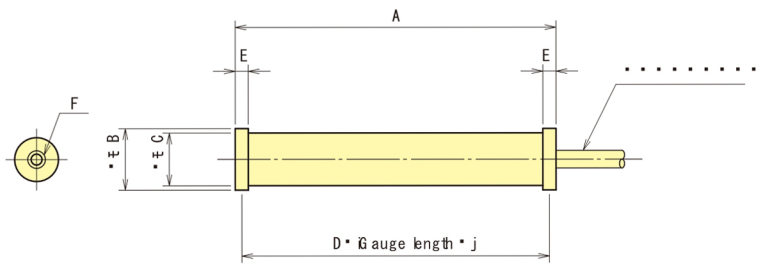
LN Strain Transducer ± 5000× 10^{-6} strain

The LN series strain transducers are designed to measure strain in materials such as concrete, synthetic resin which undergo a transition ▪ ▪ a compliant state ▪ a ▪ ▪ ▪ ▪ ▪ ▪ Their extremely ▪w modulus (40N/mm² approx. except for LN-A) and waterproof construction are ideally ▪ ▪ ▪ for ▪ ▪ ▪ ▪ ▪ ▪ ▪measurement ▪ ▪ ▪ the very early ▪ ▪ ▪ ▪ curing. ▪ ▪ are totally ▪ ▪ ▪ ▪ ▪ ▪ ▪ ▪ ▪ ▪ absorption, producing excellent stability for long-term ▪ ▪ ▪ ▪ ▪ ▪ ▪ ▪ ▪ ▪ ▪ ▪ ▪ ▪ ▪ ▪ ▪temperature measurement is also possible with the LN-A and LN-B. The built-in thermocouple sensor of the LN-AT /LN-BT enable actual temperature measurement in addition to strain measurement. Adding to the above embedment ▪ ▪ surface ▪ ▪ ▪measurement ▪ ▪ concrete, ▪ ▪ ▪ steel is also available with various optional fittings.

■FEATURES

- ●▪ ▪ ▪ ▪ ▪ ▪ ▪ ▪ ▪compensated ▪ ▪ ▪ ▪ ▪ ▪ ▪ ▪ ▪ a ▪ ▪ ▪ thermal expansion coefficient similar to concrete
- ●Low elastic modulus enables inner strain measurement ▪
- ●Simultaneous measurement of strain and temperature except for LN-41 , LN-61G
- ●Surface strain measurement is also available on to ▪

Protection ratings :
▪ ▪ ▪ ▪ ▪ ▪ ▪ ▪ ▪ ▪ ▪ ▪ ▪
IP 68 equivalent for LN-61G ▪ ▪ ▪ ▪



Type	Dimensions (mm)						Weight
	A	B	C	D	E	F	(g)
LN-41	34	12	10	31	3	M3 Depth4	12
LN-61G	54	20	17	50	4	M3 Depth6	45
LN-211B LN-211C	104	20	17	100	4	M3 Depth6	75
LN-211IC	104	20	17	100	4	M3 Depth6	80
LN-311B	205	28	23	200	5	M5 Depth8	220
LN-211BU LN-211CU	104	20	17	100	4	M3 Depth6	75
LN-311BU	205	28	23	205	5	M5 Depth8	220

■SPECIFICATIONS

TYPE	LN-41	LN-61G	LN-211B	LN-211C	LN-211IC	LN-311B	LN-211BU	LN-211CU	LN-311BU
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/mm²		1000N/mm²	40N/mm²		1000N/mm²	1000N/mm²	40N/mm²	1000N/mm²
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						

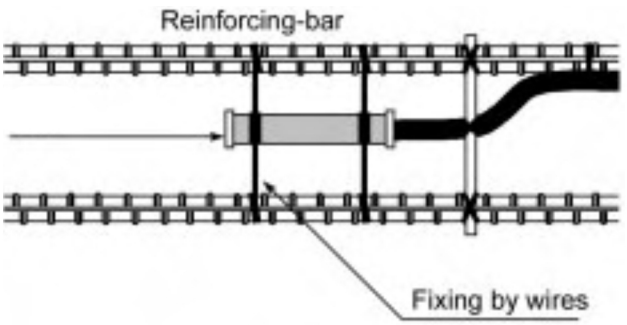
*1 Relative temperature measurement possible
*2 Real temperature measurement possible

