Civil Engineering & Construction Instruments

7

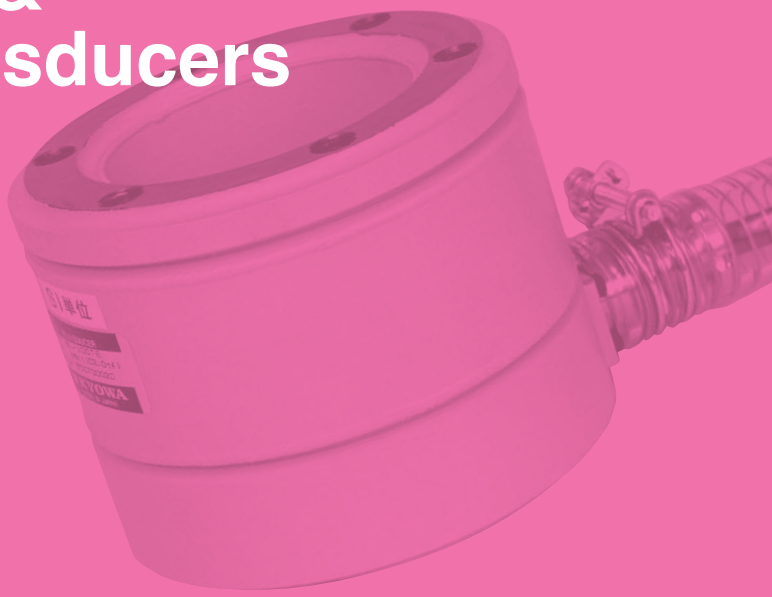
About Countermeasure Against Induced Lightning Surge

Strain gage Type Civil Engineering Transducers

Measuring Instruments

- When using for special purposes, contact us.
- For prices and delivery date, contact us.

Civil Engineering & Construction Transducers



Since we produced Carlson type transducers in Japan, KYOWA has obtained many successful results in designing and manufacturing measuring instruments and systems for management, maintenance, design and research of large-scale civil engineering works and structures in Japan and abroad.
Now, KYOWA offers not only various civil engineering transducers but also special measuring equipment, applicable for safe execution and maintenance of civil engineering and construction works automatic monitoring, and data processing systems with regard to rock bed, landslide, structure and dam behavior.

Strain Gage Civil Engineering Transducers

All KYOWA civil engineering transducers adopt self-temperature-compensated foil strain gages, for all of sensing element which are incorporated into a Wheatstone bridge. Using the strain gages, these transducers convert soil or water pressure to corresponding voltage for measurement with strain amplifiers and other peripheral equipment. The applied self-temperature-compensated foil strain gages ensure stable measurement with less drift due to temperature changes.
KYOWA also provides unique civil engineering transducers which enable measurement of temperature together with strain, stress or displacement.

Features

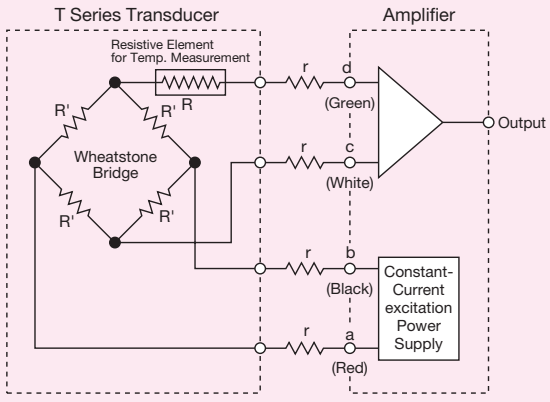
- Unique models available for measurement of physical quantities together with temperature.
- Nonlinearity, hysteresis and repeatability are excellent.
- Stable against temperature change; no compemsation is required with regard to thermal effect on measurement.
- Since they can be connected directly to strain amplifiers and peripheral equipment, automatic measuring systems can easily be configured.
- Excellent environmental capability ensures safe measurement under adverse temperature, humidity and vibration conditions.
- Countermeasures against lightning are available.

T Series Civil Engineering Transducers with Temperature Measuring Function

Though possible by Strain gage type transducers, ordinary strain gage civil engineering transducers cannot measure temperature together with strain, stress or displacement. Thus, thermometer need to be additionally installed when embedding these transducers in concrete structures.
To solve such problems, KYOWA has developed civil engineering transducers with a temperature measuring function. The function is provided for strain transducers, reinforcing-bar stress transducers, stress transducers, joint transducers and water level transducers. These transducers have a platinum resistance thermometer sensor mounted at the output side of ordinary civil engineering transducers.

Independent Measurement of Physical Quantity and Temperature during measurement

The platinum resistance thermometer sensor is connected to the output of the bridge circuit and has no electrical concern with the input of the instruments, thereby giving no effect to measurement of physical quantity. Through a different circuit from the physical quantity measuring circuit, temperature is measured based on resistance change of the temperature measuring resistor. Generally, instruments providing constant-current bridge excitation are used for civil engineering transducers with a temperature measuring function and such instruments are not affected by the resistance of extension cable.



R = Resistance of temperature measuremen resistive element
R'= Strain gage resistance
r = Resistance of extension cable

Bridge Circuit of T Series

Relation between Strain and Voltage of Transducer Output

KYOWA civil engineering transducer outputs detected strain quantity in μ m/m or output voltage in mV/V or μ V/V when excited to bridge circuit with 1V. The strain value and output voltage, e, has the following relation, ε.

$$e = \frac{1}{4} Ks \cdot E \cdot \varepsilon$$

Ks : Gage factor of civil engineering transducer
E : excitation voltage

$$\therefore \frac{e}{E} = \frac{1}{4} Ks \cdot \varepsilon$$

If the gage factor Ks is 2.00,

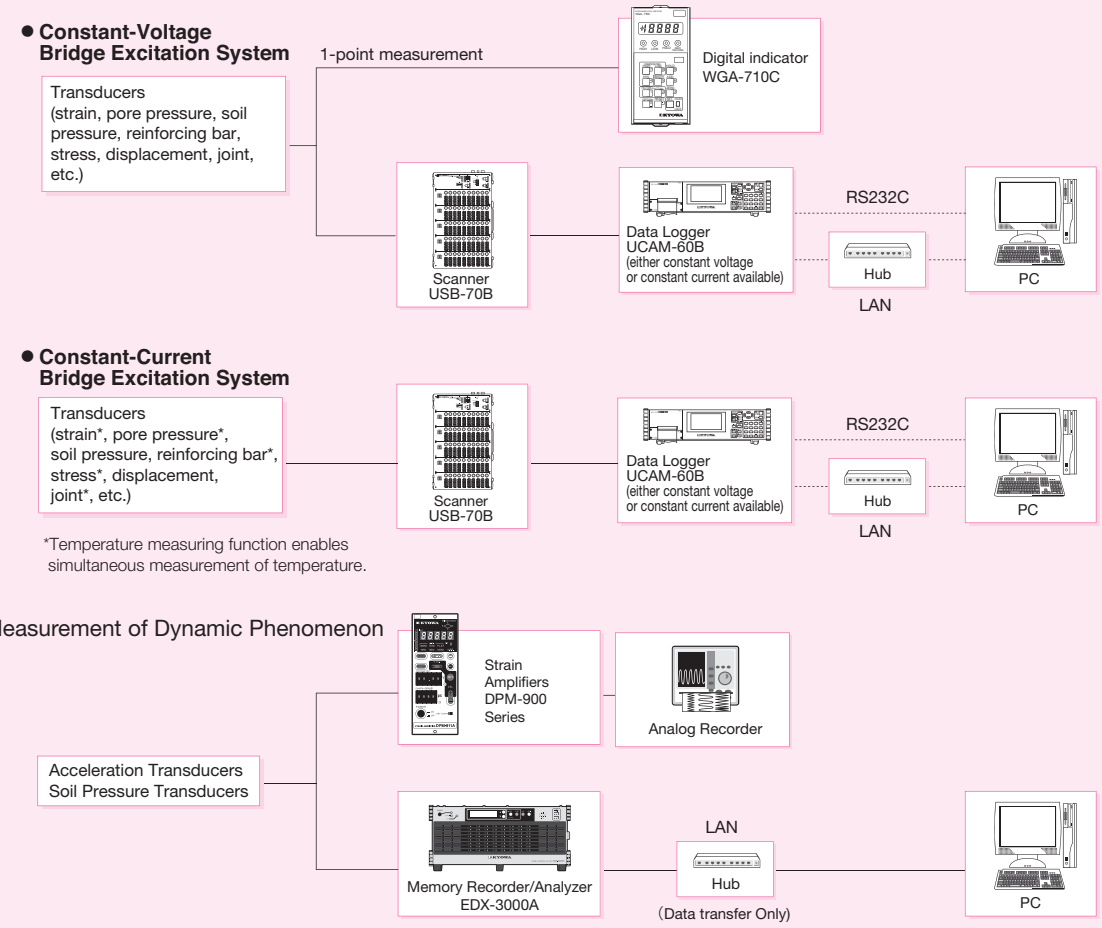
$$2\frac{e}{E} = \varepsilon$$; and thus, if E = 1 V, 2e = ε

Accordingly, the relation between transducer voltage ouput and strain is always 1:2. when gage factor is 2
e.g. 3000 μm/m → 1500 μV/V = 1.5 mV/V

※For special technical terms, refer to page 9-10.

Small to Large-Scale Measurement for Deformation Monitoring and Control

Cable	Temp. Measurement with T Series	Bridge Excitation of Measuring Instrument
Short	No	Constant voltage
	Yes	Constant current
Long	No	Constant current
	Yes	Constant current



Conversion of Measured Strain (Transducer Output Voltage) to Physical Quantity

Strain or voltage measured by pore pressure transducer, joint transducer or load cell is converted into physical quantity in proper engineering unit using the calibration factor stated in the Test Data Sheet as follows:

● In the case of using a strain amplifier

Required physical quantity = Measured strain (μm/m) x A
where, A is the calibration factor indicating the physical quantity corresponding to reference equivalent strain of 1 μm/m.

● In the case of using an amplifier other than a strain amplifier or a recorder

$$\text{Required physical quantity} = \frac{\text{Bridge output voltage } (\mu V)}{\text{Bridge excitation voltage (V)}} \times B$$

where, B is the calibration factor indicating the physical quantity corresponding to 1 μV output per 1 V bridge excitation voltage.

Bridge Excitation Systems for Civil Engineering Transducers

Types

Amplifiers used in conjunction with civil engineering transducers are available in 2 bridge excitation systems: constant voltage and constant current. These two systems have their respective features shown in the table below, to permit selection according to measurement purposes and applications.
All KYOWA strain gage transducers, including those for civil engineering, are calibrated at the factory using the constant-voltage system.

Bridge Excitation System	Constant-Voltage System	Constant-Current System
Civil engineering transducers	Measurement of physical quantity possible	Measurement of physical quantity possible
T series transducers	Measurement of physical quantity (only engineering quantity possible)	Temperature measurement together with physical quantity possible*
Applicable gage bridge	60 to 1000Ω	350Ω
Calculation for compensation of declined sensitivity due to cable extension	Required	Not required
Applications	Measurement with cable not extended too long. Mainly for experimental measurement	Measurement through extension cable Mainly for field measurement

* T series is provided with temperature measuring function.

Reasons why the constant-current system is used for measurement through extension cable

If a 100 m long cable with cross-section 0.5 mm^2 is used for connection between a KYOWA civil engineering transducer with bridge resistance of 350Ω and an amplifier of the constant-voltage bridge excitation system, sensitivity declines by approximately 2%. To avoid such inconvenience, it is recommended to use an amplifier of the constant-current bridge excitation system, which ensures measurement with less error.
For details, refer to page 9-15.

※For use under corrosive liquid or gaseous environment, contact us.

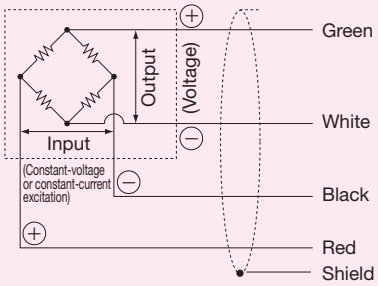
Field-Use Extension Cables

Field-Use Extension Cables for Long-Term Measurement

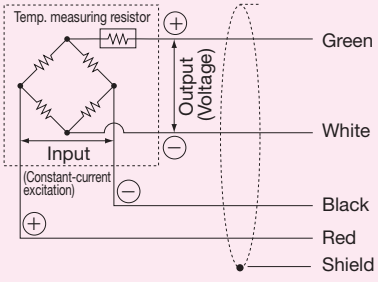
Most of cables attached to KYOWA civil engineering transducers are 1m long to enable optimum connection between transducers and amplifiers using extension cables matched with the distance in the field. Civil engineering and construction measurement is carried out for a comparatively long period of time, thereby requiring not only transducers but also extension cables to be durable and reliable. KYOWA has been developing field-use extension cables considering them as important parts of transducers. To maintain the insulation resistance of extension cables, KYOWA adopts the ethylene-propylene rubber which features high insulation resistance. Also, all KYOWA extension cables are rubber-filled to ensure reliable performance for a long period of time. Select the most suitable one by considering the application, field conditions and tensile strength.

■Bridge Circuit and Cable Connection of Civil Engineering Transducer

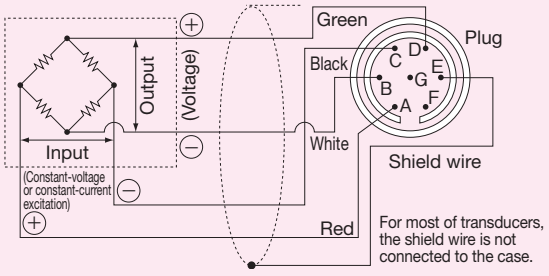
● In the case of the cable bared at the tip



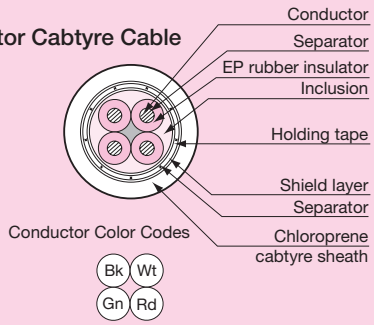
● Civil engineering transducer with temp. measuring function and with the cable bared at the tip



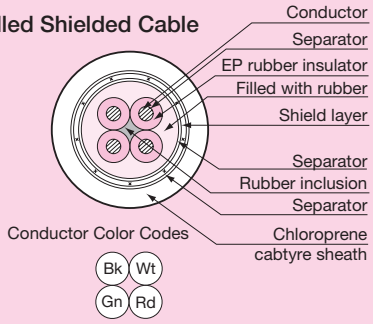
● In the case of the cable terminated with NDIS connector plug



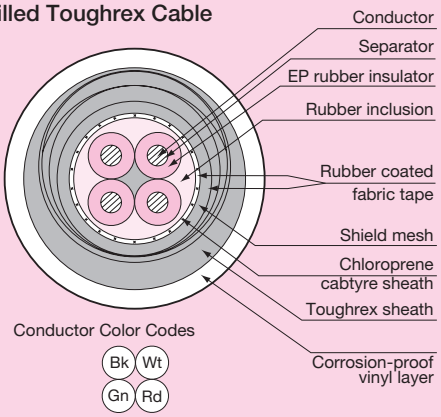
■4-Conductor Cabtyre Cable



■Rubber-Filled Shielded Cable



■Rubber-Filled Toughrex Cable



Type	4-Conductor Cabtyre Cable	Rubber-Filled Shielded Cable	Rubber-Filled Toughrex Cable
Name	4-conductor (0.5 mm²) shielded cabtyre cable	4-conductor (0.5 mm²) rubber-filled shielded abtyre cable	4-conductor (0.5 mm²) rubber-filled shielded, Toughrex-sheathed
Model	K-PNCT-SB (1) 4×0.5	TF-0.5 (K-PNCT-SB (2) 4×0.5)	K-PNCT-SB (2) TX(FE) ZV4×0.5
Externa diameter	8.5	11.5	22
Application	Surface laying	Surface laying Embedded in concrete	Sunface laying Embedded inbank
	Static measurement	Dynamic measurement	
Sheath	Chloroprene cabtyre		
Shield	Mesh shield		
Insulator	EP rubber insulator		
Structure	Rubber-filled type		
Tensile Strength	Approx. 147 N	Approx. 147 N	Approx. 147 N Armouring pipe 2.942 kN

Note:
- ●Cold-resistant, heat-resistant and oil-resistant cables are also available.
- ●For a multiple-conductor cable to extend multiple transducer cables with a single cable, contact a KYOWA sales representative.
- ● For the cable joint, use JB-100C, JB-200A or JB-210A.
- ●For a long-term measurement, use highly reliable KYOWA genuine cable.

Cable Connection Materials

KYOWA Cable Connection Kits JB-200A/JB-210A

JB-200A: For 4-conductor cable
JB-210A: For 8-conductor cable

These kits are highly reliable joint materials facilitating transducer cable extension and easy for connection work. With Sumitomo-3M Scotchcast 82-JA1 as the base, all necessary items for cable-to-cable connection are included in each kit. Use one kit for each connection. The JB-200A is for conventional 4-conductor cables. The JB-210A is for 8-conductor cables and is used for biaxial inclination transducers of the BKJ-A-D series, etc.

Specifications

Applicable Outer Diameter of Cable Sheath :	6 to 16 mm
Curing Time :	Approx. 1 hour at 23˚C,
	3 to 5 hours at 0˚C
Dimensions :	Max. 32mm diameter by max,184mm long

KYOWA Lightning Arrester Kit JB-100C

This kit is designed to connect to a cable near the transducer or indicator. Its special internal circuit protects the equipment from damage caused by induced lightning or induced voltage.

Specifications

Applicable Outer Diameter of Cable Sheath :	6 to 16 mm
Built-in Arresters :	5 molded units, single arrester unit is also available
	(HJB-001B).
Curing Time :	Approx. 1 hour at 23˚C, 3 to 5 hours at 0˚C
Dimensions :	Max. 44 mm diameter by max. 210 mm long

●For countermeasures against lightning, refer to page 7-5.

Cable Connectors with Waterproof Cap B-10B/B-15B

These cable connectors come with a waterproof cap to protect the extension cable tip of the civil engineering transducer. These units not only eliminate the need for troublesome cable tip protection and dampproofing work but also improve moisture-proof reliability. The NDIS connector enables one-touch connection to the indicator for immediate measurement.

Specifications

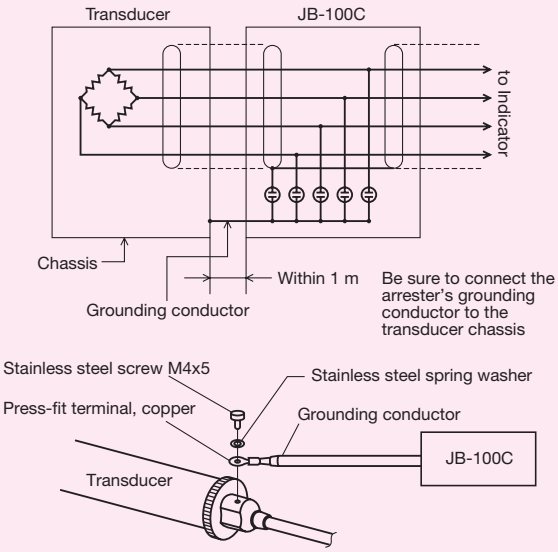
Model	Attached Cabtyre Cable
B-10B	4-conductor (0.5 mm^2) cable, 1 m long
B-15B	4-conductor (0.5 mm^2) rubber-filled cable, 1 m long

Case only is also available as B-10A or B-15A.

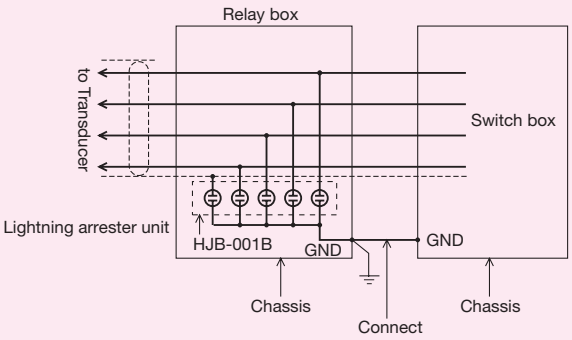
Countermeasures against Induced Lightning Surge

■How to Connect Lightning Arrester

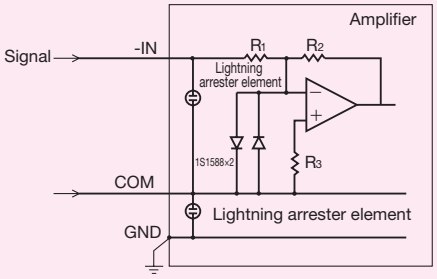
(1) To install JB-100C near transducer



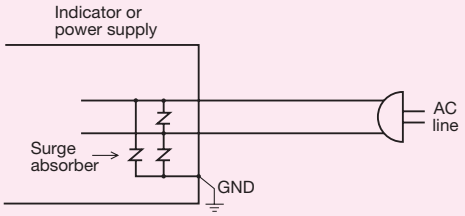
(2) To insert lightning arrester in front of switch box



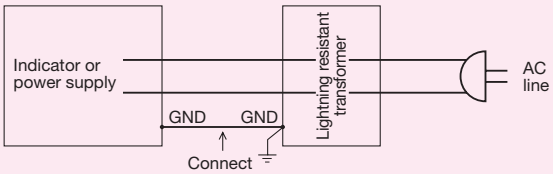
(3) To insert 2 each lightning arrester elements and diodes in amplifier



(4) To put surge absorber in power supply



(5) To insert isolation transformer between indicator or power supply and AC outlet



※Switch box with built-in lightning arrester can also be manufactured.

1. Countermeasures against Lightning in Civil Engineering Fields

When lightning discharge occurs between thunderclouds or between a thundercloud and the ground, even an induced lightning may damage embedded transducers and nearby measuring instruments if the lightning does not strike directly. Since a discharge between thunderclouds or a lightning stroke in the peripheral region abruptly changes the electric charge on the ground surface, it momentarily induces a high-tension voltage between the ground and the signal or power cable of transducers and measuring instruments. Such high-tension voltage may burn the transducer element and the semiconductors of the measuring instrument as well as damage their insulation characteristics.

