

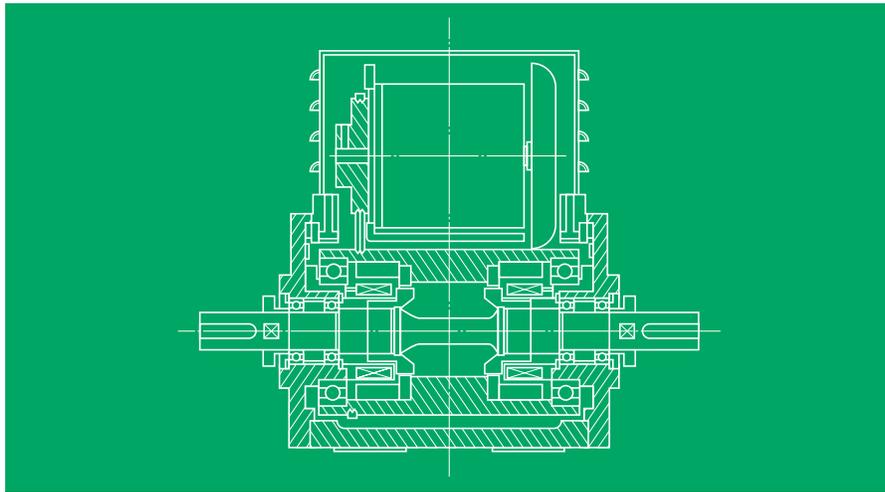
Digital Torque Meters

SELECTION GUIDE



Ono Sokki Torque Meters adopt the original phase difference method to achieve highly accurate and repeatable torque measurements and cover a wide range of applications from mechanical load measurements to torque revolution characteristics measurement of driving motors.

Torque Measurement Demand Quality and Durability in All Environments. Advanced Technology Provides the Solutions.



Ono Sokki Covers the Full Range of Torque Measurement, from mN·m to kN·m, from Stationary Shafts to Ultra-High-Speed Revolution, Aiming for the Unvarying Maximum in Efficiency, Performance and Reliability.

Digital Torque Detector & Digital Torque Meter with Arithmetic Operation Display Features

■ Outstanding durability under extremely high load

The detector shaft will not be damaged even if a load that is 400% of the rated torque is applied. Moreover, when combined with a display unit, continuous display up to 180% of the rated torque is enabled.*1

■ High accuracy and stability

The accuracy is 0.1% FS, and the precision is 0.04% FS. Processing errors are negligible since the measurement is digital, and the reproducibility characteristic is extraordinarily high.

■ Long service life, easy maintenance

The signal is detected without contacting the shaft. As there are no slip rings or brushes that need to be replaced, the detector has a long, easy-maintenance service life.

■ Wide revolution range

Ono Sokki has long years of experience in manufacturing torque detectors with an revolution range from 0 to 100,000 r/min. Please consult us if you need high-speed detectors.

■ Dual signal output

Since both digital output (BCD, RS-232C) and analog output (voltage) can be specified connection to control systems, recording instruments, panel meters, and personal computers is also facilitated.*2

■ GP-IB connection

Connection via a GP-IB interface enables the CPU to be used for data processing and the control of torque meters, as well as greatly expanding unattended and automated measurement applications.*2

■ Remote functions

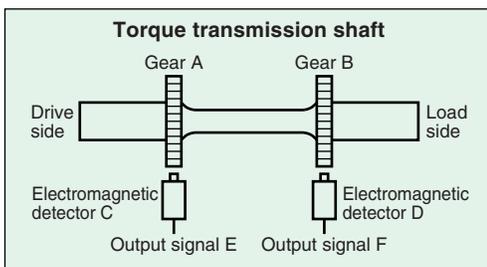
There are several convenient input and output functions for safety and control such as the synchronized driving of torque arithmetic operation display units, zero hold, and measurement preparation output.*2

*1) The guaranteed accuracy range is up to 100% of the rated torque. With 10 V as the upper limit of the analog output of display units, there are some models where output exceeding 100% is not possible.

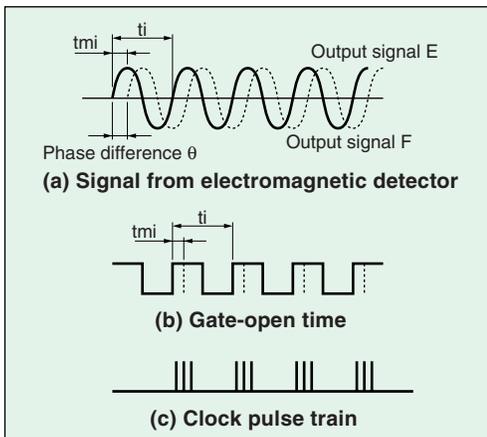
*2) Varies according to the model.

Digital Torque Meter Principle

When power is transmitted by a shaft, the shaft undergoes a torsional twisting through an angle which is proportional to the transmitted torque. A digital torque meter coupled to non-contact type electromagnetic detectors facing gears mounted at two points on the shaft detects the torsion angle as the phase difference between two AC signal voltages. Some subtle digital processing, referenced to a highly accurate and stable crystal oscillator, converts the phase difference into a measurement of the transmitted torque. The torsion angle can be detected by inserting a torque detector at a point on the torque transmission shaft.

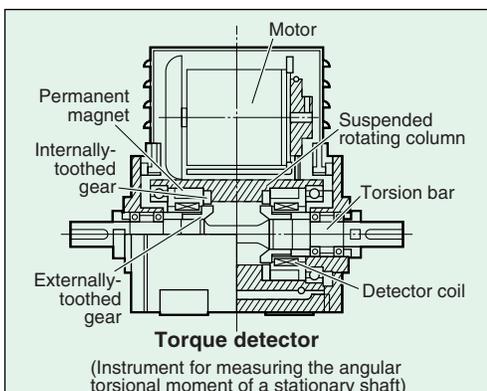


The torque transmission shaft twists through an angle proportional to the size of the applied torque, so the teeth of gears A and B are displaced in relative position by an amount equal to the torsional angle. Since detectors C and D generate AC voltages with waveforms that track the rotation of gears A and B, the phase difference between the output signals varies in proportion to the torsional angle.



The torque can, therefore, be found by measuring the phase difference between the two AC voltages. A gate is opened for a time (t_{mi}) equal to the phase difference between the two AC waveforms, creating an intermittent train of clock pulses from a crystal oscillator. Although the pulse train is not uniformly spaced, it forms a type of periodic signal having a frequency which is proportional to the phase difference (torque).

Counting the pulses in the pulse train yields the average value of the torque, and an F-V conversion is used to derive an analog output. Calculation of the phase ratio (t_{mi}/t_i) in each period gives the transient torque in the interval equal to the spacing of the teeth.



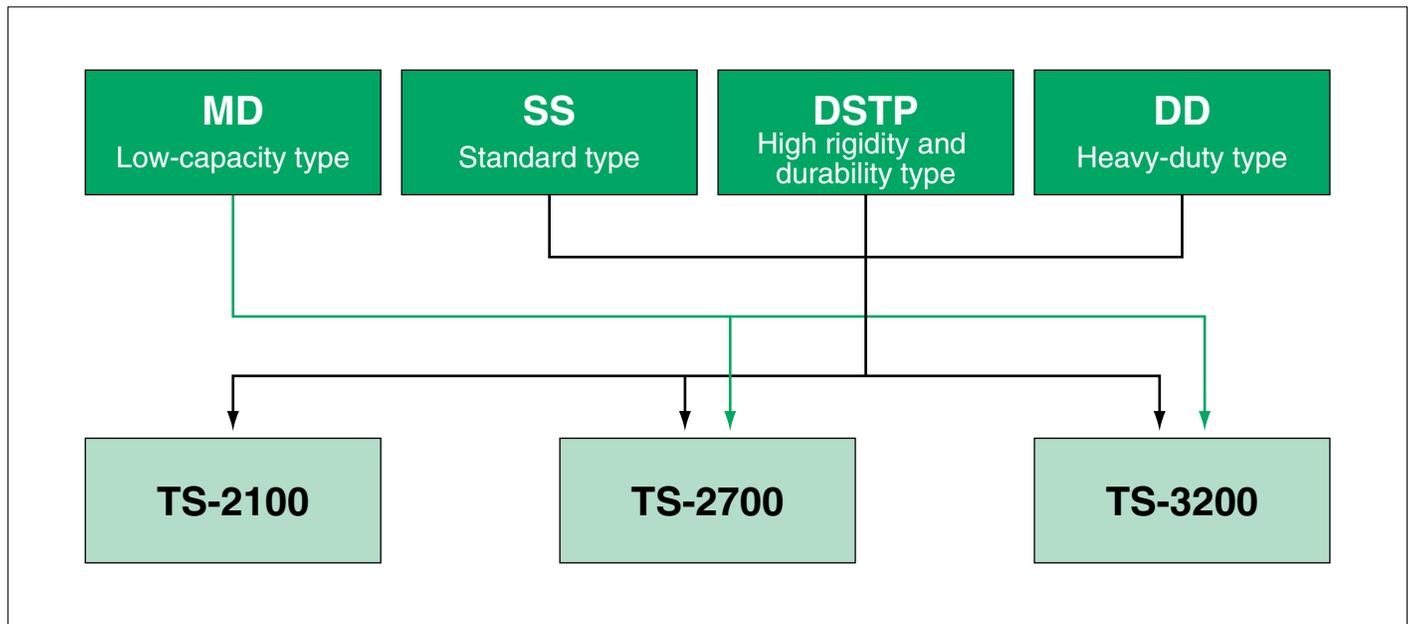
Torque applied to a stationary shaft can also be measured. A motor rotates the suspended column of the torque detector and the internally-toothed gear coupled to it, so even when the shaft (externally toothed gear) is stationary, there is a speed differential between the two gears. The magnetic flux in the coil therefore fluctuates as the internally-toothed gear turns through its circular pitch, generating an AC voltage with a sine waveform.

