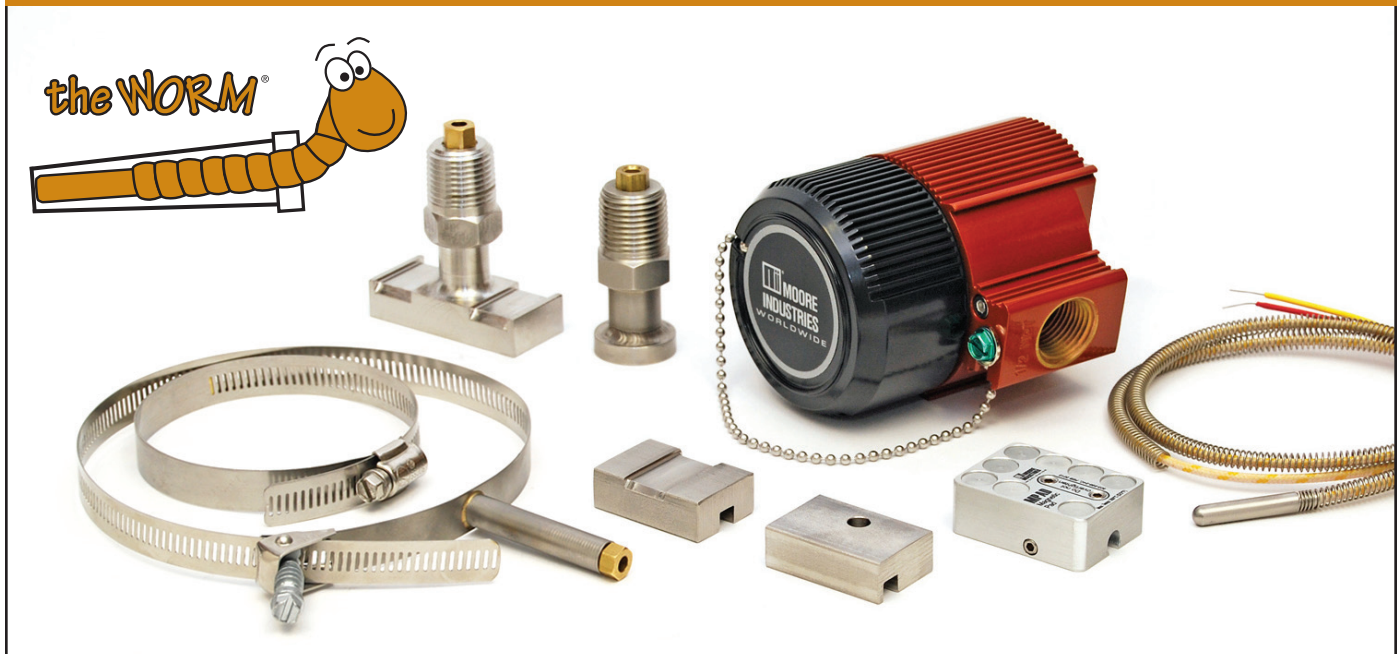


November 2015



The Versatile WORM mounts directly to the surfaces of tanks, pipes, motors, compressors, reactors or anywhere else a surface temperature measurement is needed.

Featuring Moore Industries' innovative WORM Flexible Sensor, these versatile temperature assemblies mount directly to tanks, pipes, motors, compressors, valves, reactors, wells or anywhere else a temperature measurement is needed, and eliminates errors caused by influences external to the process. Precise engineering and solid, sturdy construction allow these assemblies to endure the harshest plant conditions and field environments.

The Flexible WORM

Delivering simple installation and removal, our versatile, spring-loaded, flexible sensor trims-to-length providing quick and easy installation in a wide range of temperature measurement applications. With other sensors, such as straight sensors, you have to remove the connection head, and sometimes assembly components, to install the sensor. The WORM slides right through the connection head port, and into the assembly, without removing any assembly components. The WORM bends to accommodate awkward mounting positions and locations. Because the solid sheath portion of the WORM is only 1-1/2" long, it is totally embedded in the thermowell and ensures that no outside influences are affecting the temperature measurement.

Note: *The instructions on the following pages apply to retrofitting assemblies in the field. If you buy the completed assemblies all assembly is done at the factory.*

Features

- **Multiple mounting possibilities.** Clamp, bolt or weld in place or use our magnetic MPAD anywhere a skin (surface) temperature measurement is needed.
- **Universal temperature transmitter options.** Ready-to-install assemblies come with a choice of our universal PC-Programmable, Smart HART®, and Fieldbus Temperature Transmitters (assemblies without transmitters are also available).
- **High accuracy measurements.** These temperature assemblies keep the spring-loaded sensor in place to maintain good thermoconductance.
- **Solid, sturdy construction.** High-impact connection heads (sensors without connection heads also available) combined with stainless steel mounting accessories allow our temperature assemblies to withstand the most rigid plant environment.
- **WORM Sensor trims to desired length.** There's no need to stock an expensive array of different sensor lengths, one size fits most every thermowell application including surface mounting.
- **Popular RTD and thermocouples.** Available standard sensor types include 100 and 1000 ohm, platinum RTDs; plus J, K, T and E-type thermocouples (others are available on request).
- **Faster response time.** The WORM delivers step response times 13% faster than solid sheath sensors.