To minimize the possibility of damage to embedded transducers and nearby instruments due to induced lightning surge, the KYOWA lightning arrester kit JB-100C is installed to the connection near each embedded transducer and the lightning arrester unit HJB-001B is mounted to the switch box or the indicator. Since the power line may also be affected by the induced lightning, the lightning resistant transformer or the surge absorber is connected to the power supply.

2. KYOWA Lightning Arrester Kit JB-100C (See page 7-4.)

(1) Low discharge start voltage, 90 VDC±20%
(2) Strong against repeated surge
(8 x 20μs, 500 A ... 500 times)
(3) Endures large surge current
(8 x 20 μs, 20 kA ... 1 time)
(4) Small electrostatic capacity (1.5 pF or less)
(5) High insulation resistance (10000 MΩ or more)
(6) Applicable embedded transducers:
BS-25AT, BJ-AT, BR-BT, BEE, BEF, BEM, BEN, BPB, BPB-T, BPC, BPC-T, BT-100B, etc.

3. Method of connectrng for lightning arrester elements

Reference(1) to (5)

4. Grounding

(1) Connect the GND terminal to the class A lightning arrest ground. If the GND terminal is connected to a ground with which another instrument is connected or if good grounding is not possible, the lightning arrester does not make fully function.
(2) Grounding the cable pipe, duct, joint box, switch box and the indicator chassis ensures satisfactory effect from the viewpoint of electromagnetic shield, also.

BKJ-A

Embedment Type Inclination Transducers

●Inclination Measurement ●±5°, ±10°

Specifications

Performance

Rated Capacity :	See table below.
Nonlinearity :	Within±0.5%RO
Hysteresis :	Within±0.5%RO
Rated Output :	1.4 mV/V (2800μm/m) or more
	(minus rated capacity to plus rated capacity)

Environmental Characteristics

Safe Temperature Range :	-20 to 70℃
Compensated Temperature Range :	-10 to 60℃
Temperature Effect on Zero Balance :	Within±0.05% RO/℃
Temperature Effect on Output :	Within±0.1%/℃

Electrical Characteristics

Recommended Excitation Voltage :	2 to 10 V AC or DC
Input Resistance :	350Ω±1%
Output Resistance :	350Ω±1%
Cable : BKJ-A :	4-conductor (0.3 mm²) chloroprene shielded cable,
	6 mm diameter by 1 m long, bare at the tip
BKJ-A-D :	8-conductor (0.3 mm²) chloroprene shielded cable,
	6 mm diameter by 1 m long, bared at the tip

Mechanical Properties

Safe Overload Rating:	120%
Material:	Stainless steel (quide blade resin)
Protection Rating:	IP68 (JIS C 0920) Water resistance 490kPa
Weight:	See table below

Optional Accessories

Dedicated aluminum guide pipe B-30, 3 m long
Dedicated socket B-35, 30 cm long

Measuring Directions	Model	Rated Capacity	Weight(Approx.)
1(uniaxial)	BKJ-A-5	±5°	1kg
	BKJ-A-10	±10°	
2(biaxial)	BKJ-A-5-D	±5°	1.2kg
	BKJ-A-10-D	±10°	

Small-sized and lightweight 27mm in outer diameter. Inclination angles detected at multiple stages enable measurement of lateral displacement of the ground or earth retaining wall.

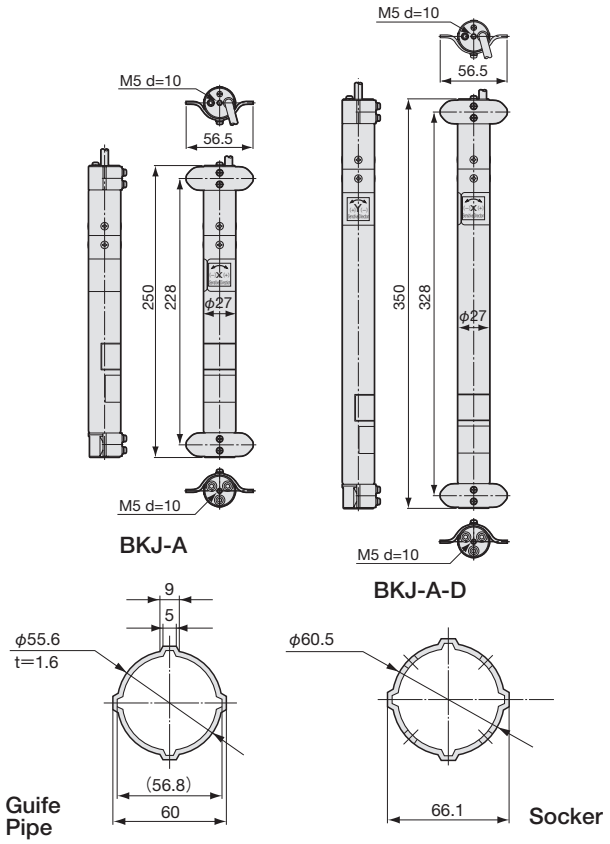
- ●Facilitate quicker and easy data recording since the BKJ-A series is installed in an aluminum guide pipe embedded beforehand in a boring or earth retaining wall.
- ●Allows installation at maximum 20 stages in a guide pipe.
- ●Available in uniaxial and biaxial types for selection to meet individual applications
- ●Designed for high immunity against lightning surge

The BKJ-A series inclination transducers are designed for embedment at multiple stages in a boring or earth retaining wall. Inclination angles detected at mutiple stages enable measurement of lateral displacement of the ground or earth retaining wall. Since the embedment method ensures quicker measurement than the insertion method, the BKJ-A series is suitable for use in information-oriented urban civil engineering fields. The BKJ-A series can be installed at maximum 20 stages in an aluminum guide pipe embedded beforehand.

To Ensure Safe Usage

To protect the cable, it is recommended to connect the dedicated aluminum guide pipe using an adhesive or screws (M4×4).Do not use rivets.

■Dimensions



BKL-A

Guide Roller-Equipped Inclination Transducers

●Inclination Measurement ●±5°, ±10°

Specifications

Performance

Rated Capacity :	±5°(BKL-A-5) ±10°(BKL-A-10)
Nonlinearity :	Within±0.5% RO
Hysteresis :	Within±0.5% RO
Rated Output :	1.4 mV/V (2800μm/m) or more
	(minus rated capacity to plus rated capacity)
Safe Temperature Range :	-20 to 70°C

Environmental Characteristics

Compensated Temperature Range :	-10 to 60°C
Temperature Effect on Zero Balance :	Within±0.05% RO/°C
Temperature Effect on Output :	Within±0.1%/°C
Recommended Excitation Voltage :	2 to 10 V AC or DC

Electrical Characteristics

Input Resistance :	350Ω±1%
Output Resistance :	350Ω±1%
Cable :	4-conductor (0.3 mm²) chloroprene shielded cable,
	6 mm diameter by 1 m long, bared at the tip
Safe Overload Rating :	120%

Mechanical Properties

Material :	Stainless steel
Protection Rating :	IP68 (JIS C 0920) Water resistance 490 kPa
Weight :	Approx. 1.3 kg

Standard Accessories

Dedicated aluminum guide pipe B-30, 3 m long

Dedicated socket B-35, 30 cm long

Inclination angles detected enable measurement of lateral displacement of the ground or earth retaining wall.

●Guide rollers ensure smooth installation.
●No grouting work required in the guide pipe
●Installable at maximum 15 stages

The BKL-A series inclination transducers are designed for embedment at multiple stages in the ground or earth retaining wall. Inclination angles detected at mutiple stages enable measurement of lateral displacement of the ground or earth retaining wall. Guide rollers provided ensure smooth installation in an aluminum guide pipe embedded beforehand, and no grouting work in the guide pipe is required.

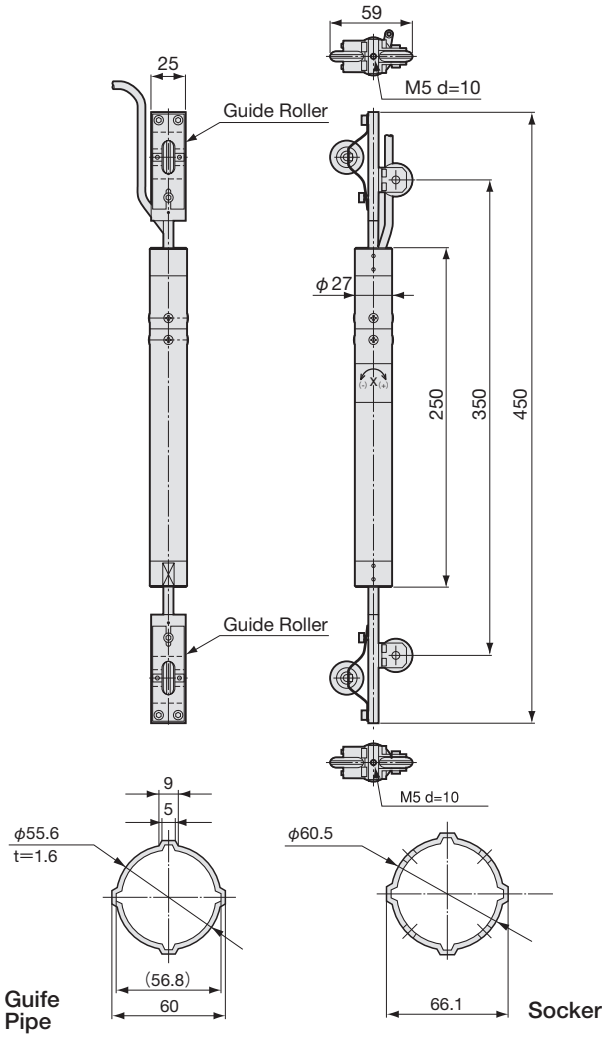
To Ensure Safe Usage

To protect the cable, it is recommended to connect the dedicated aluminum guide pipe using an adhesive or screws (M4x4). Do not use rivets.

Caution

Different from KYOWA insertion type inclination transducer BK-G, the BKJ-A cannot be lifted up and down for measurement.

Dimensions



BK-G

Insertion Type Inclination Transducers

●Inclination Measurement ●±5°, ±10°

Inclination angles detected enable measurement of lateral displacement of the ground or earth retaining wall.

- ●Highly reliable performance backed by durable structure ensure safe use in civil engineering fields.
- ●Cable and reel are standard accessories:the cable enables measurement up to 50m deep.

BK-G series inclination transducers are designed for insertion in guide pipe embedded beforehand, in the ground or the structure, detect successive inclination angles and measure lateral displacement.
And are indispensable to check for landslide or earth retaining wall, many use for lateral displacement of the ground or earth retaining wall.

Specifications

Performance

Rated Capacity :	BK-5G ±5°
	BK-10G ±10°
Nonlinearity :	Within±0.5%RO
Hysteresis :	Within±0.5%RO
Rated Output :	2.182mV/V(4364×10^{-6}μm/m)±0.5%
	(from minus rated capacity to plus rated capacity)

Environmental Characteristics

Safe temperature Range :	-20 to 60℃
Compensaated Temperature Range :	-20 to 50℃
Temperature Effect on Zero Balance :	Within±0.03%RO/℃
Temperature Effect on Output :	Within±0.03%/℃

Electrical Characteristics

Input Resistance :	500 to 660Ω
Output Resistance :	343 to 357Ω
Cable :	4-conducter (0.5mm^2) piano-wire-reinforced chloroprene-shielded cable of 60m long (contact a kyowa representative for a cable of longer than 50m)

Mechanical Properties

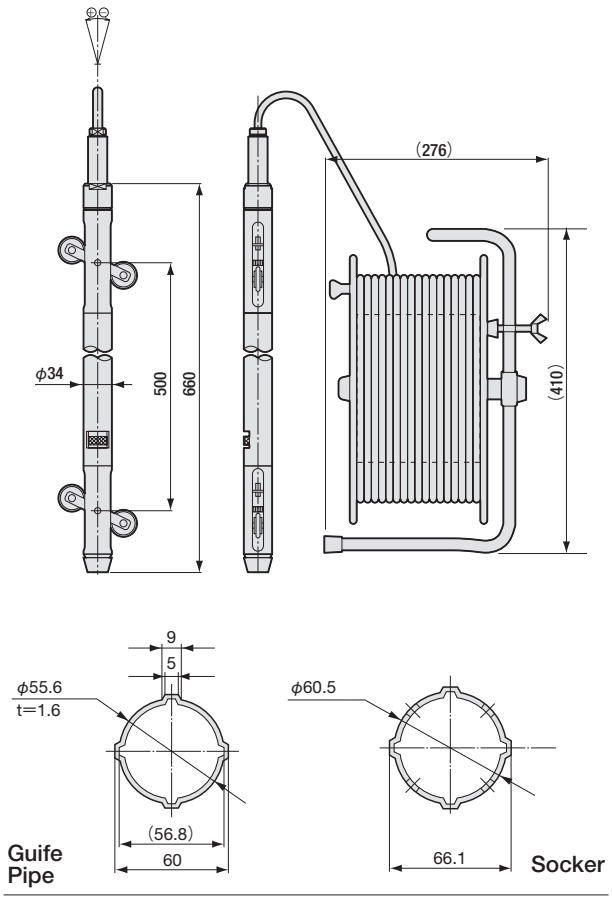
Safe over load Rating :	120%
Weight :	Approx.3.2kg

Optional Accessories

Dedicated aluminum guide pipe B-30 (3m long)
Pipe receptacle B-35(30cm long)

※60m long or cable can be manufactured.

Dimensions



BKK-A

Surface-Mounting Type Inclination Transducers

BKK-A　　BKK-A-D

●Inclination Measuremet　●±1°, ±2°

Specifications

Performance

Rated Capacity :	See table below
Nonlinearity :	Within ±0.5% RO
Hysteresis :	Within ±0.5% RO
Rated Output :	See table below

Environmental Characteristics

Safe Temperature Range :	-20 to 70℃
Safe Temperature Range :	-10 to 60℃
Temperature Effect on Zero Balance :	Within±0.005%RO/℃
Temperature Effect on Output :	Within±0.02%/℃
Long-Term Stability :	Within±0.5% RO/6 months*

Electrical Characteristics

Safe Excitation Voltage :	10V AC or DC
Recommended Excitation Voltage :	1 to 2V AC or DC
Input Resistance :	350Ω±1%
Output Resistance :	350Ω±1%
Cable :	4-conductor (0.3 mm²) chloroprene shielded cable, 7.6 mm diameter by 3 m long, bared at the tip (2 cables for biaxial models)

Mechanical Properties

Measuring Direction :	See table below
Safe Overload Rating :	120%
Interference :	Within±1% RO
Material :	Chromate-plated
Protection Rating :	IP56(JIS C 0920)
Weight :	See table below

* This value is based on actual measurement and stated with dispersion taken into consideration. Stability slowly changes during a few months after installation, and then tends to become constant.

Standard Accessory　Stopper fixing wing nut

Optional Accessories

●Wall-Mounting Fixtures
Designed to mount BKK-A transducer/s onto a wall surface; chromate-plated. BD-11A for mounting one unit and BD-12A for mounting two units.
●Horizontal Surface-Mounting Fixtures
Designed to mount BKK-A transducer/s onto a horizontal surface; chromate-plated. BD-31A for mounting one unit and BD-32A for mounting two units.
●Protection Covers
Designed to protect BKK-A transducer/s against external mechanical force; metal covers painted in grey.
BD-21A for BD-11A, BD-22A for BD-12A
BD-41A for BD-31A, BD-42A for BD-32A

Model	Measuring Direction	Rated Capacity	Rated Output	Weight (Approx.)
BKK-A-1	Uniaxial	±1°	2 mV/V (4000 μm/m) or more	6kg
BKK-A-1-D	Biaxial			6.8kg
BKK-A-2	Uniaxial	±2°	3 mV/V (6000 μm/m) or more	5.5kg
BKK-A-2-D	Biaxial			6.3kg

※Rated output is for a range from minus rated capacity to plus rated capacity.
※Model with a rated capacity of ±0.5 or ±5 can also be manufactured. (Contact a KYOWA sales representative for detailed specifications.)
※Models with temperature measuring function can also be manufactured.

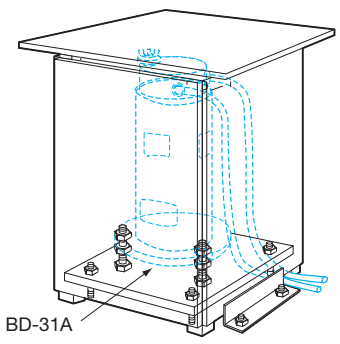
These transducers provide not only resolution twice as high as conventional systems but also outstandingly improved temperature characteristics and long-term stability.

●External stopper provided
●Improved vibration resistance
●Biaxial type available (BKK-A-D)

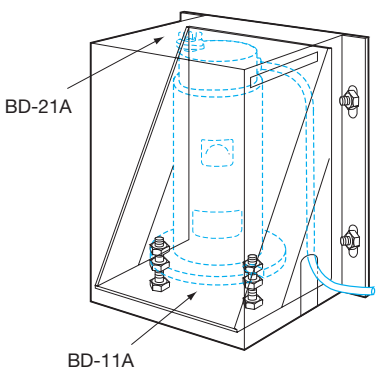
The BKK-A series inclination transducers on surface of structure. available in two types, uniaxial and biaxial, are designed to measure minute inclination quantities. They are suitably used in combination with a structural settlement transducer for measurement of the disturbance resulting from nearby engineering works as well as for measurement of landslide-initiated inclination of the ground surface.

These transducers provide not only resolution twice as high as conventional systems but also outstandingly improved temperature characteristics (temperature effect on zero balance ±0.36 seconds/℃ with ±1° rated capacity) and long-term stability (±0.5% RO). Furthermore, a stopper for detector protection is provided to ensure high handling efficiency in a total working flow from transportation to installation and measurement. Also, their structure, with highly viscous damping oil filled in, improves vibration resistance.

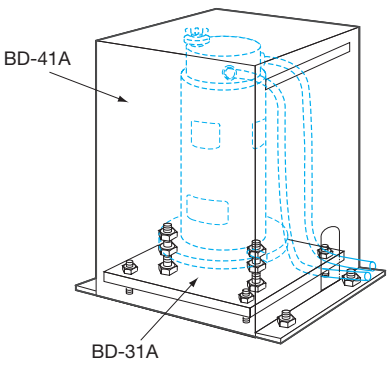
●Well-Ventilated Wood Sunshade
Manufactured on request.



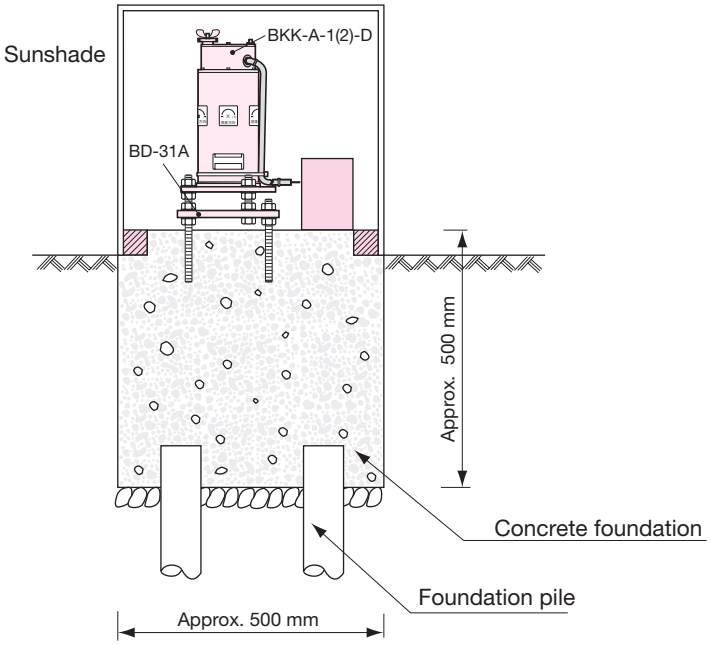
●Wall-Mounting Fixture BD-11A
Wall Protection Cover BD-21A



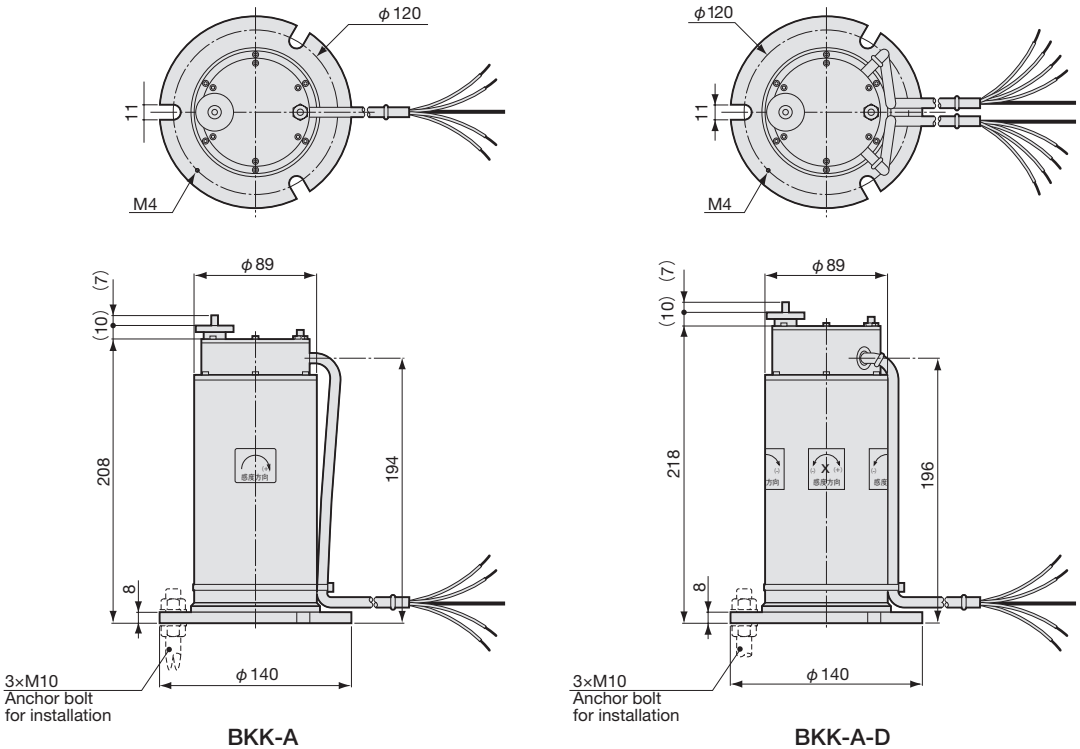
●Horizontal Surface-Mounting Fixture BD-31A
Horizontal Surface Protection Cover BD-41A



Installation Schema



Dimensions



*1. For grounding of lightning arrester kit.
*2. 0 mm when transporting.

