


# TPS-A-500NM, 1KNM TORQUE TRANSDUCER INSTRUCTION MANUAL

Thank you for purchasing TPS-A-500NM, 1KNM Torque Transducer (hereinafter referred to as the TPS-A). Before using it, please read this Instruction Manual carefully. Also, keep the manual within easy reach so that you can refer to it whenever necessary.

## 1. CALLING 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 operation of the system may result in injury of the operator and physical damage of the system.
<b>CAUTION</b>	Describes reference information, such as usage restrictions.

## 2. HANDLING

### 2.1 Preparation of shaft

The shaft is coated with preservative. Remove the preservative from the TPS-A shaft by using organic solvent, etc. before using the TPS-A. There may be a scratch on the shaft. However, it has no effect on the specifications.

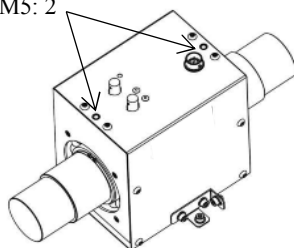
### 2.2 Installing TPS-A

Use a friction-joint coupling to joint the TPS-A shaft.

In addition, when the TPS-A is installed on a flat surface, due to tolerance of using parts, slight space (0.2 mm or less) may exist between the two surfaces. Note that the slight space has no problem. Fix the TPS-A by referring 2.3.

With an eyebolt (M5), the TPS-A can be carried by using a crane. To use a crane, remove the socket head cap screws with low head, on the upper side of the TPS-A. Then mount the eyebolt (M5) into the hole. Arrange the eyebolt (M5) by yourself.

Screw holes for eyebolt M5: 2

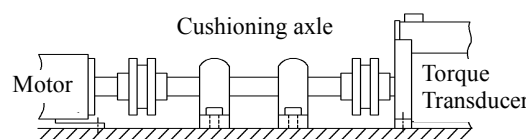


## WARNING

- 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 axle of the TPS-A.

## CAUTION

- It is recommended to use the KYOWA specified coupling (option, see "6. Specifications"). 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 axle.

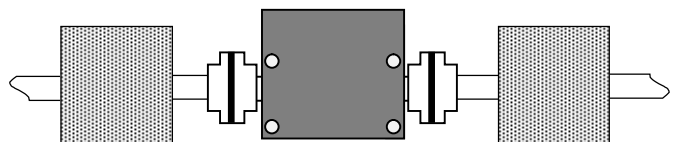


### 2.3 Fixing TPS-A

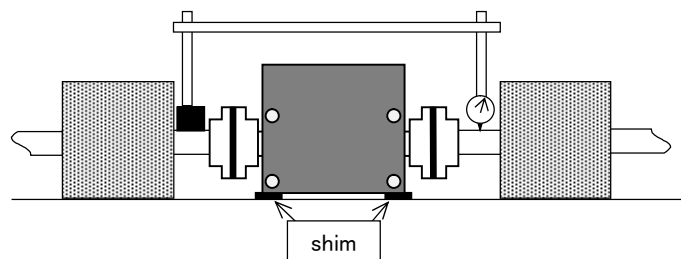
For fixing the TPS-A, it is recommended to use the accessory 2 fixtures. For fixing the fixture, use the accessory hexagon socket head cap screws (M4) and plain washers (nominal diameter 4). Arrange the fixture and fixture-screws (M4, length: 6) by yourself.

#### Example

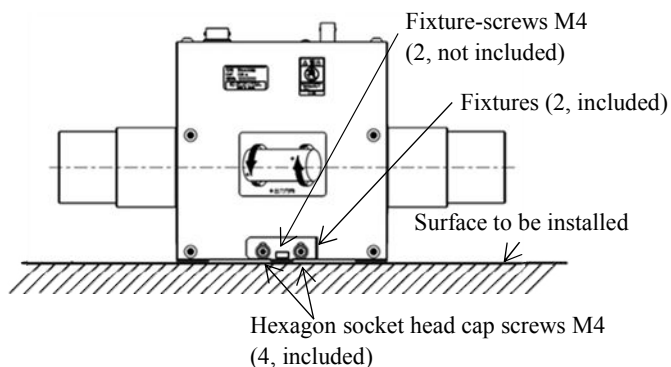
- ① Connect the TPS-A axis and other axes by using a flexible coupling.