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Ready-to-Install WORM Surface Mount Temperature Assemblies

PAD Mount (-PAD), MPAD (-MPAD) and Clamp Mount (-CLAMP)

The PAD completely surrounds the WORM, shielding it from external interference, while providing maximum heat transfer to the sensor. Weld, bolt, magnetically attach or clamp the appropriate PAD into place, securing the sensor directly against the surface in which the temperature measurement is needed (12" band is included when you order the CLAMP option).

Installation

1. Clear any insulation or paint and clean area of surface in which contact with the sensor will occur.

2. Affix the Mounting:

- A. **When welding a PAD**, position the plate against the surface to which it will be welded. Allowing enough room for the sensor to slide under the PAD, lay a steady, even weld along the outside perimeter at the base, being careful not to weld across the sensor insertion slot.
- B. **When bolting a PAD**, position PAD and insert machine screw through provided hole and tighten so that the mounting plate rests securely against the surface to be measured. **MPAD:** When you are using an MPAD, you simply position the magnetic pad where you want it in a receptive surface.
- C. **When attaching a Clamp PAD**, open the clamp band and wrap it around the prepped section of the pipe. Close and tighten the clamp band, causing the mounting plate to rest firmly against the pipe surface.

3. Slide the WORM sensor tip under the PAD's insertion slot, positioning it firmly between skin surface and mounting plate. With an MPAD, tighten the set screw on the sensor to secure it.

4. Distribute sensor leads up to the mounted connection head and thread the leads through the conduit entry port.

5. Connect each sensor wire to the appropriate temperature transmitter terminal and re-insulate as necessary.

Figure 1. Dimensions for PAD option.

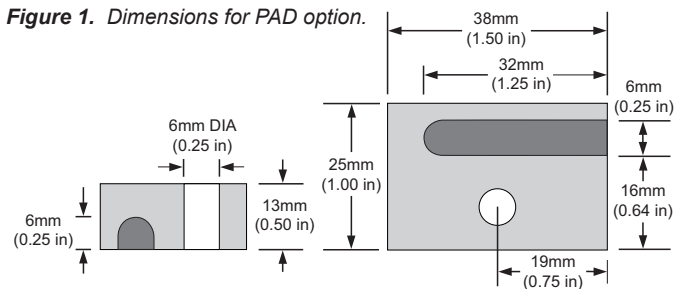


Figure 2. Dimensions for MPAD option.

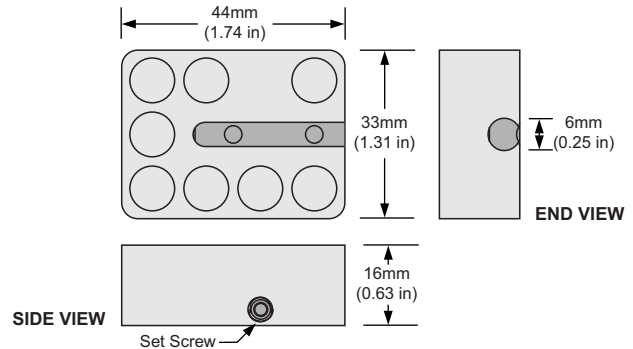


Figure 3. Dimensions for CLAMP option mounting pad.

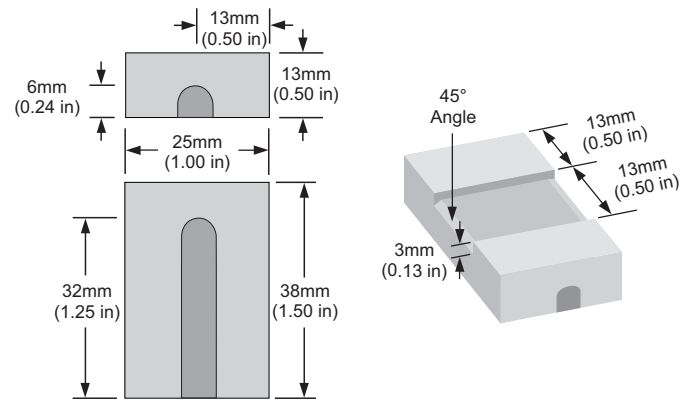
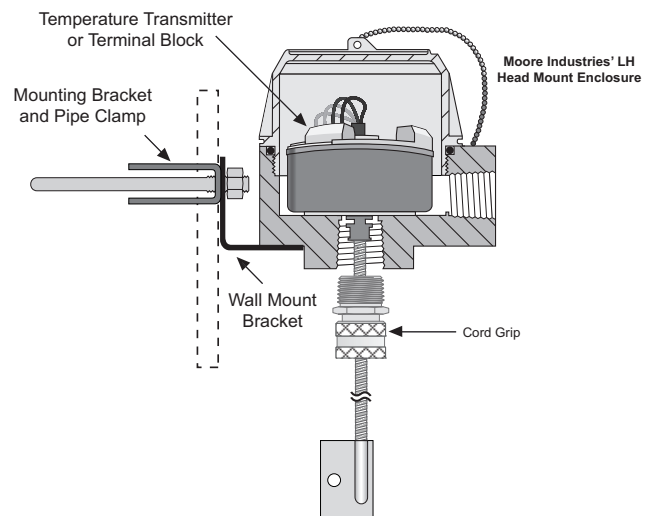


Figure 4. PAD option with remote mount connection head assembly.