The stopper is activated or deactivated by turning the knurling knob.

To Ensure Safe Usage

Fix the protection cover and mounting anchor bolts fixtures individually anchor bolts.

BL-B

Hollowed Load Cells

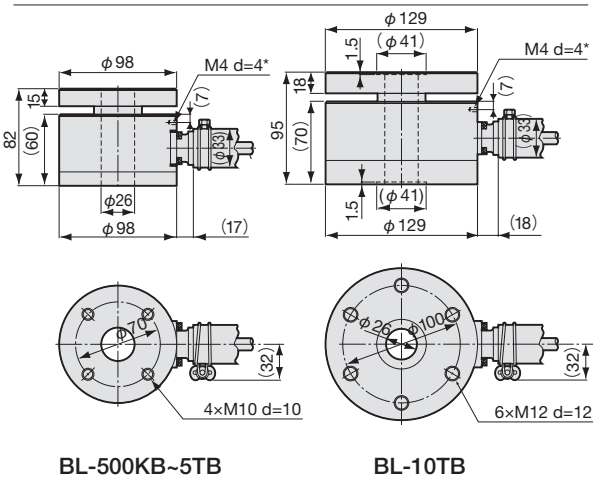
●Load Measurement ●5 to 500kN

BL-500KB~10TB　　BL-20TB　　BL-50TB

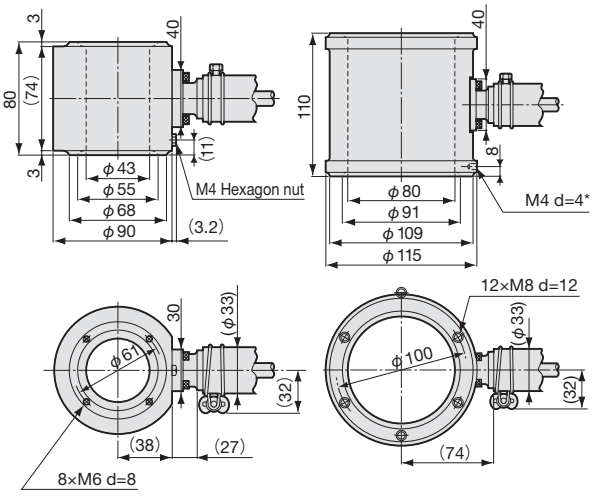
To endure field applications,these transducers feature a waterproof design ,and high accurately

The BL-B series hollowed load cells are designed to accurately measure the load applied to an earth anchor, PC anchor and the support of a tunnel arch. To endure field applications, these transducers feature a waterproof design and high accurately.

Dimensions



BL-500KB~5TB　　BL-10TB



BL-20TB　　BL-50TB

* For grounding of lightning arrester kit.

Specifications

Performance

Rated Capacity :	See table below
Nonlinearity :	Within±2% RO (BL-500KB to 10TB)
	Within ±1% RO (BL-20/50TB)
Hysteresis :	Within±1% RO
Rated Output :	1 mV/V (2000μm/m) or more

Environmental Characteristics

Safe Temperature Range :	-20 to 70˚C
Compensated Temperature Range :	-10 to 60˚C
Temperature Effect on Zero Balance :	Within±0.1% RO/˚C
Temperature Effect on Output :	Within±0.1%/˚C

Electrical Characteristics

Safe Excitation Voltage :	10V AC or DC
Recommended Excitation Voltage :	1 to 10V AC or DC
Input Resistance :	350Ω±2%
Output Resistance :	350Ω±2%
Cable : 4-conductor (0.5 mm²) chloroprene shielded cable,	
9.6 mm diameter by 1 m long, bared at the tip	
(Shield is not connected to the chassis.)	

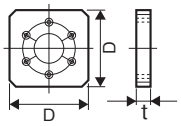
Mechanical Properties

Safe Overload Rating :	120%
Weight :	See table below

Optional Accessories

Saddle BLP-(D)x(t)s for BL-Type Load Cells

See figure at the right for (D) and (t)
Dimensions (D) and (t) are available in the following range depending on rated capacity.
D = 100 x 100 mm to 400 x 400 mm
t = 20 to 50 mm



●Inform us of dimensions of the part of equipment which contacts with the saddle.
A round saddle is also available for option.

Model	Rated Capacity	Hollow Diameter	Weight (Approx.)
BL-500KB	5kN	26	3kg
BL-1TB	10kN		
BL-2TB	20kN		
BL-5TB	50kN		
BL-10TB	100kN	26	7.5kg
BL-20TB	200kN	43	1.6kg
BL-50TB	500kN	80	3.3kg

BLW-A

Hollowed Load Cells

●Load Measurement ●500kN to 2MN

To endure field applications,these transducers feature a waterproof design,Lightweight,Thin design.

- ●Eccentric load or inner/outer load causes less sensitivity deviation.
- ●Large center hollow making it suitable for VSL method
- ●Waterproof structure, protection rating IP68 (0.5 MPa for 24 hours at 23˚C±15˚C)
- ●Thin design
- ●Lightweight

Designed to measure load of VSL anchor, etc.

Specifications

Performance

Rated Capacity :	See table below
Nonlinearity :	Within±0.8% RO
Hysteresis :	Within±0.5% RO
Rated Output :	1.25 mV/V (2500μm/m) or more

Environmental Characteristics

Safe Temperature Range :	-20 to 70˚C
Compensated Temperature Range :	-10 to 60˚C
Temperature Effect on Zero Balance :	Within±0.05% RO/˚C
Temperature Effect on Output :	Within±0.05%/˚C

Electrical Characteristics

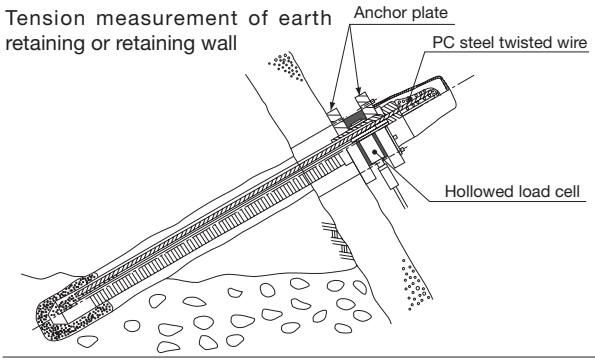
Safe Excitation Voltage :	15V AC or DC
Recommended Excitation Voltage :	1 to 10V AC or DC
Input Resistance :	350Ω±0.3%
Output Resistance :	350Ω±2%
Cable : 4-conductor (0.5 mm²) chloroprene shielded cable,	
9.6 mm diameter by 1 m long, bared at the tip	
(Shield is not connected to the chassis.)	

Mechanical Properties

Safe Overload Rating :	150%
Protection Rating :	IP68 (endures 0.5 MPa water pressure
	for 24 hours at 23˚C ±15˚C)
Weight :	See table below

■Application Sample

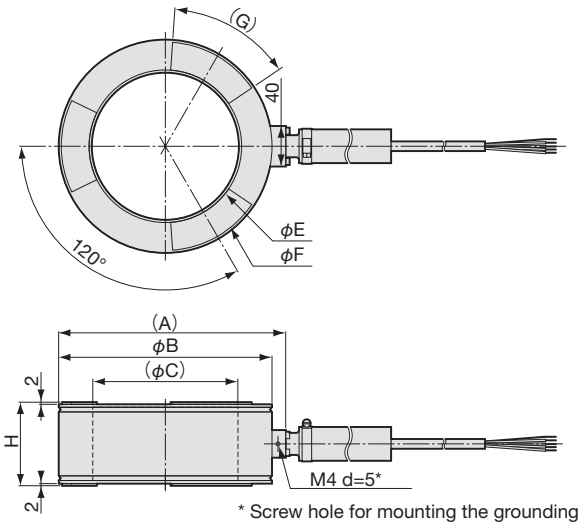
Tension measurement of earth retaining or retaining wall



Model	Rated capgcity	(A)	ϕB	(ϕC)	H	ϕE	ϕF	(G)	Weight(Appox)
BLW-A-500KN	500kN	188	175	125	64	131	170	45˚	4kg
BLW-A-1MN	1MN	223.5	210	144	82	150	205	52˚	8kg
BLW-A-1500KN	1500kN	263.5	250	155	94	161	245	46˚	14kg
BLW-A-2MN	2MN	263.5	250	155	94	161	245	60˚	14.5kg

Hollow diameter

■Dimensions



* Screw hole for mounting the grounding terminal of lightning arrester kit.

BL-E

Hollowed Load Cells

●Load Measurement ●1 & 2 MN

To endure field applications,these transducers feature a waterproof design ,and high accurately

The BL-E series hollowed load cells are designed to accurately measure the load applied to an earth anchor, PC anchor and the support of a tunnel arch. To endure field applications, these transducers feature a waterproof design and high accurately.

Specifications

Performance

Rated Capacity :	See table below
Nonlinearity :	Within±2% RO
Hysteresis :	Within±1% RO
Rated Output :	1 mV/V (2000μm/m) or more

Environmental Characteristics

Safe Temperature Range :	-20 to 70℃
Compensated Temperature Range :	-10 to 60℃
Temperature Effect on Zero Balance :	Within±0.1% RO/℃
Temperature Effect on Output :	Within±0.1%/℃

Electrical Characteristics

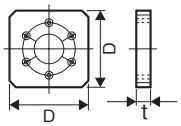
Safe Excitation Voltage :	10V AC or DC
Recommended Excitation Voltage :	1 to 10V AC or DC
Input Resistance :	350Ω±2%
Output Resistance :	350Ω±2%
Cable : 4-conductor (0.5 mm^2) chloroprene shielded cable,	
9.6 mm diameter by 1 m long, bared at the tip	
(Shield is not connected to the chassis.)	

Mechanical Properties

Safe Overload Rating :	120%
Weight :	See table below

Optional Accessories

Saddle BLP-(D)x(t)s for BL-Type Load Cells and (t) are available in the following range depending on rated capacity.
D = 100 x 100 mm to 400 x 400 mm
t = 20 to 50 mm

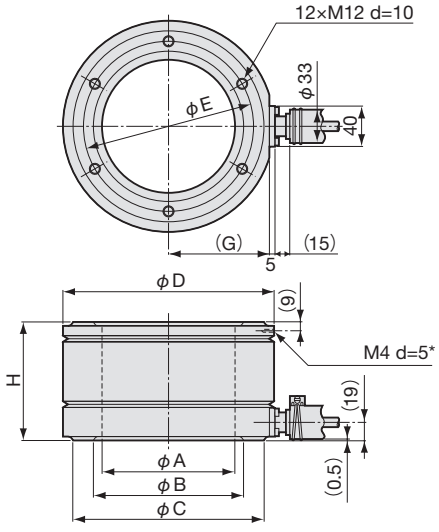


●Inform us of dimensions of the part of equipment which contacts with the saddle.
A round saddle is also available for option.

Model	Rated Capacity	ϕA	ϕB	ϕC	ϕD	ϕE	(G)	H	Weight (Approx.)
BL-100TE	1MN	85	98	128	140	113	66	110	6.6kg
BL-200TE	2MN	133	150	190	210	170	101	120	14.1kg

ϕA: Hollow diameter

■Dimensions



* For grounding of lightning arrester kit.

BLD-A-S

Hollowed Load Cells

●Load Measurement ●50 to 500 kN

Specifications

Performance

Rated Capacity :	See table below
Nonlinearity :	Within±1% RO
Hysteresis :	Within±1% RO
Rated Output :	1 mV/V (2000μm/m) or more

Environmental Characteristics

Safe Temperature Range :	-20 to 70℃
Compensated Temperature Range :	-10 to 60℃
Temperature Effect on Zero Balance :	Within±0.1% RO/℃
Temperature Effect on Output :	Within±0.1%/℃

Electrical Characteristics

Safe Excitation Voltage :	10V AC or DC
Input Resistance :	350Ω±2%
Output Resistance :	350Ω±2%
Cable :	4-conductor (0.5 mm²) chloroprene shielded cable,
	10 mm diameter by 1 m long, bared at the tip
	(Shield is not connected to the chassis.)

Mechanical Properties

Safe Overload Rating :	120%
Weight :	See table below

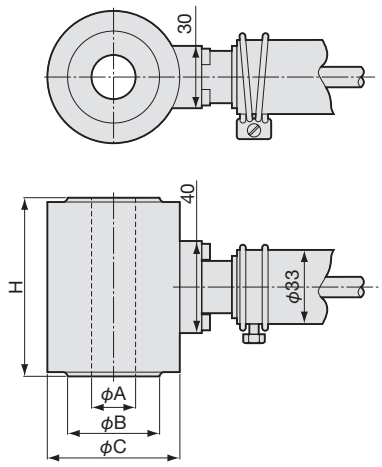
To endure field applications,these transducers feature a waterproof design ,and high accurately

The BLD-A-S series is compact and lightweight hollowed load cells designed to accurately measure the load applied to a PC anchor and rock bolt.
To endure field applications, these transducers feature a waterproof design and high accurately.

Model	Rated Capacity	ϕA	ϕB	ϕC	H	Weight (Approx.)
BLD-A-50KNS	50kN	10	22	50	60	200g
BLD-A-100KNS	100kN	20	32	61	80	300g
BLD-A-200KNS	200kN	20	42	61	80	600g
BLD-A-500KNS	500kN	25	54	64	100	1.3kg

ϕA: Hollow diameter

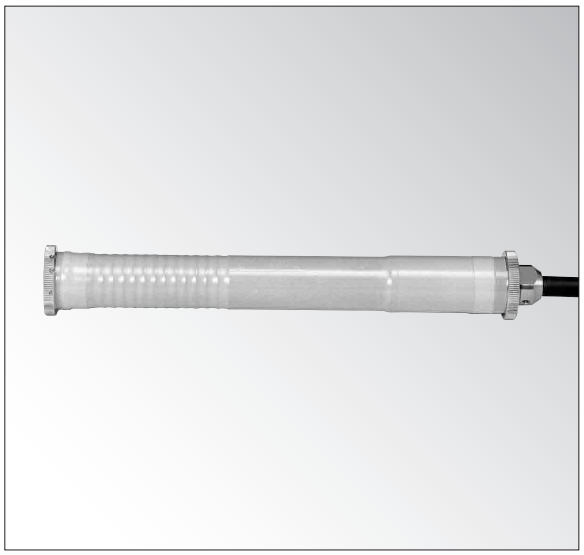
■Dimensions



BS-25AT/25BT

Strain Transducers

●Strain Measurement ●±500 & ±1000 μm/m
●With Temperature Measuring Function



Specifications

Performance

●Strain Measurement	
Rated Capacity :	±500μm/m(AT)
	±1000μm/m(BT)
Nonlinearity :	Within±1.5%RO (AT)
	Within±2%RO (BT)
Hysteresis :	Within±2%RO
Rated Output :	±1 mV/V (±2000μm/m) or more
	±0.5 mV/V (±1000μm/m) or more
●Temperature Measurement	
Rated Capacity :	-30 to 70˚C
Measurement Error :	Within ±0.5˚C (-30 to 70˚C)
(Refer to Small-Sized Temperature Transducer BTS-100AT, page 7-30.)	

Environmental Characteristics

Safe Temperature Range :	-30 to 80˚C
Compensated Temperature Range :	-20 to 70˚C
Temperature Effect on Output :	Within±0.05%/˚C

Electrical Characteristics

Recommended Excitation Voltage :	2 to 10V AC or DC
Input Resistance :	350Ω±1%
Output Resistance :	450Ω±0.8%
Cable : 4-conductor (0.5 mm²) chloroprene shielded cable,	
11.5 mm diameter by 1 m long, bared at the tip	

Mechanical Properties

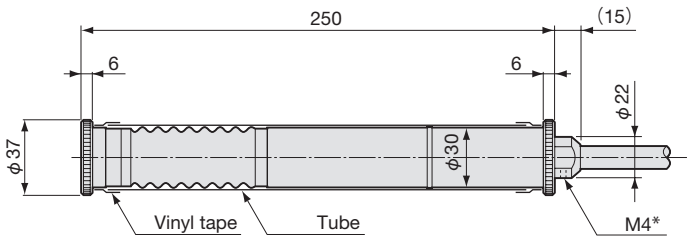
Instrument Length :	250mm
Safe Overload Rating :	120%
Apparent Linear Expansion Coefficient :	(11.5±0.6) μm/m/˚C
Weight :	Approx. 600 g

These transducers are intended for measurement of the strain occurring inside concrete with comparatively large aggregates.

●The linear expansion coefficient is approximated to that of concrete to minimize temperature effects, thereby enabling measurement of external force-initiated strain and the strain corresponding to temperature stress.
●Minimal damage against embedment vibrator and endures vibration initiated by the RCD method.

Strain transducers BS-25AT/BS-25BT are intended for measurement of the strain occurring inside concrete with comparatively large aggregates. Since a temperature measuring function is provided, these transducers can simultaneously measure strain and temperature.

■Dimensions

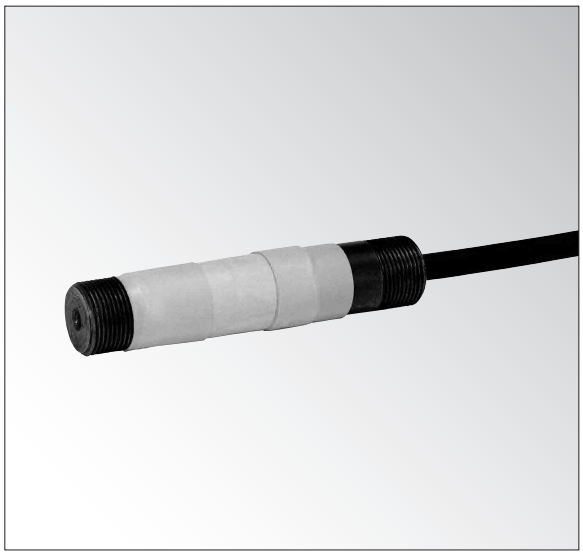


* For grounding of lightning arrester kit.

BS-8FT

Small-Sized Strain Transducer

●Strain Measurement ●±1000 μm/m
●With Temperature Measuring Function



This transducer is designed to measure strain in the inside or on the surface of thin concrete wall or on the surface of steel such as a wide flange beam.

- ●Self-temperature compensation type designed with a linear expansion coefficient approximated to that of concrete
- ●Wide application range including measurement of strain on an earth retaining strut, steel sheet-pile and tunnel support
- ●Usable for long-term measurement in place of a directly bonded strain gage

The BS-8FT strain transducer is designed to measure strain in the inside or on the surface of a thin concrete wall or on the surface of steel such as a wide-flange beam. A temperature measuring function enables it to simultaneously measure strain and temperature. Since the compact design measures only 80 mm in length, embedment applications are limited to concrete with comparatively small aggregates.

Specifications

Performance

●Strain Measurement	
Rated Capacity :	±1000 μm/m
Nonlinearity :	Within± 2% RO
Hysteresis :	Within ±3% RO
Rated Output :	±1 mV/V (±2000μm/m) or more
●Temperature Measurement	
Rated Capacity :	-30 to 70˚C
Measurement Error :	±0.5˚C (-30 to 70˚C)
(Refer to Small-Sized Temperature Transducer BTS-100AT, page 7-30.)	

Environmental Characteristics

Safe Temperature Range :	-30 to 80˚C
Compensated Temperature Range :	-20 to 70˚C
Temperature Effect on Output :	Within±0.05%/˚C

Electrical Characteristics

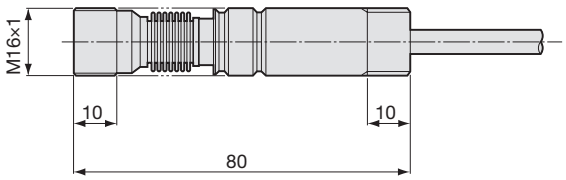
Recommended Excitation Voltage :	2 to 10V AC or DC
Input Resistance :	350Ω±1%
Output Resistance :	450Ω±1.6%
Cable : 4-conductor (0.3 mm²) chloroprene shielded cable, 6 mm diameter by 1 m long, bared at the tip	

Mechanical Properties

Instrument Length :	80mm
Safe Overload Rating :	120%
Apparent Linear Expansion Coefficient :	(11±1) x10^{-6}/˚C
Weight :	Approx. 120 g

※For concrete stress transducers, refer to page 7-27.

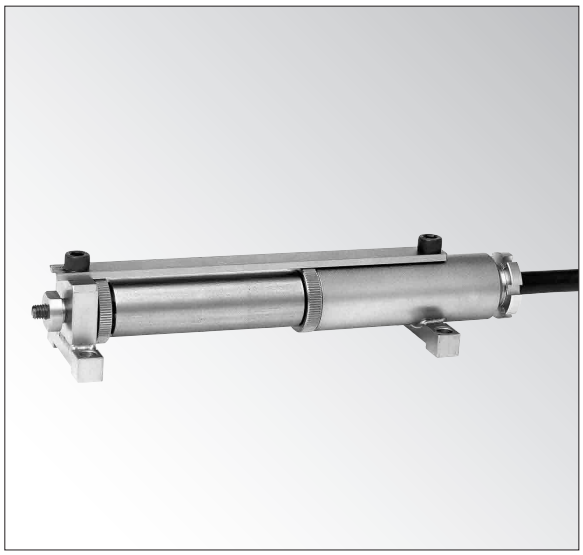
■Dimensions



BS-15CT

●Strain Measurement ●±2000μm/m
●With Temperature Measuring Function

Surface-Mounting Type Strain Transducer



For measurement of strain on steel and concrete surfaces.

