Capacitance Switches

Pointek CLS200/CLS300 (Standard)

Operating Instructions · 05/2011

SIEMENS

Safety Guidelines: Warning notices must be observed to ensure personal safety as well as that of others, and to protect the product and the connected equipment. These warning notices are accompanied by a clarification of the level of caution to be observed.

Qualified Personnel: This device/system may only be set up and operated in conjunction with this manual. Qualified personnel are only authorized to install and operate this equipment in accordance with established safety practices and standards.

Unit Repair and Excluded Liability:

- The user is responsible for all changes and repairs made to the device by the user or the user's agent.
- All new components are to be provided by Siemens Milltronics Process Instruments.
- Restrict repair to faulty components only.
- Do not reuse faulty components.

Warning: Cardboard shipping package provides limited humidity and moisture protection. This product can only function properly and safely if it is correctly transported, stored, installed, set up, operated, and maintained.
This product is intended for use in industrial areas. Operation of this equipment in a residential area may cause interference to several frequency based communications.

Note: Always use product in accordance with specifications.

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- For a selection of Siemens Milltronics level measurement manuals, go to: **www. siemens.com/processautomation**. Under Process Instrumentation, select *Level Measurement* and then go to the manual archive listed under the product family.
- For a selection of Siemens Milltronics weighing manuals, go to: **www. siemens.com/processautomation**. Under Weighing Technology, select *Continuous Weighing Systems* and then go to the manual archive listed under the product family.

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Safety Notes

Special attention must be paid to warnings and notes highlighted from the rest of the text by grey boxes.

WARNING: relates to a caution symbol on the product, and means that failure to observe the necessary precautions can result in death, serious injury, and/or considerable material damage.

WARNING[1]: means that failure to observe the necessary precautions can result in death, serious injury, and/or considerable material damage.

CAUTION: means that failure to observe the necessary precautions can result in considerable material damage.

Note: means important information about the product or that part of the operating manual.

Safety marking symbols

In manual	On Product	Description
		Caution: refer to accompanying documents (manual) for details.
		Earth (ground) Terminal
		Protective Conductor Terminal

The Manual

Note: Please follow the installation and operating procedures for a quick, trouble-free installation and to ensure the maximum accuracy and reliability of your Pointek CLS200/300. This manual applies to the Pointek CLS200/300 Standard model only.

Pointek CLS200/300 is available in two models, Standard and Digital. For information on the CLS200/300 Digital model, please see manual 7ML19985JJ02.

Note: This manual applies to CLS200 Standard devices manufactured after July 2010 and CLS300 Standard devices manufactured after January 2011. Units manufactured prior to these dates will use Operating Instructions 7ML19985JH01.

This manual will help you set up your Pointek CLS200/300 Standard for optimum performance.

Sections in this manual are designated as follows:

1. This symbol is used when there is no corresponding caution symbol on the product.

- *Pointek CLS200/300 Standard* - an introduction to Pointek CLS200/300 Standard model and to the manual
- *Specifications: Standard model*
- *Installation: Pointek CLS200 Standard*
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- *Appendix E: Dimensions - CLS200*
- *Appendix F: Dimensions - CLS300*
- *Appendix G: Shortening the cable*

We always welcome suggestions and comments about manual content, design, and accessibility. Please direct your comments to techpubs.smpi@siemens.com.

For other Siemens Milltronics level measurement manuals, go to: www.siemens.com/level and look under **Level Measurement.**

Application Examples

The application examples used in this manual illustrate typical installations using Pointek CLS200/300; other configurations may also apply.

In all examples, substitute your own application details. If the examples do not apply to your application, check the applicable parameter reference for the available options.

Technical Support

Support is available 24 hours a day.

To find your local Siemens Automation Office address, phone number and fax number go to:

www.siemens.com/automation/partner

- Click on the tab **Contacts by Product** then drill down to find your product group (**+Process Automation > +Process Instrumentation > +Level Measuring Instruments)**.
- Select the team **Technical Support.** Click on **Next**.
- Click on the appropriate continent, then select the country followed by the city. Click on **Next**.

For on-line technical support go to:

www.siemens.com/automation/support-request

- Enter the device name or order number, then click on **Search**, and select the appropriate product type. Click on **Next**.
- You will be prompted to enter a keyword describing your issue. Then either browse the relevant documentation, or click on **Next** to email a detailed description of your issue to Siemens Technical Support staff.

