KM Strain Transducer ± 5000 × 10 $^{-6}$ strain

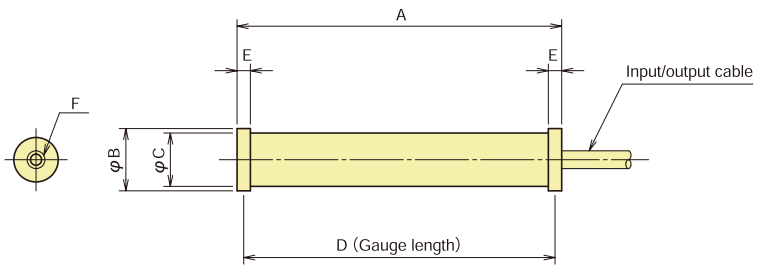


The KM series strain transducers are designed to measure strain in materials such as concrete, synthetic resin which undergo a transition from a compliant state to a hardened state. Their extremely low modulus (40N/mm^2 approx. except for KM-A) and waterproof construction are ideally suited for internal 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-A and KM-B. The built-in thermocouple sensor of the KM-AT/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.

■FEATURES

- ●Self-temperature compensated transducer having a linear thermal expansion coefficient similar to concrete
- ●Low elastic modulus enables inner strain measurement during the very early stages of curing
- ●Simultaneous measurement of strain and temperature except for **KM-30** ,**KM-50F**
- ●Surface strain measurement is also available onto retaining wall, strut, sheet pile, etc.

Protection ratings :
IP 67 equivalent for KM-30
IP 68 equivalent for KM-50F~ KM-200AT



Type	Dimensions (mm)						Weight
	A	B	C	D	E	F	(g)
KM-30	34	12	10	31	3	M3 Depth4	12
KM-50F	54	20	17	50	4	M3 Depth6	45
KM-100A KM-100B	104	20	17	100	4	M3 Depth6	75
KM-100HB	104	20	17	100	4	M3 Depth6	80
KM-200A	205	28	23	200	5	M5 Depth8	220
KM-100AT KM-100BT	104	20	17	100	4	M3 Depth6	75
KM-200AT	205	28	23	205	5	M5 Depth8	220

■SPECIFICATIONS

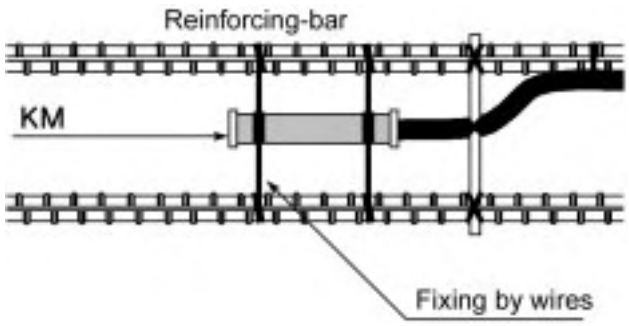
TYPE	KM-30	KM-50F	KM-100A	KM-100B	KM-100HB	KM-200A	KM-100AT	KM-100BT	KM-200AT
Capacity	± 5000× 10^{-6} strain								
Gauge length	31mm	50mm	100mm			200mm	100mm		200mm
Rated output (approxately)	2.5mV/V (5000× 10^{-6})	4mV/V (8000× 10^{-6})	2.5mV/V (5000× 10^{-6})			5mV/V (10000×10^{-6})	2.5mV/V (5000×10^{-6})		5mV/V (10000× 10^{-6})
Non-linearity	1%RO								
Apparent elastic modulus	40N/mm^2		1000N/mm^2	40N/mm^2		1000N/mm^2	1000N/mm^2	40N/mm^2	1000N/mm^2
Integral temperature	–		*1Strain gauges (350Ω Quarter gauge with 3-wire 50×10^{-6} strain/°C approx.				*2Thermocouple T		
Temperature range	–20 ~ +60°C	– 20 ~ +80°C			–20~+180°C	–20~+80°C			
Input/Output	120Ω Half bridge	350Ω Full bridge							