Torque Detector Measurement Ranges

You can select the suitable torque detector depending on the application and rated torque capacity in the table below. Though the minimum measurement value of each detector is from zero(0), accuracy and resolution are different for each detectors.

| | MD Low-capacity type | SS Standard type | DSTP High rigidity and durability type | DD Heavy-duty type | |
|--------|--------------------------------|----------------------------|--|------------------------------|--------|
| 2 mN·m | 201B | | | | 2 mN·m |
| 5 | 501B | | | | 5 |
| 10 | 102B | | | | 10 |
| 20 | 202B | | | | 20 |
| 50 | 502B | | | | 50 |
| 100 | 103B | | | | 100 |
| 200 | 203B | 002 | 002 | | 200 |
| 500 | 503B | 005 | 005 | 503 | 500 |
| 1 N·m | 104B | 010 | 01 | 104 | 1 N·m |
| 2 | 204B | 020 | 02 | 204 | 2 |
| 5 | | 050 | 05 | 504 | 5 |
| 10 | | 100 | 1 | 105 | 10 |
| 20 | | 200 | 2 | 205 | 20 |
| 50 | | 500 | 5 | 505 | 50 |
| 100 | | 101 | 10 | 106 | 100 |
| 200 | | 201 | 20 | 206 | 200 |
| 500 | | 501 | 50 | 1506B | 500 |
| 1 kN·m | | 102 | 100 | 1107B | 1 kN·m |
| 2 | | 202 | 200 | 1207B | 2 |
| 5 | | | 500 | 507 | 5 |
| 10 | | | 1000 | 108 | 10 |
| 20 | | | 2000 | | 20 |
| 50 | | | 5000 | | 50 |
| 100 | | | 10000 | | 100 |

Digital Torque Meter Combination Chart



Comparison of Digital Torque Meter with Arithmetic Operation Series Specifications

"FS" stands for "full scale". O: Provided

| Specification | | TS-2100 | TS-2700 | TS-3200 | Remarks | |
|------------------------------------|---|------------------------|--|---|---|---|
| Reference page | | Page 12 | Page 13 | Page 14 | | |
| Measurement items | Torque | O | O | O | | |
| | Revolution | O | O | O | | |
| | Output(Power) | | | O* | * Calculated value | |
| Measurement units | Torque | | N·m (mN·m, kN·m*) | mN·m, N·m, kN·m | * Adhesive seals are available to enable the use of these units. | |
| | Revolution | | r/min | r/min, r/s, Hz | | |
| | Output(Power) | | | mW, W, kW, PS | | |
| Digital display | Number of display digits | Torque | 4 digits | 4 or 5 digits(selectable) | | |
| | | Revolution | 5 digits | 5 digits | | |
| | Display method | | Green LED | Backlit LCD | | |
| | Display switching interval | | 1 s, 10 s, EXT | 1 s to 10 s (at every 1 s), EXT | | |
| | Measurement display accuracy (at 1s reference interval) /FS | Torque | | ±0.2%/FS ±1 count | ±0.2%/FS ±1 count | With N-0 compensation |
| | | Revolution | | ±0.02%/ FS* ±1 count | ±0.05% /FS* ±1 count | * FS is selectable. |
| | Absolute value display | | | | O | |
| Digital hold function | | | | Maximum value, minimum value, peak-to-peak value | | |
| Revolution input | INT | O | O | O | | |
| | EXT | O* | O* | O | * DC amplifier only | |
| | Number of pulses | 60, 120, 180 P/R | 1 to 9999 P/R | 1 to 9999 P/R | | |
| Detector parameter settings memory | | 1 type | 1 type | 10 types | | |
| Torque zero point setting | | Manual | Manual* | Manual* | * One-touch setting can be performed. | |
| Rotational direction switching | | | Manual, contact input | Manual, contact input | | |
| Decimal point position | | | Automatic selection | Automatic selection | | |
| Comparator function | | | | 2-channel (Option) | | |
| Analog output | Response time (Time constant) | | (500 ms, 100 ms) | (500 ms, 63 ms) | (16 ms to 64 s)* | * Higher speeds are available as options. |
| | Output level | Torque | 1 mV/1 digit | 0 to ±10 V/FS | 0 to ±10 V/FS | |
| | | Revolution | 10 V/10000 r/min | 0 to +10 V/FS | 0 to +10 V/FS | |
| | Applicable load | | 10 kΩ min. | 10 kΩ min. | 10 kΩ min. | |
| | Number of outputs | | 1 channel each for torque and revolution | 1 channel each for torque and revolution | 2 | |
| | Accuracy | Torque | ±0.5%/FS | ±0.2%/FS | ±0.2%/FS | 1-s averaged values |
| | | Revolution | ±0.3%/FS | ±0.1%/FS | ±0.1%/FS | 1-s averaged values |
| Output attenuator | | | | In 0.01-V steps | Adjusts the output level. | |
| Output isolation | | Available | Available | Available | This function is enabled when output is used for control. | |
| Printer output | | BCD* | BCD* | BCD (Option*) | * Open collector output | |
| Interface | | | RS-232C | BCD (TS-0323) GPIB (TS-0326)* RS-232C (TS-0325)* (All options) | * TS-0326 and TS-0325 can not be built in the TS-3200 simultaneously. | |
| Operating temperature range | | 0 to 40°C | 0 to 40°C | 0 to 40°C | | |
| Dimensions (mm), W x D x H | | 74 x 142 x 303 | 76 x 142 x 302 | 360 x 99 x 301 | | |
| Panel mounting fixture | | Provided as standard | Provided as standard | Option | | |
| Weight | | 1.8 kg | 1.8 kg | 5 kg | | |
| Remarks | | External display (op.) | | | | |
| CE marking | | | Option | Option | | |

MD Series: Low-Capacity Torque Detectors for Rotating and Stationary Shafts.

High accurate measurement for small torque with the compact size.



Small electric motors drive many of the common machines used in everyday life and business, including digital video camera, DVD player/recorder, and other audio visual equipment and the various tools of office automation: printer, disk drivers, etc. and the parts which are built in the automobiles.

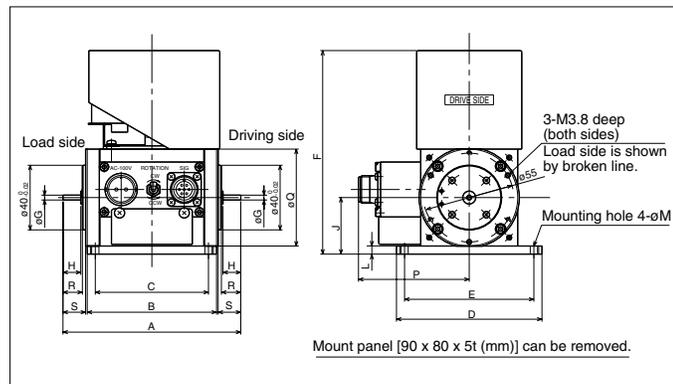
The torque detectors in the MD Series measure the torque output from these compact, precision motors to the mechanisms.

By using phase differential principle, the measurement is possible by the unit of 0.001mNm (with MD-201B/501B).

MD Series torque detectors are built into the MT Series of small torque measurement systems, where they have established a track record of outstanding reliability in small-motor performance tests.

Notes:

- (1) The MD Series should be used with the model TS-3200, TS-2700 digital torque meter.
- (2) Please refer to the below right drawing when the revolution detector is mounted. The separated amplifier [82 x 52 x 76 (mm)] is provided as an accessory.
- (3) The revolution detector can be mounted on either driving or loading side.
- (4) Please consult us for details if the optional high speed revolution range as above table is required.



Dimensions

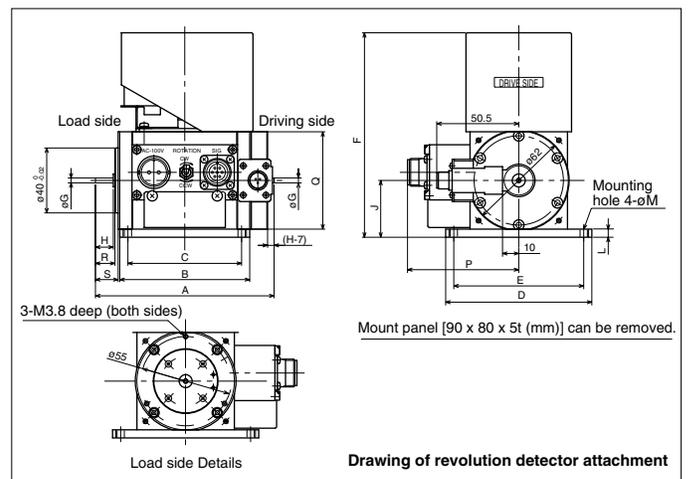
| MD | A | B | C | D | E | F | øG | H | J ^{+0.5} | L | øM | P | Q | R | S | Weight (kg) |
|------------------------|-----|----|----|----|----|-----|---------------------------------|----|-------------------|---|-----|----|----|----|----|-------------|
| 201B, 501B, 102B, 202B | 110 | 80 | 70 | 90 | 80 | 126 | 3 ⁰ _{-0.01} | 11 | 35 | 5 | 4.5 | 70 | 60 | 12 | 14 | 1.5 |
| 502B, 103B, 203B | 110 | 80 | 70 | 90 | 80 | 126 | 5 ⁰ _{-0.01} | 11 | 35 | 5 | 4.5 | 70 | 60 | 12 | 14 | 1.5 |
| 503B, 104B, 204B | 120 | 80 | 70 | 90 | 80 | 136 | 8 ⁰ _{-0.01} | 16 | 40 | 5 | 4.5 | 75 | 70 | 17 | 19 | 1.8 |

*Please refer to the page 10 for the dimensions of the detector shaft ends.

| Model MD | Measurement range (mN-m) | Minimum resolution (mN-m) | Standard revolution range (r/min) | Optional high speed revolution range (r/min) | Inertia moment (gcm ²) | Spring constant (N-m/rad) |
|----------|--------------------------|---------------------------|-----------------------------------|--|------------------------------------|---------------------------|
| 201B | 2 | 0.001 | 0 to 10,000 | 0 to 10,000 | 1.9 | 8.24 x 10 ⁻² |
| 501B | 5 | 0.001 | 0 to 10,000 | 0 to 20,000 | 1.9 | 2.06 x 10 ⁻¹ |
| 102B | 10 | 0.01 | 0 to 10,000 | 0 to 20,000 | 1.9 | 4.12 x 10 ⁻¹ |
| 202B | 20 | 0.01 | 0 to 10,000 | 0 to 20,000 | 1.9 | 8.24 x 10 ⁻¹ |
| 502B | 50 | 0.01 | 0 to 10,000 | 0 to 20,000 | 4.6 | 2.06 |
| 103B | 100 | 0.1 | 0 to 10,000 | 0 to 20,000 | 4.6 | 4.12 |
| 203B | 200 | 0.1 | 0 to 10,000 | 0 to 20,000 | 4.6 | 7.63 |
| 503B | 500 | 0.1 | 0 to 10,000 | 0 to 20,000 | 14.5 | 3.14 x 10 |
| 104B | 1000 | 1 | 0 to 10,000 | 0 to 20,000 | 14.5 | 6.18 x 10 |
| 204B | 2000 | 1 | 0 to 10,000 | 0 to 20,000 | 14.5 | 1.27 x 10 ² |

Specifications

- Accuracy : ±0.2%/Full Scale
(when combined with model TS-3200 and TS-2700 on N-0 compensation.)
- Operating temperature : 0°C to +50°C
Storage temperature : -20°C to +80°C
- Operating humidity : 95% maximum
- Vibration : 50m/s² maximum
- Connection : Connector
(Model TRC-12A10-7M10.5 at cable side)
- Power requirement : 100/120/220/240/VAC, 50/60Hz
(Please specify the voltage when ordering.)
- Accessories : Power cable (2.4 meter) x 1 pc.
Torque signal cable (5 meter) x 1 pc.
Instruction manual x 1 copy
Inspection certificate x 1 copy
- Options : Revolution detector (120 P/R)
Revolution signal cable (Model MX-800 series)



SS Series: Torque Detectors for Rotating and Stationary Shafts.

