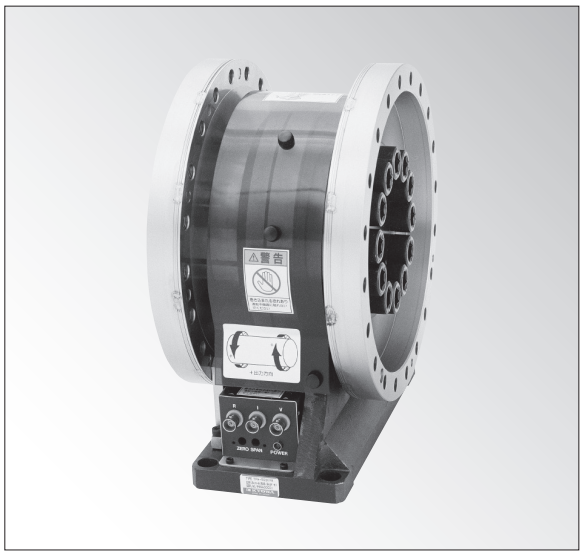
# TPH-A

●500 N·m to 50 kN·m ●Noncontact design
●No bearing ●High frequency response

## Highly Rigid Torque Transducer



## Noncontact design to shaft
## High frequency response
## High accuracy

- ●High torsional stiffness.
- ●Noncontact design without slip rings or bearing enables easy maintenance and accurate measurement in high speed.
- ●No interference to signal transmission and few noises by rotary transformer power supply method and optical signal transmission method.
- ●Diaphragm-type flexible coupling provided standard.
- ●Built-in amplifier gives voltage (±10 V), current (12 ± 8 mA) output.
- ●Tachometer output (Open collector output) enables measurement on a digital revolution counter (1 pulse/revolution).

TPH-A torque transducers allow torque to be measured up to 10000 rpm. The main feature of these transducers is high rigidity and an equipped flexible coupling. The unique design with no contact parts such as slip rings, ensures safe use even for long-term measurement of an object rotating at high speeds.
In addition, a built-in amplifier outputs voltage and current signals simultaneously and directly to recorder or indicator and A/D converter helps data acquisition by personal computer.
TPH-A torque transducers allow torque and rotating speed to be measured synchronously.

## Specifications

### Performance

| | |
|---|---|
| **Rated Capacity** | See table below. |
| **Nonlinearity** | Within ±0.2% RO |
| | (1TMA or more: Within ±0.5% RO) |
| **Hysteresis** | Within ±0.2% RO |
| | (1TMA or more: Within ±0.5% RO) |
| **Repeatability** | 0.1% RO or less |
| | (1TMA or more: 0.5% RO or less) |
| **Rated Output** | 10 V ±0.2% (Load resistance 10 kΩ or more) |
| | (1TMA or more: 10 V ±0.5%) |
| | 8 mA ±1.25% (Load resistance 500 Ω or less) |
| | (1TMA or more: 8 mA ±1.25%) |
| | [Minus rated capacity (4 mA) to zero (12 mA) to plus rated capacity (20 mA)] |

### Environmental Characteristics

| | |
|---|---|
| **Safe Temperature** | -10 to 60°C (Non-condensing) |
| **Compensated Temperature** | -10 to 60°C (Non-condensing) |
| **Temperature Effect on Zero** | Within ±0.03% RO/°C |
| **Temperature Effect on Output** | Within ±0.03%/°C |

### Electrical Characteristics

| | |
|---|---|
| **Cutoff Frequencies of AMP** | 1 kHz |
| | (Amplitude ratio at cutoff point -3 ± 2 dB) |
| **SN Ratio** | 50 dB p-p or more (Noise 60 $mV_{p\text{-}p}$ or less) |
| **Power Supply** | 100 to 240 V AC |

### Mechanical Properties

| | |
|---|---|
| **Safe Overloads** | 150% |
| | (1TMA or larger: 120%) |
| | Output is saturated at approx. 110% the rated capacity. |
| **Max. Speed** | See table below. |
| **Resonance Frequencies** | See table below. |
| **Torsion Spring Constant** | See table below. |
| **Spring Constant in Axial Direction** | See table below. |
| **Moment of Inertia** | See table below. |
| **Weight** | See table below. |

Standard Accessories: Power cable (2 m)
Dedicated bolts and nuts (42 sets including 2 spare sets)
(Note) Flange is not included. Prepare it separately.

