (2 ⁿ)	bit 2 (2 ⁿ)
White	10	bit 8 (2 ⁿ)	bit 8 (2 ⁿ)	bit 7 (2 ⁿ)	bit 6 (2 ⁿ)	bit 5 (2 ⁿ)	bit 4 (2 ⁿ)	bit 3 (2 ⁿ)
Black / White	11	bit 9 (2 ⁿ)	bit 9 (2 ⁿ)	bit 8 (2 ⁿ)	bit 7 (2 ⁿ)	bit 6 (2 ⁿ)	bit 5 (2 ⁿ)	bit 4 (2 ⁿ)
Red / white	12	bit 10 (2 ⁿ)	bit 10 (2 ⁿ)	bit 9 (2 ⁿ)	bit 8 (2 ⁿ)	bit 7 (2 ⁿ)	bit 6 (2 ⁿ)	bit 5 (2 ⁿ)★
Orange / white	13	bit 11 (2 ⁿ)	Not connected	←	←	←	←	←
Shield	—	GND	GND	←	←	←	←	←

* The parenthesis marks the bit corresponding to the binary code. ★: Most significant bit

Connector
<Pin Assignment Figure>



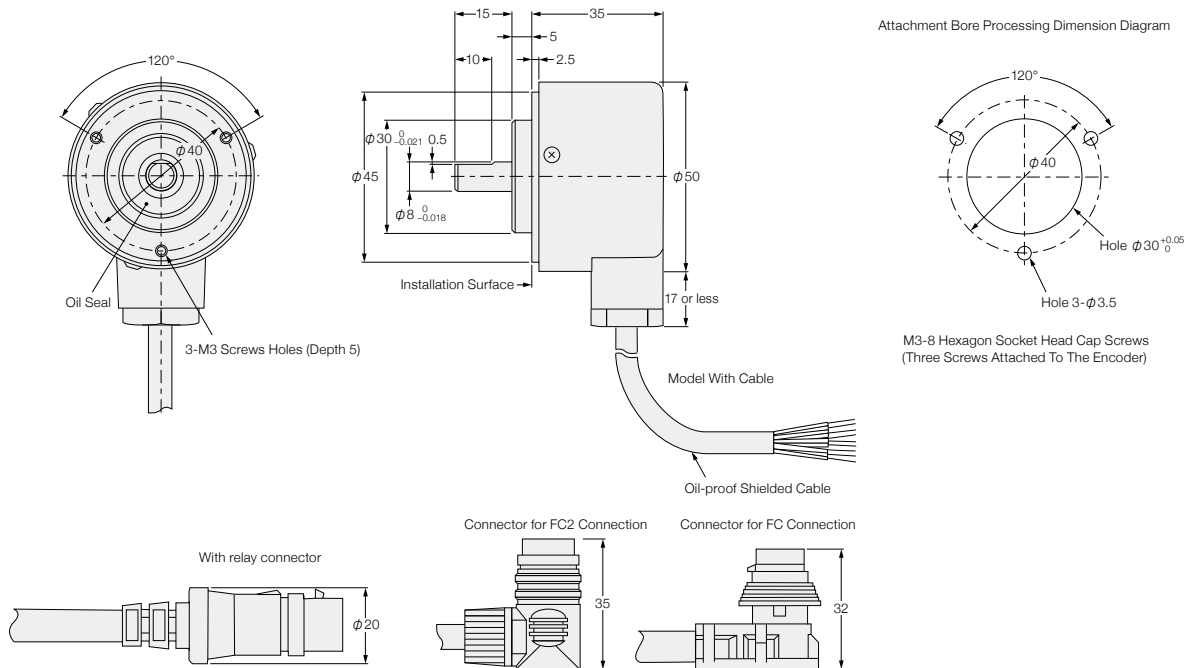
* Figure Seen from Wiring Side (Back side)

- PLC
- HMI
- SENSOR
- ENCODER**
- COUNTER
- INFORMATION

TRD-NA Series

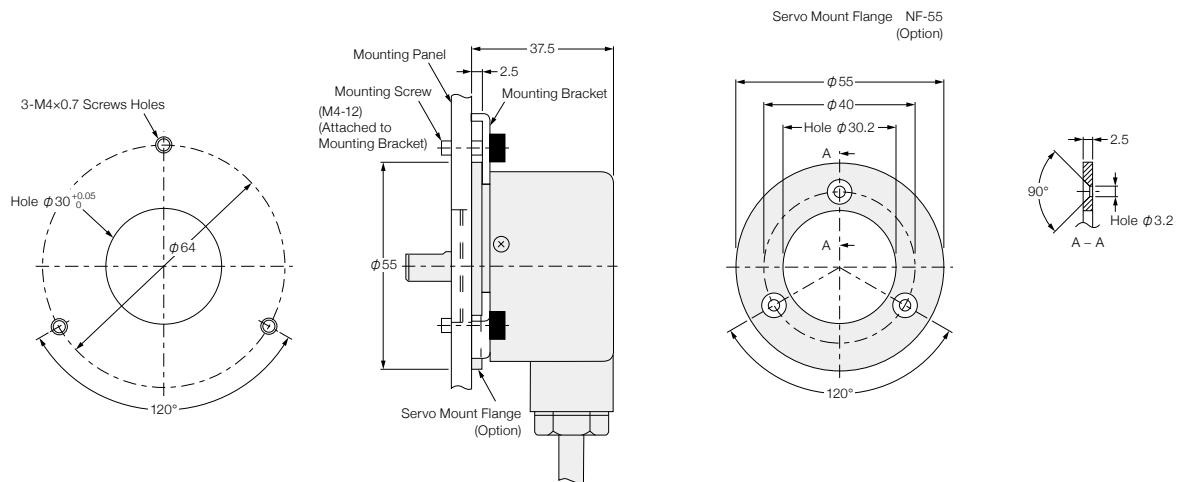
Dimensions

Dimensions (Unit: mm)



* The connector does not have a waterjet-proof structure.







Servo Mount Metal Mounting State Diagram



Servo Mount Metal Fixture (Attached to the Optional Flange)

- TRD-NA**
- TRD-K

TRD-NA Series

- PLC 
- HMI 
- SENSOR 
- ENCODER** 
- COUNTER 
- INFORMATION 

- Rotary Encoder Lineup
- Selection Guide
- Incremental Type
- Absolute Type**

- TRD-NA**
- TRD-K

- P L C
- H M I
- SENSOR
- ENCODER
- COUNTER
- INFORMATION

TRD-K Series

Features

φ78 Absolute Type

- Resolutions up to 10 bits (1,024) are available.
- High axial load due to strengthened spindle (Radial 100 N / thrust 50 N)
- Robust type using a φ10 mm stainless steel shaft
- Gray code output that eliminates reading errors
- Use of a metal slit board delivers an impact resistance of 980m/s².
- Installation using a servo mount convenient for origin adjustment is possible.