Input/output cable	LN-41	φ2.4mm	0.04mm²	3-core shielded	Vinyl cable	2m cable-end free
	LN-61G	φ6mm	0.35mm²	4-core shielded	Chloroprene cable	2m cable-end free
	LN-211B/-211C	φ9mm	0.3mm²	5-core shielded	Chloroprene cable	2m cable-end free
	LN-211IC	φ6mm	0.3mm²	5-core shielded	Fluoroplastic cable	2m cable-end free
	LN-311B	φ11.5mm	0.5mm²	5-core shielded	Chloroprene cable	2m cable-end free
	LN-211BU/-211CU	φ9mm	0.3mm²	4-core shielded	T-thermocouple compound cable	2m cable-end free
	LN-311BU	φ11.5mm	0.5mm²	4-core shielded	T-thermocouple compound cable	2m cable-end free

* Specifications are subject to change without notice

For use of inner strain measurement

The LN 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 LN 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 LN body at 2 points, then position the LN to marked points in advance of reinforcing bar to fix it.

An installation with optional Non-stress meter LNG-62/LNG-63

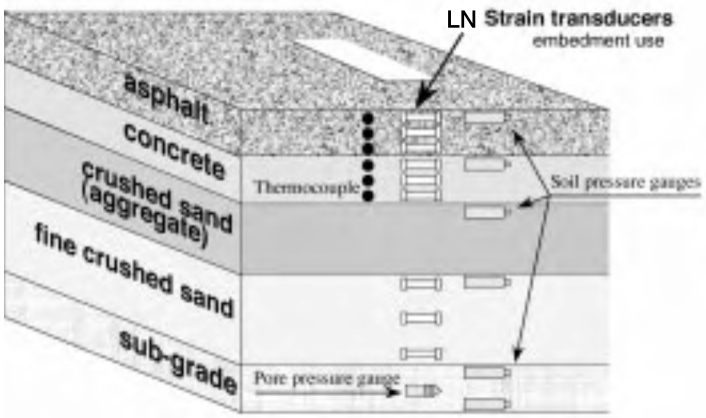
Optional Non-stress meter is available for measurement of the linear thermal expansion coefficient and dry shrinkage strain when a container with the transducer inside is embedded in concrete.

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.

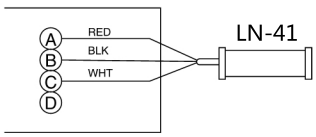
An installation to pavement

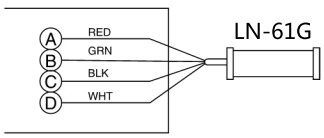
During pavement construction, driving tests, loading test, and long-period deterioration tests are conducted using various types of sensors to check the degree of fatigue in relation to the load bearing capcity. The LN measures inner stress produced in each layers under road.

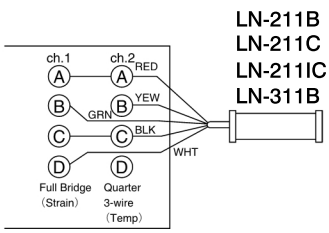
Measuring cables are separately positioned in advance. To protect sensors from mechanical damage, protective cover should be required, and such sensors are temporarily positioned. Then, they are fixed same time in each layer.



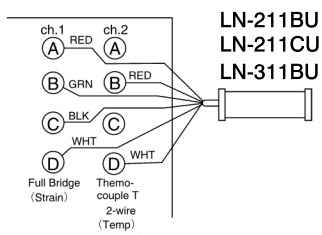
■Wiring







(Relative temperature)



(Real temperature)

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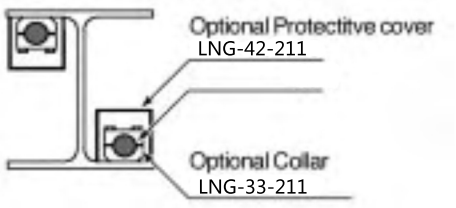
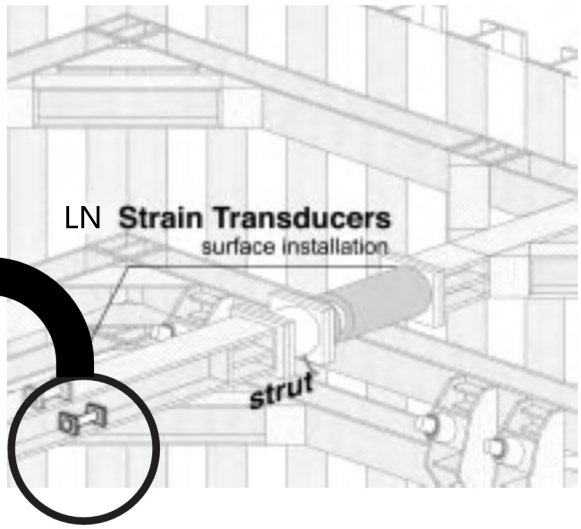
For use of surface strain measurement