PAD, MPAD, Clamp PAD Assemblies with Flex Armor over Lead Wires Model Number Examples:

TRX/CL2/D25/S316/WSPT14 -FLEXxx -BOOT -GRIP -PAD [LH2NS]
 TRX/CL2/D25/S316/WSPT14 -FLEXxx -BOOT -GRIP -MPAD [LH2NS]
 TRX/CL2/D25/S316/WSPT14 -FLEXxx -BOOT -GRIP -CLAMP [LH2NS]

BAYONET Pipe Mount (-BAY)

The BAYONET option is a clamp-on pipe band mount designed to accommodate heavily insulated applications. The sensor extension allows for installation where the insulation is up to two inches thick. This clamp-style mount will fit all pipes from 51mm (2-inches) to 300mm (12-inches) in diameter (extra band clamps are available for larger diameter pipes). The spring loaded WORM features a flat tip, and rests securely in the BAYONET allowing for maximum heat transfer to the sensor. This assembly provides a direct contact between the pipe and sensor tip, while protecting against any outside interference. The solid stainless steel construction is corrosion resistant and will withstand the harshest industrial conditions.

Installation

1. Cut away the insulation exposing the pipe's surface, forming a channel around the circumference of the pipe large enough for the BAYONET clamp.
2. Open BAYONET clamp and wrap around prepped section of pipe.
3. Close and tighten the clamp so that it stays securely against the desired surface.
4. Cut the WORM's spring to a length between 1 and 1¼-inches (this will provide the necessary pressure to securely hold the sensor probe against the pipe's surface).

5. Slide the screw-on retaining cap (threaded portion facing sensor probe) over the sensor wires until it rests against the open side of the spring.

6. Insert sensor assembly (sensor tip first) into top of BAYONET mount and screw down retaining cap.

7. Distribute sensor leads up to the mounted connection head and thread the leads through the conduit entry port.

8. Connect each sensor wire to the appropriate temperature transmitter terminal.

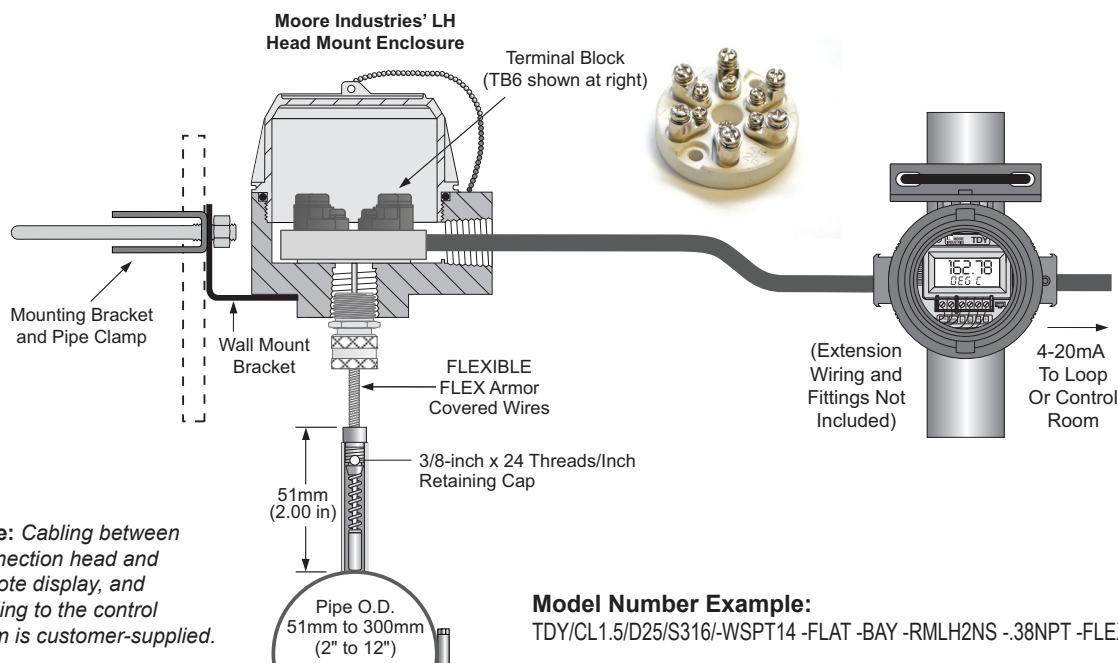
Remote-Mounted Sensor with Terminal Block (-RM)

Remove the Display From the Process (See Figure 5). Position your sensor in the heart of your process while keeping your transmitter in an easily accessible area with our *Remote Terminal Block* (-RM) option. Add the -RM option to your temperature assembly and receive two housings: a transmitter in the specified connection head, and a terminal block enclosed in an additional connection head with your selected sensor and fittings attached. Sensor extension wiring (not included; available upon request) connects the terminal block to the transmitter.

