EN294-1806C

Minebea

Torque Transducer
TMHSA

Instruction Manual

Introduction

Thank you for purchasing our TMHSA series Torque Transducer.

This instruction manual describes how to operate the device, as well as noteworthy points. Note that handling or operating the device incorrectly may result in malfunctions. Read this manual thoroughly before use for safety and optimal results.

Keep this instruction manual in a location where it is readily accessible to end users.

Overview

This equipment measures both static and dynamic torque using a thin-flange, bearing-free torque transducer that combines a torque detector flange calibrated by attaching a strain gauge and an optical transformer that acquires signals optically, without making contact with the rotor.

Features include high precision, high stiffness, improved fatigue resistance and improved long-term consistency. The stator antenna has a split configuration to facilitate mounting and detachment.

Pictograms and Conventions Used in This Manual

This manual uses the following pictograms to indicate actions to avoid at all times, aspects requiring caution, and other noteworthy matters.

Be sure to read the descriptions provided alongside these pictograms.

Warning

This indicates circumstances in which incorrect handling may result in death or serious injury to users.
Avoid the actions described here at all times.

Caution

This indicates circumstances in which incorrect handling may result in injury to users or damage to property.

This indicates operating or procedural precautions or restrictions.
Be sure to read the details provided here to avoid incorrect operations.

Safety Precautions

Please be sure to read this manual before attempting to use the equipment.

Warning

Be sure to use the equipment within its rated operating capacity range.

Warning

Impact loads or vibrations will subject the torque transducer to dynamic loads consisting of the static load multiplied by the acceleration. Make sure the value (taking acceleration into account) does not exceed the rated capacity of the torque transducer.

Warning

Install safety devices to prevent damage if excessive loads on the torque transducer are likely.

Warning

This is a rotating part. Keep a protective cover fitted at all times to keep materials from flying out.

Warning

Use the following bolts.

- Strength: JIS B 1051 strength classification of at least 12.9
- Type, size: As indicated in specifications

Warning

Confirm that the rotor and stator serial numbers match.
Mismatched parts may affect/impede operations or cause incorrect torque output values.

Warning

Confirm that the wiring is correctly connected before attempting to use the equipment. Incorrect wiring of the equipment may lead to incorrect measurements, equipment malfunctions, damage to peripheral equipment, and serious accidents.

Warning

Do not disassemble the torque transducer.

Caution

**Make sure that only one connector on either side of the stator is used at any given time.
You may connect one cable to either side to suit the installation configuration. However, do not connect cables to both sides at the same time.**

Caution

Take care when handling the transmission coil, photoemitters, and sensor window. These parts are especially delicate.

Caution

**Avoid bending excessively or pulling the cable outlet with excessive force.
Do not hang the stator by grasping the cable when carrying it.**

Caution

If used where vibrations occur, secure the cable near the cable outlet to prevent vibrations.

Caution

In environments where the screws may loosen, either make sure the screws are retightened periodically or take appropriate locking precautions.

Caution

Altering the settings while carrying out measurements using the equipment may result in incorrect measurements, equipment malfunctions, and damage to peripheral equipment.

Caution

**Protect the equipment from impact or shock—for example, impact or shock caused by striking against other objects.
Impact or shock may damage the product and lead to failures in the electrical circuits.**

1. Installation Location

Warning

Install in a location where temperature and humidity conditions are within the ranges described below.

- Environmental temperature: 0°C to 60°C
- Environmental humidity: 85% RH or less (non-condensing)

Warning

To minimize the risk of unforeseen accidents, do not install the equipment in the following locations.

- Avoid locations exposed to infrared light from sunlight, incandescent lamps, or the like. Exposure to extraneous infrared light may cause malfunctions.
- Use a protective cover to shield the equipment in areas exposed to infrared light.
- Avoid use in damp locations.
- Do not install in locations with weak floor strength. Vibration may cause damage.
- Avoid use where the atmosphere contains excessive dust or particles.
- Avoid use where the atmosphere contains corrosive gases or salt.
- Do not install in locations subject to sudden temperature or humidity fluctuations.
- Do not install close to equipment that generates magnetic or electromagnetic radiation. Electromagnetic inference may result in noise.
- Do not install in locations subject to the effects of radioactivity or radiation.
- Do not install in locations such as laboratories where there is a risk of chemical reactions.

2. Power Supply

Warning

Turn off power before connecting or disconnecting cables.
Connecting/disconnecting cables while power is on may result in electric shock or equipment damage.

Warning

Before turning on power, confirm that the power supply meets equipment specifications.
Contact MinebeaMitsumi if the specifications do not match. Using an unconfirmed power supply may result in electric shock or equipment damage.

Warning

Always ground the equipment.
Failure to connect the grounding cable may result in electric shock or equipment malfunctions.

Revision History

Date	Manual No.	Revision Reason (Details)
Aug. 2017	DRW. No. EN294-1806	First edition, ROM ver. 1.000
May.2018	DRW. No. EN294-1806A	Due to ECN FN18-02044 Delete 7-2 Autozero " Since the zero point is stored in volatile memory, the equipment returns to the state before autozero was enabled when the stator is turned off." Add 10. Component Service Lives "Calibration data storage" "Autozero data storage"
Nov.2018	DRW. No. EN294-1806B	Due to ECN KN18-0540 Add description of 5KNM to 3-2, 3-3, 8-1, 8-2
Mar.2019	DRW. No. EN294-1806C	Due to ECN FN19-0138 Add description of 10KNM to 3-2, 3-3, 8-1, 8-2

Contents

1. Part Names and Functions

The torque transducer consists of a rotor and stator.

Power is supplied from the stator to the rotor by a noncontact coil.

Torque applied to the rotor flange is detected by a strain gauge in the rotor.

The electronic circuit in the rotor converts torque values to frequencies, making the photoemitters (LEDs) along the rotor's outer circumference flash.