- ●Self-temperature compensation type with linear expansion coefficient approximated to that of concrete (11μm/m/˚C)
- ●Large capacity (±2000μm/m), high-shock and vibration-resistance, and integrated mounting legs
- ●Applicable for steel pipe piles, steel pipe laggings, steel sheet piles and hydraulic iron pipes in power stations

The BS-15CT surface mounting type strain transducer is developed especially for measurement of strain on steel and concrete surfaces. A temperature measuring function enables simultaneous measurement of strain and temperature. Installed on a pile or steel sheet pile, the rugged design endures vibration initiated by driving the pile.

Specifications

Performance

●Strain Measurement	
Rated Capacity :	±2000 μm/m
Nonlinearity :	Within±2% RO
Hysteresis :	Within±2% RO
Rated Output :	±0.625 to ±1.25 mV/V
	(±1250 to ±2500 μm/m)
●Temperature Measurement	
Rated Capacity :	-30 to 70˚C
Measurement Error :	±0.5˚C (-30 to 70˚C)
(Refer to Small-Sized Temperature Transducer BTS-100AT, page 7-30.)	

Environmental Characteristics

Safe Temperature Range :	-30 to 80˚C
Compensated Temperature Range :	-20 to 70˚C
Temperature Effect on Output :	Within ±0.05%/˚C

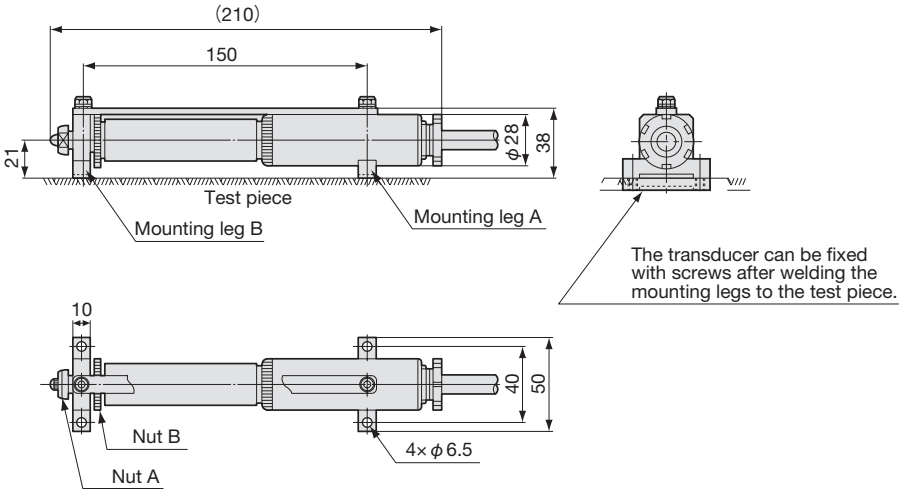
Electrical Characteristics

Recommended Excitation Voltage :	2 to 10V AC or DC
Input Resistance :	350Ω±2% at 0˚C
Output Resistance :	450Ω±1.6% at 0˚C
Cable : 4-conductor (0.5 mm²) chloroprene shielded cable, 9.6 mm, diameter by 1 m long, bared at the tip	

Mechanical Properties

Gage Mark Distance :	150mm
Safe Overload Rating :	150%
Apparent Linear Expansion Coefficient :	(11±1)×10⁻⁶/˚C
Weight :	Approx. 700 g

■Dimensions



● After welding muonting legs A and B, initial adjustment is possible with nuts A and B.

Strain Transducer Mounting Fixtures

For Strain Transducers BS-AT/BT

Strain Transducer Mounting Leg CL-25D

Designed to fix a strain transducer onto the surface of a reinforcing bar, concrete, etc. Use a dummy strain transducer to determine spacing between each leg.

Dummy Strain Transducer CSD-25M

Has the same dimensions as BS-AT/BS-BT strain transducers. Use this to fix strain transducer mounting legs.

For Strain Transducer BS-8FT

Strain Transducer Mounting Leg CL-8

Designed to fix a strain trans ducer onto the surface of a reinforcing bar, concrete, etc. Use a dummy strain trans ducer to determine spacing between each leg.

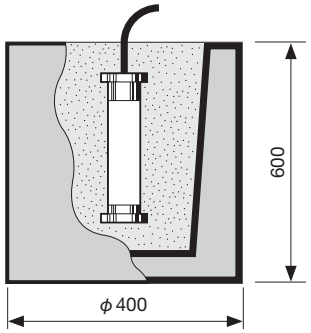
Dummy Strain Transducer BSD-8B

Has the same dimensions as BS-8FT strain transducer. Use this to fix strain transducer mounting legs.

Strain Transducer Spider CD

This fixture for plane or solid stress measurement lets strain transducers maintain their respective angles.
Hub CD-AH
Rod CD-AS

Non-Stress Transducer Case

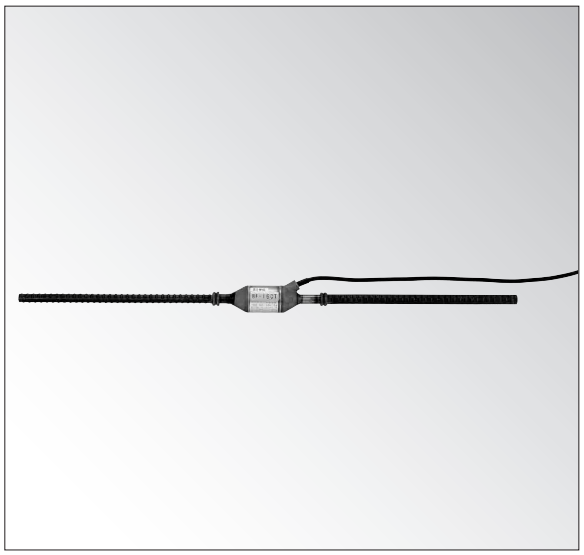


The special cylindrial case has a strain transducer installed inside. To avoid stress, the case isolates the transducer from mass concrete to let it measure the linear expansion coefficient of the concrete. The measurement result is used to obtain a correction factor for analysis.

BF-CT

●Stress Measurement ●300 MPa
●With Temperature Measuring Function

Reinforcing-Bar Stress Transducers



For stress measurement of reinforcing bar

●For long-term stable measurement, the transducer proper features a special structure with inert gas filled in.
●The self-temperature-compensated strain gage used for the transducer enables measurement of the temperature stress of the reinforcing bar.

The BF-CT series stress transducers are designed for stress measurement by welding both ends to a reinforcing bar in the field. They are available in various models for selection according to diameters of the reinforcing bars. Each model provides a temperature measuring function to enable simultaneous measurement of stress and temperature.

Specifications

Performance

●Stress Measurement	
Rated Capacity :	300 MPa (1Mpa=1N/mm²)
Nonlinearity :	Within±1% RO
Hysteresis :	Within±1.5% RO
Rated Output :	1.85 mV/V (3700μm/m) or more
●Temperature Measurement	
Rated Capacity :	-30 to 70˚C
Measurement Error :	±0.5˚C (-30 to 70˚C)
(Refer to Small-Sized Temperature Transducer BTS-100AT, page 7-30.)	

Environmental Characteristics

Safe Temperature Range :	-30 to 80˚C
Compensated Temperature Range :	-20 to 70˚C
Temperature Effect on Zero Balance :	Within±0.05% RO/˚C
Temperature Effect on Output :	Within±0.05%/˚C

Electrical Characteristics

Recommended Excitation Voltage :	2 to10V AC or DC
Input Resistance :	350Ω±2% at 0˚C
Output Resistance :	450Ω±1.6% at 0˚C
Cable : 4-conductor (0.5mm²) chloroprene shielded cable, 8 mm diameter by 1 m long, bared at the tip	

Mechanical Properties

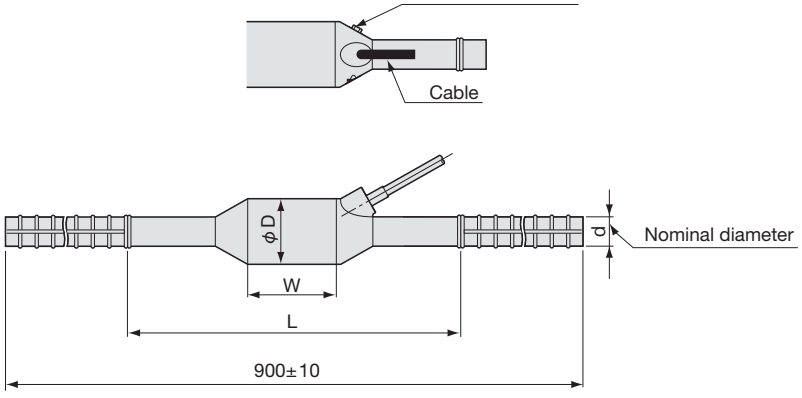
Safe Overload Rating :	110%
Nominal Diameter (Deformed Bar) :	See table below
Weight :	See table below

Other

Applicable Reinforcing Bar :	SD345 (formerly, SD35)

Model	d*	ϕD	W	L	Weight (Approx.)
BF-10CT	D10	43	55	(190)	900g
BF-13CT	D13				1.3kg
BF-16CT	D16	49	56	(200)	1.8kg
BF-19CT	D19				2.5kg
BF-22CT	D22				3.2kg
BF-25CT	D25	61	70	(220)	4.3kg
BF-29CT	D29				5.3kg
BF-32CT	D32				6.3kg

Dimensions

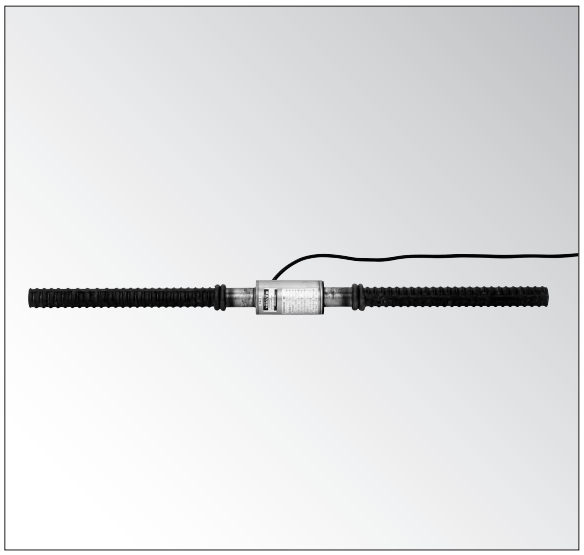


* For grounding of lightning arrester kit.

BFD-A-TS

●Stress Measurement ●300 MPa
●With Temperatare measuring Function

Reinforcing-Bar Stress Transducers



For stress measurement of reinforcing bar

●For long-term stable measurement, the transducer proper features a special structure with inert gas filled in.
●The self-temperature-compensated strain gage used for the transducer enables measurement of temperature stress of the reinforcing bar.

The BFD-A-TS series transducers are designed for stress measurement of reinforcing bars whose nominal diameters are larger than those measured by the BF-CT series. The BFD-A-TS series is used by welding both ends to a reinforcing bar in the field. Select the model suitable for the diameter of the reinforcing bar. Each model provides a temperature measuring function to enable simultaneous measurement of stress and temperature.

Specifications

Performance

●Performance	
Rated Capacity :	300 MPa (1Mpa=1N/mm^2)
(Please contact sales staff about rated capacity for 350 to 400MPa)	
Nonlinearity :	Within±1% RO
Hysteresis :	Within ±1% RO
Rated Output :	1.85 mV/V (3700 μm/m) or more
●Temperature Measurement	
Rated Capacity :	-30 to 70˚C
Measurement Error :	±0.5˚C (-30 to 70˚C)
(Refer to Small-Sized Temperature Transducer BTS-100AT, page 7-30.)	

Environmental Characteristics

Safe Temperature Range :	-30 to 80˚C
Compensated Temperature Range :	-10 to 70˚C
Temperature Effect on Zero Balance :	Within±0.1% RO/C
Temperature Effect on Output :	Within±0.1%/˚C

Electrical Characteristics

Safe Excitation Voltage :	10 V AC or DC
Input Resistance :	350Ω±2% at 0˚C
Output Resistance :	450Ω±2% at 0˚C
Cable : 4-conductor (0.5 mm^2) chloroprene shielded cable,	
8 mm diameter by 1 m long, bared at the tip	

Mechanical Properties

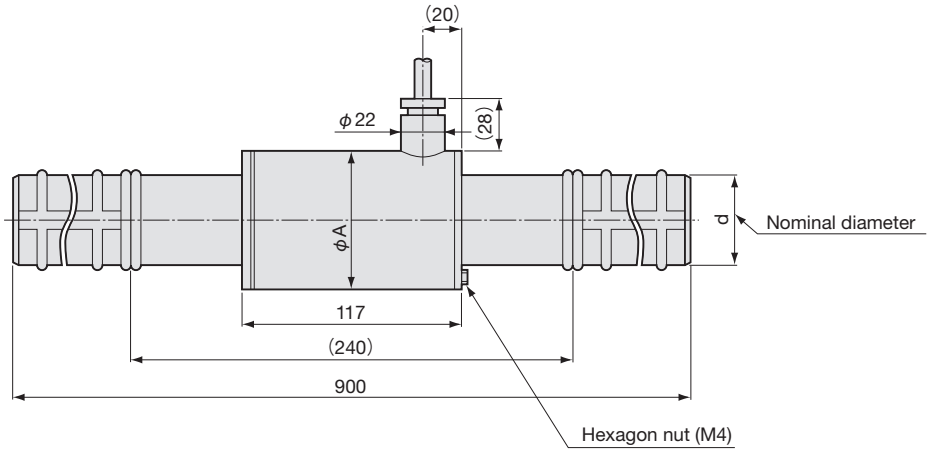
Safe Overload Rating :	110%
Nominal Diameter (Deformed Bar) :	See table below
Material :	Metallic finish

Other

Applicable Reinforcing Bar : SD345 (formerly, SD35)
Reinforcing-Bar : Please provide Reinforcing-Bar for BFD-A-51TS to Kyowa
2 pieces x 335mm long
Calibration : The BFD-A-51TS is calibrated by applying to a single
sensing section, compressive load (approx. 600 kN) equivalent to the
rated capacity of 300 MPa and compressive load (approx. 670 kN)
equivalent to the safe overload rating

Model	ϕA	d (Deformed Bar)
BFD-A-35TS	60.5	D35
BFD-A-38TS	63.5	D38
BFD-A-41TS	70.0	D41
BFD-A-51TS	76.3	D51

Dimensions



* For grounding of lightning arrester kit.

BPB-A/BPB-A-T

Pore Pressure Transducers

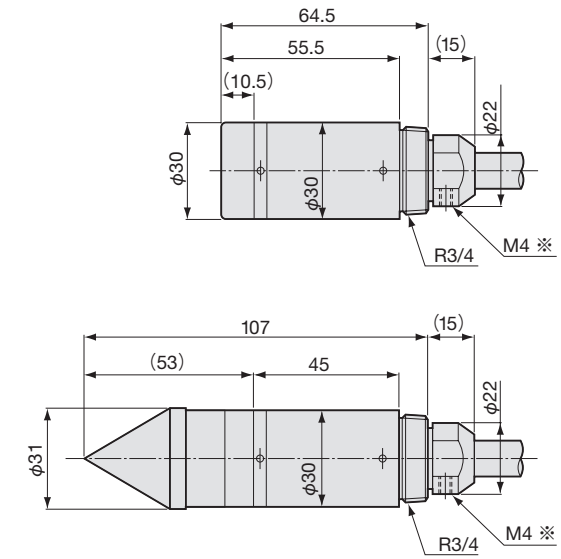
- Water Pressure Measurement
- 200 kPa to 2 MPa
- With Temperature Measuring Function

Embedded in a boring or together with a pile or steel sheet pile. These transducers measure pore water pressure Recommendable Excitation Voltage.

- Small-sized design, 30 mm in outer diameter, enables installation in borings of small diameters.
- Flat filter (10μm mesh standard) is provided to prevent the sensing part from clogging.
- Stainless steel case (including flat filter FB-10SUS)

Embedded in a boring or together with a pile or steel sheet pile, BPB-A/BPB-A-T series transducers measure pore water pressures or pore pressures. If desired, they can be used as pressure-based underground water level transducers by installing in a well. Recommendable Excitation Voltage. The BPB-A-T series is provided with temperature measuring function for simultaneous measurement of pore pressure and temperature. The cable length may be changed as specified.

Dimensions



* For grounding of lightning arrester kit.

Specifications

Performance

Pore Pressure Measurement	
Rated Capacity :	See table below
Nonlinearity :	Within±2% RO (BPB-A-200KP)
	Within ±1% RO (BPB-A-500KP to 2MP)
Hysteresis :	Within ±1% RO
Rated Output :	0.75 mV/V (1500μm/m) or more (BPB-A-200KP)
	1 mV/V (2000μm/m) or more (BPB-A-500KP to 2MP)
Temperature Measurement (BPB-A-T)	
Rated Capacity :	-30 to 70˚C
Measurement Error :	±0.5˚C (-30 to 70˚C)
(Refer to Small-Sized Temperature Transducer BTS-100AT, page 7-30.)	

Environmental Characteristics

Safe Temperature Range :	0 to 80˚C (BPB-A) (non-freezing)
	-30 to 80˚C (BPB-A-T) (non-freezing)
Compensated Temperature Range :	0 to 60˚C (non-freezing)
Temperature Effect on Zero Balance :	Within ±0.1% RO/˚C
Temperature Effect on Output :	Within ±0.1%/˚C

Electrical Characteristics

Recommendable Excitation Voltage :	2 to 10 V AC or DC
Input Resistance :	350Ω±1% (BPB-A-T at 0˚C)
Output Resistance :	350Ω±1%
	(450Ω±0.8% at 0˚C with BPB-A-T)
Cable :	4-conductor (0.5 mm^2) chloroprene shielded cable,
	11.5 mm diameter by 1 m long, bared at the tip

Mechanical Properties

Safe Overload Rating :	150%
Weight :	Approx. 320 g

※Double shielded cable can also be manufactured.

Temperature Measuring Function		Rated Capacity
No	Yes	
BPB-A-200KP		200kPa
BPB-A-500KP	BPB-A-500KP-T	500kPa
BPB-A-1MP	BPB-A-1MP-T	1MPa
BPB-A-2MP		2MPa

BPF and FB Filters for Pore Pressure Transducers

BPF-B

FB

These filters are used to prevent the sensing portion of the pore pressure transducer which is embedded in clay soil or mud from clogging. The standard mesh size is 10μm. If grouting is made around the embedded site, use the 2 μm mesh filter.

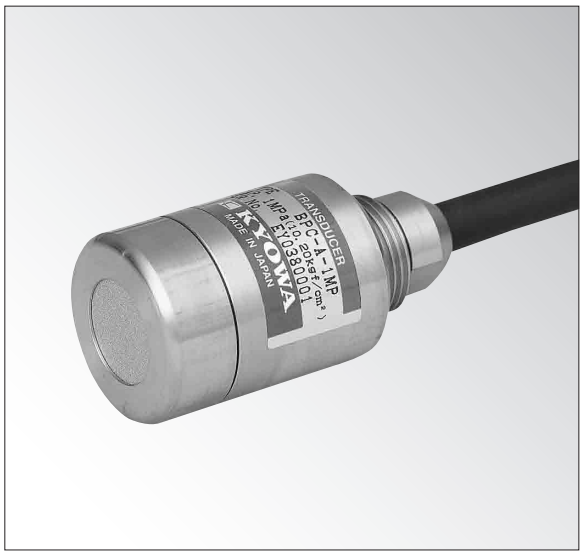
Cone Filter	Flat Filter	Mesh Size
BPF-2B	FB-2	2 μm
BPF-5B	FB-5	5 μm
BPF-10B	FB-10SUS	10 μm
	FB-40	40 μm
	FB-100	100 μm

※Filter section is made of brass, sintered metallic finish.
※10μm flat filter only is made of stainless steel.

BPC-A

Pore Pressure Transducers

●Water Pressure Measurement
●200 kPa to 2 MPa



For underground pore pressure measurement

●Double-cased structure ensures measurement without receiving any effect of lateral pressure.
●Flat filter (10μm mesh standard) is provided to prevent the sensing part from clogging.
● Stainless steel case (including flat filter FB-10SUS)

Embedded in soil, BPC-A transducers measure underground pore pressures. A double-cased structure lets them perform without receiving any adverse effect from lateral pressures and makes them suitable for measurement where underground soil pressures change significantly. The cable length may be as desired.

Specifications

Performance

●Pore Pressure Measurement	
Rated Capacity :	See table below
Nonlinearity :	Within±2% RO (BPC-A-200KP)
	Within ±1% RO (BPC-A-500KP to 2MP)
Hysteresis :	Within±1% RO
Rated Output :	0.75 mV/V (1500μm/m) or more (BPC-A-200KP)
	1 mV/V (2000μm/m) or more (BPC-A-500KP to 2MP)

Environmental Characteristics

Safe Temperature Range :	0 to 80℃ (BPC-A) (non-freezing)
Compensated Temperature Range :	0 to 60℃ (non-freezing)
Temperature Effect on Zero Balance :	Within±0.1% RO/℃
Temperature Effect on Output :	Within±0.1%/℃

Electrical Characteristics

Recommendable Excitation Voltage :	2 to 10V AC or DC
Input Resistance :	350±1%
Output Resistance :	350Ω±1%
Cable : 4-conductor (0.5 mm²) chloroprene cable,	
11.5 mm diameter by 1 m long, bared at the tip	

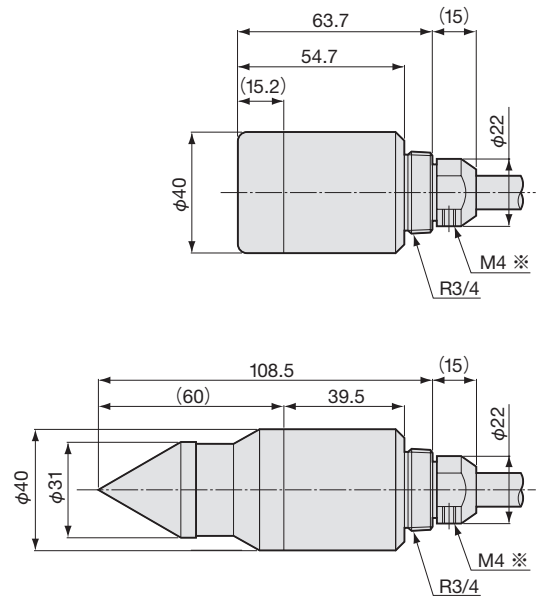
Mechanical Properties

Safe Overload Rating :	150%
Weight :	Approx. 550 g

※Double shielded cable can also be manufactured.