Model Number List

Type	Model Number	Resolution	Cable Length	Remarks	
Dustproof and waterjet-proof Type with Cables Taken Out from the Side	TRD-K180-YS	180 (8-bit)	2 m	Provided with an FC-21 dedicated connector	Provided with a cable expansion connection connector
	TRD-K256-YS	256 (8-bit)			
	TRD-K360-YS	360 (9-bit)		TRD-K360-YCS	TRD-K360-YPS
	TRD-K512-YS	512 (9-bit)		TRD-K512-YCS	TRD-K512-YPS
	TRD-K720-YS	720 (10-bit)		TRD-K720-YCS	TRD-K720-YPS
Dustproof and Waterjet-proof Connector Type (with Cables Taken Out from the Back)	TRD-K1024-YS	1,024 (10-bit)	No	TRD-K1024-YCS	TRD-K1024-YPS
	TRD-K360-YC2	360 (9-bit)			
	TRD-K512-YC2	512 (9-bit)			
	TRD-K720-YC2	720 (10-bit)			
	TRD-K1024-YC2	1,024 (10-bit)			

TRD-K **-Y** **C** **S**

- Series classification
- Resolution
- Gray code output
- Connection form
- C : Provided with an FC-21 dedicated connector
- P : Provided with a cable expansion connection connector
- C2: Dustproof and waterjet-proof connector type (with cables taken out from the back)
- With cables taken out from the side

Electrical Specifications

Model Number	TRD-K -Y 	
Power Supply	Supply Voltage	10.8 to 26.4 V DC
	Allowable Ripple	3% rms or less
	Consumption Current	70 mA or lower (No load)
Output Code	Gray binary	
Maximum Response Frequency	20 kHz	
Precision	(360 / (Resolution x 2))°	
Rotation Direction	Increase of output code in clockwise rotation (CW)	
Output	Output Form	NPN open collector output
	Output Logic	Negative logic (Active low)
	Residual Voltage	0.4 V or lower
	Sink Current	30 mA or lower
	Load Supply Voltage	30 V DC or lower
Rise / Fall Time*	Not larger than 2.0 μs (Load resistance 1 kΩ)	

*Cable length 2 m, maximum load

Mechanical Specifications

Starting Torque	0.1 N·m or less (+20°C)
Moment of Inertia	1 x 10 ⁻⁵ kg·m ²
Shaft Allowable Load	Radial: 100 N
	Thrust: 50 N
Maximum Allowable Number of Revolutions (Note 1)	5,000 rpm
Cable	Outside diameter φ7.8 mm 12-core shielded oil-resistant vinyl chloride cable Core wire nominal cross-sectional area: 0.3 mm ²
Weight	Type with cable taken out from the side: Approx. 750 g (With 2 m cable) Connector type: Approx. 500 g

Note 1: Maximum number of revolutions that can be mechanically endured

Environmental Requirements

Use Ambient Temperature	-10 to +50°C
Storage Ambient Humidity	-25 to +80°C
Use Ambient Humidity	35 to 85% RH (No condensation)
Withstand Voltage	500 V AC 50/60 Hz 1 minute*
Insulation Resistance	10 MΩ or higher (500 V DC mega)
Vibration Resistance (Endurance)	Displacement half amplitude: 0.75 mm, 10 to 55 Hz, 3 axial directions, each 1 h
Impact Resistance (Endurance)	980 m/s ² 11 ms, each 3 times in 3 axial directions
Protective Structure	IP65 (Dustproof and waterjet-proof type)

* The power supply, signal lines, and shield between the cases are excluded.

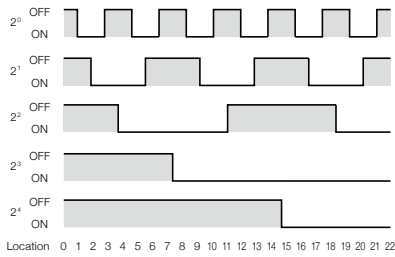
TRD-K Series

Specifications

- PLC
- HMI
- SENSOR
- ENCODER**
- COUNTER
- INFORMATION

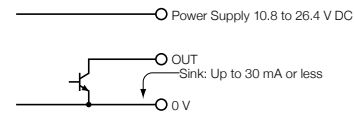
- Rotary Encoder Lineup
- Selection Guide
- Incremental Type
- Absolute Type**

Output Waveform



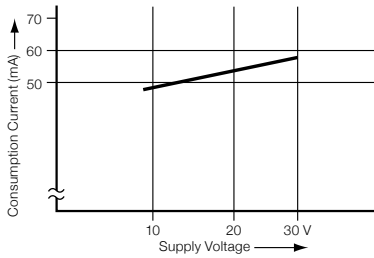
Output Circuit

Open Collector



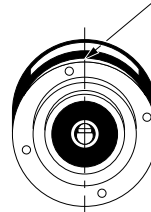
Electrical Characteristics (Typical)

Consumption Current Characteristics



Home Position

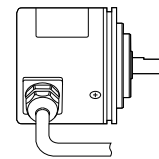
Match the Cover Installation Screw on the Nameplate Side and the Notch of the Shaft (Upward-pointing).



Connection

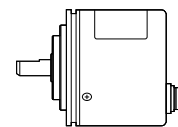
Type with Cable Taken Out from the Side

Line Color	Model Number	TRD-K1024-□ TRD-K720-□	TRD-K360-□ TRD-K512-□	TRD-K180-□ TRD-K256-□
Red		Power supply +12/24 V	←	←
Black		Power supply 0 V	←	←
Brown	Output	2 ⁰	←	←
Orange		2 ¹	←	←
Yellow		2 ²	←	←
Green		2 ³	←	←
Blue		2 ⁴	←	←
Purple		2 ⁵	←	←
Gray		2 ⁶	←	←
White		2 ⁷	←	←
Pink		2 ⁸	←	(Not connected)
Light Blue		2 ⁹	(Not connected)	(Not connected)
Shield		GND	←	←

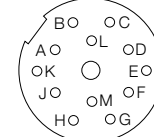


Dustproof and Waterjet-proof Connector Type

Pin No.	Model Number	TRD-K1024-□ TRD-K720-□	TRD-K360-□ TRD-K512-□
A		Power supply +12/24 V	←
B	Output	2 ⁰	←
C		2 ¹	←
D		2 ²	←
E		2 ³	←
F		2 ⁴	←
G		2 ⁵	←
H		2 ⁶	←
J		2 ⁷	←
K		2 ⁸	←
L	2 ⁹	(Not connected)	
M		Power supply 0 V	←



