Rebar Strainmeters and "Sister Bars"

Applications

Rebar Strainmeters are commonly used for measuring strains in…

- **Concrete piles & caissons**
- **Slurry walls**
- **Cast-in-place concrete piles**
- **Concrete foundation slabs and footings**
- **Osterberg pile tests**
- **All concrete structures**

Close-up of Model 4911 shown as installed in concrete pile reinforcing cage.

Model 4911A Rebar Strainmeter (front) and the Model 4911 "Sister Bar" (rear).

Operating Principle

Rebar Strainmeters and "Sister Bars" are designed to be embedded in concrete for the purpose of measuring concrete strains due to imposed loads. The Rebar Strainmeter is designed to be welded into, and become an integral part of, the existing rebar cage, while the "Sister Bar" is installed by tying it alongside an existing length of rebar in the rebar cage.

The rebar extensions on either side of the central strain-gaged area are long enough to ensure adequate contact with the surrounding concrete so that the measured strains inside the steel are equal to the strains in the surrounding concrete.

In use, Rebar Strainmeters and "Sister Bars" are usually installed in pairs on either side of the neutral axis of the structural member being investigated. This is done so that bending moments may be analyzed in addition to axial loads.

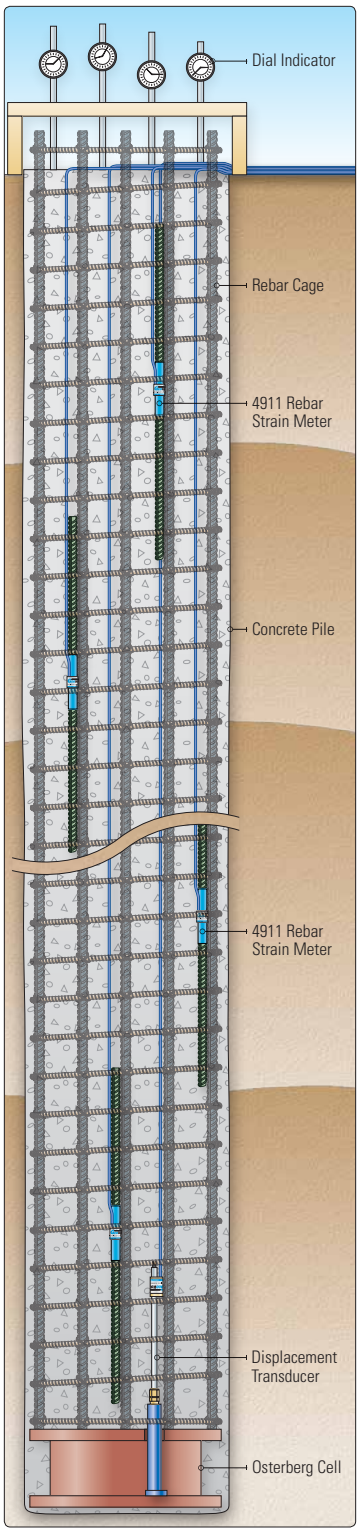
A built-in thermistor enables the measurement of temperatures and aids in the evaluation of thermally induced strains.

