


# TPS-A-01NM to 2NM Torque Transducers

## INSTRUCTION MANUAL

Thank you for purchasing this KYOWA product. Before using it, read this instruction manual carefully. Also, keep the manual within easy reach so that you can refer to whenever necessary. Specifications and dimensions described in this manual could be changed without notice. Please visit our website for the latest version.

### 1. CALLING THE OPERATOR'S ATTENTION

The following cautionary symbols and headlines are used to invite the operator's attention. Be sure to observe the accompanying precautions in order to safeguard the operator and preserve the performance of the instruments.

 <b>WARNING</b>	Improper handling can cause serious injury to the operator.
<b>CAUTION</b>	Cautions are given to invite the operator's attention, in order to avoid instrument failure or mal-function.

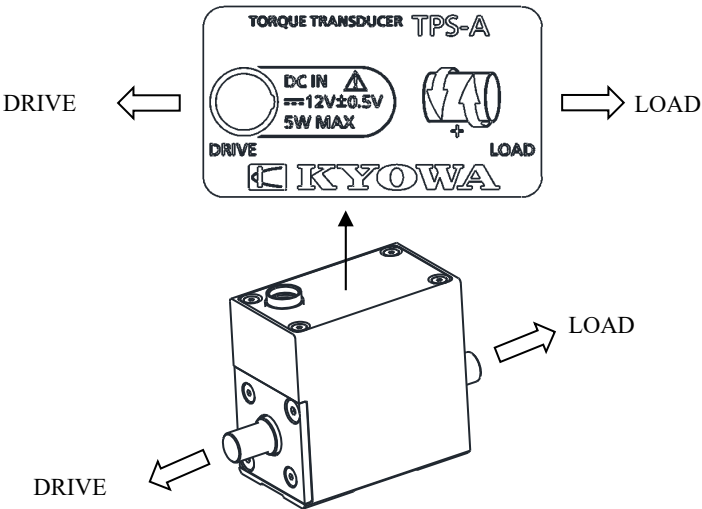
### 2. IMPORTANT NOTICE

Unless specified, the transducer must not be used under hydrogen environment.

### 3. HANDLING

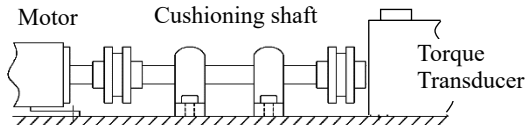
#### 3.1 Installing TPS-A

The TPS-A has DRIVE side and LOAD side as follows. Be sure to install the TPS-A correctly.  
Use a friction-joint coupling to joint the TPS-A shaft. There may be a scratch on the shaft. However, it has no effect on the specifications.



### CAUTION

- It is recommended to use the Kyowa specified coupling (optional, see "7. SPECIFICATIONS Optional accessories "). When you do not use the Kyowa specified coupling, be sure to use a flexible coupling.
- The coupling should mount within the max. permissible misalignment.
- The TPS-A construction resists against neither water nor moisture. Therefore, do not use it in abnormally high humidity environments or in vacuum or corrosive atmosphere.
- Where vibration occurs on the driving device and/or the driven device, provide cushioning shaft.

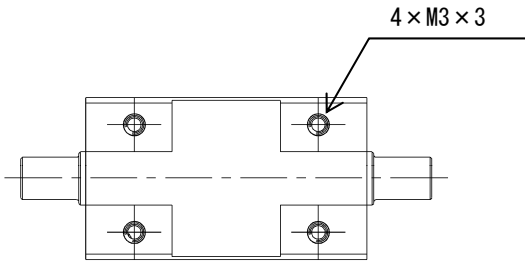


### PRECAUTIONS ON CE MARKING


- Be sure to use the dedicated cable (TE-57R).
- Wiring should be 30 m or less. Be sure to connect the shield wire to the ground.
- Do not use the product outdoors.

#### 3.2 Fixing TPS-A

Fix the TPS-A by using the screw holes (M3×3) on the bottom panel. (The tightening bolts are not included.)  
The purpose of the fixing is to prevent the TPS-A from rotation. When fixing the TPS-A, make sure the TPS-A shaft matches the other shaft properly.