Model Number Example:

TDY/CL2/D25/S316/-WSPT14 -BAY -SPR2 -SSB36 -GRIP -BOOT -RMLH2NS [BH2NGP]

Figure 5. BAYONET option with remote mount connection head assembly.



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Ready-to-Install WORM Surface Mount Temperature Assemblies

PIPE Mount (-PIPE) and TANK Mount (-TANK)

The PIPE Mount option quickly clamps onto most pipes (a 12" band is included when you order the -PIPE option). The TANK Mount option (S316) welds into place, securing the spring loaded sensor tip directly against the surface in which the temperature measurement is needed. In both options the spring loaded sensor is completely encased and features a flat tip, creating the best environment for maximum heat transfer to the probe. Both mounts are heavy duty stainless steel construction is corrosion-resistant and suitable for use in any field environment. The top portion is equipped with a 1/2-inch NPT connection for mounting a transmitter and field-mount enclosure.

Installation

1. Clear any insulation and clean surface area where installation will occur.

For PIPE Mount:

A. Open and wrap both clamp bands around a section of pipe. Place the mounting plate between the clamps and pipe, ensuring that the clamps rest in the provided channels on the top of the PIPE Mount's base.

B. Close and tighten the clamp bands, forcing the PIPE Mount to rest firmly against the pipe surface. Screw the connection head onto the 1/2-inch NPT threads at the top of PIPE Mount.

C. Cut the WORM's spring to be between 1/2 to 1-inch longer than the combined length of the PIPE Mount and conduit entry port of the connection head (this will provide the necessary pressure to securely hold the sensor against the skin surface).

2. Insert the sensor assembly (sensor tip first) through the connection head and into the top of the PIPE Mount or TANK Mount and secure it with the thread nut. Install the transmitter and head.

3. Connect each sensor wire to the appropriate temperature transmitter terminal. Re-insulate if necessary.

Note: When running sensor leads distances in excess of 36-inches please use the provided screw-on retaining cap to keep the necessary pressure on the sensor tip.

Figure 6. Dimensions for PIPE option (left) and TANK option dimensions (right).

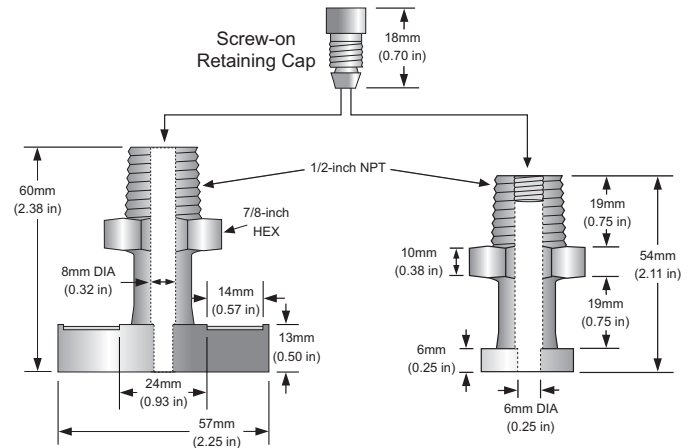
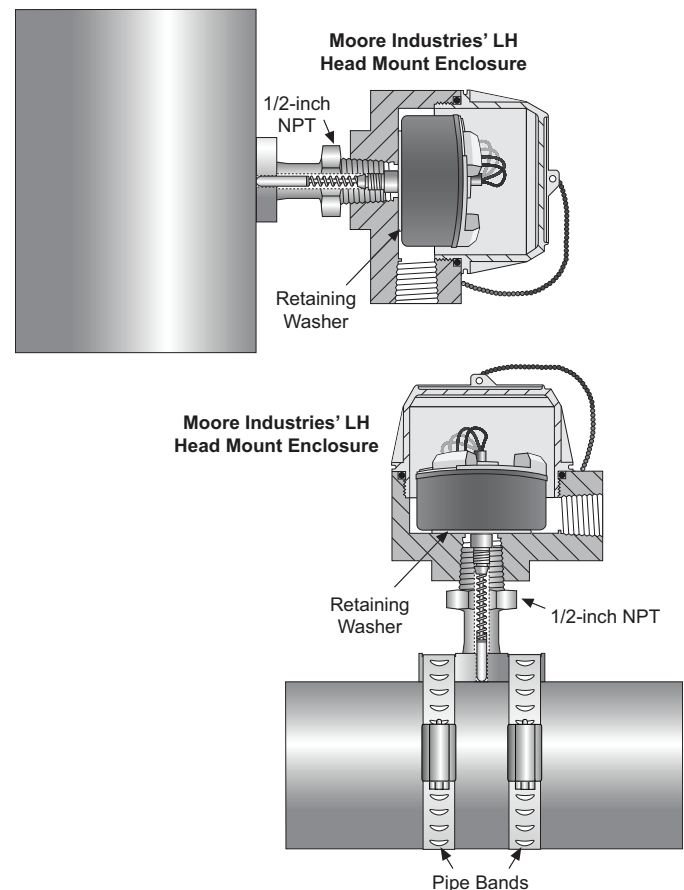


Figure 7. TANK option with connection head assembly (left) and PIPE option with connection head assembly (right).