Connector
<Pin Assignment Figure>



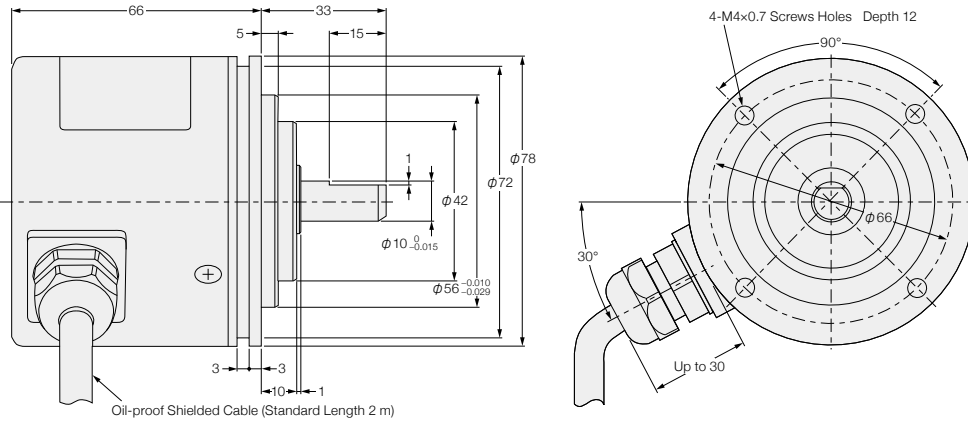
*Figure Seen from Wiring Side (Back side)

TRD-K Series

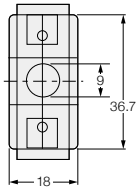
Dimensions

Dimensions (Unit: mm)

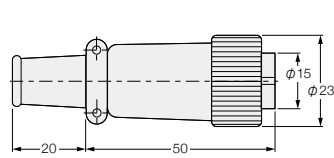
Type with Cable Taken Out from the Side (TRD-K□-YS)



FC-21 dedicated connector
(TRD-K□-YCS)
Model: Made by Honda MR-16L/MR-16M

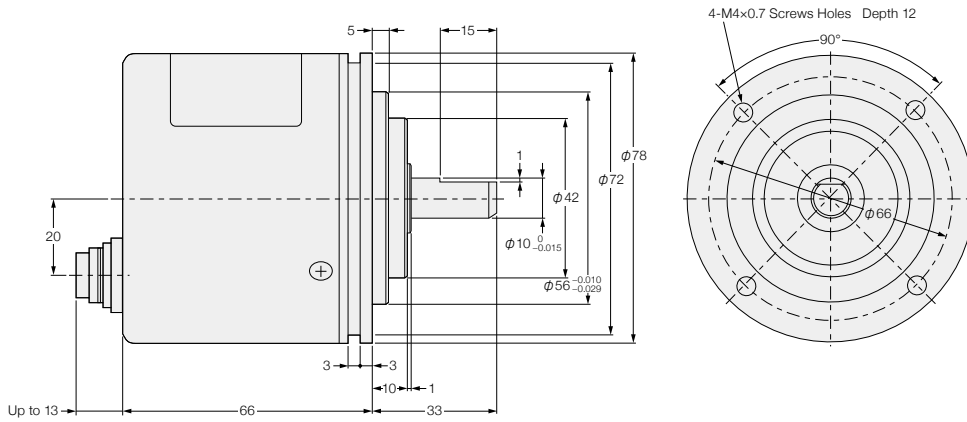


Cable expansion connection connector
(TRD-K□-YPS)
Model: Made by Hirose RM15TPD-12P



* Connector is not equipped with the cable for TRD-K□-YS

Dustproof and Waterjet-proof Connector Type (TRD-K□-YC2)

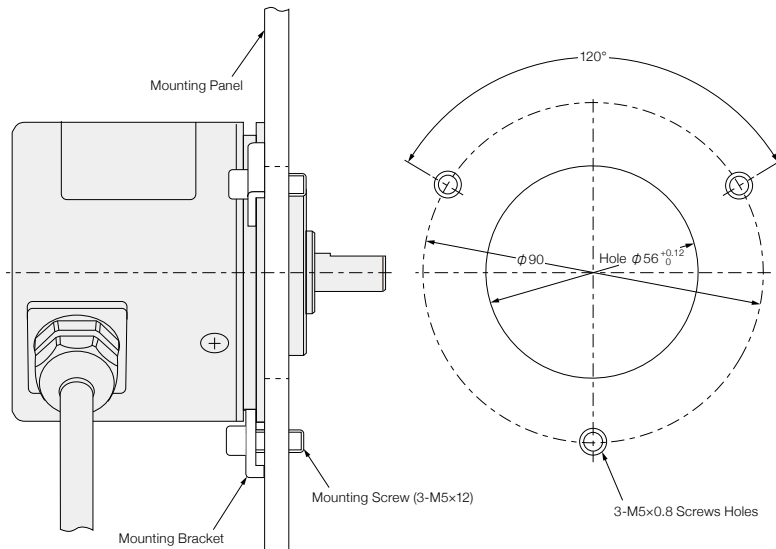


Model numbers of connectors
(Option)

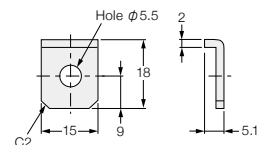
- Straight: BMCC-12
- Angular: BAFC-12

* For details, see the page on options.

Servo Mount Metal Mounting State Diagram



Servo mount metal fixture KM-9
(Accessories)









- PLC
- HMI
- SENSOR
- ENCODER
- COUNTER
- INFORMATION

- Rotary Encoder Lineup
- Selection Guide
- Incremental Type
- Absolute Type

- TRD-NA
- TRD-K

TRD-K Series

- PLC 
- HMI 
- SENSOR 
- ENCODER **
- COUNTER 
- INFORMATION 

- Rotary Encoder Lineup
- Selection Guide
- Incremental Type
- Absolute Type**

- TRD-NA
- TRD-K**

- PLC
- HMI
- SENSOR
- ENCODER
- COUNTER
- INFORMATION

Special Specifications/Option

Mounting Brackets·Couplings

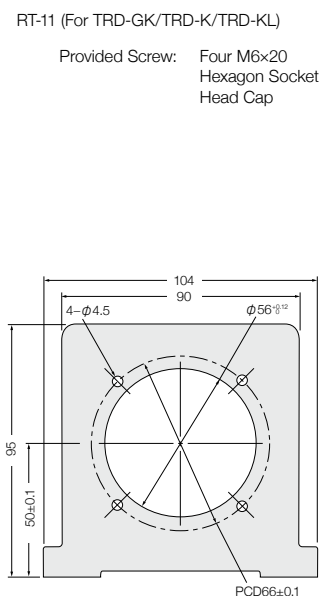
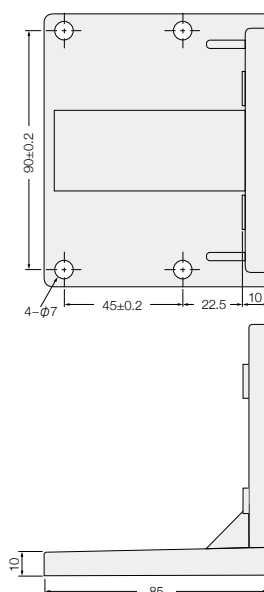
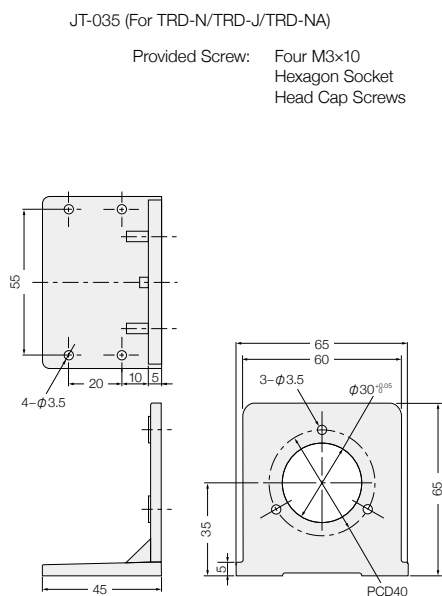
Special Specifications Products

Other than standard products, the following special specifications types can be manufactured. For details, consult with us.

