# INSTRUCTION MANUAL

Arc Weldable strain meter
Model SME-2020

**SENSORS & MEASUREMENTS ENTERPRISES**
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# Introduction

## Applications

VW Arc-Weldable Strain Gauges are used to measure strain in steel. Typical applications include:

- Monitoring Structural members of building and bridges during and after construction.
- Determining changes in load on wall anchors and other post tensioned support systems.
- Monitoring load in struts used to brace excavations.
- Measuring strain in tunnel linings and supports.
- Monitoring areas of concentrated stress in pipes.
- Monitoring distribution of load in pile tests.

## Operation

A steel wire is held in tension between two mounting blocks that are welded to the surface of the measured member. Strain in the member is transmitted through the mounting blocks to the wire inside. An increase in tensile strain increases tension in the wire A decrease in tension strain decreases tension in the wire.

The tension in the wire is measured by plucking the wire with electromagnetic coils and measuring the frequency of the resulting vibration. Strain in the wire is calculated by squaring the frequency reading and multiplying by a gauge factor and a batch calibration factor.

# On of the Strain Gauge

## Testing

Test each sensor before installing it. Use a readout and an ohm meter to conduct these tests.

- Connect a readout (see manual readout instructions.) Pull, but do not twist, gently on the ends of the gauge. The Hz reading should be seen to increase as the ends are pulled and decreases as they are released.
- The RTD reading should be near ambient temperature.
- Resistance between the orange/white and orange leads should be about 300 ohms.
- Resistance between blue/white and blue leads should be about 2k ohms.

## General Considerations

Sensor Handling: Do not twist or pull hard on the ends of the sensor. This may cause non-repairable damage to the sensor.

Sensor Identification : Mark cables before installation so that sensors can be identified after installation.

Cable Strain Relief: Position the strain relief for signal cables.

## Strain Gauge Considerations

Orientation Position the strain gauge so that its long axis is parallel with the axis of loading.

Bending: The strain gauge should be installed along the neutral axis of the structural member when possible. Bending will increase strain on one side of the neutral axis and decrease strain on the opposite side. Axial strain can be isolated from bending strain by installing gauges on opposite sides of the member and averaging the change in strain reported by both gauges.

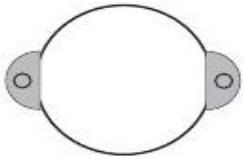
Irregularities: A void installing strain gauges near irregularities in the member or near the ends of the member since readings from these locations may not adequately represent strain in the other portions of the member.

Sunlight: Try to shield gauges from direct sunlight. If the gauges from direct sunlight. If the gauge is heated faster than the steel beneath it, it may report changes in strain that are not representative of the steel.

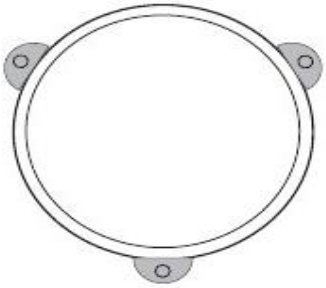
Reuse: Strain gauges can be reused. Keep in mind that set screws bite into the ends of the gauge. When the gauge is reinstalled, it must be rotated slightly to avoid slippage.

## Typical Placement

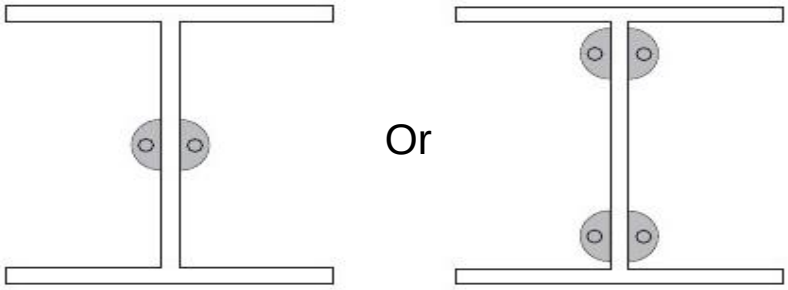
Threadbars install gauges on opposite sides of the bar.



Pipe Piles or Struts Install gauges 120 apart.

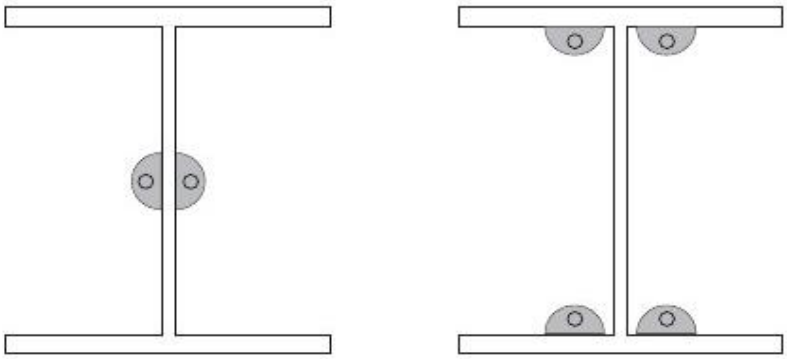


Driven H- Piles Install gauges in the middle of the web. Add protective covering.