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

Input/output cable							
	KM-30	φ2.4mm	0.04mm^2	3-core shielded	Vinyl cable	2m	cable-end free
	KM-50F	φ6mm	0.35mm^2	4-core shielded	Chloroprene cable	2m	cable-end free
	KM-100A/-100B	φ9mm	0.3mm^2	5-core shielded	Chloroprene cable	2m	cable-end free
	KM-100HB	φ6mm	0.3mm^2	5-core shielded	Fluoroplastic cable	2m	cable-end free
	KM-200A	φ11.5mm	0.5mm^2	5-core shielded	Chloroprene cable	2m	cable-end free
	KM-100AT/-100BT	φ9mm	0.3mm^2	4-core shielded	T-thermocouple compound cable	2m	cable-end free
	KM-200AT	φ11.5mm	0.5mm^2	4-core shielded	T-thermocouple compound cable	2m	cable-end free

For use of inner strain measurement

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



An installation to reinfocing concrete structures inside

As shown in figure right, attach wires to KM body at 2 points, then position the KM to marked points in advance of reinforcing bar to fix it.

An installation with optional Non-stress meter KMF-51/KMF-52

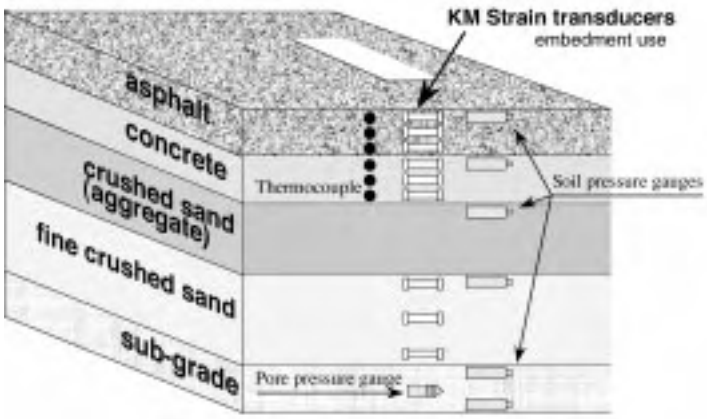
Optional Non-stress meter is available for measurement of the linear thermal expansion coefficient and dry shrinkage strain when a container with the transducer inside is embedded in concrete.

In case that the non-stress meter can not be applied, prepare the same model of concrete specimen to install the meter with the same condition of water inducement during unloaded. And linear thermal expansion coefficient and dry shrinkage strain of concrete can be measured.

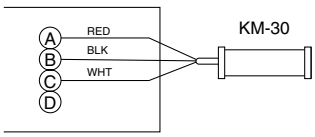
An installation to pavement

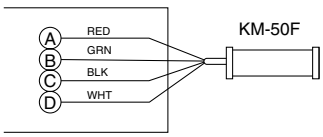
During pavement construction, driving tests, loading test, and long-period deterioration tests are conducted using various types of sensors to check the degree of fatigue in relation to the load bearing capcity. The KM measures inner stress produced in each layers under road.

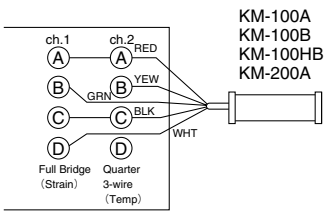
Measuring cables are separately positioned in advance. To protect sensors from mechanical damage, protective cover should be required, and such sensors are temporarily positioned. Then, they are fixed same time in each layer.



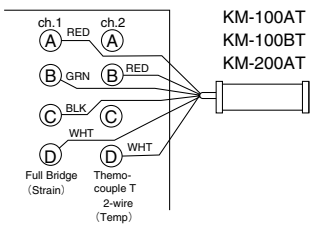
■Wiring







(Relative temperature)



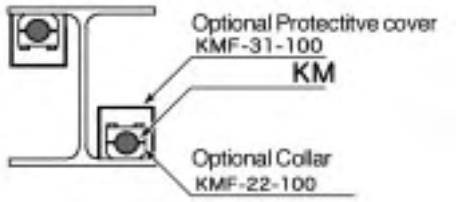
(Real temperature)