Special Specification Contents	Applicable Models					
	TRD-S/SH	TRD-N/NH	TRD-J	TRD-GK	TRD-NA	TRD-K
Changed Cable Length	●	●	●	●	●	●
Treated Terminal of Cable (With Connector)	●	●	●	●	●	●
Pulse Product Except Standard Products	●	●	●	●		
Extended Length of Shaft	●	●	●	●	●	●
Changed Thickness of Shaft	●	●	●	●	●	●
Counterclockwise rotation output (Counting increases in CCW)						●

Option (Unit: mm)

Mounting Brackets



Couplings

1. Material and features of coupling

- Three kinds of coupling made of resin, metal, and flat spring are available. They can be selected according to conditions of use. Select the most suitable type for your conditions of use.
- Basically, it is recommended to use couplings made of metal and flat spring for "high resolution" and couplings made of resin for "low resolution." (When the resolution exceeds 3,600 P/R, it is considered high resolution.)
- For safety's sake, use metal couplings for applications that involve intense acceleration and deceleration, normal and reverse rotation, intermittence, or when using encoders that have high starting torque even for relatively "low resolution." Use flat spring couplings for applications that generate ultralow rotating speeds or when using encoders that have high starting torque.

Material	Advantage	Disadvantage
Resin	<ul style="list-style-type: none"> - Low price - The alignment of shafts when mounting can be rough. - Lightweight. The moment of inertia is small and the load on the drive system is small. - Electrical insulation is possible. 	<ul style="list-style-type: none"> - The couplings can be mounted even if the misalignment between axes is large. Therefore, if they are used in this state for a long time, resin-made couples have lower strength than metal couples and may be damaged by fatigue phenomena. - There is little margin of strength in screw parts. Therefore, if forces that surpass the specified value are applied, screw parts may be damaged, causing the shaft slip.
Metal Flat spring	<ul style="list-style-type: none"> - Torsional rigidity is high. Suitable for high resolution. - Allowable transmission torque is large. 	<ul style="list-style-type: none"> - High price - The weight is heavy, which may place a large load on the drive system. - Since the allowable misalignment for mounting couplings to each other is small, accurate positioning is required when mounting the couplings.

2. Misalignment allowance of coupling (Eccentricity error, deflection angle error, and axial displacement error)

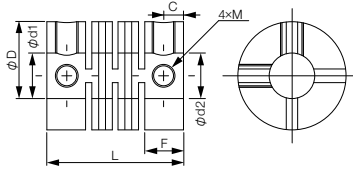
- Since the allowable eccentricity error, allowable deflection angle error, and allowable axial direction displacement of couplings are correlated, namely if one of them increases, the others decrease, they should be considered all together.
- If the misalignment is serious, excessive load is added to the shaft, which may be damaged or result in an extremely shorter life. Since the service-life is longer with little misalignment, make the misalignment as little as possible.

3.Procedure for mounting couplings

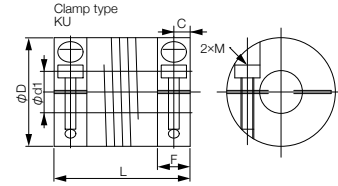
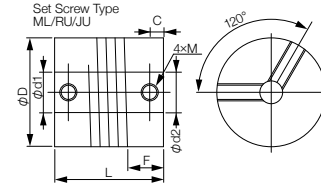
- 1) Wipe off dirt and oil cleanly from the surface of the mounting axle and coupling mounting plane using a waste cloth.
- 2) Center the mounting axle and put the coupling over the axle.
 - Make sure that the coupling smoothly moves when it is set over both axles.
 - Do not use screws to anchor the coupling to the axles.
- 3) Anchor the encoder. Do not push the axle into the coupling more than the proper distance.
- 4) Anchor the coupling. Anchor the axles by tightening screws to the proper torque value.

4.Coupling dimensions (Unit: mm)

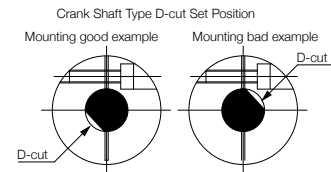
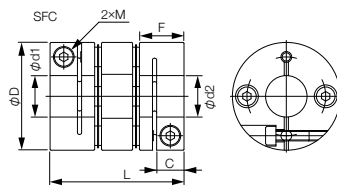
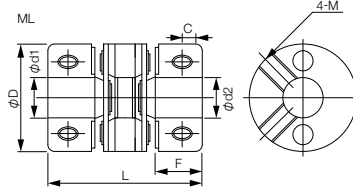
Plastic coupling



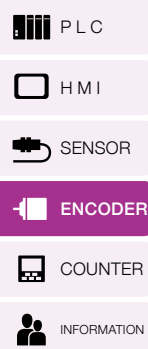
Metal coupling



Coupling made of flat spring



Type	K/E Model Number	Conforming Rotary Encoder	Material	d1	d2	D [ϕ mm]	L [mm]	F [mm]	C [mm]	Shaft Insertion Depth [mm]	Screw	
											Size	Tightening Torque [N·m]
Plastic Coupling	GJ-4	TRD-MX	Glass-fiber reinforced PBT resin	4	4	13	21	5.3	3	5.0 or more 5.3 or less	M3	0.2
	GJ-6	TRD-S/2E	Glass-fiber reinforced PBT resin	6	6	15	22	5.2	3	5.0 or more 5.2 or less	M3	0.25
	GJ-8	TRD-N/J/NA	Glass-fiber reinforced PBT resin	8	8	19	24	6.8	3.5	6.6 or more 6.8 or less	M4	0.4
	GJ-10	TRD-GK/K	Glass-fiber reinforced PBT resin	10	10	22	26	7.1	4	6.9 or more 7.1 or less	M4	0.5
Metal Coupling	MU-075	TRD-MX	Aluminum alloy (Equivalent to 7075)	4	4	19.1	19.1	4.6	2.4	6 or more 8 or less	M3	0.7
	RU-075	TRD-S/2E	Aluminum alloy (Equivalent to 7075)	6	6	19.1	19.1	4.6	2.4	6 or more 8 or less	M3	0.7
	JU-100	TRD-N/J/NA	Aluminum alloy (Equivalent to 7075)	8	8	25.4	25.4	6.6	3.8	7 or more 10 or less	M5	3.6
	RU-100	TRD-GK/K	Aluminum alloy (Equivalent to 7075)	10	10	25.4	25.4	6.6	3.8	7 or more 10 or less	M5	3.6
	KU-100	TRD-GK/K	Aluminum alloy (Equivalent to 7075)	10	10	25	32	7.9	3.8	7 or more 14 or less	M3	1.5
Coupling Made of Flat Spring	ML16P-4-4	TRD-MX	Aluminum die-cast hub + Polyimide plate	4	4	16	23	7	3	6.8 or more 7 or less	M3	0.7
	ML16P-6-6	TRD-S/2E	Aluminum die-cast hub + Polyimide plate	6	6	16	23	7	3	6.8 or more 7 or less	M3	0.7
	ML20P-8-8	TRD-N/J/NA	Aluminum die-cast hub + Polyimide plate	8	8	20	25	7.5	3.7	7.3 or more 7.5 or less	M3	0.7
	ML25P-10-10	TRD-GK/K	Aluminum die-cast hub + Polyimide plate	10	10	25	30	9	4	8.8 or more 9 or less	M4	1.7
	SFC-10-10	TRD-GK/K	Aluminum alloy + Stainless steel plate	10	10	26	32.3	10.7	3.3	7 or more 10 or less	M2.5	1.1



