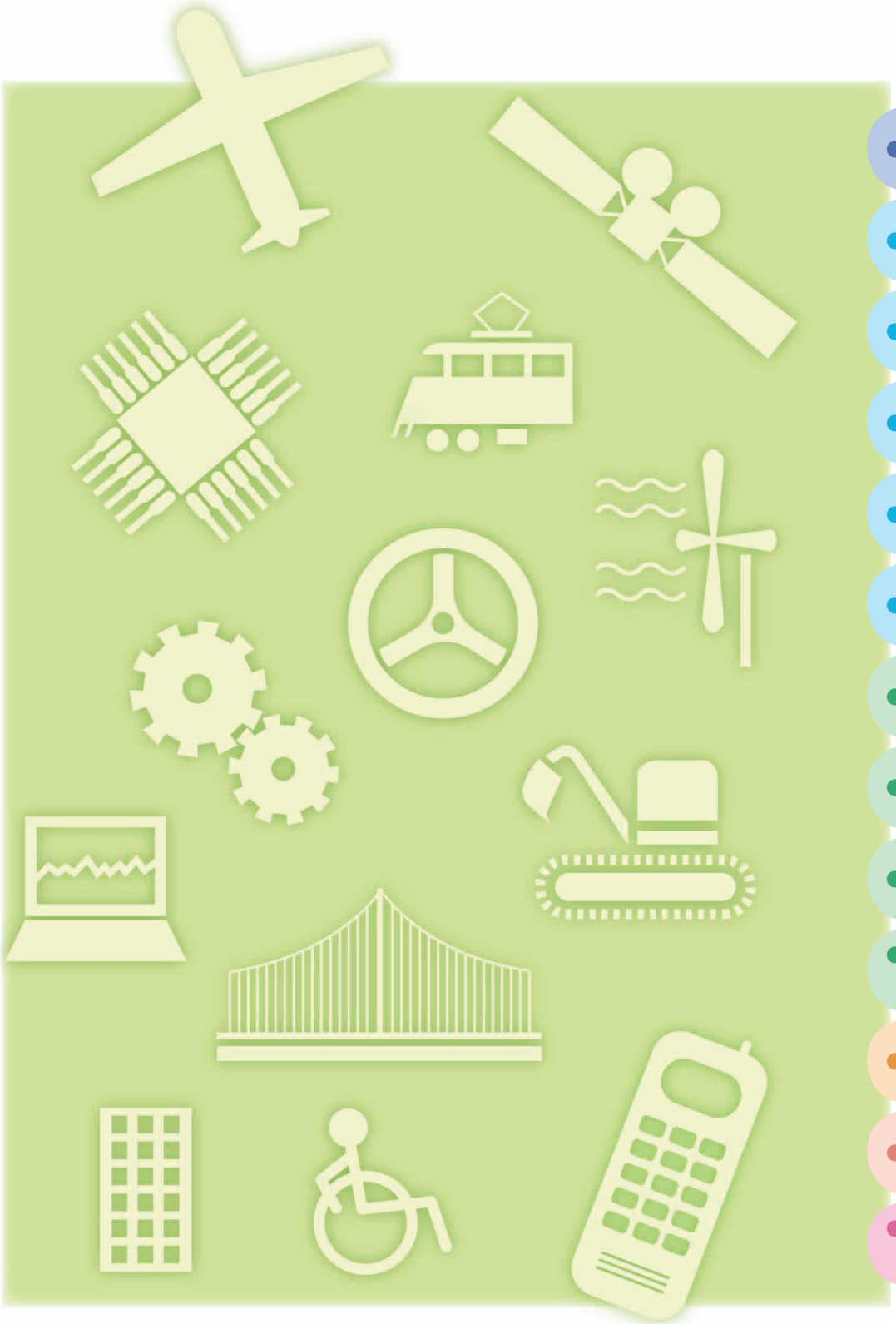
KYOWA

# KYOWA MEASURING INSTRUMENTS



- Strain Gages
- Load Cells
- Pressure Transducers
- Acceleration Transducers
- Torque Transducers
- Displacement Transducers
- Dynamic Strain Amplifiers
- Data Loggers
- Data Analyzers
- Instrumentation Amplifiers & Related Instruments
- Automotive Test Equipment
- Traffic System
- Civil Engineering/ Construction Instruments

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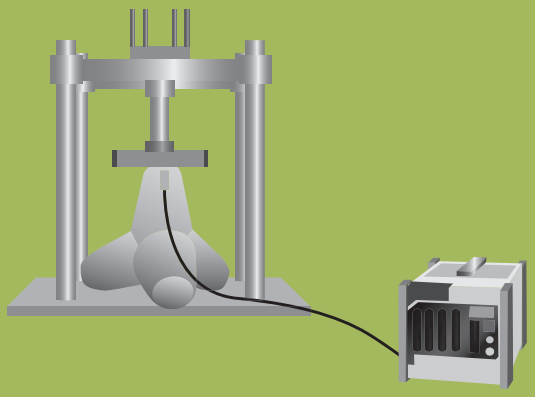
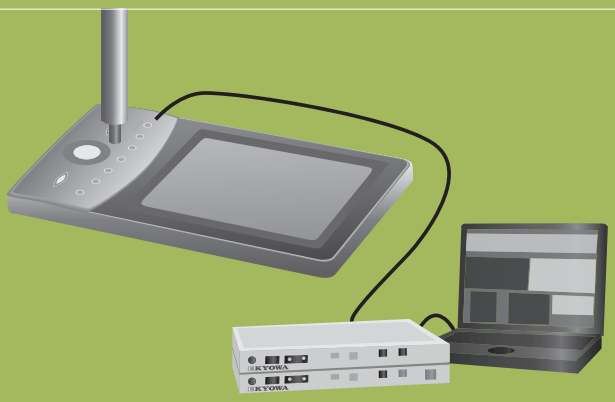
# Strain Gages

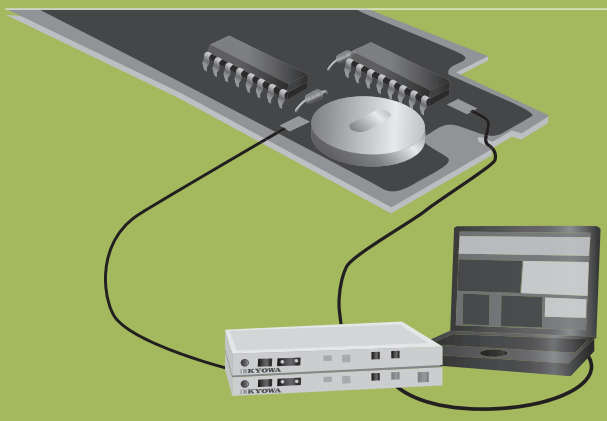
## ● Strain Gages measurement example



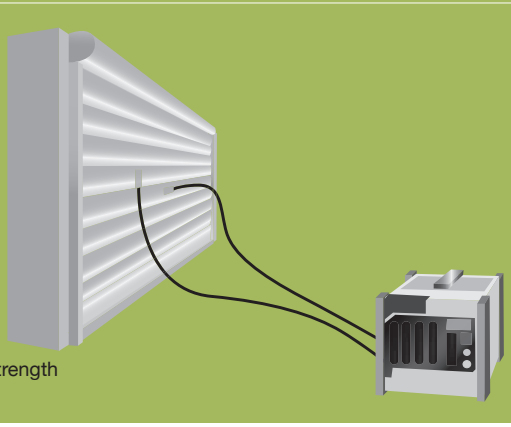
●Stress Measurement of precast concrete such as Tetrapod®



●Stress measurement of plastic parts



●Stress measurement when printed wiring board is mounted



●Strain Measurement during strength testing of a shutter

## General-Purpose Foil Strain Gages

## KFG

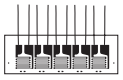
- ●Superior flexibility, and outstanding moisture proofness requiring no coating treatment unless splashed directly with water.
- ●All models are equipped with leadwire cable.
- ●Improved characteristics
  Operating temperature range: –196 to 120°C (when bonded with CC-33A), –196 to 150°C (when bonded with PC-600)
  High performance : Self-temperature-compensation of ±1.0μm/m/°C at normal temperatures and capability of measurement up to strain limit of 5% (uniaxial)

Uniaxial

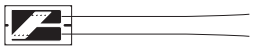
Uniaxial with 2-wire cable



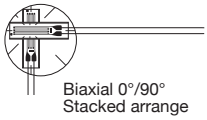
Uniaxial for fine wire



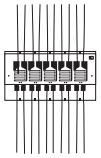
Uniaxial 5-element



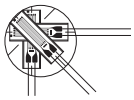
Uniaxial for shearing stress



Biaxial 0°/90°
Stacked arrange

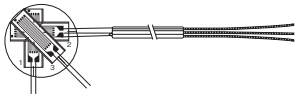


Biaxial 5-element

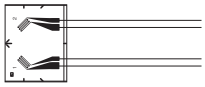


Triaxial 0°/90°/45°
Stacked arrangement

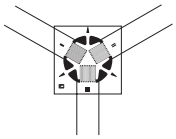
Uniaxial



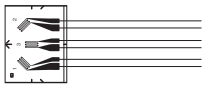
Triaxial 0°/90°/45°
Stacked arrangement with 3-leadwire cables



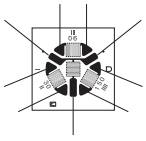
Biaxial 0°/90°
plane arrangement



Triaxial 0°/120°/240°
Plane arrangement



Triaxial 0°/90°/45°
plane arrangement



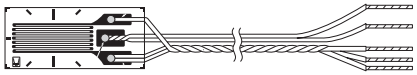
Quadraxial 0°/30°/90°/150°
Plane arrangement

| | |
|---|---|
| Gage length | 0.2, 0.3, 1, 2, 3, 4, 5, 6, 10, 20, 30 mm |
| Gage pattern | Uniaxial, biaxial, triaxial, quadraxial, |
| | uniaxial 5-element, biaxial 5-element |
| Applicable linear expansion coefficient | 5, 11, 16, 23, 27x10$^{-6}$/°C |
| Applicable adhesive | Cyanoacrylate CC-33A |
| Resistance | 60, 120, 350, 500, 1000Ω |
| Applications | General stress measurement, |
| | stress analysis, torque measurement, |
| | fine wire, shearing stress, |
| | concentrated stress |
| | (uniaxial/biaxial 5-element) |

★Leadwire cable: Polyester-coated copper wires (2 to 100 cm), vinyl-coated cable (15 cm to 30 m), middle temperature cable (15 cm to 30 m)

## Foil Strain Gages with Temperature Sensor
## KFGT

- Foil strain gage and T-type thermocouple are integrated.
- Suitable for strain measurement in environment with varying or gradient temperature.
- Thermally-induced apparent strain is compensated with high precision.

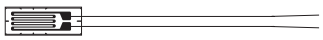


| | |
|---|---|
| Gage length | 2, 5 mm |
| Gage pattern | Uniaxial only |
| Applicable linear expansion coefficient | 11, 16, 23, 27 × $10^{-6}$/°C |
| Resistance | 120Ω |
| Operating temperature range | –10 to 120°C |

★Leadwires 1 m long

## Foil Strain Gages
## KFR

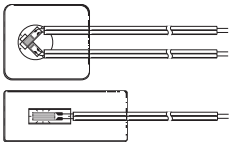
- Polyimde base makes KFR gages usable at –196 to 150°C (adhesive: PC-600).



| | |
|---|---|
| Gage length | 0.15, 0.2, 0.5, 1, 2, 5 mm |
| Gage pattern | Uniaxial, triaxial 0°/90°/45°, |
| | uniaxial 5-element |
| Applicable linear expansion coefficient | 11, 16, 23 × $10^{-6}$/°C |
| Resistance | 120, 350Ω |

## Waterproof Foil Strain Gages
## KFW/KFWS

- Usable either outdoors or underwater (100hours or more under 10MPa in water)



| | |
|---|---|
| Gage length | 2, 5 mm |
| Gage pattern | Uniaxial, biaxial 0°/90°Stacked arrangement, |
| | triaxial 0°/90°/45°Stacked arrangement |
| | (triaxial is available only for KFW) |
| Applicable linear expansion coefficient | 11, 16, 23 × $10^{-6}$/°C |
| Resistance | 120, 350 Ω (KFWS: 120 Ω only) |

## Weldable Waterproof Foil Strain Gages
## KCW

- Available in 2 types: Uniaxial 1-element G10
- Welding type requires no coating treatment.

| | |
|---|---|
| Applicable linear expansion coefficient | 11 × $10^{-6}$/°C |
| Operating temperature rang | –20 to 100°C |
| Flange size | 5 × 21 mm, t = 0.1 mm |

## Strain Gages for Concrete
## KC/KFG

**Wire Gages (KC)**

| | |
|---|---|
| Gage length | 60, 70, 80, 120 mm |
| Gage pattern | Uniaxial |

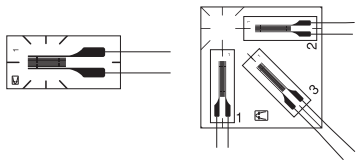
**Foil Gages (KFG)**

| | |
|---|---|
| Gage Length | 10, 20, 30 mm |
| Gage pattern | Uniaxial, biaxial 0°/90°, |
| | triaxial 0°/90°/45° |
| | (Biaxial and triaxial are available only with a gage length of 10 mm.) |

★Concrete-embedded gages (KM, KMC) are also available.

## Foil Strain Gages for Composite Materials
## KFRP

- Suitable for strain measurement of composite materials such as CFRP and GFRP

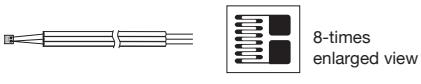


| | |
|---|---|
| Gage length | 2, 5 mm |
| Gage pattern | Uniaxial, |
| | triaxial 0°/90°/45°Plane arrangement |
| Applicable linear expansion coefficient | 1, 3, 6, 9 × $10^{-6}$/°C |
| Resistance | 120, 350Ω |
| Operating temperature range | –55 to 200°C (adhesive: EP-34B) |

★KFP gages for plastics such as acryl are also available.

## Foil Strain Gages for Printed Boards
## KFRS

- Ultra-small gage base enables bonding to mounted components and narrow space on printed boards (uniaxial: 1.2 × 1.1 mm, biaxial and triaxial: 2.5 × 2.5 mm)
- Applicable linear expansion coefficient: 13 × $10^{-6}$/°C (meeting that of printed boards)

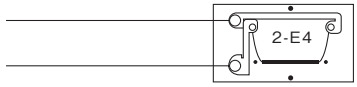



| | |
|---|---|
| Gage length | 0.2, 1 mm |
| Gage pattern | Uniaxial, biaxial 0°/90°, |
| | triaxial 0°/90°/45° |

★Self-temperature-compensation range: –30 to120°C, applicable to thermal cycling tests

## Semiconductor Strain Gages
## KSP/KSPH/KSPL/KSN

- Semiconductor used for the resistive element ensures several 10 times higher sensitivity than foil strain gages.




| | |
|---|---|
| Gage length | 1, 2, 3, 4, 6, 7, 9 mm |
| Gage pattern | Uniaxial, biaxial 0°/90°, |
| | uniaxial 2-element |
| Applicable linear expansion coefficient | 11, 16 × $10^{-6}$/°C(KSN) |

★Semiconductor gages with no gage base are also available.

## Encapsulated High-Temperature Strain Gages
## KHCV/KHCS/KHCM/KHC

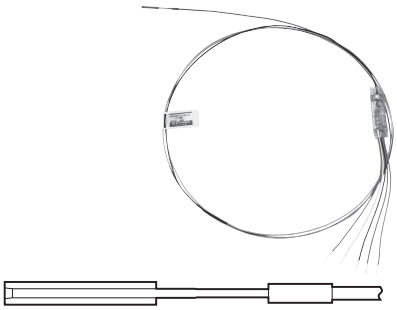
- Designed to be spot-welded to measuring objects

| | |
|---|---|
| Gage length | 5 mm (KHC, KHCV), |
| | 10 mm (KHCS, KHCM, KHC), |
| | 20 mm (KHC) |
| Gage pattern | 2-element temperature-compensation |
| | type except for 1-element KHCV |
| Applicable linear expansion coefficient | 11 × $10^{-6}$/°C (KHCS, KHCM, KHC) |
| | 13 × $10^{-6}$/°C (KHCS, KHCM) |
| | 16 × $10^{-6}$/°C (KHCS, KHCM, KHC) |
| Maximum operating temperature | KHCV: 800°C (dynamic strain) |
| | KHCS: 750°C KHCM: 650°C KHC: 550°C |

★Material: Inconel 600 except for KHC-G9 made of SUS 321

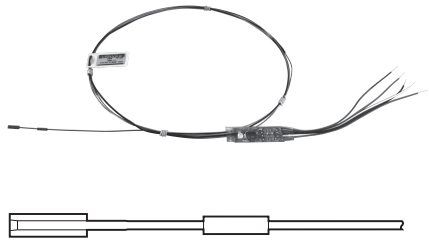
## Encapsulated High-Temperature Strain Gages NEW
## KHCX

- Encapsulated design enables easy installation by spot-welding.
- Immediate measurement upon installation is possible; no curing or coating required.
- Gage length is 10 mm.
- Gage resistance is 120 Ω.
- Gage factor of approximately 1.5 is ensured even at 950°C.
- Half-bridge structure ensures temperature compensation.
- Bridge adapter enables easy and error-free connection to an amplifier.

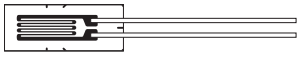


## Encapsulated High-Temperature Strain Gages NEW
## KHCR

- Encapsulated design enables easy installation by spot-welding.
- Immediate measurement upon installation is possible; no curing or coating required.
- Gage length is 5 mm.
- Gage resistance is 120 Ω.
- Gage factor of approximately 1.2 or higher is ensured even at 750°C.
- Half-bridge structure ensures temperature compensation.
- Bridge adapter enables easy and error-free connection to an amplifier.
- Compression fitting option enables easy wiring into a vessel, etc.

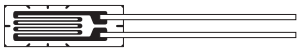


## High-Temperature Foil Strain Gages
## KFU



| | |
|---|---|
| Gage length | 2, 5 mm |
| Gage pattern | Uniaxial, biaxial 0°/90°, triaxial 0°/90°/45° |
| Applicable linear expansion coefficient | 11, 16, 23 × $10^{-6}$/°C |
| Resistance | 120, 350Ω |
| Operating temperature range | –196 to 350°C (adhesive: PI-32) |

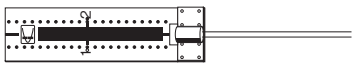
## High-Temperature Foil Strain Gages
## KFH



| | |
|---|---|
| Gage length | 0.2, 0.5, 1, 2, 5 mm |
| Gage pattern | Uniaxial, triaxial 0°/90°/45° |
| Applicable linear expansion coefficient | 11, 16, 23 × $10^{-6}$/°C |
| Resistance | 120Ω |
| Operating temperature range | –196 to 250°C(adhesives: PC-6, PI-32) |
| | –55 to 200°C(adhesives: EP-34B) |

## High-Temperature Foil Strain Gages
## KH

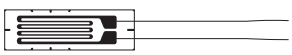
- Metal base enables easy bonding of the 350 Ω KH gage with the small-sized spot welder.



| | |
|---|---|
| Gage length | 5 mm |
| Operating temperature range | –50 to 350°C |
| Applicable linear expansion coefficient | 11, 16 × $10^{-6}$/°C |

## Low-Temperature Foil Strain Gages
## KFL

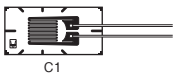
- Usable at a temperature as low as –269°C if bonded with PC-600 adhesive or –196°C if bonded with CC-33A or UC-26B adhesive

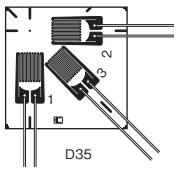


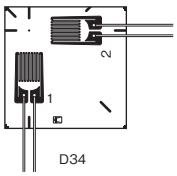
| | |
|---|---|
| Gage length | 0.2, 0.5, 1, 2, 5, 30 mm |
| Gage pattern | Uniaxial, triaxial 0°/90°/45° |
| Applicable linear expansion coefficient | 5, 11, 16, 23 × $10^{-6}$/°C |
| | (5 is available only for a gage length of 30 mm) |
| Resistance | 120, 350Ω |

## High-Elongation Foil Strain Gages
## KFEL

- Enabling strain measurement in elastic to plastic region
- Enabling strain measurement for maximum elongation of approximately 10 to 15%
- Suitable for tensile tests of materials


C1

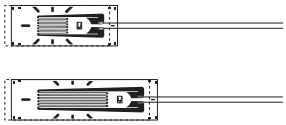

D35


D34

| | |
|---|---|
| Gage length | 2, 5 mm |
| Gage pattern | Uniaxial, biaxial 0°/90°Plane arrangement, triaxial 0°/90°/45° |
| Resistance | 120Ω |
| Operating temperature range | –10 to 80°C(adhesive: CC-36) |

## Ultrahigh-Elongation Foil Strain Gages
## KFEM

- Enabling strain measurement in elastic to plastic region
- Enabling strain measurement for maximum elongation of 20 to 30% (room temperature)
- Suitable for tensile tests of material



| | |
|---|---|
| Gage length | 2, 5 mm |
| Gage pattern | Uniaxial |
| Resistance | 120Ω |
| Operating temperature range | –10 to 80°C (adhesive: CC-36) |

## Foil Strain Gages with Protector
## KCH

- Suitable for weighing tanks and hoppers and for measuring tare weight of tracks
- Mounted to measuring objects with the adhesive and stud bolts
- Moisture and waterproofed


KCH-5A-1

| | |
|---|---|
| Gage length | 2, 5 mm |
| Gage pattern | Uniaxial, biaxial 0°/90°, triaxial 0°/90°/45°, bridge for bending or shearing stress measurement |
| Resistance | 350Ω |

★With vinyl-coated shield cable 10 m long

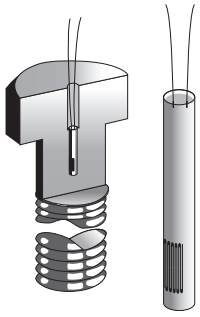
## Gages for Residual Stress Measurement
## KFG

- Available in 2 types: Model equipped with a terminal for easy connection/disconnection of leadwires and model for boring method

| | |
|---|---|
| Gage pattern and gage length | Model with terminal: Uniaxial, biaxial, triaxial; 1, 2 mm<br>Model for boring method: Triaxial 0°/135°/90° Plane arrangement; 1.5, 3 mm |
| Applicable linear expansion coefficient | 11, 16, 23, 27 × $10^{-6}$/°C<br>(27 is available only for boring method.) |

## Gages for Bolt Axial Tension Measurement
## KFG

- When it is difficult to bond a gage to the surface of a bolt for tightening stress measurement, etc., these KFG gages are embedded into the hole bored from the top head of the bolt.



| | |
|---|---|
| Gage length | 1.5, 3 mm |
| Applicable linear expansion coefficient | 11 × $10^{-6}$/°C |
| Operating temperature range | Room temp. to 50°C |

★Boring diameter: 2 mm

## Coating Agents

- Coating agents are applied to strain gages and gage terminals to prevent them from adsorbing moisture. These agents are available in a variety of types including wax, rubber and putty.

## Adhesives

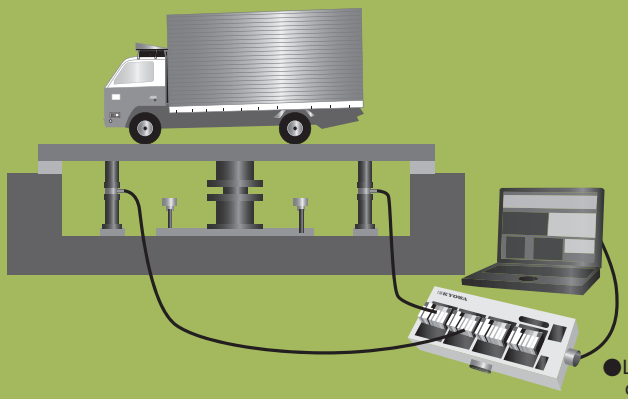
- To ensure better measuring results, various kinds of adhesives are available for selection based on measuring objects, gage base materials and measuring conditions.