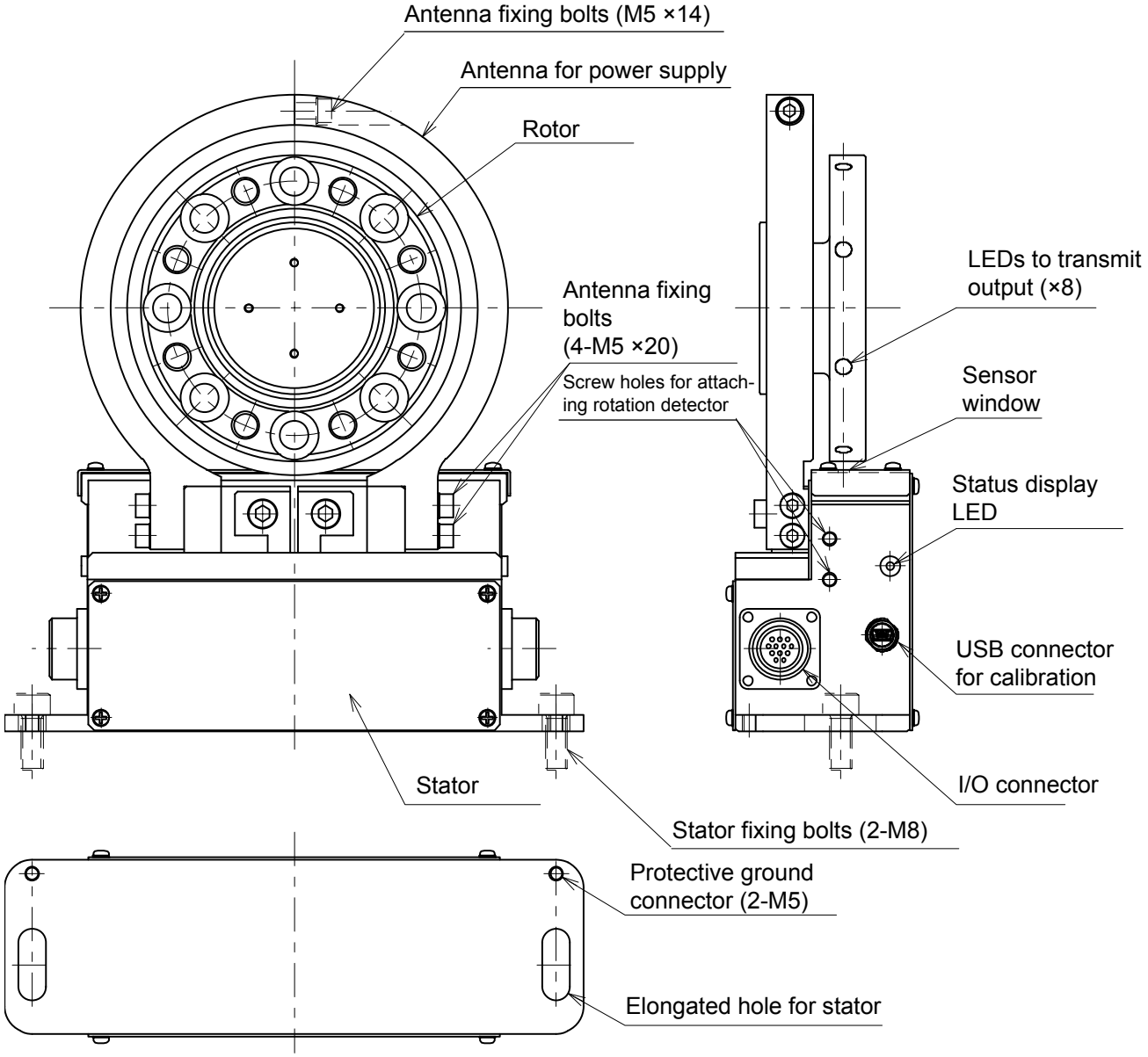
(Under negative-rated torque: approx. 5 kHz, under zero torque: approx. 10 kHz, under positive-rated torque: approx. 15 kHz)

Rotor light entering the sensor window on the stator is converted into a voltage by the photoreceptor and electronic circuit.

Two torque values are produced at the same time: stator frequency output and analog voltage output.

★ Frequency output: Use the values on the certificate of analysis to convert to torque values.

★ Analog voltage output: Corrected voltage values are produced from calibration data recorded in the stator.



Name	Function
I/O connector	I/O connector for connecting power, a digital multimeter, frequency counter, and so on The same signals are transferred through connectors on either side. (Both cannot be used at the same time.)
USB connector for calibration	USB connector for calibrating the torque transducer or changing settings The same signals are transferred through connectors on either side. (Both cannot be used at the same time.)
Status display LED	Shows torque transducer status. (Same display on the LEDs on the left and right) Lit in green: Normal status Flashing green: Low light levels Lit in red: Insufficient light levels
Protective ground connector	Connect this to ground to eliminate noise effects such as static electricity. Do not connect any wires other than the grounding wire. Connect at one of the two positions.

Caution

Caps are included for the I/O connectors and USB connectors for calibration.
Make sure connectors not in use are covered with caps at all times.

2. Configuration

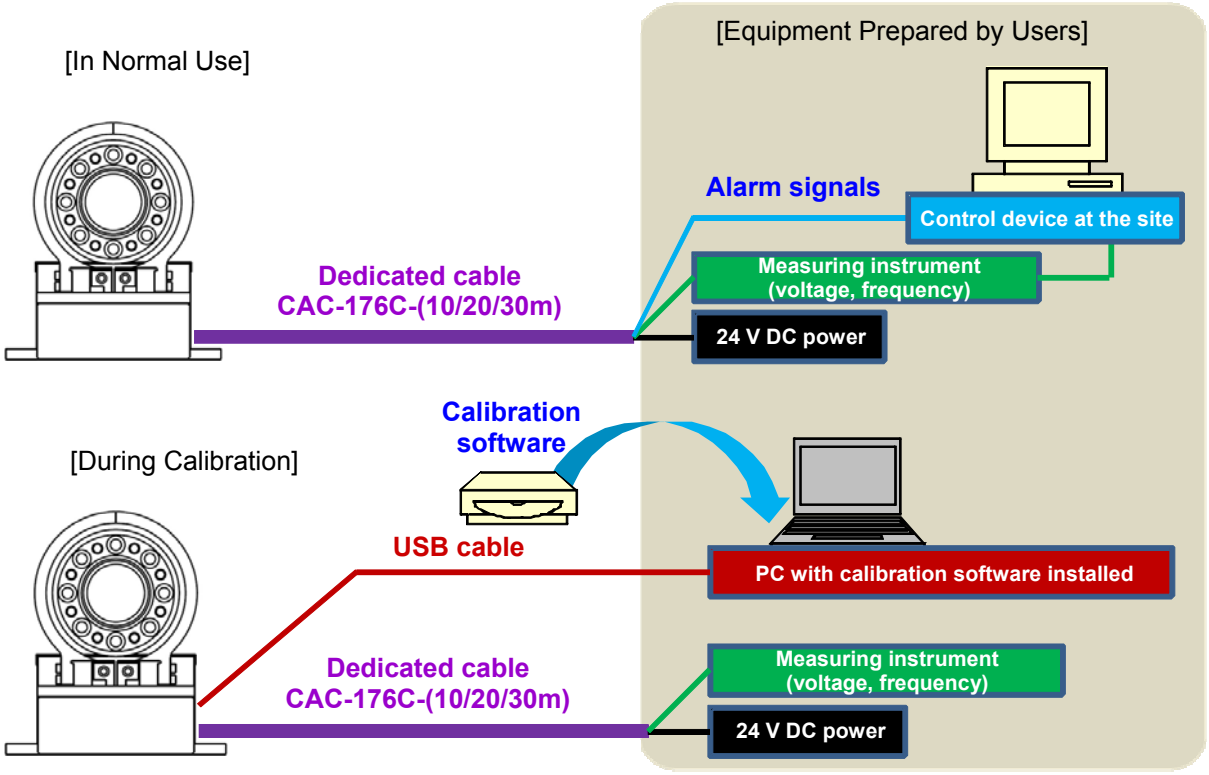
TMHSA torque transducers can be used in either of two configurations.

(1) Without a transmitter (OPT-563B)

Torque output consists solely of frequency output and voltage output.

Calibration is performed using a connected computer.

★For calibration instructions, refer to the calibration software manual.