Surface strain measurement onto steel and concrete structures is available with **LN-211C** or **LN-211CU**. (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 LNG-33-211 with welding works. Optional Protective Cover LNG-42-211 protects the transducer from physical damage.

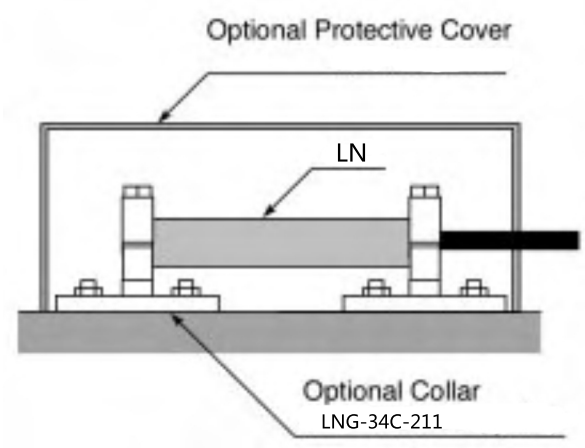




The LN model is combined with optional Collar LNG-33-211 to install onto surface of steel by welding.

An installation onto surface of concrete structure

A strain transducer is installed onto surface of concrete using optional Collar LNG-34C-211 with anchoring works. Optional Protective Cover LNG-43C-211 protects the transducer from physical damage.



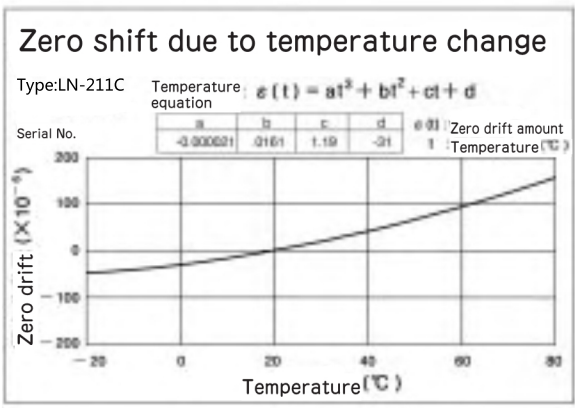
The LN model is combined with optional Collar LNG-34C-211 to install onto surface of concrete structure with anchor bolts.

■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
LN-211B/LN-211C/LN211IC/LN311B
Thermocouple sensor integral type
LN-211BU/LN-211CU/LN311BU

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.

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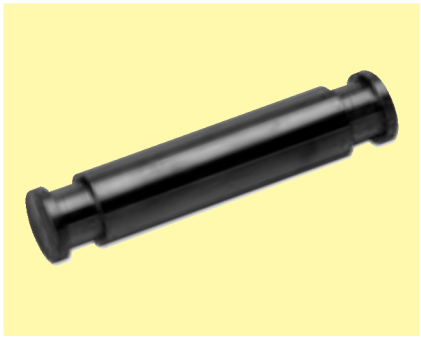
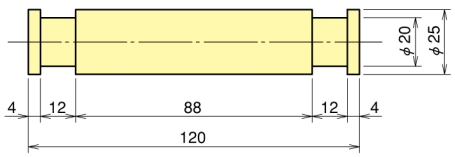
LN Optional accessory

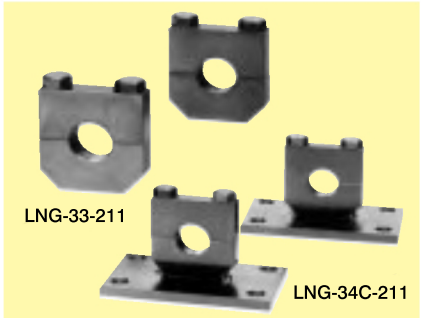


Spacer LNG-23-211

A spacer is needed whenever strain transducer is installed to measure surface strain. The **LNG-23-211** spacer is used to accurately locate the gauge length needed to attach **LNG-33** and **LNG-34C** Collars to a structure.