## Gage Terminals

- To protect gage leads, gage terminals are applied to the connection between strain gages and leadwires. They are available in various materials and shapes.

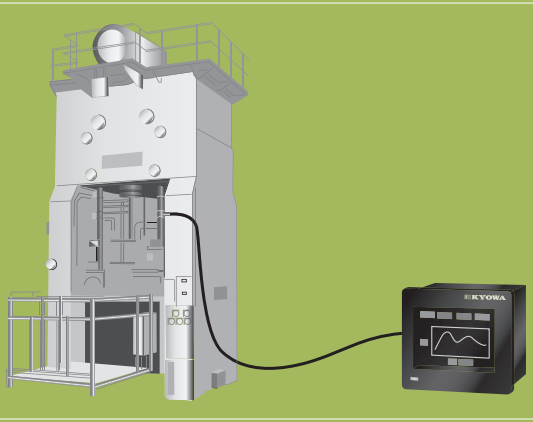
# Load Cells

## Load Cells measurement example



●Load measurement of plate bearing test

●Weight control of Hopper Tank



●Load control of Press machine

●6 component force measurement of an artificial leg or robot with built-in load cells

## Small-Sized Compression Load Cells
## LMA-A

●Ultra-small, lightweight and low cost

LMA-A-5 to 50N



LMA-A-100N to 1KN

| | |
|---|---|
| Rated capacity | 5 N to 1 kN |
| Nonlinearity | Within ±1% RO |
| Hysteresis | Within ±1% RO |
| Rated output | 0.75 to 2 mV/V (0.6 to 2 mV/V with 5N) |
| Safe overload rating | 150% |
| Dimensions & weight (excluding cable) | 5 to 50N : 12 mm$\phi$ × 4 mm high, approx. 1.5 g |
| | 100N to 1KN : 20 mm$\phi$ × 9.5 mm high, approx. 11 g |

## Small-Sized Compression Load Cells
## LMB-A

●Ultra-small, lightweight and low cost

LMB-A-50N to 200N



LMB-A-500N to 2KN

| | |
|---|---|
| Rated capacity | 50 N to 2 kN |
| Nonlinearity | Within ±0.5% RO |
| Hysteresis | Within ±0.5% RO |
| Rated output | 1.4 mV/V or more |
| Safe overload rating | 150% |
| Dimensions & weight (excluding cable) | 50 to 200N : 10 mm$\phi$ × 4 mm high, approx. 1.5 g |
| | 500N to 2KN : 16 mm$\phi$ × 7 mm high, approx. 6 g |

## Small-Sized Compression Load Cells
## LMBT-A

●Ultra-small,for high temperature (100°C)

LMBT-A-50 to 200N

LMBT-A-500N to 2KN

| | |
|---|---|
| Rated capacity | 50 N to 2 kN |
| Nonlinearity | Within ±0.3% RO |
| Hysteresis | Within ±0.3% RO |
| Rated output | 1.4 mV/V or more |
| Safe overload rating | 150% |
| Dimensions & weight (excluding cable) | 5 to 200N : 10 mm$\phi$ × 4 mm high, approx. 1.5 g |
| | 500N to 2KN : 16 mm$\phi$ × 7 mm high, approx. 6.5 g |

## Small-Sized Compression Load Cells
## LMR-S-SA2

●Small, lightweight and low cost


LMR-S-20KNSA2

| | |
|---|---|
| Rated capacity | 2 to 20 kN |
| Nonlinearity | Within ±1% RO (within ±2% RO with 20KNSA2) |
| Hysteresis | Within ±1% RO (within ±2% RO with 20KNSA2) |
| Rated output | 1 mV/V or more |
| Safe overload rating | 120% |
| Dimensions | 21 mm$\phi$ × 10 mm high |
| weight | approx. 25 g |

## Small-Sized Compression Load Cells
## LCN-A

- Stainless steel enclosure
- Small, lightweight and low-priced

| | |
|---|---|
| Rated capacity | 500 N to 20 kN |
| Nonlinearity | Within ±0.15% RO |
| Hysteresis | Within ±0.1% RO |
| Rated output | 2 mV/V ±0.3% |
| Safe overload rating | 200% |
| Dimensions | 50 mm$\phi$ × 25 mm high |
| weight | approx. 220 g |

## Small-Sized Compression Load Cells
## LCX-A-ID (TEDS)

- Small, lightweight and thin
- Stainless steel enclosure with waterproof connector
- TEDS installed

LCX-A-500N to 2KN-ID

LCX-A-5 to 20KN-ID

| | |
|---|---|
| Rated capacity | 500 N to 20 kN |
| Nonlinearity | Within ±0.1% RO |
| Hysteresis | Within ±0.1% RO |
| Rated output | 1.5 mV/V or more (1 mV/V or more with 500N) |
| Safe overload rating | 150% |
| Dimensions & weight (including cable) | 500N to 2KN : 28 mm$\phi$ × 18 mm high, approx. 45 g |
| | 5KN to 20KN : 43 mm$\phi$ × 22 mm high, approx. 120 g |

## Small-Sized Compression Load Cells
## LC-V

- Compact and lightweight

| | |
|---|---|
| Rated capacity | 50 to 200 kN |
| Nonlinearity | Within ±0.05% RO |
| Hysteresis | Within ±0.05% RO |
| Rated output | 2.5 mV/V ±0.2% |
| Safe overload rating | 150% |
| Dimensions | 68 mm$\phi$ × 40 mm high to 98 mm$\phi$ × 55 mm high |
| weight | approx. 1.0 kg ~ approx. 3.1 kg |

★Cycling life: 10 million times or more

## Small-Sized Compression Load Cells
## LCV-A

- Small, lightweight and large capacity

| | |
|---|---|
| Rated capacity | 500 kN, 1 MN |
| Nonlinearity | Within ±0.1% RO |
| Hysteresis | Within ±0.1% RO |
| Rated output | 2.5 mV/V ±0.2% |
| Safe overload rating | 150% |
| Dimensions | 126 mm$\phi$ × 95 mm high to 146 mm$\phi$ × 120 mm high |
| weight | approx. 6 kg ~ approx. 11 kg |

★Cycling life: 10 million times or more

## General-Purpose Compression Load Cells
## LC-E

- Highly stable
- Hermetically sealed structure with inert gas filled in

| | |
|---|---|
| Rated capacity | 2, 5 MN |
| Nonlinearity | Within ±0.5% RO |
| Hysteresis | Within ±0.2% RO |
| Rated output | 2 mV/V ±1% |
| Safe overload rating | 150% |
| Dimensions | 210 mm$\phi$ × 267 mm high ~ 340 mm$\phi$ × 267 mm high |
| weight | approx. 49 kg ~ approx. 65 kg |

## Thin Compression Load Cells
## LCK-A

- Thickness: 25 mm (5 to 20KN)

| | |
|---|---|
| Rated capacity | 5 to 200 kN |
| Nonlinearity | Within ±0.2% RO |
| | (within ±0.5% RO with 200KN) |
| Hysteresis | Within ±0.2% RO |
| | (within ±0.5% RO with 200KN) |
| Rated output | 2 mV/V ±0.5% |
| Safe overload rating | 150% |
| Dimensions | 78 mm$\phi$ × 25 mm high to 118 mm$\phi$ × 50 mm high |
| weight | approx. 900 g ~ approx. 4.1 kg |

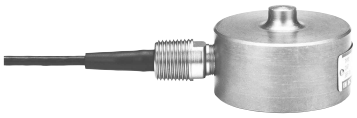
## High-Accuracy Compression Load Cells
## LCH-F

- Long-term accurate measurement possible under severe conditions
- 6-conductor cable (remote sensing) is adopted.

| | |
|---|---|
| Rated capacity | 100, 200 kN |
| Nonlinearity | Within ±0.02% RO |
| Hysteresis | Within ±0.02% RO |
| Rated outpu | 2 mV/V ±0.1% |
| Safe overload rating | 200% |
| Dimensions | 156 mm$\phi$ × 90 mm high to 176 mm$\phi$ × 110 mm high |
| weight | approx. 12 kg ~ approx. 17 kg |

## High-Temp. Compression Load Cells
## LC-FH

- Safe temperature range
  –10 to 150°C
- Compensated temperature range
  –10 to 150°C



| | |
|---|---|
| Rated capacity | 500 N to 200 kN |
| Nonlinearity | Within ±0.5% RO |
| Hysteresis | Within ±0.5% RO |
| Rated output | 1.5 mV/V ±0.2% |
| Safe overload rating | 200% |
| weight | approx. 1.5 kg ~ approx. 8.5 kg |

## High/Low-Temp. Tension Load Cells
## LT-FH/FL

- Safe temperature range
  FH –10 to 150°C
  FL –200 to 80°C
- Compensated temperature range
  FH –10 to 150°C
  FL –196 to 30°C

LT-FH

| | |
|---|---|
| Rated capacity | 500 N to 200 kN |
| Nonlinearity | Within ±0.5% RO |
| Hysteresis | Within ±0.5% RO |
| Rated output | 1.5 mV/V ±0.2% |
| Safe overload rating | 200% |
| Critical overload | 500% |
| weight | approx. 2.3 kg ~ approx. 45 kg |

## High-Accuracy Tension Load Cells
## LTZ-A

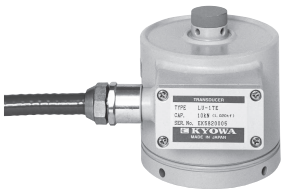
- Compact, lightweight, and easy to use and maintain

LTZ-50 to 100KA

LTZ-200KA to 2TA

| | |
|---|---|
| Rated capacity | 500 N to 50 kN |
| Nonlinearity | Within ±0.03% RO |
| | (within ±0.05% RO with 500KA or larger) |
| Hysteresis | Within ±0.03% RO |
| | (within ±0.05% RO with 500KA or larger) |
| Rated output | 3 mV/V ±0.2% |
| Safe overload rating | 150% |
| weight | approx. 300 g ~ approx. 4.4 kg |

## Tension/Compression Load Cells
## LU-E

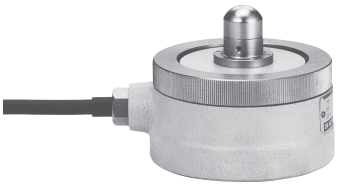


| | |
|---|---|
| Rated capacity | ±500 N to ±200 kN |
| Nonlinearity | Within ±0.2% RO |
| Hysteresis | Within ±0.1% RO |
| Rated output | ±2 mV/V ±0.2% |
| Safe overload rating | 150% |
| weight | approx. 3.9 kg ~ approx. 22.5 kg |

★Order production goods

## Small-Capacity Tension/Compression Load Cells
## LU-A

- Small capacity
- High accuracy



| | |
|---|---|
| Rated capacity | ±50 to ±200 N |
| Nonlinearity | Within ±0.3% RO |
| Hysteresis | Within ±0.2% RO |
| Rated output | ±1.5 mV/V ±0.5% |
| Safe overload rating | 120% |
| Weight | approx. 2.3 kg |

## Beam-Shape Load Cells
## LUB-B

- Compact, lightweight and low cost
- Metal bellows adopted

| | |
|---|---|
| Rated capacity | 50 N to 20 kN |
| Nonlinearity | Within ±0.03% RO |
| | (within ±0.05% RO with 100KB or larger) |
| Hysteresis | Within ±0.03% RO |
| | (within ±0.05% RO with 100KB or larger) |
| Rated output | 2 mV/V ±0.3% |
| Safe overload rating | 150% |
| Weight | approx. 530 g ~ approx. 3.2 kg |

## Small-Sized Tension/Compression Load Cells NEW
## LUX-B-ID (TEDS)

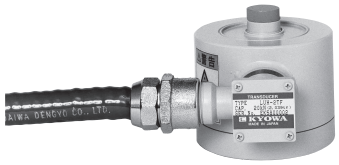
- Minimal thermal effects on output.
- Suitable for measuring and controlling loads applied to small-scale presses and press-fitting devices.

| | |
|---|---|
| Rated capacity | ±50 N to ±200 N |
| Nonlinearity | Within ±0.15% RO |
| Hysteresis | Within ±0.15% RO |
| Rated output | ±0.9 mV/V or more |
| Safe overload rating | 150% |
| weight | approx. 50 g |

★For TEDS, see "About TEDS" on page 07.

## High-Accuracy Tension/Compression Load Cells
## LUH-F

- Excellent zero-float characteristic (50 to 500KF)
- 6-conductor cable (remote sensing) is adopted.



| | |
|---|---|
| Rated capacity | ±500 N to ±200 kN |
| Nonlinearity | Within ±0.02% RO |
| Hysteresis | Within ±0.02% RO |
| Rated output | ±2 mV/V ±0.1% |
| Safe overload rating | 150% |
| Weight | approx. 2.1 kg ~ approx. 38 kg |

## Load Cells for Minute Load Measurement
## LVS-A/LTS-A

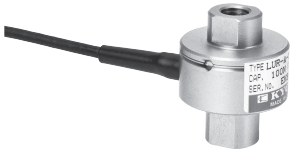
- Enable highly accurate measurement of minute load.
- 2 types are available :
  LVS senses load in vertical direction tothe mounting surface and LTS senses load in horizontal direction to the mounting suface.

LVS-A

| | |
|---|---|
| Rated capacity | LVS : 50 mN to 20 N |
| | LTS : 500 mN to 20 N |
| Nonlinearity | Within ±0.5% RO |
| Hysteresis | Within ±0.5% RO |
| Rated output | 1.5 mV/V or more |
| | (1.2 mV/V with 5 and 10GA) |
| Safe overload rating | 120% |
| Weight | approx. 50 g |

## Small-Sized Tension/Compression Load Cells
## LUR-A-SA1

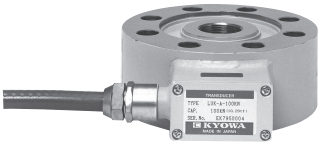
- Compact, lightweight, 28 mm in diameter



| | |
|---|---|
| Rated capacity | ±50 N to ±2 kN |
| Nonlinearity | Within ±0.5% RO |
| Hysteresis | Within ±0.5% RO |
| Rated output | ±0.5 mV/V or more (Approx. ±0.4 mV/V with 50NSA1) |
| Safe overload rating | 150% |
| Weight | approx. 80 g |

## Tension/Compression Load Cells
## LUK-A

- Thin designe



| | |
|---|---|
| Rated capacity | ±5 kN to ±2 MN |
| Nonlinearity | Within ±0.1% RO |
| | (within ±0.2% RO with 500KN or larger) |
| Hysteresis: | Within ±0.1% RO |
| | (within ±0.2% RO with 500KN or larger) |
| Rated output | ±2 mV/V ±1 % (±10% with 5KN ~ 20KN) |
| Safe overload rating | 150% |
| Weight | approx. 900 g ~ approx. 245 kg |

## 3-Component Force Transducer
## LSM-B-SA1

- Compact, lightweight, and easy to handle

| | |
|---|---|
| Rated capacity | 10 N to ±500 N with all force |
| | components Fx, Fy and Fz |
| Nonlinearity | Within ±0.5% RO |
| Hysteresis | Within ±0.5% RO |
| Rated output | Approx. ±0.5 mV/V |
| Safe overload rating | 150% |
| Weight | approx. 600 g ~ approx. 1.6 kg |

★Interference: ±3% RO

## Compact 6-Component Force Transducers

## LFM-A

| | |
|---|---|
| Rated capacity | Refer to the table below |
| Nonlinearity | Within ±0.5% RO |
| Hysteresis | Within ±0.5% RO |
| Rated output | Refer to the table below |
| Safe overload rating | 150% |
| Dimensions | 66 mm$\phi$ × 40 mm high |
| Weight | Refer to the table below |

| Model | Rated capacity | Rated output | Weight, approx. |
|---|---|---|---|
| LFM-A-1KN | FX : ±1000N | FX : ±1.5mV/V or more | 160g |
| | FY : ±1000N | FY : ±1.5mV/V or more | |
| | FZ : ±1000N | FZ : ±1.8mV/V or more | |
| | MX : ±50N·m | MX : ±4.0mV/V or more | |
| | MY : ±50N·m | MY : ±4.0mV/V or more | |
| | MZ : ±25N·m | MZ : ±2.4mV/V or more | |
| LFM-A-3KN | FX : ±3000N | FX : ±1.6mV/V or more | 360g |
| | FY : ±3000N | FY : ±1.6mV/V or more | |
| | FZ : ±3000N | FZ : ±1.6mV/V or more | |
| | MX : ±100N·m | MX : ±2.4mV/V or more | |
| | MY : ±100N·m | MY : ±2.4mV/V or more | |
| | MZ : ±50N·m | MZ : ±1.6mV/V or more | |

## Compact 6-Component Force Transducers with Built-in Amplifier

## LFX-A

| | |
|---|---|
| Rated capacity | Refer to the table below |
| Nonlinearity | Within ±0.5% RO |
| Hysteresis | Within ±0.5% RO |
| Rated output | Approx. ±1500 mV with no-load output at the center |
| Safe overload rating | 150% |
| Dimensions | 66 mm$\phi$ × 40 mm high |
| Weight | Refer to the table below |

| Model | Rated capacity | Rated output | Weight, approx. |
|---|---|---|---|
| LFX-A-1KN | FX : ±1000N | Approx. ±1500 mV with no-load output at the center | 210g |
| | FY : ±1000N | | |
| | FZ : ±1000N | | |
| | MX : ±40N·m | | |
| | MY : ±40N·m | | |
| | MZ : ±25N·m | | |
| LFX-A-3KN | FX : ±3000N | | 420g |
| | FY : ±3000N | | |
| | FZ : ±3000N | | |
| | MX : ±100N·m | | |
| | MY : ±100N·m | | |
| | MZ : ±50N·m | | |

## Washer-Type Load Cells

## LCW-C-SA3

- Models of the same capacities are available with different diameters.
- Thin design makes them suitable for industrial applications.

| | |
|---|---|
| Rated capacity | 10 to 300 kN |
| Nonlinearity | Within ±1% RO |
| Hysteresis | Within ±1% RO |
| Rated output | approx. 1 mV/V |
| Safe overload rating | 150% |

## Washer-Type Load Cells

## LCW-D-S/E-S

- Hermetically-sealed structure with inert gas filled in
- Heat-and oil-ewsistant cable
- High reliability

LCW-E-S

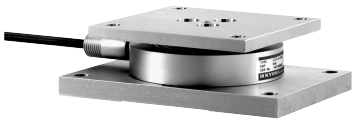
LCW-D-S

| | |
|---|---|
| Rated capacity | 1 to 5 MN |
| Nonlinearity | Within ±1% RO |
| Hysteresis | Within ±1% RO |
| Rated output | 1 mV/V or more |
| Safe overload rating | 150% |

## Stainless Steel Load Cells

## LCTS-B

- For weighing of tanks and hoppers
- Thin, top and bottom plates integrated, and steady brace provided



| | |
|---|---|
| Rated capacity | 5 to 100 kN |
| Nonlinearity | Within ±0.05% RO |
| Hysteresis | Within ±0.05% RO |
| Rated output | 2 mV/V ±0.1% |
| Safe overload rating | 150% |

## Thin Load Cells "Multiforce Sensor"

## LCTA-A

- Endure lateral load and highly accurate.
- Rubber attachment enables use with the top and bottom fixed.

| | |
|---|---|
| Rated capacity | 500 N to 3 kN |
| Nonlinearity | Within ±0.05% RO |
| Hysteresis | Within ±0.05% RO |
| Rated output | 2 mV/V ±0.2% |
| Safe overload rating | 150% |

## Thin Load Cells "Multiforce Sensor"

## LCTB-A

| | |
|---|---|
| Rated capacity | 5 to 50 kN |
| Nonlinearity | Within ±0.03% RO |
| Hysteresis | Within ±0.03% RO |
| Rated output | 1.5 mV/V ±0.2% |
| Safe overload rating | 150% |

## Thin Load Cells "Multiforce Sensor"

## LCTE-A

| | |
|---|---|
| Rated capacity | 10 to 100 kN |
| Nonlinearity | Within ±0.05% RO<br>(±0.1% RO with 100KN) |
| Hysteresis | Within ±0.05% RO<br>(±0.1% RO with 100KN) |
| Rated output | 2 mV/V ±0.2% |
| Safe overload rating | 150% |

## Thin Load Cells "Multiforce Sensor"

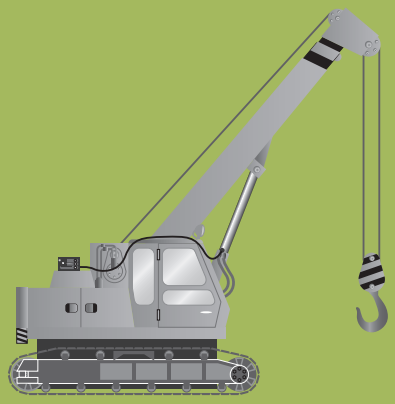
## LCTD-A

| | |
|---|---|
| Rated capacity | 100 to 300 kN |
| Nonlinearity | Within ±0.03% RO |
| Hysteresis | Within ±0.03% RO |
| Rated output | 2 mV/V ±0.2% |
| Safe overload rating | 150% |

**About TEDS (Transducer Electronic Data Sheet)**
To enable amplifier to correctly measure signals of transducers, amplifiers should be adjusted based on transducer's calibration data. Conventionally, such adjustment has been made manually by engineer. TEDS-installed transducers let TEDS-compatiable amplifiers read the data to ensure automatic adjustment upon connection, thereby shortening adjustment and preventing erroneous setting.