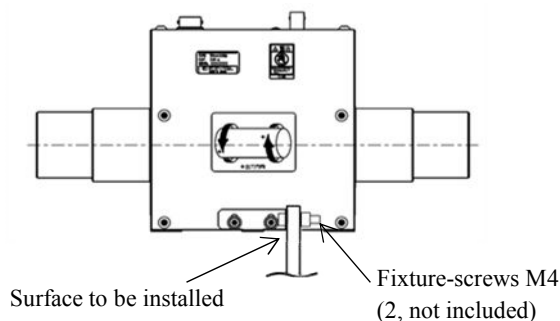
- ② Match the TPS-A axis height and flexible coupling height by using a shim and fix them. Measure the concentricity of axes by using a dial gage.



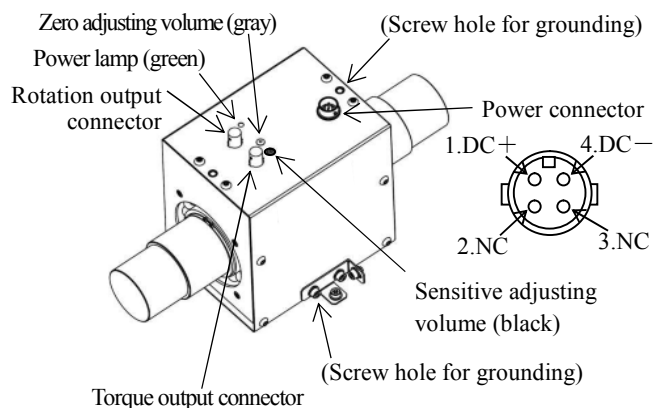
- ③ To fix the TPS-A on the surface, parallel to the bottom of the TPS-A, temporary fix the fixture on the surface to be installed. Fasten the plain washers and hexagon socket head cap screws into the "screw holes for fixture". Then securely fix the fixture.



To fix the TPS-A on the surface, vertical to the axis of the TPS-A, temporary fix the fixture on the surface to be installed. Fasten the plain washers and hexagon socket head cap screws into the "screw holes for fixture". Then securely fix the fixture.



### 3. CONNECTING



#### 3.1 Power

It is necessary to supply 10 VDC to 16 VDC to the power connector. (12 VDC is recommended.) The negative (-) side of the DC power is insulated from TPS-A case and screw hole for grounding. Use the "screw holes for eyebolt" or "screw holes for fixture" as the "screw hole for grounding". (See "2. Handling")

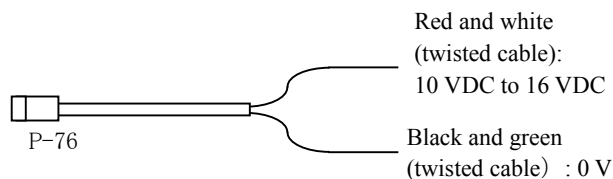
##### For using AC adapter

It is recommended to use the KYOWA specified AC adapter "SA-10A-EDS" (option, see "6. Specifications"). Connect the AC adapter to the power connector. The power lamp lights up (green).

##### For using DC power

It is recommended to use the KYOWA specified DC power cable "P-76" (option, see "6. Specifications").

After connecting the power cable to the power connector, supply 10 VDC to 16 VDC from the external DC power. The power lamp lights up (green).



### CAUTION

- Use 10 VDC to 16 VDC power. In addition, use power with less noise. Or, electronic components may be damaged.
- Be sure to ground the TPS-A by using screw holes for grounding.
- Be sure to connect power correctly.
- Fix cables to keep them from moving due to vibration.