### To Ensure Safe Usage

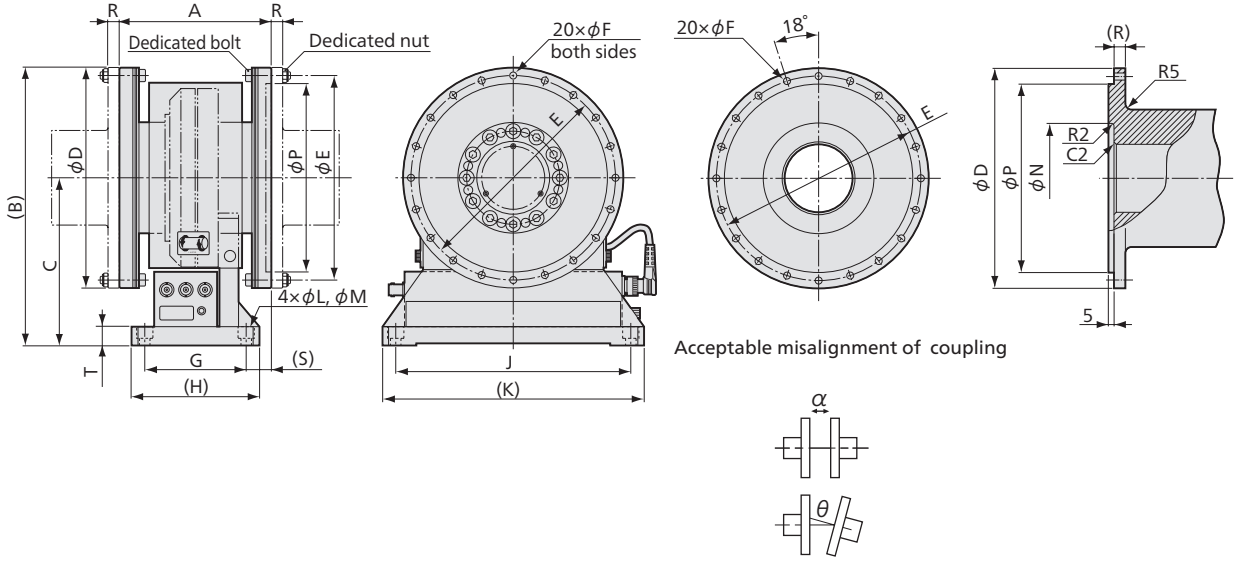
TPH-A series torque transducers are not cased, and thus, the rotating part and couplings are exposed. Considering fatigue failures of these parts, the user should consider installation of a safety steel cover, etc.
Specially designed diaphragm couplings are incorporated into all transducers.
Permissible misalignment of the standard diaphragm coupling in the torque converter is ¼ degree for the angular displacement and 0.5mm for compression and expansion. When these limits are exceeded, there is a possibility of damage.
For other general safety precautions, see page 2-137.

| Models | Rated Capacity | Resonance Frequencies | Max. Speed (rpm) | Torsion Spring Constant* | Improvement Ratio (Times) | Spring Constant in Axial Direction (N/mm) | Moments of Inertia ($kg.m^2$) | Weight |
|---|---|---|---|---|---|---|---|---|
| **TPH-50KMA** | ±500 N·m | ≈ 1.0 kHz | 10000 | $6.37\times10^5$ N·m/rad | 21.0 | $3.1\times10^3$ | ≈ 0.032 | ≈ 10.7 kg |
| **TPH-100KMA** | ±1 kN·m | ≈ 1.0 kHz | | $1.67\times10^6$ N·m/rad | 20.5 | $3.2\times10^3$ | ≈ 0.070 | ≈ 15.9 kg |
| **TPH-200KMA** | ±2 kN·m | ≈ 1.4 kHz | | $3.04\times10^6$ N·m/rad | 18.2 | | | |
| **TPH-500KMA** | ±5 kN·m | ≈ 1.5 kHz | | $2.25\times10^6$ N·m/rad | 6.4 | $2.6\times10^3$ | ≈ 0.120 | ≈ 18.4 kg |
| **TPH-1TMA** | ±10 kN·m | ≈ 1.6 kHz | 5000 | $7.35\times10^6$ N·m/rad | 10.6 | $2.1\times10^3$ | ≈ 0.650 | ≈ 40 kg |
| **TPH-2TMA** | ±20 kN·m | ≈ 1.7 kHz | 3000 | $1.47\times10^7$ N·m/rad | 12.5 | $2.5\times10^3$ | ≈ 0.810 | ≈ 53 kg |
| **TPH-4TMA** | ±40 kN·m | ≈ 2.3 kHz | | $2.94\times10^7$ N·m/rad | —— | $2.0\times10^3$ | ≈ 1.580 | ≈ 83 kg |
| **TPH-5TMA** | ±50 kN·m | ≈ 2.4 kHz | | $4.90\times10^7$ N·m/rad | —— | $2.0\times10^3$ | ≈ 1.700 | ≈ 100 kg |

*The stated torsion spring constants of earlier Kyowa's models are with the TPH-A only and excluding the coupling.