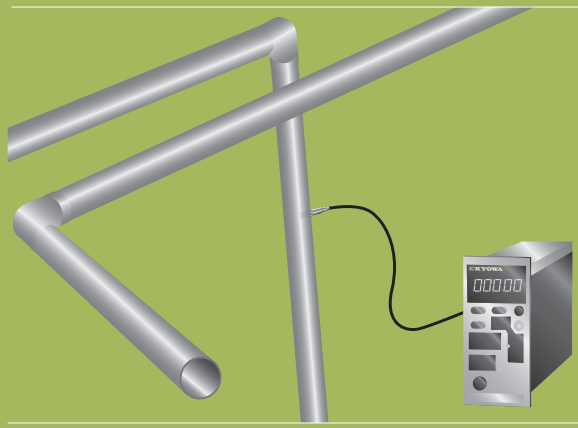
# Pressure Transducers

## Pressure Transducers measurement example

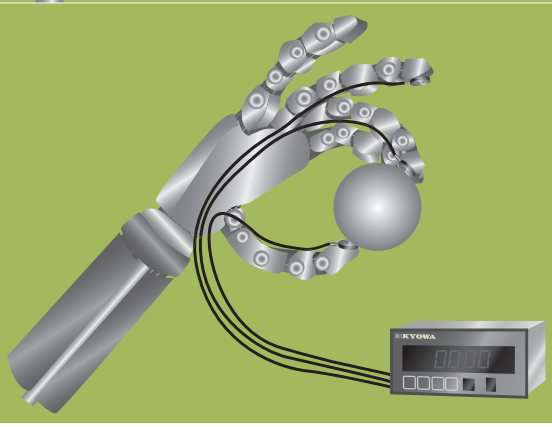


●oil pressure control of construction machinery

●Refrigerant pressure monitoring of on air conditioner



●Pressure measurement in tight space such as inside a pipe



●Used for touch-sensors by mourting pressure transducers to a robot

## Small-Sized Pressure Transducers
## PGL-A

●Semiflush type for measurement of highly viscous medium

PGL-A-A

| | |
|---|---|
| Rated capacity | 1 to 50 MPa |
| Nonlinearity | Within ±0.3% RO |
| | (within ±0.5% RO with 2MPa or smaller) |
| Hysteresis | Within ±0.2% RO |
| | (within ±0.5% RO with 2MPa or smaller) |
| Rated output | 2 mV/V ±20% |
| | (within ±30% with 2MPa or smaller) |
| Safe overload rating | 150% |
| Mounting screw | G1/8, male |
| Weight | approx. 20 g |

★Material: Metal finish

## Small-Sized Pressure Transducers
## PGS-A

●Compact, lightweight, and highly durable; vibration acceleration 490.3 m/s², impact acceleration 4903 m/s²

| | |
|---|---|
| Rated capacity | 1 to 50 MPa |
| Nonlinearity | Within ±0.2% RO |
| | (within ±0.3% RO with 20KA, |
| | within ±0.4% RO with 10KA) |
| Hysteresis | Within ±0.2% RO |
| Rated output | 2 mV/V ±0.5% |
| Safe overload rating | 150% |
| Mounting screw | G3/8, male |
| Weight | approx. 120 g |

★Materials: Aluminum, alumite treated (mainframe), SUS 630 (liquid-contacting part)

## Small-Sized Pressure Transducers
## PGM-H

●Semiflush type for measurement of highly viscous medium

| | |
|---|---|
| Rated capacity | 500 kPa to 50 MPa |
| Nonlinearity | Within ±0.3% RO |
| | (within ±0.5% RO with 5 to 20KH) |
| Hysteresis | Within ±0.2% RO |
| Rated output | 2 mV/V or more |
| | (1.5 mV/V or more with 5KH) |
| Safe overload rating | 150% |
| Mounting screw | G3/8, male |
| Weight | approx. 120 g |

★Materials: SUS metal finish (mainframe), SUS 630 (liquid-contacting part)

## Small-Sized Pressure Transducers
## PGM-E

●Flush diaphragm type

| | |
|---|---|
| Rated capacity | 1 ~ 50 MPa |
| Nonlinearity | Within ±1% RO |
| Hysteresis | Within ±1% RO |
| Rated output | 1 mV/V or more |
| | (1.4 mV/V or more with 500KE) |
| Safe overload rating | 150% |
| Mounting screw | G3/8, male |
| Weight | approx. 200 g (the cable is contained) |

★Materials: SUS metal finish (mainframe), SUS 630 (liquid-contacting part) (SUS 630 and SUS 304 with 10 and 20KE)

## Pressure Transducers
## PG-U

| | |
|---|---|
| Rated capacity | 200 kPa ~ 50 MPa |
| Nonlinearity | Within ±0.2% RO |
| | (within ±0.3% RO with 2 to 10KU) |
| Hysteresis | Within ±0.2% RO |
| | (within ±0.3% RO with 2 to 10KU) |
| Rated output | 2 mV/V ±0.5% (±1% with 2 to 10KU) |
| Safe overload rating | 150% |
| Mounting screw | G3/8, male |
| Weight | approx. 300 g (approx. 500 g with 2.5KN) |

★Materials: Aluminum, alumite treated(mainframe), ZDC, chrome-plated (mainframe) with 10KU or larger, SUS 630 (liquid-contacting part)

## Small-Sized Stainless Steel Pressure Transducers
## PGM-D

●Small pressure sensing surface, flush diaphragm type

| | |
|---|---|
| Rated capacity | 5 ~ 50 MPa |
| Nonlinearity | Within ±0.5% RO |
| Hysteresis | Within ±0.5% RO |
| Rated output | 1.5 mV/V ±20% |
| Safe overload rating | 150% |
| Mounting screw | G1/8, male |
| Weight | approx. 150 g (the cable is contained) |

★Materials: SUS metal finish (mainframe), SUS 630 (liquid-contacting part)

## Small-Sized Pressure Transducers
## PGMC-A

●Pressure sensing part diameter as small as 5.5 mm
●Flush diaphragm type

| | |
|---|---|
| Rated capacity | 200 kPa ~ 1 MPa |
| Nonlinearity | Within ±1.5% RO |
| Hysteresis | Within ±1.5% RO |
| Rated output | PGM-200kPa: 0.6 mV/V or more |
| | PGM-500kPa, 1MPa: 1 mV/V or more ±20% |
| Safe overload rating | 150% |
| Mounting screw | G1/8, male |
| Weight | approx. 140 g (the cable is contained) |

★Materials: C1720 (liquid-contacting part), SUS 303 (screw)

## High Pressure Transducers
## PG-H

| | |
|---|---|
| Rated capacity | 100, 200 MPa |
| Nonlinearity | Within ±0.2% RO |
| Hysteresis | Within ±0.2% RO |
| Rated output | 1.5 mV/V ±0.5% |
| Safe overload rating | 150% |
| Mounting screw | G1/2, male |
| Weight | approx. 220 g |

★Materials: SUS metal finish (mainframe), SUS 630 (liquid-contacting part)

## High-Pressure-Resistant Pressure Transducers
## PGR-A

●Usable at high temperatures up to100°C
●Withstanding high pressures
●Highly accurate

| | |
|---|---|
| Rated capacity | 1 ~ 20 MPa |
| Nonlinearity | Within ±0.1% RO |
| Hysteresis | Within ±0.1% RO |
| Rated output | 1.5 mV/V ±5% |
| Safe overload rating | 300% |
| Mounting screw | G3/8, male |
| Weight | approx. 400 g |

★Materials: SUS metal finish (mainframe), SUS 630 (liquid-contacting part)

## Small-Sized High/Low Temp. Pressure Transducers
## PHL-A

●Flush diaphragm type for measurement of highly viscous medium
●Safe temperature range: –196 to 210°C

PHL-A-B

| | |
|---|---|
| Rated capacity | 1 ~ 50 MPa |
| Nonlinearity | Within ±0.3% RO |
| | (within ±0.5% RO with 2MPa or smaller) |
| Hysteresis | Within ±0.2% RO |
| | (within ±0.5% RO with 2MPa or smaller) |
| Rated output | 2 mV/V ±20% |
| | (within 30% with 2MPa or smaller) |
| Safe overload rating | 150% |
| Mounting screw | G1/8, male |
| Weight | approx. 20 g |

★Material: Metal finish, connector type

## Small-Capacity Pressure Transducers
## PGM-G

●Communicating tube incorporated in the cable for back Pressure compensation

| | |
|---|---|
| Rated capacity | 20 ~ 100 kPa |
| Nonlinearity | Within ±0.5% RO |
| Hysteresis | Within ±0.3% RO |
| Rated output | PGM-02KG: 0.75 mV/V or more |
| | PGM-05KG: 1.25 mV/V or more |
| | PGM-1KG: 1.4 mV/V or more |
| Safe overload rating | 150% |
| Mounting screw | M14 × 1, male |
| Weight | approx. 40 g (the cable is contained) |

★Materials: SUS metal finish (mainframe), SUS 304 (liquid-contacting part)

## Absolute Pressure Transducers
## PAB-A

●Measurement from absolute pressure Zero absolute pressure (vacuum) possible

| | |
|---|---|
| Rated capacity | 200 kPaabs ~ 2 MPaabs |
| Nonlinearity | Within ±0.1% RO |
| Hysteresis | Within ±0.1% RO |
| Rated output | 2 mV/V or more |
| Safe overload rating | 150% |
| Mounting screw | 7/16-20UNF |
| Weight | approx. 130 g |

★Material: SUS 630 (liquid-contacting part)

## Highly Reliable Sputter Gage Pressure Transducers

# PHS-A

- Safe temperature range: -196 to 230°C
- Long-term stable measurement at 200°C
- Absolute pressure measurement possible
- Excellent high-temperature characteristics

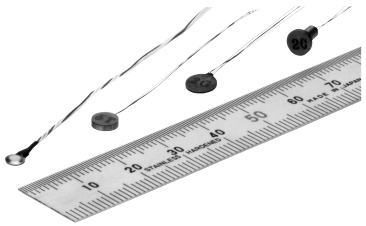
| | |
|---|---|
| Rated capacity | 200 kPaabs to 20 MPaabs |
| Nonlinearity | Within ±0.2% RO |
| Hysteresis | Within ±0.2% RO |
| Rated output | 1.5 mV/V or more |
| Safe overload rating | 150% |
| Mounting screw | G3/8, male |
| Weight | approx. 150 g |

★Materials: SUS metal finish (mainframe), SUS 630 (liquid-contacting part)

## Miniature Pressure Transducers

# PSS/PS/PSM

- Thin, small in diameter, lightweight, intended for distributed pressure measurement
- Bondable with adhesive



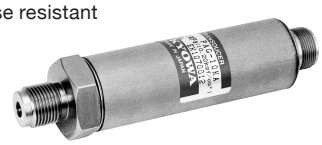
| | |
|---|---|
| Rated capacity | 50 kPa to 7 MPa |
| Nonlinearity | Within ±1% RO |
| Hysteresis | Within ±1% RO |
| Rated output | 0.25 to 1 mV/V |
| Safe overload rating | 150% |
| Weight | approx. 0.15 to 0.5 g |

★Type C: Flat, type D: Conical;
Type D is available only for PSM series.

## Highly Stable Current-Output Pressure Transducers

# PAG-A

- Highly reliable
- Highly stable
- High resolution
- Noise resistant



| | |
|---|---|
| Rated capacity | 200 kPa to 1 MPa |
| Nonlinearity | Within ±0.1% RO |
| | (within ±0.05% RO(Typica) to 30 to 70% of each rated capacity, |
| | The transducer is usually used in that range) |
| Hysteresis | Within ±0.2% RO |
| Rated output | 4 to 20 mV/V |
| Safe overload rating | 150% |
| Mounting screw | G3/8, male |
| Weight | approx. 270 g |

★Materials: SUS metal finish (mainframe), SUS 630 (liquid-contacting part)

## High/Low-Temperature Pressure Transducers

# PHB-A

- Safe temperature range: –196 to 210°C

| | |
|---|---|
| Rated capacity | 1 to 50 MPa |
| Nonlinearity | Within ±0.4% RO |
| Hysteresis | Within ±0.4% RO |
| Rated output | 2.2 mV/V ±15% |
| Safe overload rating | 120% |
| Mounting screw | G3/8, male |
| Weight | approx. 530 g (the cable is contained) |

★Materials: SUS metal finish (mainframe), SUS 630 (liquid-contacting part)

## Micro Differential Pressure Transducers

# PDS-A/PDV-A

- Compact, lightweight, quick response, high accuracy and high sensitivity

PDS-A

PDV-A

| | |
|---|---|
| Rated capacity | 1 to 7 kPa |
| Nonlinearity | Within ±0.5% RO |
| | (within 0.7% RO with 25GA) |
| Hysteresis | Within ±0.3% RO |
| Rated output | PDS-10GA : ±7 to 23 mV |
| | PDS-25 to 70GA : ±13 to 23 mV |
| | PDV-A: ±5 V |
| Safe overload rating | PDS/PDV-10GA: 600% |
| | PDS/PDV-25 to 70GA : 300% |
| Weight | PDS : approx. 40 g |
| | PDV : approx. 100 g |

## Output Pressure Transmitters

# PAV-R/U,PAA-R/U

- Highly Resistant against Noise during Transmission

R type

U type

| | |
|---|---|
| Rated capacity | 500 kPa to 50 MPa |
| Nonlinearity | Within ±0.2% RO |
| Hysteresis | Within ±0.2% RO |
| Rated output | PAV-R,U : 0 to 5V |
| | PAA-R,U : 4 to 20mA |
| Safe overload rating | 200% |
| Mounting screw | G3/8, male |
| Weight | approx. 200 to 260 g |

★Materials: SUS metal finish (mainframe), SUS 630 (liquid-contacting part)

## Small-Sized High-Temp. Pressure Transducers

# PHF-S-SA2

- Safe temperature range: –40 to 170°C
- Compact and lightweight

| | |
|---|---|
| Rated capacity | 2 to 20 MPa |
| Nonlinearity | Within ±0.3% RO |
| | (within ±0.4% RO with 2MPSA2) |
| Hysteresis | Within ±0.2% RO |
| Rated output | 2 mV/V |
| Safe overload rating | 150% |
| Mounting screw | R1/8 male |
| Weight | approx. 50 g |

## Flush Diaphragm Type High-Temperature Pressure Transducers

# PHC-B

- Safe temperature range: –30 to 240°C

| | |
|---|---|
| Rated capacity | 2 to 20 MPa |
| Nonlinearity | Within ±0.5% RO |
| Hysteresis | Within ±0.5% RO |
| Rated output | 0.6 mV/V or more |
| Safe overload rating | 150% |
| Mounting screw | G1/8, male |
| Weight | approx. 115 g (the cable is contained) |

★Materials: SUS metal finish (mainframe), SUS 630 (liquid-contacting part)

## Output Pressure Transmitters

# PVL/PAL

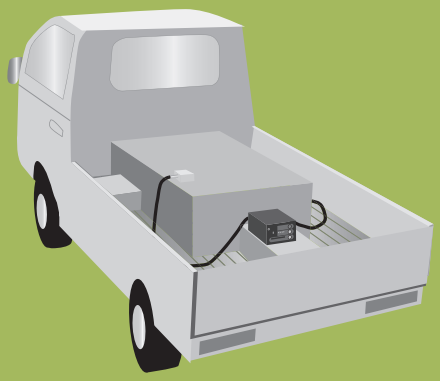
PVL-A,B

| | |
|---|---|
| Rated capacity | 500 kPa to 50 MPa |
| Nonlinearity | Within ±0.3% RO |
| | (within 0.5% RO with 5K ~ 20K) |
| Hysteresis | Within ±0.3% RO |
| | (within 0.5% RO with 5K ~ 20K) |
| Rated output | PVL-A,C : 1 to 5V |
| | PVL-B,D : 0 to 5V |
| | PAL : 4 to 20mA |
| Safe overload rating | 150% |
| Mounting screw | G3/8, male |
| Weight | approx. 110 g |

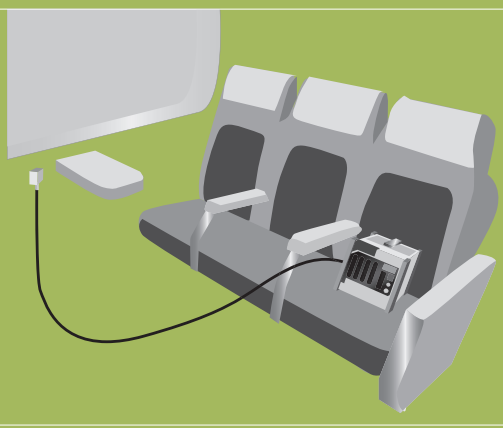
★Materials: SUS metal finish (mainframe), SUS 630 (liquid-contacting part)

# Acceleration Transducers

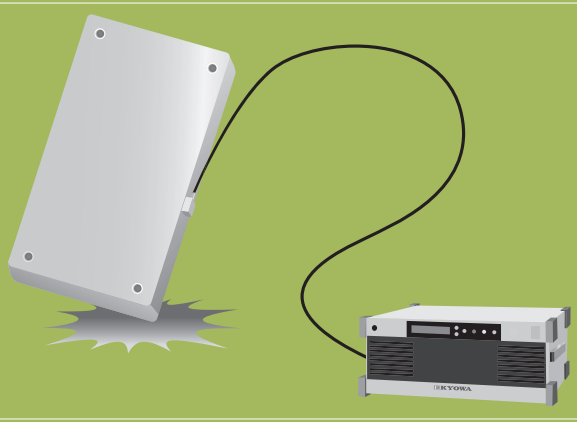
## ●Acceleration Transducers measurement example



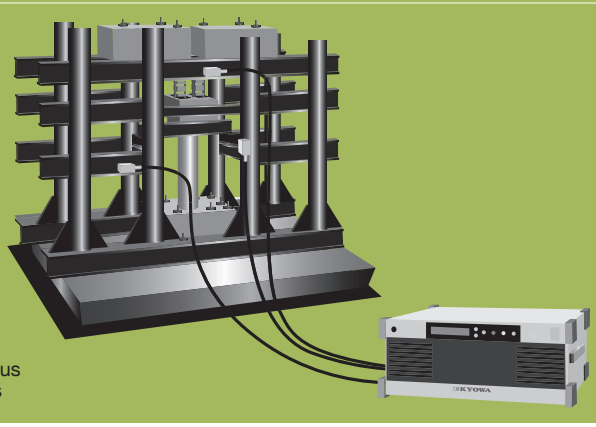
●Vibration tests on goods daring truck transportation



●Vibration tests on railway vehicle and truck



●Drop impact tests of fuel cell container and Lithium-ion battery



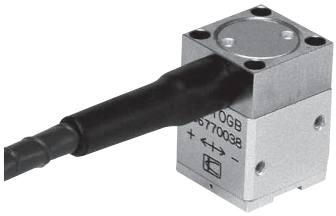
●Vibration tests on various structures such as piers

## Small-Capacity Acceleration Transducers

## AS-GA,GB

●Compact and lightweight design gives minimal effect to vibration mode.


AS-GA



AS-GB

| | |
|---|---|
| Rated capacity | ±9.807 to 196.1 m/s² |
| Nonlinearity | Within ±1% RO |
| Hysteresis | Within ±1% RO |
| Rated output | 0.5 mV/V or more |
| Safe overload rating | 300% |
| Frequency response range | DC to (40 to 250) Hz |
| Weight | approx. 15 g (GA), 25 g (GB) |

## Small-Sized Acceleration Transducers

# AS-A,B

- Compact and lightweight
- Cycling life: 10 million times

AS-A

AS-B

| | |
|---|---|
| Rated capacity | ±980.7 to 9807 m/s² (A) |
| | ±98.07 to 490.3 m/s² (B) |
| Nonlinearity | Within ±1% RO |
| Hysteresis | Within ±1% RO |
| Rated output | 0.5 mV/V or more (A) |
| | 0.5 mV/V ±20 % (±25% with 10B) (B) |
| Safe overload rating | 300% |
| Frequency response range | DC to (1.2 to 5) kHz (A) |
| | DC to (300 Hz to 1 kHz) (B) |
| Weight | approx. 6.5 g (A), 13 g (B) |

## Small-Sized Triaxial Acceleration Transducers

# AS-TG

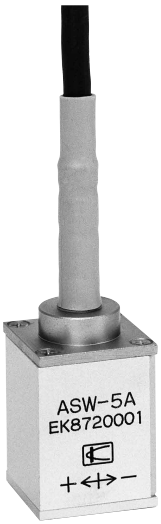
- Simultaneous measurement of acceleration in X, Y and Z directions.


| | |
|---|---|
| Rated capacity | ±9.807 to 196.1 m/s² |
| Nonlinearity | Within ±1% RO |
| Hysteresis | Within ±1% RO |
| Rated output | 0.5 mV/V or more |
| Safe overload rating | 1000% (with stopper) |
| Frequency response range | DC to (40 to 250) Hz |
| Weight | approx. 110 g |

## Waterproof Acceleration Transducers

# ASW-A

- Usable under water and soil




| | |
|---|---|
| Rated capacity | ±9.807 to 196.1 m/s² |
| Nonlinearity | Within ±1% RO |
| Hysteresis | Within ±1% RO |
| Rated output | 0.5 mV/V or more |
| Safe overload rating | 300% |
| Frequency response range | DC to (40 to 250) Hz |
| Weight | approx. 40 g |

★Hydraulic resistance : 490.3 kPa

## Quick Response Acceleration Transducers

# AS-HA,HB

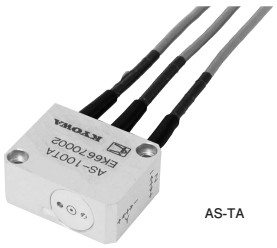
AS-HA

AS-HB

| | |
|---|---|
| Rated capacity | ±980.7 to 9807 m/s² (HA) |
| | ±98.07 to 490.3 m/s² (HB) |
| Nonlinearity | Within ±1% RO |
| Hysteresis | Within ±1% RO |
| Rated output | 0.5 mV/V ±20% (±25% with 10HB) |
| Safe overload rating | 300% |
| Frequency response range | DC to (2 to 7) kHz (HA), |
| | DC to (500 Hz to 1.5 kHz) (HB) |
| Weight | approx. 6.5 g (HA), 13 g (HB) |

## Triaxial Acceleration Transducers

# AS-TA,TB



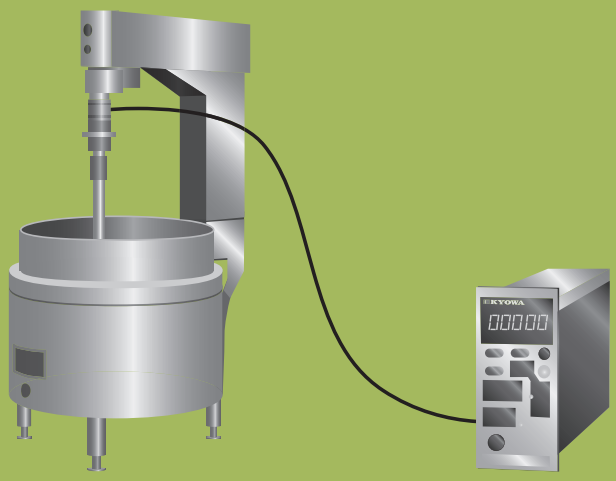
AS-TA

AS-TB

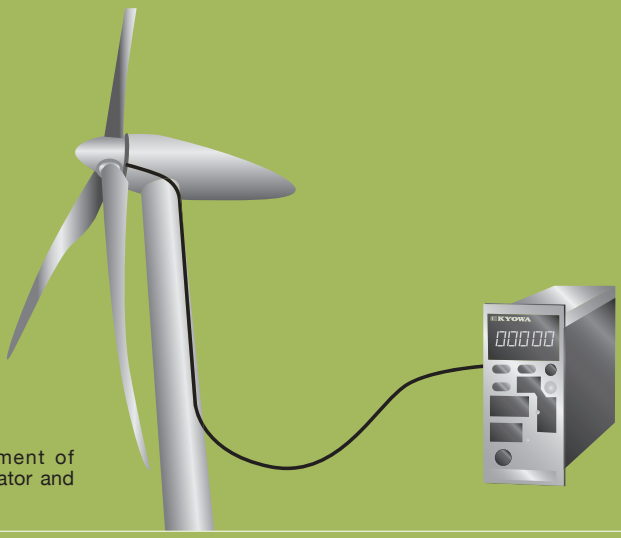
| | |
|---|---|
| Rated capacity | ±98.07 to 9807 m/s² |
| Nonlinearity | Within ±1% RO |
| Hysteresis | Within ±1% RO |
| Rated output | 0.5 mV/V or more (TA) |
| | 0.5 mV/V ±20% (TB) (±25% with 10TB) |
| Safe overload rating | 300% (each axis) |
| Frequency response range | DC to (1.2 to 5) kHz (TA) |
| | DC to (350 Hz to 1 kHz) (TB) |
| Weight | approx. 45 g (TA), 95 g (TB) |

# Torque Transducers

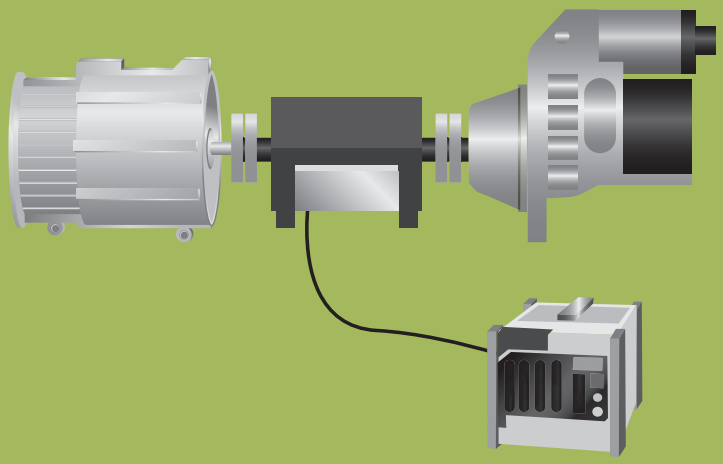
## Torque Transducers measurement example



●Torque measurement and control of a stir machine when food is stirred



●Torque measurement of wind power generator and dynamo



●Torque evaluation of motors

## Torque Transducers NEW

### TPS-A

●Non-contact design facilitates maintenance.

| | |
|---|---|
| Rated capacity | TPS-A-10NM: ±10 N·m |
| | TPS-A-50NM: ±50 N·m |
| Nonlinearity | Within ±0.3% RO |
| Hysteresis | Within ±0.3% RO |
| Rated output | ±5 ± 0.2 V(load resistance 5 kΩ or more) |
| Safe overload rating | TPS-A-10NM:150%, TPS-A-50NM:120% |
| MAX. speed | 5000 rpm |

## Torque Transducers

### TP-AB/CB

●Bending or thrust of the shaft causes minimal adverse effect, thereby enabling highly accurate measurement.