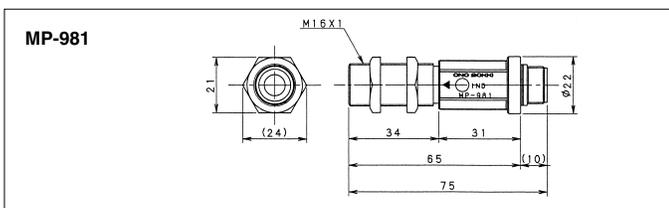
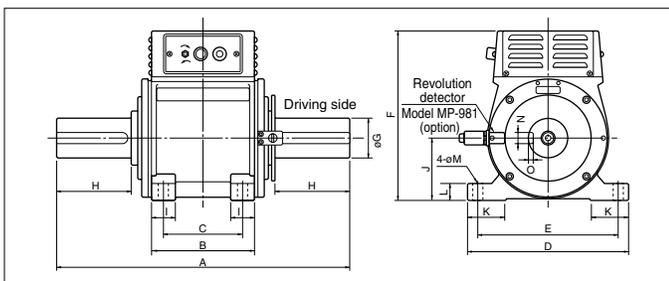
Wide measurement range, from Stationary to High-Speed.



The SS Series has a long performance sales record in a wide variety of applications, including performance tests of motors, pumps, compressors, blowers, boring machine, and gears. Thanks to the economics of mass production, these detectors are as inexpensive as strain gauge types and they are stocked for immediately delivery. High rigidity results from the unitized cast-casing construction. Combining high performance with ease of use, these standard-type torque detectors require no maintenance or replacement of parts. this series features 13 models, covering the range from 0.2N·m to 2000N·m.

Notes:

- (1) SS series torque detectors can be connected to any models of TS-series digital torque meters except the TS-7700 Torque Station Pro.
- (2) The standard cable length for torque signal cable is 5 meter and can be extended on request with extra charge when ordering.
- (3) Recommended coupling
Model SS-002 to SS-100: Micro coupling
Model SS-200 to SS-202: Form-flex coupling
(Please refer to the page 16 in details.)



Dimensions

| SS | A | B | C | D | E | F | øG | H | I | J | K | L | øM | N ^{ø9} | O | Weight (kg) |
|-------------------------|-----|-----|-----|-----|-----|-----|------------------|-----|----|---------------------------------|----|----|----|-----------------|---|-------------|
| 002, 005, 010, 020, 050 | 200 | 104 | 70 | 130 | 105 | 167 | 8 ^{h6} | 17 | 32 | 50 ⁰ _{-0.2} | 25 | 15 | 10 | — | — | 5 |
| 100, 200 | 220 | 104 | 70 | 130 | 105 | 167 | 14 ^{h6} | 27 | 32 | 50 ⁰ _{-0.2} | 25 | 15 | 10 | 5 | 3 | 5.5 |
| 500, 101 | 300 | 150 | 115 | 200 | 170 | 230 | 25 ^{h6} | 45 | 35 | 80 ⁰ _{-0.5} | 40 | 20 | 14 | 8 | 4 | 14 |
| 201, 501 | 350 | 150 | 115 | 200 | 170 | 230 | 36 ^{h6} | 70 | 35 | 80 ⁰ _{-0.5} | 40 | 20 | 14 | 10 | 5 | 15 |
| 102, 202 | 430 | 150 | 115 | 230 | 200 | 245 | 55 ^{h6} | 110 | 35 | 90 ⁰ _{-0.5} | 55 | 25 | 14 | 16 | 6 | 23 |

*Please refer to the page 10 for the dimensions of the detector shaft ends.

| Model SS | Measurement range (N·m) | Minimum resolution (mN·m) | Revolution range (r/min) | Inertia moment (kgm ²) | Spring constant (N·m/rad) |
|----------|-------------------------|---------------------------|--------------------------|------------------------------------|---------------------------|
| 002 | 0.2 | 0.1 | 0 to 6000 | 4.25 x 10 ⁻⁵ | 1.67 x 10 |
| 005 | 0.5 | 0.1 | 0 to 6000 | 4.25 x 10 ⁻⁵ | 4.12 x 10 |
| 010 | 1 | 1 | 0 to 6000 | 4.25 x 10 ⁻⁵ | 8.24 x 10 |
| 020 | 2 | 1 | 0 to 6000 | 4.25 x 10 ⁻⁵ | 1.67 x 10 ² |
| 050 | 5 | 1 | 0 to 6000 | 4.25 x 10 ⁻⁵ | 4.12 x 10 ² |
| 100 | 10 | 10 | 0 to 8000 | 5.00 x 10 ⁻⁵ | 7.75 x 10 ² |
| 200 | 20 | 10 | 0 to 8000 | 5.00 x 10 ⁻⁵ | 1.57 x 10 ³ |
| 500 | 50 | 10 | 0 to 6000 | 1.30 x 10 ⁻³ | 6.18 x 10 ³ |
| 101 | 100 | 100 | 0 to 6000 | 1.30 x 10 ⁻³ | 1.27 x 10 ⁴ |
| 201 | 200 | 100 | 0 to 6000 | 1.45 x 10 ⁻³ | 2.54 x 10 ⁴ |
| 501 | 500 | 100 | 0 to 6000 | 1.50 x 10 ⁻³ | 6.18 x 10 ⁴ |
| 102 | 1000 | 1000 | 0 to 5000 | 5.00 x 10 ⁻³ | 1.67 x 10 ⁵ |
| 202 | 2000 | 1000 | 0 to 5000 | 5.25 x 10 ⁻³ | 3.43 x 10 ⁵ |

Specifications

- Accuracy : ±0.2%/Full Scale (when combined with model TS-3200 and TS-2700 on N-0 compensation.)
±0.5%/Full Scale (when combined with model TS-2100.)
- Operating temperature : 0°C to +50°C
Storage temperature : -20°C to +80°C
Operating humidity : 95% maximum
Vibration : 50m/s² maximum
Connection : Connector (Model TRC-12A10-7M10.5 at cable side)
Revolution detecting gear : Attached as standard
Power requirement : 100/120/220/240/VAC, 50/60Hz
(Please specify the voltage when ordering.)
- Accessories : Power cable(2.4 meter) x 1 pc.
Torque signal cable(5 meter) x 1 pc.
Instruction manual x 1 copy
Inspection certificate x 1 copy
Key of the detector shaft ends (Model SS-100 to SS-202 only)
- Options : Revolution detector (Model MP-981)
Revolution signal cable (Model MX-800 series)
Rotational direction of the the attached motor of torque detector is changed externally.
(Only for wiring without exchange switch)
CE marking

Revolution detector Model MP-981(option)



Specifications

- Measurement range : 1 to 20,000 r/min (60 P/R)
Measurement accuracy : ±0.02% / Full Scale at reference time (1 second) of TS series
Operating temperature : 0°C to +70°C
Weight : Approx. 80 g

DSTP Series: Torque Detectors for Rotating and Stationary Shafts.

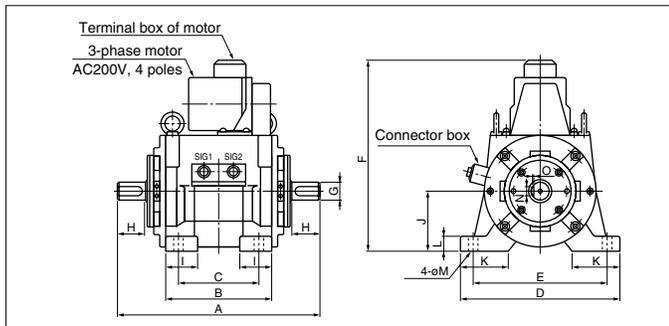
Outstanding Rigidity and Durability with Covering Large Torque Capacity



The DSTP Series cover the large-capacity range of torque measurement from stationary to high speed. This series has rigid and durable construction, their outstanding capabilities have made them a popular choice in wide variety applications for many years.

Notes:

- (1) DSTP Series torque detectors can be connected to any models of TS-series digital torque meters except the TS-7700 Torque Station Pro.
- (2) The standard cable length for torque signal cable is 5 meter and can be extended on request when ordering (extra charge is required).
- (3) The DSTP Series are semi-standard models manufactured on order. They are designed for use in high-speed and large torque measurement. Owing to coupling balance and critical speed problem being raised at high speed, please check the rate of revolution before ordering. Please consult us for details.



Dimensions

| DSTP | A | B | C | D | E | F | øG | H | I | J | K | L | øM | N ^ø | O | Weight (kg) |
|------------------|------|-----|-----|-----|-----|-----|-------------------|-----|-----|-----------------------|-----|----|----|----------------|-----------------------|-------------|
| 002, 005, 01, 02 | 180 | 90 | 60 | 170 | 140 | 250 | 8 ^{h6} | 17 | 30 | 65 ^{0/-0.5} | 35 | 15 | 12 | - | - | 9 |
| 05, 1, 2 | 270 | 136 | 110 | 180 | 150 | 270 | 14 ^{h6} | 25 | 33 | 70 ^{0/-0.5} | 46 | 15 | 12 | 5 | 3 ^{+0.1/0} | 19 |
| 5, 10 | 300 | 156 | 120 | 234 | 200 | 305 | 30 ^{h6} | 43 | 48 | 90 ^{0/-0.5} | 69 | 22 | 14 | 8 | 4 ^{+0.2/0} | 27 |
| 20 | 330 | 156 | 120 | 234 | 200 | 305 | 30 ^{h6} | 58 | 48 | 90 ^{0/-0.5} | 69 | 22 | 14 | 8 | 4 ^{+0.2/0} | 27 |
| 50 | 450 | 180 | 140 | 260 | 220 | 350 | 36 ^{h6} | 72 | 50 | 110 ^{0/-0.5} | 50 | 23 | 15 | 10 | 5 ^{+0.2/0} | 56 |
| 100 | 500 | 180 | 140 | 260 | 220 | 350 | 46 ^{h6} | 93 | 50 | 110 ^{0/-0.5} | 50 | 23 | 15 | 14 | 5.5 ^{+0.2/0} | 58.5 |
| 200 | 600 | 180 | 140 | 280 | 240 | 380 | 51 ^{h6} | 110 | 50 | 125 ^{0/-0.5} | 80 | 25 | 15 | 16 | 6 ^{+0.2/0} | 93 |
| 500 | 640 | 320 | 250 | 370 | 310 | 390 | 85 ^{h6} | 120 | 100 | 125 ^{0/-0.5} | 125 | 40 | 27 | 25 | 9 ^{+0.2/0} | 120 |
| 1000 | 700 | 320 | 250 | 370 | 310 | 390 | 110 ^{h6} | 140 | 100 | 125 ^{0/-0.5} | 125 | 40 | 27 | 28 | 10 ^{+0.2/0} | 140 |
| 2000 | 900 | 360 | 280 | 520 | 450 | 540 | 140 ^{h6} | 220 | 120 | 200 ^{0/-0.5} | 150 | 55 | 33 | 36 | 12 ^{+0.3/0} | 330 |
| 5000 | 1100 | 360 | 280 | 520 | 450 | 540 | 170 ^{h6} | 300 | 120 | 200 ^{0/-0.5} | 150 | 55 | 33 | 45 | 15 ^{+0.3/0} | 450 |
| 10000 | 1500 | 490 | 400 | 700 | 620 | 748 | 220 ^{h6} | 330 | 160 | 280 ^{0/-1} | 200 | 90 | 45 | 50 | 17 ^{+0.3/0} | 1500 |

