Transducers
(Strain gage based & others)

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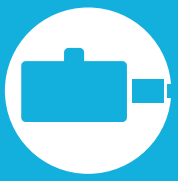
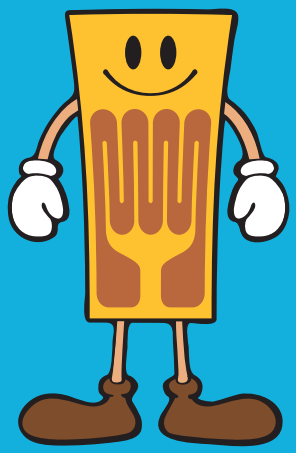
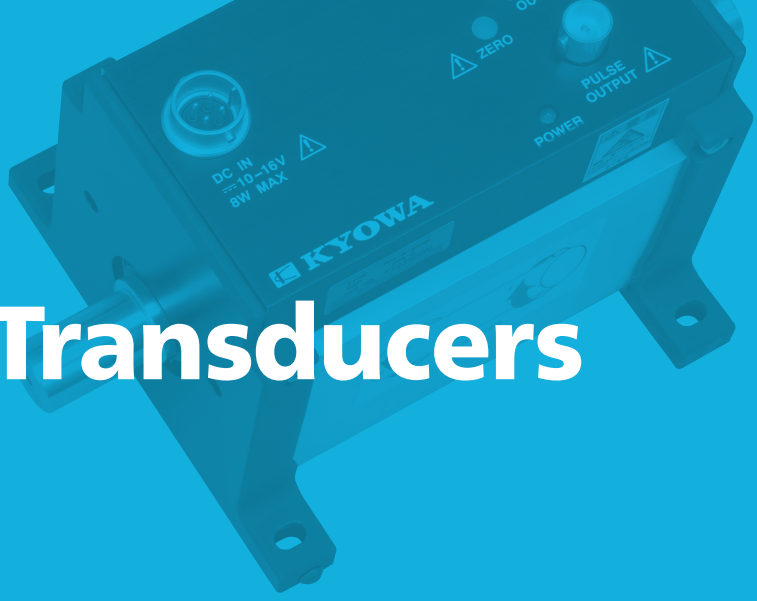




Note:
When using for special purposes, please contact us.
For prices and delivery date, please contact us.

Strain Gage Transducers



About strain & μm/m
Strain is an absolute value without unit.

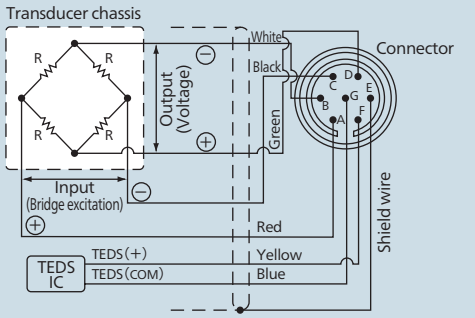
It expresses the ratio of elongation to the original length.
For example,
if a bar changed 0.001 mm from its original 1 m long,
then the strain is 0.001mm/1m=0.000001=1μm/m

Important Notice
Strain gage transducers cannot be used under hydrogen environment.

(For automotive test transducers, refer to chapter 5.)
(For civil engineering and architectural transducers, refer to chapter 7.)

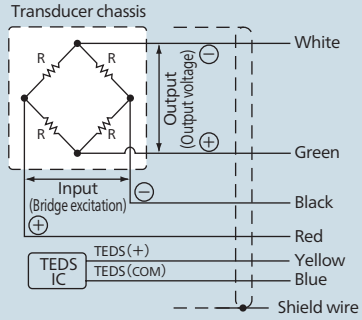
Transducer's Bridge Circuit and Cable Connection

●Cable terminated with an NDIS connector plug



TEDS(+) and TEDS(COM) are expressed as TEDS+ and TEDS- respectively in some measuring instruments.

●Cable bared at the tip



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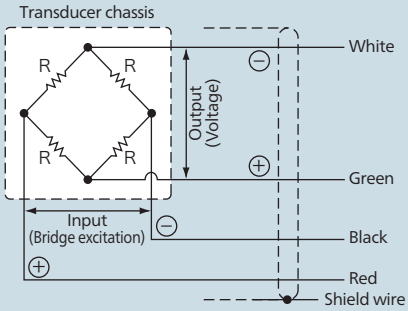

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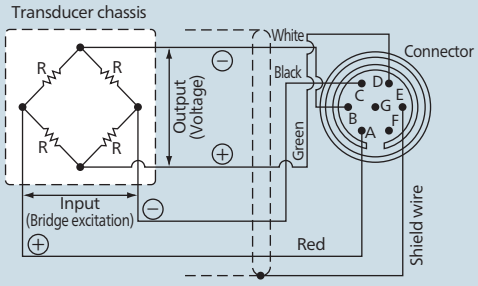


For most transducers, the shield wire is not connected to the case.