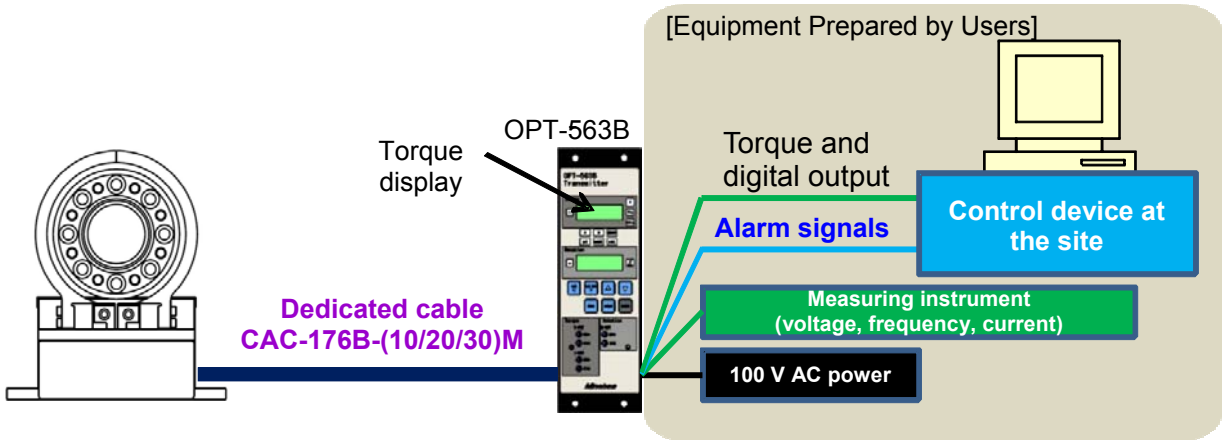


(2) With a transmitter (OPT-563B)

Offers a full range of features, including torque display and digital output.

Calibration is performed by pressing buttons on the OPT-563B.

★For connection and calibration instructions, refer to the OPT-563B manual.



Additionally, to detect the rotating speed, use in conjunction with an optional rotary speed detector (RPM-*-*-*)

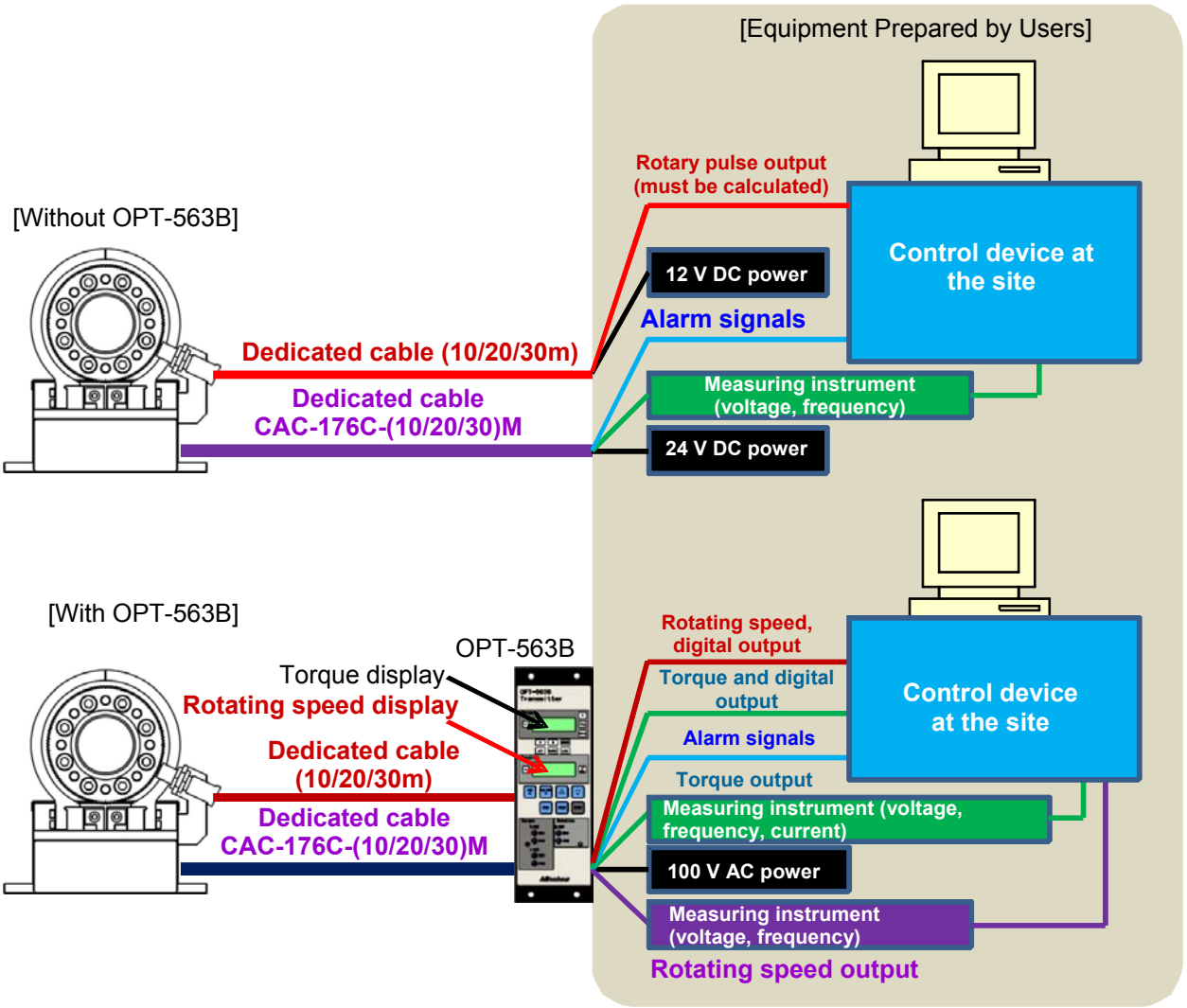
Without a transmitter (OPT-563B), you will need to provide your own 12 V DC power supply for the detector.

You will also need to calculate rotating speed. Output from the detector is in the form of pulse signals generated by passing of the 120-tooth detection gear.

If an OPT-563B transmitter is available, you can connect the cable from the detector to the OPT-563B to power the detector and display the rotating speed on the OPT-563B.

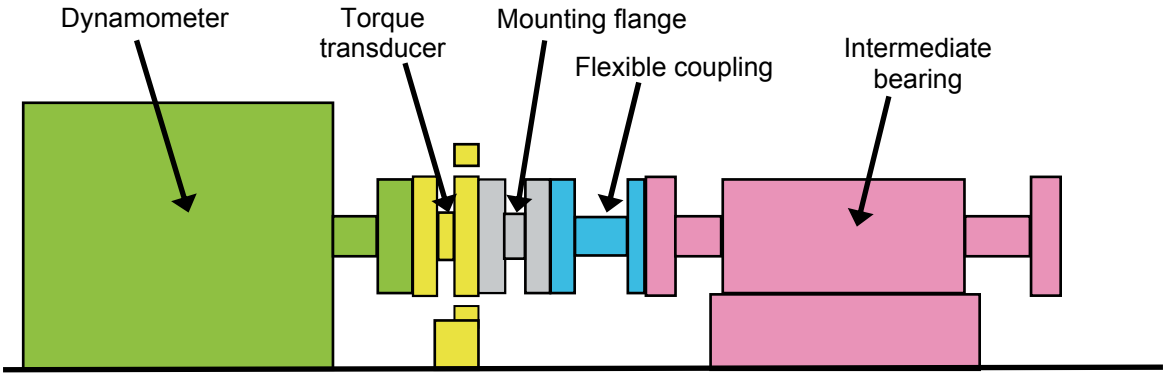
Connecting two detectors enables detection of the direction of rotation.

What's more, OPT-563B can be used to convert rotating speed to voltage, current, or frequency.