* Please refer to page 10 for the dimensions of the detector shaft ends. (DSTP-002/005/01/02)

* When the revolution detecting gear is provided (option), the dimensions of "H" is different from the above table. Please check it when ordering.

| Model DSTP | Measurement range (N·m) | Minimum resolution (mN·m) | Revolution range (r/min) | Inertia moment (kgm ²) | Spring constant (N·m/rad) |
|------------|-------------------------|---------------------------|--------------------------|------------------------------------|---------------------------|
| 002 | 0.2 | 0.1 | 0 to 4000 | 2.9 x 10 ⁻⁵ | 1.47 x 10 |
| 005 | 0.5 | 0.1 | 0 to 4000 | 2.9 x 10 ⁻⁵ | 3.53 x 10 |
| 01 | 1 | 1 | 0 to 4000 | 2.9 x 10 ⁻⁵ | 6.67 x 10 |
| 02 | 2 | 1 | 0 to 4000 | 2.9 x 10 ⁻⁵ | 1.18 x 10 ² |
| 05 | 5 | 1 | 0 to 6000 | 1.00 x 10 ⁻⁴ | 3.44 x 10 ² |
| 1 | 10 | 10 | 0 to 6000 | 1.00 x 10 ⁻⁴ | 6.37 x 10 ² |
| 2 | 20 | 10 | 0 to 6000 | 1.00 x 10 ⁻⁴ | 1.08 x 10 ³ |
| 5 | 50 | 10 | 0 to 6000 | 6.70 x 10 ⁻⁴ | 3.63 x 10 ³ |
| 10 | 100 | 100 | 0 to 6000 | 6.73 x 10 ⁻⁴ | 6.96 x 10 ³ |
| 20 | 200 | 100 | 0 to 6000 | 6.80 x 10 ⁻⁴ | 1.27 x 10 ⁴ |
| 50 | 500 | 100 | 0 to 6000 | 2.00 x 10 ⁻³ | 2.94 x 10 ⁴ |
| 100 | 1000 | 1000 | 0 to 5000 | 3.30 x 10 ⁻³ | 5.98 x 10 ⁴ |
| 200 | 2000 | 1000 | 0 to 5000 | 5.71 x 10 ⁻³ | 1.08 x 10 ⁵ |
| 500 | 5000 | 1000 | 0 to 4000 | 3.74 x 10 ⁻² | 4.81 x 10 ⁵ |
| 1000 | 10,000 | 10,000 | 0 to 3000 | 9.69 x 10 ⁻² | 9.71 x 10 ⁵ |
| 2000 | 20,000 | 10,000 | 0 to 2000 | 3.32 x 10 ⁻¹ | 3.04 x 10 ⁶ |
| 5000 | 50,000 | 10,000 | 0 to 1500 | 8.53 x 10 ⁻¹ | 7.06 x 10 ⁶ |
| 10000 | 100,000 | 100,000 | 0 to 1000 | - | - |

Specifications

- Accuracy : ±0.2%/Full Scale
(when combined with model TS-3200 and TS-2700 on N-0 compensation.)
±0.5%/Full Scale
(when combined with model TS-2100.)
- Operating temperature : 0°C to +50°C
Storage temperature : -20°C to +80°C
- Operating humidity : 95% maximum
Vibration : 50m/s² maximum
- Connection : Connector (Model 12P2B at cable side)
- Power requirement : 200VAC, 50/60Hz, 3-phase
- Accessories : Torque signal cable (5 meter) x 1 pc.
Power cable (5 meter) x 1 pc.
Instruction manual x 1 copy
Inspection certificate x 1 copy
- Options : Revolution detector
Revolution detecting gear
Revolution signal cable (Model MX-800 series)

DD Series: Torque Detectors for Rotating and Stationary Shafts.

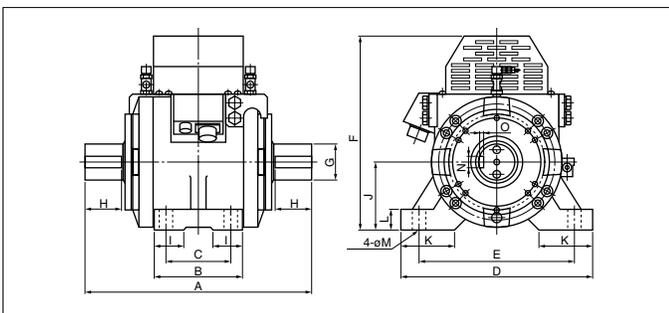
*Heavy Duty Type with Double Bearings
to Withstand Thrust and Radial Loads Fluctuation.*



The DD Series is high performance of SS Series, which can measure the larger capacity torque at higher speed. Model DD-505 to DD-108 are mostly suitable for the torque measurement with heavy load. The double bearings provide three to five times the strength of the DSTP Series under radial and thrust load. Further, it can be connected directly with propeller shaft which does not need the intermediate coupling and save space as well. Oil drop lubrication unit is required.

Notes:

- (1) Radial loads are recovery forces caused by eccentricity or miscentering of the coupling when the shaft rotates. The load specifications are limit values. Loads of these values would affect vibration performance and service life.
- (2) Please consult us for details if the optional high speed revolution range as above table is required.
- (3) Interference-fit coupling is recommended.
- (4) Please consult us concerning the weight of the coupling.
- (5) A revolution detector can not be attached with the main body of DD detector depending on the model. If it is required to measure the revolution, please consult us for details.
- (6) Spindle oil (ISO VG22) should be used for lubrication at a rate of 20 to 30 drops per minute.
- (7) Grease lubrication type is also manufactured. Please consult us for details.



Dimensions

| DD | A | B | C | D | E | F | øG | H | I | J _{-0.5} ⁰ | K | L | øM | N ^{ø9} | O ₀ ^{+0.2} | Weight (kg) |
|---------------------|-----|-----|-----|-----|-----|-----|--------------------|-----|----|--------------------------------|-----|----|----|-----------------|--------------------------------|-------------|
| 503, 104, 204 | 185 | 75 | 50 | 180 | 150 | 215 | 8 ^{h5} | 16 | - | 65 | 60 | 20 | 12 | - | - | 20 |
| 504 | 185 | 75 | 50 | 180 | 150 | 215 | 8 ^{h5} | 16 | - | 65 | 60 | 20 | 12 | 3 | 1.8 | 20 |
| 105, 205 | 230 | 100 | 70 | 200 | 170 | 240 | 14 ^{h5} | 20 | - | 80 | 60 | 20 | 12 | 5 | 3 | 25 |
| 505, 106, 206 | 320 | 125 | 90 | 240 | 200 | 280 | 36 ^{js6} | 40 | - | 85 | 80 | 30 | 19 | 10 | 5 | 40 |
| 1506B, 1107B, 1207B | 380 | 135 | 90 | 280 | 240 | 318 | 60 ^{js6} | 65 | - | 95 | 90 | 30 | 23 | 18 | 7 | 53 |
| 507 | 600 | 230 | 180 | 410 | 345 | 420 | 85 ^{js6} | 105 | 80 | 150 | 105 | 40 | 26 | 25 | 9 | 180 |
| 108 | 680 | 230 | 180 | 410 | 345 | 420 | 110 ^{js6} | 130 | 80 | 150 | 105 | 40 | 26 | 28 | 10 | 210 |

*Please refer to page 10 for the dimensions of the detector shaft ends.

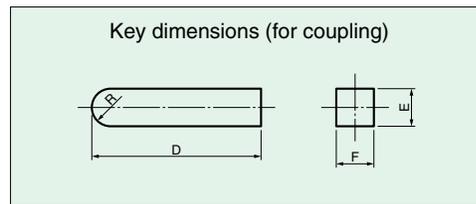
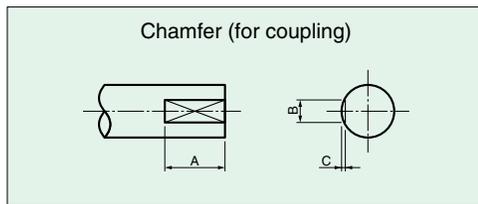
| Model DD | Measurement range | Minimum resolution | Standard revolution range | Optional high speed revolution range | Inertia moment | Spring constant | Load value | |
|----------|--|--------------------|---------------------------|--------------------------------------|-------------------------|------------------------|------------|------------|
| | (N·m) | (mN·m) | (r/min) | (r/min) | (kgm ²) | (N·m/rad) | radial (N) | Thrust (N) |
| 503 | 0.5 | 0.1 | 0 to 20,000 | 0 to 30,000 | 1.00 x 10 ⁻⁵ | 3.82 x 10 | | |
| 104 | 1 | 1 | 0 to 20,000 | 0 to 30,000 | 1.00 x 10 ⁻⁵ | 7.26 x 10 | | |
| 204 | 2 | 1 | 0 to 20,000 | 0 to 30,000 | 1.00 x 10 ⁻⁵ | 1.32 x 10 ² | | |
| 504 | 5 | 1 | 0 to 20,000 | 0 to 30,000 | 1.00 x 10 ⁻⁵ | 2.62 x 10 ² | | |
| 105 | 10 | 10 | 0 to 20,000 | 0 to 30,000 | 5.93 x 10 ⁻⁵ | 6.18 x 10 ² | | |
| 205 | 20 | 10 | 0 to 20,000 | 0 to 30,000 | 5.95 x 10 ⁻⁵ | 1.11 x 10 ² | | |
| 505 | 50 | 10 | 0 to 10,000 | 0 to 13,000 | 1.5 x 10 ⁻³ | 3.63 x 10 ² | 300 | 1500 |
| 106 | 100 | 100 | 0 to 10,000 | 0 to 13,000 | 1.5 x 10 ⁻³ | 7.06 x 10 ² | 300 | 1500 |
| 206 | 200 | 100 | 0 to 10,000 | 0 to 13,000 | 1.5 x 10 ⁻³ | 1.37 x 10 ⁴ | 300 | 1500 |
| 1506B | 500 | 100 | 0 to 8000 | 0 to 10,000 | 8.6 x 10 ⁻³ | 5.30 x 10 ⁴ | 300 | 2000 |
| 1107B | 1000 | 1000 | 0 to 8000 | 0 to 10,000 | 8.6 x 10 ⁻³ | 9.90 x 10 ⁴ | 400 | 2000 |
| 1207B | 2000 | 1000 | 0 to 8000 | 0 to 10,000 | 8.7 x 10 ⁻³ | 1.77 x 10 ⁵ | 400 | 2000 |
| 507 | 5000 | 1000 | 0 to 6000 | 0 to 6000 | 4.8 x 10 ⁻² | 5.36 x 10 ⁵ | 600 | 2000 |
| 108 | 10,000 | 10,000 | 0 to 4000 | 0 to 4000 | 1.43 x 10 ⁻¹ | - | 800 | 2000 |
| Remarks | Oil dropping lubrication method is standard at DD Series. The above revolution range are the values for the detector alone, and vary depending on the load balance of the coupling connected to the shaft ends and the mounting method of the coupling. | | | | | | | |