## Dimensions

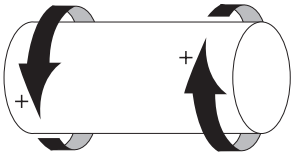
Coupling flange diagram is available on request.



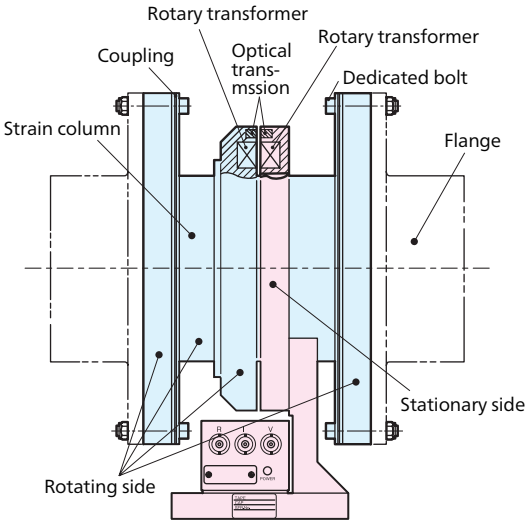

| Models | A | (B) | C | ϕD | E | ϕF | G | (H) | J | (K) | ϕL | ϕM | ϕN | ϕP | R | (S) | T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TPH-50KMA | 134 | 241.5 | 145.5 | 192 | 178 | 6 | 90 | 112 | 208 | 230 | 9 | 14 d=10 | 96 | 163 | 10 | 22 | 16 |
| TPH-100KMA<br>TPH-200KMA | 146 | 272 | 160 | 224 | 207 | 6 | 90 | 112 | 208 | 230 | 9 | 14 d=10 | 120 | 191 | 10 | 28 | |
| TPH-500KMA | 150 | 281 | 160 | 242 | 220 | 10 | 90 | 112 | 208 | 230 | 9 | 14 d=10 | 125 | 201 | 12 | 30 | |
| TPH-1TMA | 200 | 362 | 197 | 330 | 308 | 10 | 90 | 112 | 208 | 230 | 10 | 15 d=10 | 188 | 283 | 12 | 65.3 | 25 |
| TPH-2TMA | 200 | 405 | 220 | 370 | 348 | 13 | 120 | 150 | 310 | 340 | 11 | 18 d=12 | 222 | 325 | 16 | 42.3 | |
| TPH-4TMA | 200 | 470 | 250 | 440 | 408 | 16 | 150 | 180 | 372 | 400 | 13 | 19 d=12 | 260 | 376 | 20 | 24.3 | |
| TPH-5TMA | 260 | 470 | 250 | 440 | 408 | 16 | 150 | 180 | 372 | 400 | 13 | 19 d=12 | 260 | 376 | 20 | 54.3 | |

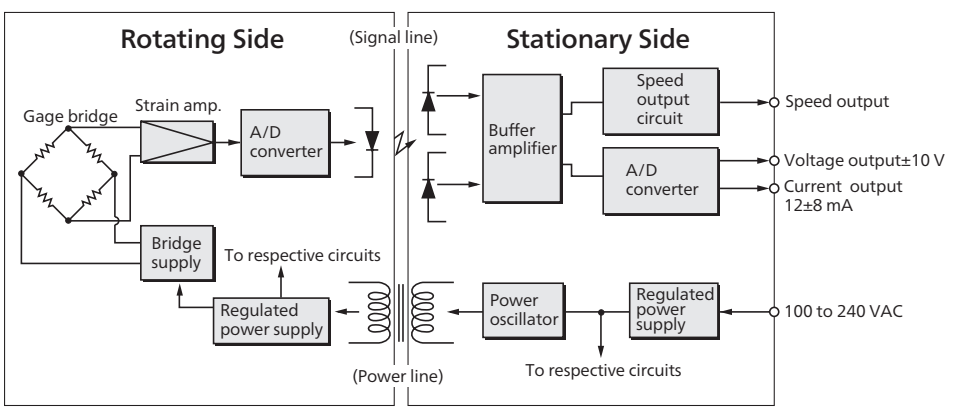
## Power and signal transmission in TPH series

Using a strain gage, TPH-A torque transducers detect torsion corresponding to torque and convert it to voltage. After amplified, the voltage is digitized and then transferred as an optical signal to the stationary side via light-emitting diode. The transferred digital signal is converted to an analog signal for torque measurement. The rotating speed is optically transferred, too enabling simultaneous measurement of torque and rotating speed. The rotating side is powered through the rotary transformer.