3. Mounting Procedure

3-1. Typical mounting configuration



3-2. Mounting flange restrictions

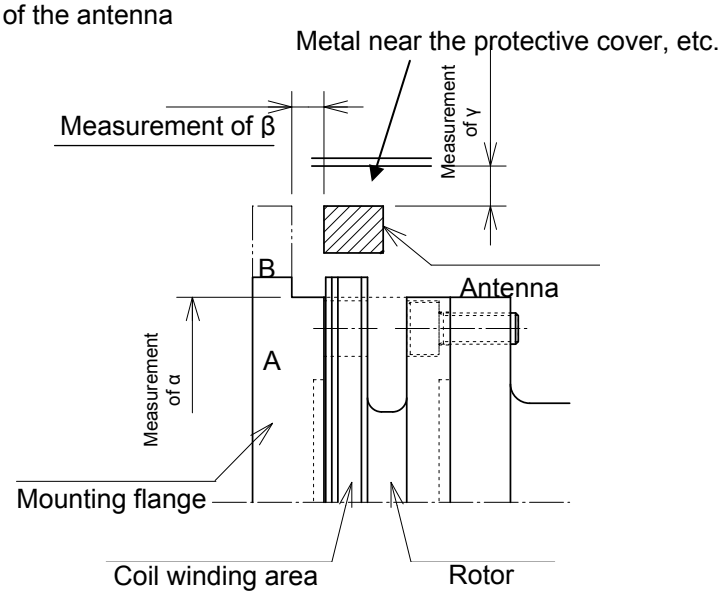
Caution

Any metal objects near the coil around the rotor and the ring-shaped stator antenna may interfere with power supply and cause a zero shift or drift in output values.
Refer to the following information when determining the suitable shape and material of the mounting flange and protective cover.

(1) Measurement of mounting unit outer diameter (α)
Measured to the edge of the torque transducer rotor
- Maximum diameter of 104 mm for TMHSA-100NM to 300NM
- Maximum diameter of 111 mm for TMHSA-500NM and 1KNM
- Maximum diameter of 153 mm for TMHSA-2KNM and 3KNM
- Maximum diameter of 182 mm for TMHSA-5KNM
- Maximum diameter of 226 mm for TMHSA-10KNM

(2) Distance from rotor flange edge face (β)
- At least 8 mm for A type mounting flange configuration (diameter extends to rotor)
- At least 15 mm for B type mounting flange configuration (diameter extends to antenna)

(3) Distance from stator antenna to protective cover, etc. (γ)
- At least 10 mm from the outer diameter of the antenna



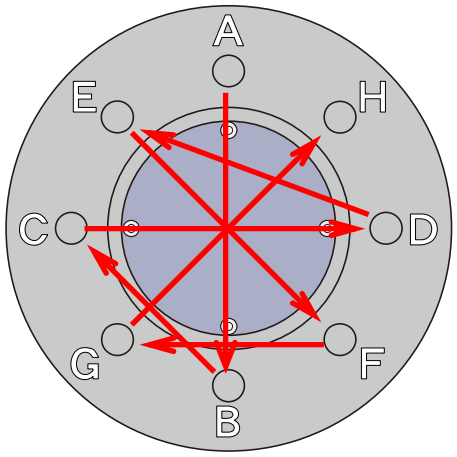
3-3. Mounting procedure and precautions

(1) Use fixing bolts with a JIS B 1051 strength classification of at least 12.9.
(2) Make sure the length of the threaded screw shaft is at least equal to the nominal screw diameter.
(3) Make sure the stator clamping base is level and offers adequate stiffness.
(4) Confirm that the rotor and stator serial numbers match.
(5) Clean the rotor flange surface and engaged parts by wiping them with ethanol or similar solvent.

Any remaining anticorrosive agent applied at the time of shipment may cause slipping, resulting in a zero shift in output values.

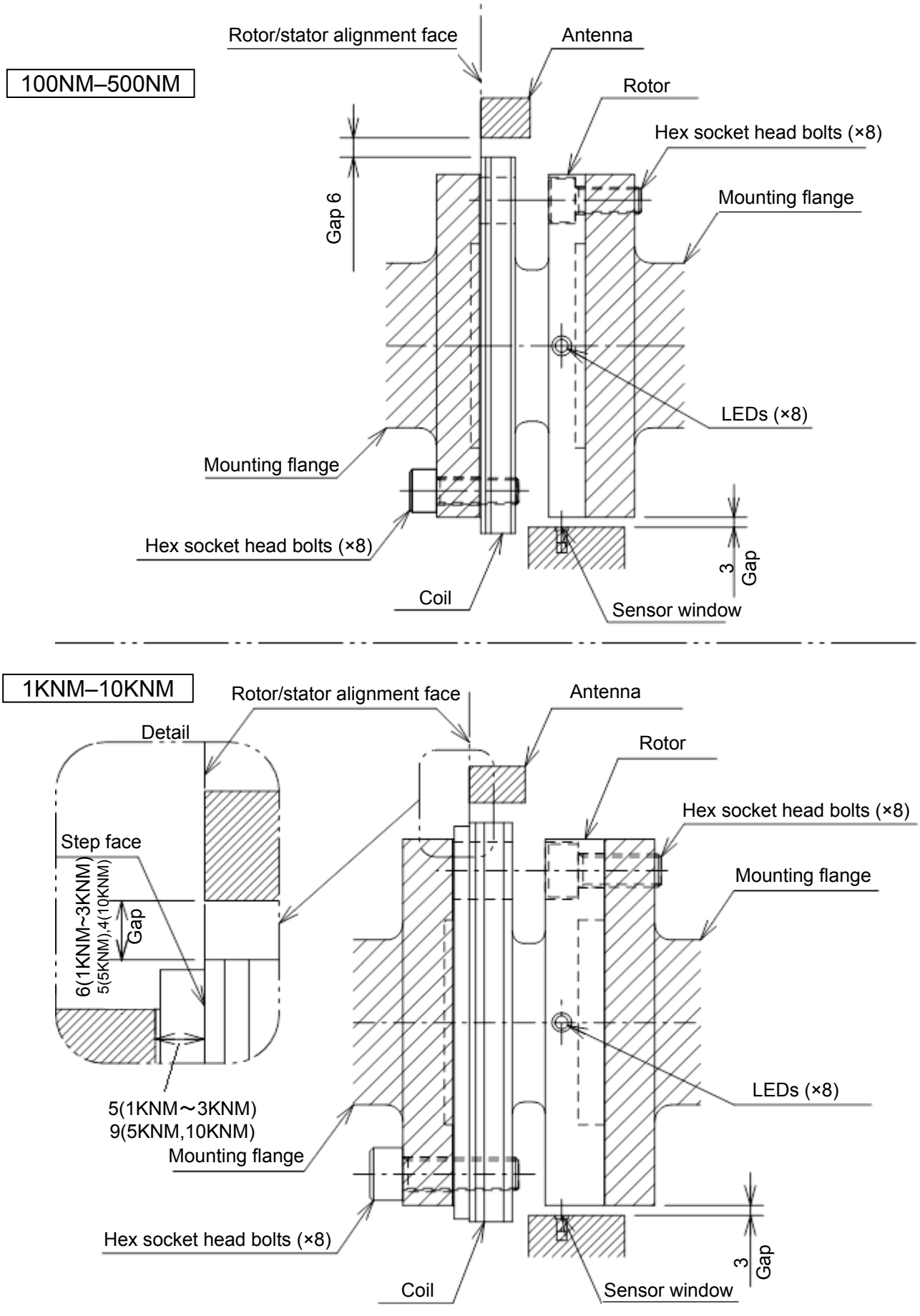
(6) Be careful to avoid trapping debris and foreign matter inside when mounting.
(7) Mount the rotor in the following sequence:
1) Using an initial tightening torque of 1/4, tighten in the order A→B→C→...→H.
2) Using a secondary tightening torque of 1/2, tighten in the order A→B→C→...→H.
3) When using the final tightening torque, tighten in the order A→B→C→...→H.