●Resistances between conductors or plug pins (In case of a 120 Ω or 350 Ω transducers)

Connector plug pins		Input (A-C)	Output (B-D)	A-B	A-D	B-C	C-D
Conductors		RD-BK	WT-GR	RD-WT	RD-GR	WT-BK	BK-GR
Bridge resistance (R)	350 Ω	350 Ω	350 Ω	262.5 Ω	262.5 Ω	262.5 Ω	262.5 Ω
	120 Ω	120 Ω	120 Ω	90 Ω	90 Ω	90 Ω	90 Ω

Strain gage transducers are designed to transduce physical variables such as load, force, pressure, acceleration, vibration, displacement and torque into electric signals by using strain gages as sensing elements. The electric output signals can be connected to various measuring instruments to monitor, record and control physical variables. Use of strain gages as sensing elements makes the transducers compact & lightweight while ensuring least mechanical displacement and superior linearity due to simple structure. Practically, strain gage transducers are widely used for research and as industrial measuring devices for production control. Among them, load cells are used to detect compressive or tensile force; pressure transducers, to detect water, oil or air pressure; acceleration transducers, to detect impact or vibration acceleration; displacement transducers, to detect displacement in various loading tests and materials tests; torque transducers, to detect torque such as twisting force of a rotating object; transducers for automotive tests; and civil engineering and architectural transducers, to measure soil pressure, stress, pore pressure, etc.

Conversion of Measured Strain or Output Voltage into Physical Quantity

Measured strain or output voltage can easily be converted into physical quantity by using the calibration constant written in the Test Data Sheet attached to each transducer.

●Measured strain on strain amplifiers
Wanted physical quantity = Measured strain (μm/m) x A
A: Calibration constant indicating the physical quantity corresponding to 1-μm/m equivalent strain.

●Output voltage on other type of amplifier or recorder

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

B: Calibration constant indicating physical quantity corresponding to 1-μV output/1-V bridge voltage

Rated output of each transducer is stated in voltage(mV/V) and strain(μm/m).

Rated output of each transducer is stated in mV/V. It indicates the voltage (mV) which is output for the rated capacity with the bridge voltage at 1 V.
The output voltage has the following relation with a strain quantity (μm/m):
1 mV/V = 2000 μm/m

For details, refer to Technical Notes page 9-14.

Sensitivity Decrease due to Cable Extension

If a strain gage transducer is connected to a signal conditioner, digital indicator or strain amplifier via extension cable, we cannot ignore the sensitivity decrease due to the extension cable resistance which lowers the voltage applied to the transducer.
The rated output with lowered sensitivity can be obtained from the following equation:

$$\varepsilon_0 = \left(\frac{R}{R + (r \times L)}\right) \varepsilon_i$$

R: Transducer's input resistance (Ω)
r: Extension cable's reciprocating resistance (Ω) per meter
L: Extension cable length (m)
ε_i: Rated output written in the Test Data Sheet

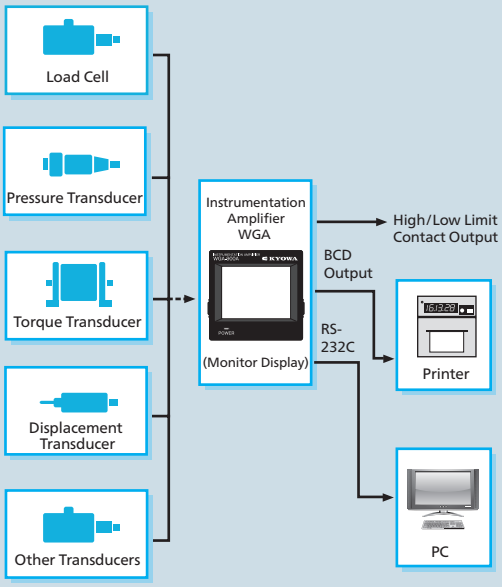
Sensitivity Decrease in Kyowa's Extension Cables

Models	Cable Length (L)	Sensitivity Dropped (Approx.)	Reference	
			r×L (Ω) (Approx.)	$\frac{R}{R+(r\times L)}$
N-82	10 m	0.2%	0.8	0.998
N-83	20 m	0.5%	1.6	0.995
N-84	30 m	0.7%	2.4	0.993
N-85	50 m	1.1%	4	0.989
N-100	100 m	2.2%	8	0.978