TP-CB

| | |
|---|---|
| Rated capacity | 100 N·m to 5 kN·m |
| Nonlinearity | Within ±0.2% RO |
| Hysteresis | Within ±0.2% RO |
| Rated output | 1.5 mV/V ±0.2% (±0.5% with 5 kN·m) |
| Safe overload rating | 120% |
| MAX. speed | 2500 to 9000 rpm |

★TP-AB with no installation feet and TP-CB with installation feet

## Small-Sized Torque Transducers

### TP-D/E

●For small torque measurement

TP-E

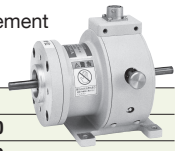
| | |
|---|---|
| Rated capacity | 0.2 to 2 N·m |
| Nonlinearity | Within ±1% RO |
| Hysteresis | Within ±1% RO |
| Rated output | 0.75 to 1.5 mV/V |
| Safe overload rating | 120% |
| MAX. speed | 4000 rpm |

★TP-D with no installation feet and TP-E with installation feet

## High-Speed Torque Transducers

### TP-M

●For small torque measurement
●Equipped with overload prevention stopper



| | |
|---|---|
| Rated capacity | 0.2 to 5 N·m |
| Nonlinearity | Within ±0.2% RO |
| Hysteresis | Within ±0.2% RO |
| Rated output | 0.75 to 1.5 mV/V |
| Safe overload rating | 150% (stopper operates at 150%.) |
| Operating speed | 3000 to 15000 rpm |

## Rotary Transformer Torque Transducers

### TPN-AB/CB

●Non-contact design facilitates maintenance.

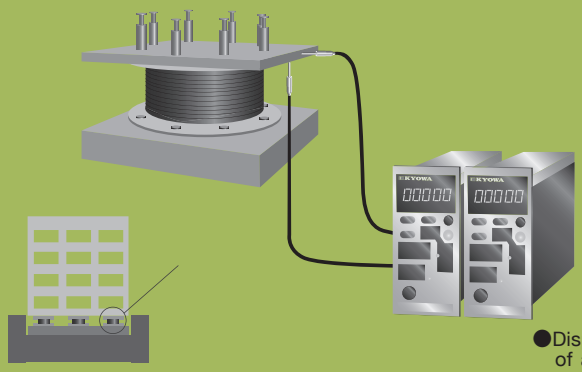
TPN-CB

| | |
|---|---|
| Rated capacity | 100 to 500 N·m |
| Nonlinearity | Within ±0.2% RO |
| Hysteresis | Within ±0.2% RO |
| Rated output | 1.2 mV/V or more |
| Safe overload rating | 150% |
| MAX. speed | 5000 to 12000 rpm |

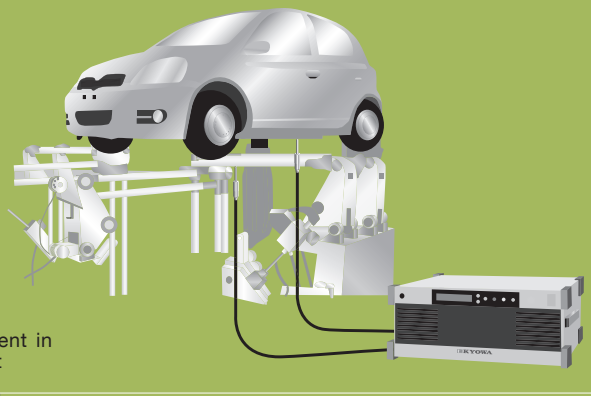
★Mating amplifier : DPM dynamic strain amplifier (carrier: 5 kHz)
★TPN-AB with no installation feet and TPN-CB with installation feet

# Displacement Transducers

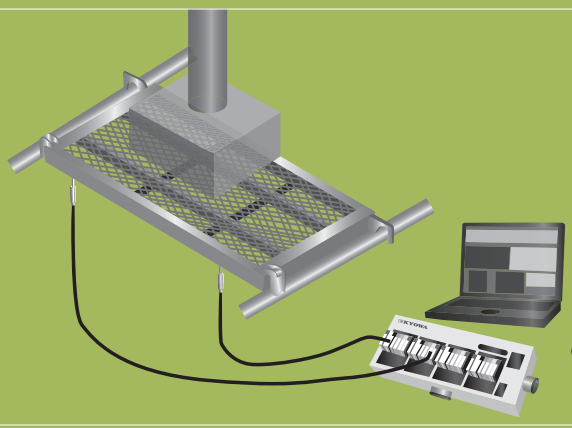
## Displacement Transducers measurement example



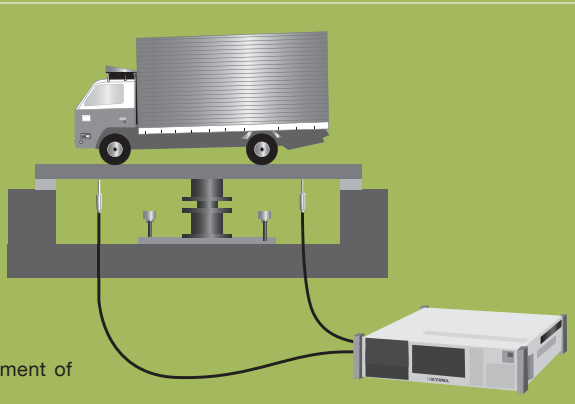
●Displacement measurement of antiseismic rubber used for seismically isolated structure in vibration test



●Deflection measurement in auto body strength test



●Deflection or displacement measurement on strength test of scaffolding frames



●Displacement measurement of plate bearing test

### Displacement Transducers
## DTH-A

●Compact, lightweight, highly accurate and high output level

| | |
|---|---|
| Rated capacity | 5 to 100 mm |
| Nonlinearity | Within ±0.1% RO |
| Hysteresis | Within ±0.1% RO |
| Rated output | 5 mV/V ±0.1% |
| Measuring force: | approx. 1.5 to 4 N |

### Displacement Transducer
## DTJ-A-200

●Direct-reading scale provided

| | |
|---|---|
| Rated capacity | 200 mm |
| Nonlinearity | Within ±0.3% RO |
| Hysteresis | Within ±0.3% RO |
| Rated output | 5 mV/V ±0.3% |
| Measuring force | approx. 5.9 N |

### Displacement Transducers
## DT-A

●Direct-reading scale provided

| | |
|---|---|
| Rated capacity | 50, 100 mm |
| Nonlinearity | Within ±0.5% RO |
| Hysteresis | Within ±0.5% RO |
| Rated output | 1.5 mV/V ±20% |
| Measuring force | approx. 4.4 N |

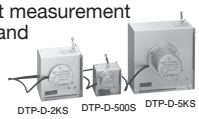
### Dial Gage Displacement Transducers
## DT-D

●Direct-reading dial gage provided
●Easy installation and maintenance

| | |
|---|---|
| Rated capacity | 10 to 50 mm |
| Nonlinearity | Within ±0.5% RO |
| Hysteresis | Within ±0.5% RO |
| Rated output | 1.5 mV/V or more |
| Measuring force | approx. 1.47 to 1.77 N |
| Safe overload rating | 100% |

### Potentiometer Displacement Transducers
## DTP-D-S

●For large displacement measurement
●Compact, lightweight and high output level



DTP-D-2KS DTP-D-500S DTP-D-5KS

| | |
|---|---|
| Rated capacity | 500 to 5000 mm |
| Nonlinearity | Within ±0.3% RO |
| Hysteresis | Within ±0.3% RO |
| Rated output | 5 mV/V ±0.3% |
| Measuring force | 0.98 to 1.67 N |
| Safe overload rating | 120% |

★Flexible steady point type is available.

### Inductance Displacement Transducers
## DLT-AS/BS

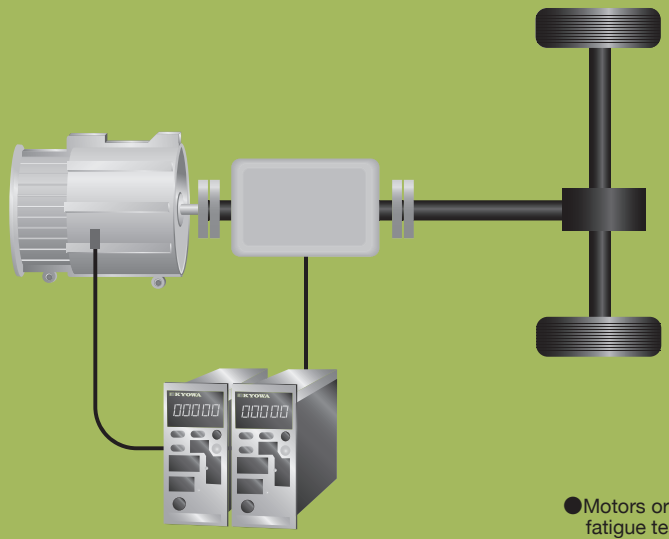
●Less abrasion and small measuring force

| | |
|---|---|
| Rated capacity | ±5 to 500 mm |
| Nonlinearity | Within ±0.5% RO |
| Hysteresis | Within ±0.5% RO |
| Rated output | approx. ±2 mV/V |

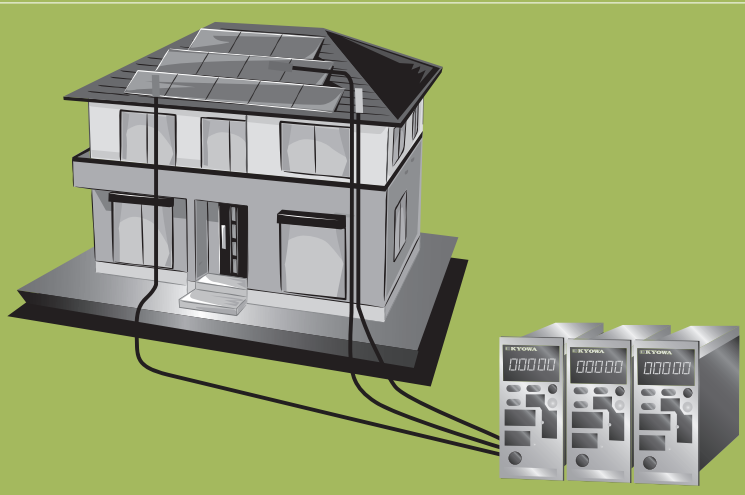
★Mating amplifier: DPM dynamic strain amplifier (carrier: 5 kHz)

# Dynamic Strain Amplifiers

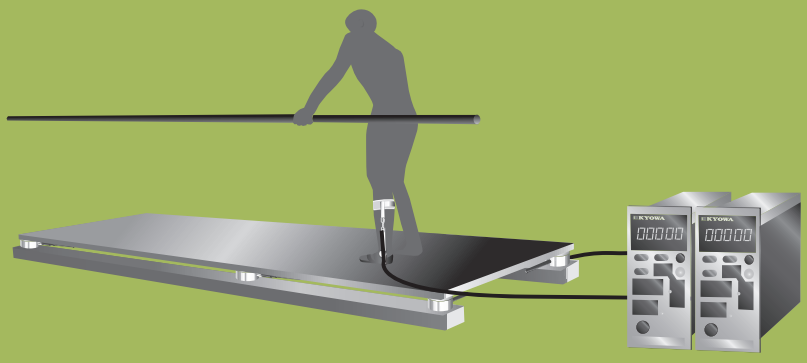
## ● Dynamic Strain Amplifiers measurement example



●Motors or assist- motor fatigue test



●Vibration measurement house of solar panels or with solar panels attached



●Gait analysis of disabled people

## Strain Amplifiers NEW

## DPM-911A/912A

- ●Working hours can be greatly shortened by easy setting.
- ●Sensitivity (measuring range) is set in combination of strain level and output voltage settings.
- ●High voltage output of ±10 V and high SN ratio are ensured.
- ●Vertical bar meter is easy to see.
- ●Sensitivity of TEDS-installed transducer is automatically registered.
- ●Overinput is alarmed by flickering 4½-digit output voltage indicator.
- ●Unbalanced capacitive components are automatically canceled by the CST method.


| | |
|---|---|
| Number of measuring channels | 1 |
| | (multi-channel configuration possible |
| | by combining multiple units) |
| Models and frequency response ranges | DPM-911A: DC to 2.5 kHz |
| | DPM-912A: DC to 5 kHz |
| Output | OUTPUT A: ±10 V |
| | (load resistance 5 kΩ or more) |
| | OUTPUT B: ±10 V |
| | (load resistance 5 kΩ or more) |
| Low-pass filter | Second order Butterworth |
| | Cutoff frequency: 6 steps of 10, 30, 100, |
| | 300, 1k [Hz] and FLAT |
| | Cutoff accuracy: –3 ± 1 dB |
| | Attenuation: –12 ± 1 dB/oct. |
| | (except when the low-pass filter |
| | of DPM-911A is set to 1 kHz) |
| Power supply | AC LINE (approx. 10 VA/100 VAC), |
| | 10.5 to 15 VDC (approx. 0.6 A/12 VDC) |
| Dimensions | 49(W) × 128.5(H) × 262.5(D) mm |
| | (excluding protrusions) |
| | Panel cut dimensions: 50(W) × 113(H) mm |
| Weight | approx. 1.2 kg |

## Strain Amplifiers
# DPM-713B

- Bridge check function allows checking of connections between strain gage and input connector.
- Highly accurate 4-digit indicator, which flickers against overrange input

| | |
|---|---|
| Number of measuring channels | 1 |
| | (multiple units can be combined |
| | for multichannel configuration) |
| Frequency response range | DC to 10 kHz |
| Balance adjustment method | Resistance: True electron auto balance |
| | Capacitance: CST (capacitance self-tracking) |
| Sensitivity | 0.2 V or more to 10 μm/m input with |
| | bridge excitation 2 Vrms |
| Output | Dual output; ±5 V or more (load 5 kΩ or more), |
| | ±10 mA or more (load 30 Ω) |
| Low-pass filter | 10, 30, 100, 300 , 1k (Hz) and |
| | F (Flat), Attenuation –12 dB/oct. |
| Power supply | AC line or 10.5 to 15 VDC |
| Dimensions | 49 × 128.5 × 262.5 (excluding protrusions) |
| Weight | approx. 1.4 kg |

## Strain Amplifiers
# DPM-750A Series

- Signal output at an extremely high S/N ratio is ensured by minimizing effects of noise and common mode voltage of power line or equipment generating high electric field.
- Bridge check function allows checking of connections between strain gage and input connector.
- Highly accurate 4-digit indicator, which flickers against overrange input

DPM-752A

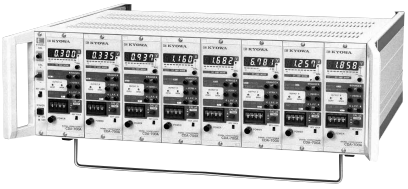
| | |
|---|---|
| Number of measuring channels | 1 |
| | (multichannel configuration possible) |
| Models and frequency response ranges | DPM-751A: DC to 2 kHz |
| | DPM-752A: DC to 5 kHz |
| SN ratio | Range 100 μm/m |
| | DPM-751A: 43 dBp-p or higher |
| | DPM-752A: 40 dBp-p or higher |
| | Range other than 100 μm/m |
| | DPM-751A: 49 dBp-p or higher |
| | DPM-752A: 46 dBp-p or higher |
| Balance adjustment method | Resistance: True electron auto balance |
| | Capacitance: CST (capacitance self-tracking) |
| Sensitivity | 0.2 V or more to 10 μm/m input with |
| | bridge excitation 2 Vrms |
| Output | Dual output; ±5 V or more (load 5 kΩ or more), |
| | ±10 mA or more (load 30 Ω) |
| Low-pass filter | 10, 30, 100, 300, 1k (Hz) and |
| | F (Flat), Attenuation –12 dB/oct. |
| Power supply | AC line or 10.5 to 15 VDC |
| Dimensions | 49 × 128.5 × 262.5 (excluding protrusions) |
| Weight | approx. 1.4 kg |

## Signal Conditioners
# CDV/CDA-700A

- Maximum gain of 10000x makes them usable as DC amplifiers.
- Highly accurate 4-digit indicator
- Setting conditions are backed against power failure.
- Key-lock function prevents erroneous setting.
- Low-pass filter:
  10, 100, 1k, 10k (Hz) and F (Flat)
  Attenuation –24 dB/oct.

CDV-700A

CDA-700A



8 Units accommoduted in Portable Housing Case YB-508A

| | |
|---|---|
| Number of measuring channels | 1 |
| | (multichannel configuration possible) |
| Models and bridge excitation | CDV-700A: Constant voltage, |
| | CDA-700A: Constant current |
| Output | A: ±10 V or more, |
| | B: ±10 V or more (vernier control provided), |
| | 4 to 20 mA (as specified) |
| Balance adjustment method | True electron auto balance |
| Power supply | AC line or 10.5 to 15 VDC |
| Dimensions | 49 × 128.5 × 262.5 (excluding protrusions) |
| Weight | approx. 1.4 kg |

## Multi Conditioner Systems
# MCD-A

- For optimum system configuration, various cards are available including dynamic strain, signal conditioner, F-V converter, charge amplifier and thermocouple.
- All conditioner cards have the input and output isolated.
- Excellent vibration resistance enables onboard application.
- 8 and 16-channel unit bases are available for configuration of desire multichannel configuration.
- Dynamic strain amplifier card is provided with true electron type auto- balance system and with the CST system which cancels capacitive unbalance by constantly tracking capacitive component.
- Input/output isolation system ensures high noise resistance and safety.
- Conforming to CE marking

MCD-8A unit base
(with monitor and DPM-71A cards mounted)

**●Unit Bases MCD-8A/16A**

| | |
|---|---|
| Models | MCD-8A: To accommodate 8 conditioner cards |
| | MCD-16A: To accommodate 16 conditioner cards |
| Vibration resistance | 49.03 m/s² (5 G) (5 to 55 Hz) |
| Power supply | 100 to 240 VAC, 9 to 18 VDC |
| Dimensions & weight | MCD-8A: 264 × 132.5 × 300 mm |
| | (excluding protrusions), approx. 7 kg |
| | MCD-16A: 426 × 132.5 × 300 mm |
| | (excluding protrusions), approx. 10 kg |
| EMC standard | EN 61326-1 (common to all cards) |
| Safety standard | EN 61010-1 |
| | (Installation category Ⅱ, Pollution level 2) |

**●Monitor Card DPE-71A**

**●Speifications Common to All Conditioner Cards**

| | |
|---|---|
| Number of measuring channels | 1 |
| Output | 2-way output |
| | (the same voltage is output to the BNC |
| | connector and centralized connector.) |
| | Output voltage: ±5 V (5 kΩ load or more) |

**●Dynamic Strain Amplifier Cards DPM-71A/72A**

| Model | Frequency response range | Carrier |
|---|---|---|
| DPM-71A | DC to 2.5 kHz (deviation ±10%) | 5 kHz |
| DPM-72A | DC to 5 kHz (deviation ±10%) | 12 kHz |

**●Signal Conditioner Card CDV-71A**

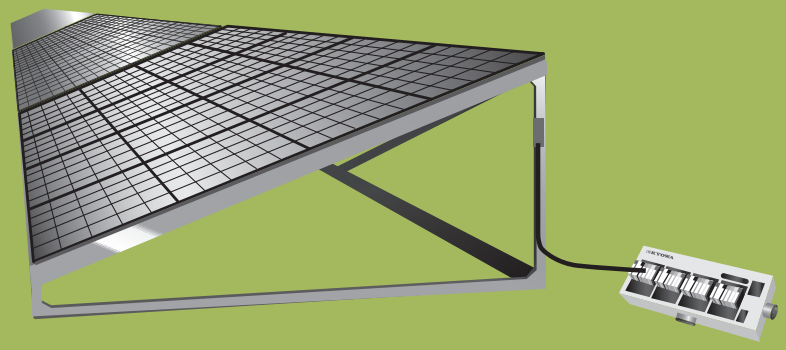
**●Thermocouple Card CTA-71A**

**●F-V Converter Card CFV-71A**

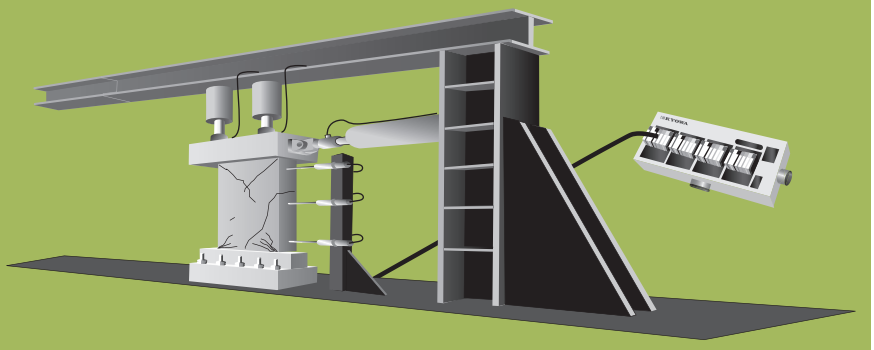
**●Charge Amplifier Card CCA-71A**

# Data Loggers

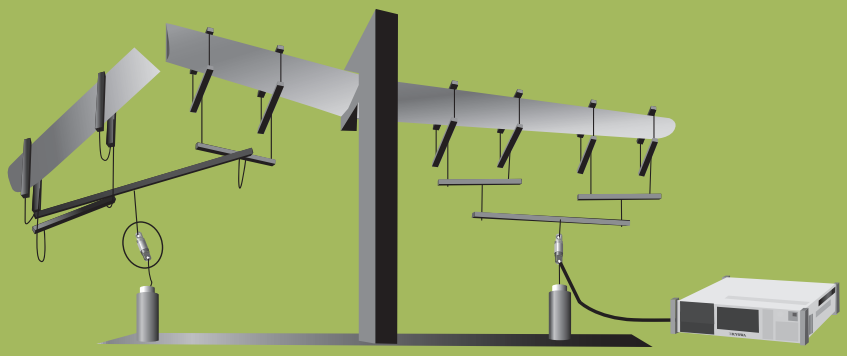
## Data Loggers measurement example



●Static measurement of solar panel



●Point load test of concrete pillar



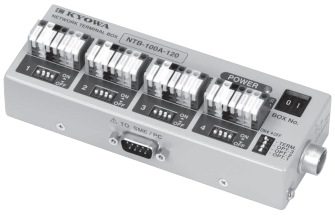
●load test of glider wing

## Network Terminal Boxes NEW

## NTB-100A (For TEDS)

- Decentralized arrangement to wide places is possible via a single wire.
- These compact and lightweight bridge boxes provide digital output.
- One AC adapter enables coupling of maximum 8 units.
- Easy software enables quick measurement.