Siemens IA/DT Technical Support Center: phone +49 (0)911 895 7222

Abbreviations and Identifications

Short form	Long Form	Description	Units
CE / FM / CSA	Conformitè Europèene / Factory Mutual / Canadian Standards Association	safety approval	
ε_r		relative dielectric constant	
ESD	Electrostatic Discharge		
Ex	Explosion Proof	safety approval	
Exd	Flame Proof	method of protection for hazardous area	
FEP	Fluorinated Ethylene Polymer	modified polymer	
FKM/FPM	Fluorelastomer		
FFKM/FFPM	Perfluoroelastomer		
IS	Intrinsically Safe	method of protection for hazardous area	
LCD	Liquid Crystal Display		
LUI	Local User Interface		
µF	micro Farads	10^{-6}	Farad
µs	micro Seconds	10^{-6}	Seconds
NC	normally closed	relay contact position	
NO	normally open	relay contact position	
pF	pico Farads	10^{-12}	Farad
PDM	Process Device Manager	configuration tool	
PEEK	Polyaryletheretherketone	organic polymer	
PPS	Polyphenylene Sulfide	polymer	
PTFE	Polytetrafluoroethylene	thermoplastic fluoropolymer	
PVDF	Polyvinylidene Fluoride	engineered fluoropolymer	

Pointek CLS200/300 Standard

Notes:

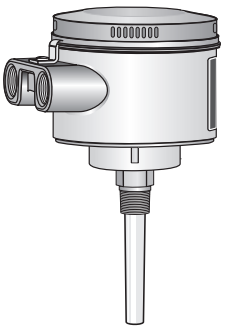
- Pointek CLS200/300 is available in two models: the standard model, and the digital model with integral local display. For information on the CLS200/300 Digital, please see manual 7ML19985JJ02.
- Pointek CLS200/300 is to be used only in the manner outlined in this instruction manual, otherwise protection provided by the equipment may be impaired.
- This product is intended for use in industrial areas. Operation of this equipment in a residential area may cause interference to several frequency based communications.

Pointek CLS200/300 is a versatile capacitance switch, ideal for level detection of interfaces, solids, liquids, slurries, and foam, and for simple pump control. The switch responds to the presence of any material with a relative dielectric constant of 1.5 or more by detecting a change in capacitance, which is registered as a change in oscillating frequency.

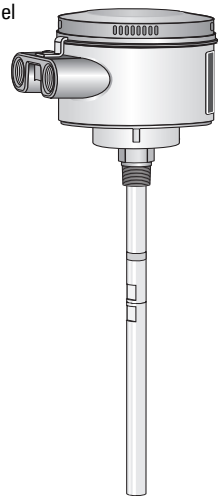
The switch can be set to detect before contact or on contact with the probe. The design of the CLS200 Standard allows the instrument to operate independently of the tank wall or pipe, so it does not require an external reference electrode for level detection in a non-conductive vessel such as concrete or plastic.[1] The CLS300 Standard requires a connection to earth/ground for effective capacitance measurement.

The power supply is galvanically isolated and can accept voltages in the range 12 to 250 V AC/DC, depending on the application. The materials used in the probe construction provide a high level of chemical resistance, and an excellent temperature rating on the process wetted portion of the probe: up to 125 °C (257 °F) for the CLS200 and 400 °C (752 °F) for the CLS300.

CLS200 Standard model



CLS300 Standard model



1. Refer to *Specifications: Standard model* on page 6 for CE applications.

Modular design and construction provide a wide choice of configurations, including rod, cable, and sanitary versions. When used with a SensGuard protection cover, the CLS200 sensor is protected from shearing, impact, and abrasion, in tough primary processes.

Pointek CLS200/300 Applications

Pointek CLS200/300 is designed for level detection and simple pump control in a variety of applications:

- Liquids, solids (powder and granules), slurries, interface detection (for example, oil/water), and foam detection
- Foods and pharmaceuticals
- Chemical and petrochemical
- High pressure and temperature

Pointek CLS200/300 Features

- Potted construction protects components from shock, vibration, humidity, and/or condensation
- High chemical resistance on probes
- Level detection independent of tank wall/pipe (CLS200 only)[1]
- Freely programmable set up covers wide range of applications/materials
- Integrated Local User Interface (LUI) for ease of use
- Rigid and cable versions available
- Patented Active Shield minimizes the effect of product build-up at the sensor mounting point (CLS300 only)

1. Refer to *Specifications: Standard model* on page 6 for CE applications.

Specifications: Standard model

Note: Siemens Milltronics makes every attempt to ensure the accuracy of these specifications, but reserves the right to change them at any time.

