

TPN-AB/CB Torque Transducers

INSTRUCTION MANUAL

Thank you for purchasing the KYOWA product. 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

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 instrument.



Warning! Improper handling may cause serious injury to the operator. To avoid harm, be sure to observe the accompanying instructions.



Caution! Improper handling may cause deleterious effects to the operator's body. To avoid harm, be sure to observe the accompanying instructions.

Notes

In order to avoid instrument failure or malfunction, be sure to observe the accompanying instructions.

2. Safety precautions



Warning!

- During operation, keep out of the installed equipment, or the operator may be caught in it.
- Avoid torque loads in excess of the allowable overload rating, or the torque transducer may break.

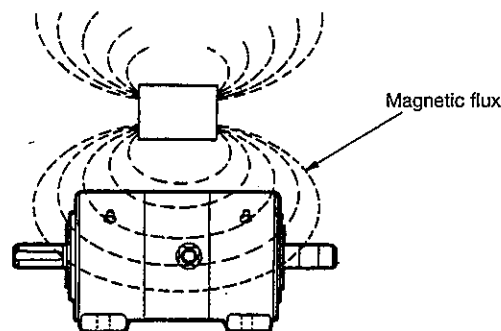


Caution!

- Check to be sure that there is no axial eccentricity in the installation and all the devices are placed in their correct positions.
- Provide protective coverings to the devices that are to revolve. Check to be sure that the screws on the transducer mainframe are tight.

3. Handling precautions

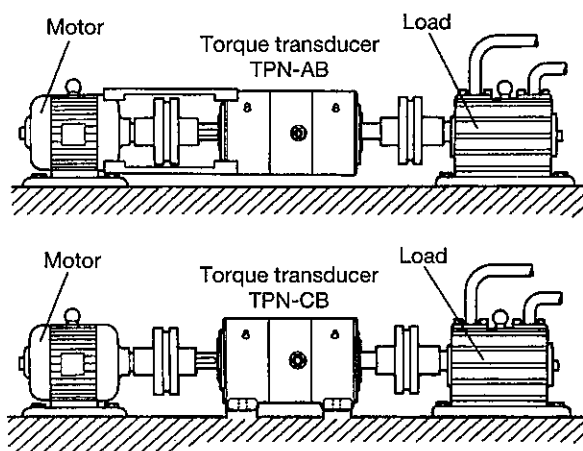
- 3.1 This torque transducer uses magnetic flux to transmit signals within the transducer. If exposed to a strong external magnetic field, the transducer may not only cause measurement error but also make measurement impossible. The transducer is so constructed that it is hardly affected by an external magnetic field. However if it is affected, take the following measures to reduce the effects.
- 3.1.1 Move the transducer away from the object which is generating the magnetic field. Note that the intensity of a magnetic field is in inverse proportion to the square of distance.
- 3.1.2 Insert an iron plate between the transducer and the object which is generating the magnetic flux, or enclose the object with iron plates.
- 3.1.3 The magnetic flux affected in the direction as sketched in the illustration below is especially influential. Carefully avoid it.



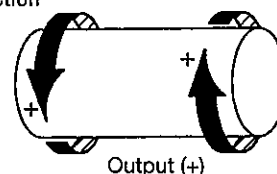
- 3.2 The transducer is so designed that it best matches 5kHz carrier wave type dynamic strain amplifiers. With a different carrier wave frequency, the transducer's sensitivity will vary. In order to use the transducer in the correct manner, be sure to have the transducer calibrated (at cost) in combination with your dynamic strain amplifier. Note that the transducer cannot be used with a DC type strain amplifier.

4. Installation

- 4.1 Using toluene or acetone, remove the rustproof coats from the transducer shaft.
- 4.2 Where a flexible coupling is not used, the centering of the motor, torque transducer and load should be maintained within a tolerance of 3/100(mm). Especially with the TPN-CB torque transducer, use a flexible coupling as much as possible. When fixing the mounting legs, take care to avoid a force affected in the axial direction.



4.3 Sensing direction



- 4.4 When installing the transducer, take care to avoid simultaneous torque and bending moment on the transducer shaft.
- 4.5 Carefully avoid heat on the shaft when mounting the coupling. Also avoid shocks on the shaft when inserting the keys in it using a tool.
- 4.6 When installing the transducer, take care to avoid loads in excess of the allowable loads listed below.