Option

Couplings

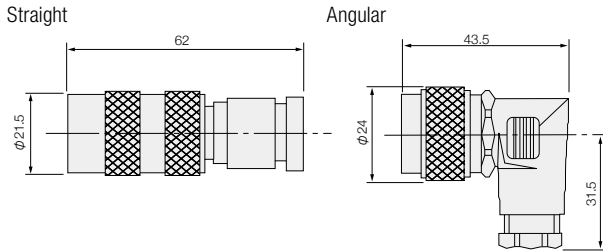
5. Specifications of couplings

Type	K/E Model Number	Static Torsion Spring Constant [N·m/rad]	Normal Torque [N·m]	Maximum Number of Revolutions [rpm]	Moment of Inertia [kg·m ²]	Allowable Eccentricity [mm]	Allowable Deflection Angle [°]	Allowable End Play [±mm]
Resin	GJ-4	6	0.6	4,000	7.0×10^{-8}	0.4	5	0.4
	GJ-6	10	0.8	6,000	1.2×10^{-7}	0.5	5	0.4
	GJ-8	20	1.5	8,000	3.9×10^{-7}	0.5	5	0.4
	GJ-10	32	2.0	10,000	7.0×10^{-7}	0.5	5	0.4
Metal	MU-075	8.2	1.0	25,000	7.02×10^{-7}	0.25	5	0.25
	RU-075	8.2	1.0	25,000	7.02×10^{-7}	0.25	5	0.25
	JU-100	14.3	1.6	25,000	2.87×10^{-6}	0.25	5	0.25
	RU-100	14.3	1.6	25,000	2.87×10^{-6}	0.25	5	0.25
	KU-100	14.3	1.6	10,000	3.60×10^{-6}	0.25	5	0.25
Flat Spring	ML16P-4-4	70	0.4	19,000	2.4×10^{-7}	0.6	5	0.3
	ML16P-6-6	70	0.4	19,000	2.4×10^{-7}	0.6	5	0.3
	ML20P-8-8	130	0.6	18,000	7.2×10^{-7}	0.6	5	0.4
	ML25P-10-10	240	1.4	16,000	2.2×10^{-6}	0.6	5	0.6
	SFC-10-10	1,850	2.0	10,000	3.43×10^{-6}	0.15	2	0.33

Option Connector·Junction Cables

- PLC
- HMI
- SENSOR
- ENCODER**
- COUNTER
- INFORMATION

Cable Connector (for TRD-GK/TRD-K Series Connector)



Type	for TRD-GK Series		for TRD-K Series	
	Straight	Angular	Straight	Angular
Model number	BMCC-6	BAFC-6	BMCC-12	BAFC-12
Number of pins	6P		12P	
Connecting Wire Cross-section	0.75mm ² or less		0.25mm ² or less	
Terminal	Soldered			
Conforming Cable Outside Diameter	5 to 8 mm			
Protective Structure	IP67 (When connected and locked)			

Junction Cables

Target Model No. (Absolute Type)	Appearance	Cable Length	Model Number	Remarks		
 TRD-NA TRD-NA360NWE TRD-NA720NWE TRD-NA□(R)NWE TRD-NA□(R)PWE □...1024 or less		3 m	F-30GF2	Programmable cam for FC2 series connection		
		5 m	F-50GF2			
		10 m	F-100GF2			
		 TRD-K TRD-K360-YC2 TRD-KL360-YC2 TRD-K720-YC2 TRD-KL720-YC2		3 m	F-30GF	Programmable cam for FC series connection
				5 m	F-50GF	
				10 m	F-100GF	
 TRD-KL TRD-K360-YC2 TRD-KL360-YC2 TRD-K720-YC2 TRD-KL720-YC2		2 m	F-20G	Extension cable		
		3 m	F-30G			
		5 m	F-50G			
		10 m	F-100G			
 TRD-KL TRD-K360-YC2 TRD-KL360-YC2 TRD-K720-YC2 TRD-KL720-YC2		5 m	F-2542	Programmable cam for FC series connection		
		2 m	F-20ANC2			
		5 m	F-50ANC2			
		2 m	F-20BNC2			
		5 m	F-50BNC2			
		2 m	F-20ANC2A			
5 m	F-50ANC2A					
2 m	F-20BNC2A					
5 m	F-50BNC2A					

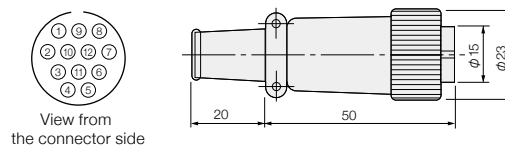
Conversion Cable







Appearance	Cable Length	Model Number	Remarks
	0.2 m	F-2GF-7308	Connector conversion cable for connecting programmable cam switch (FC-Series) and rotary encoder (TRD-NA□NWF2)
	0.2 m	F-2GF2	Connector conversion cable for connecting programmable cam switch (FC2-Series) and rotary encoder (TRD-NA□NWF)

Cable expansion connection connector

Model: Made by Hirose RM15TPD-12P

Pin Assignment	Line Color	Signal Name	Pin Assignment	Line Color	Signal Name
1	Red	Vcc	7	Purple	2 ⁵
2	Brown	2 ⁰	8	Gray	2 ⁶
3	Orange	2 ¹	9	White	2 ⁷
4	Yellow	2 ²	10	Pink	2 ⁸
5	Green	2 ³	11	Light Blue	2 ⁹
6	Blue	2 ⁴	12	Black	0 V



-  PLC
-  HMI
-  SENSOR
-  ENCODER
-  COUNTER
-  INFORMATION

Explanatory Material

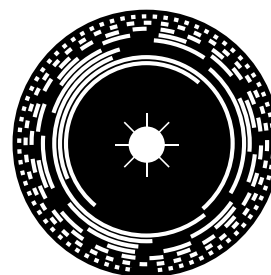
Explanation of Absolute Type

Features of Absolute Type

The signal for the absolute position as determined by the rotation angle is output as a code (gray code) in parallel. Therefore, a counter is not necessary and the signal is always output according to the angle of the input rotational axis when the power is turned on.