#### 3.2 Torque output

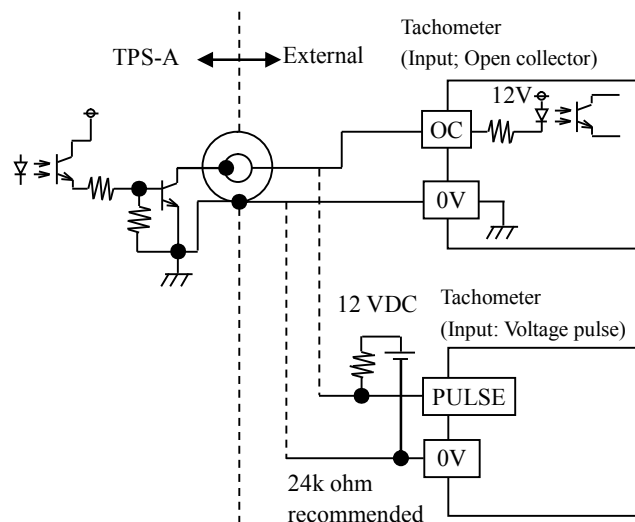
The TPS-A outputs voltage proportional to the torque from the "VOLTAGE OUTPUT" connector. Connect the TPS-A to a device that can measure voltage by using a cable with BNC connector (option, see "6. Specifications").

### 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 "VOLTAGE OUTPUT" terminals. Or, it may cause trouble.
- Do not apply voltage to the torque output connector from external. Or, it may cause trouble.
- Fix cables to keep them from moving due to vibration.
- The negative (-) side of the torque output connector has same potential with the TPS-A.

#### 3.3 Rotation output

The TPS-A outputs four pulses/rotation based on open collector method from the "PULSE OUTPUT" connector. Connect the TPS-A to the recommended tachometer, etc. by using the cable with BNC connector (option, see "6. Specifications").



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 Hz to 400 Hz or more
Minimum pulse width	15 μs or more

Voltage pulse input	
Low level	±0 V to 2.0 V
High level	4.5 V to 30 V
Input Frequency	0.1 Hz 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 voltage to the torque output connector from external. 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.

## 4. MEASURING

### 4.1 Adjusting zero

For adjusting the zero point of the torque output after mounting the TPS-A, use the zero adjusting volume (gray) on the upper side. Remove a gray cap and turn around the zero adjusting volume with precision screwdriver, etc. Adjusting range is approx. ±100mV.

## CAUTION

- Replace the cap to prevent the volume from dust or oil after adjusting the zero.
- If you use the TPS-A at vibration place for a long term, the zero adjusting volume increases little by little and the zero point may move. Check the zero point at regular intervals. To fix the zero adjusting volume temporarily, paste commercially available lacquer composition, etc. little.
- The torque output of the TPS-A is adjusted to 0 V with no rotation and no load applied. Check the flatness of the mounted surface and center alignment so as not to apply excessive force to the TPS-A when output with no-load applied exceeds the zero adjustment range.
- Do not touch the sensitivity adjusting volume by removing a black cap. Or, values on the Test Data Sheet and Specifications are not guaranteed.

### 4.2 Test run

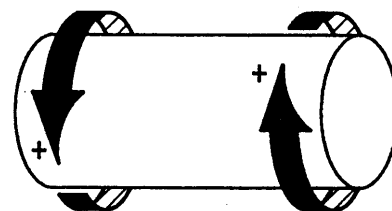
If you can rotate the axis, rotate the axis 2 or 3 times by hand first and check that the axis rotates correctly. Then test run the TPS-A at low speed and check that the axis rotates smoothly.

## 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.

### 4.3 Measuring

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



Output (+)

## ! WARNING

- Operate the TPS-A with the rated output or less. Or, the TPS-A may be damaged or wrecked. Voltage output is saturated at approx. 110% the rated capacity. You cannot obtain the appropriate output during overloading.
- 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 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). Or, the TPS-A may be destroyed or damaged.

### 4.4 Conversion

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

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

### 4.5 Countermeasures against noise

- Apart the torque output cable from the wiring of the power system since the negative (–) side of the torque output and case of the TPS-A are short-circuited.
- 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.

