VW Embedment Jointmeter

52632244

This equipment should be installed, maintained, and operated by technically qualified personnel. Any errors or omissions in data, or the interpretation of data, are not the responsibility of Slope Indicator Company. The information herein is subject to change without notification.

SLOPE INDICATOR
12123 Harbour Reach Drive
Mukilteo, Washington, USA, 98275
Tel: 425-493-6200 Fax: 425-493-6250
E-mail: solutions@slope.com
Website: www.slopeindicator.com

Contents

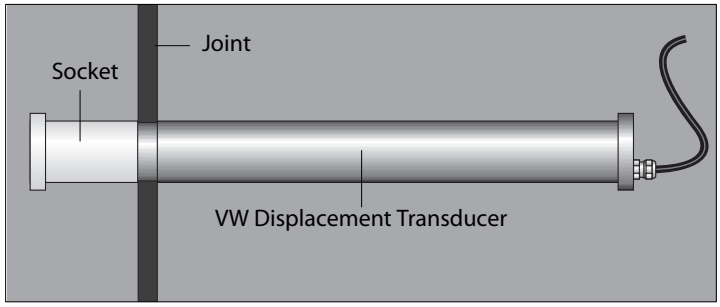
Introduction

About Embedment Jointmeters

The VW embedment jointmeter is used to monitor movement at joints in mass concrete structures.

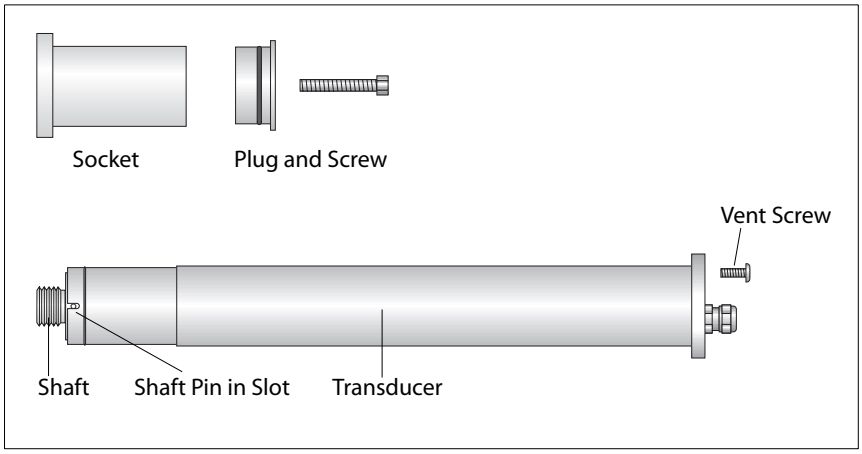
The jointmeter has two main components: a socket and a waterproof VW displacement transducer. The socket is embedded in the first pour of concrete. The transducer is screwed into the socket and embedded in the second pour of concrete. The jointmeter now spans the joint between the two adjacent pours.

Opening and closing of the joint pulls or pushes the shaft of the transducer, causing a change in reading. The initial reading is used as a datum. Subsequent readings are compared to the datum to calculate the magnitude and rate of movement at the joint.



Components

The drawing below shows components of the VW embedment jointmeter as of January, 2004.



Handling

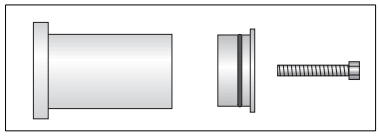
- Do not hold instrument by its cable.
- Do not pull shaft outside its range.
- Do not twist shaft. Before screwing shaft into socket, check that shaft pins are positioned in slots.

Installation

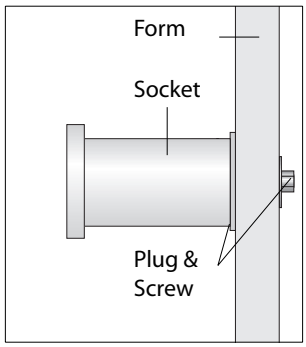
Installing the Socket

The socket is installed in the first pour of concrete.

1. Remove screw and press plug into socket.



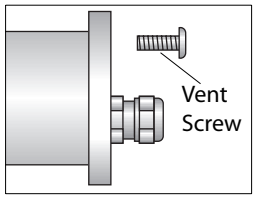
2. Position socket on form. Drawing shows socket held to form by plug and screw.
3. Add additional support or protection to ensure that the socket does not move during concreting. For example, weld or tie socket to nearby reinforcing bars.