Specifications

| | |
|-----------------------|--|
| Accuracy | : ±0.2%/Full Scale (when combined with model TS-3200 and TS-2700 on N-0 compensation.) ±0.5%/Full Scale (when combined with model TS-2100.) |
| Operating temperature | : 0°C to +50°C |
| Storage temperature | : -20°C to +80°C |
| Operating humidity | : 95% maximum |
| Vibration | : 50m/s ² maximum |
| Connection | : Connector (Model TRC116-12A10-7M10.5 at cable side) |
| Power requirement | : 200VAC, 50/60Hz, 3-phase |
| Accessories | : Torque signal cable (5 meter) x 1 pc. Power cable (5 meter) x 1 pc. Instruction manual x 1 copy Inspection certificate x 1 copy |
| Options | : Oil drip lubrication device Revolution detector Bearing temperature alarm output |

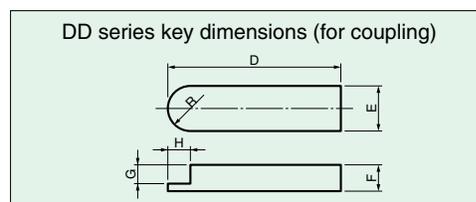
Torque Detector Shaft End and Attached Motor Specifications.

| Model name | | Chamfer | | | Key dimensions | | | | Attached motor specifications | | |
|------------|-------------------------|-----------------|---|-----|-----------------|----------------------------------|----------------------------------|---------|-------------------------------|----------------------|------------------------|
| | | A | B | C | D | E _{h9} | F | R | Power requirement | No. of poles | Consumption power (VA) |
| SS | 002, 005, 010, 020, 050 | 17 | 4 | 0.5 | | | | | 100/120/220/240 VAC | Single-phase 4 poles | 35 |
| | 100, 200 | | | | 25 | 5 | 5 ⁰ _{-0.03} | 2.5 | 100/120/220/240 VAC | Single-phase 4 poles | 35 |
| | 500, 101 | | | | 40 | 8 | 7 ⁰ _{-0.09} | 4 | 100/120/220/240 VAC | Single-phase 4 poles | 50 |
| | 201, 501 | | | | 65 | 10 | 8 ⁰ _{-0.09} | 5 | 100/120/220/240 VAC | Single-phase 4 poles | 50 |
| | 102, 202 | | | | 105 | 16 | 10 ⁰ _{-0.09} | 8 | 100/120/220/240 VAC | Single-phase 4 poles | 50 |
| DSTP | 002, 005, 01, 02 | 17 | 4 | 0.5 | | | | | 200 VAC | 3-phase 4 poles | 50 |
| | 05, 1, 2 | | | | 23 | 5 | 5 ⁰ _{-0.03} | 2.5 | 200 VAC | 3-phase 4 poles | 50 |
| | 5, 10 | | | | 40 | 8 | 7 ⁰ _{-0.09} | 4 | 200 VAC | 3-phase 4 poles | 50 |
| | 20 | | | | 55 | 8 | 7 ⁰ _{-0.09} | 4 | 200 VAC | 3-phase 4 poles | 50 |
| | 50 | | | | 70 | 10 | 8 ⁰ _{-0.09} | 5 | 200 VAC | 3-phase 4 poles | 120 |
| | 100 | | | | 91 | 14 | 9 ⁰ _{-0.09} | 7 | 200 VAC | 3-phase 4 poles | 120 |
| | 200 | | | | 108 | 16 | 10 ⁰ _{-0.09} | 8 | 200 VAC | 3-phase 4 poles | 120 |
| | 500 | | | | 118 | 25 | 14 ⁰ _{-0.11} | 12.5 | 200 VAC | 3-phase 4 poles | 120 |
| | 1000 | | | | 137 | 28 | 16 ⁰ _{-0.11} | 14 | 200 VAC | 3-phase 4 poles | 120 |
| | 2000 | | | | 215 | 36 | 20 ⁰ _{-0.13} | 18 | 200 VAC | 3-phase 4 poles | 460 |
| | 5000 | | | | 294 | 45 | 25 ⁰ _{-0.13} | 22.5 | 200 VAC | 3-phase 4 poles | 460 |
| 10000 | | | | 355 | 50 | 28 ⁰ _{-0.13} | 25 | 200 VAC | 3-phase 4 poles | 460 | |
| ★ DD | 503, 104, 204 | 15 | 4 | 0.5 | | | | | 200 VAC | 3-phase 4 poles | 25 |
| | 504 | | | | 15 | 3 | 3 ⁰ _{-0.025} | 1.5 | | | |
| | 105, 205 | | | | 22.5 | 5 | 5 ⁰ _{-0.03} | 2.5 | | | |
| | 505, 106, 206 | | | | 39 | 10 | 8 ⁰ _{-0.09} | 5 | 200 VAC | 3-phase 4 poles | 50 |
| | 1506B, 1107B, 1207B | | | | 70 | 18 | 11 ⁰ _{-0.11} | 9 | 200 VAC | 3-phase 4 poles | 50 |
| | 507 | | | | 113 | 25 | 14 ⁰ _{-0.11} | 12.5 | 200 VAC | 3-phase 4 poles | 140 |
| 108 | | | | 137 | 28 | 16 ⁰ _{-0.11} | 14 | 200 VAC | 3-phase 4 poles | 140 | |
| MD | 201B to 202B | Without chamfer | | | No using of key | | | | 100/120/220/240 VAC | Single-phase 2 poles | 10 |
| | 502 to 203B | 10 | 3 | 0.5 | | | | | | | |
| | 503B to 204B | 15 | 4 | 0.5 | | | | | | | |



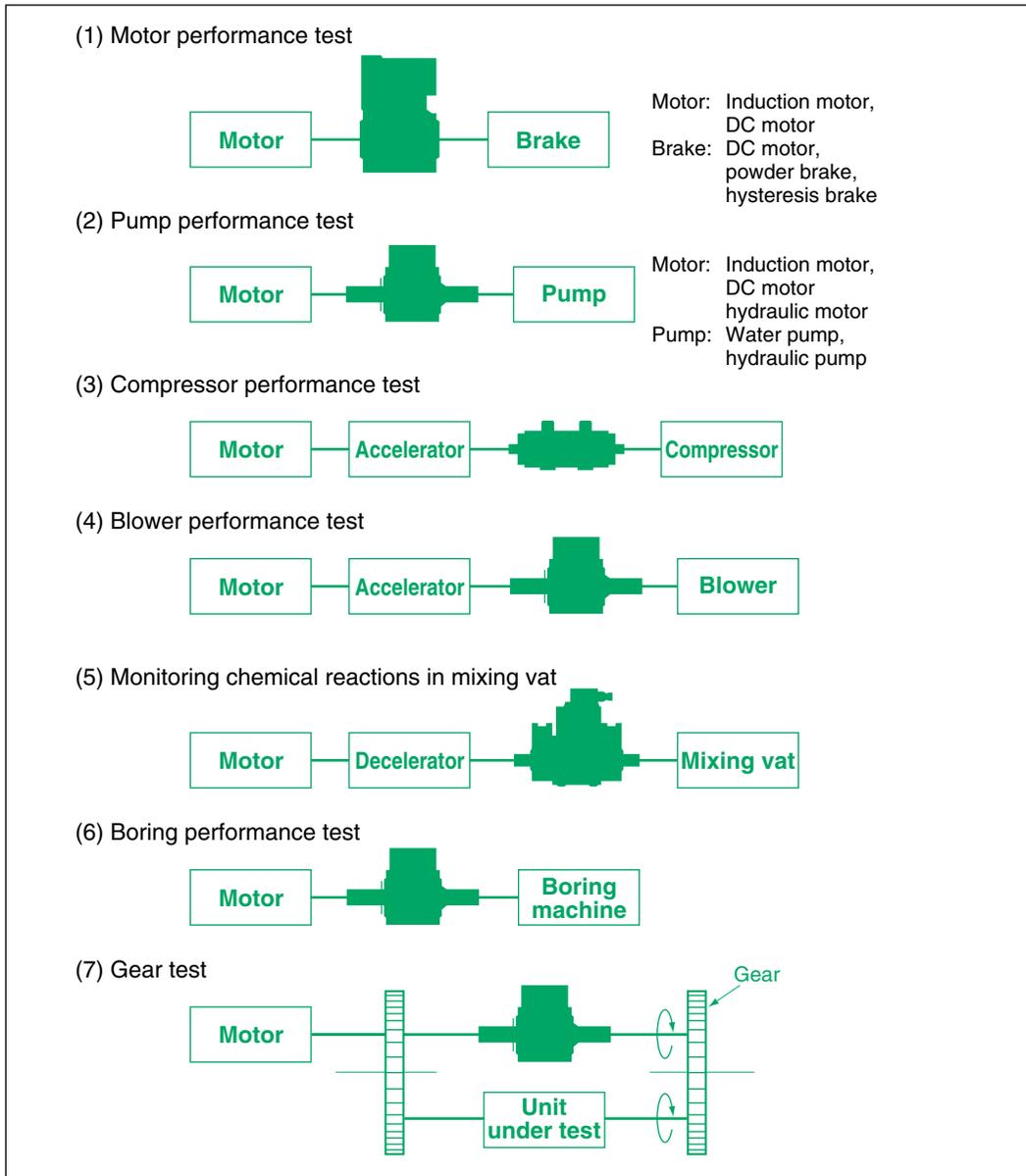
★

| Model name | Key dimensions | |
|---------------------|----------------|-----|
| | G | H |
| 504 | — | — |
| 105, 205 | 2.5 | 2.5 |
| 505, 106, 206 | — | — |
| 1506B, 1107B, 1207B | 7 | 7 |
| 507 | 7 | 9 |
| 108 | 9 | 8 |

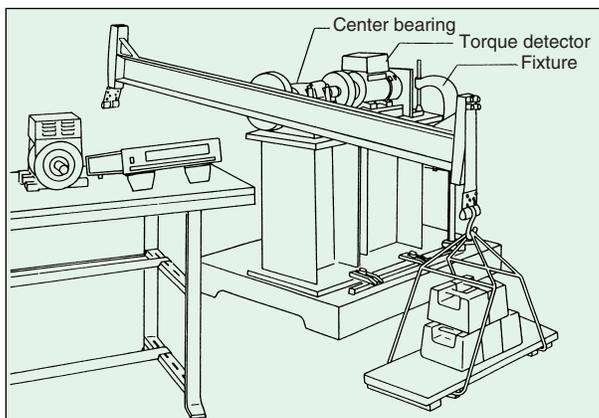


Torque Measurement: Ono Sokki's Proven Record and Extensive Product Lineup Tell the Whole Story.

