

# Internal strain of concrete, synthetic resin

## KM Strain Transducers

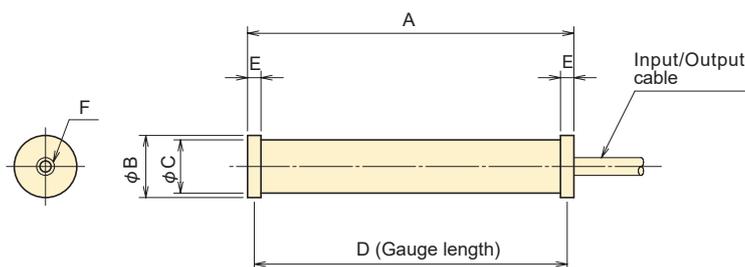
Civil engineering design



The KM series strain transducers are designed to measure strain in materials such as concrete, synthetic resin which undergo a transition from a compliant state to a hardened state. Their extremely low modulus (40N/mm<sup>2</sup> approx.) and waterproof construction are ideally suited for internal strain measurement during the very early stages of curing. They are totally impervious to moisture absorption, producing excellent stability for long-term strain measurement. Relative temperature measurement is also possible with the KM-B. The built-in thermocouple sensor of the KM-BT enable actual temperature measurement in addition to strain measurement. Adding to the above embedment use, surface strain measurement onto concrete, H-beam steel is also available with various optional fittings.

The KM series is compliant to CE marking except for KM-30 and KM-50F.

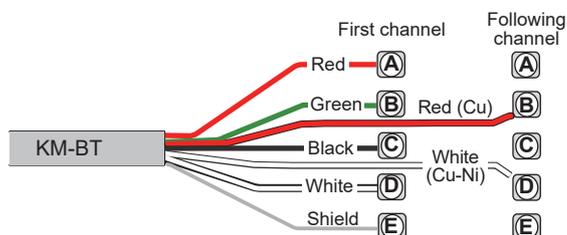
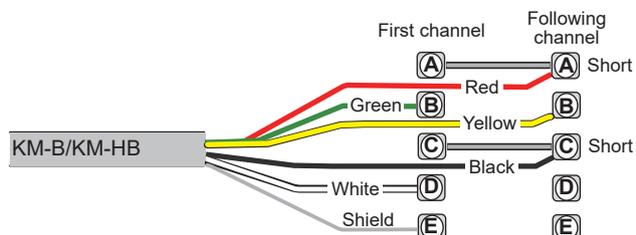
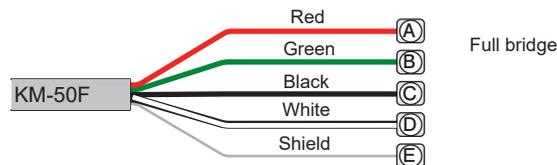
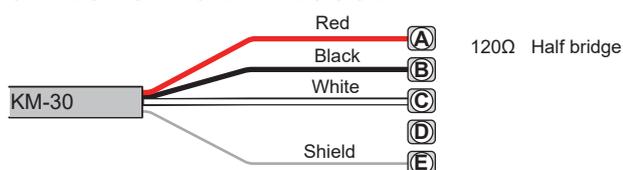
Protection ratings: IP67 equivalent for KM-30  
IP68 equivalent for KM-50F ~ KM-100BT



### ■ DIMENSION

| TYPE     | Dimension |     |     |     |   |        |
|----------|-----------|-----|-----|-----|---|--------|
|          | A         | φ B | φ C | D   | E | F      |
| KM-30    | 34        | 12  | 10  | 31  | 3 | M3 DP4 |
| KM-50F   | 54        | 20  | 17  | 50  | 4 | M3 DP4 |
| KM-100B  | 104       | 20  | 17  | 100 | 4 | M3 DP6 |
| KM-100HB | 104       | 20  | 17  | 100 | 4 | M3 DP6 |
| KM-100BT | 104       | 20  | 17  | 100 | 4 | M3 DP6 |

### ■ CONNECTION TO DATA LOGGER



Consecutive 2 channels should be required for simultaneous measurement of strain and temperature.