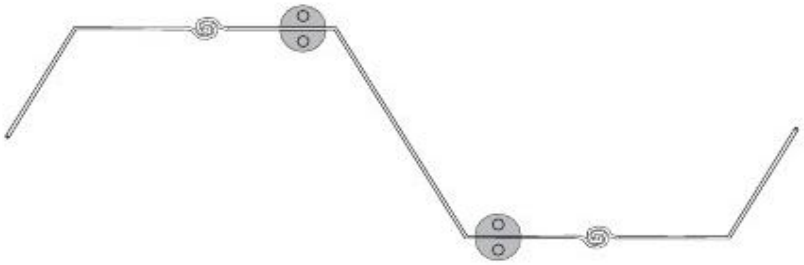


## Typical Placement Continued

I- Beams Install gauges in the middle of the web, or if installed on the flanges, as near to the web as possible.



Sheet Piles Install gauge on both sides of the pile, awqzy from the clutches.

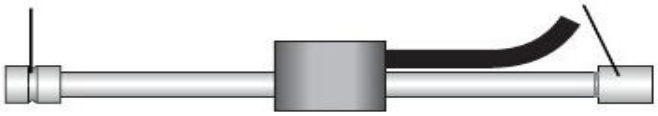


## Detailed Instructions

These instruction assume that locations for the strain gauges have already been specified.

### Components

The various components of the strain gauge are identified below.



Mounting blocks are identical.Thre are two set screws on each block.

Spacer bar hold mounting blocks in correct position during welding.

Prepare the Surface

1. Clean the surface with a wire brush or sander to remove all rust and dirt.
2. Use solvent to remove oil and residue.

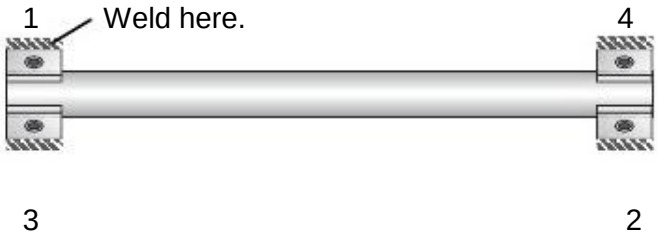
Prepare Mounting Blocks

It is convenient to have additional spacer bars if you have more than one strain gauge to install.

1. Fit mounting blocks onto spacer bar.
2. Check that ends of spacer bar are flush with outside surface of mounting blocks. Tighten set screws.

Weld Mounting Blocks

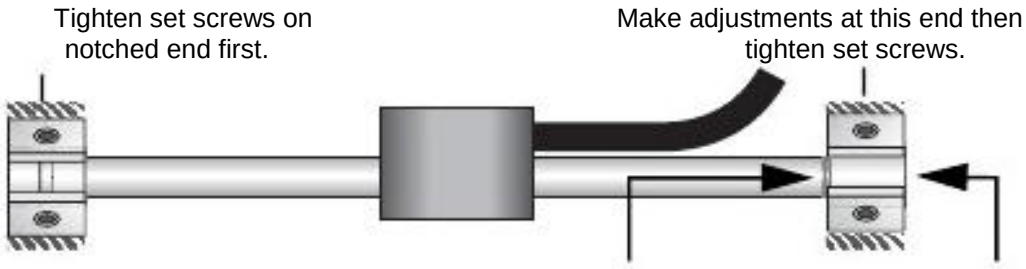
Heat distorts the measured surface, So try to use the lowest power setting on the arc-welder.




1. Hold mounting blocks against the surface, by pressing firmly on the spacer bar.
2. Weld mounting blocks to the surface. Follow the weld sequence shown above. Do not weld in other areas.

3. Allow weld to cool, then remove spacer bar. If bolt-on-protective covers are specified, install studs at least six inches away from the mounting blocks.

Set the Strain Gauge  This step requires a readout.




1. Slide the strain gauge into the mounting blocks.
2. Tighten set screws at the notched-end of the gauge. Do not tighten set screws at the adjustment-end of the gauge.
3. Tighten the set screw. The readings may change, but it is not necessary to be precise.

**Check the working of the sensors as follows:**

- The coil resistance measured by the digital Multimeter should lie between 110-130 ohm.
- Connect the sensor to the readout unit model 2460-P.The initial offset reading lie between 700-900 Hz. For both the models.
- This initial reading on the indicator should be stable. A crude but a simple and very effective method of checking whether the sensor is responding to changes in strain is as follows:
- Press the two ends of the strain meter gently between the four fingers and verify that the strain reading on the indicator increases. Pulling the ends gently will decrease the strain reading.
- This change in reading ensures that the deformation produced by straining the strain meter is transmitted to the vibrating wire sensing element.

CAUTION:  The strain meter is a delicate and sensitive instrument. It should be

handled with care.twisting it or applying too much force on it may result in a zero shift or even permanently damaging it.

# Taking Readings

**Observation Sheet:**

| Sl. | Date | Sensor no. Group A | Sensor no. Group B | Sensor no. Group C | Sensor no. Group B | Sensor no. Group D | Sensor no. Group E | Sensor no. NSSM |
|---|---|---|---|---|---|---|---|---|
| | | Location | Location | Location | Location | Location | Location | Location |
| | | E.L | E.L | E.L | E.L | E.L | E.L | E.L |
| | | μ strains | μ strains | μ strains | μ strains | μ strains | μ strains | μ strains |
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**Frequency of observation**

The strain meter reading should be taken before installation and after embedment in the concrete. 1st reading of the strain should be taken 24 hours after setting of the concrete. Even though SME Strain meter is temperature compensated, it is recommended to note the date, time and temperature while taking the initial readings of the strain meters. Subsequent readings of strain be taken every day for the first three days, on alternate days for the next three weeks and at appropriate intervals thereafter.

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