

# LEAD WIRES

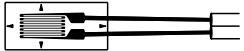
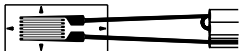
## Effects of lead wire temperature

### General wiring method and bridge configuration

Bridge configuration	Lead wires	Availability during measurement with temperature change
Quarter bridge with 2-wire	Paralleled 2-wire	Not available
Quarter bridge with 3-wire	Paralleled 2-wire	Available
Half bridge	Paralleled 2-/3-wire	Available
Full bridge	4-core cable	Available

With 2-wire system, changes in lead wire temperature cause changes in the lead wire resistance which in turn generate thermal output. The lead wire temperature has not effect on thermal output for quarter bridge with 3-wire system.

### Connections of strain gauge and extension lead wires

Lead wires connection	Strain gauge connection
Paralleled 2-wire pre-attached to quarter bridge	
Paralleled 3-wire pre-attached to quarter bridge with 3-wire system	

## Gauge factor correction due to the lead wire

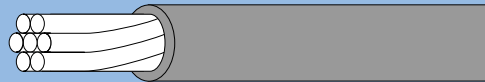
The lead wire resistance between the strain gauge and the strainmeter can noticeably lower the gauge factor. Calculation for the correction should be required depending on the measurement method and on the lead wire type and length.

In case of 2-wire	In case of 3-wire system
A: Correction coefficient of lead wire $A = \frac{R}{R + rL}$	A: Correction coefficient of lead wire $A = \frac{R}{R + \frac{rL}{2}}$
$K_0$ : Gauge factor corrected $K_0 = \frac{R}{R + rL} K = A K$	$K_0$ : Gauge factor corrected $K_0 = \frac{R}{R + \frac{rL}{2}} K = A K$
,where	
R : Nominal gauge resistance (Ω)	
r : Total resistance per meter of lead wire (Ω/m)	
L : Length of lead wire (m)	

## Total resistance per meter of lead wire

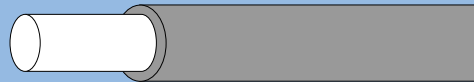
In strain gauges, the lead wire resistance produces a deterioration of gauge sensitivity and thermal drift. The lead wire should always be as thick and as short as possible.

### Stranded wire/Twisted wire



Construction core/diameter	7/0.12	10/0.12	7/0.16	7/0.18	12/0.18	20/0.18
Cross section area of lead wire (mm <sup>2</sup> )	0.08	0.11	0.14	0.18	0.3	0.5
Total resistance of lead wire per meter (Ω)	0.44	0.32	0.24	0.20	0.12	0.07

### Single-core wire



Construction	Polyimide wire (φ 0.14mm)	Polyimide wire (φ 0.18mm)
Cross section area of lead wire (mm <sup>2</sup> )	0.015	0.025
Total resistance of lead wire per meter (Ω)	2.5	1.5

## Setting the gauge factor to the strainmeter

### Static strainmeter/Data Logger

$$C_s = \frac{2.00}{K_0}$$

$C_s$  : Coefficient set  
 $K_0$  : Gauge factor corrected with lead wire attached