Applicable transducer : **LN-211C**
LN-211CU

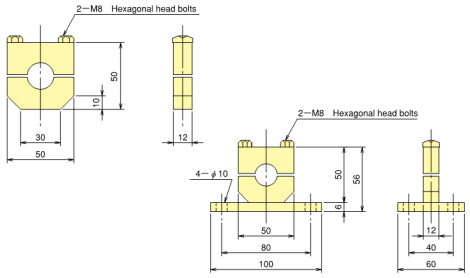


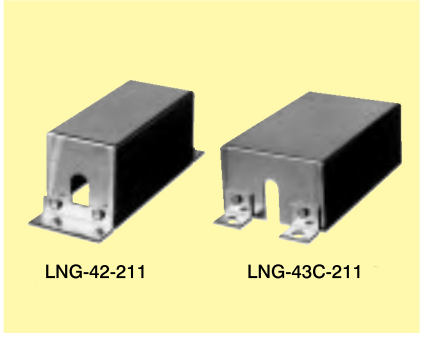


Collar LNG-33-211/LNG-34C-211

The **LNG-33-211** Collars are used to mount a strain transducer to steel surface (2 per set), and **LNG-34-211** Collars are used to mount the transducer to the surface of concrete (2 per set).

Applicable transducer : **LN-211C**
LN-211CU

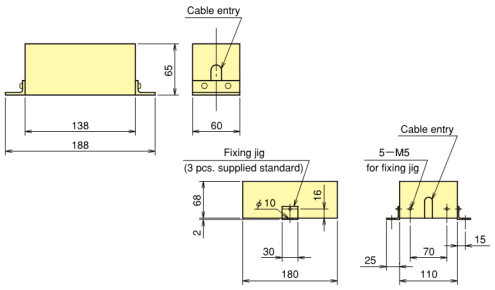


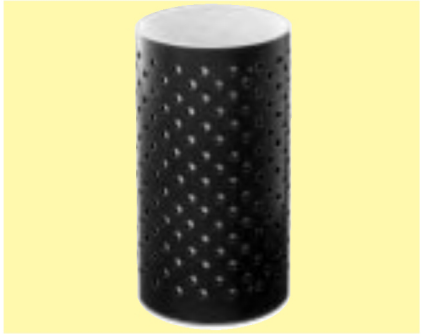


Protective Cover LNG-42-211/LNG-43C-211

The **LNG-42-211** protective Cover is used to protect the transducer attached onto steel surface with a **LNG-33** Collar, and the **LNG-43C-211** is the same onto concrete surface with a **LNG-34C** Collar.

Applicable transducer : **LN-211C**
LN-211CU

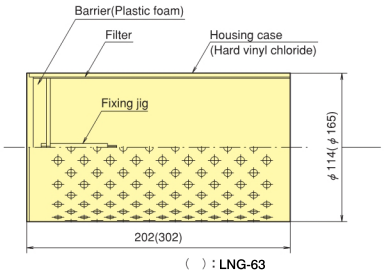


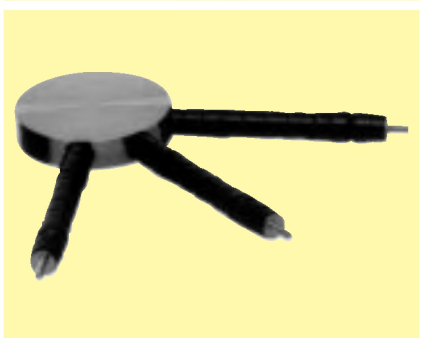


Non-stress meter LNG-62/LNG-63

LNG-62 and **LNG-63** 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
LNG-62	LN-211B LN-211C LN-211BU LN-211CU
LNG-63	LN-311B LN-311BU

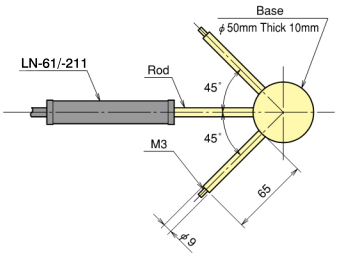




Spiders LNG-52/LNG-53

LNG-52 and **LNG-53** 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	LNG-52-2	2	LN-61G LN-211B LN-211BU LN-211C LN-211CU
	LNG-52-3	3	
3-dimensional	LNG-53-3	3	
	LNG-53-4	4	
	LNG-53-5	5	
	LNG-53-6	6	



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