PIPE, TANK mount Model Number Examples (No FLEX or SSB with these options):

TRY / CL24 / D25 / S316 / -WSPT14 - PIPE [LH1NS]
TRY / CL24 / D25 / S316 / -WSPT14 - TANK [LH1NS]

Select one from each category to order a WORM Sensor with Mounting Accessory:

Universal Temperature Transmitter (See TDY, THZ³/TDZ³, STZ and TRY/TRX Data Sheets for Specifications)

- TDY** Isolated, PC-Programmable Temperature Transmitter with Display (Specify with BH2NG or D2LC Housing)
- TDZ³** Isolated, Dual Input Smart HART[®] Temperature Transmitter with Display (Specify with BH2NG or D2LC Housing)
- STZ** Isolated, Functional Safety Dual Input Smart HART[®] Temperature Transmitter (Specify with LH2NS or BH2NG Housing Only)
- TFZ** Isolated, Programmable, FOUNDATION Fieldbus™ Temperature Transmitter with Display (Specify with BH2NG or D2LC Housing)
- THZ³** Isolated, Dual Input Smart HART[®] Temperature Transmitter (Specify with LH1NS or LH2NS Housing)
- TPZ** Isolated, PC-Programmable PROFIBUS PA Temperature Transmitter with Display (Specify with BH2NG or D2LC Housing)
- TRY** Isolated, PC-Programmable Temperature Transmitter (Specify with LH1NS or LH2NS Housing)
- TRX** Non-Isolated, PC-Programmable Temperature Transmitter (Specify with LH1NS or LH2NS Housing)
- SEN** Sensor Only; No Transmitter

Sensor Length

- CL1.5** 1.5-Inch Standard WORM Capsule Length (Use only with "-.38NPT -FLEX?" Option)
- CL2** 2-Inch Length (Required for -FLEX and -SSB Options and Inconel Sheath with WHTCK)
- CL24** 24-Inch Wire Jacket and Spring Length plus 6-8" Lead Wires (Specify for Total Sensor Insertion Lengths of 22-inches and Under)
- CL36** 36-Inch Wire Jacket and Spring Length plus 6-8" Lead Wires (Specify for Total Sensor Insertion Lengths of 34-inches and Under)
- CL?** Special Wire Jacket and Spring Length plus 6-8" Lead Wires - Replace "?" with Length up to 120" (Specify in 0.25-inch Increments)

Sensor Sheath Diameter

- D25** Appropriate for 0.25-Inch and 6mm Diameter Applications

Sensor Sheath Material

- S316** Stainless Steel 316
- INC** Inconel 600

Sensor Type (See Page 8 for Specifications)

RTD SENSORS:

- WSPT14** Standard Temp. Pt 385 RTD; 4-Wire; 100 ohm (450°F maximum)
- WS2PT14** Standard Temp. Pt 385 RTD; 4-Wire; 100 ohm (Dual Sensor, 450°F maximum)
- WSPT104** Standard Temp. Pt 385 RTD; 4-Wire; 1000 ohm (450°F maximum)
- WHPT14** High Temp. Pt 385 RTD; 4-Wire; 100 ohm (800°F maximum)
- WH2PT13** High Temp. Pt 385 RTD; 3-Wire; 100 ohm (Dual Sensor, 800°F maximum)
- WHPT104** High Temp. Pt 385 RTD; 4-Wire; 1000 ohm (800°F maximum)
- WSN1204** Nickel RTD; 4-Wire; 120 ohm (450°F maximum)
- WSCU4** Copper RTD; 4-Wire; 10 ohm (450°F maximum)

THERMOCOUPLE SENSORS:

- WSTC?G** Standard Temp., Replace "?" with J, K, T or E T/C, Grounded (450°F maximum)
- WS2TC?G** Standard Temp., Replace "?" with J, K, T or E T/C, Grounded (Dual Sensor, 450°F maximum)
- WSTC?U** Standard Temp., Replace "?" with J, K, T or E T/C, Ungrounded (450°F maximum)
- WS2TC?U** Standard Temp., Replace "?" with J, K, T or E T/C, Ungrounded (Dual Sensor, 450°F maximum)
- WHTC?G** High Temp., Replace "?" with J, K, T or E T/C, Grounded
- WH2TC?G** High Temp., Replace "?" with J, K, T or E T/C, Grounded (Dual Sensor)
- WHTC?U** High Temp., Replace "?" with J, K, T or E T/C, Ungrounded
- WH2TC?U** High Temp., Replace "?" with J, K, T or E T/C, Ungrounded (Dual Sensor)

IMPORTANT NOTE

Specify Standard Temperature WS* WORM sensors for measurements up to 232°C (450°F).

Specify High Temperature WHPT* WORM sensors for measurements up to 427°C (800°F).

Specify High Temperature WHTC* WORM sensors for measurements up to 760°C (1400°F).

For temperatures up to 1093°C (2000°F), specify WHTCKG or WHTCKU with a CL2 Sheath Length and Inconel Material.