Capacity	Bolt size	1/4 tightening torque (N·m)	1/2 tightening torque (N·m)	Tightening torque (N·m)
100NM–300NM	M8	11	21	42
500NM, 1KNM	M10	23	45	90
2KNM, 3KNM	M12	38	75	150
5KNM	M14	55	110	220
10KNM	M16	85	170	340



(8) Be careful to avoid damaging the coil around the rotor.
(9) After mounting, remove the green protective tape on the LEDs.

[Detailed view of rotor attachment]



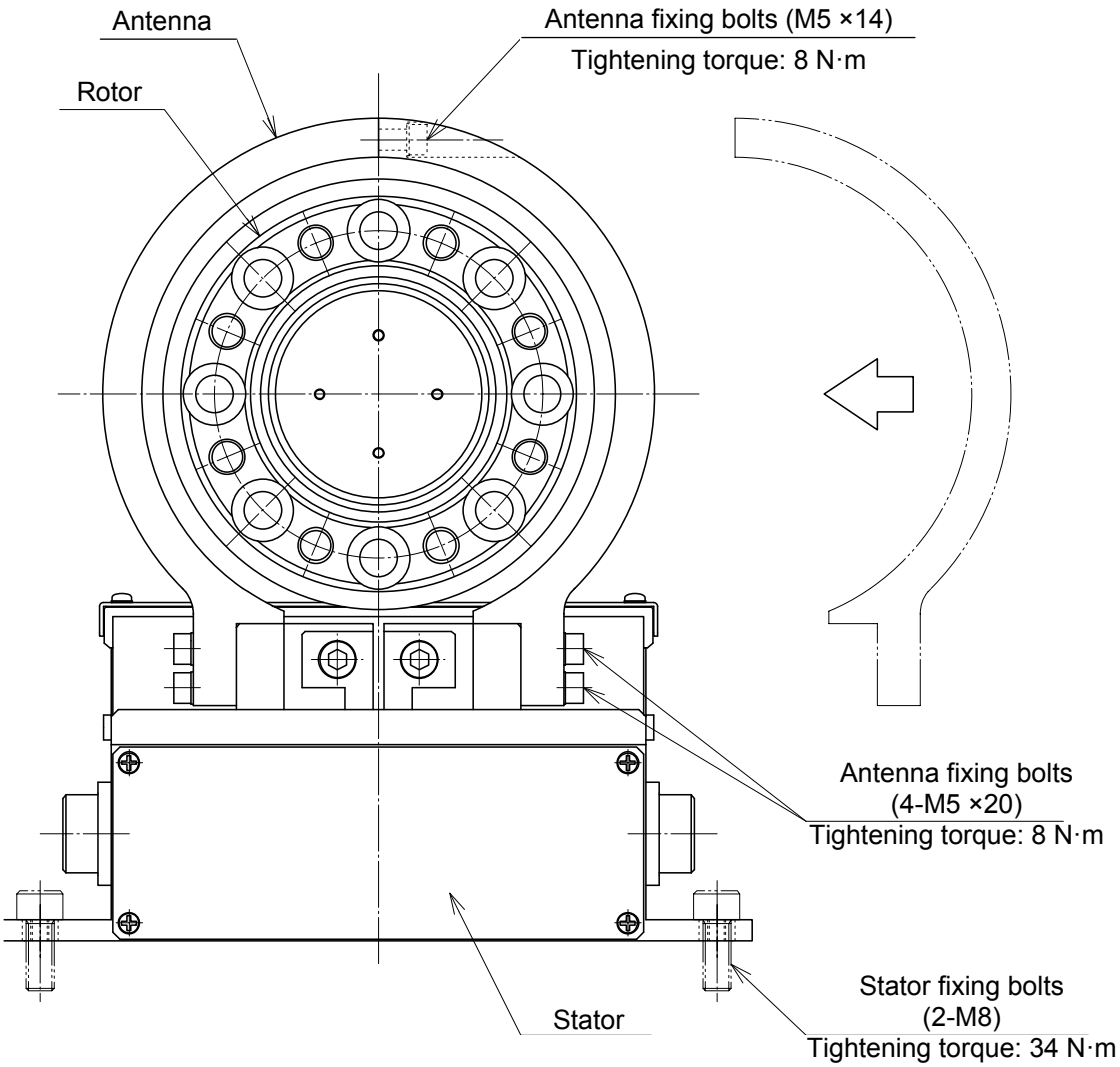
(10) Mount the stator in the following sequence:

1) Remove the antenna fixing bolts shown below to separate the antenna.
   Be careful to avoid losing the bolts and flat spring washers after removal.
2) Place the rotor inside before reassembling the separated antenna.
   Insert the flat spring washers and tighten to a torque of 8 N·m.

Bolts that are too loose pose the risk of inconsistent output and may generate heat and cause alarms.

3) Align the stator with the rotor.
   Align as shown in "Detailed view of rotor attachment."
   Mounting precautions
   • Align the rotor LEDs with the stator sensor window.
   • Ensure a gap of 3 mm ±0.5 mm between the stator sensor cover and the rotor.
   • Ensure an even gap of 6 mm ±1 mm(5KNM:5mm,10KNM:4mm) between the rotor and the antenna.
4) Secure with stator fixing bolts.
   Attach using M8 bolts with plain/spring washers.

(11) Never loosen any bolts other than those specified for separating the antenna.