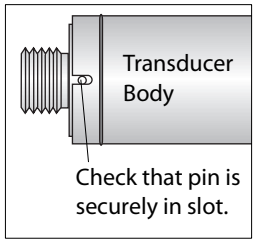
Installing the Transducer

The transducer is embedded in the adjacent pour of concrete.

1. Remove plug from socket after form has been stripped away. Clean socket. Apply grease to inside of socket.
2. Plan cable handling. Five clockwise turns of transducer body are required to screw the transducer shaft into socket. To prevent damage to cable, you must reverse twist cable or rotate cable coil as transducer is screwed in.
3. Remove vent screw from transducer body. Keep screw.

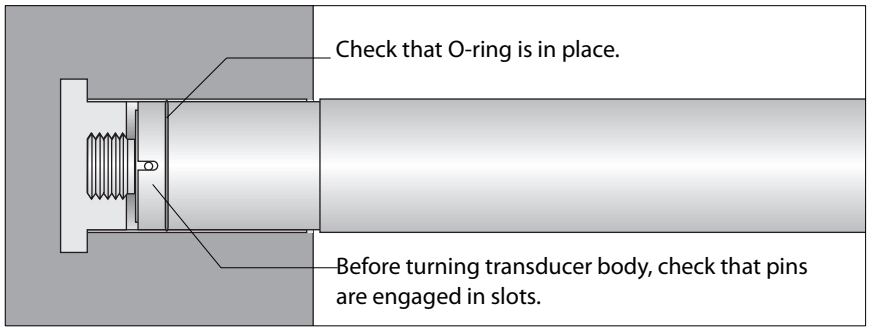


4. Check that pin is securely in slot, as shown in drawing. Pin prevents shaft from twisting during installation.



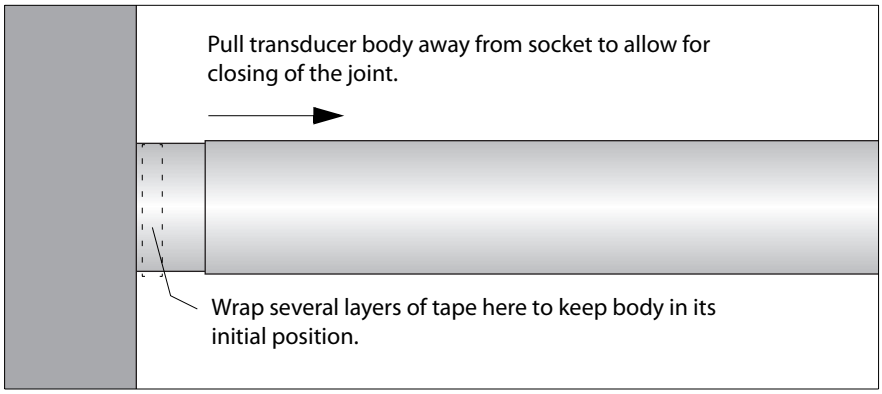
Installing Transducer continued

5. Check that O-ring is in place on transducer body. Push transducer into socket. Turn transducer about five clockwise turns to screw transducer shaft into socket. Do not over-tighten.

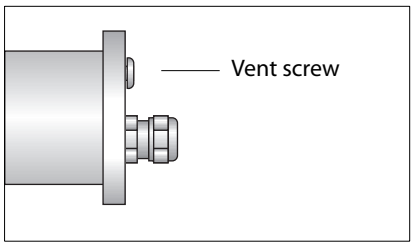


6. Secure transducer body and cable for concreting. Tie body to nearby rebar and add protection if possible. Find a safe route for signal cable Devise protection for cable where necessary. Route cables away from sources of electrical noise, such as motors or AC power lines.

7. Set initial position of transducer. Reserve part of range for closing of the joint. Nominal range of transducer is 50 mm. To reserve about 25% of range for closing of joint, pull transducer body out about 12 or 13 mm. Wrap electrical tap around transducer body, as shown in the drawing below, to hold its position.



8. Replace vent screw.



9. Connect readout and take reading to verify that jointmeter is working. Note serial number of jointmeter, too.

Taking Readings

Introduction

These instructions tell how to take readings with Slope Indicator's portable readouts. Instructions for reading VW sensors with a Campbell Scientific CR10 can be found at www.slopeindicator.com. Go to Support - Tech Notes and click on the link: "CR10-VW Sensors."