Pointek CLS200/300

Power

• supply	12 to 250 V AC/DC (0 to 60 Hz)
• power consumption	2W max.

Performance

• Repeatability	±1% of measurement

Interface

• configuration	locally, using dip switches and potentiometers
• local display	3 LED indicators
• output	relay contact and solid-state switch
• polarity-independent	yes
• failsafe	relay and solid-state switch can be de-energized in the absence of a sensor signal

Alarm Outputs

• relay	1 Form C (SPDT) contact (selectable NC or NO contact) max. switching voltage/current (DC): 30 V DC / 5 A max. switching voltage/current (AC): 250 V AC / 8 A (resistive load)
• solid-state switch	rated 30 V DC or peak 30 V AC, 82 mA
• time delay	ON/OFF alarm, selectable 1 to 60 seconds duration
• hysteresis	dependent on ε_r: max. 2 mm (0.08") @ ε_r = 1.5
• failsafe operation	Failsafe High or Failsafe Low
• delay timers	2: Alarm ON to OFF and Alarm OFF to ON

Mechanical

Electrode - CLS200 Standard

Model	Length (max)	Process Connections	Extension	Tensile (max)	Wetted Parts
Rod	5500 mm/ 216.5"	• Threaded: ¾",1", or 1 ½" BSPT (R), BSPP (G) or NPT; 1 ¼" NPT only • Welded flange: ASME: 1",1 ½", 2",3" or 4" DN 25, 40, 50, 80 or 100	316L[1] stainless steel	n/a	• 316L[1] stainless steel (optional PFA coating) • FKM seals (optional FFKM) • PPS probe (optional PVDF)
Sanitary	5500 mm/ 216.5"	1", 1 ½ ", 2",2 ½" and 3"sanitary clamp	316L[1] stainless steel	n/a	• 316L[1] stainless steel • FKM seals (optional FFKM) • PPS probe (optional PVDF)
Cable	30 m/ 98.4 ft	• Threaded: ¾ ", 1", or 1 ½" BSPT (R), BSPP (G) or NPT; 1 ¼" NPT only • Welded flange: ASME: 1",1 ½", 2",3" or 4" DN 25, 40, 50, 80 or 100	FEP (Fluorinated Ethylene Polymer)	180 kg/ 400 lbs	• 316L[1] stainless steel • FEP jacketed cable • FKM seals (optional FFKM) • PPS probe (optional PVDF)

1. Or 1.4404 material.

Electrode - CLS300 Standard

Model	Length (max)	Process Connections	Tensile (max)	Wetted Parts
Rod (19 mm/ 0.75″ dia.)	1000 mm/40″	• Threaded: ¾″, 1", or 1 ½" BSPT (R), BSPP (G) or NPT; 1 ¼″ NPT only • Welded flange: ASME: 1″, 1 ½″, 2″, 3″ or 4″ DN 25, 40, 50, 80 or 100	n/a	• 316L[1] stainless steel • FKM seals (optional FFKM) • PFA lining on Active Shield • PEEK isolators
Cable	25000 mm/ 985″	• Threaded: 1 ½" BSPT (R), BSPP (G) or NPT; 1 ¼″ NPT only • Welded flange: ASME: 1 ½″, 2″, 3″ or 4″ DN 40, 50, 80 or 100	1900 kg/ 4188 lbs	• 316L[1] stainless steel Active Shield and cable weight • 316L[1] stainless steel cable (optional PFA jacketed cable) • FKM seals (optional FFKM) • PEEK isolators
High Temperature version	1000 mm/40″	• Threaded: ¾″, 1", or 1 ½" BSPT (R), BSPP (G) or NPT; 1 ¼″ NPT only • Welded flange: ASME: 1″, 1 ½″, 2″, 3″ or 4″ DN 25, 40, 50, 80 or 100	n/a	• 316L[1] stainless steel • Ceramic isolators

Active Shield Length (CLS300 only):

Active Shield	Length		Minimum insertion length		
	Threaded	Flanged	Rod version	Cable version	High Temp. version
Standard length	125 mm/4.92″	105 mm/4.13″	350 mm/13.78″	500 mm/19.69″	350 mm/13.78″
Extended shield	250 mm/9.84″	230 mm/9.06″	500 mm/19.69″	1000 mm/40″	500 mm/19.69″
Extended shield	400 mm/15.75″	380 mm/14.96″	750 mm/29.53″	1000 mm/40″	750 mm/29.53″

Enclosure

- termination — removable terminal block, conductor cross-section 2.5 mm^2 max.
- construction — epoxy-coated aluminum with gasket
- optional thermal isolator — 316L[1] stainless steel
- cable entry — 2 x M20 thread (option: 1 x 1/2″ NPT with adaptor, and 1 x plugged entry)
- ingress protection — Type 4 / NEMA 4 / IP65 standard, IP68 optional

Note: The use of approved watertight conduit hubs/glands is required for Type 4 / NEMA 4, Type 6 / NEMA 6, IP68 (outdoor applications).For CE requirements the use of EMC rated cable entries is required for all CLS200 devices and for CLS300 devices with flange process connections.