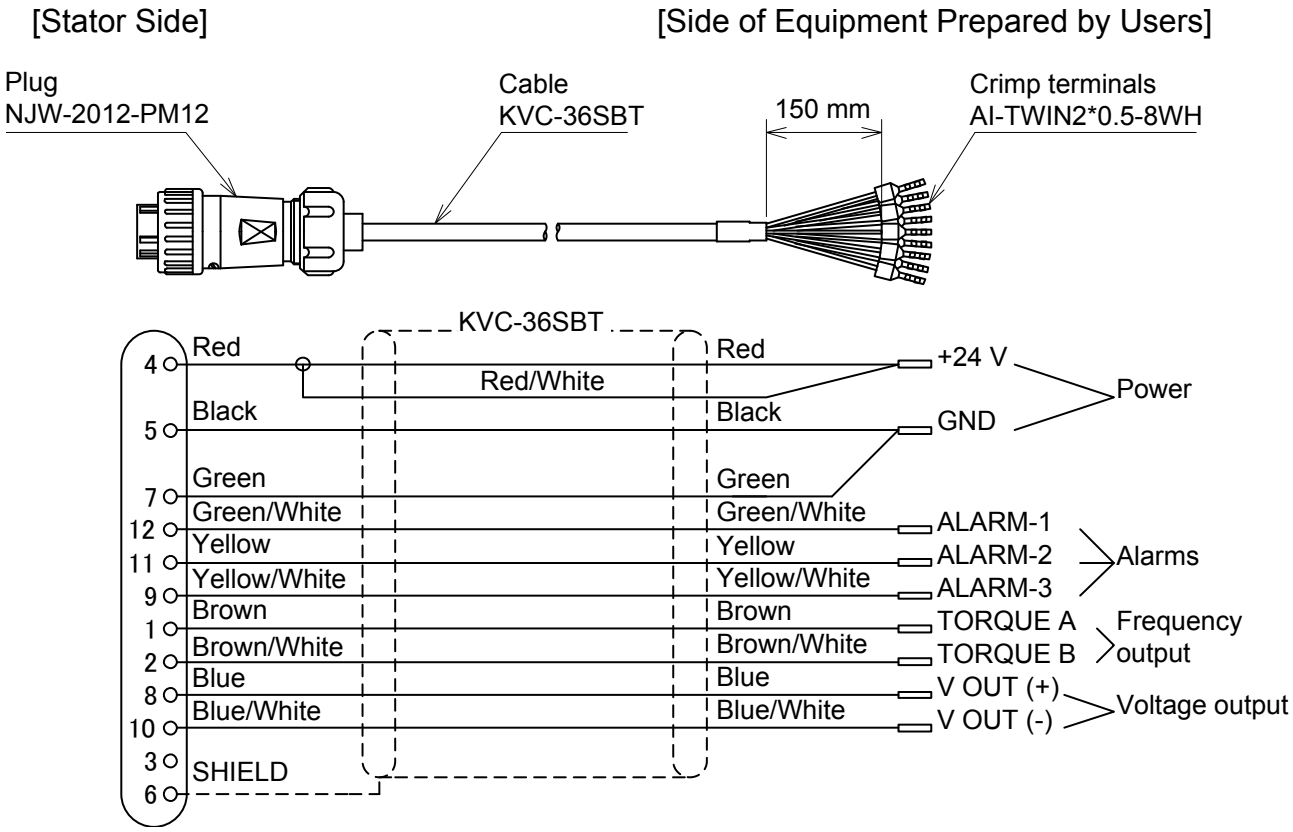
4. Connections

4-1. Wiring precautions

Caution

- **Always turn off power before connecting or disconnecting the equipment.**
- **Do not turn on power until all installation work is complete.**
- **There is no ON/OFF switch on the unit itself.**
- **Keep cables connected to the unit as far as possible from sources of noise such as power lines or control interfaces**
- **The conduit should house exclusively cables connected to the equipment itself. Avoid joint use with other lines in the conduit.**
- **Always ground the equipment. Use Type D single grounding. Do not share a ground with the power supply system.**

4-2. Dedicated cable (CAC-176C-*M, sold separately)

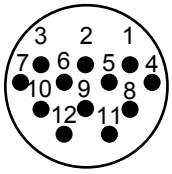


Always use the dedicated cable to connect the equipment to the torque transducer. To avoid increased sensitivity to external noise and loss of accuracy, do not connect an extension cable to the connector board. If the standard included cable is too short, contact a MinebeaMitsumi sales office or dealer.

4-3. Stator connector pin assignment

Pin layout

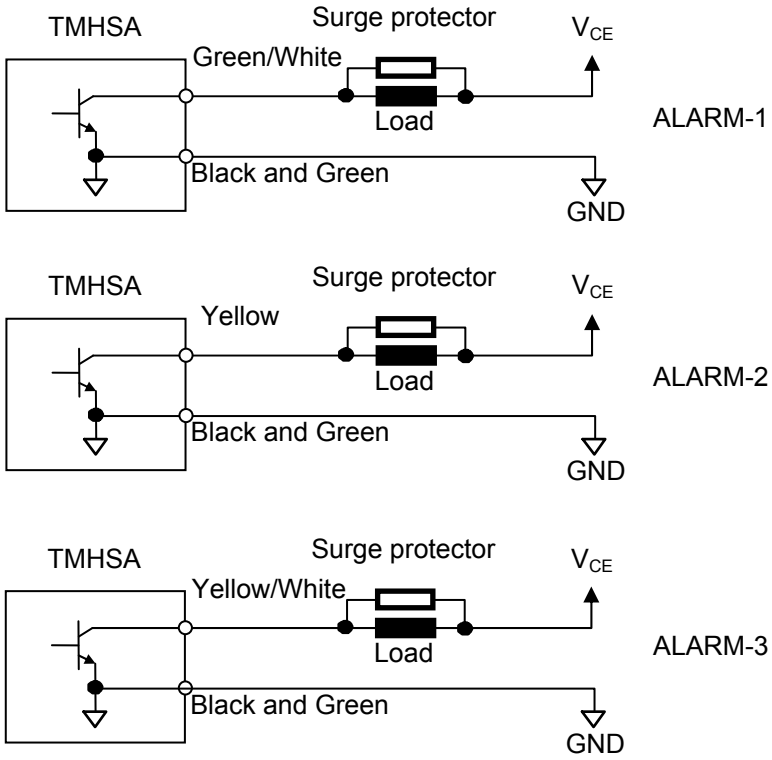
Pin no.	Cable color	Signal	Operation
1	Brown	TORQUE A	Torque frequency output
2	Brown/White	TORQUE B	Torque frequency output
3	-	N.C.	Do not connect.
4	Red and Red/White	+24 V	Supply voltage: 24 V
5	Black	GND	Supply voltage: 0 V
6	-	SHIELD	Connect the cable shield to the case ground.
7	Green	GND	Ground
8	Blue	V OUT (+)	Torque voltage output: ±10 V
9	Green/White	ALARM-1	ALARM-1 signal (low light level) output terminal. "Low" is constantly output by the torque transducer.
10	Blue/White	V OUT (-)	Torque voltage output: 0 V
11	Yellow	ALARM-2	ALARM-2 signal (low light level) output terminal. "Low" is output by the torque transducer when light levels are low.
12	Yellow/White	ALARM-3	ALARM-3 signal (low light level) output terminal. "Low" is output by the torque transducer when light levels are too low to maintain performance.



Connector plug format: NJW-2012-PM12 (UL)

4-4. Alarm output connections

An alarm signal is output externally if normal operation becomes impossible because the rotor and stator are installed in the wrong positions or if the stator sensor is fouled.



Open collector rating

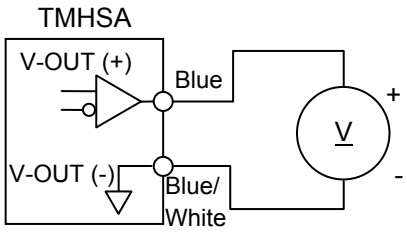
V_{CE}: 35 V DC I_C: 40 mA DC max.

Cable color	Signal	Operation
Black and Green	GND	Output terminal common wire (in common with power)
Green/White	ALARM-1	"Low" under normal circumstances
Yellow	ALARM-2	"Low" at low light levels
Yellow/White	ALARM-3	"Low" when light levels are too low to maintain performance

To protect external control output, add a suitable surge protector for the load.

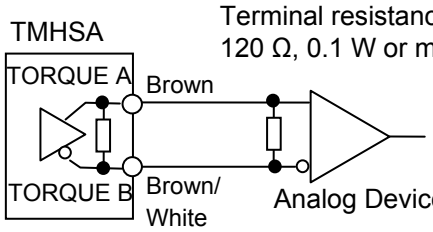
4-5. Torque voltage output connections

Voltage output for torque is produced by the voltage output connector.



To a digital multimeter, PLC, or similar device
- Load resistance: 2 kΩ or more
- Capacity load: 0.1 µF or less

4-6. Torque frequency output connections



Differential line driver frequency counter or other devices

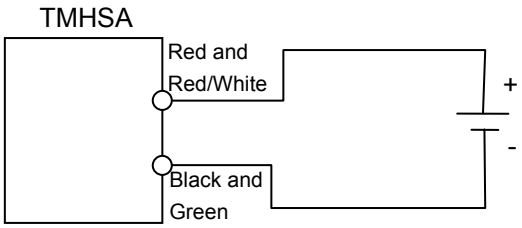
Analog Devices ADM485 or similar

For cables longer than 10 m, we recommend using a terminal resistance of 120 Ω between the cables (brown and brown/white).