Mode	Rated Capacity
BPC-A-200KP	200kPa
BPC-A-500KP	500kPa
BPC-A-1MP	1MPa
BPC-A-2MP	2MPa

Dimensions



* For grounding of lightning arrester kit.

BPF and FB Filters for Pore Pressure Transducers

BPF-C

FB

These filters are used to prevent the sensing portion of the pore pressure transducer which is embedded in clay soil or mud from clogging. The standard mesh size is 10μm. If grouting is made around the embedded site, use the 2μm mesh filter.

Cone Filter	Flat Filter	Mesh Size
BPF-2C	FB-2	2μm
BPF-5C	FB-5	5μm
BPF-10C	FB-10SUS	10μm
	FB-40	40μm
	FB-100	100μm

※Filter section is made of brass, sintered metallic finish.
※10-μm flat filter only is made of stainless steel.

BPG-A-S

●Water Pressure Measurement ●200 & 500 kPa

High-Sensitivity Pore Pressure Transducers

Suitable for high sensitivity measurement of underground water level.

- ●High sensitivity (4000μm/m) and high accuracy (±0.5% RO)
- ●Excellent temperature characteristics (±0.02% RO/℃)
- ●Cone filter attached (possible to replace to a flat filter)

Featuring rated output of 4000μm/m, the BPG-A-S series pore pressure transducers provide a sensitivity twice as high as ordinary units. Thus, they are suitable for precise measurement of underground water level etc by embedding in a well, etc.

Specifications

Performance

Rated Capacity :	BPG-A-200KPS : 200kPa
	BPG-A-500KPS : 500kPa
Nonlinearity :	Within±0.5% RO
Hysteresis :	Within±0.5% RO
Rated Output :	2 mV/V (4000 μm/m) ±2%
Safe Temperature Range :	-20 to 70℃ (non-freezing)

Environmental Characteristics

Compensated Temperature Range :	-10 to 60℃(non-freezing)
Temperature Effect on Zero Balance :	Within±0.02% RO/℃
Temperature Effect on Output :	Within±0.02%/℃

Electrical Characteristics

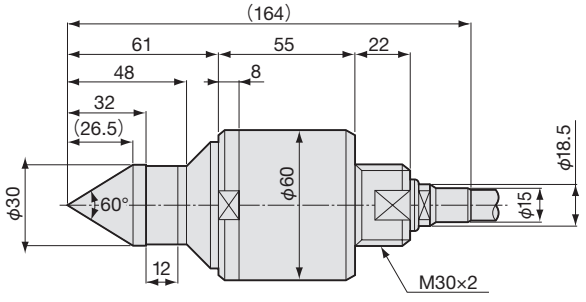
Input Resistance :	350Ω±1%
Output Resistance :	350Ω±1%
Cable :	4-conductor (0.5 mm²) chloroprene shielded cable,
	10 mm diameter by 1 m long, bared at the tip
	(Shield is not connected to the mainframe.)
Safe Overload Rating :	120%

Mechanical Properties

Material :	Stainless steel metallic finish (filter sintered brass metallic finish
Water Pressure Resistance of Cable Outlet :	240kPa(200KPS)
	600kPa(500KPS)
Weight :	Approx, 800g

Note:10μm flat filter stanless steel only

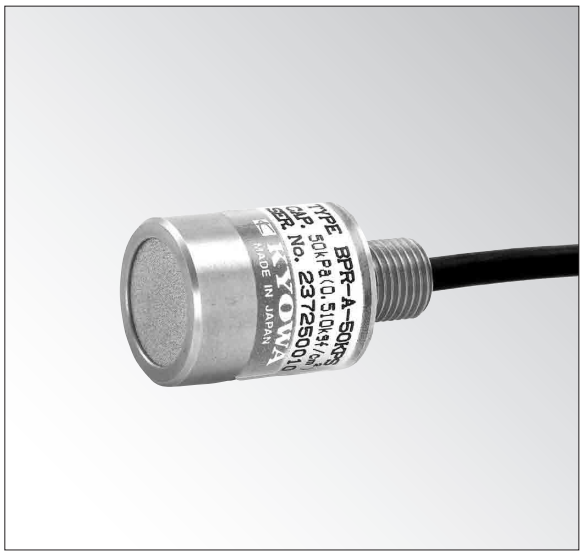
■Dimensions



BPR-A-S

●Water Pressure Measurement ●50 to 200 kPa

Small-Sized Pore Pressure Transducers



Suitable for model experiments,Highly-sensitive,small levels of pore pressure.

●Small-size (20 mm diameter), small rated capacity (50 to 200 kPa) and high sensitivity (2000μm/m)
●Filter is stainless (standard 10μm)

Featuring an outer diameter of 20 mm, the BPR-A-S series is highly sensitive transducers for measurement of small levels of pore pressure. A watertight design enables embedment applications and makes them suitable for model experiments.

Specifications

Performance

Rated Capacity :	See table below
Nonlinearity :	Within±1% RO (within±2% RO with 50KPS)
Hysteresis :	Within±1% RO
Rated Output :	Approx. 0.4 to 0.6 mV/V (800 to 1200μm/m) (50KPS)
	Approx. 0.8 to 1.2 mV/V (1600 to 2400μm/m) (100KPS)
	1 mV/V (2000μm/m) or more (200KPS)

Environmental Characteristics

Safe Temperature Range :	0 to 80°C (non-freezing)
Temperature Effect on Zero Balance :	Within±0.8% RO/°C (50KPS)
	Within±0.4% RO/°C (100KPS)
	Within±0.2% RO/°C (200KPS)
Temperature Effect on Output :	Within±0.1%/°C

Electrical Characteristics

Safe Excitation Voltage :	8V AC or DC
Input Resistance :	120Ω±5%
Output Resistance :	120Ω±5%
Cable :	4-conductor (0.08 mm²) chloroprene shielded cable,
	4 mm diameter by 10 m long, terminated with NDIS
	connector plug (Shield is not connected to the chassis.)

Mechanical Properties

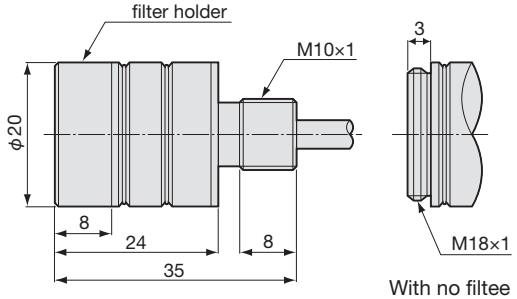
Safe Overload Rating :	120%
Case :	Stainless steel metallic finish
Weight :	Approx. 35 g

Model	Rated Capacity
BPR-A-50KPS	50kPa
BPR-A-100KPS	100kPa
BPR-A-200KPS	200kPa

To Ensure Safe Usage

For long-term measurement, it is recommended to separately measure temperature and atmospheric pressure for compensation of measured values.

Dimensions

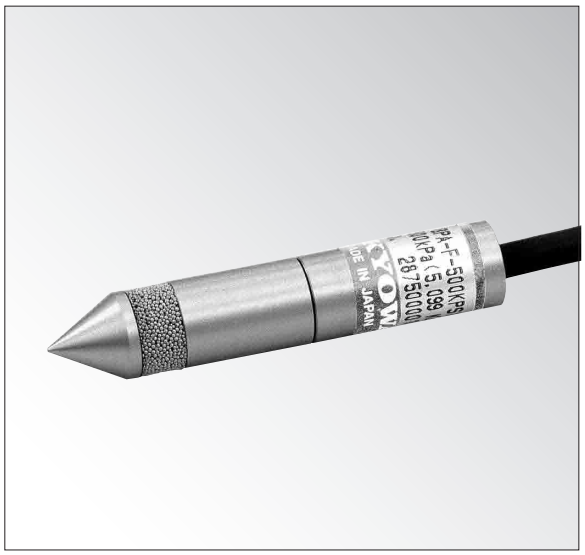


Filter is thrusted into the filter holder, which can be removed from the pressure sensor.
※Flat filter only is usable and any cone filter cannot be used.

BPA-F-S

●Water Pressure Measurement ●200 & 500 kPa

Small-Sized Pore Pressure Transducers



Suitable for indoor model experiments such as liquefaction tests.

- ●Small-sized, 10 mm in diameter
- ●Watertight design enabling embedment applications for short-term experiments
- ●Suitable for indoor experiments such as liquefaction tests
- ●Cone or flat tip type can be used properly.

Featuring an outer diameter of 10 mm, the BPA-F-S series pore pressure transducers are suitable for indoor model experiments such as liquefaction tests. Cone or flat tip type can properly be used according to the test condition.

Specifications

Performance

Rated Capacity :	BPA-F-200KPS : 200kPa
	BPA-F-500KPS : 500kPa
Nonlinearity :	Within±1% RO
Hysteresis :	Within±1% RO
Rated Output :	0.85 mV/V (1700 μm/m) ±30% (200KPS)
	1 mV/V (2000 μm/m) ±20% (500KPS)
Safe Temperature Range :	0 to 70˚C (non-freezing)

Environmental Characteristics

Compensated Temperature Range :	0 to 50˚C(non-freezing)
Temperature Effect on Zero Balance :	Within±0.3% RO/˚C
Temperature Effect on Output :	Within±0.3%/˚C
Safe Excitation Voltage :	3V AC or DC

Electrical Characteristics

Input Resistance :	350Ω±10%
Output Resistance :	350Ω±10%
Cable :	4-conductor (0.08 mm²) FTFE shielded cable,
	4 mm diameter by 3 m long, bared at the tip
	(Shield is not connected to the chassis.)
Safe Overload Rating :	120% (100% with 500KPS)

Mechanical Properties

Water Pressure Resistance of Cable Outlet :	Approx. 240 kPa (200KPS)
	Approx. 500 kPa (500KPS)
Material :	Stainless steel (filter sintered brass metallic finish)
Weight :	Approx. 40 g

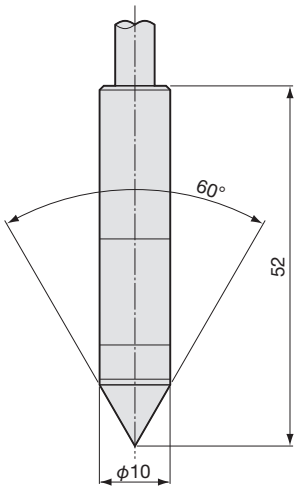
Standard Accessories

Filters
Cone type, 40μm (attached with main body) and 100μm
Flat type, 40μm and 100μm
Cone filter fixture (attached with main body), Flat filter fixture

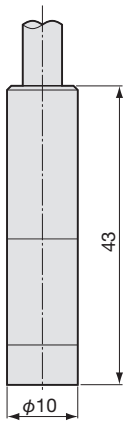
To Ensure Safe Usage

For long-term measurement, it is recommended to separately measure temperature and atmospheric pressure for compensation of measured values.

■Dimensions



With cone filter mounted

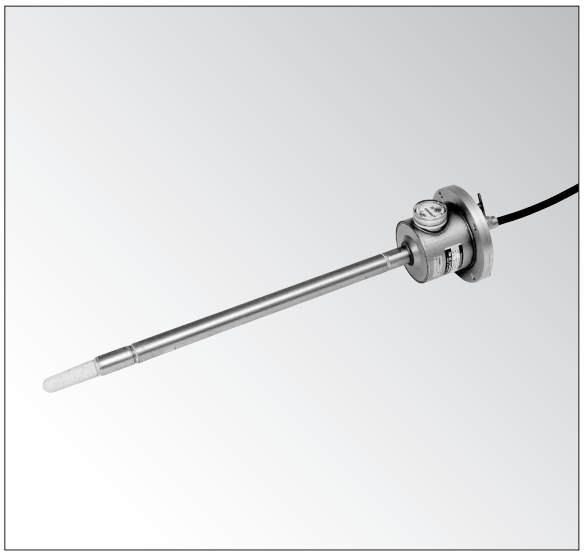


With flat filter mounted

BPT-A-80KPS

Soil Moisture Transducer

●Water Pressure Measurement ● -80 kPa



This transducer is suitable for measurement of soil moisture absorbing force and proper for management of plant cultivation

The BPT-A-80KPS is a soil moisture transducer designed to measure water pressure in a vessel equipped with a porous cup (porous ceramic tube) and filled with degassed water. If the soil around the embedded porous cup is dry, the soil absorbs water from the vessel via the porous cup. By measuring this negative pressure (water absorbing pressure), the amount of moisture in the soil is obtained. Thus, this transducer is applicable not only to check for possible landslide or grasp the stability of a banking but also to know changing soil moisture and proper irrigation time in plant caltivation.

Specifications

Performance

Rated Capacity :	-80kPa
	200 kPa for positive pressure
Nonlineacity :	Within±0.5% RO
Hysteresis :	Within±0.5% RO
Rated Output :	-0.8 mV/V (-1600μm/m) or more

Environmental Characteristics

Safe Temperature Range :	0 to 80℃(non-freezing)
Compensated Temperature Range :	0 to 70℃ (non-freezing)
Temperature Effect on Zero Balance :	Within±0.05% RO/℃
Temperature Effect on Output :	Within±0.05%/℃

Electrical Characteristics

Safe Excitation Voltage :	10V AC or DC
Input Resistance :	350Ω±2%
Output Resistance :	350Ω±2%
Cable :	4-conductor (0.5 mm²) chloroprene shielded cable,
	10 mm diameter by 1 m long, bared at the tip
	(Shield is not connected to the chassis.)

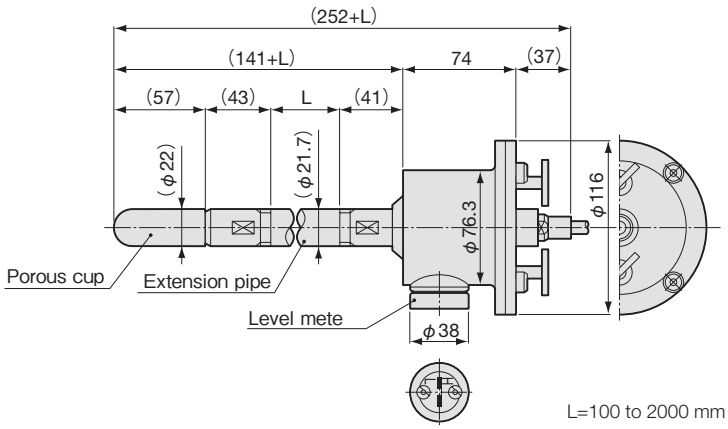
Mechanical Properties

Safe Overload Rating :	100%
Case :	Stainless steel metallic finish
	(excluding porous cup and level meter)
Weight :	Approx. 3.5 kg

To Ensure Safe Usage

The BPT-A-80KPS is delivered with a vessel filled with degassed water. Never store it unused for a long period of time. Embed it upon purchasing.

Dimensions



L=100 to 2000 mm (as specified)

BR-BT

Stress Transducers

●Stress Measurement ●2 to 10MPa
●With Temperature Measuring Function

Enables measure concrete stress directly as stress and not via strain

●Theoretically backed performance of direct concrete stress measurement with no conversion from a detected strain quantity.
●Receive minimal effects of creep and changing elastic modulus of concrete. and there by ensure accurate stress measurement.
●Also usable for stress measurement of the natural ground by installing at the rear of a tunnel lining.

A temperature measuring function enable them to measure stress and temperature simultaneously.

Specifications

Performance

●Stress Measurement	
Rated Capacity :	See table below
Nonlinearity :	Within±1% RO
Hysteresis :	Within±0.5% RO
Rated Output :	±1mV/V(±2000μm/m) or more
●Temperature Measurement	
Rated Capacite :	-30 to 70℃
Temperature Measurement Error :	±0.5℃(-30 to 70℃)
	(Refer to small-sized temperature
	transducer BTS-100AT, Page 7-30)

Environmental Characteristics

Safe Temperture :	-30 to 80℃
Compensated Temperature :	-20 to 70℃
Temperature Effect on Zero Balane :	Within±0.05%RO/℃
Temperafure Effect on Output :	Within±0.05%/℃

Electrical Characteristics

Recommended Fxcitation Voltage :	2 to 10V AC to DC
Input Resistance at 0° :	350Ω±1%
Output Resistance at 0° :	450Ω±0.8%
Cable :	4-conductor(0.5mm²) chloroprene-coated cable of
	8mm diameter by 1m long.bared at the tip

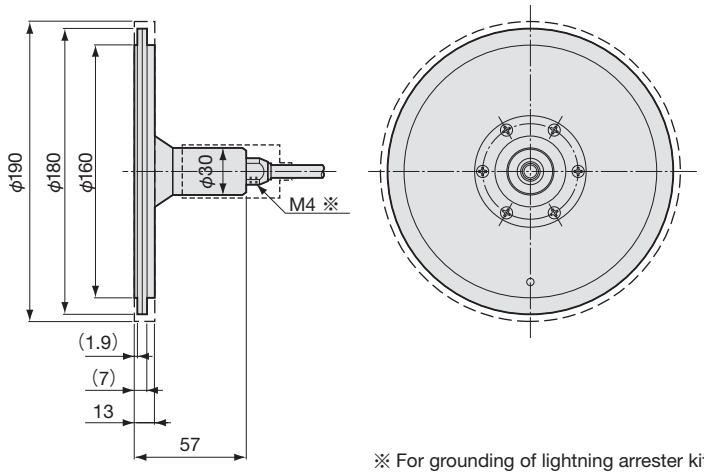
Mechanical Properties

Safe over load Rating :	150% (120% for 100KBT)
Weight :	Approx. 2.9kg

Model	Rated Capacity
BR-20KBT	2MPa
BR-50KBT	5MPa
BR-100KBT	10MPa

※Models providing smaller rated capacities (200k,500k,and 1Mpa) manufactured on option.

■Dimensions



※ For grounding of lightning arrester kit.

BWL-ET

Water Level Transducers

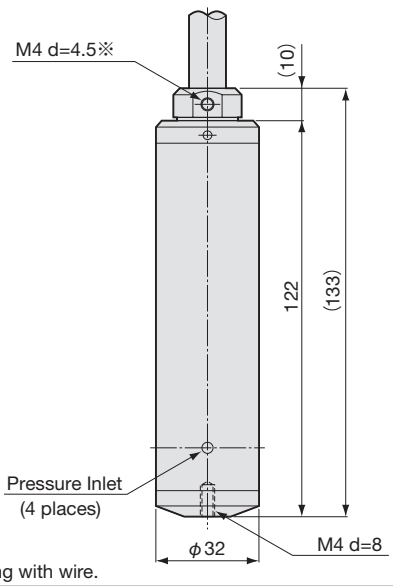
●Water Level Measurement ●10 to 30 m
●With Temperature Measuring Function

Suitable for measure changing underground water levels in landslide areas.

- ●Stainless steel enclosure ensures excellent corrosion resistance, while a built-in lightning arrester assures safe operation without receiving any effect of thunderbolts.
- ●Simultaneous measurement of water level and water temperature
- ●Easy installation, maintenance and inspection
- ●Applicable for measurement of underground water levels in landslide areas and water levels of dams, rivers, intake wells and tanks

The BWL-ET series is strain gage type water level transducers designed to measure changing underground water levels in landslide areas, etc. They do not require any compensation against fluctuations in atmospheric pressure, and thus ensure accurate measurement. A temperature measuring function lets them perform simultaneous measurement of water level and temperature.

■Dimensions



※For hanging with wire.

Specifications

Performance

●Water Level Measurement	
Rated Capacity :	See table below
Nonlinearity :	Within±0.15% RO
Hysteresis :	Within±0.10% RO
Repeatability :	0.05% RO or less
Rated Output :	2 mV/V (4000μm/m) or more
●Temperature Measurement	
Rated Capacity :	-20 to 60˚C
Measurement Error :	±0.5˚C (-20 to 60˚C)
(Refer to Small-Sized Temperature Transducer BTS-100AT, page 7-30.)	

Environmental Characteristics

Safe Temperature Range :	-20 to 60˚C (non-freezing)
Compensated Temperature Range :	0 to 50˚C (non-freezing)
Temperature Effect on Zero Balance :	Within±0.01% RO/˚C
Temperature Effect on Output :	Within±0.01%/˚C

Electrical Characteristics

Safe Excitation Voltage :	10 V (Current 28.5 mA)
Recommended Excitation Voltage :	2 to 6 V (Current 5.7 to 17.1 mA)
Input Resistance :	350Ω±2% at 0˚C
Output Resistance :	450Ω±2% at 0˚C
Cable : 4-conductor (0.5 mm²) capillary-equipped chloroprene	
shielded cable, 11.3 mm diameter,	
bared at the tip (Shield is not connected to the chassis)	

Mechanical Properties

Safe Overload Rating :	150%
Weight :	Approx. 400 g

Other

Built-in lightning arrester
Atmospheric pressure compensation type

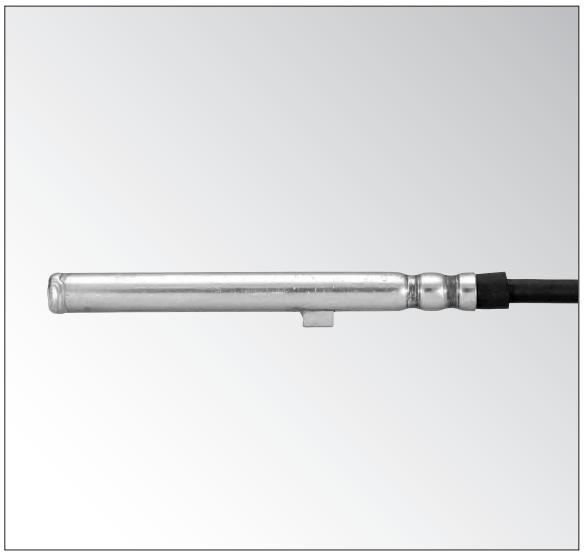
※For use under freezing environment or where the transducer is exposed to corrosive liquid or gases, contact a KYOWA sales representative.