● Examples of Digital Torque Meter Applications



● Calibration of Torque Detector



Example:

$$\text{Torque} = W \times \ell$$

(500Nm = 500N x 1m)

Digital Torque Meter (1) TS-2100

Discontinued
(Reference only)

Compact Design and Isolated Analog Output to be Suitable for Safe and Easy Connection to Control Systems or CPUs.

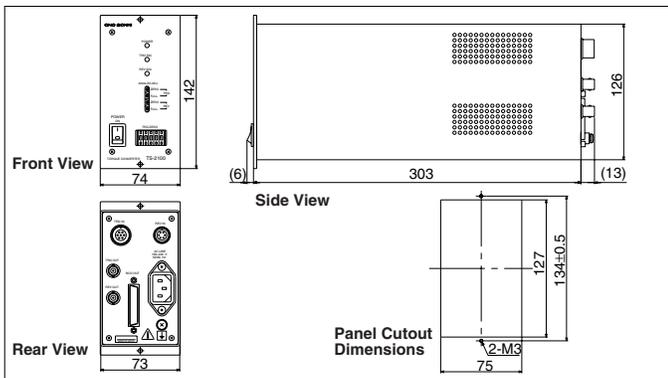
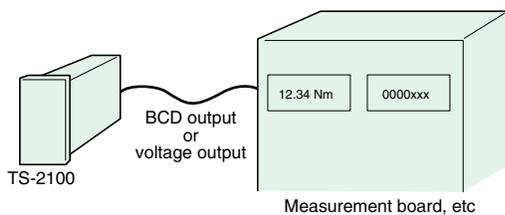


In spite of its compact body, the TS-2100 provides both revolution and torque measurement functions. Measurement data can be output as an analog voltage output or BCD digital output, which is suitable for easy connection to a programmable controller or a personal computer. This compact size enables highly efficient use of space by building into a control panel or measurement panel. Further, by using the accessory rubber feet, this panel-type instrument can be used as a stand-alone benchtop type instrument.

Notes:

- (1) With no N-0 compensation function provided, the TS-2100 cannot be connected with the MD series torque detector.
- (2) Torque data output varies depending on the range of a torque detector used. In general, the range is shown in the higher most digit (1 or 2 or 5) in the detector capacity.
- (3) In order to supply the suitable cable which can withstand the power supply to this unit, please specify the electrical power voltage when ordering.

Combination example with an external display unit



Specifications

Torque Measurement Section

Input Section
Input signal : Phase-differential type detector output signal
Cable connector : TRC116-12A10-7M10.5

Display Section
Numerical value display : Nil
Indicator : Lights when a signal is input

Revolution Measurement Section

Input Section
1. INT..... Used for the torque measurement signal SIG 2.
2. REV IN... Output signal of electromagnetic type revolution detector (MP-981)

Input frequency range : 20Hz to 30kHz
Matching connector : R03-PB6M

Display Section
Numerical value display : Nil
Indicator : Light at inputting a signal

Setting Section

Front Panel Setting Section

Zero compensation of torque : 5-digit digital switches
Analog output adjustment : Potentiometer for minute adjustment of zero/span

Setting Section of Inside the Panel

Torque range : 1, 2, 5, 10 manual selection
Number of pulses : 60, 120, 180 P/R

Output Section

Analog Voltage Output Section

Torque output level : Range 1; 0 to ±1V
Range 2; 0 to ±2V
Range 5; 0 to ±5V
Range 10; 0 to ±10V

Revolution output level : 0 to +10V/9999 r/min

Over scale output : 180% of torque range, ±10V max

Time constant : Torque; 500ms/100ms can be selected.
Revolution; 100ms

Linearity : Torque; ±0.5% FS
Revolution; ±0.3% FS

Isolation : Withstanding voltage of 250 VDC for one minute
COMMON is same for torque and revolution.

Proper load : 10kΩ or more

Matching connector : CO2 type (BNC)

Digital Output Section

Output type : BCD

| pin No. | Signal name | pin No. | Signal name |
|---------|--|---------|--|
| 1 | Data output 1 x 10 ⁰ | 26 | Data output 2 x 10 ¹ |
| 2 | (Torque 2 x 10 ⁰ section) | 27 | (Revolution 4 x 10 ¹ section) |
| 3 | 4 x 10 ⁰ | 28 | 8 x 10 ¹ |
| 4 | 8 x 10 ⁰ | 29 | 1 x 10 ² |
| 5 | 1 x 10 ¹ | 30 | 2 x 10 ² |
| 6 | 2 x 10 ¹ | 31 | 4 x 10 ² |
| 7 | 4 x 10 ¹ | 32 | 8 x 10 ² |
| 8 | 8 x 10 ¹ | 33 | 1 x 10 ³ |
| 9 | 1 x 10 ² | 34 | 2 x 10 ³ |
| 10 | 2 x 10 ² | 35 | 4 x 10 ³ |
| 11 | 4 x 10 ² | 36 | 8 x 10 ³ |
| 12 | 8 x 10 ² | 37 | NC |
| 13 | 1 x 10 ³ | 38 | NC |
| 14 | 2 x 10 ³ | 39 | NC |
| 15 | 4 x 10 ³ | 40 | NC |
| 16 | 8 x 10 ³ | 41 | NC |
| 17 | NC | 42 | Torque polarity output "+-" |
| 18 | NC | 43 | Torque polarity output "+-" |
| 19 | NC | 44 | NC |
| 20 | NC | 45 | NC |
| 21 | Data output 1 x 10 ⁰ | 46 | NC |
| 22 | (Revolution 2 x 10 ⁰ section) | 47 | Hold input |
| 23 | 4 x 10 ⁰ | 48 | Busy input |
| 24 | 8 x 10 ⁰ | 49 | Print command output |
| 25 | 1 x 10 ¹ | 50 | Common |

Torque scale

: 4 digits numeral, 1 digit polarity
Range 1; ±1000 counts
Range 2; ±2000 counts
Range 5; ±5000 counts
Range 10; ±10000 counts
(The decimal position in the displayed value is neglected.)

Revolution scale

: 4 digits numeral 0 to 9999

Output renewal

: Every 1s

Matching connector

: DX40-50P

Option : External display unit (BCD input)
Output cable

General Specification

Power voltage

: 100 to 240 VAC, 50/60Hz

Power consumption

: Approx. 20 VA (100 VAC)

Insulation resistance

: 10MΩ min. at 500 VDC

Withstanding voltage

: 1500 VAC for 1 min.

Operating temperature range

: 0 to 40°C

Storage temperature range

: -10 to +70°C

Weight

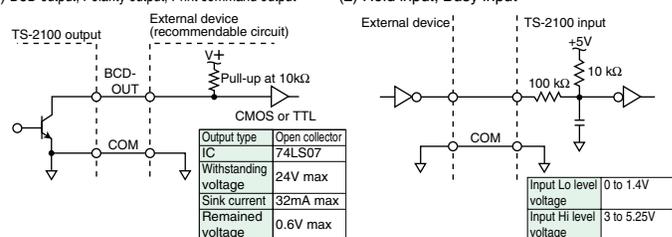
: Approx. 1.8kg

Accessories: Rubber foot x 4 pcs.
Power cable (1.9m) x 1 pc.
Instruction manual x 1 copy

BCD recommendable interface

(1) BCD output, Polarity output, Print command output

(2) Hold input, Busy input



Digital Torque Meter (2) TS-2700

General Type of Compact Torque Converter with Digital Display, Suitable for Panel Mounting



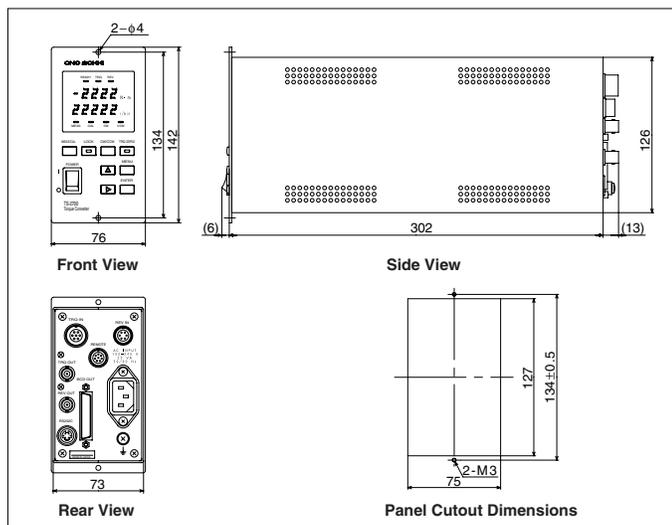
The TS-2700 can provide a digital display of the measurement data while outputting the data to an external device using analog voltage, BCD or RS-232C outputs. Being compact in size, it does not take up much space when mounted in an instrumentation panel. It can also be accommodated neatly adjacent to a control device inside the panel. The display units are N·m, and r/min, but other units can also be specified by using the accessory unit seals.

Other functions:

- Remote control functions: External switching of rotation direction setting, changing the BCD data switching interval (100 ms to 64 s), synchronized driving of two TS-2700 units, safety interlock using measurement preparation complete signal outputs are possible.
- N-0 compensation function: Inputting the N-0 compensation value enables a torque measurement accuracy of $\pm 0.2\%$ of full scale.
- CW/CCW switching: The settings of both rotation directions are stored in an internal non-volatile memory to enable them to be switched.

Notes:

In order to supply the suitable cable which can withstand the power supply to this unit, please specify the electrical power voltage when ordering.