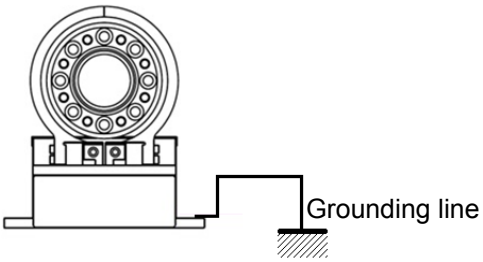
4-7. Power and ground connections

Connect the power supply and ground the unit as shown in the following figure. Use Type D single grounding.

24 V DC (permissible fluctuation range: 22–26 V DC)



Type D single grounding



Caution

For power and grounding, connect securely, as shown. Use within the rated power range.

Use Type D single grounding for the equipment. If not, the equipment may be susceptible to noise from other devices, resulting in malfunctions.

5. Testing Operation

5-1. Status display

Check the LED indicator on the side of the stator to confirm normal operation.

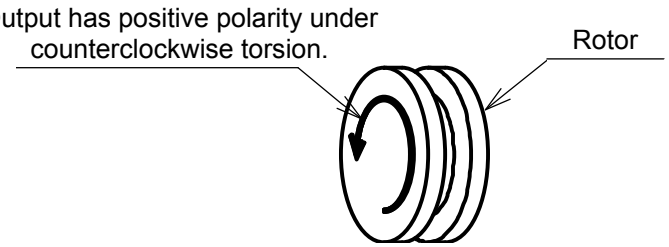
Color	Description
Green (lit)	Working normally (sufficient light received)
Green (flashing)	Light received has decreased. → Check the alignment of the rotor and stator. Clean the sensor window.
Red (lit)	Insufficient light received (Error) → Check the alignment of the rotor and stator. Clean the sensor window.

The torque transducer transmits torque signals in the form of light. Thus, optical transmission may be obstructed if the transmitting and receiving components are fouled by oil mist or excessive dust or particles. This may prevent accurate torque signal transmission. Clean the light-transmitting components regularly based on the status display.

5-2. Checking output

Confirm that the output changes when a torque load is applied.

[Direction of torsion, polarity of output]



Analog voltage output polarity can be changed by adjusting settings with the calibration software. In case of unexpected polarity, check the settings.

5-3. Running-in operation

Perform running-in operation.

Wait at least 10 minutes after power startup before performing calibration or measurement.

If you removed and reattached the rotor, perform preloading of positive and negative torque repeatedly to allow the contact to stabilize.

6. Calibration

Calibration refers to the process of adjusting equipment voltage output to match the torque acting on the torque transducer in order to ensure that the electrical signal from the torque transducer is output as an accurate torque value.

For example, this adjustment ensures accurate equipment voltage output of 10.000 V when a torque of 1,000 N·m acts on the torque transducer.

The torque transducer is connected via USB to a personal computer running calibration software.

To use the computer's USB interface, install the dedicated driver on the personal computer.

Use a USB cable no longer than 5 m.

★For calibration instructions, refer to the calibration software manual.

Warning

Always calibrate the equipment before initial use or if you replace the torque transducer. Failure to calibrate the equipment may result in incorrect measurement, equipment malfunction, and damage to peripherals. Likewise, recalibrate the equipment if it has already been calibrated but gives incorrect results.

- **Recalibrate as needed if used in a different environment.**
- **Before calibration, confirm that the rotor's photoemitters (LEDs) and the stator's sensor window are clean. Dirty photoemitters or a dirty sensor window may prevent correct signal reception, which may in turn prevent correct calibration.**
- **Reattaching the rotor may cause a zero output shift. Restore the zero reading.**

7. Functions

7-1. Filter settings

The equipment includes two filters: a low-pass filter and a stabilizing digital filter that processes the torque signals acquired. Use the calibration software to set up filter functions.

⚠ Caution

The low-pass and digital filters affect voltage output.
They do not affect frequency output.
Inappropriate filter settings may result in incorrect measurements and unforeseen accidents.

Low-pass filter for torque

The low-pass filter for torque lets you adjust the responsiveness of the analog output for torque (voltage output).

For this equipment, the passband can be set to one of eight levels: 1 Hz, 10 Hz, 30 Hz, 50 Hz, 100 Hz, 300 Hz, 500 Hz, or 1 kHz.

Switching requires a personal computer and the calibration software.

By default, [1 kHz] is selected.

★For operating instructions, refer to the calibration software manual.

Frequencies tend to have the following characteristics:

Frequency	1 Hz 100 Hz 1 kHz
Noise resistance Response speed	Stable ⟷ Sensitive Slow ⟷ Fast

Digital filter for torque

The digital filter for torque provides stability through moving-average processing of input torque values.

For this equipment, the digital filter for torque can be set in a range of 1–512 samples.

The value set determines the number of moving-average samples for the digital filter for torque.

Setup requires a personal computer and the calibration software.

By default, [1 sample] is set.

★For operating instructions, refer to the calibration software manual.

The number of moving-average samples tends to have the following characteristics:

Number of moving-average samples	512 samples 1 sample
Noise resistance Response speed	Stable ⟷ Sensitive Slow ⟷ Fast

7-2. Autozero

The equipment has an autozero function for voltage output.

You can restore the zero point (if disturbed by mounting flange removal or attachment, for example) without affecting the span point.

Use the calibration software to enable autozero.

7-3. Symmetry correction

Symmetry can be corrected because the values for clockwise and counterclockwise torque can be registered separately.

Use the calibration software to perform symmetry corrections.

7-4. Torque voltage output

You can convert torque signals (frequencies) input from the torque transducer to analog voltage values for output in a range of ±10 V.

Use the calibration software to make adjustments.

7-5. Torque frequency output

You can convert optical torque signals (frequencies) input from the torque transducer to differential voltage frequency signals for output.

No zero or span adjustment functions are available for frequency output. Users should make any needed adjustments on their own equipment.

8. Specifications

8-1. Specifications

Model (indicated capacity)		100NM	200NM	300NM	500NM	1KNM	2KNM	3KNM	5KNM	10KNM
Load characteristics										
Rated capacity (R.C.)		±100 Nm	±200 Nm	±300 Nm	±500 Nm	±1 kNm	±2 kNm	±3 kNm	±5 kNm	±10 kNm
Safe overload		150% R.C.								
Ultimate overload		300% R.C.								
Rated output (R.O.)		Voltage output: ±10 V Frequency output: 10 kHz ±5 kHz								
Measurement accuracy (including nonlinearity, hysteresis, and repeatability)		Frequency output: ±0.02% R.O. Voltage output: ±0.03% R.O.								
Temperature characteristics										
Acceptable temperature range		-10°C to 70°C								
Operating temperature range		0°C to 60°C (non-condensing)								
Temp. effect on zero balance		0.02% R.O./10°C								
Temp. effect on output		0.03% load/10°C								
Rotation characteristics										
Max. rotation speed (rpm)		25 000			22 000		16 000		14 000	12 000
Noise during rotation		0.5% R.O. p-p (WB: 1 kHz)								
Other characteristics										
Class of protection		IP54								
Materials		Rotor: Alloy steel								
		Stator: Aluminum alloy								
Fatigue life		10^7 cycles under rated load								
Weight	Rotor (kg)	Approx. 1.0			Approx. 1.2	Approx. 1.6	Approx. 3.5		Approx. 6.0	Approx. 10.2
	Stator (kg)	Approx. 1.5							Approx. 1.7	