Model	Rated Capacity (Water Level)	Cable Length
BWL-10MET	10m	30m
BWL-20MET	20m	40m
BWL-30MET	30m	50m

BT-100B

Temperature Transducer

●Temperature Measurement ● -30 to 70 ˚C



Specifications

Performance

Rated Capacity :	-30 to 70˚C
Measurement Error :	±0.3˚C (-30 to 70˚C)
Output :	50μV/V/˚C (100μm/m/˚C)

Electrical Characteristics

Input Resistance :	350Ω +0.3%/-0% at 25˚C
Output Resistance :	350Ω +0.3%/-0% at 25˚C
Cable :	4-conductor (0.5 mm²) chloroprene cable,
	8 mm diameter by 1 m long, bared at the tip

Mechanical Properties

Water Pressure Resistance :	200kPa
Weight :	Approx. 120 g

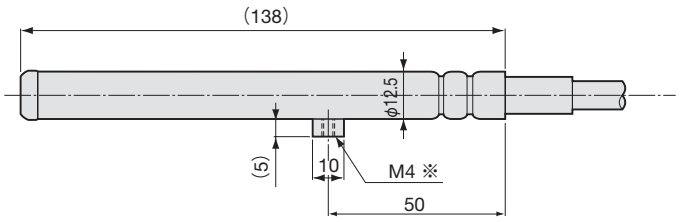
※Model with a water pressure resistance higher than 200 kPa can also be manufactured. Inquiries are welcome.

Temperature measurement for many kind of structures

●Resolution as high as 0.01˚C with measurement error of only ±0.3%
●High water pressure resistance of 200 kPa enables underground embedment or water temperature measurement.

Embedded in concrete or soil, the BT-100B temperature transducer can be used to measure temperature distribution in structures or temperature for compensation of linear expansion coefficient of concrete.

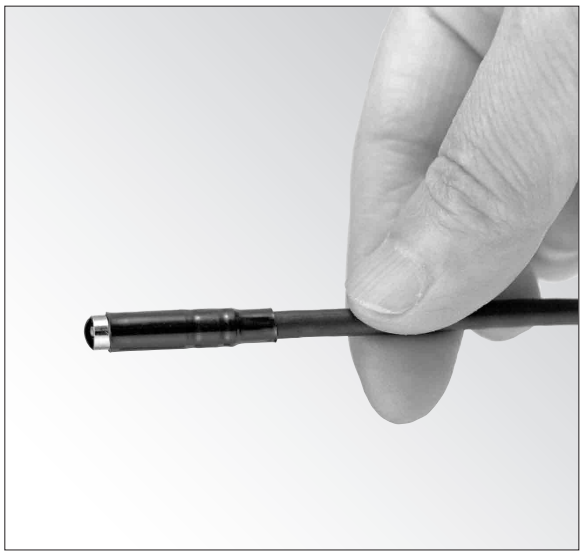
■Dimensions



※For grounding of lightning arrester kit.

BTS-100AT

Small-Sized Temperature Transducer



●Temperature Measurement ● -30 to 70 ˚C

Specifications

Performance

Rated Capacity :	-30 to 70˚C
Measurement Error :	±0.5˚C (-30 to 70˚C)
	(when used in combination with UCAM-65B
	or UCAM-60B)

Electrical Characteristics

Cable :	4-conductor (0.08 mm^2) chloroprene shielded cable,
	4 mm diameter by 5 m long, bared at the tip
	(Shield is not connected to the chassis)

Mechanical Properties

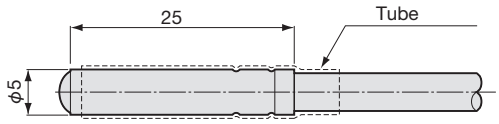
Weight : Approx. 10 g

Small-Sized Temperature Transducer for model experiment

- ●Small sized, 5 mm in outer diameter
- ●Usable only in combination with a measuring instrument compatible with resistance thermometer sensors
- ●Embedment applications possible for model experiments and short-term measurements.

The BTS-100AT is a temperature transducer using a temperature measuring resistor (Pt100 JIS) which is provided for transducers with a temperature measuring function. A special small-sized design makes the transducer suitable for model experiments.

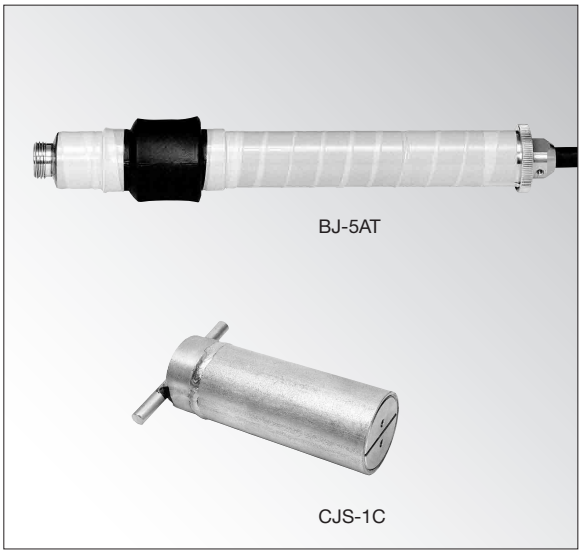
■Dimensions



BJ-AT

Joint Transducers

●Displacement Measurement ●5 to 50 mm
●With Temperature Measuring Function

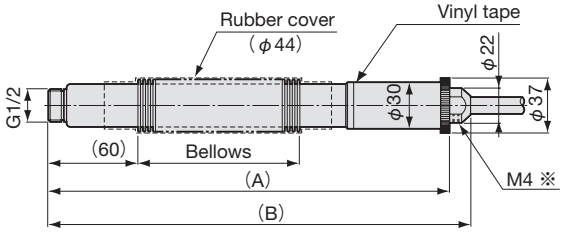


Suitable to check concrete blocks for opening at the joint.

●Suitable to check concrete blocks for an opening at the joint or cracks initiated mainly by temperature change
●Mounting fixtures are available to measure an opening between a hydraulic pipe and backing concrete, as well as to use them as ordinary displacement transducers to check for deformation of blocks at dam monitoring areas or to detect displacement of rock-bed.
●For embedment in concrete, the dedicated receptacle CJS-1C is embedded in advance in a preceding block and the joint transducer is installed to the next block.

Embedded across a joint of adjoining concrete blocks, the BJ-AT series joint transducers measure an opening between blocks. A temperature measuring function enables simultaneous measurement of displacement and temperature. In addition, for measurement of cracks of concrete or rock-bed, a dedicated receptacle allows embedment in concrete and mounting legs or fixtures enable surface installation.

■Dimensions



※For grounding of lightning arrester kit.

Specifications

Performance

●Displacement Measurement	
Rated Capacity :	See table below
Nonlinearity :	Within±1.5% RO
Hysteresis :	Within±1.5% RO
Rated Output :	1 mV/V (2000μm/m) or more
●Temperature Measurement	
Rated Capacity :	-30 to 70˚C
Measurement Error :	±0.5 ˚C (-30 to 70˚C)
(Refer to Small-Sized Temperature Transducer BTS-100AT, page 7-30.)	

Environmental Characteristics

Safe Temperature Range :	-30 to 80˚C
Compensated Temperature Range :	-20 to 70˚C
Temperature Effect on Zero Balance :	Within±0.05% RO/˚C
Temperature Effect on Output :	Within±0.05%/˚C

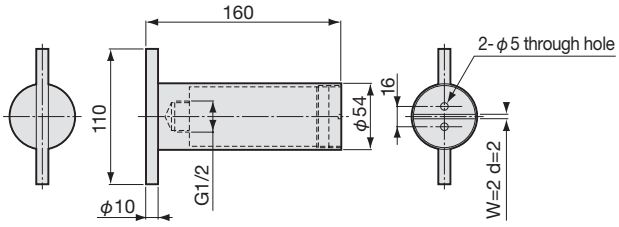
Electrical Characteristics

Recommended Excitation Voltage :	2 to 10V AC or DC
Input Resistance :	350Ω±1% at 0˚C
Output Resistance :	450Ω±0.8% at 0˚C
Cable :	4-conductor (0.5 mm²) chloroprene shielded cable,
	11.5 mm diameter by 1 m long, bared at the tip

Mechanical Properties

Safe Overload Rating :	120%
Weight :	Approx. 790 g

Optional Accessory Dedicated receptacle CJS-1S



CJS-1C

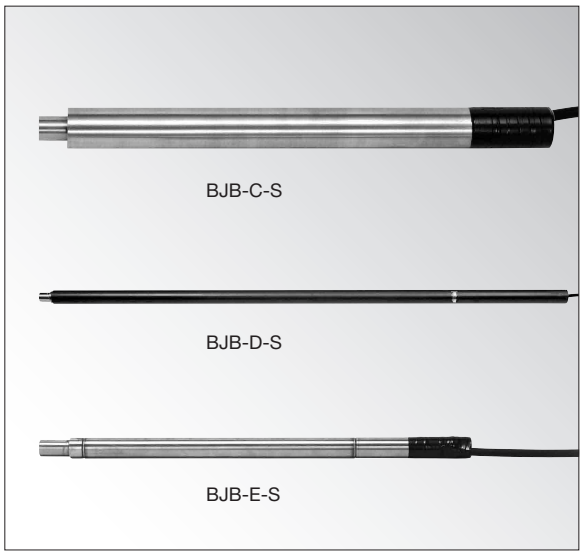
※For surface installation and various mounting fixtures, contact KYOWA sales representative.
※For ordinary displacement transducers, refer to pages 2-133 to 143.

Model	Rated Capacity (Displacement)	A (Approx.)	B (Approx.)	Bellows (Approx.)
BJ-5AT	5mm	260	275	25
BJ-10AT	10mm			
BJ-20AT	20mm	260	275	50
BJ-50AT	50mm	270	285	100

BJB-C-S/D-S/E-S

Displacement Transducers

●Displacement Measurement ●50 to 2000 mm



3 models are available for selection of the most suitable one.

- ●BJB-C-S series is suitable for ordinary measurement of rock-bed displacement.
- ●BJB-D-S series is available with high rated capacities and is suitable for measurement of the settlement of soft ground.
- ●Slender BJB-E-S series is suitable for embedment in a boring and for rock-bed displacement measurement in NATM.

The BJB-C-S, BJB-D-S and BJB-E-S series displacement transducers are used as detectors for measurement of rock-bed displacement and ground settlement. Varieties of models are available for selection of the most suitable one based on the measuring range, dimensions and field situations.

Specifications

Performance

Rated Capacity :	See table below
Nonlinearity :	Within±2% RO
Hysteresis :	Within±1% RO
Rated Output :	1 mV/V (2000μm/m) or more

Environmental Characteristics

Safe Temperature Range :	-20 to 70℃
Compensated Temperature Range :	-10 to 60℃
Temperature Effect on Zero Balance :	Within±0.1% RO/℃
Temperature Effect on Output :	Within±0.1%/℃

Electrical Characteristics

Recommended Excitation Voltage :	10V AC or DC
Input Resistance :	350Ω±2%
Output Resistance :	350Ω±2%

Cable : 4-conductor (0.5 mm²) chloroprene cable, bared at the tip

Model	Diameter (mm)	Cable Length (m)
BJB-C-S	11.5	1
BJB-D-S	11.5	2
BJB-E-S	8	1

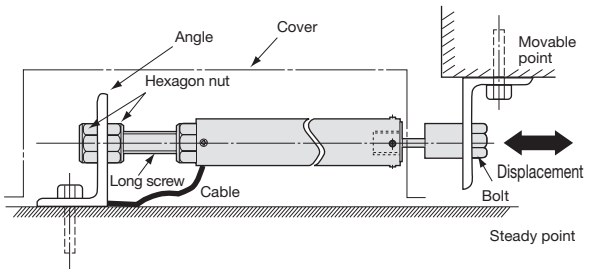
Mechanical Properties

Safe Overload Rating :	120% (110% with BJB-D-S)
Measuring Force :	Approx. 78 N

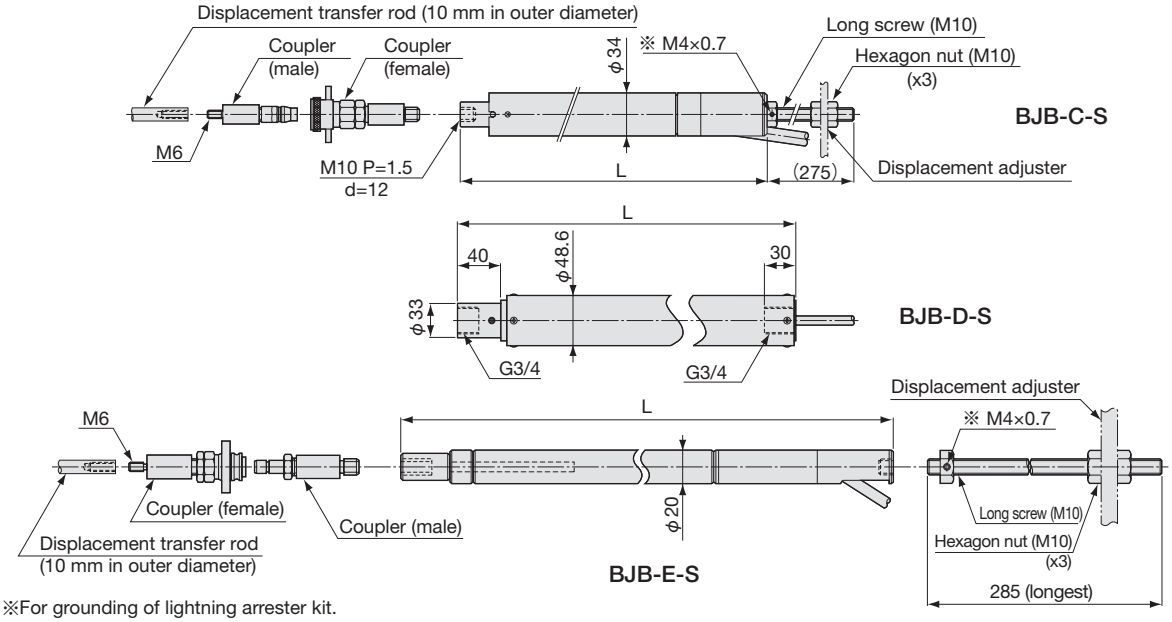
※ Various mounting fixtures extend the application range. For details, contact a KYOWA sales representative.
※ For ordinary displacements, refer to page 2-133 to 143.

Model	Rated Capacity	L (mm)	Remarks
BJB-C-100S	100mm	455	With coupler
BJB-C-200S	200mm	640	
BJB-D-500S	500mm	1144	Used as detector of SVC, SVM, SDD
BJB-D-1KS	1000mm	1859	
BJB-D-2KS	2000mm	3289	
BJB-E-50S	50mm	417	With coupler
BJB-E-100S	100mm	416	

■Installation Example



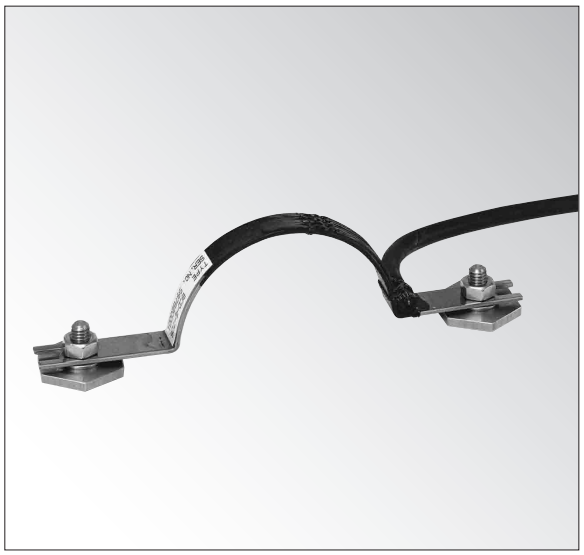
■Dimensions



※For grounding of lightning arrester kit.

BCD-E-70S

Concrete Surface Displacement Transducer



- Displacement Measurement
- 1.4 mm for tension & 0.35 mm for compression

Specifications

Performance

Rated Capacity :	2% tensile strain or less (0 to 1.40 mm)
	0.5% compressive strain or less (0 to 0.35 mm)
	(with a gage mark distance of 70 mm)
Nonlinearity :	Within±3% RO
Hysteresis :	Within±3% RO
Rated Output:	Approx. 2.5 mV/V (approx. 5000μm/m)
(when a displacement is given to the rated tensile capacity	
from 0.5% compressive strain as the origin)	

Environmental Characteristics

Safe Temperature Range :	-20 to 70˚C
Compensated Temperature Range :	-10 to 60˚C
Temperature Effect on Zero Balance :	Within±0.1% RO/˚C
Temperature Effect on Output :	Within±0.1%/˚C

Electrical Characteristics

Safe Excitation Voltage :	10V AC or DC
Input Resistance :	120Ω±10%
Output Resistance :	120Ω±10%
Cable :	4-conductor (0.08 mm²) ETFE shielded cable,
	4 mm diameter by 3 m long, bared at the tip diameter by 3 m

Mechanical Properties

Safe Overload Rating :	110%
Measuring Force :	Approx. 1.96 N (for 2.0% tensile strain)
Weight :	Approx. 15 g

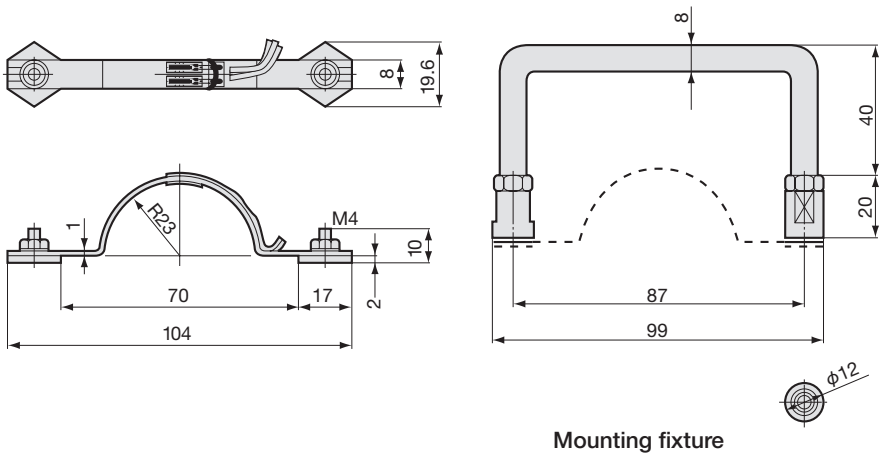
Optional Accessory Mounting fixture BCD-E-70SJ

For indoor testing of concrete loads

- A dedicated mounting fixture and adhesive facilitate mounting on concrete surfaces.
- Screw fixing makes it reusable.
- Easy installation for applications to other than concrete

The BCD-E-70S is a surface displacement transducer developed for indoor testing of concrete loads.

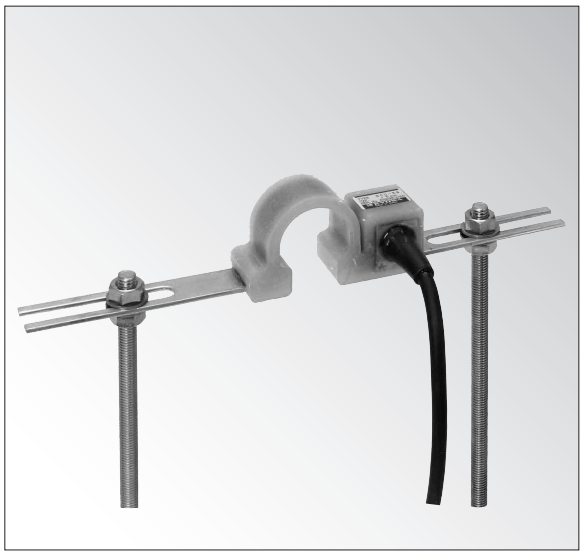
Dimensions



Mounting fixture
BCD-E-70SJ

BCD-5B

Crack Displacement Transducer



- Displacement Measurement
- ±5 mm

Specifications

Performance

Rated Capacity :	±5 mm
Nonlinearity :	Within±2% RO
Hysteresis :	Within±2% RO
Repeatability :	2% RO or less
Rated Output :	±1 mV/V (±2000μm/m)±5%

Environmental Characteristics

Safe Temperature Range :	-10 to 60˚C

Electrical Characteristics

Recommended Excitation Voltage :	2 to 10V AC or DC
Input Resistance :	350Ω±2%
Output Resistance :	350Ω±2%
Cable :	4-conductor (0.3mm²) chloroprene shielded cable,
	7.6 mm diameter by 1 m long,
	bared at the tip (Shield is not connected to the chassis)

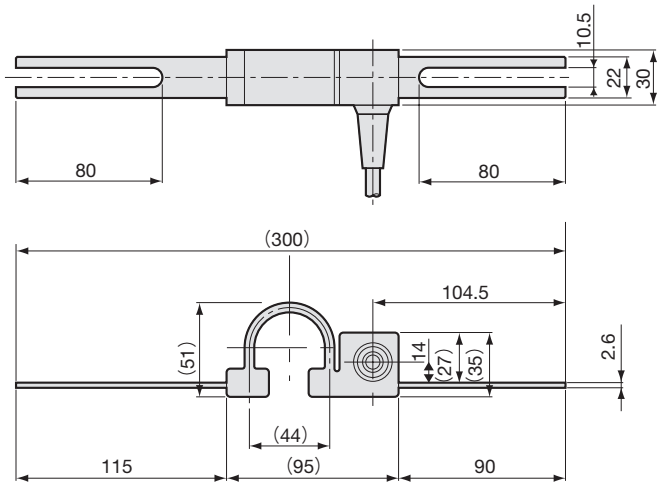
Mechanical Properties

Safe Overload Rating :	150%
Measuring Force :	Approx. 9.8 N/5 mm
Weight :	Approx. 450 g

Easy to install even on a weak rock-bed for accurate measurement.