NTB-101A-350



NTB-100A-120

| | |
|---|---|
| Number of Measuring Channels | 4 |
| Scanning Speed | Approx. 0.5 seconds per channel for 0 to ±30000 μm/m |
| | Approx. 1 second per channel for 0 to ±300000 μm/m |
| Bridge Excitation | Approx. 2 VDC for constant-voltage bridge excitation |
| | Approx. 5.6 mA for constant-current bridge excitation |
| | (with bridge resistance 350 Ω) |
| Measuring Range | 0 to ±300000 μm/m with constant-voltage bridge excitation |
| | 0 to ±30000 μm/m with constant-current bridge excitation |
| | –30.0 to 70.0°C with civil engineering transducers |
| | having temperature measuring function |
| Resolution | 1 μm/m for 0 to ±30000 μm/m, |
| | 10 μm/m for 0 to ±300000 μm/m, 0.1°C |
| Accuracy | ±(0.05% rdg. + 2 μm/m) for 0 to ±30000 μm/m |
| | ±(0.10% rdg. + 20 μm/m) for 0 to ±300000 μm/m |
| | ±0.5°C |
| Operating Temperature Range | –10 to 50°C |
| Operating Humidity Range | 20 to 85% RH (noncondensing) |
| Power Supply | 11 to 16 VDC |
| Dimensions & Weight | One-touch lock type |
| | 150(W) × 28(H) × 55(D) mm |
| | (excluding protrusions), approx. 310 g |
| | Screw soldering type |
| | 150(W) × 28(H) × 110(D) mm |
| | (excluding protrusions), approx. 650 g |

## Handy Data Logger

NEW

# SME-30A/31A/100A/101A (For TEDS)

- Measurement data is saved in SD card.
- Bridge circuit is built in, enabling direct connection of strain gage.
- Measuring range is ±300000 μm/m.
- Network Terminal Box enables multi-channel measurement with the SME-100A.

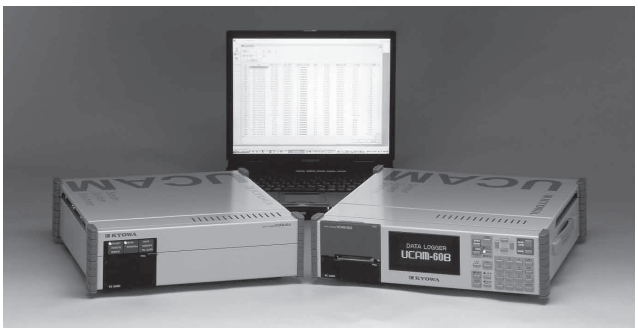
SME-100A SME-30A

| | |
|---|---|
| Number of Measuring Channels | 1 |
| Sampling Frequency | Approx. 2 Hz with strain input in a range of 0 to ±30000 μm/m |
| | Approx. 1 Hz with strain input exceeding ±30000 μm/m |
| | Approx. 1 Hz with civil engineering transducer with temperature measuring function |
| Measuring Mode | Relative mode (each value is obtained by deducting the initial unbalance) |
| Calculation Function | Enables multiplication of each measurement by coefficient. |
| Bridge Excitation | Constant voltage: 2 VDC, Constant current: 5.6 mA (bridge resistance 350 Ω) |
| Measuring Range | Strain : 0 to ±300000 μm/m with constant-voltage bridge excitation |
| | 0 to ±20000 μm/m with constant-current bridge excitation |
| | Temp.: –30° to 70°C with civil engineering transducer with |
| | temperature measuring function |
| Check Function | Insulation resistance measurement: 2 MΩ to 100 MΩ |
| | Resistance measurement: 0 to 20 kΩ |
| Interval Measurement | Selectable interval: 1 minute to 99 hours 59 minutes in 1-minute steps |
| | Starting date/time: Year/month/day, hour:minute |
| Display | Monochrome LCD, 128 × 64 dots |
| Operating Temperature | –10° to 50°C |
| Humidity Range | 20 to 85% RH (noncondensing) |
| Power Supply | AA size alkaline dry cell (2 pieces) |
| Dimensions & Weight | 108.4 × 188 × 41 mm, approx. 450 g |

## Data Loggers

# UCAM-60B/65B (For TEDS)

The UCAM-60B data logger is an all-in-one instrument developed in full pursuit of easy handling in the field. The instrument is provided with all functions required for measurement in the field, including easy-to-use keys, bright readable display and printer for immediately confirming measured results. The UCAM-65B is an online version wholly controlled by the PC.
Both models can measure up to 30 channels of data with the mainframe only, while external scanners enable measurement in up to 1000 channels. Measured results are stored in internal memory and are saved in a flash ATA card if inserted in the PC card slot for offline data transfer to the PC. In addition, the UCAM-60B and UCAM-65B are provided with Ethernet and RS-232C ports which enable the PC to not only control these data loggers through the control software UCS-60B but also process data for rosette analysis, etc. in the field by directly receiving data.



**UCAM-60B**

- Fluorescent display tube ensures easy observation in the field.
- Built-in thermal printer enables immediate confirmation of measured results.
- Control software UCS-60B (optional for UCAM-60B) can place the UCAM-60B under the control of the PC connected through Ethernet or RS-232C port.

**UCAM-65B**

- With the UCAM-65B, measuring conditions, etc. are set from the PC and measured results are transferred to the PC.
- Can be used for interval measurement as a stand-alone unit with no PC connected.

**Common to UCAM-60B and UCAM-65B**

- Can connect TEDS-compatible sensors (dedicated scanning unit USS-61B/62B/63B)
- Can measure up to 20000 μm/m with a resolution of 0.1 μm/m.
- Scanning at 50 ms/channel
- High-speed scanning at 20 ms/channel is possible.
- DC-operated version is available for operation where no AC outlet is available.
- Configuration

  Mainframe : UCAM-60B, UCAM-65B
  Dedicated scanners mounted to mainframe:
  USS-61B (TEDS-compatible)
  USS-62B (with NDIS connectors,TEDS-compatible)
  USS-62B M6 (with clamp-style terminal board and NDIS connectors)
  USS-63B (TEDS-compatible, with lightning arrester)
  Note : A dedicated scanner is provided with 10 channels and up to 3 units can be mounted to the mainframe.
  External scanners
  USB-70 series (USI-67A scanner interface required)
  USB-51A/51AT (USI-65A scanner interface required)
  USB-20A/50A (USI-65A scanner interface required)
  USB-50D (USI-65A scanner interface required)
  Scanner interfaces
  USI-67A for USB-70 series
  USI-65A for USB-20/50/51 series
  External input/output unit UIO-60A
  Control software UCS-60B

★For TEDS, see "About TEDS" on page 07.

## Data Loggers UCAM-60B/65B

●Sensors and connectable scanners

| Sensor \ Scanner | | Internal scanner | External scanner | |
|---|---|---|---|---|
| | | | General purpose | Civil engineering |
| | | | USB-70B-10/20 | USB-70B-30 |
| **Strain gages & strain gage transducers** | | | | |
| 1-gage method | 120 Ω | ✓ | ✓ | ✓ |
| | 240 Ω | ✓ | ✓ | ✓ |
| | 350 Ω | ✓ | ✓ | ✓ |
| 1-gage true dummy method | 120 Ω | ✓ | ✓ | ✓ |
| | 240 Ω | ✓ | ✓ | ✓ |
| 2-gage method, 60 to 1000 Ω | | | | |
| Active-dummy method | | ✓ | ✓ | ✓ |
| Active-active method | | ✓ | ✓ | ✓ |
| Common dummy method | | | ✓ | ✓ |
| 4-gage method, 60 to 1000 Ω*3 | | | | |
| Opposite side active method | | ✓ | ✓ | ✓ |
| Full-bridge method | | ✓ | ✓ | ✓ |
| **Civil engineering transducers** | | | | |
| 4-gage method, 120 Ω | | | | |
| Constant-current excitation | | ✓ | | |
| 4-gage method, 350 Ω | | | | |
| Constant-current excitation | | ✓ | ✓ | ✓ |
| With temp. measuring function | | ✓ | | ✓ |
| **Voltage output sensors (DC)** | | ✓ | ✓ | ✓ |
| **Temperature** | | | | |
| Thermocouple | K(CA) | ✓ | ✓ | ✓ |
| | T (CC) | ✓ | ✓ | ✓ |
| | E (CRC) | ✓ | ✓ | ✓ |
| | J (IC) | ✓ | ✓ | ✓ |
| | R | ✓ | ✓ | ✓ |
| Platinum resistance thermometer sensor | | | | |
| Pt100 (new JIS) | | ✓ | | ✓ |
| JPt100 (old JIS) | | ✓ | | ✓ |
| **Potentiometer sensors** | | ✓ | ✓ | ✓ |
| **Built-in lightning arrester** | | ✓ *1 | | ✓ |
| **Scanner interface (USI-)*2** | | Not required | -67A | -67A |

Notes : 1. With USS-63B mounted
2. Use either of the scanner interfaces for connection to external scanners.
3. 120 to 1000 Ω with high-resolution mode

| | |
|---|---|
| **Number of measuring channels** | **Max. 30 with dedicated scanners** |
| | **Max. 1000 with external scanners** |
| | **Max. 1000 with internal scanners plus external scanners** |
| **Scanning speed (USS-61B/62B/63B only)** | **50 ms/channel (standard mode)** |
| | **280 ms/channel (high-resolution mode) (Can be set for every channel.)** |
| | **20 ms/channel (high-speed mode) (Available for USS-61, 62, and 63B only)** |
| **PC card slot** | **Conforms to PCMCIA Ver. 4.2.** |
| | **Accepts commercially available flash ATA card.** |
| **Interface** | **RS-232C, LAN (10BASE-T/100BASE-TX)** |
| **Operating temperature** | **0 to 50°C** |
| **humidity range** | **20 to 85% RH (noncondensing)** |
| **Power supply** | **85 to 264 VAC, 50/60 Hz (AC version)** |
| | **10 to 16 VDC (DC version)** |
| **Dimensions** | **UCAM-60B: 360 × 88 × 400 mm (excluding protrusions)** |
| | **UCAM-65B: 327 × 88 × 365 mm (excluding protrusions)** |
| **Weight** | **approx. 8 kg (60B), 5 kg (65B)** |

## Control Software

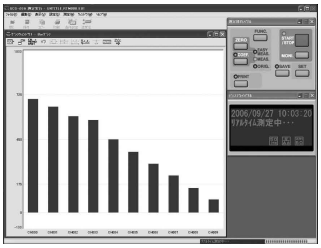
## UCS-60B

The software enhances the performance of the data logger by letting the PC present measured results in graphic and numeric formats as well as perform data analysis.

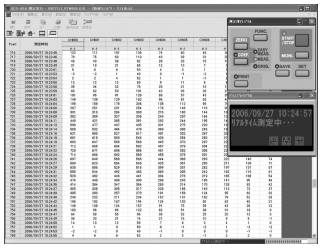
- ●Controls UCAM-60A/B, 65A/B, 20PC, and 500A/B.
- ●Enables presentation of numeric list on the PC.
- ●Enables presentation of maximum 50 graphs at a time on the PC with 20-CH data/window.
- ●Arithmetic operation, statistic operation and rosette analysis
- ●Reading and storing of measuring and calculating condition files

| | |
|---|---|
| **CPU** | **Pentium 4 2 GHz or higher or the equivalent** |
| **OS** | **MS-Windows 98/98SE/Me/2000/XP/Vista** |
| **Memory** | **2 GB or more** |
| **Hard disk** | **10 MB or more (excluding data)** |

### ● Measured Data Monitor Windows

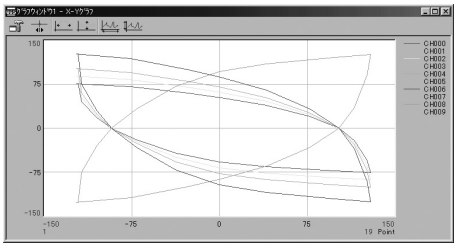


Bar Graph Window



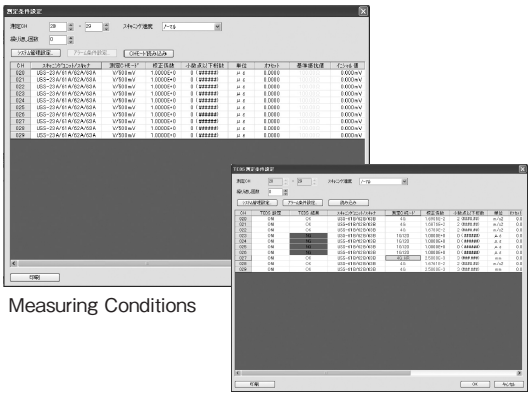
Numeric Window

### ● Data Reproduce Window



X-Y Graph

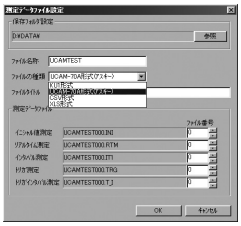
### ● Condition Setting Windows



Measuring Conditions

TEDS Information

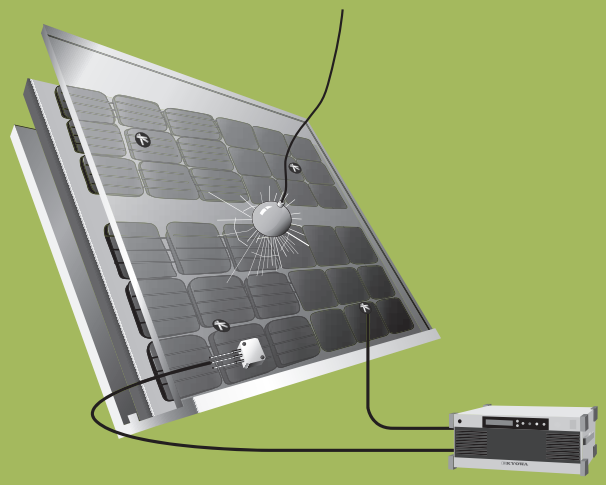
System Management



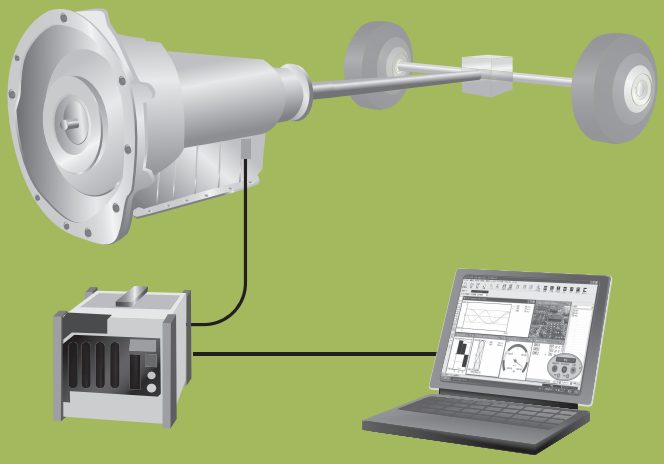
Data Filing Conditions

# Data Analyzers

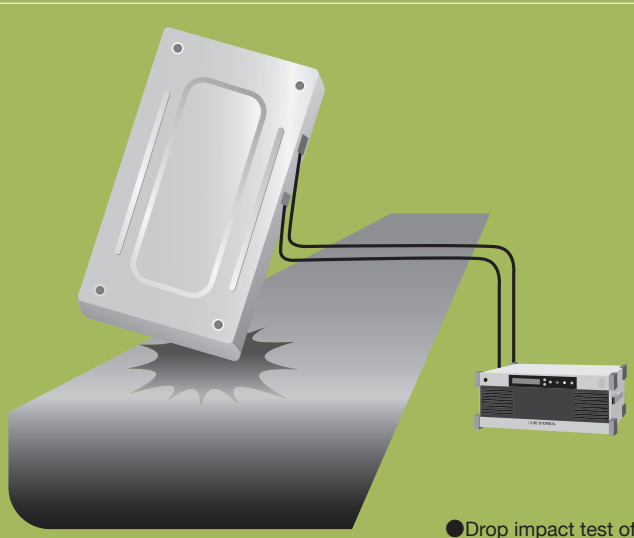
## ● Data Analyzers measurement example



●Solar panel impact and damage measurements



●Oil pressure measurement of automatic transmission



●Drop impact test of lithium-ion battery

## Sensor Interfaces

## PCD-300 Series

The PCD-300 series sensor interfaces make the existing PC a versatile measuring instrument. The PCD-300B enables the PC to perform stress measurement through the use of strain gages and force, pressure, acceleration and displacement measurement through the use of strain gage transducers. The PCD-320A enables the PC to measure voltage signals. The sensor interfaces are connected to the PC via USB interface.
Connect strain gages and strain gage transducers or voltage output type sensors to the rear input terminals of the sensor interface and start the accessory dynamic data acquisition software DCS-100A. Then, the PC operates as a measuring instrument. Once sensors are connected, interactive operation on the PC enables the operator to obtain measured data in proper engineering units. One sensor interface provides 4 channels and up to 4 units can be connected in cascade to extend to a 16-channel system suitable for small-scale measurement. Needless to say, the PCD-300B can be combined with the PCD-320A for simultaneous measurement of strain and voltage signals. Thus, the PCD-300 series can effectively be utilized as measuring tools in every scene including simple experiments and sophisticated measurement.

- 2 models are available: PCD-300B for strain measurement and PCD-320A for voltage measurement.
- Connected to the PC via USB interface
- One unit provides 4 channels and 4 units enable 16-channel measurement.
- Optional synchronous cable enables simultaneous sampling with 4 units.
- Synchronous connection enables simultaneous measurement of strain and voltage.
- The dynamic data acquisition software DCS-100A which operates on Windows 2000/XP/Vista is provided standard for PCD-300B, while the control software PCD-30A which operates on Windows 98/98SE/Me/ 2000/XP, for PCD-320A.
- The DCS-100A supports both PCD-300B and PCD-320A.
- Low cost
- Compact and lightweight
- Optional analysis software DAS-100A or NI DIAdem enables data analysis on the PC.

**Specifications common to PCD-300B and PCD-320A**

- Number of measuring channels: 4 (up to 4 units can be connected in cascade for 16-channel measurement.)
- Interface: USB 1.1
- Operating temperature/humidity range: 0 to 40∞C, 20 to 85% RH (noncondensing)
- Power supply: 100 to 240 VAC (AC adapter provided standard)

PCD-300B

PC is not provided.

## PCD-300B

| | |
|---|---|
| Applicable sensors | Strain gages, strain gage transducers |
| Applicable gage resistance | 1 or 2-gage method: 120Ω |
| | 4-gage method: 120 Ω to 1 kΩ |
| Input adapters | UI-10A (with NDIS connectors for strain gage transducers, TEDS-compatible) |
| | UI-11A (clamp-style terminal board for strain gages, TEDS-compatible) |
| | UI-15A (lever-equipped terminal board for strain gages) |
| | UI-16A (quick-fitting lock-style terminal board for strain gages) |
| Bridge excitation | 2 VAC rms, carrier: 1 kHz sine wave |
| Balance adjustment range | Resistance: ±2% (±10000 μm/m) or more |
| | Capacitance: 5000 pF or more |
| Balance adjustment method | Resistance: True electron auto-balance system |
| | Capacitance: CST system (automatic tracking) |
| Nonlinearity | Within ±0.1% FS |
| Gage factor | 2.00 fixed |
| Range | 8 steps of 200, 500, 1000, 2000, 5000, 10000. 20000 μm/m and OFF |
| Accuracy | Within ±0.5% FS |
| Frequency band | DC to 200 Hz, deviation ±10% |
| Low-pass filter | Second order Butterworth |
| (PCD-300B-F only) | Cutoff frequency: 10, 30, 100 Hz and Flat |
| | Amplitude ratio at cutoff point: –(3 ± 1) dB |
| | Attenuation: –(12 ± 1) dB/oct. |
| A-D converter | Resolution max. 24 bits |
| Sampling frequency | 1 Hz to 10 kHz (simultaneous sampling) |
| Current consumption | 0.7A or less (12 VDC) |
| Dimensions | 265.2 × 26.7 × 215 mm (excluding protrusions) |
| Weight | approx. 1.1 kg with UI-10A mounted (excluding accessory AC adapter) |

★For TEDS, see "About TEDS" on page 07.

## PCD-330B-F

Strain gauges Strain gauge transducers The voltage output type converter is connected, The warp and pressure, the acceleration, and displacement, etc. are requested in each engineering only by setting it at least.

●Standard equipment Low-pass filter

### Warp measurement mode specification

Each specification is the same as the following (PCD-300B, PCD-300B-F)

### Voltage measurement mode specification

| | |
|---|---|
| Applicable Sensors | Type of output of voltage of voltage output type converter conditioner |
| Input form | Unbalanced input |
| Range | 7 steps of 1, 2, 5, 10, 20, 50v and off |
| Accuracy | Within 0.2% |
| Frequency Response Range | DC ~ 1 kHz deviation -3 + 1dB |
| High-pass Filter | 2 steps of 0.2Hz and off |
| Low-pass Filter | Second order Butterworth |
| Cutoff frequency | 5 steps of 10,30,100,300Hz and Flat |
| Amplitude ratio at cutoff point | –(3±1)dB |
| Attenuation | –(12±1)dB/oct. |
| Zero Stability | Within ±0.03% FS/8h,within±0.003% FS/°C |
| Sensitivity Stability | Within ±0.1%/8h,within±0.02%/°C |

PCD-330B-F

### Input Adapter Options

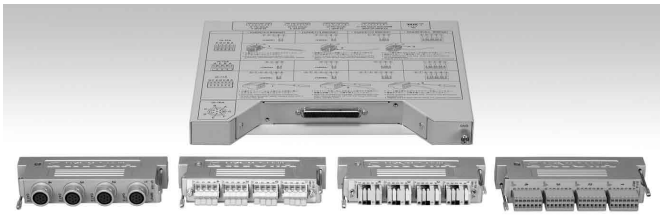
For strain gauges transducers having the cable terminated with NDIS connector Plug

UI-10A For strain gauges and strain gauge transducer having the cable bared at the tip
UI-11A (clamp-style terminal block)
UI-15A (clamp-style terminal block with operating levers)
UI-16A (one-touch lock type clamp-style terminal block)
Voltage measurement exclusive use
UI-30A (BNC connector Plug)

★A-Dconverter : ach specification is the same as the following.(PCD-300B,PCD-300B-F)
Sampling frequency
TEDS function, Interface, Externals size, Weight

## PCD-320A

| | |
|---|---|
| Applicable sensors | Voltage output sensors |
| Input mode | Unbalanced |
| Input resistance | 1 MΩ or more |
| Coupling | DC/AC switchable |
| Range | 7 steps of 1, 2, 5, 10, 20, 50 V and OFF |
| Frequency response range | DC coupling: DC to 1 kHz AC coupling: 0.2 Hz to 1 kHz |
| | Deviation: within +1/–3 dB |
| Low-pass filter | Transmission characteristics: 2nd order Butterworth |
| | Cutoff frequency: 5 steps of 10, 30, 100, 300 Hz and FLAT |
| | Amplitude ratio at cutoff point: –(3 ± 1) dB/oct. |
| | Attenuation: –(12 ± 1) dB/oct. |
| A-D converter | Resolution12-bit, successive approximation, simultaneous sampling |
| Sampling frequency | 1 Hz to 5 kHz |
| External trigger signal | No-voltage conact, open collector, 5 V CMOS level, number of points: 1 |
| Measuring input terminals | BNC connectors |
| | Input/output not isolated |
| | Max. allowable input voltage: 30 VAC or 60 VDC |
| | Max. rated grounding voltage: 30 VAC or 60 VDC |
| Dimensions | 265.2 × 24.7 × 215 mm (excluding protrusions) |
| Weight | approx. 750 g (excluding accessory AC adapter) |
| Safety standard | EN61010-1, installation category Ⅱ , pollution degree 2 |
| EMC standard | EN61326-1, class A instrument |

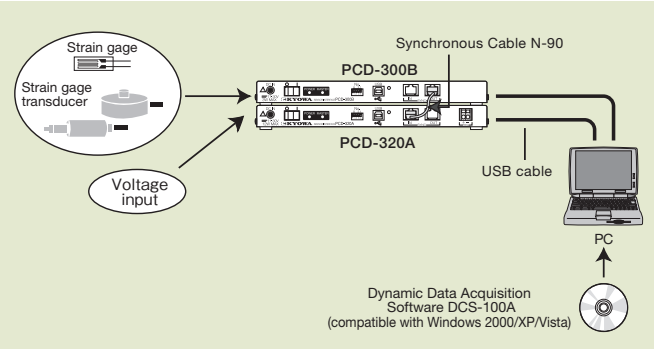


**Input Adapter UI-10A** (TEDS-compatible) with NDIS connectors

**Input Adapter UI-15A** Clamp-style terminal block with operating levers

**Input Adapter UI-16A** Clamp-style terminal block wih quick-fitting locks

**Input Adapter UI-11A** (TEDS-compatible) Clamp-style terminal block




## Control Software

## PCD-30A

The control software PCD-30A enables the PC to control the sensor interfaces of PCD-320A. Using the software, the PC sets measuring conditions and performs data acquisition, graph display and file conversion to CSV format on MS-Windows 2000/XP/Vista. The software is supplied in CD-R and for use, it is installed in the hard disk of the PC.