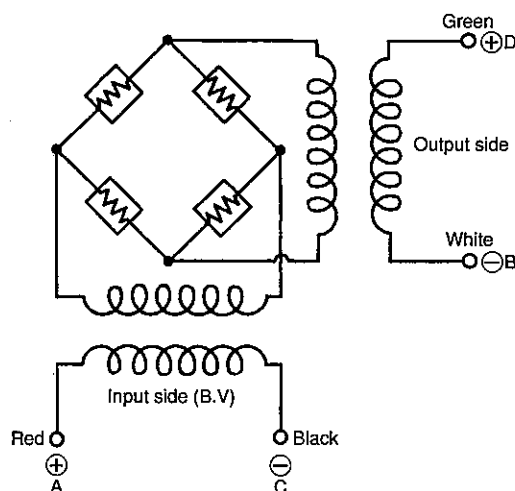
Torque transducer model	Allowable thrust load approx. (N)	Allowable load on shaft end approx. (N)
TPN-1KMAB/CB	100	4
TPN-2KMAB/CB	100	8
TPN-5KMAB/CB	300	15
TPN-10KMAB/CB	500	25
TPN-20KMAB/CB	500	50
TPN-50KMAB/CB	1000	60

Torque transducer's allowable loads

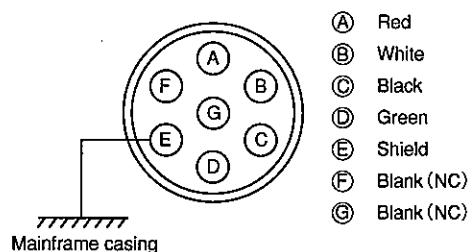
- 4.7 As delivered, the keys are a little larger than the key grooves. So, file the keys to make them fit the grooves in the coupling and transducer, then drive them into the grooves.
- 4.8 Additional grease is necessary for a long time high-speed revolution of the transducer. For how to apply grease, refer to Item 8.4.
- 4.9 The transducer construction resists against neither water nor moisture. Do not therefore use it in abnormally high humidity or high temperature environments or in vacuum or corrosive atmosphere.

5. Connection

5.1 Circuitry



5.2 The wiring of the connector on the mainframe is shown below.



6. Operation

- 6.1 If static friction torque of the load is comparatively large, it will cause measuring error. To avoid harm, run the torque transducer at a slow speed, and take the average of zero variations as zero. Also, if the cable moves, the zero point may drift a little. To avoid harm, fix the cable to keep it from moving largely. Do not make an abrupt start of the transducer when it is loaded, or an overload may occur to result in a breakdown of the transducer shaft. (If abnormal sound is heard, inspect the installation.)
- 6.2 If it is intended to measure dynamic torque such as fluctuating torque or starting characteristic of the motor, maintain the proper relation between the transducer's characteristic frequency and the moment of inertia on the motor and load. The transducer's characteristic frequency must be sufficiently high compared with fluctuating torque frequency. For information of the transducer's characteristic frequency, contact the manufacturer. The table below shows angle of torsion, torsion spring constant and inertial moment against rated torque.

Torque transducer model	Angle of torsion (rated) approx. (rad)	Torsion spring constant approx. (N-m/rad)	Inertia moment approx. (kg-cm ²)
TPN-1KMAB/CB	0.024	417	0.43
TPN-2KMAB/CB	0.028	714	0.43
TPN-5KMAB/CB	0.021	2381	3.94
TPN-10KMAB/CB	0.025	4000	3.96
TPN-20KMAB/CB	0.018	11111	34.2
TPN-50KMAB/CB	0.020	25000	34.6

7. Conversion

- 7.1 For conversion, use the calibration factor stated in the calibration sheet.
- 7.2 When a strain amplifier is used, the outputs read in $\epsilon \times 10^{-6}$ equivalent strain. The torque value corresponding to 1×10^{-6} equivalent strain is stated in the calibration sheet. The torque value is then calculated through multiplication.

$$\text{Torque} = (\text{Strain amplifier's output: } \epsilon \times 10^{-6}) \times (\text{Calibration factor: N-m/} 1 \times 10^{-6})$$

8. Storage precautions and inspection

- 8.1 Avoid water, oil and dust on the connector plug.
- 8.2 In order to reduce the effects of external induction, etc., perform common grounding on the respective housings of the motor and torque transducer.
- 8.3 All necessary adjustments of the transducer are made by the manufacturer. If abnormality is found, do not gain access to the internal parts, but immediately contact KYOWA or KYOWA representative.
- 8.4 To apply additional grease, observe the instructions given below.
(1) Decide on the amount of additional grease by referring to the following table: Lives of grease vs. numbers of revolutions per minute.