+ Output direction



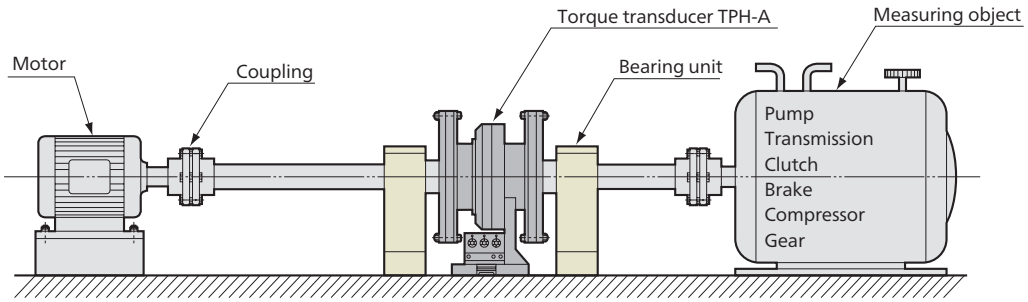



## Applications for torque measurement

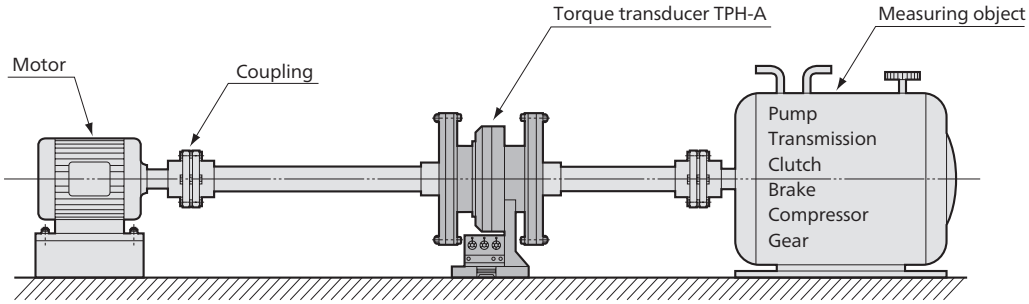
### 1. Application where the distance between motor and measuring object is long and the rotation speed is high

● It is recommended to install a bearing unit.

Recommended Example



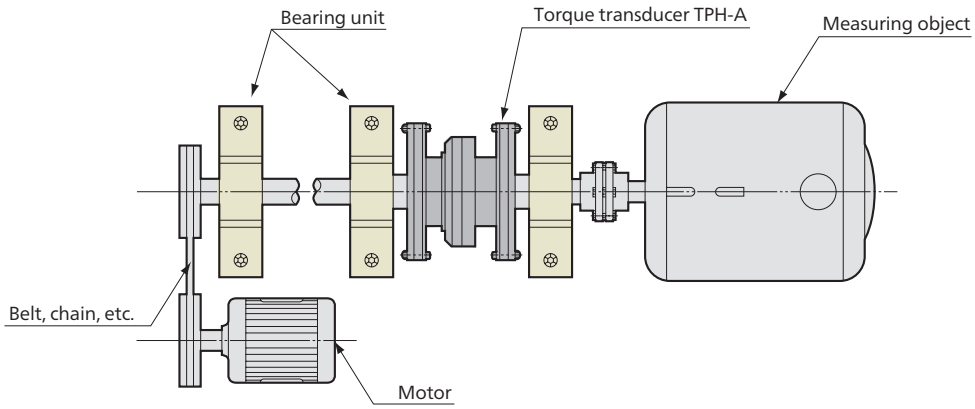

Wrong Example



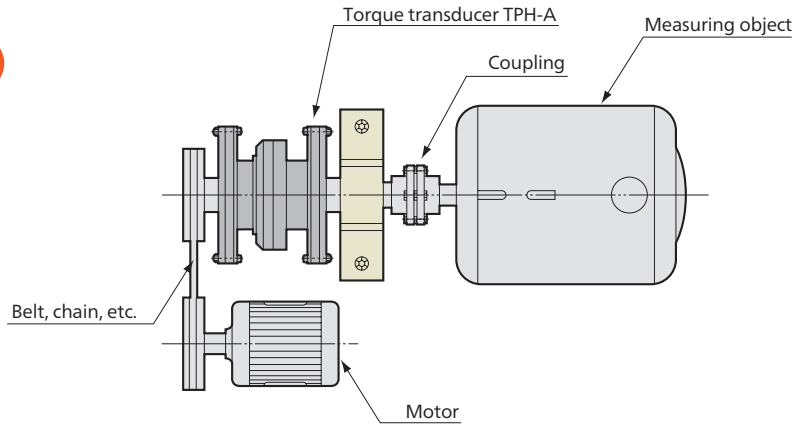

### 2. If connected using belt or chain, etc.

● It is recommended to install bearing units.

Recommended Example




Prohibited Example




● Dynamic measurement

TPH-A Recommended products for combination