Specifications

Torque Measurement Section

■ Input Section

Input signal : Phase-differential type detector output signal
Matching connector : TRC116-12A10-7M10.5

■ Setting Section

Zero compensation : 1 point each for CW, CCW, push-button setting of auto-zero
N-0 compensation : 5 points each for CW, CCW
Zero switching : CW, CCW, EXT.
Decimal point lighting : Automatic

■ Display Section

Numerical value display : 7-segment green LEDs
Display range : -9999 to +9999
Display unit : N·m (mN·m, kN·m are also available by using the accessory seals.)
Display switching interval : 1 s/10 s/EXT
Accuracy (1-s averaged values) : With N-0 compensation : $\pm 0.2\%/FS \pm 1$ count
Without N-0 compensation : $\pm 0.5\%/FS \pm 1$ count

Revolution Measurement Section

■ Input Section

1. REV IN.... Output signal from Ono Sokki's MP-981 electromagnetic type revolution detector
Input frequency range : 1 Hz to 100 kHz (accuracy guaranteed from 10 Hz)
Matching connector : R03-PB6M

2. INT..... Used for SIG2 torque signals

■ Setting Section

Number of detector pulses : 1 to 9999 P/R

■ Display Section

The numerical value display unit and the display switching interval are the same as those given in the Torque Measurement Section.
Display range : Up to 99999
Display unit : r/min
Accuracy (1-s averaged values) : $\pm 0.02\%/FS \pm 1$ count

Output Section

■ Analog Voltage Output Section

Torque output level : 0 to $\pm 10V/FS$
Revolution output level : 0 to 10 V/FS
Time constant : Torque: 500 ms/63 ms
Revolution: 63 ms
Accuracy : Torque: $\pm 0.2\%/FS$ (when N-0 compensation is used)
Revolution: $\pm 0.1\%/FS$
Isolation : Withstand voltage of 250 VDC for one minute
COMMON is the same for torque and revolution.

Proper load : 10 k Ω or more
Matching connector : CO2 type (BNC)

■ Digital Output Section

Output format : BCD
Output renewal : Every 1 s
Matching connector : DX40-50P
■ RS-232C (refer to the chart below.)
Transmission speed : 9600 bps
Functions : Input of zero value, N-0 value, and settings; output of measured values and setting conditions

Compatible cable

: AX-5022
■ Remote functions (refer to the chart below.)
Input : CW, CCW switching, clear input, trigger input
Output : Trigger output, measurement preparations complete signal output

General Specifications

Power supply voltage : 100 to 240 VAC, 50/60 Hz
Power consumption : Approx. 25 VA (100 VAC)
Insulation resistance : 10 M Ω min. at 500 VDC
Withstand voltage : 1500 VAC for one minute
Operating temperature range : 0 to +40°C
Storage temperature range : -10 to +55°C
Weight : Approx. 1.8 kg
Accessories: Display unit seals x 1 set
Matching connector for remote control x 1 set
Rubber foot x 4 pcs.
Power cable (1.9 m) x 1 pc.
Instruction manual x 1 copy

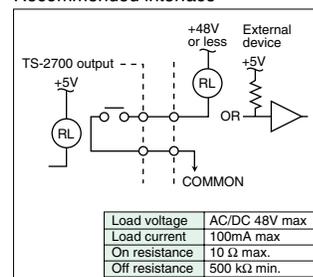
■ RS-232C Pin Assignments

| Pin | Signal name | Pin | Signal name |
|-----|---------------------|-----|-----------------------|
| 1 | - | 5 | RTS (Request to Send) |
| 2 | RxD (Receive Data) | 6 | - |
| 3 | TxD (Transmit Data) | 7 | SG (Common) |
| 4 | CTS (Clear to Send) | 8 | - |

■ Remote Function Pin Assignments

| Pin | Signal name | Remarks |
|-----|------------------|---|
| A | CLR IN | |
| B | TRG IN | Non-voltage contact input (COMMON is common) |
| C | CW/CCW switching | |
| D | COM | |
| E | READY OUT | |
| F | Ditto COM-1 | Non-voltage contact output (COMMON is separate) |
| G | TRG OUT | |
| H | Ditto COM-2 | |

Recommended interface



Digital Torque Meter with Arithmetic Operation Display **TS-3200**

Advanced Model with an Easy-to-use LCD and a Range of Optional Interfaces to Utilize the Full Potential of High-accurate Digital Data



The TS-3200 uses an LCD display for the setting the measurement condition and displaying the measurement data. Settings are easy to make, and different numerical display formats can be selected to suit various applications. Ten torque detection settings can be stored in memory, which is a very convenient function when you have several torque detectors. A wide selection of interfaces, including those sold separately as options, is provided to enable remote input/output of control functions, data output using analog voltage, BCD and comparator outputs, and data transmission using RS-232C, and GP-IB interfaces. Select the optimal interface to use with your equipment combination.

Built-in option

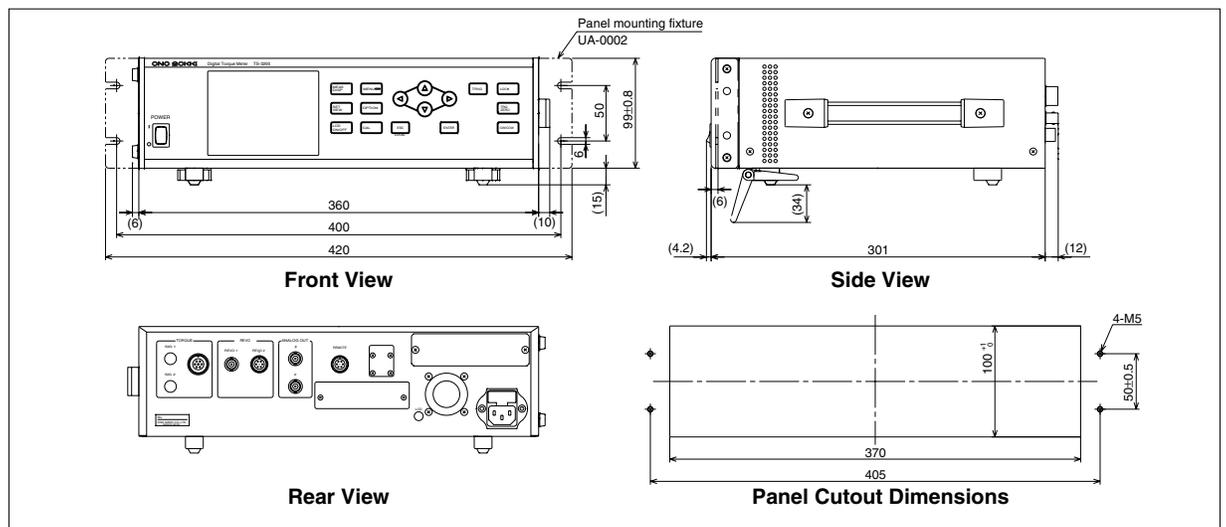
■ High-speed response software: TS-0321 (sold separately)

Enables output of results processed at high speeds up a maximum of 1 ms. This option is added to the standard analog voltage output function.

- Channels : 2 channels
- Connector : Output from the normal analog voltage output terminal
- Restrictions : No comparator output, fixed analog output time constant, software cannot be used with SS or MD torque detectors.

Notes:

- (1) In order to supply the suitable cable which can withstand the power supply to this unit, please specify the electrical power voltage when ordering.
- (2) When using the TS-3200 in combination with an MD or SS type torque detector, use a time constant of at least 63 ms for analog output.