8-2. Mechanical characteristics (rotor)

Model (indicated capacity)	100NM	200NM	300NM	500NM	1KNM	2KNM	3KNM	5KNM	10KNM
Response frequency (kHz)	1								
Moment of inertia ($kg \cdot cm^2$)	13.79	13.80	13.82	19.77	26.86	107.6	107.8	260.3	668.4
Torsional rigidity (kN·m/rad)	325.0	371.4	472.7	660.7	909.8	1515	1881	2647	4043
Torsional natural frequency	4.757	5.161	5.822	5.701	5.899	3.801	4.258	3.233	2.489
Bending natural frequency (radial direction, kHz)	2.821	2.911	3.073	3.135	3.492	1.763	1.995	1.857	1.368
Bending natural frequency (thrust direction, kHz)	3.458	3.528	3.656	3.715	4.519	2.380	2.590	2.356	1.670
Twist angle (°)	0.018	0.031	0.036	0.043	0.063	0.076	0.091	0.108	0.142
Accurate safe bending load	75	150	225	375	750	800	1 000	1650	2750
Accurate safe thrust load (N)	65	130	195	325	650	3 750	12 000	20 000	22 000

8-3. Power

Rated power supply	24 V DC ±2 V
Current consumed	1 A or less
Rated (nominal) power consumption	24 W or less

8-4. Output signals (voltage)

Output voltage	±10 V DC
Resistive load	2 kΩ or more
Output capacitance load	0.1 μF or less
Resolution	Approx. 1/12 000 or more
Over-range	Approx. ±11 V DC
Output cycles	Approx. 400 000 cycles/s

8-5. Output signals (frequency)

Output range	10 ±5 kHz
Output voltage	Differential voltage
Resolution	Approx. 0.2 Hz or more
Over-range	Approx. 4 kHz, Approx. 16 kHz
Output cycles	Approx. 10 000 cycles/s

8-6. Adjustment of output voltage

Zero adjustment range	±2% R.O.
Moving average	Selectable from 1, 2, 4, 8, 16, 32, 64, 128, 256, and 512 samples (Default: 1 sample)
Low-pass filter	Selectable from 1 Hz, 10 Hz, 30 Hz, 50 Hz, 100 Hz, 300 Hz, 500 Hz, and 1 kHz (Default: 1 kHz)
Output polarity inversion	Output polarity is inverted relative to the direction of torsion.

8-7. Status display LED

Normal operating status	Lit in green
Light level low status	Flashing green
Alarm status	Lit in red

8-8. Interfaces

USB (RS-232C)	Conforms to USB2.0. Output connector: miniUSB connector B type (female) Transmission mode: Half-duplex Sync mode: Asynchronous Baud: 38,400 bps Data bit length: 8 bit Parity: None Stop bit: 1 bit Terminator: CR+LF

The USB interface is provided for calibration. This USB interface cannot be used to acquire torque values.

8-9. General specifications

Operating temperature/ humidity range	Temperature	0°C to 60°C
	Humidity	85% RH or less (non-condensing)
Acceptable temperature range		-10°C to 70°C

8-10. Accessories

Certificate of analysis	1
Instruction manual	1
CD-ROM (calibration software, USB driver)	1
USB cable	1

8-11. Options

Name	Model	Notes
Dedicated cable	CAC-176C-*M	When used without a transmitter (OPT-563B) Selectable from 10 m, 20 m, and 30 m lengths Example: CAC-176C-10M (10 m)
Dedicated cable	CAC-176B-*M	When used with a transmitter (OPT-563B) Selectable from 10 m, 20 m, and 30 m lengths
Transmitter	OPT-563B	Used when display, digital output, or calibration without a personal computer is required
Rotation detector	RPM-*-*-*	For measuring rotating speed. Set includes rotation detector (MP-9820), gear module, and mounting fixture. Indicate required capacity, number of rotation detectors, and cable length. Cable length: 10M, 20M, 30M Number of rotation detectors: 1, 2 Capacity: 100 (for 100NM–300NM), 500, 1K, 2K (for 2KNM–3KNM) , 5K, 10K Example: RPM-100-1-10M (capacity: 100NM; no. of rotation detectors: 1; cable length: 10 m)

9. Warranty

9-1. Warranty

The warranty for this equipment is valid for a period of one year from the date of delivery.

Please contact the MinebeaMitsumi sales office or dealer from which you purchased the product for repairs or service during the warranty period.

9-2. Repairs

Before requesting repairs, double-check that all connections, settings, and adjustments are correct.

In particular, confirm that torque transducer connections are not disconnected.

If problems remain after these inspections, contact the MinebeaMitsumi sales office or dealer from which you purchased the equipment for repairs.

10. Component Service Lives

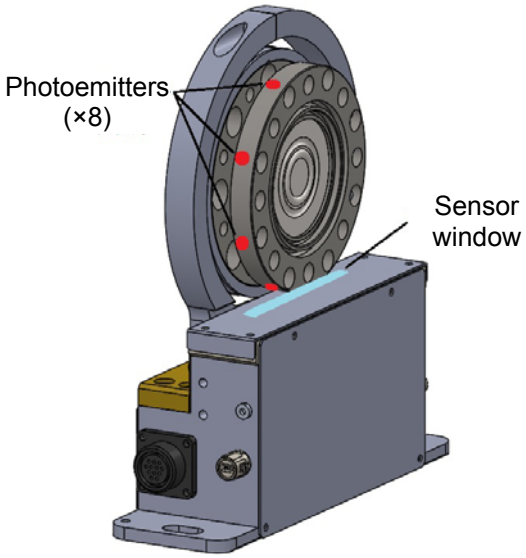
Components used in the equipment have finite service lives. The exact service lives will vary depending on usage methods and operating conditions, but guideline figures are provided below.

Component	Purpose	Approximate life
EEPROM	Calibration data storage Setting data storage Autozero data storage	Approx. 1 million write cycles to EEPROM
Electrolytic capacitor	Removal of power supply noise	Approx. 10 years (at operating temperature of 20°C)

11. Maintenance and Inspections

The torque transducer transmits signals optically. This means the signal may not be transmitted or received correctly if the photoemitters (LEDs) or stator sensor window is dirty.

If necessary, clean the photoemitter and sensor window surfaces with ethanol or other solvent.



12. Troubleshooting

If readings are unstable or abnormal, confirm that connections with other instruments are correct and that usage precautions are observed, then inspect the torque transducer as described below.

(1) Confirm that the stator status display LED remains lit in green.
(2) Confirm that the output changes when you twist the rotor by hand.
(3) Confirm that the output (zero balance) with no load is not significantly shifted.
(4) Confirm that the rotor and stator are correctly aligned.
(5) Confirm that the antenna fixing bolts are not loose.
(6) Confirm that rotor LEDs and the stator sensor window are free of scratches and dirt.

If the equipment is subjected to overloading or excessive rotating speeds or if the equipment is subjected to overloading in the bending/thrust directions, remove the load and record the difference from the zero output value of the state before subjected to the load.

Be sure to recalibrate and verify that the equipment can be used correctly.

Contact us if you encounter abnormalities or if you have any questions.

The information provided in this manual is subject to change without notice.

●The contents of this manual may subject to change without notice.

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