Stranded cables of Green, White and shield are connected to the first channel. Remaining cables of Red, Yellow and Black should be connected directly to the following channel for temperature measurement, making short-circuit between A-A and C-C with copper wire for strain measurement.

Consecutive 2 channels should be required for simultaneous measurement of strain and temperature.

Stranded cables of Red, Green, Black, White and shield to the first channel for strain measurement. Thermocouple of single core Red and White should be connected directly to the following channel for temperature measurement.

### ■ SPECIFICATIONS

| TYPE                         | KM-30                                   | KM-50F                                | KM-100B   | KM-100HB     | KM-100BT          |
|------------------------------|---|---------------------------------------|---|--------------|-------------------|
| Capacity                     | ±5000x10 <sup>-6</sup> strain           |                                       |   |              |                   |
| Gauge length                 | 31mm                                    | 50mm                                  | 100mm   |              |                   |
| Rated output (Approximately) | 2.5mV/V<br>5000x10 <sup>-6</sup> strain | 4mV/V<br>8000x10 <sup>-6</sup> strain | 2.5mV/V<br>5000x10 <sup>-6</sup> strain   |              |                   |
| Non-linearity                | 1%RO                                    |                                       |   |              |                   |
| Apparent elastic modulus     | 40N/mm <sup>2</sup>                     |                                       |   |              |                   |
| Strain measurement           | 120Ω Half bridge                        | 350Ω Full bridge                      |   |              |                   |
| Temperature measurement      | -                                       |                                       | *1 Strain gauge (350Ω Quarter bridge 3-wire method :50x 10 <sup>-6</sup> strain/°C) |              | *2 Thermocouple T |
| Allowable temperature range  | -20 ~ +60°C                             | -20 ~ +80°C                           |   | -20 ~ +180°C | -20 ~ +80°C       |
| Input/Output resistance      | 120Ω (Half bridge)                      | 350Ω Full bridge                      |   |              |                   |
| Weight                       | 12 g                                    | 45 g                                  | 75 g  | 80 g         | 75 g              |

Input/Output cable :

KM-30 φ 2.4mm 0.04mm<sup>2</sup> 3-core shielded vinyl cable 2m  
 KM-50F φ 6mm 0.35mm<sup>2</sup> 4-core shielded chloroprene cable 2m  
 KM-100B φ 9mm 0.3mm<sup>2</sup> 5-core shielded fluoroplastic cable 2m  
 KM-100BT φ 9mm 0.3mm<sup>2</sup> 4-core shielded T-thermocouple compound cable 2m

\*1 Relative temperature measurement possible  
 \*2 Real temperature measurement possible

# Internal strain of asphalt pavement

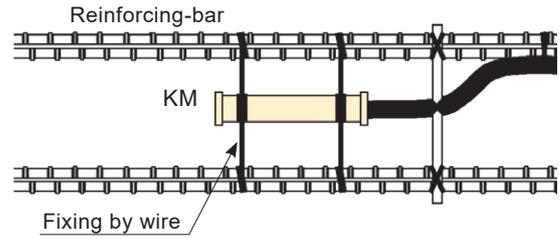
## KM Strain Transducers

Civil engineering design

### For use of internal strain measurement

The KM Strain Transducers make possible strain measurement in materials such as concrete which undergo transition from a compliant state to a hardened state. The KM is designed to measure various strains produced by external force, ambient temperature, drying shrinkage, materials creep, etc. Applicable gauge length should be three times as large as the diameter of the aggregate so as to give an averaged evaluation of the concrete.

As illustrated right, the KM end is wired between reinforcing bars, then position the KM to marked points of reinforcing bar in advance.