Specifications

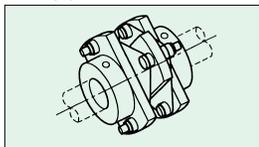
| | | | |
|---|--|--|--|
| Torque Measurement Section | | | |
| ■ Input Section | | | |
| Input signal : Phase-differential type detector output signal | | | |
| Matching connector : TRC-116-12A10-7M10.5 | | | |
| ■ Setting Section | | | |
| Capacity : ±1 to 9999 | | | |
| Factor : 1 to 65535 | | | |
| Unit : mN-m, N-m, kN-m | | | |
| Zero compensation : 1 point each for CW and CCW; manual and automatic | | | |
| N-0 compensation : 10 points each for CW and CCW; manual and automatic | | | |
| Zero switching : CW, CCW, EXT | | | |
| Response time : Time constant, 16 ms /31 ms/63 ms/125 ms /250 ms/500 ms/1s /2 s/4s/8s/16s/32s/64s | | | |
| ■ Display Section | | | |
| Number of digits displayed : Polarity indication + 4 digits, Polarity indication + 5 digits, selectable | | | |
| Display renewal rate : 1 to 10 s (in 1-s increments), or external input signal | | | |
| Accuracy : When used in combination with a torque detector (and the display renewal rate is 1 s) With N-0 compensation : ±0.2%/FS ± 1 count (when the display is 4 digits.) Without N-0 compensation : ±0.5%/FS ± 1 count (when the display is 4 digits.) | | | |
| ■ Output Section | | | |
| Analog output : Voltage output 0 ±10 V/full scale | | | |
| Scale : Full scale voltage can be set from 0.1 V to 10 V. (in 0.1 V increments) | | | |
| Response time : 16 ms to 64 s, depending on the time constant setting | | | |
| Accuracy : When used in combination with a torque detector (and the display renewal rate is 1 s) With N-0 compensation : ±0.2%/FS ± 1 count (when the display is 4 digits.) Without N-0 compensation : ±0.5%/FS ± 1 count (when the display is 4 digits.) | | | |
| Temperature drift : ±0.01%/FS/°C | | | |
| Matching connector : C02 type (BNC) | | | |
| Revolution Measurement Section | | | |
| ■ Input Section | | | |
| 1. REVO1.....For sinewave input | | | |
| Input signal : Signal output from an electromagnetic revolution detector such as Ono Sokki's MP-910 | | | |
| Input impedance : 10 kΩ min. | | | |
| Input frequency range : 10 Hz to 100 kHz | | | |
| Input signal amplitude range : 0.2 to 45 Vrms | | | |
| Matching connector : C02 type (BNC) | | | |
| 2. REVO2.....For squarewave input | | | |
| Input signal : Signal output from an electromagnetic revolution detector such as Ono Sokki's MP-981 | | | |
| Input impedance : 10 kΩ min. | | | |
| Input frequency range : 1 Hz to 200 kHz | | | |
| Input signal amplitude range : High level +4 to +30 V Low level 0.6 V max. Pulse width 2 μs min. | | | |
| Power supplied : 12 VDC, 100 mA | | | |
| Matching connector : R03-PB6M | | | |
| 3. INT.....Used for SIG2 torque signals | | | |
| ■ Setting Section | | | |
| Unit : r/min, r/s, Hz | | | |
| Number of pulses : 1 to 99999 P/R | | | |
| Gear ratio : ±1 to 9999/1 to 9999 (display is possible of the revolution prior to the speed change) | | | |
| Offset : ±1 to 9999 (only when the unit is r/min) Measured value = actual measured value - offset | | | |
| Response time : Time constant setting, 16 ms/31 ms/63 ms/125 ms/250 ms/500 ms/1s/2 s/4s/8s/16s/32s/64s | | | |
| ■ Display Section | | | |
| Number of display digits : 5 digits | | | |
| Display resolution : 0.001, 0.01, 0.1, 1, selectable from the capacity (full scale) setting | | | |
| Display renewal rate : Same as the torque section | | | |
| Accuracy : ±0.05%/FS ± 1 count (when the display renewal rate is 1 s) | | | |
| ■ Output Section | | | |
| Accuracy : (1-s averaged values) ±0.1%/FS | | | |
| The other specifications are the same as those for the Torque Output Section | | | |
| Output (Power) Processing Section | | | |
| ■ Processing Method | | | |
| Output (W) = torque (N-m) x revolution (r/min) x 2 π/60 | | | |
| Output (PS) = 0.7355 kW | | | |
| ■ Display Section | | | |
| Number of display digits : Polarity indication + 5 digits | | | |
| Display renewal rate : Same as for the torque section | | | |
| Unit : mW, W, kW, PS | | | |
| Accuracy : Torque display accuracy + revolution display accuracy | | | |
| The other specifications are the same as those for the Torque Output Section | | | |
| Display Panel | | | |
| ■ LCD Specifications | | | |
| Backlight : 320 x 240 dots | | | |
| On/off function provided | | | |
| Main display: Selectable from 2 to 3 levels. Select from torque, revolution, Output (Power). | | | |
| Sub display: Peak value (MAX, MIN, P-P), ripple ratio | | | |
| Status display : Measurement preparations complete, clear input, torque signal input, revolution signal input, CW/CCW, comparator output ON/OFF | | | |
| Interface Section | | | |
| Model TS-0325 and TS-0326 can not be built in simultaneously. | | | |
| ■ Remote Functions | | | |
| Clear input : Contact input, when contact closure, the display and output are forced to 0. | | | |
| Revolution direction selection input : Contact input, switching between CW and CCW torque zero position, CCW when contact closure | | | |
| Trigger input : Contact input, when external gate is contact closure, the display and BCD are renewed. When the trigger function is used, OR function with the display panel switch. | | | |
| Trigger output : Contact output, on/off synchronized with the gate time. Example: When the gate is 1s, 0.5s ON 0.5s OFF. | | | |
| Preparations complete output : Contact output, contact closure when TS is in the torque measurement status. | | | |
| Input section : When the input is non-voltage contact | | | |
| Open voltage : 5.25 V max. | | | |
| Short-circuit current : 1 mA max. | | | |
| When the input is voltage | | | |
| High level : +4 to +5.25 V | | | |
| Low level : 0 to +1 V | | | |
| Output Section : PhotoMOS relay | | | |
| Load voltage : 30 VDC max. | | | |
| Load current : 100 mA max. | | | |
| On resistance : 10Ω max. | | | |
| Off resistance : 500 kΩ min. | | | |
| Matching connector : R03-PB8M | | | |
| ■ Analog Voltage Output (refer to each item for more details) | | | |
| Channels : 2 channels | | | |
| Item : Two items selectable from Torque, Revolution, and Output (Power) | | | |
| Matching connector : C02 type (BNC) | | | |
| ■ TS-0322 Comparator Output (sold separately) | | | |
| Channels : 2 channels | | | |
| Item : Setting of the Torque, Revolution, and POWER (output) upper or lower level | | | |
| Output renewal : At the specified interval (0.004 to 10 s, External) | | | |
| Reference comparison : Average value at each specified time | | | |
| Output format : Same as the remote function output section | | | |
| Matching connector : RM128PG-4S | | | |
| ■ TS-0323 BCD Output (sold separately) | | | |
| Channels : 2 channels | | | |
| Item : Two items selectable from Torque, Revolution, and Output (Power) | | | |
| Output renewal : At each gate time set (0.1 to 10 s, External) or at each sampling interval | | | |
| Output format : Positive logic open collector output | | | |
| Matching connector : 57-30500 Amphenol full pitch, 50 pins | | | |
| ■ TS-0325 RS-232C (sold separately) | | | |
| Standard : Conforms to EIA and JISX5101 | | | |
| Transmission rate (bps) : 1200, 2400, 4800, 9600, 19200 | | | |
| Matching connector : D-sub 9-pin, female | | | |
| ■ TS-0326 GP-IB (sold separately) | | | |
| Electrical and mechanical specifications: Conform to IEEE 488-1978 | | | |
| General Specifications | | | |
| Power supply voltage : 100 to 240 VAC ±10%, 50/60 Hz | | | |
| Power consumption : 70 VA max. | | | |
| Insulation resistance : 10 MΩ min. at 500 VDC | | | |
| Withstand voltage : 1500 VAC for one minute | | | |
| Operating temperature range : 0 to 40°C | | | |
| Storage temperature range : -10 to 55°C | | | |
| Weight : Approx. 5 kg | | | |
| Accessories : Instruction manual 1 copy Power cable (1.9 meter) 1 pc. Matching connector for remote control x 1 pc. | | | |
| Options | | | |
| ■ Panel Mounting Fixture | | | |
| UA-0001 : For 480-mm width racks | | | |
| UA-0002 : For mounting in a panel cutout of the same width as the TS-3200 | | | |
| CE marking | | | |

Recommended Couplings for Torque Detection

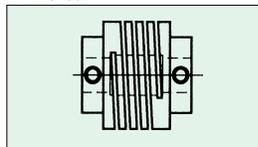
| | Micro | Helical | NSO Diaphragm | Form-flex |
|--|--|---|---|---|
| Recommended torque detector | SS-002 to SS-100 | Low-capacity models | High-capacity models | SS-200 to SS-202 |
| Maximum revolution | 20,000 r/min / 10 N-m | 25,000 r/min / 2.5 N-m | 23,000 r/min / 1,090 N-m | 19,000 r/min / 1,300 N-m |
| Transmitted torque capacity | 10 N-m max. | 2.5 N-m max. | 200 to 38,140 N-m | 20 to 181,500 N-m |
| Features | <ol style="list-style-type: none"> 1. No backlash 2. Large torsional rigidity 3. Non-magnetic material 4. Easy maintenance 5. Eccentric, angle of deviation absorption 6. Low inertia moment 7. Water-resistant, chemical-resistant, oil-resistant | <ol style="list-style-type: none"> 1. No backlash 2. Small-format, lightweight 3. Ideal for use with micro precision devices 4. Easy maintenance 5. Eccentric, angle of deviation absorption 6. Low inertia moment 7. Duralmin material (non-magnetic material) and stainless, two types | <ol style="list-style-type: none"> 1. No backlash 2. Large torsional rigidity 3. Large allowable eccentric, angle of deviation tolerance 4. Lightweight, easy attachment and removal 5. High-speed rotation enabled 6. Easy maintenance 7. Water-resistant, chemical-resistant, oil-resistant 8. Fail-safe construction | <ol style="list-style-type: none"> 1. No backlash 2. Large torsional rigidity 3. Large allowable eccentric, angle of deviation tolerance 4. Lightweight, easy attachment and removal 5. High-speed rotation enabled 6. Easy maintenance 7. Water-resistant, chemical-resistant, oil-resistant 8. Fail-safe construction |
| Allowable Eccentricity/ Angle of deviation | (At 10 N-m transmitted torque) 0.7 mm 1.5° | (At 2.5 N-m transmitted torque) 0.25 mm 5° | (At 200 N-m transmitted torque) Core extension 0.27 mm to 0.85 mm Angle of deviation: 1/3° | (At 250 N-m transmitted torque) Core extension 1 mm Angle of deviation: 1° |
| Weight | 280 (g) (At 10 N-m transmitted torque) | 38 (g) (Duralmin) (At 2.3 N-m transmitted torque) | 4 (kg) (At 200 N-m transmitted torque) | 3.7 (kg) (At 250 N-m transmitted torque) |
| Usage methods | <ol style="list-style-type: none"> 1. Extend the cores of the torque detector and the target measurement object shafts, and then attach the flanges, plate springs and spacers. 2. Move the devices in the axial direction to attach and remove the couplings. 3. Eccentricity and angle deviation are exceedingly small at high revolutions. | <ol style="list-style-type: none"> 1. Extend the cores of both shafts, and then move the devices in the axial direction to connect the couplings to the shafts. 2. Move the devices in the axial direction to attach and remove the couplings. 3. At 25,000 r/min, Core extension 0.1 mm max. Angle of deviation 0.5° max. | <ol style="list-style-type: none"> 1. Attach flanges to both devices, extend the cores, and then insert the flexible units. 2. The couplings can be attached or removed without any need to move the devices in the axial direction. | <ol style="list-style-type: none"> 1. Attach hubs to both devices, extend the cores, and then insert the element spacers. 2. The couplings can be attached or removed without any need to move the devices in the axial direction. |
| Operating temperature range | -30 to +100°C | -40 to +150°C | -100 to +320°C 120 to 150°C (heating temperature for heat shrinking) | -30 to +100°C 90 to 120°C (heating temperature for heat shrinking) |
| Applicable torque | 10 N-m max. | 2 N-m max. | 200 to 30,000 N-m | 34 to 100,000 N-m |
| Configuration (see diagrams below) | A | B | C | D |

■ Coupling Figure

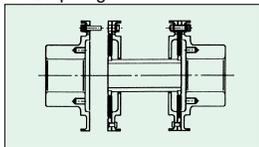
A : Micro



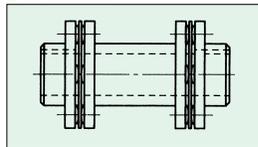
B : Helical



C : Diaphragm

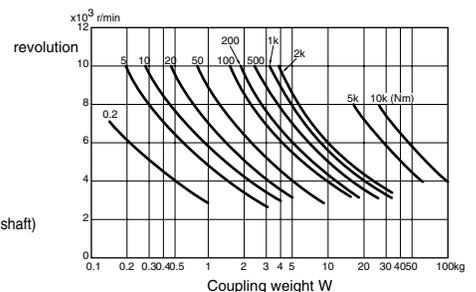
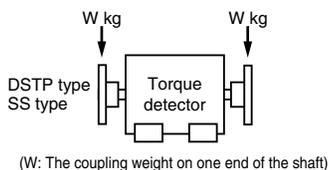


D : Form-flex



■ Revolution and Coupling Weight

The weight of the coupling that can be attached to the torque detector is determined by the maximum revolution used. Please refer to the following chart for details.



*Outer appearance and specifications are subject to change without prior notice.

ONOSOKKI

URL: <http://www.onosokki.co.jp/English/english.htm>

U.S.A. & CANADA

Ono Sokki Technology Inc.
2171 Executive Drive, Suite 400
Addison, IL. 60101 U.S.A.
Phone : 630-627-9700
Fax : 630-627-0004
URL : <http://www.onosokki.net>
E-mail : info@onosokki.net

P.R.CHINA

Ono Sokki Beijing Office
Beijing Jing Guang Center 3510
Hu Jia Lou, Chao Yang Qu
Beijing P.R.C. 100020
Phone : 010-6597-3113
Fax : 010-6597-3114
E-mail : onosokki@public.bta.net.cn

WORLDWIDE

Ono Sokki Co., Ltd.
1-16-1 Hakusan, Midori-ku,
Yokohama 226-8507, Japan
Phone: 045-935-3976
Fax : 045-930-1906
E-mail: overseas@onosokki.co.jp