TPN-1, 2KMAB/CB		TPN-5, 10KMAB/CB		TPN-20, 50KMAB/CB	
Rotating speed (rpm)	Life of grease (hours)	Rotating speed (rpm)	Life of grease (hours)	Rotating speed (rpm)	Life of grease (hours)
8000	3000	6000	2400	4000	2400
7000	4500	5000	4000	3000	4400
6000	6800	4000	6600	2000	8500

(2) Apply additional grease in the following manner.

From two nipples provided on the mainframe, apply grease using a grease pump. Take care to apply 1 to 1.5cc grease at a time.

(Grease: Shell Oil - Albania grease No.2)

(3) In order to insure equal grease on the bearing, be sure to keep the transducer running a slow speed, i.e. from several scores to several hundred revolutions per minute.

(4) Make sure to remove old grease before application of new grease. For this, detach the grease cover from the side of the torque transducer, and remove old grease. After that, attach the grease cover once again and apply new grease. (See the figure below.)

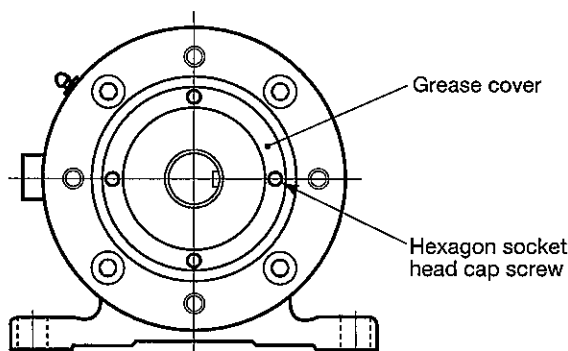
This operation should be performed every two (or three) occurrences of grease application.

NOTES: • Old grease should be removed in the manner that the bearing is only slightly covered by the one.

- When removing grease, take utmost care to avoid damage on the bearing and to keep dust out.

Side view

To detach the grease cover, remove four hexagon socket head cap screws (M4).



9. Coupling for connection

Select and use a proper coupling by considering operating conditions (applicable load, revolution, centering accuracy of motor and load, etc.) and safety.

10. Specifications

Model	Rated capacity	Maximum revolutions
TPN-1KMAB/CB	10N·m (1.020kgf·m)	12000rpm
TPN-2KMAB/CB	20N·m (2.039kgf·m)	12000rpm
TPN-5KMAB/CB	50N·m (5.099kgf·m)	7500rpm
TPN-10KMAB/CB	100N·m (10.20kgf·m)	7500rpm
TPN-20KMAB/CB	200N·m (20.39kgf·m)	5000rpm
TPN-50KMAB/CB	500N·m (50.99kgf·m)	5000rpm

NOTE: The units and numerical values in brackets in the [CAP.] column on the nameplate and also those in the above rated capacity column depend on the conventional expression just for reference.

Rated output: 1.2mV/V (2400 × 10⁻⁶ strain) or higher

Non-linearity: ±0.2%RO

Hysteresis: ±0.2%RO

Repeatability: 0.1%RO or better

Recommended bridge voltage: 2V, AC (carrier wave frequency: 5kHz)

Safe overload rating: 150%

Compensated temp. range: -10 to 60°C

Thermal effect on zero balance: ±0.03%RO/°C

Thermal effect on output: ±0.03%/°C

Zero drift induced by revolution: 0.7%RO or better (at max. speed)

Cable: 0.3mm², 4-conductor shielded chloroprene 5m, ø7.6mm, terminated in connector plug on both ends (conformable to NDIS)

Applicable measuring instruments: DPM series carrier wave type dynamic strain amplifiers (with carrier wave frequency of 5kHz)

Weight:

Model	Weight (app.)	Model	Weight (app.)
TPN-1KMAB	3.0kg	TPN-1KMCB	3.5kg
TPN-2KMAB	3.0kg	TPN-2KMCB	3.5kg
TPN-5KMAB	6.0kg	TPN-5KMCB	7.0kg
TPN-10KMAB	6.0kg	TPN-10KMCB	7.0kg
TPN-20KMAB	14.0kg	TPN-20KMCB	14.5kg
TPN-50KMAB	14.0kg	TPN-50KMCB	14.5kg

Accessories

Calibration sheet	1
Instruction manual	1
Warranty	1
Cable	1
Keys	1 set