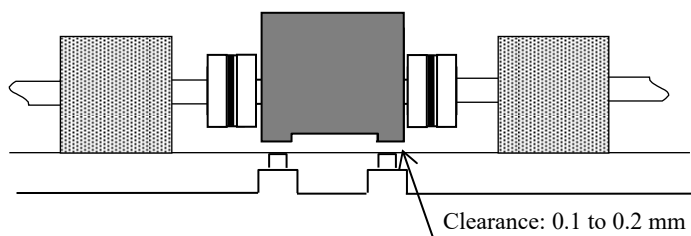
TPS—A bottom panel

 <b>WARNING</b>
● Provide protective coverings to the devices that are to revolve. During operation, keep out of the devices, or the operator may be caught in it.
● Avoid such a manner as causing torque and bending moment simultaneously to the shaft of the TPS-A.

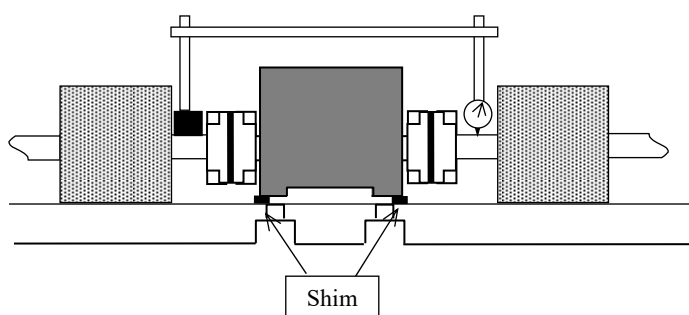
## Example

- ①Connect the TPS-A shaft and other shaft by using a flexible coupling.

Adjust the height of the other shaft to make sure the clearance, between the TPS-A bottom panel and mounting surface, has enough space for the shim.

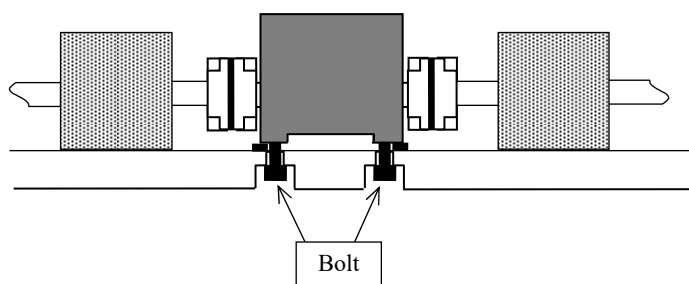


- ②Match the TPS-A shaft height and flexible coupling height by using a shim and fix them. Measure the concentricity of axes by using a dial gage.

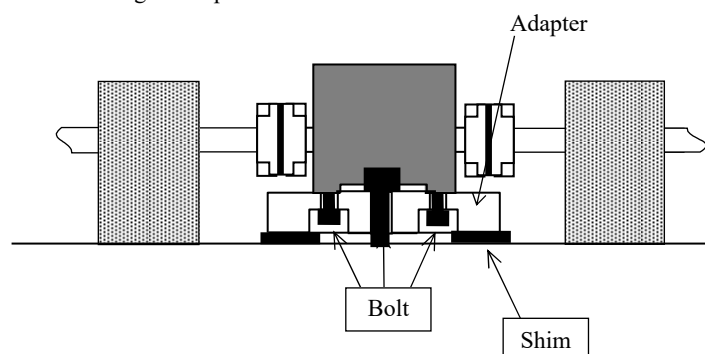


- ③Fix the TPS-A from the back.

For your information, the example <When using an adapter>is as follows.



<When using an adapter>

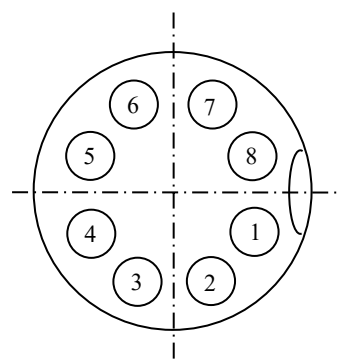


## 4. CONNECTING

- 4.1 The connector pin No. of TPS-A and optional dedicated cables (TE-57R, TE-58R and TE57-A-24V see "7. SPECIFICATIONS") colors are as follows.

