

# Connections

## Connecting an encoder with a KOYO electronic counter

Use the following tables when selecting a counter to be connected with an encoder:

- (1) Sensor power source: Use the following table to select voltage/current of a sensor power source for each rotary encoder.

Counter Model number	Sensor power source	Rotary encoder							
		TRD-N		TRD-J			TRD-GK		
		S	RZ/RZL	S	RZ/RZL	RZV	R/RZ/RZL	BZ	
KCN-A	24 VDC/15 mA	▲	▲	▲	▲	×	▲	▲	
KCV	24 VDC/60 mA	●	●	●	●	×	▲	▲	
KCX	12 VDC/50 mA	●	▲	●	●	×	●	▲	
KCX-B	24 VDC/80 mA	●	●	●	●	×	●	▲	
TC-V	24 VDC/60 mA	●	●	●	●	×	▲	▲	
TC-4L	12 VDC/30 mA	▲	▲	●	▲	×	▲	▲	
TC-4	12 VDC/50 mA	●	▲	●	●	×	●	▲	

●: Integrated ▲: Optional ×: Incompatible  
 ※: TC-4 / TC-4B / TC-4S

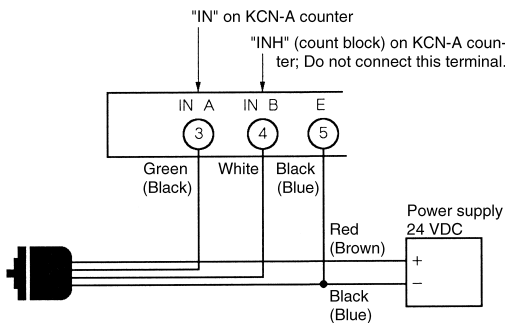
- (2) Home position output (OUT Z) logic When connecting a home position output (OUT Z) of a rotary encoder to a reset/preset input of a counter, use the following table to select a home position output logic which suits with the input type of the counter.

Counter Model number	Rotary encoder			
	TRD-N/J/GK		TRD-J	TRD-GK
	RZ	RZL	RZV	BZ
KCN-A	●	●	×	●
KCV	●	●	×	●
KCX	●	×	×	●
KCX-B	●	●	×	●
TC-V	●	●	×	●
TC-4L	×	●	×	×
TC-41	●	●	×	●
TC-4/4B/4S	×	●	×	×

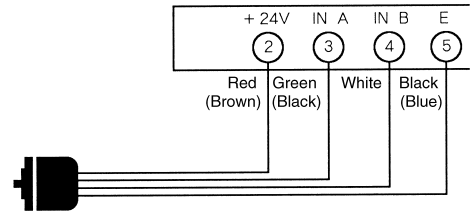
●: Integrated ×: Incompatible

Connection examples The colors in parentheses apply to TRD-N series counters. The colors without parentheses apply to TRD-J/GK series counters.

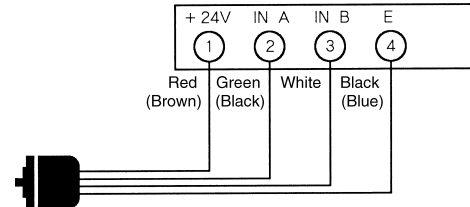
### ● KCN-A Series



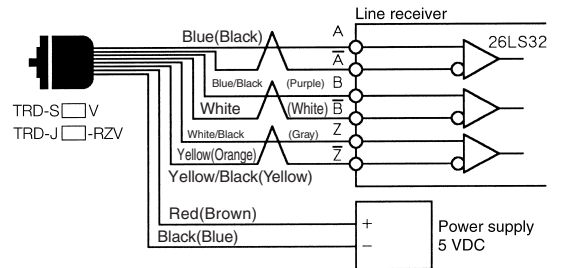
### ● KCV Series



### ● KCX-B Series



### ● Connecting a line driver output

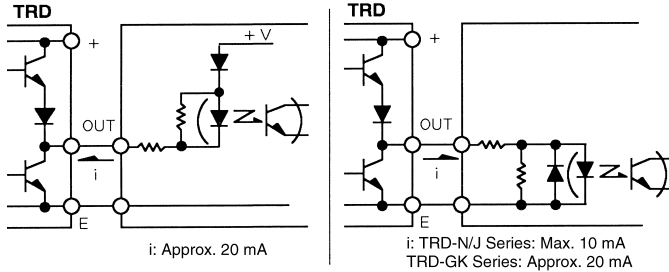


# Precautions and noise prevention

## ■ Photocoupler

A rotary encoder can directly drive a photocoupler.