## Compact Recorder

# EDS-400A

The EDS-400A is a compact 4-channel recorder equipped with signal conditioners and high-speed 16-bit resolution A-D converters, enabling high-speed digital recording of dynamic strain and voltage phenomena.
Desired measuring and recording conditions are set to the recorder by communicating with the PC through LAN or by inserting a compact flash memory card in which the conditions are written beforehand.
Measured data is directly written in the compact flash memory card, while it is possible to monitor the waveform on the PC during data acquisition in progress.
Acquired data is transferred to the PC either on line via LAN or off line via the compact flash memory card.
The accessory software enables the PC to display the waveform of the collected data, while the optional DAS-100A or NI DIAdem data analysis software enables data analysis in various modes.

- Compact and lightweight design requires less space.
- 4-channel measurement possible with a single unit
- Up to 8 units can be connected for 32-channel measurement.
- Maximum sampling frequency of 100 kHz (1-channel measurement) ensures high-speed recording.
- Simultaneous sampling of 4 channels is possible at 20 kHz.
- Suitable as an onboard data logger
- LAN interface provided
- Analog filters are built in.


| | |
|---|---|
| Number of measuring channels | 4 |
| Applicable sensors | Strain gages (4-gage method),Strain gage transducers,Voltage output sensors |
| Applicable bridge resistance | 120 to 1000 Ω (4-gage method) |
| Gage factor | 2.00 fixed |
| Bridge excitation | 2 VDC |
| Voltage measuring range | ±20 V |
| Frequency response range | DC to 20 kHz |
| Resolution of A-D conversion | 16 bits |
| Sampling method | Simultaneous sampling of all channels |
| Samping frequency | 1 Hz to 100 kHz (16 steps) |
| LAN interface | 10BASE-T/100BASE-TX |
| Monitoring | Waveform, bar graph and numeric data can be monitored on the PC connected via LAN. |
| Data storage | Compact flash memory card (128 MB to 1 GB) |
| Synchronized operation | Possible by connecting up to 8 units in cascade with dedicated synchronous cables. |
| Operating temperature | 0 to 50 °C |
| humidity range | 20 to 90%RH (noncondensing) |
| Vibration resistance | 49.03 m/s2 (5 G) (5 to 55 Hz) (when operating) |
| Power supply | 10 to 16 VDC |
| Dimensions & Weight | 100 × 50 × 110 mm (excluding protrusions), approx. 500 g |

### Typical recording time with 128-MB CF card (standard accessory)

| Sampling equency | Number of measuring channels | | | |
|---|---|---|---|---|
| | 1 | 2 | 3 | 4 |
| 100kHz | 8.0 minutes | | | |
| 50kHz | 16 minutes | 8.0 minutes | | |
| 20kHz | 40 minutes | 20 minutes | 13 minutes | 10 minutes |
| 10kHz | 80 minutes | 40 minutes | 26 minutes | 20 minutes |
| 5kHz | 160 minutes | 80 minutes | 53 minutes | 40 minutes |
| 2kHz | 6.6 hours | 3.5 hours | 133 minutes | 100 minutes |
| 1kHz | 13 hours | 6.6 hours | 4.4 hours | 3.3 hours |
| 500kHz | 26 hours | 13 hours | 8.8 hours | 6.6 hours |
| 200kHz | 2.7 days | 33 hours | 22 hours | 16 hours |
| 100kHz | 5.5 days | 2.7 days | 44 hours | 33 hours |
| 50kHz | 11 days | 5.5 days | 3.7 days | 2.7 days |
| 20kHz | 27 days | 13 days | 9.2 days | 6.9 days |
| 10kHz | 55 days | 27 days | 18 days | 13 days |
| 5kHz | 111 days | 55 days | 37 days | 27 days |
| 2kHz | 277 days | 138 days | 92 days | 69 days |
| 1kHz | 555 days | 277 days | 185 days | 138 days |

## Control Software

# EDS-40A

Enables the PC to set, save and read channel, measuring and recording conditions as well as monitor measuring data and perform data collection, data coupling, graph dispay, file conversion and environmental setting.

| | |
|---|---|
| CPU | Pentium Ⅲ 700 MHz or higher |
| OS | Windows 2000/XP |
| Memory | 256 MB or more |
| Hard disk | Blank space 10 MB or more (except for data) |

## Universal Recorders

# EDX-100A (For TEDS)

Available with 1, 2 or 4 slots, the EDX-100A is a universal recorder that enables flexible configuration and free arrangement while ensuring multiple functions. The wide application range extends from small-scale measurement of 8 channels to large-scale measurement of up to 128 channels by connecting 4 units of the EDX-100A.
For PC connection, LAN and USB ports are provided. The LAN port enables the PC to control up to 4 units of EDX-100A, while the USB port ensures easy connection between the EDX-100A and the PC.
In addition, the EDX-100A can be operated as a stand-alone unit with no PC connected. A compact flash memory card enables condition setting and data collection. To respond to the need for a wide variety of measurements, 6 different types of conditioner cards are available.

- Compact and lightweight
- Available with 1, 2 or 4 slots
- LAN port for establishing multichannel network (max. 128 channels)
- USB port for easy connection to the PC
- Operatable as a stand-alone unit
- High-speed sampling at 100 kHz (10 kHz for 16-channel measurement)
- CAN data recording possible with CAN-40A, CAN-41A conditioner card mounted
- Various conditioner cards available
- TEDS-compatible (for TEDS, refer to "About TEDS" on page 4.)
- Voice memo can be recorded by using an optional dedicated remote control unit.
- Dynamic data recording software DCS-100A is included in standard accessories.
- Measured data is saved in KYOWA standard KS2 format and can be analyzed with optional data analysis software DAS-100A.
- Models

| Model | | Number of conditioner card slots | Max. number of analog input channels |
|---|---|---|---|
| w/o handle grip | with handle grip | | |
| EDX-100A-1 | EDX-100A-1H | 1 | 8 |
| EDX-100A-2 | EDX-100A-2H | 2 | 16 |
| EDX-100A-4 | EDX-100A-4H | 4 | 32 |

Note: Number of slots: The number of slots for conditioner cards

EDX-100A-1H EDX-100A-2H EDX-100A-4H

| | |
|---|---|
| Analog input | Provided by optional conditioner cards (in common with EDX-2000A) |
| CAN data input | Provided by the CAN-40A, CAN-41A card |
| Voice memo input | Possible through the optional dedicated remote control unit. |
| | Reproduction of voice memo requires the optional data analysis |
| | software DAS-100A. |
| Sampling method | Simultaneous sampling of all channels |
| Sampling frequency range systems | 1-2-5 system for 1 Hz to 100 kHz |
| | $2^n$ system for 1 Hz to 65.536 kHz |
| Sampling frequency range | 1 Hz to 100 kHz for 1-channel measurement |
| | 1 Hz to 50 kHz for 3-channel measurement |
| | 1 Hz to 20 kHz for 8-channel measurement |
| | 1 Hz to 10 kHz for 16-channel measurement |
| | 1 Hz to 5 kHz for 32-channel measurement |
| | 1 Hz to 1 kHz for CAN data measurement |
| Data storage | CF card (128 MB to 8GB; 45x speed or higher). |
| | The CF card enables offline data transfer to the PC after completion |
| | of data recording. |
| Operating keys | REC/PAUSE, STOP, BAL., READ, ID, LAN/USB |
| Communications interfaces | USB 2.0, LAN (10BASE-T/100BASE-TX) |
| Power supply | 10 to 18 VDC |
| Operating temperature | 0 to 50°C |
| humidity range | 20 to 90% RH (noncondensing) |
| Vibration resistance | ±29.42 m/s² (3 G), 5 to 55 Hz (when operating) |
| | ±49.03 m/s² (5 G), 5 to 55 Hz (when not operating) |
| Shock resistance | 196.1 m/s² (20 G)/11 msec |
| Dimensions (excluding protrusions) | EDX-100A-1: 70.0(W) × 132.5(H) × 255(D) mm |
| | EDX-100A-2: 92.5(W) × 132.5(H) × 255(D) mm |
| | EDX-100A-4: 137.5(W) × 132.5 (H) × 255(D) mm |
| Weight, approx. | EDX-100A-1: 1.6 kg (1.7 kg with 1 CDV-40B card mounted) |
| | EDX-100A-2: 1.8 kg (2.0 kg with 2 CDV-40B cards mounted) |
| | EDX-100A-4: 2.0 kg (2.6 kg with 4 CDV-40B cards mounted) |

★For TEDS, see "About TEDS" on page 07.

# Optional Built-in Conditioner Cards Common to EDX-100A, EDX-2000A and EDX-3000A

### Strain/voltage measuring card CDV-40B(-F) (compatible with TEDS)

| Item | Strain measurement | Voltage measurement |
|---|---|---|
| Number of input channels | 8 (centralized connector) | |
| Input mode | Balanced input | Unbalanced input |
| Input resistance | Approx. (10 MΩ + 10 MΩ) | Approx. 1 MΩ |
| Coupling | DC/AC (DC cut) | |
| Applicable gage factor | 2.00 | — |
| Bridge excitation | 2.00 VDC ±2 % (120 Ω to 1kΩ) | — |
| Balance adjustment range | Bridge resistance ±2.4 %(±12000 μm/m) | — |
| Measuring range | 500, 1k, 2k, 5k, 20k, 50k μm/m, OFF | 0.1, 0.2, 0.5, 1, 2, 5, 10 V, OFF |
| Range accuracy | ±0.2% FS for each range | |
| Nonlinearity | ±0.1% FS | |
| Frequency response range | DC coupling: DC to 50 kHz, dev. +1 dB/–3 dB | |
| | AC coupling: 0.2, 1 Hz to 50 kHz | |
| Low-pass f ilter | Filter type: 2nd order Butterworth | |
| | Cutoff frequency: 8 steps of 10, 30, 100, 300, 1k, 3k, 10 kHz and F (flat) | |
| | Amplitude ratio at cutoff point: –3 dB ±1 dB | |
| | Attenuation: –12 dB/oct. ±1 dB/oct. | |
| High-pass filter (DC cut) | Cutoff frequency: 0.2 Hz, 1 Hz | |
| | Attenuation: –6 dB/oct. | |
| Resolution of A-D converter | 16 bits | |

Note: Models with suffix F are equipped with an antialiasing filter.
(e.g. CDV-40B-F, DPM-42A-F and CCA-40A-F).

### Dynamic strain amplifier card DPM-42A(-F) (compatible with TEDS)

For strain gages and strain gage transducers. The card uses carrier for bridge excitation and thus, it is suitable for measurement of low level strain. This card has the input and output isolated and measuring channels isolated from each otherr.
Applicable sensors: Strain gages, strain gage transducers
Number of measuring channels: 4
Frequency response range: DC to 5 kHz

### Thermocouple card CTA-40A

For temperature measurement with 2 types of thermocouples, K (CA) and T (CC). This card has the input and output isolated and measuring channels isolated from each otherr.
Applicable sensors: Thermocouples K (CA) and T (CC)
Number of input channels: 8

### F/V converter card CFV-40A

For measurement of input pulse frequency. This card has a power supply for sensors and the input and output isolated.
Applicable sensors: AC signal output sensors
Number of input channels: 4

### CAN card CAN-40A,CAN-41A(EDX-2000A can use only CAN-40A)

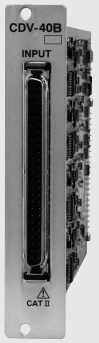
For measurement of data frame on the controller Area Network (CAN)
This card CAN-40A are CAN-up to 16 different data frame, dual input CAN-41A can acquire different communication thread-Tong 2 threads of data frames (up 32 type) regular analog data at the same time.
CAN-40: 1,CAN-41: 2
Number of CAN ports
Connector: D-sub 9-pin for high-speed and low-speed CANs
Compatible CAN version: Bosch 2.0B (conforms to ISO 11898); switchable between high-speed CAN and low-speed CAN

### Charge amplifier card CCA-40A(-F) (compatible with TEDS)

For piezoelectric accelerometers.
Applicable sensors: Piezoelectric accelerometers
Number of measuring channels: 8

### DA Card DAC-40A

For an alog reproduction of the data recorded with EDX-2000A.
Number of Output channels: 8
Output Voltage: ±5VFS(coad resistance: 5kΩ or more)



CDV-40B

DPM-42A

CTA-40A

CT-2A

CFV-40A

CCA-40A

CAN-40A

CAN-41A

DAC-40A

## Memory Recorder/Analyzers

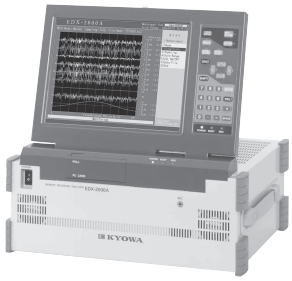
# EDX-2000A

The EDX-2000A is a general-purpose extensible all-in-one instrument that can measure, display, record and analyze signals sent from various connected sensors.
The maximum number of mountable channels is 32 or 64. Data acquisition in 16 channels is possible at 200 kHz (32 channels at 100 kHz). If sensor signals of 32 channels are sampled at 10 kHz, the large-capacity disk can store approximately 13 hours of data. Acquired and processed data can easily be transferred to the PC on or off line. In addition, the EDX-2000A can record voice memos and if an optional DA card is used, it can perform analog reproduction of acquired digital data.

- Perform FFT analysis/histogram analysis while recording, thereby enabling monitoring of input signals and confirmation of analyzed results on the display.
- Optional conditioner cards can freely be mounted to configure an optimum all-in-one instrument for each individual application.
- Each CDV-40A strain/voltage measuring card provides 8 channels.
- FFT analysis, histogram analysis and arithmetic operation possible
- Maximum sampling frequency: 200 kHz (simultaneous sampling of 16 channels)
- Easy and speedy interactive operation
- Easy-to-handle ATA card or hard disk card for data transfer to the PC
- Online data transfer to PC through LAN interface
- Built-in battery against instantaneous power failure (in DC operation)
- KYOWA standard KS2 format and the optional data analysis software (DAS-100A) are applicable to acquired data.
- Models

| Model | Max. analog input channels | Number of slots |
|---|---|---|
| EDX-2000A-32 | 32 | 4 |
| EDX-2000A-64 | 64 | 8 |

Note: Number of slots: The number of slots for conditioner cards



EDX-2000A-32

| | |
|---|---|
| Number of input channels | EDX-2000A-32: Max. 32 |
| | EDX-2000A-64: Max. 64 |
| Digital input | 16-bit, TTL level, contact input |
| Voice input | 1 channel (voice memos input during measurement are recorded together with measured data.) |
| Sampling method | Simultaneous sampling of all channels |
| Sampling frequency | 1 Hz to 200 kHz for data acquisition up to 16 channels |
| | 1 Hz to 100 kHz for data acquisition up to 32 channels |
| | 1 Hz to 50 kHz for data acquisition up to 64 channels |
| | 1 Hz to 10 kHz when real-time analysis is performed. |
| Data storage capacity | 30 GB or more |
| Built-in display | Equivalent to 10.4-inch color LCD |
| Operating keys | Key panel on mainframe and external keyboard |
| Interface | Keyboard, external display, USB, LAN |
| Power supply | 100 to 120/190 to 240 VAC, 10 to 30 VDC |
| Operating temperature | 0 to 40°C |
| humidity range | 20 to 80%RH (noncondensing) |
| Vibration resistance | 29.42 m/s2 (3 G), 5 to 55 Hz (when operating) |
| | 49.03 m/s2 (5 G), 5 to 55 Hz (when not operating) |
| Shock resistance | 196.1 m/s2 (20 G)/11 ms |
| Dimensions & weight | EDX-2000A-32: 350 × 132 × 300 mm (excluding protrusions), |
| | approx. 12 kg (with 2 CDV-40A cards mounted) |
| | EDX-2000A-64 : 430 × 156 × 300 mm (excluding protrusions), |
| | approx. 13 kg (with 2 CDV-40A cards mounted) |

### Software Specifications

- Setting measuring conditions : Measuring channel conditions, measuring modes, sampling frequency, number of recording data, test information and measuring conditions are set, saved and read through the software.
- Types of monitoring dat a: Numerics, time-axis graph, bar graph
- Relative (X-Y) graph : 1 graph/display, 2 graphs/dispay
  Each graph can be traced as 4-channel relative graph.
- Real-time analysis : FFT analysis, histogram analysis
  Either of them is selectable during monitoring or data acquisition.

### Data Reproduction

- Types of graph
  Time-axis (X-T) graph : 1 graph/display, 2 graphs/display, 4 graphs/display
  Relative (X-Y) graph : 1 graph/display; 8-channel relative graph
  All channel graph : Max. 16 channels/display
- Data file editing : Data editing, header editing, file saving, cutting, conversion to ASC Ⅱ
- Statistic processing : Display and storage of maximum value, minimum value, average value and standard deviation
- Analysis : Arithmetic operations, FFT analysis, histogram analysis

## Memory Recorder/Analyzer NEW

# EDX-3000A

- Signals in 32 channels can simultaneously be sampled at a maximum 200 kHz.
- Various conditioner cards are selectable as required for each specific application.
- The conditioner cards are common to EDX-100A/2000A.

| | |
|---|---|
| Number of Input Channels | Max. 64 (with 8 CDV-40B cards mounted) |
| Analog Input | Can connect conditioner cards for EDX-2000A/100A. |
| Digital Input | 32 bits, TTL level, contact input |
| CAN Data Inpu | Can connect one CAN-40A or 41A card. |
| Voice Input | 1 channel |
| TEDS Compatibility | Conditioner cards CDV-40B/A(-F), DPM-42A(-F) and CCA-40A(-F) are TEDS compatible. |
| Analog Output | Analog output connector of conditioner cards except for CDV-40B/A(-F) |
| | and CAN-40A or 41A enables voltage monitoring in ±5 V FS. |
| Sampling System | Simultaneous sampling of all channels |
| Sampling Frequency | 1/2/5 System |
| | 1 Hz to 200 kHz for up to 32-channel data acquisition |
| | 1 Hz to 100 kHz for up to 64-channel data acquisition |
| | 1 Hz to 10 kHz for real-time simultaneous data processing |
| | 2n System |
| | 2 Hz to 131072 Hz for up to 32-channel data acquisition |
| | 2 Hz to 65536 Hz for up to 64-channel data acquisition |
| | 2 Hz to 8192 Hz for real-time simultaneous data processing |

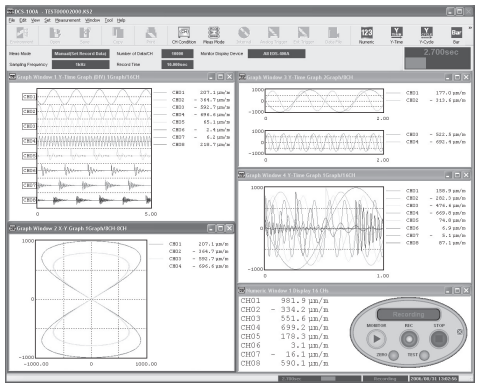
| | |
|---|---|
| Data Storage | SSD:30 GB or more HDD:100 GB or more |
| Synchronous Operation | Synchronous cable enables cascade connection of up to 10 units of EDX-3000A. |
| Indicators | Removable 15-inch color LCD (option) |
| | Channel status LED indicators, REC/PAUSE LED |
| | Small-sized LCD for various status indications |
| Operation Keys | REC, STOP and BAL, OPT on front panel |
| | External Control I/O: |
| | Keyboard and mouse are optional. |
| | CONT IN/OUT for remote control or synchronous operation |
| | Ext. Trigger IN/OUT (BNC) |
| | Ext. Clock IN/OUT (BNC) |
| | READY (BNC) |
| Interface Ports | Mini DIN 6-pin for connection to keyboard conforming to 106 |
| | 15-pin VGA connector to external display |
| | USB 2.0 ports, 2 on the front and 6 on the rear |
| | LAN port, 10/100/1000Base-T, for online control |
| Stand-alone Operation | Optional display, keyboard and mouse enable the user to set measuring conditions, |
| | monitor signals under measurement and perform data acquisition, |
| | reproduction and analyzing with no PC connected. |
| Data Acquisition with Mainframe | REC/PAUSE, STOP and BAL keys on the mainframe enable |
| | data acquisition with no display, keyboard and mouse connected. |
| Power Supply | 100 to 240 VAC, 50/60 Hz |
| | Battery is built in against instantaneous power failure. |
| Operating Temperature | 0 to 40°C |
| Humidity Range | 20 to 80% RH (noncondensing) |
| Storage Temperature Range | –20 to 60°C |
| Dimensions | 440(W) × 186(H) × 341(D) mm, excluding LCD and protrusions |

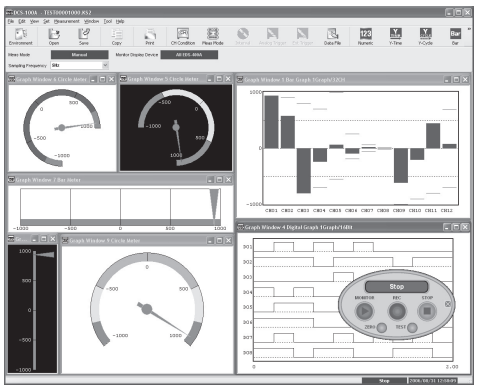
# Software

## Dynamic Data Acquisition Software

## DCS-100A

- Enables presentation of various graph and numeric windows; 6 types of graph windows include Y-Time graph, bar graph, X-Y graph, digital graph, circular meter and bar meter.
- Display layout can freely be configured and saved for each individual test.
- Controlling KYOWA's lineup of data recorders including the EDS-400A EDX-100A, and PCD-300 series
- Monitoring real-time variables while reviewing reproduced data
- Enables direct saving of measured data on PC's hard disk (with some restrictions on the sampling frequency and the number of channels).
- Allows access to the data analysis software DAS-100A or NI DIAdem from the toolbar.
- Data file format: KYOWA standard file format KS2
- Readable formats: File formats with which any controlled recorder saves the data in the medium, and KS2 format which is used by this software for saving data





**Operating Environment (PC)**

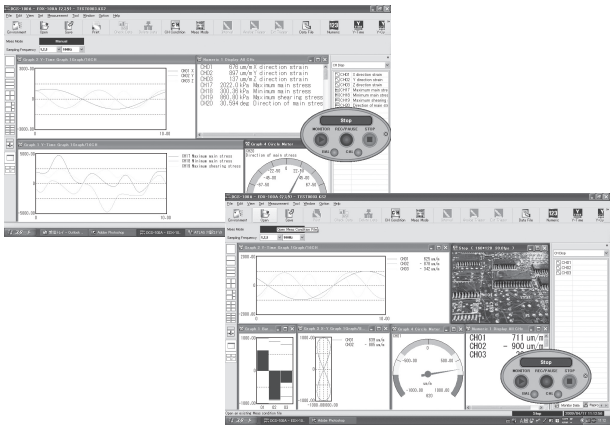
| | |
|---|---|
| CPU | Pentium Ⅲ , 1 GHz or higher (Pentium 4, 2 GHz recommended) |
| OS | Windows XP/Vista |
| Memory | 512 MB or more (1 GB or more recommended) |
| Interface | 100BASE-TX/USB 2.0 |
| Hard disk | Blank space 10 MB or more |
| Display | 1024 × 768 dots, full color or more |
| Disk drive | CD-ROM drive |

## Software Option for DCS-100A

NEW

## DCS-101A

- Enables monitoring/recording of moving image data in linkage with measuring operation.
- Enables reproduction of moving image and test data with cursors synchronized.
- Enables arithmetic operation of measurement data in real time.
- Enables rosette analysis and matrix analysis.