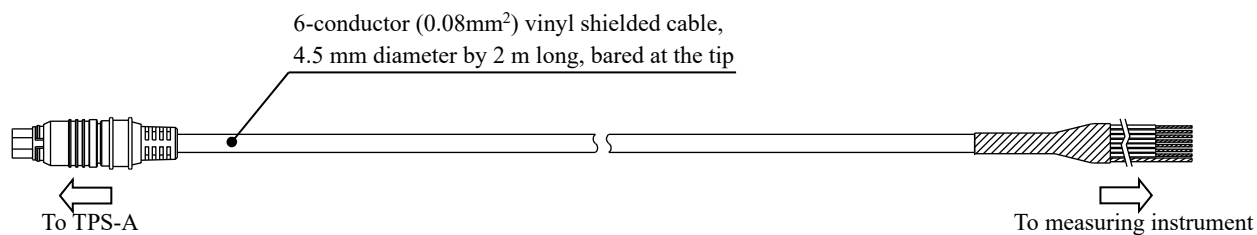
Signal	Connector pin No.	TE-57R TE57-A-24V colors	TE-58R
DC +	1	Red	Power Connector +
Vout -	2	White	BNC Output -
DC -	3	Black	Power Connector -
Vout +	4	Green	BNC Output +
OC +	5	Blue	BNC Pulse +
OC -	6	Yellow	BNC Pulse -
None	7	None	None
Shield	8	Shield	Shield

Connector pin assignment(TPS-A)