The BCD-5B crack displacement transducer is designed to measure cracks occurring in concrete structures and rock-beds of mines and quarries. Conventional crack displacement transducers have large measuring force and cannot ensure high measuring accuracy unless mounted sturdily. Furthermore, they are difficult to install on a weak rock-bed. By contrast, the BCD-5B provides an extremely small measuring force and is easy to install even on a weak rock-bed for accurate measurement.

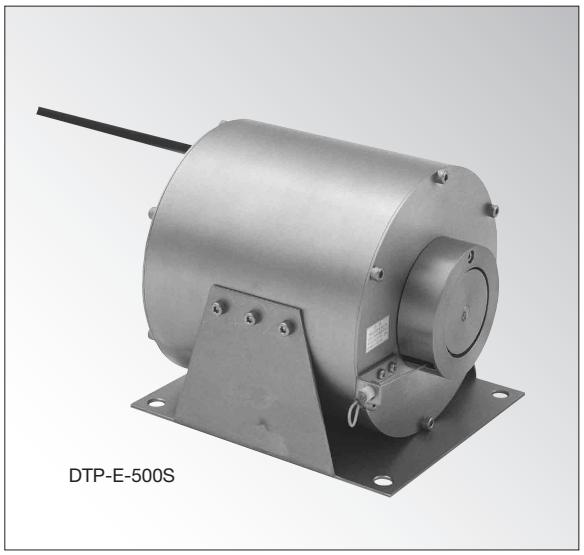
Dimensions



DTP-E-S

●Displacement Measurement ●500 to 2000mm

Drip Proof Large-Capacity Displacement Transducers



DTP-E-500S

Suitable for large displacement by dripproof structure

- ●Displacement measurement by expansion and contraction (winding)of wire
- ●Compact size and low measuring force.
- ●Connectable to strain amplifier for measurement
- ●Resolution Approx.1/1850

The DTP-E-S series are potentiometer-based transducers for measurement of large displacement. A dripproof structure enables applications where they may be splashed with water or involving highly humid environment.

To ensure Safe Usage

This Transducer cannot be used for a dynamic measurement,a measurement object with rapid movement and a micro vibration.

Specifications

Performance

Rated Capacity :	See table below
Nonlinearity :	Within±1% RO
Hysteresis :	Within±1% RO
Rated Output :	Approx : 5mV/V(10000μm/V)
Resolution :	1/1850

Environmental Characteristics

Operating Temperature Range : -10 to 60˚C

Electrical Characteristics

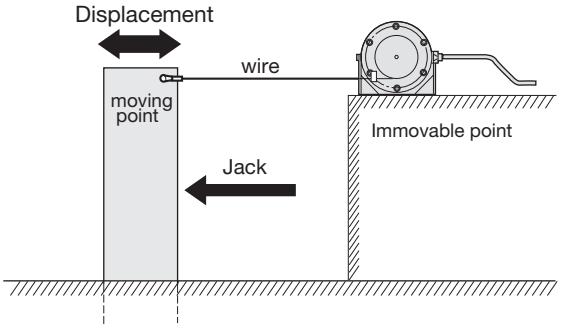
Detection Method :	Potentiometer based
Safe Excitation Voltage :	10V AC or DC
Recommended Rxcitantion Voltage :	1 to 5 V AC or DC
Input Resistance :	350Ω±5%
Dutput Resistance :	350Ω±5%
Cable :	4-conductor(0.5mm^2 shielded chloroprehe-coated cable
	of lomm diameter by 3m long
	bare at the tip (Shield is not connected to the chassis)

Mechanical Properties

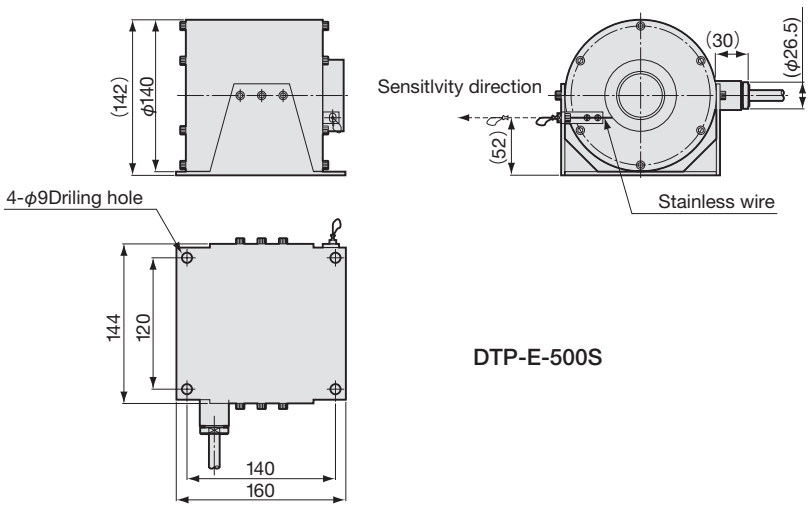
Safe Overload Rating :	120%
Measuring Force :	See table below
Cycling life :	10^4 times
Degree of Protection :	IP67 dripproofin conformity to JIS(C0920)
Enclolsure :	Stainless

Model	Rated Capacity	Measuring force (Approx)
DTP-E-500S	500mm	9.8N
DTP-E-1KS	1000mm	4.9N
DTP-E-2KS	2000mm	

■Displacement



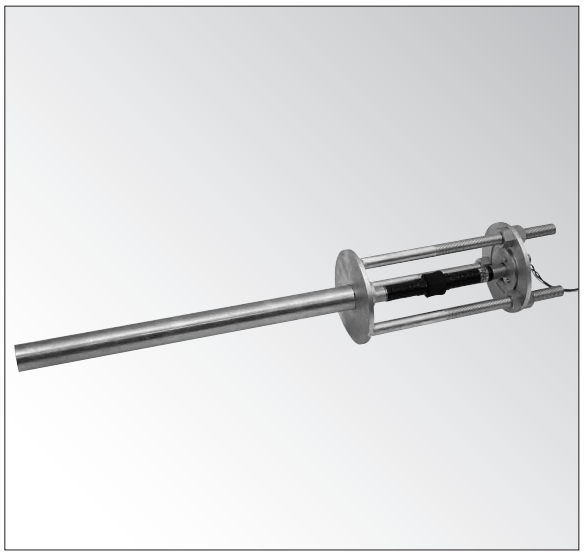
■Displacement



DTP-E-500S

BRD-AT

Rock-Bed Compression Displacement Transducers



- Displacement Measurement
- 5 to 50 mm
- With Temperature Measuring Function

Specifications

Performance

●Displacement Measurement	
Rated Capacity :	See table below
Nonlinearity :	Within±1.5% RO
Hysteresis :	Within±1.5% RO
Rated Output :	1 mV/V (2000μm/m) or more
●Temperature Measurement	
Rated Capacity :	-30 to 70˚C
Measurement Error :	±0.5˚C (-30 to 70˚C)
(Refer to Small-Sized Temperature Transducer BTS-100AT, page 7-30.)	

Environmental Characteristics

Safe Temperature Range :	-30 to 80˚C
Compensated Temperature Range :	-20 to 70˚C
Temperature Effect on Zero Balance :	Within±0.05% RO/˚C
Temperature Effect on Output :	Within±0.05%/˚C

Electrical Characteristics

Recommended Excitation Voltage :	2 to 10V AC or DC
Input Resistance :	350Ω±1% at 0˚C
Output Resistance :	450Ω±0.8% at 0˚C
Cable :	4-conductor (0.5 mm²) chloroprene cable,
	11.5 mm diameter by 1 m long, bared at the tip

Mechanical Properties

Safe Overload Rating :	120%
Length of Mounting Frame :	950mm
Weight :	Approx. 10.5 kg

※For the BJ-AT, refer to page 7-31
※ For ordinary displacements, refer to page 2-133 to 143.

Model	Rated Capacity
BRD-5AT	5mm
BRD-10AT	10mm
BRD-20AT	20mm
BRD-50AT	50mm

Suitable for compressive changes of rock-bed and enables measurement of upheaval.

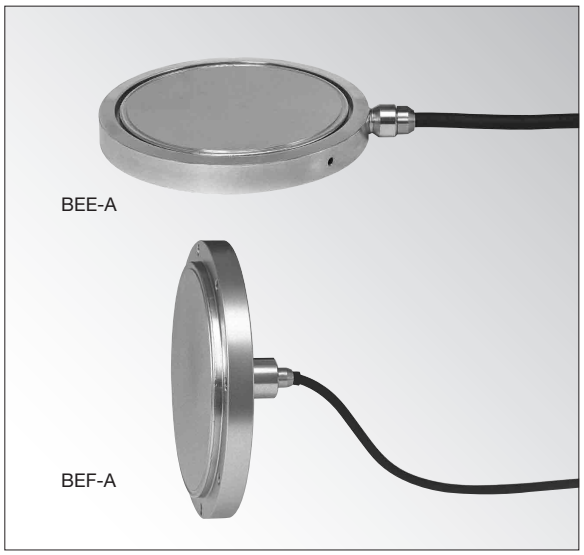
●For displacement detection, the BJ-AT joint transducer which has abundant achievements is used.

The BRD-AT series rock-bed compression displacement transducers are designed to measure compressive changes of rock-bed. They detect relative displacement between the ground surface and the anchor fixed to the bottom of a boring. A temperature measuring function enables simultaneous measurement of displacement and temperature. Zero balance adjustment at the time of installation enables measurement of upheaval, and thus they can be used for rock-bed grout management.

BEE-A/BEF-A

Soil Pressure Transducers

●Pressure Measurement ●200 kPa to 2 MPa



A pressure-sensing surface 160mm in diameter,used most popularly in measuring fields.

- ●Applied pressure causes minimal diaphragm displacement thanks to a dual diaphragm design.
- ●Highly accurate displacement ratio of the pressure-sensing surface to its diameter is less than 1/100,000.
- ●Can measure dynamic soil pressure caused by earthquake, etc.

The BEE-A and BEF-A series are soil pressure transducers with an outer diameter of 200 mm which are used most popularly in measuring fields. The BEE-A series for underground soil pressure measurement is embedded in a core zone of a rockfill dam or ordinary banking. The BEE-A series can also measure soil pressure of 3 or 4face objects. The BEF-A series can be used for soil pressure measurement of a continuous underground earth retaining wall.

Specifications

Performance

Rated :	See table below Capacity:
Nonlinearity :	Within±1% RO (BEE/BEF-500KP to 2MP)
	Within±3% RO (BEE/BEF-A-200KP)
Hysteresis :	Within±1% RO
Rated Output :	1 mV/V (2000μm/m) or more(BEE/BEF-500KP to 2MP)
	0.9 mV/V (1800μm/m)or more (BEE/BEF-A-200KP)

Environmental Characteristics

Safe Temperature Range :	-20 to 80℃
Compensated Temperature Range :	-15 to 70℃
Temperature Effect on Zero Balance :	Within±0.1% RO/℃
Temperature Effect on Output :	Within±0.1%/℃

Electrical Characteristics

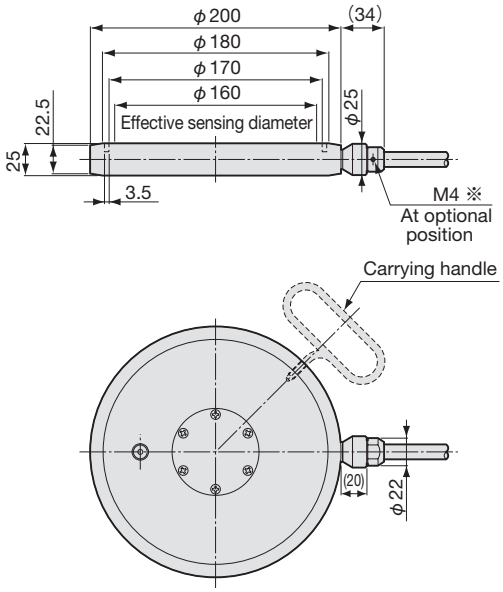
Recommended Excitation Voltage :	2 to 10V AC or DC
Input Resistance :	350Ω±1%
Output Resistance :	350Ω±1%
Cable :	4-conductor (0.5 mm²) chloroprene cable,
	11.5 mm diameter by 1 m long, bared at the tip

Mechanical Properties

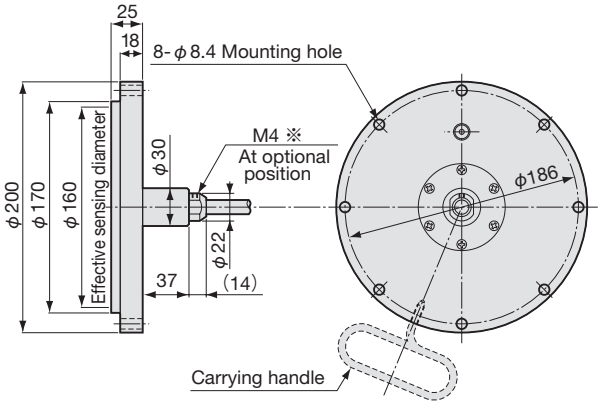
Safe Overload Rating :	120%
Weight :	Approx. 6 kg (BEE-A) Approx. 5.7 kg (BEF-A)

Model	Rated Capacity	Use
BEE-A-200KP	200kPa	Underground soil pressure measurement
BEE-A-500KP	500kPa	
BEE-A-1MP	1MPa	
BEE-A-2MP	2MPa	
BEF-A-200KP	200kPa	Wall surface soil pressure measurement
BEF-A-500KP	500kPa	
BEF-A-1MP	1MPa	
BEF-A-2MP	2MPa	

■Dimensions



BEE-A



BEF-A

※For grounding of lightning arrester kit.

BEM-A

Soil Pressure Transducers

●Pressure Measurement ●50 kPa to 1 MPa

A pressure-sensing surface 80mm in diameter. The stainless steel design enables marine applications.

●Dual diaphragm design with the pressure medium sealed between the pressure-sensing surface and strain gage-bonded diaphragm enables transmission of minute displacement through enlargement.
●Stainless steel construction

The BEM-A series is underground soil pressure transducers with a pressure-sensing surface 80 mm in diameter. The strainless steel design enables marine applications.

Specifications

Performance

Rated Capacity :	See table below
Nonlinearity :	Within±2% RO (BEM-A-50KP to 200KP)
	Within 1% RO (BEM-A-500KP & 1MP)
Hysteresis :	Within±1% RO
Rated Output :	0.25 mV/V (500μm/m) or more (BEM-A-50KP)
	0.5 mV/V (1000μm/m) or more (BEM-A-100KP)
	1 mV/V (2000μm/n) or more (BEM-A-200KP to 1MP)

Environmental Characteristics

Safe Temperature Range :	-20 to 80˚C
Compensated Temperature Range :	-15 to 70˚C
Temperature Effect on Zero Balance:	
Within±0.5% RO/˚C (BEM-A-50KP)	
Within±0.3% RO/˚C (BEM-A-100KP & 200KP)	
Within±0.2% RO/˚C (BEM-A-500KP & 1MP)	
Temperature Effect on Output :	Within±0.1%/˚C

Electrical Characteristics

Safe Excitation Voltage :	10V AC or DC
Recommended Excitation Voltage :	2 to 8V AC or DC
Input Resistance :	350Ω±1%
Output Resistance :	350Ω±1%
Cable :	4-conductor (0.5 mm²) chloroprene cable, 8 mm diameter by 1 m long, bared at the tip

Mechanical Properties

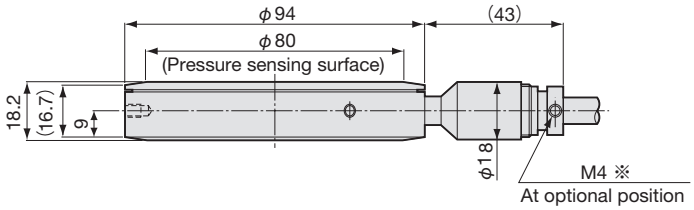
Safe Overload Rating :	120%
Weight :	Approx. 1 kg

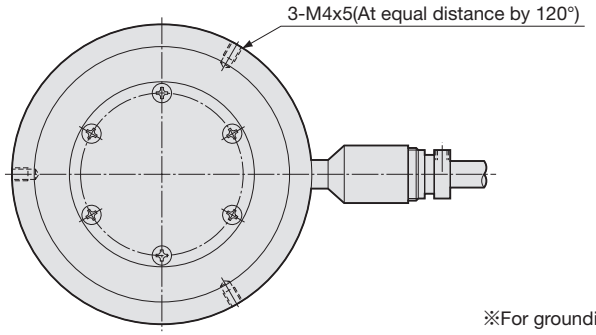
Model	Rated Capacity
BEM-A-50KP	50kPa
BEM-A-100KP	100kPa
BEM-A-200KP	200kPa
BEM-A-500KP	500kPa
BEM-A-1MP	1MPa

To Ensure Safe Usage

Avoid installation onto a wall surface.

■Dimensions





※For grounding of lightning arrester kit.

BEN-A

Soil Pressure Transducers

●Pressure Measurement ●500 kPa & 1 MPa

A pressure-sensing surface 70mm in diameter. Vibration-resistant design for installation on driven materials

- ●Dual diaphragm design, with the pressure medium sealed between the pressure-sensing surface and strain gage-bonded diaphragm, enables transmission of minute displacement through enlargement.
- ●Vibration-resistant design for installation on driven materials
- ●Highly wear-resistant pressure sensing surface

The BEN-A series soil pressure transducers are specially designed to endure vibrations. Thus, they are suitable for installation on driven materials such as sheet piles and steel pipe piles.

Specifications

Performance

Rated Capacity :	BEN-A-500KP : 500kPa	
	BEN-A-1MP : 1MPa	
Nonlinearity :	Within±1% RO	
Hysteresis :	Within±1% RO	
Rated Output :	1 mV/V (2000μm/n) or more	

Environmental Characteristics

Safe Temperature Range :	-20 to 80˚C	
Compensated Temperature Range :	-10 to 50˚C	
Temperature Effect on Zero Balance :	Within±0.4% RO/˚C (BEN-A-500KP)	
	Within±0.2% RO/˚C (BEN-A-1MP)	
Temperature Effect on Output :	Within±0.2%/˚C (BEN-A-500KP)	
	Within±0.1%/˚C (BEN-A-1MP)	

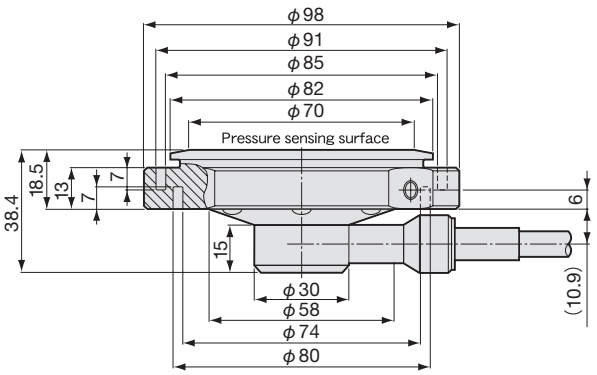
Electrical Characteristics

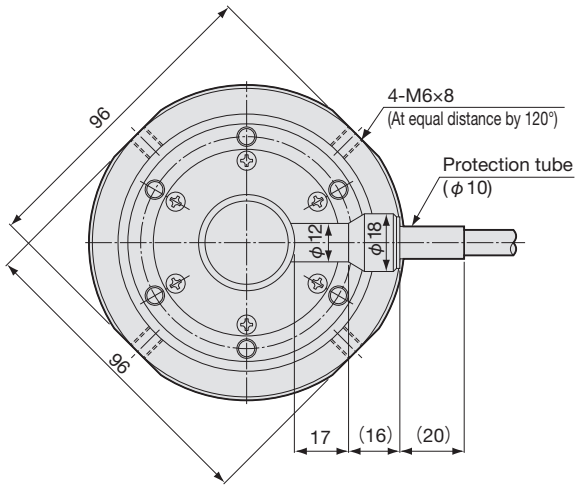
Safe Excitation Voltage :	10V AC or DC
Recommended Excitation Voltage :	2 to 8V AC or DC
Input Resistance :	350Ω±1%
Output Resistance :	350Ω±1%
Cable :	4-conductor (0.5 mm^2) chloroprene cable, 8 mm diameter by 1 m long, bared at the tip

Mechanical Properties

Safe Overload Rating :	150%
Weight :	Approx. 1 kg

■Dimensions





BEG-A-S

●Pressure Measurement ●200 kPa to 2 MPa

Large-Sized Soil Pressure Transducers

Suitable for soil pressure measurement of rock-fill dams

The BEG-A-S series soil pressure transducers are designed for soil pressure measurement of a banking containing large aggregates. This series is used mainly for soil pressure measurement of rock-fill dams containing large aggregates.

Specifications

Performance

Rated Capacity :	See table below
Nonlinearity*:	Within±2% RO (BEG-A-200KPS)
	Within±1% RO (BEG-A-500KPS to 2MPS)
Hysteresis* :	Within±1% RO
Rated Output* :	1mV/V(2000μm/m) or more
	0.75mV/V(1500μm/m) or more (BEG-A-200KPS)

Environmental Characteristics

Safe Temperature Range :	-20 to 80℃
Compensated Temperature Range :	-10 to 70℃
Temperature Effect on Zero Balance* :	Within±0.1% RO/℃
Temperature Effect on Output* :	Within ±0.1%/℃

Electrical Characteristics

Safe Excitation Voltage :	10V AC or DC
Input Resistance :	350Ω±2%
Output Resistance :	350Ω±2%
Cable :	4-conductor (0.5 mm²) chloroprene shielded cable,
	11 mm diameter by 2 m long, bared at the tip

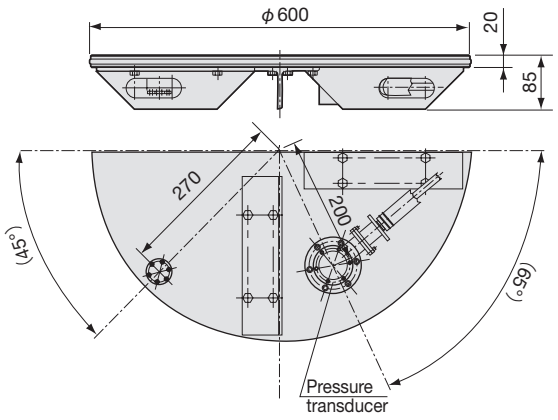
Mechanical Properties

Safe Overload Rating :	120%
Material :	Corrosion-proof painting on whole surface

* Asterisked specifications are for the single pressure transducer proper.