Bridge resistance R = 350Ω,
Reciprocating resistance per 1 m of 4-conductor (0.5 mm^2) chloroprene cabtyre extension cable: 0.0794 Ω ≈ 0.08Ω

■Measuring System Block Diagrams

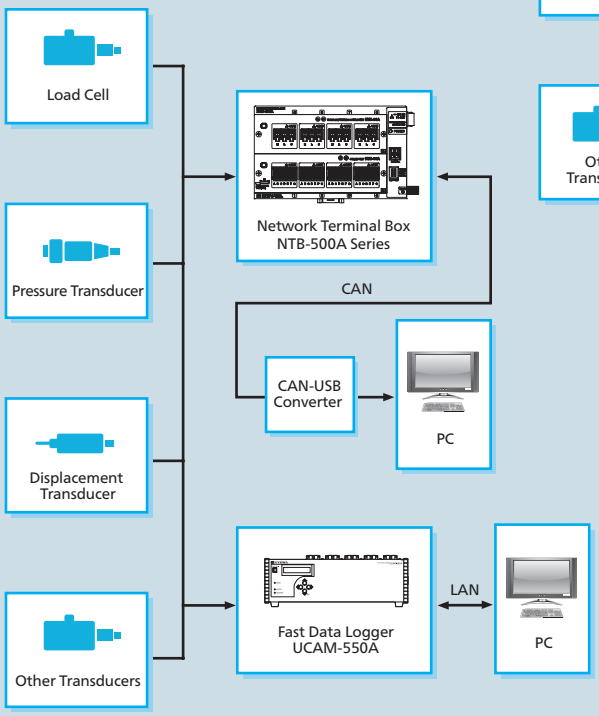
●Indication, Measurement, Control & Monitor



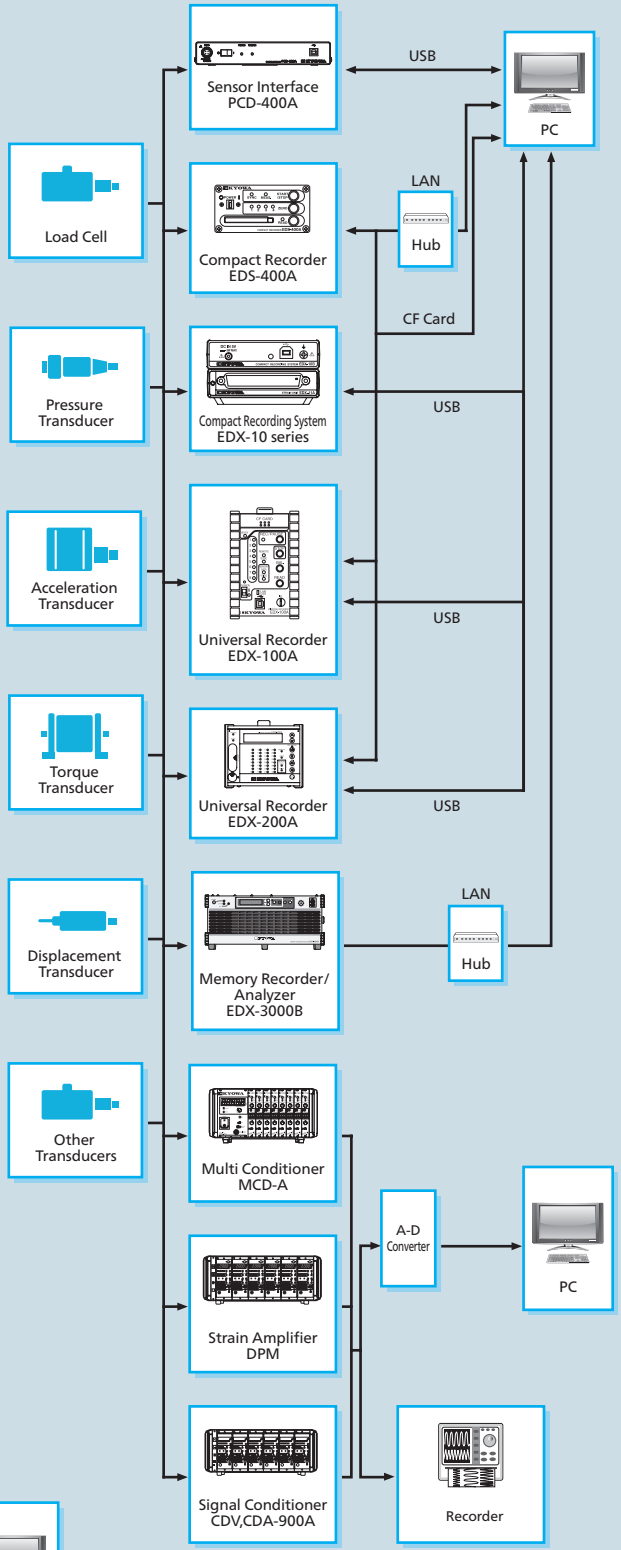
Transducer's connectors and cables differ depending on models. For details, refer to description of each model or pager 8-1.