## 5. STORAGE AND MAINTENANCE PRECAUTIONS

- Protect the TPS-A from condensation due to abrupt temperature change.
- Take care to avoid water, oil and dust on the connection plug.
- The bearing inside the TPS-A is a consumable item. When you continuously operate the TPS-A at the maximum rotation speed, replace it every year.
- 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.

## 6. SPECIFICATIONS

Model	Rated capacity	Safe overload rating (*)	Moment of inertia
TPS-A-500NM	500N·m	150 %	$2.3 \times 10^{-4} \text{ kg} \cdot \text{m}^2$
TPS-A-1KNM	1kN·m	150 %	$2.6 \times 10^{-4} \text{ kg} \cdot \text{m}^2$

(\*) Output is saturated at approx. 110% the rated capacity.

Model	Maximum rotation speed	Safe bending moment (*)	Safe load at shaft end	Weight (Approx.)
TPS-A-500NM	5000 rpm	150 N·m	800 N	9 kg
TPS-A-1KNM	4000 rpm	150 N·m	800 N	10 kg

(\*) For a single sensor

Rated output	$\pm 5 \text{ V} \pm 0.2 \text{ V}$
Nonlinearity	Within $\pm 0.3\% \text{ RO}$
Hysteresis	Within $\pm 0.3\% \text{ RO}$
Compensated temperature range	-10 to 60°C (noncondensing)
Safe temperature range	-10 to 70°C (noncondensing)
Temperature effect on zero balance	Within $\pm 0.03\% \text{ RO}/^\circ\text{C}$
Temperature effect on output	Within $\pm 0.05\% / ^\circ\text{C}$
Rotation speed output	4 pulses/rotation (open collector)
Frequency response range	DC to 500 Hz (+1dB, -3dB)
Load resistance	5 k ohm or more
SN ratio	45 dB or more
Power supply	10 VDC to 16 VDC
Current consumption	0.5 A or less (with 12 VDC supplied)
Degree of protection	IP40

[Reference value] Torsion spring constant and angle of torsion

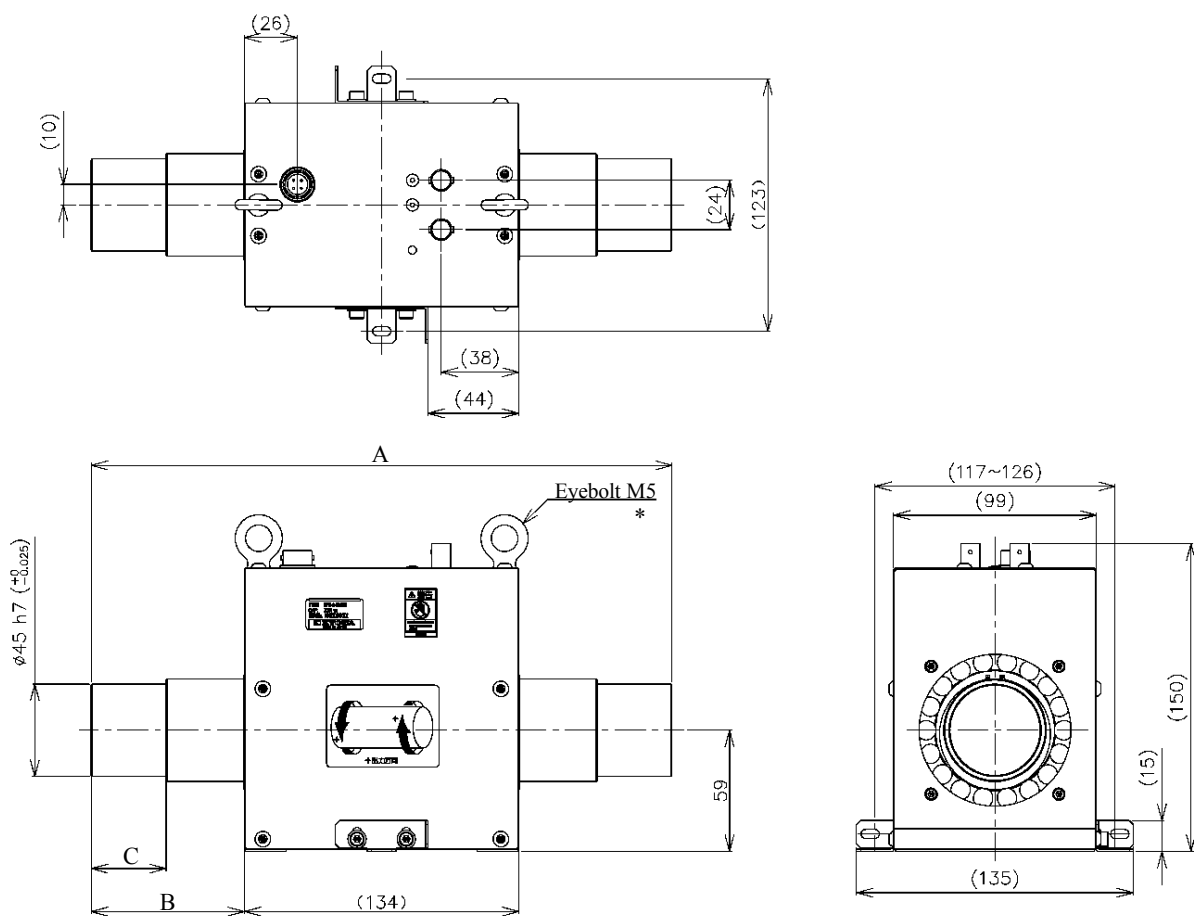
Model	Torsion spring constant	Angle of torsion by the rated
TPS-A-500NM	Approx. $1.01 \times 10^5 \text{ N} \cdot \text{m}/\text{rad}$	Approx. $4.9 \times 10^{-3} \text{ rad}$
TPS-A-1KNM	Approx. $1.47 \times 10^5 \text{ N} \cdot \text{m}/\text{rad}$	Approx. $4.4 \times 10^{-3} \text{ rad}$