Since a counter is not necessary, the absolute encoder is always stable against chattering caused by electric noise and vibrations.

Moreover, even if the power is turned on again after powering off, an accurate rotation angle can be read and the system can be quickly started because origin return is not necessary.



What is the Gray code?

Gray code

Bit Output	Decimal Number										
	0	1	2	3	4	5	6	7	8	9	10
1 ON OFF		■				■				■	
2 ON OFF			■		■						■
3 ON OFF				■		■					
4 ON OFF							■			■	

Binary code

Bit Weight	Decimal Number										
	0	1	2	3	4	5	6	7	8	9	10
2 ¹ ON OFF		■		■		■		■		■	
2 ² ON OFF			■		■		■		■		■
2 ³ ON OFF				■		■		■		■	
2 ⁴ ON OFF							■		■		■

As shown in the figure above, in the case of a binary code, several bits change simultaneously between neighboring codes.

Since the input response speed of devices connected to the encoder has some variation, errors occur in that codes that were not actually output are read in the case of binary code.

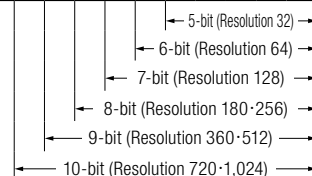
In contrast, since only 1 bit between neighboring codes changes in the case of gray codes, reading errors such as those in binary code do not occur.

* "ON" in the figure indicates the state that the output transistor turns on and the current flows in.

Output Code Table

Decimal system	bit									
	10	9	8	7	6	5	4	3	2	1
0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	1
2	0	0	0	0	0	0	0	0	1	1
31	0	0	0	0	0	1	0	0	0	0
32	0	0	0	0	1	1	0	0	0	0
37	0	0	0	0	1	1	0	1	1	1
38	0	0	0	0	1	1	0	1	0	1
63	0	0	0	0	1	0	0	0	0	0
64	0	0	0	1	1	0	0	0	0	0
75	0	0	0	1	1	0	1	1	1	0
76	0	0	0	1	1	0	1	0	1	0
127	0	0	0	1	0	0	0	0	0	0
128	0	0	1	1	0	0	0	0	0	0
151	0	0	1	1	0	1	1	1	0	0
152	0	0	1	1	0	1	0	1	0	0
217	0	0	1	0	1	1	0	1	0	1
218	0	0	1	0	1	1	0	1	1	1
255	0	0	1	0	0	0	0	0	0	0
256	0	1	1	0	0	0	0	0	0	0
435	0	1	0	1	1	0	1	0	1	0
436	0	1	0	1	1	0	1	1	1	0
511	0	1	0	0	0	0	0	0	0	0
512	1	1	0	0	0	0	0	0	0	0
871	1	0	1	1	0	1	0	1	0	0
872	1	0	1	1	0	1	1	1	0	0
1022	1	0	0	0	0	0	0	0	0	1
1023	1	0	0	0	0	0	0	0	0	0

*Output transistor
"1"=ON "0"=OFF



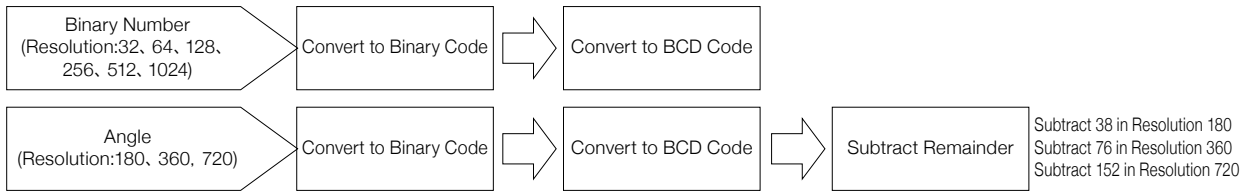
Explanatory Material

Explanation of Absolute Type

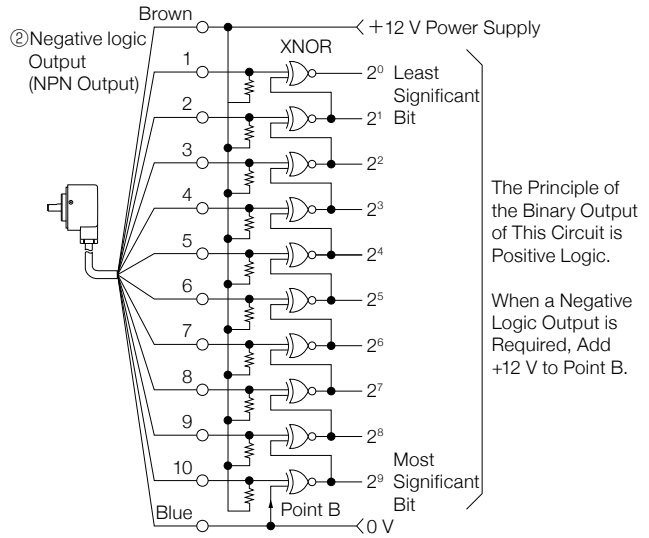
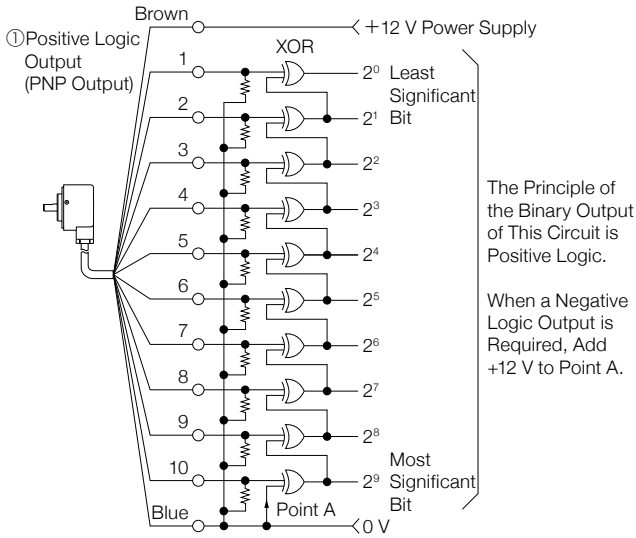
- PLC
- HMI
- SENSOR
- ENCODER**
- COUNTER
- INFORMATION

Conversion of Output Code

Since gray code is used, take the following procedures when converting output code into binary code or BCD code.