Accessory Item: If you are ordering options -PIPE, -PAD or -CLAMP for use on a pipe larger than 12" diameter, you can order extra 12" bands: P/N 233-227-02

T/C IDENTIFICATION

| Type | Wire Color | |
|------|------------|-----|
| | + | - |
| E | Purple | Red |
| J | White | Red |
| K | Yellow | Red |
| T | Blue | Red |

Continue on next page

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Ready-to-Install WORM Surface Mount Temperature Assemblies

Select one from each category to order a WORM Sensor with Mounting Accessory:

Assembly Options

- PAD Mounting Plate
- CLAMP Mounting Plate with Pipe Clamp
- MPAD Magnetic Protective Surface Mounting PAD for Metal Surfaces
- PIPE Thermowell Pipe Mount with Clamps (Requires -FLAT option and can be used with .38NPT -FLEX Option)
- BAY Bayonet Pipe Mounting Clamp (Requires -FLAT option and can be used with .38NPT -FLEX Option)
- TANK Mounted by Welding to a Surface (Requires -FLAT option and can be used with .38NPT -FLEX Option)
- .38NPT-FLEX? 3/8-inch Fitting Attached to Flex Cable for -PIPE, -BAY and -TANK options; Replace "?" with FLEX Armor Lengths in Inches (-BOOT Required)
- FLEX-BOOT Flex Armor (Requires CL2 Sensor Length), Replace "?" with FLEX Armor Lengths in Inches
- .SSB? -BOOT Stainless Steel Braided (Requires CL2 Sensor Length), Replace "?" with FLEX Armor Lengths in Inches
- GRIP Cord Grip to Secure Sensor Wires to Enclosure
- BOOT Protection for the Lead Wire Jacket and Secure Positioning of the Cord Grip (Required with SSB? and FLEX? Options)
- LL? Special Wire Jacket Length Plus 6-8" Lead Wires - Replace "?" with Length up to 120" (Specify in 0.25-inch Increments)

Sensor Options

- .04 1/3 DIN High Accuracy RTD Sensor (.04%)
- .06 Class "A" High Accuracy RTD Sensor (.06%)
- 10G 10G Low-Intensity Vibration Sensor (See Sensor Specifications)
- 30G 30G High-Intensity Vibration Sensor (See Sensor Specifications)
- WW Wire Wound Option Required for Temperature Below -10°F (RTDs Only)
- ETR Extended Temperature Required for Temperature Above +800 to 1000°F (RTDs Only)
- FLAT Flat Surface on the WORM Sheath Tip (Only Specify with Replacement Sensor Order for Fittings -PIPE, -TANK or -BAY)
- SPR? Special Spring Length - Replace "?" with Length up to 120" (Specify in 0.25-inch Increments)
- VTB High Accuracy Temperature System Calibration with NIST Test Data Report (.04 or .06 Option Required)
- VTD Standard Factory Calibration with NIST Test Data Report
- TB6 6-Position Terminal Block (Mounted in Enclosure, LH1NS, LH2NS, CH19 or CH21 Head Type)
- TB8 8-Position Terminal Block (Mounted in Enclosure, LH1NS, LH2NS, CH19 or CH21 Head Type)

Remote Mount Enclosure Options

- RMLH1NS* Remote-Mounted Terminal Block in LH1NS Connection Head Any Complete Assembly Model Number
- RMLH2NS* Remote-Mounted Terminal Block in LH2NS Connection Head Any Complete Assembly Model Number
- RMCH19 Remote-Mounted Terminal Block in CH19 SS Connection Head Any Complete Assembly Model Number
- FS Functional Safety (Yellow) LH2 housing. Can only be ordered with LH2* Connection Head OR with STZ and -RMLH2* option.

Connection Head/Enclosure

- LH1NS* Aluminum Body with Velox Cap, NEMA 4X, IP66 TRY, TRX, THZ³ or T2X Transmitter; SEN with TB6
- LH2NS* Aluminum Body with Aluminum Cap, Explosion-Proof TRY, TRX, THZ³, STZ or T2X Transmitter; or SEN with TB6
- BH2NG Aluminum Body with Clear Glass Cover, Explosion-Proof TDY, TDZ, STZ, RIY or TIY Transmitter
- D2LC* 2 Hub, Low Base, Clear Cover, NEMA 4X, IP66 TDY, TDZ, RIY or TIY Transmitter
- CH6 Polypropylene Body and Cap, NEMA 4X TRY, TRX, THZ3/THZ2 or T2X Transmitter; or SEN
- CH3 Polypropylene Body and Cap, NEMA 4X with Integral Terminal Block SEN
- CH21 Stainless Steel 316 Body and Cap, NEMA 4X TRY, TRX, THZ3/THZ2 or T2X Transmitter; or SEN
- CH19 Stainless Steel 316 Body and Cap, NEMA 4X No Transmitter; with TB6 or TB8 Option
- SEN Sensor Only; No Transmitter

Note: Add "P" Suffix to Enclosure (i.e., LH1NSP) for 2-inch Pipe-Mount Hardware.