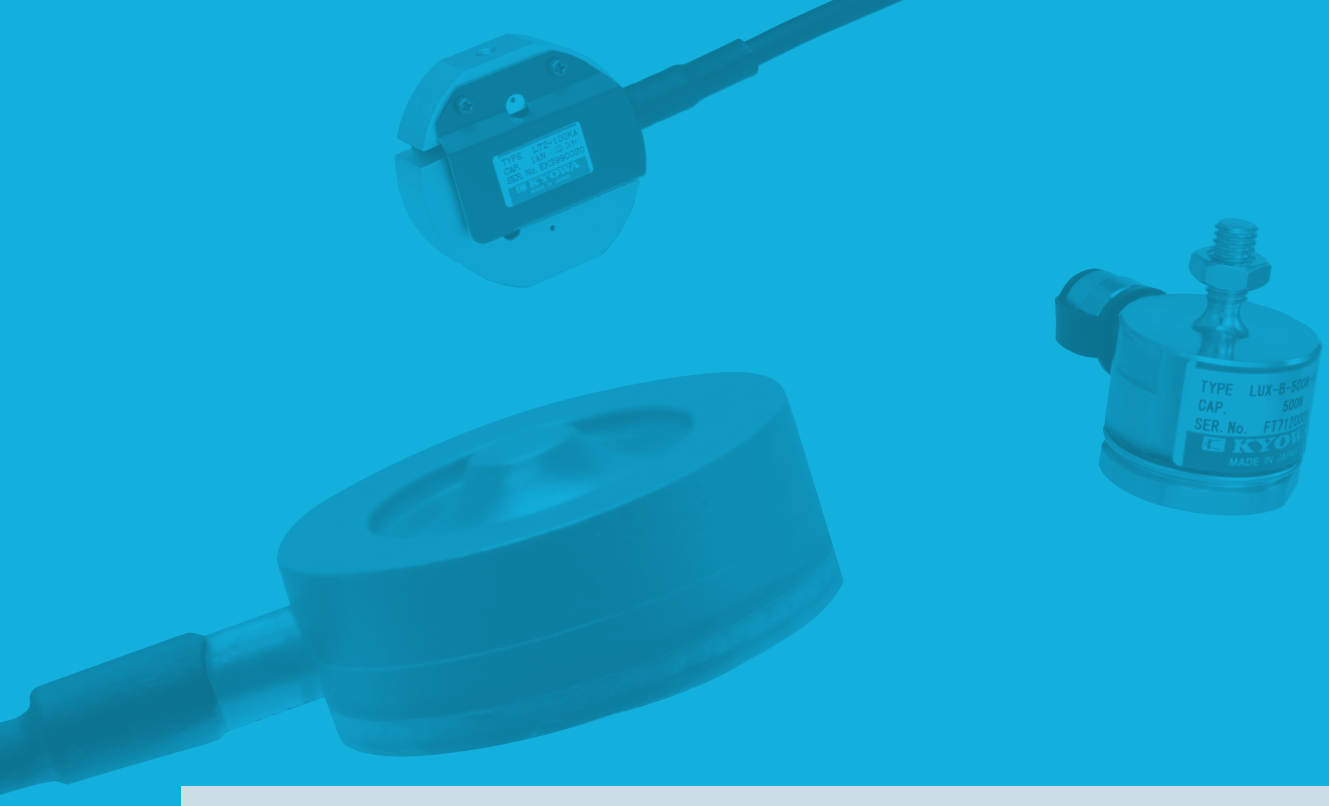
Note: In combination use of pressure transducers and instrumentation conditioners in WGA series, the measuring range is rarely exceeded due to initial unbalance of the transducer. For details, contact us.

●Measurement of Dynamic Phenomena at Medium Speed



●Measurement of Dynamic Phenomena





●Measurement of Static Phenomena