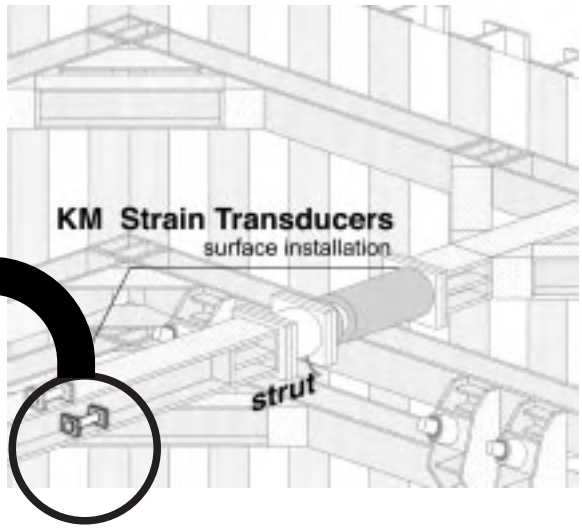
For use of surface strain measurement

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 surface of steel structure

A strain transducer is installed onto surface of steel using optional Collar KMF-22-100 with welding works. Optional Protective Cover KMF-31-100 protects the transducer from physical damage.

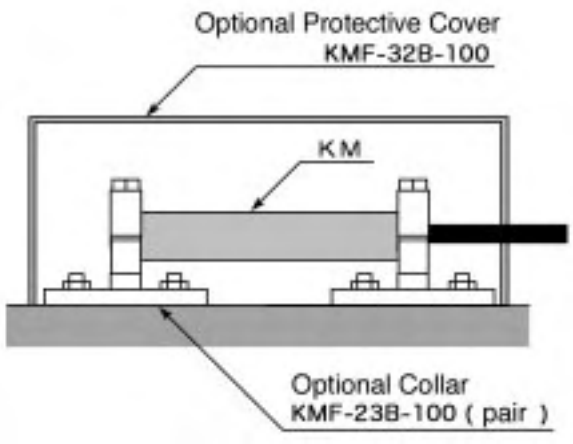




The KM model is combined with optional Collar KMF-22-100 to install onto surface of steel by welding.

An installation onto surface of concrete structure

A strain transducer is installed onto surface of concrete using optional Collar KMF-23B-100 with anchoring works. Optional Protective Cover KMF-32B-100 protects the transducer from physical damage.



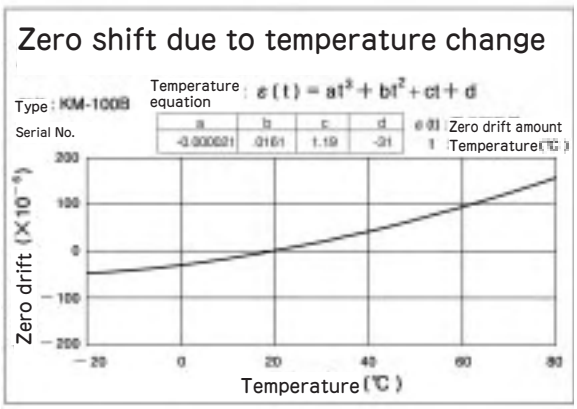
The KM model is combined with optional Collar KMF-23B-100 to install onto surface of concrete structure with anchor bolts.

■Temperature measurement by Strain Transducer

Temperature sensor-integrated strain transducer have 2 types. One is for relative temperature measurement with strain gauge 350Ω quarter bridge with 3-wire system, another is for real temperature measurement with thermocouple sensor. Using Data Logger, it makes more precise measurement possible. Comparing to an external temperature probe use, this model can save considerable installation and wiring works.

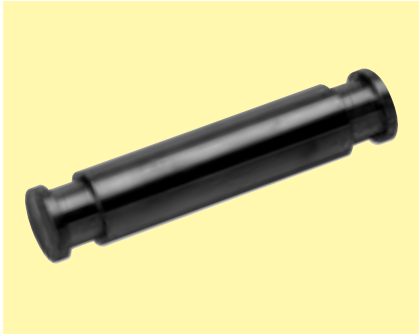
Strain gauge temperature sensor integral type
KM-100A/KM-100B/KM-100HB/KM-200A
Thermocouple sensor integral type
KM-100AT/KM-100BT/KM-200AT

Example of Temperature data (optional)



For more precise strain measurement with the transducer, correction of zero shift should be required. Optional temperature data on each supply is available on request.