See Previous Page for detailed information

THZ3 / CL36 / D25 / S316 / -WSPT104 -CLAMP -FLEX12 -BOOT -GRIP -.06 -TB6 -RMLH2NS [LH2NS] (Ordering Number Example)

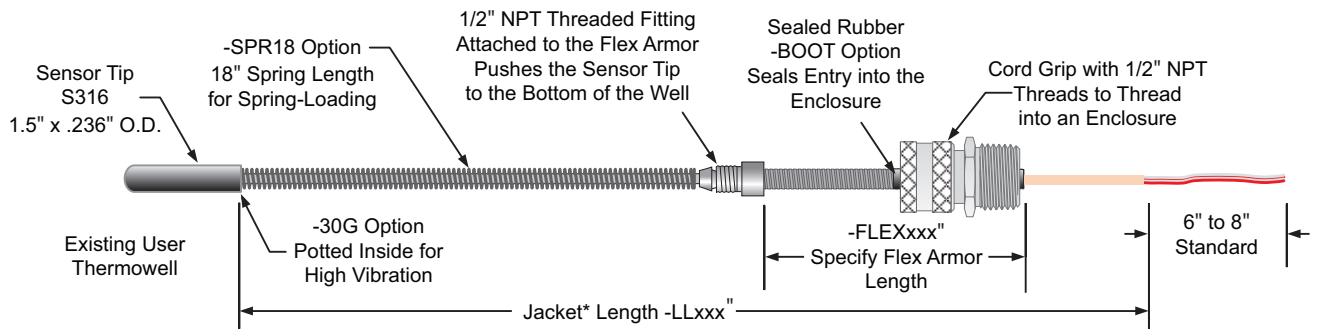
Flexible WORM Sensor with Flex Armor Cable for -BAY, -PIPE and -TANK

The WORM sensor with Flex Armor cable cover and fittings mount easily into a standard threaded thermowell, providing both flexibility and protection of the wiring.

1. Pull the wire out of the Flex Armor and remove the spring.
2. Insert only the spring into the well.

3. Cut the spring about 1.5 to 2 inches longer than the well.
4. Discard the excess spring.
5. Re-assemble it by putting the spring back onto the lead wires.
6. Insert the loose lead wires into the 1/2 inch fitting attached to the Flex Armor.
7. Insert the sensor tip into the well and thread it into the 1/2 inch fitting.

Figure 8. Flexible WORM Sensor attached with Flex Armor Cable to a threaded fitting and threaded into a thermowell.



Additional WORM Sensor Options

Multiple WORM Sensor configurations are available. Pictured here are those which are the most commonly used, along with the mounting options covered throughout in this data sheet.

Figure 9. Standard WORM Sensor; Lead Length with Overall Jacket* and Cord Grip

Model Number Example: **SEN / CL1.5 / D25 / S316 / -WSPT14 -LL120 -GRIP [SEN]**

Uses: Surface measurements where lead wire protection is not needed. Non-abrasive environment.

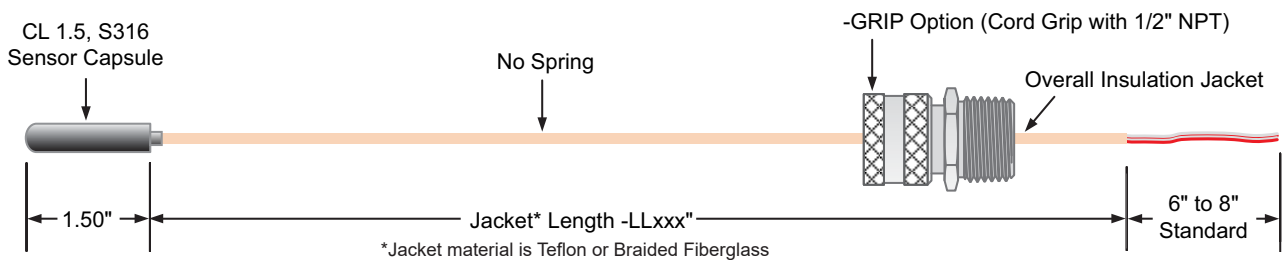
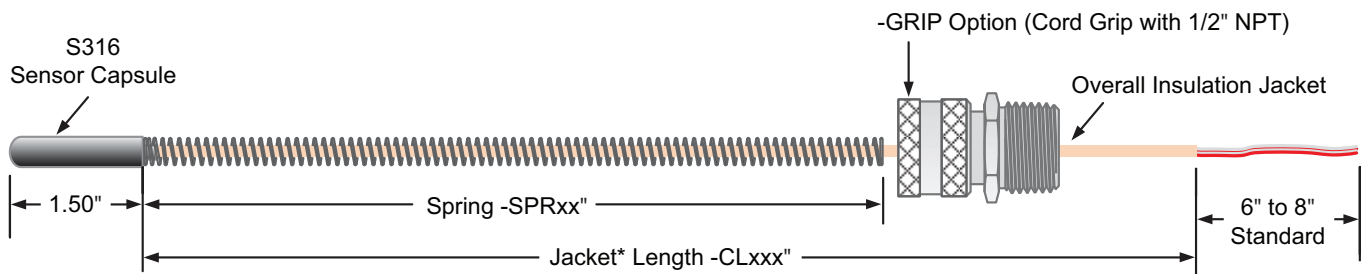


Figure 10. Standard WORM Sensor; Lead Length with Overall Jacket* and Spring and Cord Grip

Model Number Example: **SEN / CL120 / D25 / S316 / -WSPT14 -SPR24 -GRIP [SEN]**

Uses: Anytime you want the compressed spring to keep the sensor in contact with the well or hot surface. When used with the WORM Nose the spring adds weight to keep the sensor in the Nose. Increased protection of the lead wire against abrasion.