Example of a Circuit that Converts Gray Code Into Binary Code (When the resolution is 1,024)



- PLC
- HMI
- SENSOR
- ENCODER
- COUNTER
- INFORMATION

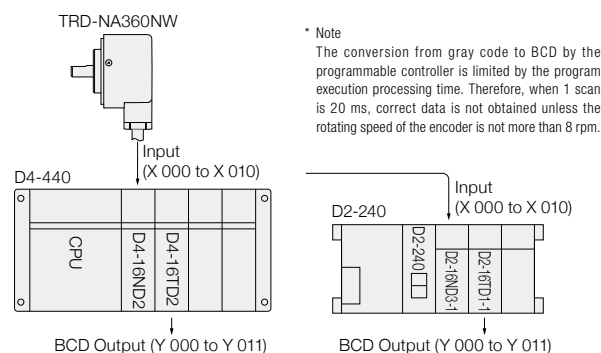
Explanatory Material

Explanation of Absolute Type

Conversion From [Gray Code] → [BCD Code] Based on the PLC Program

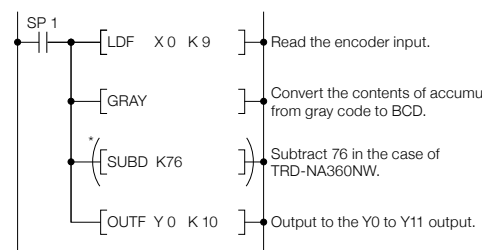
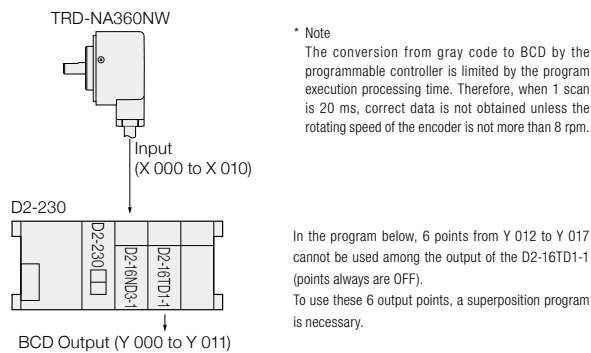
Example of TRD-NA and D4-440 • D2-240

TRD-NA360NW Output Connection	D4-440•D2-240 Input No.
Red Least significant bit	X 000
Orange	X 001
Yellow	X 002
Green	X 003
Purple	X 004
Gray	X 005
White	X 006
Black / White	X 007
Red / White Most significant bit	X 010

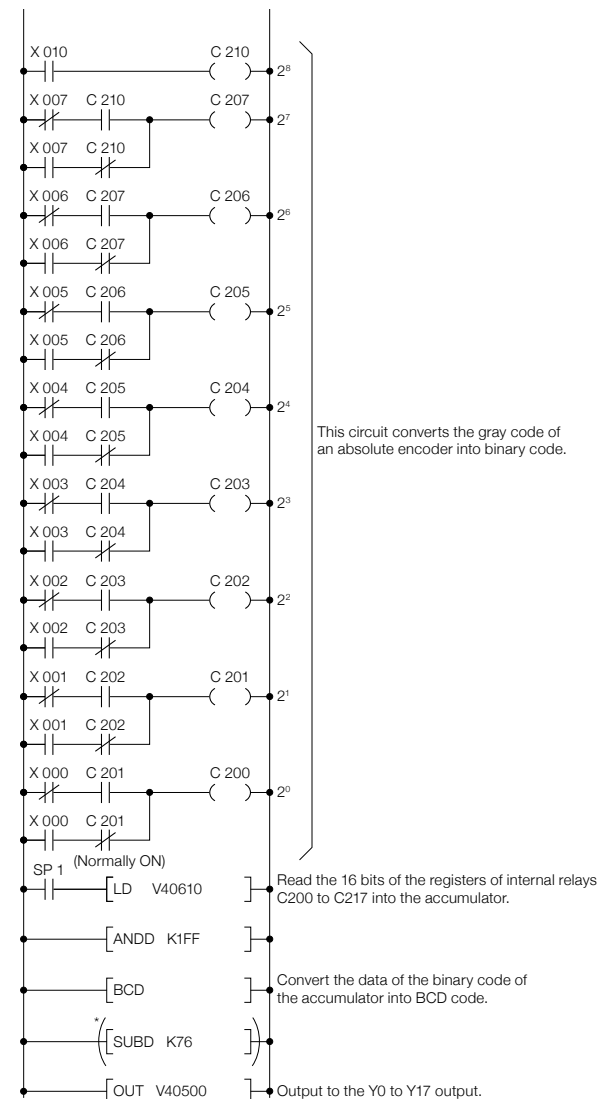


Example of TRD-NA and D2-230

TRD-NA360NW Output Connection	D2-230 Input No.
Red Least significant bit	X 000
Orange	X 001
Yellow	X 002
Green	X 003
Purple	X 004
Gray	X 005
White	X 006
Black / White	X 007
Red / White Most significant bit	X 010



* Because the TRD-NA360□ of 360 resolution uses an excess of 76 gray codes, 76 should be subtracted to make the BCD output code of 0° to 360°. In the TRD-NA512□ of 512 resolution and TRD-NA1024□ of 1024 resolution, this SUBC instruction should be eliminated.



* Because the TRD-NA360□ of 360 resolution uses an excess of 76 gray codes, 76 should be subtracted to make the BCD output code of 0° to 360°.

Explanatory Material

Connection of Incremental Type

- PLC
- HMI
- SENSOR
- ENCODER**
- COUNTER
- INFORMATION

Connection with Koyo Electronics' Electronic Counters, etc.

When connecting to a counter, etc., select a model after checking (1) sensor power source (voltage / current) of the counter and (2) the logic of the origin signal, using the table below.

(1) Sensor power source

The voltage and current correlation to the sensor power source and each model of the rotary encoder is shown in the table below.

Connected Devices		Rotary Encoder						
Series Model Number	Sensor Power Source	TRD-N		TRD-J			TRD-GK	
		S	RZ/RZL	S	RZ/RZL	RZV	R/RZ/RZL	BZ
KCV	24 V DC/60 mA	●	●	●	●	×	▲	▲
KCX	12 V DC/50 mA	●	▲	●	●	×	●	▲
KCX-B	24 V DC/80 mA	●	●	●	●	×	●	▲
TC-V	24 V DC/60 mA	●	●	●	●	×	▲	▲
TC-4L	12 V DC/30 mA	▲	▲	●	▲	×	▲	▲
TC-4□*	12 V DC/50 mA	●	▲	●	●	×	●	▲

● mark: Conforming (Usable) ▲ mark: A power supply is separately required.
 × mark: Nonconforming (Unusable) *TC-4/TC-4B/TC-4S/TC-4W

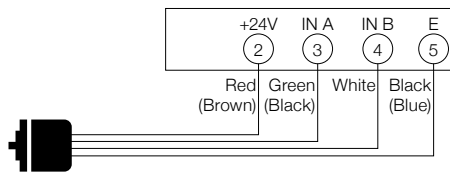
(2) Origin logic

When connecting the origin output (OUTZ) of the rotary encoder to the reset and preset input of a counter, etc., it is necessary to select the origin logic that conforms to the input format, as this differs according to counter. Check the model numbers of conforming electronic counters by referring the table below.