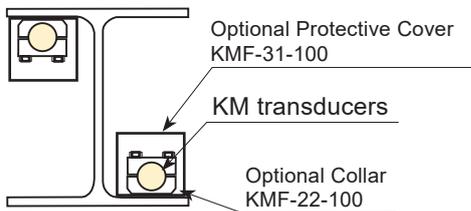
### For surface strain measurement

Surface strain measurement onto steel and concrete structures is available with KM-100B or KM-100BT. (Optional fittings such as Spacer and Collar are available for fixing the model and positioning gauge length.)

#### An installation onto the surface of steel structure



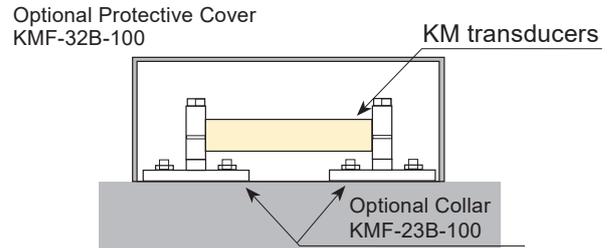
The KM model is combined with optional Collar KMF-22-100 to install onto the surface of steel by welding.



#### An installation onto the surface of concrete structure

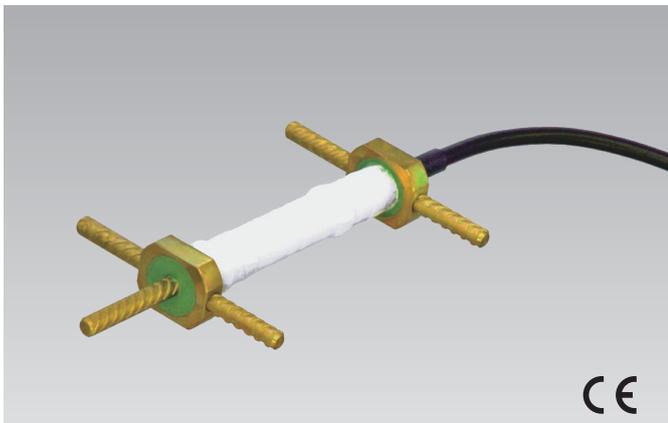


The KM model is combined with optional Collar KMF-23B-100 to install onto the surface of concrete structure with anchor bolts.

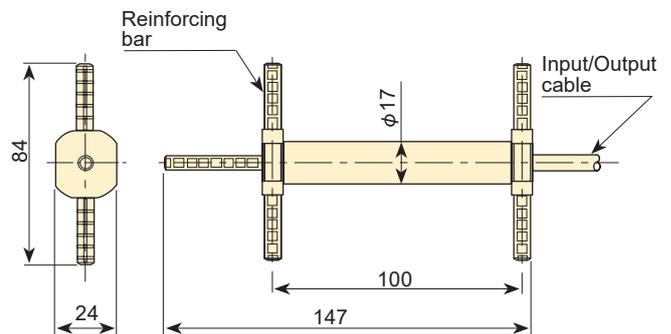


## KM-HAS Strain Transducers

Civil engineering design



The KM-HAS transducers are embedded into asphalt for measurement of internal strain. The transducers have reinforcing bar flanges at its both ends for good fixation to asphalt pavement materials, and provide for fully waterproof construction. The operating temperature range is -20 to +180°C.



### ■ SPECIFICATIONS

| TYPE                         | KM-100HAS                               |
|------------------------------|---|
| Capacity                     | $\pm 5000 \times 10^{-6}$ strain        |
| Gauge length                 | 100mm                                   |
| Rated output (Approximately) | 2.5mV/V ( $5000 \times 10^{-6}$ strain) |
| Non-linearity                | 1%RO                                    |
| Apparent elastic modulus     | Approx. 40N/mm <sup>2</sup>             |
| Strain measurement           | 350Ω Full bridge                        |
| Temperature measurement      | 350Ω Quarter bridge 3-wire              |
| Allowable temperature range  | -20 ~ +180°C                            |
| Bridge excitation            | Recommended 1~2V, Allowable 10V         |