● TE-57R

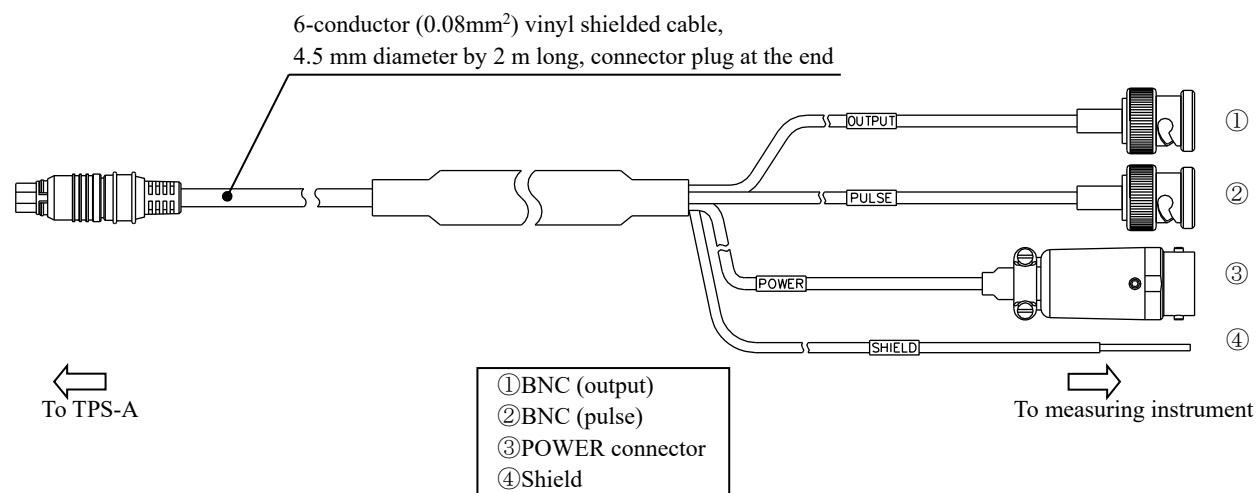
Power Supply Voltage:11.5 to 12.5VDC



● TE-58R

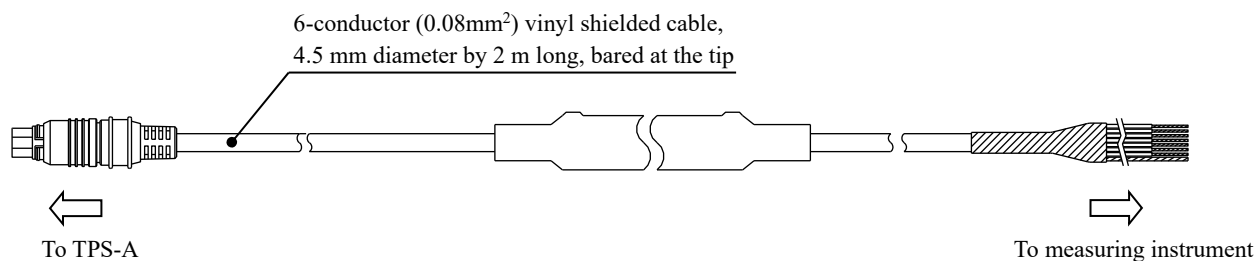
For connecting the optional AC adapter (SA-10A-EDS) or DC power cable (P-76).

- AC adapter (SA-10A-EDS): Input 100 VAC to 240 VAC, 50Hz/60Hz, 0.4A  
Output 12 VDC, 1.5A
- DC power cable (P-76) : Power Supply Voltage:11.5 to 12.5V, connector RM12BPE-4S (71)



● TE57-A-24V

Power Supply Voltage:14 to 30VDC



## 4.2 Power

### For using DC power

#### TE-57R:

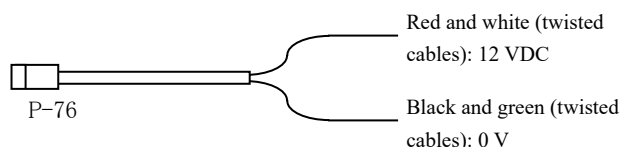
Power Supply 11.5 to 12.5 VDC (recommended: 12VDC) to the [DC+] and [DC-].

#### TE-58R:

We recommend using the Kyowa specified power cable "P-76" (optional, see "7. SPECIFICATIONS").

Connect the power cable to the power connector.

Power Supply 11.5 to 12.5 VDC (recommended: 12VDC).



#### TE57-A-24V:

Power Supply 14 to 30 VDC to the [DC+] and [DC-].

### For using AC power

#### TE-57R:

Not available.

#### TE-58R:

We recommend using the Kyowa specified AC adapter "SA-10A-EDS" (optional, see "7. SPECIFICATIONS").

Connect the AC adapter to the power connector.

#### TE57-A-24V:

Not available.

## CAUTION

- The [DC-] is isolated from the TPS-A chassis.
- TE-57R  
Use the power supply voltage within 11.5 to 12.5VDC.  
In addition, use the power supply with less noise.  
Or, it may lower the performance and cause troubles.
- TE57-A-24V  
Use the power supply voltage within 14 to 30VDC.  
In addition, use the power supply with less noise.  
Or, it may lower the performance and cause troubles.
- Never connect the [DC+] and [DC-] adversely. Or, it may cause troubles and accidents.
- Fix cables to keep them from moving due to vibration.
- Preheat the TPS-A 20 minutes or more after the power ON.

## 4.3 Torque output

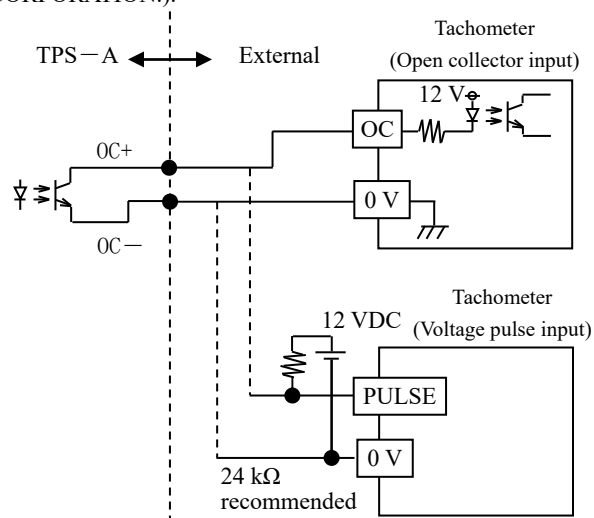
The TPS-A outputs voltage, proportional to the torque, from the [Vout+] and [Vout-].

## CAUTION

- Longer cables are susceptible to noise.  
For extension, be sure to use a shielded cable.  
(within 3 m recommended)
- Do not short-circuit the [Vout+] and [Vout-].  
Or, it may cause trouble.
- Do not apply voltage to the [Vout+] and [Vout-] from the external. Or, it may cause trouble.
- Fix cables to keep them from moving due to vibration.
- The [Vout-] has the same potential as the TPS-A chassis.