Using the totem-pole structure, a TRD model can be connected as follows:



Use a sensible photocoupler. Connect it with the resistance and diodes.

## ■ DC stabilized power source

When connecting a rotary encoder, if the internal power supply of the counter or other connected device (sensor power supply, etc.) is insufficient, use a commercially-available stabilized power source.

## Precautions

Rotary encoders are constructed using precision parts, so the functions may be damaged if the encoder is shocked. Take care when handling.

## ■ Megger test

Each encoder can withstand a voltage of 500 V between its case and electronic circuit. However, do not test it with a Megger as it may be destructive to the internal circuit.

\* On the TRD-GK Series, the shielded cable is connected to the case, but isolated from the electronic circuit.

On the TRD-S/SH/2E/N/NH/J/NA/K/KL Series, the shielded cable is not connected to the case.

## ■ Installation

- Do not apply too much force to the shaft. Never try to twist it.
- Use a specified coupling for connecting the encoder shaft and the shaft of a machine to be controlled. Do not squeeze the shaft into the coupling. The two shafts should be centered carefully to prevent overload.
- The service life of the bearing is largely affected by the amount of load to the shaft. Try to reduce the load as much as possible.
- Never demount the rotary encoder. Its resistance to oil and water will be lost. Try to avoid these objects even if your model is dust and splash proofed. Wipe out any oil or water attached.

## ■ Vibration

Vibration may cause the encoder to generate false signals. Select an appropriate place for installation. The higher the pulse frequency is, the encoder is the more sensitive to vibration because the interval between slits becomes smaller. It may misinterpret vibration as the rotation of its shaft and rotary slit plate.

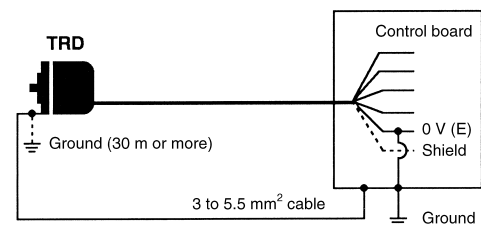
## ■ Wiring and connection

Follow the specified procedure to ensure correct wiring. For the totem-pole output, short circuit protection is provided between the output terminal and the 0 V power source, but not between the output terminal and the positive source terminal.

## Noise prevention

- Do not share the same power source or cable duct with other device.
- Using a capacitor or surge absorber, eliminate sparks from relays and switches.
- Do not use the encoder near an arc welder or an electric furnace. Use an electromagnetic shield if necessary.
- Always use a shielded cable for extension.
- For the TRD-S/SH/2E/N/NH/J/NA/K/KL Series, connect the shielded cable to the 0 V terminal, or ground it. On the TRD-GK models, the shielded cable is internally connected to the case.
- False pulse may be generated when the power is turned on or off. Wait for 0.1 second or 0.5 second after turning the power on or off.
- If electric potential exists between the encoder and the control board, connect their frames using a 3 to 5.5 mm<sup>2</sup> cable. This helps minimize noise and error.
- Grounding: The effects of noise differ depending on the relationship between the encoder and the peripheral devices. If noise occurs, make the connections as shown in the following table.

Distance from control board	Procedure
Less than 30 m	Using a 3 to 5.5 mm <sup>2</sup> cable, connect the encoder frame and the control board. Connect the 0 V terminal (E) to the control board using a similar cable, then ground it.
30 m or more	Follow the above procedure, then ground the rotary encoder.

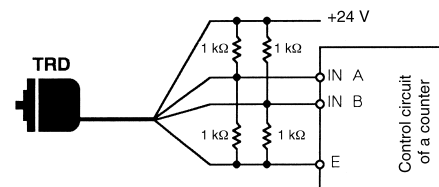


## ■ Extending cable

To extend cable, use a coaxial cable or a cable with small resistance and capacity to avoid signal interference. Lower the frequency of the encoder.

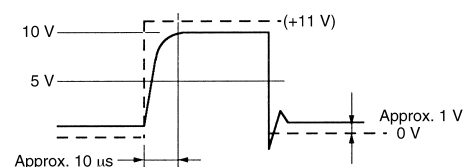
Signal may be dephased or distorted by noise in long distance transfer.

When extending cable, use a +24 V power source as follows:



The following diagram shows the signal distortion over the different lengths of cable:

Solid line: 100 m Dashed line: 2 m



Use a line driver output for long distance or high frequency transfer. Also use a twisted pair shielded cable and RS-422A line receiver.