Advantages and Limitations

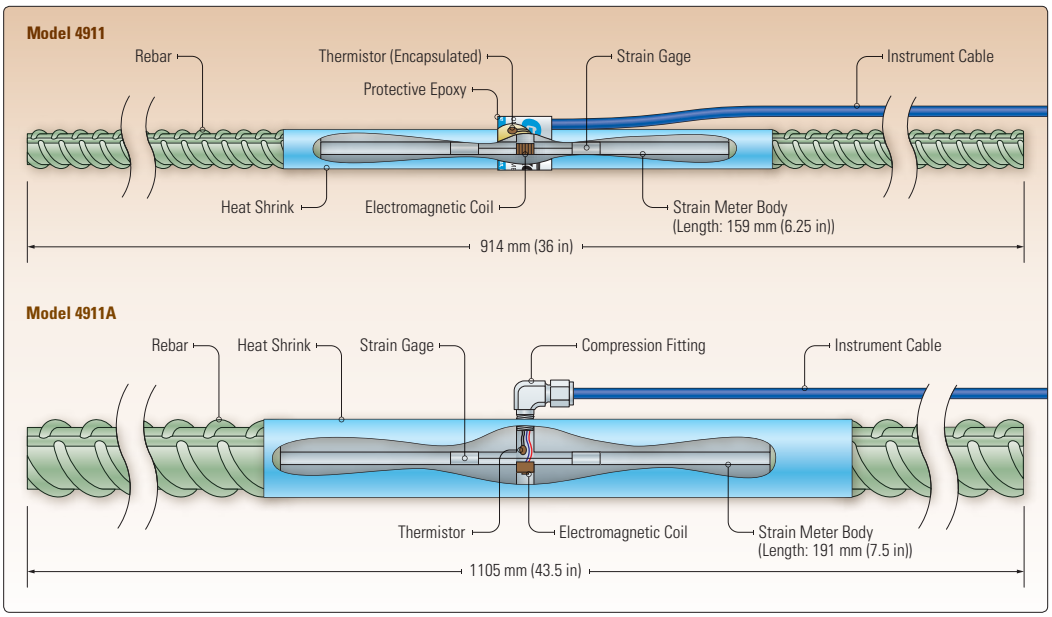
The main advantage of the Rebar Strainmeters and "Sister Bars" lies in their ruggedness. They are fully waterproof and virtually indestructible so that, if the cable is adequately protected, they are safe from damage during the concrete placement.

Each Rebar Strainmeter and "Sister Bar" is individually calibrated and tested for weld strength. The Rebar Strainmeter requires the services of an experienced welder who can guarantee full-strength welds, whereas the "Sister Bar" is very easy to install.

The single vibrating wire strain sensor, located along the axis of the strainmeter, is not affected by the bending of the strainmeter itself. It also has the advantage of all vibrating wire sensors, namely: long-term stability, it can be used with long cables and it's relatively unaffected by moisture intrusion into the cables.



● *Installation of the Model 4911 in an Osterberg Cell pile test. (For more information regarding Osterberg Cell pile testing, please contact Loadtest, Inc. — www.loadtest.com).*



● *Illustration of the Model 4911 "Sister Bar" and Model 4911A Rebar Strainmeters and their various components.*

System Components

A vibrating wire strain gage sensor is fixed axially inside a short, central length of round steel bar. This central section is de-bonded from the surrounding concrete by means of a plastic coating, and is extended by welding a length of rebar to each end. The Model 4911A Rebar Strainmeter is available in various sizes to match the size of the rebar cage into which it is to be welded, whereas the Model 4911 "Sister Bar" comes in one size only (#4 rebar, at approximately 12 mm in diameter).

A thermistor to measure temperature changes can be included in the 4911 and 4911A sensors.

Readouts and Cables

The 4911 Series Rebar Strainmeters are read using the Model GK-404 or GK-405 Readouts. Alternatively, the LC-2 Series or 8600 Series Dataloggers can be used.

The 4911 Series Rebar Strainmeters use the Model 02-250V6 4 pair, 22 AWG cable.

Technical Specifications

	4911	4911A
Standard Range	3000 με	3000 με
Resolution	0.4 με	0.4 με
Accuracy[1]	±0.25% F.S.	±0.25% F.S.
Nonlinearity	< 0.5% F.S.	< 0.5% F.S.
Temperature Range[2]	–20°C to +80°C	–20°C to +80°C
Rebar Sizes	#4 (Sister Bar)	#6, 7, 8, 9, 10, 11, 12
Length	914 mm	1105 mm

[1]Accuracy established under laboratory conditions.
[2]Other ranges available on request.

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