## 4.4 Rotation output

The TPS-A outputs 4 pulses/rotation (open collector output), from the [OC+] and [OC-]. Connect the TPS-A to the recommended tachometer (460C, TSURUGA ELECTRIC CORPORATION.).



Open collector output	
Contact capacity	30 VDC, 30 mA or less

### Recommended specifications of the target tachometer

Open collector input	
Contact capacity	30 VDC, 30 mA or less
Input Frequency	0.1 to 400 Hz or more
Minimum pulse width	15 μs or more

Voltage pulse input	
Low level	0 to 2.0 V
High level	4.5 to 30 V
Input Frequency	0.1 to 400 Hz
Minimum pulse width	15 μs or more

## CAUTION

- Use coaxial cable or shielded cable for connecting the external device. Longer cables are susceptible to noise. (within 3 m recommended)
- Do not short-circuit the "PULSE OUTPUT" terminals. Or, it may cause trouble.
- Do not apply a voltage / current or reverse voltage that exceeds the contact capacity to the "PULSE OUTPUT" terminals. Or, it may cause trouble.
- The TPS-A outputs middle-level pulse when the TPS-A stops.
- Fix cables to keep them from moving due to vibration.

## 5. MEASURING

### 5.1 Test run

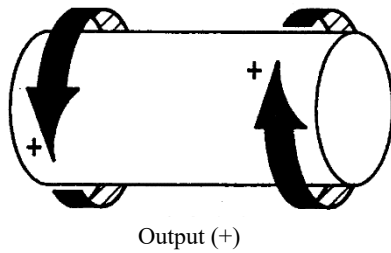
If you can rotate the shaft, rotate the shaft 2 or 3 times by hand first and check that the shaft rotates correctly. Then test run the TPS-A at low speed and check that the shaft rotates smoothly.

## CAUTION

- The TPS-A may output voltage exceeding the rated output in case of the failure. Be sure to arrange a protection circuit when measuring data. In addition, check that the TPS-A is not emitting abnormal noise with rotation.

## 5.2 Measuring

The TPS-A torque outputs voltage to + side when load is applied to the TPS-A shaft as follows. When load is applied to the reverse direction, the TPS-A torque outputs voltage to – side.



## ! WARNING

- Operate the TPS-A with the rated output or less.  
Or, the TPS-A may be destroyed or damaged.
- Pay attention to torsional natural frequencies of the TPS-A and driving device.  
Do not rotate the TPS-A at the rotation speed that is close to natural frequency.  
Or, the TPS-A may be destroyed or damaged due to resonance.
- Do not apply external impact forces (including the load applied to torques and axes, due to the sudden acceleration and sudden braking (The example of the sudden braking. The stopping time from driving is within 0.01s)).  
Or, the TPS-A may be destroyed or damaged.

## 5.3 Conversion

The measured voltage is calculated to torque with calibration constant. The calibration constant is described in the Test Data Sheet.

$$\text{Torque [N} \cdot \text{m]} = (\text{Measured voltage [V]}) \times (\text{Calibration Constant [N} \cdot \text{m/V]})$$

## 5.4 Countermeasures against noise

- To avoid induction noise, keep the TPS-A away from instruments having large leakage flux (such as big motor, transformer, etc).
- Electrical potential may generate when noise entered to the TPS-A and the mount. At this time, try to connect the TPS-A and rounding wire of measuring instrument.

## 6. MAINTENANCE AND INSPECTION

- Protect the TPS-A from condensation due to abrupt temperature change.
- Take care to avoid water, oil and dust on the connection plug.
- When you continuously operate the TPS-A at the maximum rotation speed. The life of bearing which is inside of the TPS-A will be approx. 1 year. The TPS-A cannot replace the bearing only. Contact Kyowa or our representatives.
- Recommend calibrate the product once a year or so.  
(Contact your KYOWA representative.)
- If readings are found abnormal, measure power voltage and consumption current. If an abnormal measured value appears or abnormal behavior (abnormal sound, abnormal vibration, etc.) occurs, contact Kyowa or our representatives.
- Do not disassemble the TPS-A.