**Operating Environment (PC)**

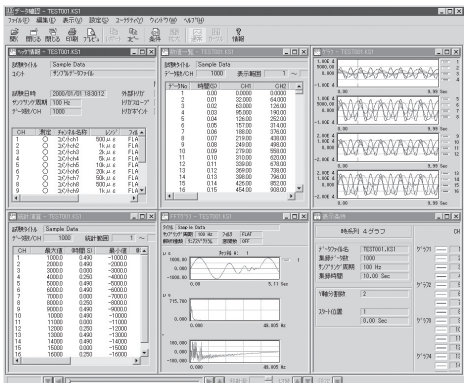
| | |
|---|---|
| OS | Windows XP/Vista (32-bit Japanese/English Edition) |
| CPU | Pentium 4, 2 GHz or higher |
| Memory | 1 GB or more (2 GB or more for Windows Vista) |
| Display | Resolution 1024 × 768 dots or more |

## Data Analysis Software

## DAS-100A

The DAS-100A enables graph display, numeric display and various kinds of analysis of the data recorded in the KYOWA standard KS1 or KS2 file format by KYOWA instruments including DBU-120A, PCD-300 series, EDX-1500A, EDX-2000A, EMR-1000A and EDS-400A.

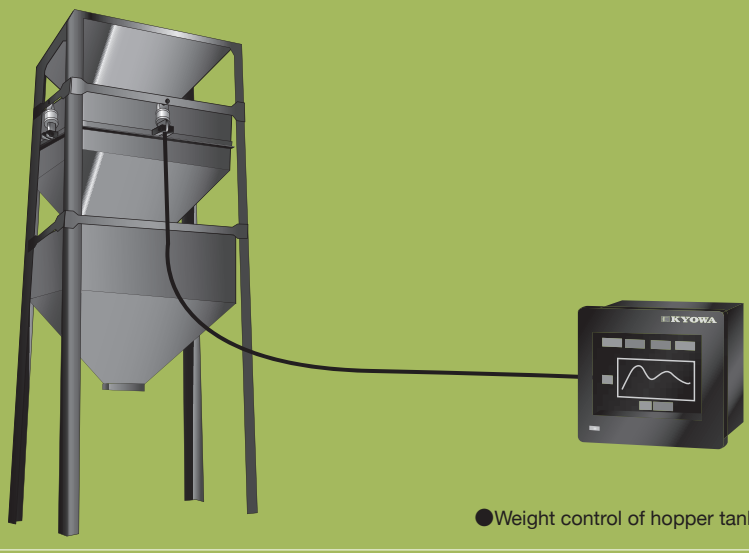
- Enables graph display of a maximum of 8 data files.
- Enables presentation of the waveform, FFT analysis graph, statistic operation results, header information, numeric list and display conditions of a selected data file.
- Enables cutting from an acquired data file and conversion to CSV format file.
- Statistic processing, arithmetic operation, FFT analysis, histogram analysis, filtering, differentiation and integration
- Graph display, and readig and saving of analysis condition file
- Printer output



| | |
|---|---|
| Applicable data files | Data files recorded in KYOWA standard KS1 or KS2 format by DBU-120A, |
| | PCD-300 series, EDX-1500A, EDX-2000A, EMR-1000A and EDS-400A. |
| | Maximum number of applicable channels: 640 |
| Operating environment (PC) | |
| CPU & Memory | As recommended of the OS |
| Display | 800 × 600 dots, 256 colors or more |
| Hard disk | Blank space 10 MB or more (except for data) |
| OS | Windows XP/Vista |
| CD-ROM drive | For installation of the DAS-100A data analysis software |

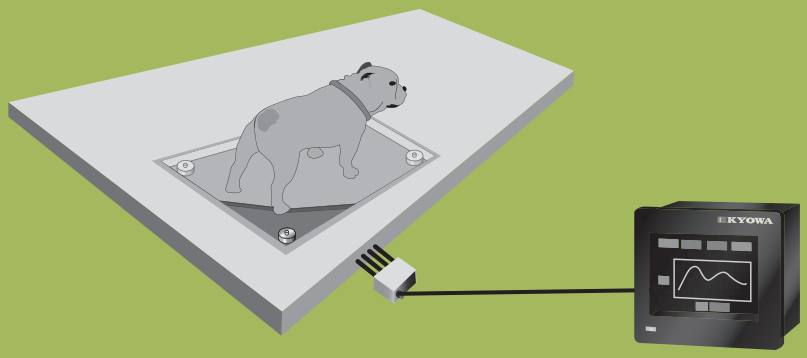
# Instrumentation Amplifiers & Related Instruments

## ● Instrumentation Amplifiers & Related Instruments measurement example



●Weight control of hopper tank

●Measurement check of hopper tank



●Body weight measurements of Pet and domestic animal's

## Instrumentation Amplifier NEW

## WGA-900A

- The measurement waveform can be displayed.
- Touch-sensitive 3.5-inch STN color LCD ensures easy operation and monitoring.
- The measurement waveform can be recorded (optional SD card is necessary).
- Characters are large and easy to see.

| | |
|---|---|
| Number of Measuring Channels | 1 |
| Applicable Transducers | Strain-gage transducers |
| Applicable Bridge Resistance | 87.5 Ω to 1 kΩ (Up to four 350 Ω |
| | transducers can be connected in parallel.) |
| Bridge Excitation | 10 or 2 VDC |
| Input Range | ±3.2 mV/V(including zero adjustment range) |
| Nonlinearity | Within ± (0.02% FS + 1 digit) |
| A-D Converter | 4000 times per second, |
| | resolution 24 bits |
| Analog Monitor | ±(5 V ± 200 mV) |
| | (load resistance 5 kΩ or more) |
| Display | 3.5-inch STN color LCD |
| | Display area: 73.0 × 55.2 mm |
| | 320 × 240 dots, touch panel |
| Indication | ±99999 |
| Sensor Output Value | Transducer output (±3.2 mV/V) is |
| | measured at 0.5-second intervals. |
| Measurement Condition Files | 32 files |
| | (16 for control input) can be saved. |
| Comparator Setting | 5; extra high (HH), high (HI), OK, low (LO), |
| | extra low (LL); Comparison value, |
| | hysteresis width, comparator output logic |
| | and using comparactor can be set. |
| Measurement Modes | Normal, peak hold, block-specified peak hold, |
| | time-specified peak hold, bottom hold, block- |
| | specified bottom hold, time-specified bottom hold, |
| | arbitrary point hold |
| | Detection times, delay time, |
| | comparison mode and display mode can be set. |
| Waveform Display | X axis setting |
| | Y axis setting |
| | Waveform start mode, transit level, |
| | level transit direction, |
| | waveform hold time |
| System Setting | Key lock, setting value initialize, |
| | backlight illumination time, contrast, clock |
| Self-check | Memory, channel |
| Operation Check | Display, touch panel, control input/ |
| | output, communication, BCD output, |
| | D/A output, SD card |
| Control Input | Zero command, hold command, |
| | reset command, waveform command, |
| | TEDS command and measurement |
| | condition select 0 to 3 |
| | Contact or open collector |
| Control Output | HH, HI, OK, LO, LL, healthy, |
| | abnormal channel, abnormal memory, |
| | communication error, SD |
| | Open collector |
| Communication | RS-232C full duplex system |
| SD Card | Saves and loads setting values, |
| | saves and edits the waveform data. |
| Power Supply | 85 to 264 VAC, 50/60 Hz; 20 VA or less |
| Dimensions | 100(W) × 96(H) × 135(D) mm |
| Weight | approx. 1.0 kg (excluding options) |

## Instrumentation Amplifier

# WGA-650B

- For strain gage transducers
- Up to 4transducers with 350Ω bridge resistance can be connected in parallel.
- High/low limit comparator (relay contact output)
- Wide no-load zero adjustment range (±2 mV/V)
- Indicated value can be output in a voltage range of 0 to 10 v or in a current range of 4 to 20 mA.
- DIN size (96 × 96 mm) ensures easy installation.

| | |
|---|---|
| Number of measuring channels | 1 |
| Measuring range | 0 to 2.5 mV/V |
| Bridge excitation | 10 VDC/2 VDC, switchable |
| Display & Sampling rate | –1999 to 19999, 4 times/sec |
| Nonlinearity | Within ±(0.03% FS + 1 digit) |
| Zero & Sensitivity | Within ±0.5 μVRTI/°C, Within ±0.0025%/°C |
| Power supply | AC line, 50/60 Hz, 20 VA or less |
| Dimensions & Weigh | 96 × 96 × 139 mm (excluding protrusions), approx. 1.3 kg |

## Instrumentation Amplifier

# WGA-670B

- For strain gage transducers
- Connectable in parallel up to 4 transducers of 350 W bridge resistance
- Peak hold function and D-A output function provided standard
- Model with BCD data output or RS-232C is also available.
- Comparator function based on preset high/low limits.
- Continuous peak hold function

| | |
|---|---|
| Number of measuring channels | 1 |
| Measuring range | ±3.2 mV/V |
| Bridge excitation | 10, 2 VDC |
| Display & Sampling rate | ±19999, 2000 times/sec |
| Frequency response | DC to 100 Hz |
| Nonlinearity | Within ±(0.03% FS + 1 digit) |
| Zero & Sensitivity | Within ±0.25 μVRTI/°C, Within ±0.01%/°C |
| EMC standard | EN61326-1 (class A) |
| Safety standard | EN61010-1 (installation category Ⅱ , pollution degree 2) |
| Power supply | 100 to 240 VAC ±10%; 20 VA or less |
| Dimensions & Weigh | 96 × 96 × 139 mm (excluding protrusions), approx. 1.1 kg |

## Instrumentation Amplifier

# WGA-710C (For TEDS)

- For strain gage transducers
- Up to 4transducers with 350Ω bridge resistance can be connected in parallel.
- Excellent noise resistance makes it suitable for incorporation into industrial equipment.
- Varieties of built-in functions extend the application field.
- Comparator function based on preset high/low limits (1 relay contact outplut transfer circuit) and peak hold function
- Setting parameters are stored in nonvolatile memory against power failure.

| | |
|---|---|
| Number of measuring channels | 1 |
| Measuring range | ±3.2 mV/V |
| Display | ±9999 |
| Selectable functions | BCD data output, Analog conditioner. D-A converter, RS-232C |
| | Isolated analog conditioner 8-step comparator |
| Power supply | 100/115/200/220 VAC (Select one.) |
| Dimensions & Weigh | 72 × 144 × 188 mm (excluding protrusions), Approx. 1.7 kg |

★For TEDS, see "About TEDS" on page 07.

## Instrumentation Amplifier

# WGA-100B

- For strain gage transducers
- Connectable in parallel up to 4 transducers of 350 Ω bridge resistance
- Compact, lightweight, low cost, and high-performance capability
- Suitable for incorporation into industrial equipment
- 2 types are available, manual balance system and auto-balance system.
- Simultaneous output of voltage and current

| | |
|---|---|
| Number of measuring channels | 1 |
| Rated output | ±10 V, 4 to 20 mA |
| Power supply | 100/200 VAC, 10 to 30 VDC(Select one.) |
| EMC standard & Safety standard | EN50081-2, 50082-2 / EN61010-1 |
| Dimensions & Weigh | 44 x 90 x 101 mm (excluding protrusions), approx. 400 g |

## Instrumentation Amplifier Printer

# 442B-K01

- For WGA-650B,670B,710C,800C,WGI-400A
- Interval operation
- Calendew clock provided

| | |
|---|---|
| Printing system | Thermal line dot |
| Printing speed & Units | Approx. 22.5 mm/s, 6 lines/s, Approx. 250 units |
| Power supply | 90 to 250 VAC, 50/60 Hz, 24 VDC ±10% |
| Dimensions & Weigh | 96(W) × 96(H) × 165.5(D)mm(excluding protrusions),approx. 700 g |

## Instrumentation Amplifier

# WGI-400A

- For strain gage transducers (TEDS-compatible)
- 3 sensitivity registration modes (actual load calibration, sensitivity-registered calibration, numerical value-registered calibration)
- 4 selectable high/low limit patterns in memory
- Level test with desired value input
- Optional functions: RS-232C, RS-485, BCD output

| | |
|---|---|
| Number of measuring channels | 1 |
| Input range | ±3.2 mV/V |
| Wide operating voltage range | 90 to 240 VAC (10 to 30 VDC optionally available) |
| Indicator | 4 digits (±9999) |
| Dimensions & Weigh | 96 × 48 × 144 mm (excluding protrusions), approx. 300 g |

★For TEDS, see "About TEDS" on page 07.

## Instrumentation Conditioners

# WDC-200C

- For strain gage transducers
- Up to 4transducers with 350Ω bridge resistance can be connected in parallel.
- Noise resistant and suitable for use on production lines
- Suitable as long-distance transmission preamplifier or transmitter

| | |
|---|---|
| Number of measuring channels | 1 |
| Measuring range | ±0.25 mV/V to ±2 mV/V or more |
| Bridge excitation | Applied peak voltage 10 vac, line frequency-synchronized system |
| Output | 0 to ±5 V (unbalanced load 5 kΩ or more) |
| Power supply | AC line, 50/60 Hz, 50 VA or less |
| Dimensions & Weigh | 66 × 136 × 220 mm (excluding protrusions),approx. 1.5 kg |

## Compact Digital Indicators

# WDS-180A, 185AS1

- Two models are available for constant voltage or constant current type.
- Suitable for simple measurement of load, pressure or displacement in combination with a transducer.
- Indicates measured values in mm/m or mV/V.
- Measure mode enables direct reading of physical quantities in proper engineering unit.
- Actual load calibration or sensitivity registration calibration is possible.
- WDS-180A provides TEDS reading circuit for easy and error-free setup.
- Compact and lightweight (66.5 mm × 92.0 mm × 28.0 mm, approx. 180 g)
- Operates on 2 pieces of AA size dry cell which is available anywhere.

| | | |
|---|---|---|
| Applicable Transducers | Strain-gage transducers (full-bridge) | |
| Applicable Bridge Resistance | WDS-180A: 60 to 1000 Ω, WDS-185AS1: 350 Ω | |
| Bridge Excitation | WDS-180A: 1 V (constant voltage) | |
| | WDS-185AS1: 2 mA (constant current) | |
| Power Supply | AA size dry cell × 2 | WDS-180A |
| Dimensions | 66.5(W) × 92.0(H) × 28.0(D) mm (excluding protrusions) | |
| Weight | approx. 180 g (with manganese dry cells built in) | |

## Sensor Checker

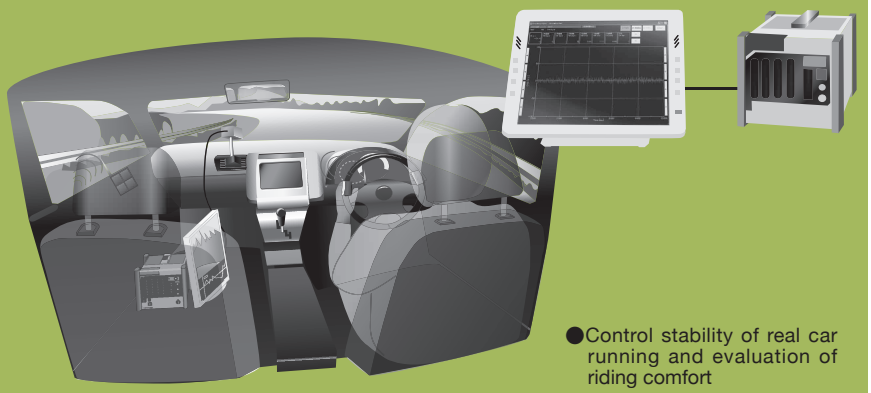
# WDS-500A(For TEDS)

- Enables easy checking of strain-gage transducers.
- Strain output enables checking of strain amplifiers.
- Strain, input/output resistance or insulation resistance can be measured individually by pressing the key.
- All these variables can be measured simultaneously in automatic mode.
- Enables reviewing of information of TEDS-installed transducers.
- Compact and lightweight (66.5 × 112 × 28 mm, approx. 200 g)
- Operates on 2 pieces of AA size dry cell which is available anywhere.

★For TEDS, see "About TEDS" on page 07.

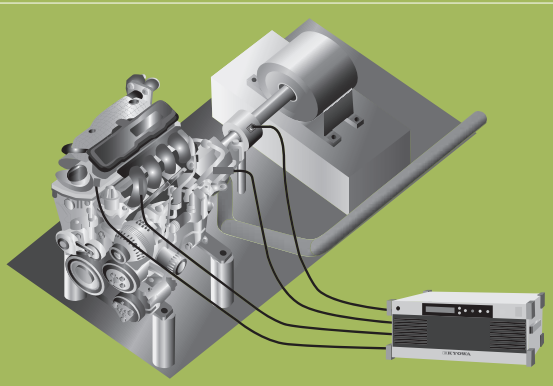
# Automotive Test Equipment

## Automotive Test Equipment measurement example

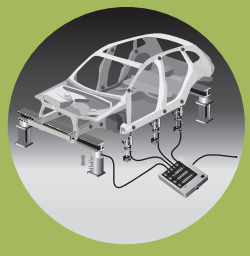


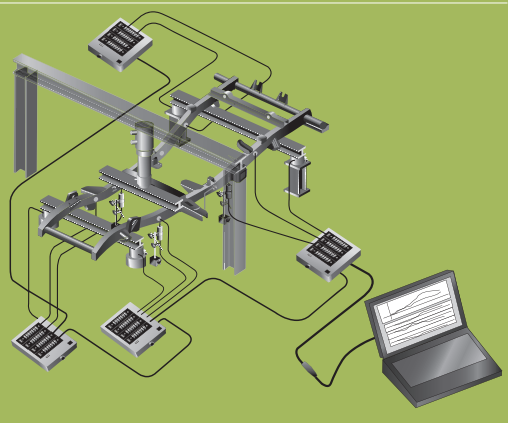
●Control stability of real car running and evaluation of riding comfort

●Full-scale crash thread, and pedestrian protection tests



●Various bench tests of engine and transmission





●Stress evaluation of auto parts and strength test on car body

## Pedal Force Transducers NEW

### LPR-C

- Easy to install and use on a variety of pedals
- Light weight design reduces effect of transducer on moment of inertia
- Rated capacity : 1kN, 2kN
- Cable outlet in optimal location to reduce cable damage

| | |
|---|---|
| Rated capacity | 1 kN, 2 kN |
| Nonlinearity | Within ±1% RO |
| Hysteresis | Within ±1% RO |
| Rated output | Approx. 0.5 mV/V |
| Safe overload rating | 150% |
| Weight | approx. 200g |

## Change Lever Operating Force Transducer

### LSA-A-S1

- Measures the 2-component force initiated by operating the floor shift change lever.

| | |
|---|---|
| Rated capacity | 200, 300 N |
| Nonlinearity | Within ±0.5% RO |
| Hysteresis | Within ±0.5% RO |
| Rated output | Approx. 0.5 mV/V (for both Fx and Fy) |
| Safe overload rating | 120% (for both Fx and Fy) |
| Weight | approx. 100 g |

★Interference: ±5% RO (between Fx and Fy )

## Hand Brake Force Transducer

### LB-B

- Measures hand brake tension.

| | |
|---|---|
| Rated capacity | 500 N, 1 kN |
| Nonlinearity | Within ±1% RO |
| Hysteresis | Within ±1% RO |
| Rated outpu | 1 to 2 mV/V |
| Safe overload rating | 120% |
| Weight | approx. 800 g |

## Steering Force/Angle Transducer

## SFA-E-SA

- Thin and lightweight
- Rotary encoder is used to detect steering angle,thereby ensuring high resolution.
- Steering force is output via built-in amplifier, and thus can be obtained with minimal effect of external noise.

| | |
|---|---|
| Rated capacity | Steering force ±20 to 100 N·m |
| Nonlinearity | Within ±0.3% RO |
| Hysteresis | Within ±0.3% RO |
| Rated output | ±2 V |
| Steering angle | Rotary encoder output 18000 pulses/360° |

## Steering Force/Angle Transducer NEW

## SFA-F-SA

- Thin and Lightweight
- Uses high resolution encoder to detect steering angle (18000pulse / 360deg.)
- Easy to install and release
- Dedicated monitor and conditioner (optional)

## Wheel 6-Component Force Measuring System

- The sensing part uses no slip ring, and thus enables running rough road at high speed and ensures easy installation with virtually no protrusion outside the wheel.
- The sensor part is thin and lightweight and is designed like a practical wheel.
- The sensor part transmits detected signals to the onboard memory recorder/analyzer in PCM multiplex telemetry system.
- The onboard memory recorder/analyzer corrects interfrence and angle and then records the data, while monitoring the real-time data in graph or numeric format.
- Large-capacity memory enables long-term data acquisition.
- Enables recording of various data by suddenly starting, abruptly braking, stopping and driving backward and forward.