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Ready-to-Install WORM Surface Mount Temperature Assemblies

Figure 11. Stainless Steel Braid (SSB) Standard WORM Sensor; Lead Length with Overall Jacket* and SS Braid and Cord Grip

Model Number Example: **SEN / CL2 / D25 / S316 / -WSPT14 -SSB120 -BOOT -GRIP [SEN]**

Uses: The SS Braid provides excellent abrasion protection while maintaining flexibility of the lead wire. The braid and wire can easily round bends (could be tied in knots) and should be used any time you need to pull the lead wire in adverse conditions.

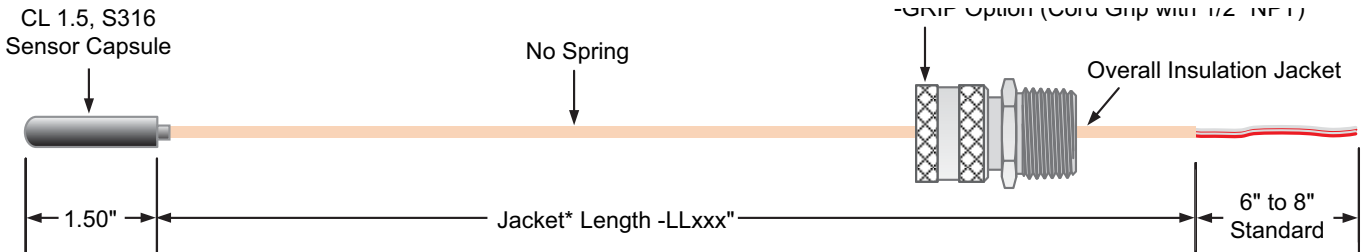
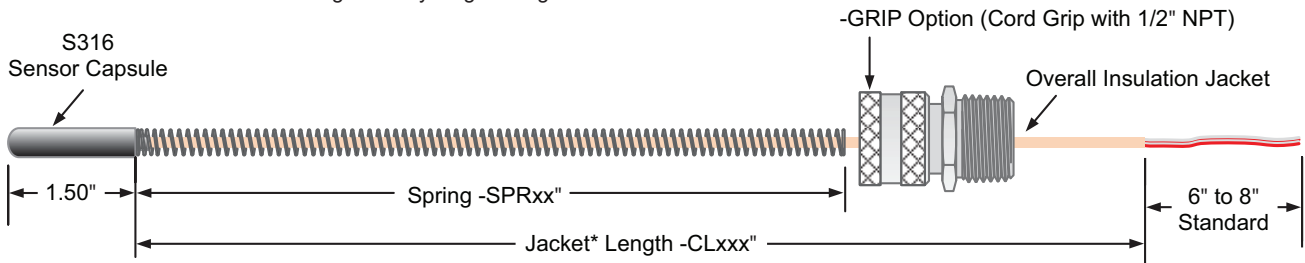


Figure 12. Flex Armor (FLEX) WORM Sensor; Lead Length with Overall Jacket* and Spring and Cord Grip

Model Number Example: **SEN / CL2 / D25 / S316 / -WSPT14 -FLEX84 -BOOT -GRIP -LL36 [SEN]**

Uses: The Flex Armor provides mechanical protection for the lead wire. Used most often with surface mount fittings or when conduit or panduit are not available for the lead wire. Protects against anything striking the lead wire.



*Jacket material is Teflon or Braided Fiberglass

Sensor Specifications

Lead Wire Materials:

Standard WORM (WS) Sensors: Teflon insulated, hermetically sealed;
High Temperature (WH) Sensors: Braided fiberglass

Sensor Sheath Material: Stainless Steel 316

Accuracy: RTD: $\pm 0.12\%$ at 0°C . Consult the factory for thermocouple tolerances

Stability: RTD: 0.2°C after 10,000 hrs. at maximum temperature (1 year, 51 days, 16 hrs. continuous)

Response Time: RTD: <5 seconds to 63.2% temperature change; Thermocouple, 4.5 sec. for ungrounded, typical; 2.0 sec. for grounded to 63.2% temperature change

Humidity: Standard WORM (WS) Sensors: Excellent moisture resistance for condensing environments; High Temperature (WH) Sensors: Specify for non-condensing atmospheres

Pull Force: Wires will withstand at least 20 lbs. of pull force before separating from sensor head

Transmitter Certifications



ANZEX

IECEX

Approvals for Hazardous 'Classified' Areas including Explosion-Proof/Flameproof, Intrinsically-Safe, Non-Incendive Type "n" and Functional Safety IEC 61508 are available. Consult the individual temperature transmitter data sheets for specific information for each certifying agency.

NOTE: Certifications apply to the temperature transmitter and connection head combination. Sensor and sensor assembly components are not included in the certifications.



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