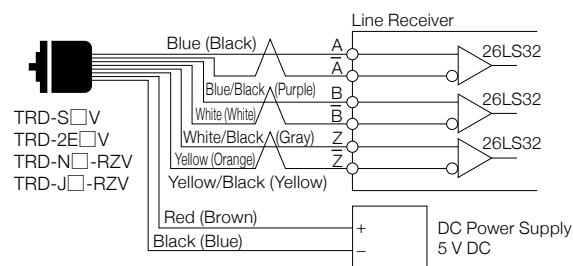
Connected Devices		Rotary Encoder			
Series Model Number		TRD-N/J/GK		TRD-J	TRD-GK
		RZ	RZL	RZV	BZ
KCV		●	●	×	●
KCX		●	×	×	●
KCX-B		●	●	×	●
TC-V		●	●	×	●
TC-4L		×	●	×	×
TC-41		●	●	×	●
TC-4/4B/4S/4W		×	●	×	×

● mark: Conforming (Usable) × mark: Nonconforming (Unusable)

KCV Series

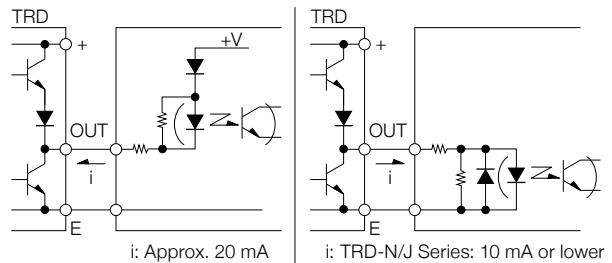


Connection of Line Driver Output Type



Connection to a Photocoupler

A photocoupler can be directly driven by the output of the rotary encoder. Example of connection: The totem-pole output of the TRD series can be used in either case shown in the figure below.



Note) Connect the resistance and diode to the photocoupler side. Use a photocoupler of fast response speed.

Connection to a Stabilized DC Power Supply

When connecting the rotary encoder, if there is a shortage in the capacity of the built-in power source of connected devices such as counters (power source for sensor, etc.), use a commercial stabilized DC power supply.

- PLC
- HMI
- SENSOR
- ENCODER**
- COUNTER
- INFORMATION

Precautions

Precautions in Use / Noise Measures

Precautions in Use

Since the rotary encoder consists of precision parts, impacting it may damage its functioning. Handle the rotary encoder with care.

Megger Tests

Although the encoder has a withstand voltage of 500 V between the case and electric circuit, since incorrect application of voltage may destroy the internal electronic circuit, do not perform megger tests.

* Although the shielded wire of the TRD-GK series is connected to the case, it is isolated from the electronic circuit.

The shielded wire of the TRD-S/SH/2E/N/NH/J/NA/K/KL series is not connected to the case.

Installation

- When installing the encoder, neither pry it open nor impact it by pounding the axle.
- For connection between the encoder axle and the axle of devices, use a coupling. When mounting a coupling to the axle, do not push it forcibly. Even if a coupling is used, since a load greater than the allowance may be applied to the axle depending on installation, perform centering carefully.
- Bearing life changes according to conditions of use and, in particular, it is largely affected by axial load. Even if it is within the specified load, bearing life can be largely extended by reducing the bearing load.
- Do not disassemble the rotary encoder. Doing so may damage oil- and drip-proofness. Moreover, even if it is of the dustproof and waterjet-proof type, do not expose the main body to water and oil for long periods of time. If it is exposed to water and oil, wipe it off.
- Anchor the hollow shaft type with the provided hexagon socket set screws. Prevent looseness by using a screw lock agent.

Vibrations

Since vibrations applied to the rotary encoder may cause false pulses, pay careful attention to the installation site.

If the more pulses per rotation there are, the shorter the slit interval of the rotary slit board becomes. Therefore, such an encoder is easily affected by vibrations and the vibrations applied during low-speed rotation and shutdown are transmitted to the shaft and the main body. As a result, the rotary slit board is virtually turned, generating false pulses.

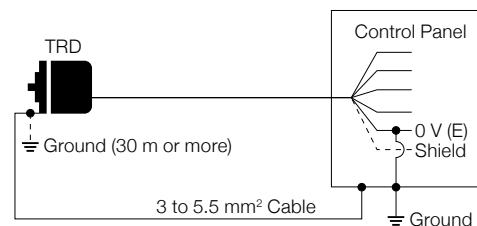
Wiring / Connections

Note that miswiring may damage the internal circuit. Regarding the totem-pole output type, protection against short-circuits is provided between the output terminal and the power source 0V side, but not between the output terminal and the power source positive side.

Noise Measures




- Do not wire cables in parallel to other power lines or in the same duct.
- Eliminate electric sparks from relays and switches in the control panel as much as possible using capacitors and elements for absorbing surge.
- Do not use the rotary encoder near electric discharge welding machines or electric furnaces. Otherwise, use electromagnetic shields.
- Be sure to use a shielded cable as an extension cable.
- Connect the shielded wires of the TRD-S/SH/2E/N/NH/J/NA/K/KL series to 0V or ground them. Since the shield of the TRD-GK series is internally connected to the case main body, it is not necessary to connect the shield at the cable end.
- Since false pulses may be generated when the power is turned on and off, use the rotary encoder 0.1 seconds after the power is turned on and 0.5 seconds after the power is turned off.
- If the potential difference occurs between the encoder chassis and control panel chassis and the noise causes a malfunction, connect the encoder chassis and the control panel chassis using a cable of 3 to 5.5 mm².
- Grounding procedure: The effects of noise differ depending on the relations between the encoder and peripheral devices. Example connections when there are the effects of noise are shown in the table below.

Distance to the Control Panel	How to Connect the Rotary Encoder
30 m or less	Connect the rotary encoder chassis to the control panel chassis using a cable of 3 to 5.5 mm ² . Connect the 0 V (E) terminal to the control panel chassis using a similar cable and ground the terminal.
30 m or more	In addition to the measures mentioned above, also ground the rotary encoder.



Precautions

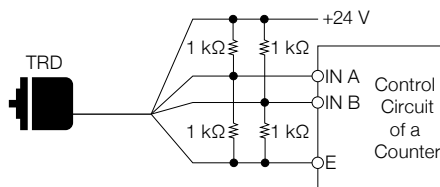
Cable Extension

PLC HMI SENSOR ENCODER COUNTER INFORMATION 

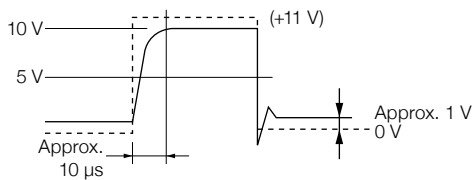
■ Cable Extension

The cable extensions are likely to cause waveform distortion due to the resistance of the cable conductor and line capacity. Therefore, use cables that have low conductor resistance and capacity, and pose little interference between signals (such as coaxial cable), and lower the maximum usable frequency.

As shown in the figure below, if the power source of the rotary encoder is fed by 24 V DC, it produces favorable results against noise over long distance signal transmission, phase shifts due to line capacity, and waveform distortion.



* The figure below shows an example of waveform distortion (continuous line) when the shielded cable is extended by 100 m. The dotted line shows a cable length of 2 m.



For long distance transmission and high pulse transmission, use line driver output. (Use a twisted-pair shielded cable as an extension cable and an RS-422A compatible line receiver for the receiving circuit.)