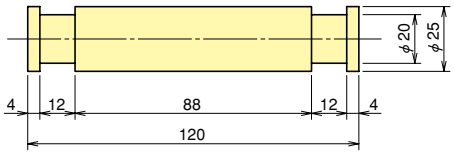
KM Optional accessory

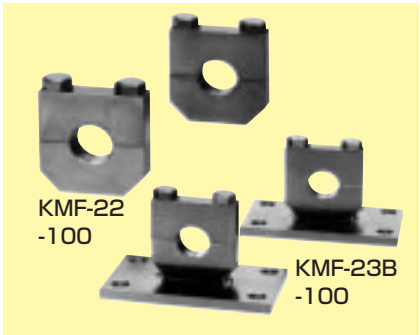


Spacer KMF-12-100

A spacer is needed whenever strain transducer is installed to measure surface strain. The KMF-12-100 spacer is used to accurately locate the gauge length needed to attach KMF-22 and KMF-23B Collars to a structure.

Applicable transducer : KM-100B
KM-100BT

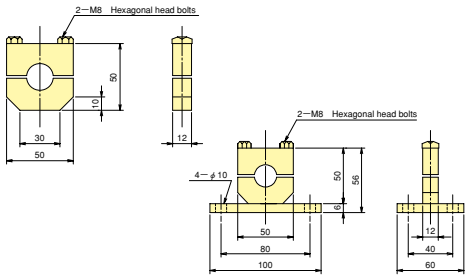


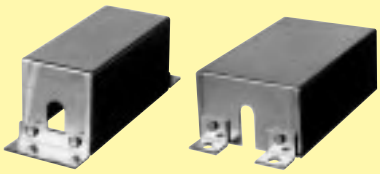


Collar KMF-22-100/KMF-23B-100

The KMF-22-100 Collars are used to mount a strain transducer to steel surface (2 per set), and KMF-23-100 Collars are used to mount the transducer to the surface of concrete (2 per set).

Applicable transducer : KM-100B
KM-100BT

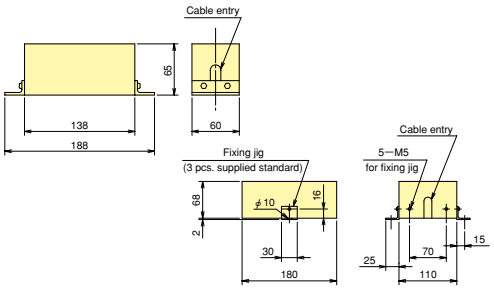




Protective Cover KMF-31-100/KMF-32B-100

The KMF-31-100 protective Cover is used to protect the transducer attached onto steel surface with a KMF-22 Collar, and the KMF-32B-100 is the same onto concrete surface with a KMF-23B Collar.

Applicable transducer : KM-100B
KM-100BT

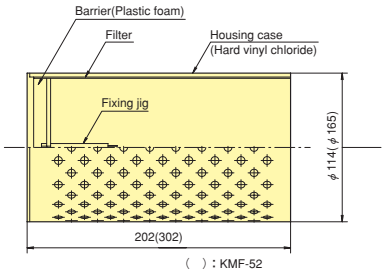


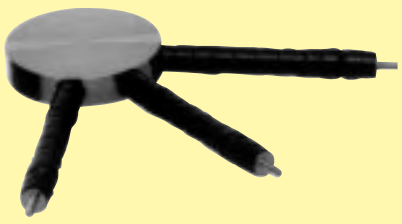


Non-stress meter KMF-51/KMF-52

KMF-51 and KMF-52 are used to measure the linear thermal expansion coefficient and dry shrinkage strain when a container with the transducer inside is embedded in concrete.

Type	Applicable transducer
KMF-51	KM-100A KM-100B KM-100AT KM-100BT
KMF-52	KM-200A KM-200AT





Spiders KMF-41/KMF-42

KMF-41 and KMF-42 Spiders are used to properly embed the transducer in a predetermined direction for measuring plane and three-dimensional stress in structure.

Type		Axes	Applicable transducer
2-dimensional	KMF-41-2	2	KM-50F KM-100A KM-100AT KM-100B KM-100BT
	KMF-41-3	3	
3-dimensional	KMF-42-3	3	
	KMF-42-4	4	
	KMF-42-5	5	
	KMF-42-6	6	