## Wheel Torque Transducer

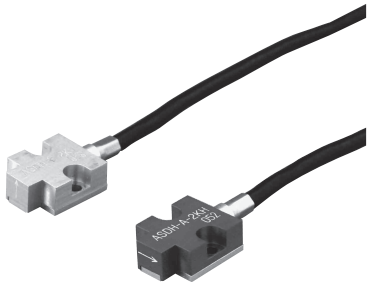
- Measures the wheel torque of running vehicle.
- Can measure the drive and control torque while running the vehicle.
- Since the transducer is manufactured to the regular wheel design, it can easily be mounted and used in an optimum condition.

| | |
|---|---|
| Rated capacity | As specified |
| Nonlinearity | Within ±0.5% RO |
| Hysteresis | Within ±0.5% RO |
| Rated output | approx. 1 mV/V |
| Rotation speed | Max. 2000 rpm |

## Miniature Crash Test Acceleration Transducers

## ASDH-A

- For crash test dummies and car bodies

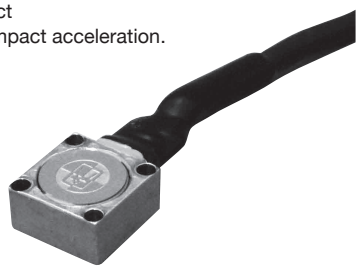


| | |
|---|---|
| Rated capacity | ±9807 m/s², ±19613 m/s² |
| Nonlinearity | Within ±0.5% RO |
| Hysteresis | Within ±0.5% RO |
| Rated output | 1.2 mV/V or more |
| Safe overload rating | 200% |
| Frequency response range | DC to 4 kHz |
| Weigh | approx. 1.4 g |

## Miniature Crash Test Acceleration Transducers

## ASE-A

- For crash test
- Damping type minimizes the resonance effect of impact acceleration.



| | |
|---|---|
| Rated capacity | ±980.7 to ±9807 m/s² |
| Nonlinearity | Within ±1% RO |
| Hysteresis | Within ±1% RO |
| Rated output | Approx. 0.5~2 mV/V |
| Safe overload rating | 200, 400, 500% |
| Frequency response range | DC to 1 kHz |
| Weight | approx. 3 g |

## Grip-design Steering Force Transducer NEW

## LSG-A,B

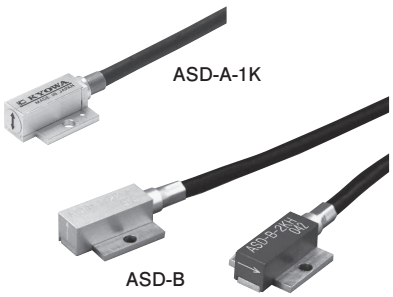
- Set transducer on the original steering wheel to measure steering rotational operating force
- Light weight design reduces effect of transducer on moment of inertia
- Rated capacity : 30N, 200N
- Does not obstruct activation of airbag

| | |
|---|---|
| Rated capacity | As specified |
| Nonlinearity | Within ±1.0% RO |
| Hysteresis | Within ±1.0% RO |
| Rated output | approx. 1.5 mV/V |

## Miniature Crash Test Acceleration Transducer

## ASD-A/ASD-B

- For crash test dummies and car bodies

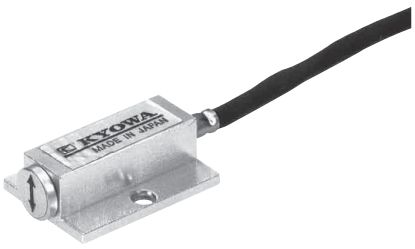



| | |
|---|---|
| Rated capacity | ±9807 m/s², ±19613 m/s² |
| Nonlinearity | Within ±0.5% RO |
| Hysteresis | Within ±0.5% RO |
| Rated output | 1.2 mV/V or more |
| Safe overload rating | 200% |
| Frequency response range | DC to 4 kHz |
| Weigh | approx. 1 g |

## Miniature Semiconductor Acceleration Transducers

## ASM-200BA

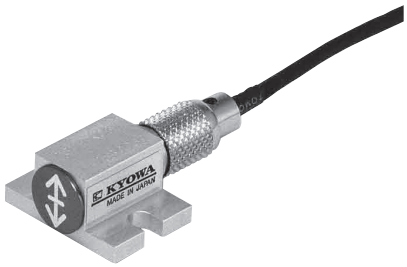
- For crash test



| | |
|---|---|
| Rated capacity | ±1961m/s² |
| Nonlinearity | Within ±1% RO |
| Hysteresis | Within ±1% RO |
| Rated output | Approx. 1.3 mV/V |
| Safe overload rating | 500% |
| Frequency response range | DC to 3.5 kHz |
| Weight | approx. 1.2 g |

## Miniature Semiconductor Acceleration Transducers
## ASM-1KCBV/CBH

- Applicable to crash test car bodies




| | |
|---|---|
| Rated capacity | ±9807 m/s² |
| Nonlinearity | Within ±1% RO |
| Hysteresis | Within ±1% RO |
| Rated output | Approx. 1.5 mV/V |
| Safe overload rating | 120% |
| Frequency response range | DC to 3.5 kHz |
| Weight | approx. 4.3 g ± 0.5 g |

## Seat Belt Tension Transducer
## LBT-A-20KNSA1

- Measures tension applied to the seat belt by the crushed dummy.

| | |
|---|---|
| Rated capacity | 20 kN |
| Nonlinearity | Within ±2% RO |
| Hysteresis | Within ±2% RO |
| Rated output | approx. 2.5 mV/V |
| Safe overload rating | 100% |

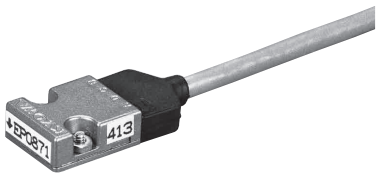
## On-Vehicle Data Logging System for Car Crash Testing
## DIS-5000A (For TEDS)

- 32 channels / 1 unit
- Space-saving installation
  (available 128 channel measurement in A4 size installation area)
- Side-by-side direct connection to expansion units
  Distributed installation of several units by cascade cable is also available.
  Maximum number of connected units is 16.
- Maximum sampling speed 100kHz
- Visible operational status by display
  Battery remaining capacity and charge state can be checked on the panel face indicator.
- Provide TEDS (IEEE1451-4) function
  Conforming to TEDS sensor (Class 2 interface) of International Standard IEEE-145.1to 145.1.4
  TEDS = Transducer Electronic Data Sheet
- High speed data transfer by 100BASE-TX network
  Controlled by the DIS-50A Control Software on the PC via LAN interface
- Enhanced self-check function
  Check Function: Sensor check, wire break check, gain check, excitation voltage check, voltage check, memory check, and battery check.

★For TEDS, see "About TEDS" on page 07.

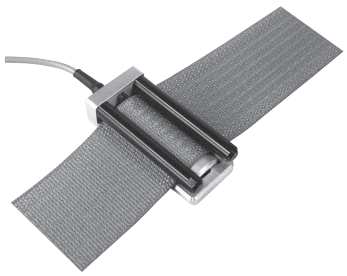

## Miniature Semiconductor Acceleration Transducers
## ASM-1KBCV/BCH M3

- Applicable to crash test car bodies




| | |
|---|---|
| Rated capacit | ±9807 m/s² |
| Nonlinearity | Within ±1% RO |
| Hysteresis | Within ±1% RO |
| Rated output | 1.75 mV/V or more |
| Safe overload rating | 150% |
| Frequency response range | DC to 2.8 kHz |
| Weigh | 4.0 g ±0.5 g |

## Child Seat Belt Tension Transducer NEW
## LBT-D-100NSA1-H



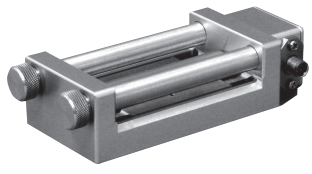
| | |
|---|---|
| Rated capacity | 100 kN |
| Nonlinearity | ±1.5% RO |
| Rated output | 1.0 mV/V or more |
| Safe overload rating | 120% |

## Airbag Timer
## DIA-512A

- Smaller and lighter than KYOWA forerunner.
- Dimensions are the same as the DIS-5000A on-vehicle data logging system.
- Level of firing current and current output duration can be set channel by channel.
- Firing current status can be saved in internal memory.
- Digital signal is output in synchronization with current output timing at each channel.
- Digital LED indicator is provided for enhanced status indication.
- Setting conditions, operation particulars and errors are logged in nonvolatile memory.


## Seat Belt Tension Transducer
## LBT-C-15KNSA2

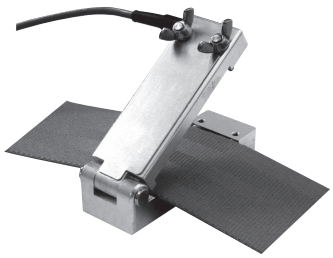
- While designed to be smaller in size and lighter in weight than the forerunner, the LBT-C-15KNSA2 provides a built-in output correction circuit for improved linearity.



| | |
|---|---|
| Rated capacity | 15k N |
| Nonlinearity | Within ±1% RO |
| Rated output | approx. 1.5 mV/V |
| Safe overload rating | 120% |

## Child Seat Belt Tension Transducer
## LBT-B-200NSA1-P

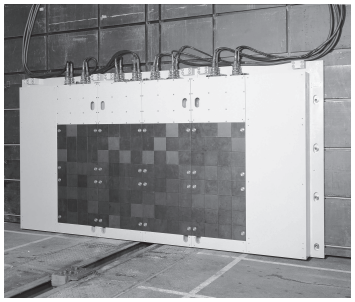
- Measures tension of the belt fixing the child seat.
- Compact, lightweight and designed with easy application in mind



| | |
|---|---|
| Rated capacity | 200 N |
| Nonlinearity | ±3% RO |
| Rated output | approx. 0.75 mV/V |
| Safe overload rating | 100% |

## Force Sensor Matrix(128 Cells)

Mounted to a fixed barrier wall, the force sensor matrix detects the impact load applied by the test vehicle when it collides against the barrier wall. The matrix consists of 128 force sensors arranged in 8 columns by 16 rows to enable measurement of the load distributed on the collided surface. The load detecting direction is vertical to the barrier wall. Each force sensor has a rated capacity of 300 or 500 kN.



## Crash Test Analysis Software

This software enables the PC to analyze crash test data in accordance with the test standards in Japan, US and Europe. Crash tests are performed with sensors applied to the head, chest, abdomen and other parts of a dummy to measure crash-initiated acceleration, displacement and load. Signals of these sensors are recorded by KYOWA DIS series onboard data acquisition systems and transferred to the PC. The PC filters and processes the data to calculate injury values. Major test methods are frontal impact test and side impact test. Dummies mounted in test vehicles include Hybrid III, side impact dummy and child dummy. This software can analyze data obtained through all these test methods and dummies.

## Barrier Matrix Test Data Analysis Software

This software enables the PC to analyze the data obtained by colliding a test vehicle against the force sensor matrix. DIS series data acquisition systems are connected to the force sensor matrix to analyze the data. The software also enables the PC to graphically display the data together with video images photographed during testing.

## Dummy Qualification Software

With dummies used for automotive crash and safety tests, laws and regulations require qualification for each of the head, neck, chest, leg, etc. of every type and structure.
For the qualification of a dummy, prescribed shock and load are applied to the test site through the tester and the corresponding response is recorded as the data of the dummy mounted sensor and the qualification tester mounted sensor. The acquired data is processed by the proper digital filter defined for the type of qualification. Then, the waveform is operated to calculate the analyzed value, which is checked against the reference value for qualification. This software enables indication of the reference value for qualification on the acquired data waveform and the calculated data waveform.
The software is applicable to the qualification of various dummies for frontal collision, side collision and child. Criterion for determining the reference value for qualification is compatible with laws and regulations in Japan, US and Europe.

## Child Seat Dynamic Test Analysis Software

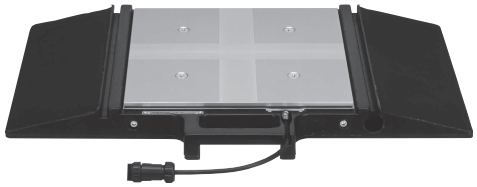
This software enables the PC to analyze the results of dynamic test (impact-applied safety evaluation test) of child seat in accordance with the test standard. For test data acquisition, DIS series onboard data acquisition system can be used. The dynamic test is performed using the thread impact tester. The child seat with a child dummy is mounted on the test seat placed on a dolly. The dolly is driven at a speed of 50 km/h and is accelerated and decelerated in a prescribed range to record resultant signals. This software enables the PC to calculate injury values of the child dummy by analyzing the acquired data. The analyzed results are displayed and printed in graphs together with injury values.

# Traffic System

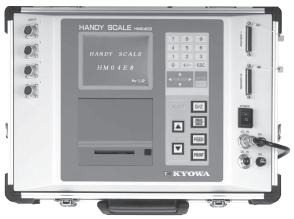
## Portable Truck Weighing System

### HS Series

- Enables easy and accurate measurement of wheel load, axle load, total weight and left-right weight balance.



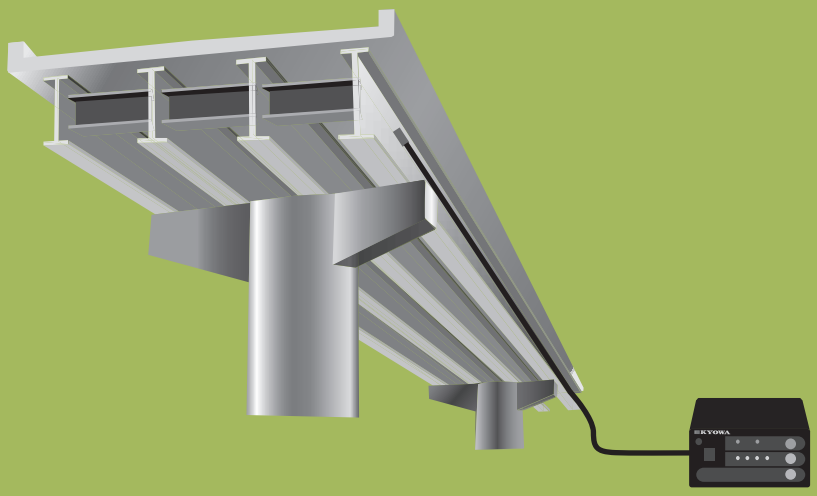
Detector



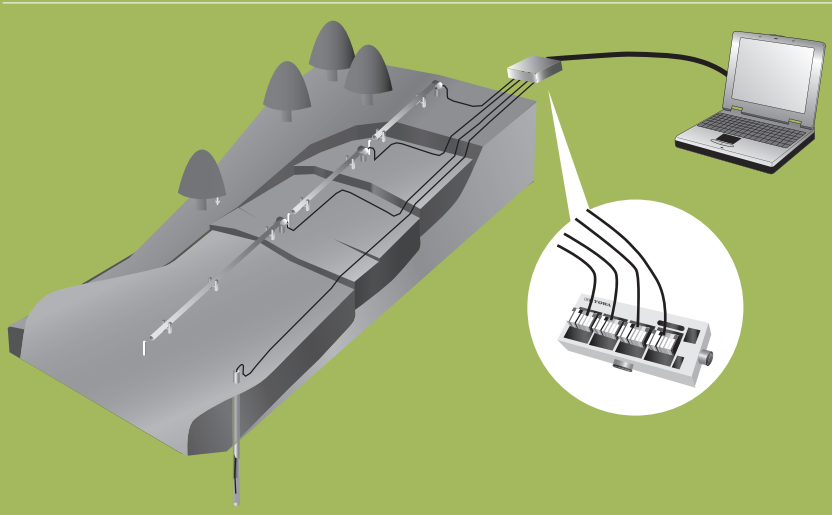

Indicator

# Civil Engineering/ Construction Instruments

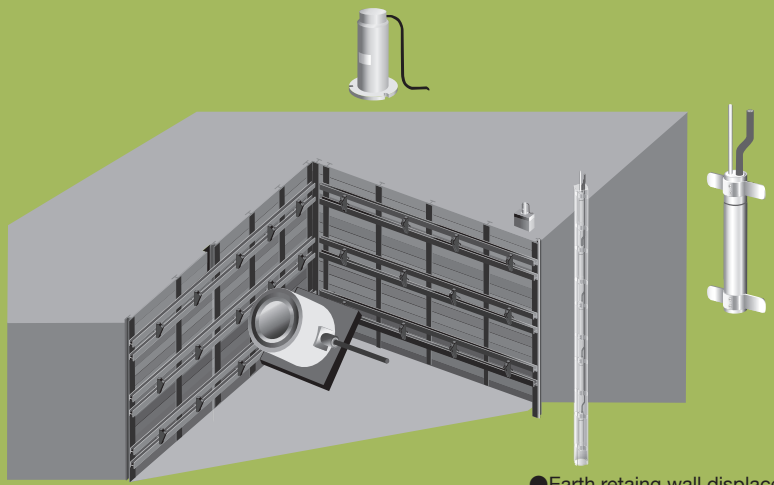
## Civil Engineering/Construction Instruments measurement example



●Bridge monitoring tests



●Landslide monitoring test



●Earth retaing wall displace ment monitoring

## Strain Transducer

### BS-AT/BT

●The linear expansion coefficient is approximated to that of concrete and temperature effects are minimized, thereby enabling measurement of not only the strain caused by external force but also the strain corresponding to temperature stress.

| | |
|---|---|
| Rated capacity | ±500 μm/m |
| | ±1000 μm/m |
| Temperature measuring range | –30 to 70°C |
| Nonlinearity | Within ±1.5%~2%RO |
| Rated output | ±1mv/v(±2000 μm/m) or more |
| | ±0.5mv/v(±1000 μm/m) or more |

## Stress Transducers

### BR-BT

●Theoretically backed performance of direct concrete stress measurement with no conversion from a detected strain quantity

| | |
|---|---|
| Rated capacity | 2Mpa~10MPa |
| Temperature measuring range | –30 to 70°C |
| Nonlinearity | Within ±10%RO |
| Rated output | ±1mv/v(±2000 μm/m) or more |

## Surface-Mounting Type Strain Transducer

### BS-15CT

●Surface –Mounting Type

| | |
|---|---|
| Rated capacity | ±2000 μm/m |
| Nonlinearity | Within ±2% RO |
| Hysteresis | Within ±2% RO |
| Rated output | ±0.625 to±1.25 mv/v |

## Embedment Type Inclination Transducers
## BKJ-A

- The inclination transducer can be installed at up to 20 stages in the guide pipe.
- Available for measurement in single and dual directions

| | |
|---|---|
| Rated capacity | ±5°, ±10° |
| Nonlinearity | Within ±0.5% RO |
| Hysteresis | Within ±0.5% RO |
| Rated output | 1.4 mV/V or more |

## Small-Sized Strain Transducer
## BS-8FT

- Suitable for strain measurement on soldier pile strut, steel sheet pile and tunnel support

| | |
|---|---|
| Rated capacity | ±1000 μm/m |
| Temperature measuring range | –30 to 70°C |
| Nonlinearity | Within ±2% RO |
| Hysteresis | Within ±3% RO |
| Rated output | ±1 mV/V or more |

## Pore Pressure Transducers
## BPC-A

- The double enclosure structure eliminates any effect of lateral pressure.
- Flat filter attached
- Enclosure is made of stainless steel.

| | |
|---|---|
| Rated capacity | 200 kPa to 2 MPa |
| Nonlinearity | Within ±1% RO |
| | (within ± 2% RO with 200KP) |
| Hysteresis | Within ±1% RO |
| Rated output | 1 mV/V or more |
| | (0.75 mV/V or more with 200KP) |
| Mounting screw | R3/4 |

## Hollowed Load Cells NEW
## BLW-A

- This load cell is a waterproof construction and is thin and light the best for the outdoors measurement.

| | |
|---|---|
| Rated capacity | 500 kN to 2 MN |
| Nonlinearity | Within ±0.8% RO |
| Hysteresis | Within ±0.5% RO |
| Rated output | 1.25 mV/V or more |

## Reinforcing-Bar Stress Transducer
## BF-CT

- Stress on reinforcing bar is measured by welding both ends of this transducer to the bar.

| | |
|---|---|
| Rated capacity | 300 MPa |
| Temperature measuring range | –30 to 70°C |
| Applicable reinforcing bar | SD345 |
| Deformed reinforcing bar | D10 to D32 |
| Nonlinearity | Within ±1% RO |
| Hysteresis | Within ±1.5% RO |
| Rated output | 1.85 mV/V or more |

## Small-Sized Pore Pressure Transducer
## BPA-F-S

- Small-sized (outer diameter : 10 mm) and suitable for indoor model experiments
- Short-term embedded application is possible.

| | |
|---|---|
| Rated capacity | 200, 500 kPa |
| Nonlinearity | Within ±1% RO |
| Hysteresis | Within ±1% RO |
| Rated output | 0.85 mV/V ±30% (200 kPa) |
| | 1 mV/V ±20% (500 kPa) |

## Hollowed Load Cells
## BL-B/E

- For measurement of load applied to an earth anchor or the support of tunnel arch

| | |
|---|---|
| Rated capacity | BL-B: 5 to 500 kN |
| | BL-E: 1, 2 MN |
| Nonlinearity | Within ±2% RO |
| Hysteresis | Within ±1% RO |
| Rated output | 1 mV/V or more |

## Pore Pressures Transducer
## BPB-A/BPB-A-T

- The small outer diameter of 30 mm enables installation of these pore pressure transducers in a small boring.
- Flat filter attached
- Enclosure is made of stainless steel.

| | |
|---|---|
| Rated capacity | 200 kPa to 2 MPa |
| Temperature measuring range | –30 to 70°C (BPB-A-T) |
| Nonlinearity | Within ±1% RO |
| | (within ±2% RO with 200KP) |
| Hysteresis | Within ±1% RO |
| Rated output | 1 mV/V or more |
| | (0.75 mV/V or more with 200KP) |
| Mounting screw | R3/4 |

## Water Level Transducer
## BWL-ET

- For measurement of fluctuation of underground water level
- Lightning arrester element built in. Atmospheric pressure
- compensated

| | |
|---|---|
| Rated capacity | Water level 0 to (10, 20, 30) m |
| Temperature measuring range | –20 to 60 °C |
| Nonlinearity | Within ±0.15% RO |
| Hysteresis | Within ±0.1% RO |
| Rated output | 2 mV/V or more |

*Stainless steel structure of 32 mmϕ by 122 mm long

## Temperature Transducer
## BT-100B

- For embedded application (hydraulic pressure resistance: 200 kPa)

| | |
|---|---|
| Rated capacity | –30 to 70 °C |
| Resolution | 0.01 °C |
| Measuring error | ±0.3 °C |
| Output | 50 μV/V/°C |
| Weight | approx. 120 g |

## Concrete Surface Displacement Transducer
## BCD-E-70S

- Easy installation using a fixture and adhesive
- Reusable
- Rated capacity

| | |
|---|---|
| Tension | 2.0% strain or less (0 to 1.40 mm) |
| Compression | 0.5% strain or less (0 to 0.35 mm) |
| Nonlinearity | Within ±3% RO |
| Hysteresis | Within ±3% RO |
| Rated output | approx. 2.5 mV/V |

## Large-Sized Soil Pressure Transducers
## BEG-A-S

- 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.

| | |
|---|---|
| Rated capacity | 200 k to 2 MPa |
| Temperature measuring range | –20 to 80 °C |
| Nonlinearity | Within ±1.0% RO |
| Hysteresis | Within ±1.0% RO |
| Rated output | 1 mV/V or more |

## Small-Sized Temperature Transducer
## BTS-100AT

- The diameter is as small as 5 mm.
- Embedded application possible for model experiments and short-term measurement
- Connected to an amplifier constant-current bridge excitation type for measurement

| | |
|---|---|
| Rated capacit | –30 to 70 °C |
| Measuring error | ±0.5 °C |
| Weight | approx.10 g |

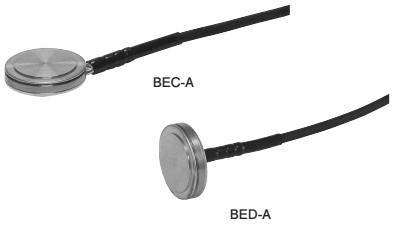
## Crack Displacement Transducer
## BCD-5B

- For measurement of crack occurring on rock bed, etc.
- Small measuring force enables installation to soft rock bed.

| | |
|---|---|
| Rated capacity | ±5 mm |
| Nonlinearity | Within ±2% RO |
| Hysteresis | Within ±2% RO |
| Rated output | ±1 mV/V ±5% |
| Measuring force | approx. 9.8 N/5 mm |

## Small-Sized Soil Pressure Transducers
## BEC-A/BED-A

- 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.




| | |
|---|---|
| Rated capacity | 200 k to 1 MPa |
| Temperature measuring range | –10 to 60 °C |
| Nonlinearity | Within ±2% RO |
| Hysteresis | Within ±1% RO |
| Weight | approx. 120 g |

## Joint Transducer
## BJ-AT

- For measurement of an opening degree of joint, such as between concrete blocks
- Crack of rock-bed can be measured.

| | |
|---|---|
| Rated capacity | 0 to (5 to 50) mm |
| Temperature measuring range | –30 to 70 °C |
| Nonlinearity | Within ±1.5% RO |
| Hysteresis | Within ±1.5% RO |
| Rated output | 1 mV/V or more |

## Soil Pressure Transducers
## BEE-A/BEF-A/BEM-A/BFN-A

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


| Model | Diam.* | Rated capacity |
|---|---|---|
| BEE-A | 160 | 200 k to 2 MPa |
| BEF-A | 160 | 200 k to 2 MPa |
| BEM-A | 80 | 50 k to 1 MPa |
| BFN-A | 70 | 500 k, 1 MPa |

*Diameter of sensing diaphragm in mm

## Wall-Surface Soil Pressure Transducers
## BER-A-110S

- Load cell type design receives no bending effect of structure.
- Cable is attached at right angle or in parallel to the sensing diaphragm.
- Diameter of the sensing diaphragm and rated capacity

| Model | Diam.* | Rated capacity |
|---|---|---|
| BER-110S | 95 | 100 k to 2 MPa |

*Diameter of sensing diaphragm in mm

**www.kyowa-ei.com**

Specifications are subject to change without notice for improvement.

| | |
|---|---|
| **Safety precautions** | Be sure to observe the safety precautions given in the instruction manual, in order to ensure correct and safe operation. |

JQA-0821
JQA-EM4824

*Reliability through integration*

KYOWA

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Cat.No.507-U62

Printed in Japan 07/10