Reading with the VW Data Recorder

1. Connect signal cable to the Data Recorder.

Binding Posts	Wire Colors	
VW	Orange	Red
VW	White & Orange	Black
TEMP	Blue	White
TEMP	White & Blue	Green
SHIELD	Shield	Shield

2. Choose Hz + Thermistor.
3. Select the 1400-3500 Hz range.
4. The recorder shows a VW reading in Hz and a temperature reading in degrees C.

Reading with the VWP Indicator

1. Connect signal cable to the VWP Indicator's jumper cable (part number 52611950) as shown in the table below.

Clips	Wire Colors		Function
Red	Orange	Red	VW
Red	White & Orange	Black	VW

2. Select the 1.4-3.5 kHz range with the Sweep key.
3. Select Hz with the Data key. The VWP Indicator cannot read thermistors.

Reading with the DataMate MP

The DataMate MP allows you to choose engineering units for your readings. See the DataMate MP manual for directions on programming. Here we tell how to use the DataMate MP's manual mode.

Manual Mode

1. Connect the DataMate to the sensor (see connection table below).
2. Switch on. Press ✔ (Manual Mode).
3. Scroll through the list to find "Vibrating Wire Hz."
4. Press ↵ to excite the sensor and display a reading of the VW element. Ignore the temperature reading (which is preset for RTDs).
5. To see a reading of the thermistor, scroll through the list to find "Thermistor," press ↵ to see the temperature reading in degrees C.

Connections

The DataMate jumper cable has a universal connector that connects directly to a universal terminal box or to signal cables that are terminated with a universal connector. A bare-wire adapter (BWA) is also supplied with the DataMate. It allows connection to wires of the signal cable as shown below:

Terminals on BWA or Terminal Box	Wire Colors		Function
5	Blue	White	Temp
6	White & Orange	Black	VW
7	White & Blue	Green	Temp
8	Orange	Red	VW
10	Shield	Shield	Shield

Data Reduction

Step 1 Find the correct calibration record for your sensor

1. Use the sensor serial number to match the sensor with its calibration record. This is important because each sensor has a unique calibration.

2. Find the A, B, and C coefficients for this sensor. The calibration records shows a table of test values. Below the test values is an equation. The equation shows how to convert Hz readings to millimeters of displacement. Values for the A, B, and C coefficients are listed to the right of the equation. These values are different for each sensor.

Step 2 Convert Hz readings to millimeters or inches

1. Use the A, B, and C coefficients listed on the sensor calibration record.

2. Apply the coefficients as follows:

   Displacement in mm = $AF^2 + BF + C$
   where F is the sensor reading in Hz, and
   A, B, and C are values listed on the sensor calibration record

3. The resulting displacement value is the position of the sensor shaft. A fully-extended shaft provides a displacement value of 60mm or 100mm, depending on the model.

4. To convert the displacement value to inches, divide by 25.4.

Step 3 Calculate changes

Subtract the initial value from the current value. This provides positive numbers as the crack opens and negative values as the crack closes.

About Temperature Readings

We recommend that you record temperature the temperature when your read the jointmeter because temperature data can help you understand movement due to temperature changes. However, it is not necessary or useful to correct for temperature effects on the transducer.

Testing and Troubleshooting

Test VW Sensor

1. Connect readout as explained in "Taking Readings".
2. Take reading with shaft in closed position.
3. Value of reading should be close to "Function Test Reading" listed on calibration record. Note that reading should be taken when the sensor is at a temperature similar to the ambient temperature listed on the calibration record.

Test Cable

This test requires a multimeter. Check the following:

- Resistance between VW leads should be about 290 to 300 ohms.
- Resistance between Temp leads should be about 2000 ohms with an RTD or 3000 ohms with a thermistor.
- Resistance between any lead and shield or any lead and body (use the threads on the shaft) should be infinity (open circuit).

Function	Wire Colors	
VW	Orange	Red
VW	White & Orange	Black
TEMP	Blue	White
TEMP	White & Blue	Green
SHIELD	Shield	Shield

Unstable Readings

- Are you using an appropriate sweep frequency?
- Is the transducer shaft out of range?
- Is there a source of electrical noise nearby? Check that the shield drain wire is connected to ground.

No Reading

- Is the cable cut or crushed? Check with an ohmmeter. See cable information above.
- Check resistance between VW wires. Very high resistance, i.e. greater than 1 mega-ohm or infinite, indicates that a wire has been cut.Very low resistance, lower than 100 ohms, indicates that there is a short in the cable.