

# TRANSDUCER-SPECIFIC STRAIN GAUGES

TML gauges are not only used for strain measurement, but also as sensors for strain gauge-type transducers. Strain gauge-type transducers convert various types of physical quantities to mechanical strain in the stress-generating body (elastic body) and use strain gauges to convert mechanical strain to electric output. Strain gauge-type transducers are generally categorized into the following types.

- Force transducers (Load cell)
- Pressure transducers
- Acceleration transducers
- Displacement transducers
- Torque transducers

## VARIOUS TYPE OF TML TRANSDUCER-SPECIFIC STRAIN GAUGES

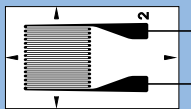
### GAUGE SHAPE AND GAUGE LENGTH

Single, Rectangular 2-element, Torque(Shearing) strain measurement

Pattern	Gauge length (mm)
Single-element	2, 3
90° 2-element	2, 3, 6
Torque (Shearing strain) use	2

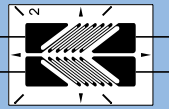
Pattern

Single-element



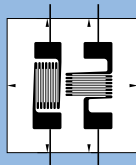
(LA)

Torque



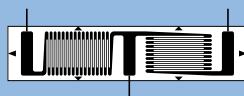
(CT)

90° 2-element



(CB)

90° 2-element



(CM)

2 types of 90° 2-element gauge are lined-up with different pattern of gauge tab. CM-type has half-bridge configuration.

### GAUGE RESISTANCE

Pattern	Gauge resistance (Ω)
Single-element	350, 1000
90° 2-element	120, 350
Torque (Shearing strain) use	350

\* 1000-ohm gauge has less power consumption in bridge circuit comparing to 350-ohm gauge's and limits Joule's heat generation.

### GAUGE BACKING MATERIALS

Unlike stress measurement gauges, the gauge backing materials for transducer-specific strain gauge cannot be determined based solely on the operational temperature and bonding method. To ensure maximum transducer performance, it is necessary to test various combinations using different stress-generating bodies (elastic bodies) to select the most suitable backing materials.

#### Operational temperature

Operational temperature range differs from heat-resistive temperature's.

F series gauge (with epoxy backing) is also available for use of heat-curing type bonding adhesives. Refer to page 61-62 for the details.

Gauge series	Gauge base materials	Operational temperature
F	Epoxy resin	-20~+80°C
QF	Polyimide resin	-20~+200°C
EF	Polyimide resin	-20~+200°C

### OPERATIONAL TEMPERATURE RANGE

Operational temperature differs from heat-resistant temperature. F series gauge having epoxy resin is available with heat-curing type bonding adhesive.

### CREEP ADJUSTMENT

The creep characteristic is particularly important in force transducers. The most common compensation system uses the material creep (+) of the stress-generating body (elastic body) and the gauge creep (-) to cancel each other. Various TML strain gauges are available for creep adjustment and are selectable by creep code.

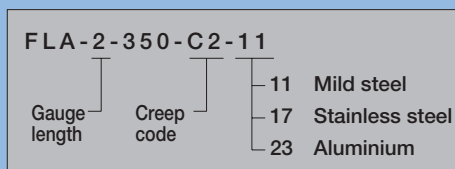
Creep code

Gauge creep	Large → Small
Creep code	C2 > C4 > C6 > C8


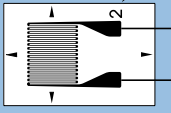

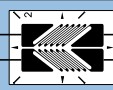

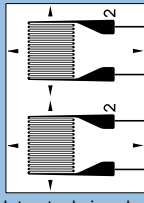








### TEMPERATURE SENSITIVITY COMPENSATION

Elasticity modulus of strain-generating body (elastic body) varies with temperature variation. In the same manner, as ambient temperature around the strain-generating body varies, resulting in change of apparent strain. To reduce such temperature influence, sensitivity compensation resistor is assembled in bridge circuit.

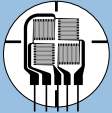
### ■ Coding system of Transducer-specific strain gauges

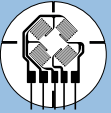


**TRANSDUCER-SPECIFIC  
STRAIN GAUGES**

Gauge pattern	Type	Gauge size		Backing		Resistance in $\Omega$		
		L	W	L	W			
<p>●Single-element (G.F. 2.1 approx.)</p>  <p>FLA-2-350-C2-11</p>  <p>(Not actual size shown)</p>	FLA-2-350 -C2 -11 (QF) C4 17 C6 23 C8	L : length	W : width (Unit : mm)	2	2.9	6.8	4.6	350
	FLA-3-350 -C2 -11 (QF) C4 17 C6 23 C8	3	3.2	8.5	5.0	350		
	FLA-3-1000-C2 -11 (QF) C4 17 C6 23 C8	3	4.2	9.2	5.8	1000		
<p>●Torque (Shearing strain) measurement</p>  <p>FCT-2-350-C2-11</p>  <p>(Not actual size shown)</p>	FCT-2-350 -C2 -11 (QF) C4 17 C6 23 C8	2	1.7	7.6	5.3	350		
<p>●Single-axis 2-element</p>  <p>FLA-2-350-C2-2H-11</p>  <p>(Not actual size shown)</p>	FLA-2-350 -C2-2H -11 (QF) C4-2H 17 C6-2H 23 C8-2H	2	2.9	6.8	9.2	350		
	FLA-3-350 -C2-2H -11 (QF) C4-2H 17 C6-2H 23 C8-2H	3	3.2	8.5	10.0	350		
<p>●90° 2-element</p>  <p>FCB-2-11</p>  <p>FCB-3-350</p>  <p>FCB-6-350</p>  <p>FCB-2.8-350</p>  <p>FCM-2.8-350</p>  <p>EFCM-2-350</p>  <p>EFCMX-3-350</p>  <p>EFCMY-3-350</p>	FCB (QF) -2 -3-350 -11 -6-350 17 -2.8-350 23	2	1.5	8.2	8.0	120		
		3	3.2	10.5	9.1	350		
		6	2.0	10.0	13.0	350		
			2.8	2.8	12.0	8.5	350	
		FCM-2.8-350	2.8	2.8	12.0	8.5	350	
		EFCM-2-350-11	2.5	1.4	3.0	12.2	350	
		EFCMX-3-350-11	3	1.6	8.0	7.5	350	
		EFCMY-3-350-11	3	1.6	10.0	6.5	350	

●In addition to those shown above, various other gauges for transducers are available.

Bending (Force transducer use) 

Shearing (Torque transducer use) 

●Detailed specifications must be discussed and decided before ordering gauges for transducers.  
Consult a sales representative.