## 7. SPECIFICATIONS

Model	Rated capacity	Safe bending moment (*)
TPS-A-01NM	$\pm 0.1 \text{ N} \cdot \text{m}$	$1.0 \text{ N} \cdot \text{m}$
TPS-A-05NM	$\pm 0.5 \text{ N} \cdot \text{m}$	
TPS-A-1NM	$\pm 1 \text{ N} \cdot \text{m}$	$1.2 \text{ N} \cdot \text{m}$
TPS-A-2NM	$\pm 2 \text{ N} \cdot \text{m}$	

(\*) For a single sensor

### ◆ Performance

Rated capacity	: See table above.
Rated output	: $5 \text{ V} \pm 4\%$ (load resistance $2 \text{ k}\Omega$ or more)
Nonlinearity	: Within $\pm 0.1\%$ RO
Hysteresis	: Within $\pm 0.1\%$ RO

### ◆ Environmental Characteristics

Safe temperature range	: $-10$ to $70^\circ\text{C}$ (Non-condensing)
Compensated temperature range	: $-10$ to $60^\circ\text{C}$ (Non-condensing)
Temperature effect on zero balance	: Within $\pm 0.03\%$ RO/ $^\circ\text{C}$
Temperature effect on output	: Within $\pm 0.1\%$ / $^\circ\text{C}$

### ◆ Electrical Characteristics

Cutoff frequency (amplifier)	: $1.5 \text{ kHz}$ (amplitude ratio at cutoff point $-3 \pm 1 \text{ dB}$ )
SN ratio	: $50 \text{ dB}$ or more (when no rotation)
Power supply	: $12 \pm 0.5 \text{ VDC}$
Current consumption	: $0.4 \text{ A}$ or less (with $12 \text{ V DC}$ supplied)

### ◆ Mechanical Properties

Safe overload rating	: $200\%$ (Output is saturated at approx. $110\%$ the rated capacity)
Maximum rotation speed	: $15000 \text{ rpm}$
Rotation speed output	: $4 \text{ pulse/rotation}$ (Open collector output, detecting the rotational direction is not available)
Degree of Protection	: IP40 (IEC 60529)
Safe bending moment	: See table above.
Safe load at shaft end	: $300 \text{ N}$ (when no rotation)
Moment of inertia	: $1.5 \times 10^{-6} \text{ kg} \cdot \text{m}^2$
Weight	: Approx. $150 \text{ g}$
Compliance	: Directive 2011/65/EU, (EU)2015/863 (10 restricted substances) (RoHS) Directive EN-61326-1(class-A) (EMC)※

※ When using the dedicated cable (TE-57R) only

[NOTE] Products with CE Marking are compliant European RoHS Directive and EMC Directive.

[Reference value] Torsion spring constant and angle of torsion

Model	Torsion spring constant	Angle of torsion by the rated
TPS-A-01NM	Approx. $27.6 \text{ N} \cdot \text{m/rad}$	Approx. $3.6 \times 10^{-3} \text{ rad}$
TPS-A-05NM	Approx. $192 \text{ N} \cdot \text{m/rad}$	Approx. $2.6 \times 10^{-3} \text{ rad}$
TPS-A-1NM	Approx. $229 \text{ N} \cdot \text{m/rad}$	Approx. $4.4 \times 10^{-3} \text{ rad}$
TPS-A-2NM	Approx. $345 \text{ N} \cdot \text{m/rad}$	Approx. $5.8 \times 10^{-3} \text{ rad}$

### ◆ Accessories

Test Data Sheet	: 1
Instruction Manual	: 1 (This book)

### Optional accessories

- Cable A: TE-57R
- Cable B: TE-58R  
For connecting the optional AC adapter (SA-10A-EDS) or DC power cable (P-76).
- Cable C: TE57-A-24V
- AC adapter :SA-10A-EDS
- DC power cable: P-76 [connector RM12BPE-4S (71)]
- Coupling: SFC-025SA2-T011-K-8B-\*\*B (Miki Pulley Co., Ltd.)  
\*\*: Shaft diameter of the target

### Outside drawing (with the fixtures)