Model	Rated Capacity
BEG-A-200KPS	200kPa
BEG-A-500KPS	500kPa
BEG-A-1MPS	1MPa
BEG-A-2MPS	2MPa

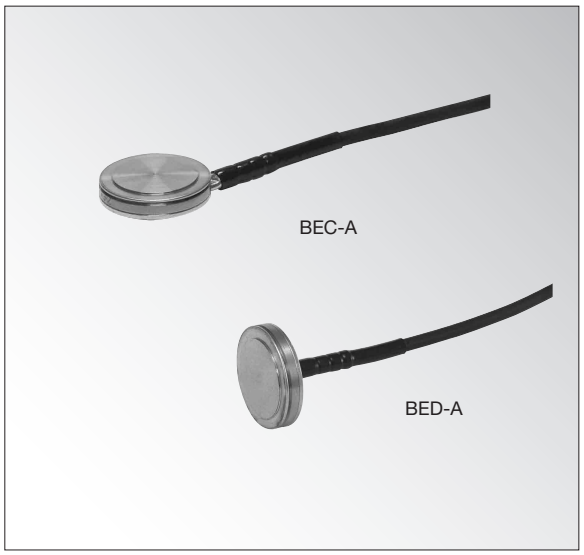
Dimensions



BEC-A/BED-A

●Pressure Measurement
●200 kPa to 1 MPa

Small-Sized Soil Pressure Transducers



A pressure-sensing surface 23mm in diameter. Suitable for measurement fo soil pressure distribution in short-term or model experiment

●Suitable for short-term experiments

The BEC-A and BED-A series are small-sized soil pressure transducers having an outer diameter of 30 mm and a pressure-sensing surface diameter of 27 mm. They are used for measurement of soil pressure distribution in short-term or model experiments.

Specifications

Performance

Rated Capacity :	See table below
Nonlinearity :	Within±2% RO
Hysteresis :	Within±1% RO
Rated Output :	0.25 mV/V (500μm/m) or more

Environmental Characteristics

Safe Temperature Range :	-10 to 60˚C
Temperature Effect on Zero Balance :	Within±0.4% RO/˚C
Temperature Effect on Output :	Within±0.4%/˚C

Electrical Characteristics

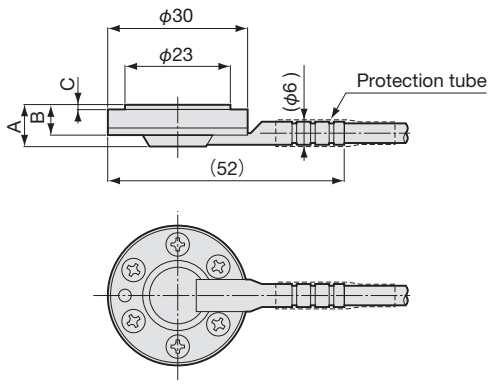
Recommended Excitation Voltage :	2 to 4V AC or DC
Input Resistance :	120Ω±1.7%
Output Resistance :	120Ω±1.7%
Cable :	4-conductor (0.08 mm^2) chloroprene shielded cable,
	4 mm diameter by 3 m long,
	bared at the tip (Shield is not connected to the chassis)

Mechanical Properties

Safe Overload Rating :	120%
Weight :	Approx. 120 g

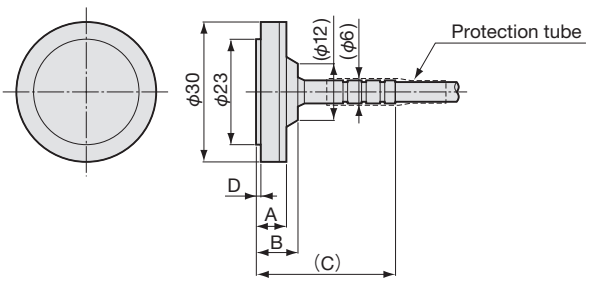
Model	Rated Capacity	Use
BEC-A-200KP	200kPa	Underground soil pressure measurement
BEC-A-500KP	500kPa	
BEC-A-1MP	1MPa	
BED-A-200KP	200kPa	Wall surface soil pressure measurement
BED-A-500KP	500kPa	
BED-A-1MP	1MPa	

■Dimensions



Model	A	B	C
BEC-A-200KP	8.7	6.2	0.5
BEC-A-500KP	9	6.5	0.8
BEC-A-1MP			

BEC-A



Model	A	B	C	D
BED-A-200KP	6.2	8.7	29.7	0.5
BED-A-500KP	6.5	9	30	0.8
BED-A-1MP				

BED-A

BER-A-110S

●Pressure Measurement
●100 kPa to 2 MPa

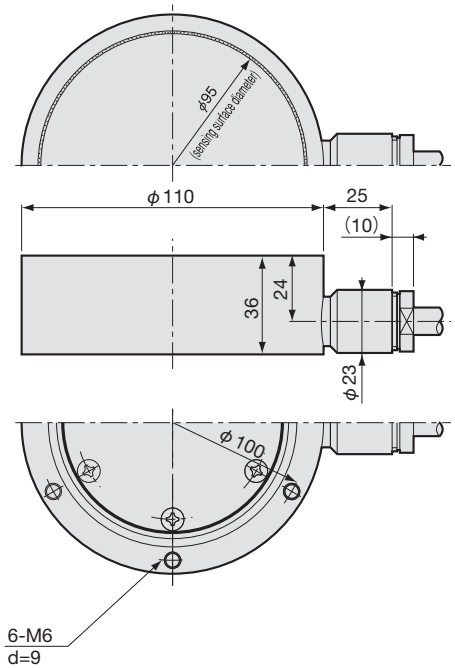
Wall-Surface Soil Pressure Transducers

Stainless steel models can be manufactured for wave pressure measurement.

- ●Wear of the pressure sensing surface does not affect output or initial values.
- ●Load cell-based design is less affected by bending effects.
- ●Usable for pressure measurement of coal or grain in a silo
- ●For pressure measurement of pulverulent bodies of approximately 15 mm in diameter

The BER-A-110S soil pressure transducers come with the cable attached in parallel to the pressure-sensing surface

■Dimensions



Specifications

Performance

Rated Capacity :	See table below
Nonlinearity :	Within±1% RO
Hysteresis :	Within±1% RO
Rated Output :	1 mV/V (2000μm/m) or more

Environmental Characteristics

Safe Temperature Range :	-30 to 80℃
Compensated Temperature Range :	0 to 70℃
Temperature Effect on Zero Balance :	Within±0.1% RO/℃
Temperature Effect on Output :	Within±0.1%/℃

Electrical Characteristics

Safe Excitation Voltage :	10V AC or DC
Recommended Excitation Voltage :	1 to 5V AC or DC
Input Resistance :	350Ω±2%
Output Resistance :	350Ω±2%
Cable :	4-conductor (0.5 mm²) chloroprene shielded cable,
	10 mm diameter by 1 m long, bared at the tip
	(Shield is not connected to the chassis.)

Mechanical Properties

Safe Overload Rating :	120%
Maximum Load :	See table below
Pressure Sensing Surface Diameter :	Approx. 95 mm
Material :	Stainless steel metallic finish (pressure sensing surface)
	ZnC-plated MF (flange and cable outlet)
Water Pressure Resistance of Cable Outlet :	600 kPa
Weight :	Approx. 2.2 kg

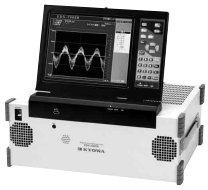
※ Can optionally be coated with anti-biofouling paint.

Model	Rated Cabacity	Mar lo`ad
BER-A-100KP110S	100kPa	850N
BER-A-200KP110S	200kPa	1.701kN
BER-A-500KP110S	500kPa	4.253kN
BER-A-1MP110S	1MPa	8.506kN
BER-A-2MP110S	2MPa	17.01kN

To Ensure Safe Usage

Do not apply to the pressure sensing surface any load exceeding the maximum load stated in table above.

Civil Engineering Measuring Instrument Selection Chart

Model	Number of Measuring Channels (in combination with scanners)	Applicable Sensors (for Civil Engineering)	Features	Interface to external	Power Supply	Ref page
Data logger **UCAM-60B** **UCAM-65B**	30 (Max1000)	Strain gage Strain gage transducer Strain gage civilengineering transducer Civil engineering transducer with temp meas function DC voltage-output sensor DC current-output sensor (UCAM-60B, 65B) Thermocouple Resistance thermometer sensor Potentiometer sensor (UCAM-60B, 65B) EDX depends on selection of conditioner card.	All-in-one Setting,measurement, display and printout on the single unit(60B) 	LAN RS-232C	AC85 to 264V (AC version) DC10 to 16V (DC version)	3-26
NEW Digital Strain Recorder **RMH-301B** **RMH-210A M10**	1 10		Constant current excitation The data acguisition of a long term by unattended possible Saving data to PC from ATA card by USB Interface  RMH-210A M10 RMH-301B	RMH-301B USBmemory USB Interface RMH-210A M10 Flash ATA card RS-232C	Dedicated battery	7-44 7-46
Memory Recorder/ Analyzer **EDX-2000B**	4-slot: Max32channels 8-slot: Max64channels		Real-time measurement, monitoring, recording & processing possible 	LAN USB memory	AC100 to 120V, AC190 to 240V, DC10 to 30V (AC/DC operation)	3-62
NEW Network Terminal Boxes **NTB-100A Series** **NTB-201A**	4 (Max 32)	Strain gage Strain gage transducer Civil engineering transducer with tempmeas function DC voltage-output sensor Thermocouple	Easy software enables quick measurement  NTB-100A-120  NTB-101A-350  NTB-201A	Dedicated interface (CAN equivalent)	DC 11 to 16V	3-39
NEW Portable Data Recorder **SME-30A/31A**	1	Strain gage Strain gage transducers Civil engineering transducer with tempmeas function	Easy to use Portable type 	SD card	SS size dry cell ※SME-31A Usable to AC adapter	3-44

RMH-301B

Digital Strain Recorder

●Collected saving date by USB memory

Most suitable for long-term measurement in the absence of personnel under the environment without external power supply

- ●Small and lightweight
- ●Equipped with a display used to confirm setting conditions and measured values
- ●Easy to collect data by USB memory

Digital strain recorder RMH-301B is a battery-powered data collection device with low power consumption, suitable for long-tem measurement in the absence of personnel at the places without external power supply such as long-distance mountainous and heavy-snowfall area.
Enables to Strain gage civil engineering transducers and civil engineering transducers with tempmeas function and of single-channel measurement.
Equipped with operation panel and display enables operation relating to measuring condition setting and measurement.
Data can be collected via USB memory. Data can be easily reclaimed at site just by inserting USB disk. In addition to original forms, data can be saved in CSV format.
The optional software (RMH-390A) can be used to control computers and collect data through USB interface.

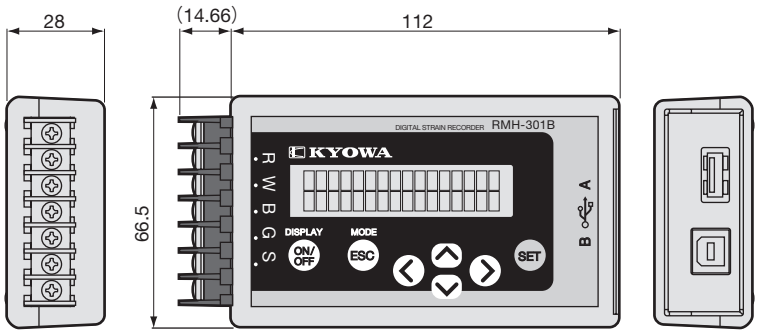
Specifications

■Overall operation	
Operating temperature range :	-20 to 50˚C
Operating humidity range :	10 to 95%RH (no-condensing)
Operating environment :	No external interference caused by grime and large-capacity motors, etc.
Dimensions :	112(W)×28(H)×66.5(D)mm (excluding protrusions)
Weight :	Approx 180 g
■Hard ware	
Number of Measuring Channel :	1
Measuring object :	Strain gage transducer Strain gage civil engineering transducer Civil engineering transducer with tempmeas function
Range of used bridge resistance :	350Ω (4 strain gage method)
Cable length :	0.5mm^2 4-conductor shielded cable maximum 2.0km
Strain rate :	Fixed 2.00
Bridge current :	Approx DC2.19mA (constant current)
Temperature measurement current :	DC0.24mA (constant current)
Measuring range :	Strain capacity :±20000μm/m Temperature :-30.0 to+70.0˚C
Resolution :	Strain capacity : 1×10^{-6}(μm/m) Temperature : 0.1˚C
Measuring accuracy :	Strain capacity : ±0.1%FS Temperature : ±0.5˚C
Data storage :	Strain capacity : 30720 times Temperature : 30720 times Strain + temperature:20475 times
Clock :	Year (2 digits of the Gregorian calendar), Month, Date,Hour,Minute
Measuring interval :	1 to 59 minute (with 1 minute as the unit) 1 to 99 hour (with 1 hour as the unit)
Display :	LCD (16 digits×2 lines)
Operation :	Arrow keys, ON/OFF, SET, ESC
Interface :	USB1.1
Power supply :	DC6 to 15V
Current consumption :	100mA during operation and below 100μA under standby status
Input specifications :	M3 bolt suitable to crimp terminal RAV, 1.25-3 equivalents
■Control software (RMH-390A) optional accessories	
Setting function :	Setting of data collection conditions (measuring name, measuring point number, final measuring channel) setting of channel conditions (transducer name, measuring point mode, initial value, calibration factor and unit)
Collection function :	Measurement start (measurement start time, interval measurement time and measurement times) Measurement stop Data collection (USB, RS-232C) (measuring data is automatically saved as data collection pass)
USB storage function :	Entering measuring conditions Data collection
Data display :	Initial data display/physical quantity display value display (display channel and display period setting) Time series chart display (maximum 3 charts· display channel· display period setting, line type and color selection, automatic and calibration) Print (printer printing documents)
Data editing :	Measuring data editing (editing of title and data parts)
Data conversion :	Converted to ASCII format
Check function :	Self diagnosis of measurer (inspection of A-D, cell voltage, transducer and ROM/RAM) test measurement real-time monitoring
Others :	Address book setting, Communications condition setting, Time setting and Help function

■Operating environment	
OS :	Microsoft Windows (32bit, Japanese version)
	2000 Professional
	XP Home Edition
	XP Professional
	Vista
Interface :	USB Interface (RMH-301B)
	CD-ROM or DVD
	(for software installation)
CPU :	PentiumⅢ, 1GHz or higher
Memory required :	RAM 512MB or more
Hard disk :	Hard disk capacity or more 20MB (for installation,
	excluding that for data)
	spare capacity or more 10MB (excluding that for
	saving measuring data)
Graphic :	High resolution video or more
	Super VGA (800×600)
	adaptor and monitor or more 1024×768,
	or more full-color
Others :	Keyboard and Microsoft Mouse
	or interchangeable pointing device

Optional Accessories　Battery pack　RB-5A（5Ah）
RB-10A（10Ah）

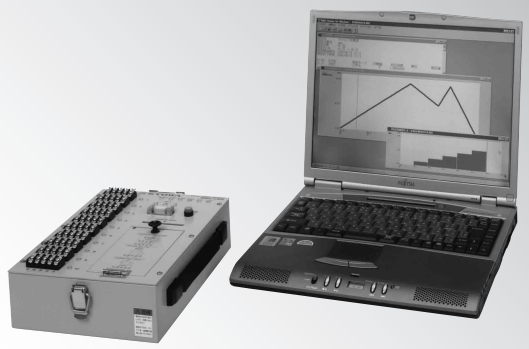
■Dimension drawing



RMH-210A M10

Digital Strain Recorder

●Reclaiming collected data via flash ATA card



RMH-210A M10

Please prepare flash ATA card and computer by yourself.

Enables long-term operation without AC power supply (note 1) Data collection without operator

- ●Enables strain, displacement and temperature measurement just using one set of Civil engineering transducer with tempmeas function (strain + temperature and displacement + temperature)
- ●Enables interval measurement
- ●Enables power and measurement condition setting as well as check for internal memory and transducer inspection within the recorder
- ●Enables measuring condition setting and data collection via flash ATA card
- ●Enables realizing functions such as measuring condition setting, data saving, waveform display and print through computer and configured control software
- ●The optional control software is able to letting ASCII conversion function with data correspond to the processing of common software such as Excel

Note 1) data collection time
About 3 years (2 times of measurement per day). When the optional battery assembly is used under normal temperature, the theoretical calculation time considering data such as setting and data collection is excluded.

Specifications

■RMH-210A M10

Applicable transducer :	Strain gage civil engineering transducer
	Civil engineering transducer with tempmeas
	function strain gage transducer
	DC voltage
	DC current
Number of Measuring Channels :	10
Applicable bridge resistance :	
	350Ω (4 strain gage method)
	For that of 120Ω, please contact us.
Bridge power supply :	about DC2.85mA (constant current)
	($0.5mm^2$ 4-conductor shielded cable,
	maximum 400m)

	Measuring range	Resolution	Measuring accuracy
Strain	±20000μm/m	±20000μm/m	±0.1% FS
Temperature	-30 to 70°C (note 2)	0.1°C	±0.5°C
Voltage	±10V	1mV	±0.1% FS
Current	±20mA	0.01mA	

Note 2) Depend on civil engineering transducer with tempmeas function

Measuring time :	Within 120 seconds/10 channels
Temperature measurement current :	
	Approx DC 0.285mA (constant current)
Data storage	24000 data/channel for each input
Clock :	Year (2 digits of the Gregorian calendar),
	Month, Date, Hour, Minute
Measurement interval	3 minute to 99 hour and 59 minute
check :	MEAS measurement operation inspection
	MEMO, memory inspection
	SENS, sensor inspection
	(parallel resistance method during strain measurement)
	BATT battery residual quantity inspection
Monitoring function :	Showing the following content by LED lighting
	and flashing
	MEAS measurement operation
	MEMO memory checking result
	MEAS sensor checking result
	(RMH-210A has display for each input channel)
	BATT, battery residual quantity/battery alarm
	POWER, power ON
	DATA, during datasaving of flash ATA card
	SET RMH setting of flash ATA card
Interface :	RS-232C baud rate 600, 1200, 2400, 4800, 9600bps
	PC slot based on PC CARD STANDARD
Operating temperature and humidity ranges :	
	-20~50°C, 10~95%RH (noncondensing)
Power supply :	DC6~15V Battery pack (optional)
	current consumption below 100mA during
	operation (during inserting non-flash ATA card)
	below 100μA under standby status
Dimensions and weight :	RMH-210A M10 184(W)×250(H)×90(D)mm
	(excluding protrusions)
	Approx 1.9kg (excluding battery)
others :	with lightning protector

Digital strain recorder RMH can realize long-term measurement in the absence of personnel through the data collection device with built-in lithium battery. It is suitable for long-tem measurement in the absence of personnel at the places without external power supply such as long-distance mountainous and blizzard zones. It is of compact structure without operation and display parts, and can achieve high efficiency of measurement operation in addition to easy setting. 10-channel measurement can be completed through strain gage civil engineering transducer and civil engineering transducer with tempmeas function supplied with of DC voltage and DC current, etc.
All operations related to measurement such as measuring condition setting, measurement and chart display can be controlled by using special software (RMH-290A) on computer, and measuring condition setting and data collection can be realized via flash ATA card. Therefore, it is not necessary to carry computer when working at site. Even if measurement points are decentralized, work can be completed easily within a short time. The data collection via flash ATA card can be processed by computer and can display values and curves.
In case flash ATA card is not used, RMH and computer can be directly connected with RS-232C interface to collect data.

Optional Accessories

■Flash memory card

TS128MCF45　128MB　(produced by Transcend Japan)

(※) SDAD-38-J60 is required (memory card adapter, produced by SUN DISK)

■Battery pack　RB-10A

RB-10A　RMH-210A applicable to M10　10Ah type
single 2-shaped 6-cell lithium battery
collection period (note) about 3 years
(2 times of measurement per day)
note) collection period refers to
the design value without considering
setting, data collection, etc. under normal temperature

■RS cable　N-40

■Control software　RMH-290A

Setting function :	Setting of collection conditions
	(measuring name, measuring point number,
	final measuring channel)
	Setting of channel conditions
	(transducer name, measuring point mode, initial value,
	calibration factor and unit)
Collection function:	Measurement start
	(measurement start time, interval measurement
	time and measurement times)
	Measurement stop
	Data collection (RS-232C)
	(measuring data is automatically saved as data
	collection pass)
Memory card function :	
	Condition setting
	(collection and channel conditions)
	Data collection
	(collection of measuring data)
	Read data
	(storge from flash ATA card to data storage pass.)
Data display :	Initial data display/physical quantity display
	Numeric display
	(Display channel and Display period setting)
	Time series chart display
	(Maximum 3 charts · Display channel · Display
	period setting, line type and color selection,
	automatic and calibration)
	Print (printer printing documents)
Data editing :	Measuring data editing
	(editing of title and data parts)
Data conversion :	converted to ASCII format
Check :	Self inspection of measurer
	(Inspection of A-D,
	Cell voltage, Transducer and ROM／RAM)
	Test measurement
	Real-time monitoring
Others :	Address book setting,
	Communications condition
	setting (RS-232C), Time setting and
	Help function

■PC

OS :	Japanese MS-Windows98/98SE/Me/2000/XP
Memory :	32MB　or more

■Dimension drawing