Accessories	Test Data Sheet: 1 Warranty: 1 Instruction Manual: 1 Fixture: 2 Hexagon socket head cap screws M4×6: 4 (For connecting the TPS-A and fixtures) Plain washer M4: 4 (For connecting the TPS-A and fixtures)
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#### Optional accessories

- AC adapter: SA-10A-EDS  
 Input: 100 VAC to 240 VAC, 50 Hz/60 Hz, 0.4 A  
 Output: 12 VDC, 1.5 A
- DC power cable: P-76 [connector RM12BPE-4S (71)]
- Cables:  
 U-58 (connector BNC - alligator clip, length: 1.5 m)  
 U-59 (connector BNC - BNC, length: 1.5 m)  
 U-15 (connector BNC - P12-7, length: 1.5 m)
- Grounding Wire: P-72
- Coupling:  
 SFF-140SS-K-45K-\*\*K○ (for 500NM, Miki Pulley Co., Ltd.)  
 SFH-190S-T010-K-45K-\*\*K○ (for 1KNM, Miki Pulley Co., Ltd.)  
 \*\*: Shaft diameter of the target○: Shaft tolerance of the target (Blank: h7, K: k6, M: m6, J: j6, S: 35+0.010 to 0)
- Hexagon socket screw (dog point):  
 MSSG8-16 (for removing the SFF-140SS, Misumi Group Inc.)  
 MSSG10-35 (for removing the SFH-190S, Misumi Group Inc.)
  - To remove the above couplings, use the hexagon socket screw (dog point).
  - Since the TPS-A has been downsized, a screw other than the hexagon socket screw (dog point) cannot be inserted into the above couplings. Be sure to use the hexagon socket screw (dog point).
  - To remove the above couplings, use 3 hexagon socket screws (dog point).
- Tachometer: 460C (TSURUGA ELECTRIC CORPORATION.)

#### Outside drawing (with the fixtures)



Model	A	B	C
TPS-A-500NM	283	(75)	36.5
TPS-A-1KNM	350	(108)	70

\* Arrange the eyebolt (M5) by yourself.