Weight

Weight varies based on configuration. For example:

- compact Pointek CLS200/300, 100 mm (4″) insertion length, 3/4″ process connection — 1 kg (2.20 lb.) approx.

Environmental

- location — indoor/outdoor
- altitude — 2000 m (6562 ft.) max.
- ambient temperature
  - general applications — –40 to 85 °C (–40 to +185 °F)
  - in potentially explosive atmospheres — refer to appropriate certificate
- storage temperature — –40 to 85 °C (–40 to +185 °F)
- relative humidity — suitable for outdoor (Type 4 / NEMA 4 / IP68)
- installation category — II
- pollution degree — 4

1. Or 1.4404 material.

Process

Note: Please see *Pointek CLS200 Standard Pressure versus Temperature Curves* and *Pointek CLS300 Standard Pressure versus Temperature Curves* on page 45.

- relative dielectric constant (εr) 1.5 minimum
- **CLS200** temperature:[1]
  - without thermal isolator –40 to 85 °C (–40 to 185 °F)
  - with thermal isolator –40 to 125 °C (–40 to 257 °F)

- **CLS200** pressure (vessel):
  - rod version –1 to 25 bar g/–14.6 to 365 psi g (nominal)
  - cable version –1 to 10 bar g/–14.6 to 150 psi g (nominal)
  - sliding coupling version –1 to 10 bar g/–14.6 to 150 psi g (nominal)

- **CLS300** temperature:[1]
  - rod/cable version without thermal isolator –40 to 85°C (–40 to 185°F)
  - rod/cable version with thermal isolator –40 to 200°C (–40 to 392 °F)
  - high temperature version –40 to 400 °C (–40 to 752 °F)

- **CLS300** pressure (vessel): –1 to 35 bar g/–14.6 to 511 psi g (nominal)

Approvals (verify against product nameplate)

CLS200

• General Purpose	CSA, FM, CE, C-TICK
• Dust Ignition Proof	ATEX II 1/2 D T100°C
• Dust Ignition Proof with IS Probe	CSA/FM Class II, Div. 1, Gr. E, F, G CSA/FM Class III T4
• Explosion Proof Enclosure with IS Probe	CSA/FM Class I, Div. 1, Gr. A, B, C, D CSA/FM Class II, Div. 1 Gr. E, F, G CSA/FM Class III T4
• Flame Proof Enclosure with IS Probe	ATEX II 1/2 G EEx d[ia] IIC T6 to T4 ATEX II 1/2 D T100°C
• Marine	Lloyds Register of Shipping, Categories ENV1, ENV2 and ENV5
• Overfill Protection	WHG (Germany)
• Others	Pattern Approval (China)

Note: EN 61326 (CE EMC) testing was conducted on the Pointek CLS200 while mounted in a metallic vessel and wired using shielded cable, where the cable was terminated in an EMC cable gland at the device entry point.

1. at process connection

CLS300

• General Purpose	CSA, FM, CE, C-TICK
• Dust Ignition Proof	CSA/FM Class II, Div. 1, Gr. E, F, G
with IS Probe	CSA/FM Class III T4
	ATEX II 1/2 D T100°C
• Explosion Proof	CSA/FM Class I, Div. 1, Gr. A, B, C, D
with IS Probe	CSA/FM Class II, Div. 1, Gr. E, F, G
	CSA/FM Class III T4
• Flame Proof Enclosure	ATEX II 1/2G EEx d[ia] IIC T6 to T1
with IS Probe	ATEX II 1/2 D T100°C
• Marine	Lloyds Register of Shipping, Categories ENV1, ENV2 and ENV5
• Overfill Protection	WHG (Germany)
• Others	Pattern Approval (China)

Note: EN 61326 (CE EMC) testing was conducted on the Pointek CLS300 while mounted in a metallic vessel and wired using shielded cable. Units with flange process connections were tested while mounted in a metallic vessel with a metallic gasket and an EMC cable gland at the device entry point.

Installation: Pointek CLS200 Standard

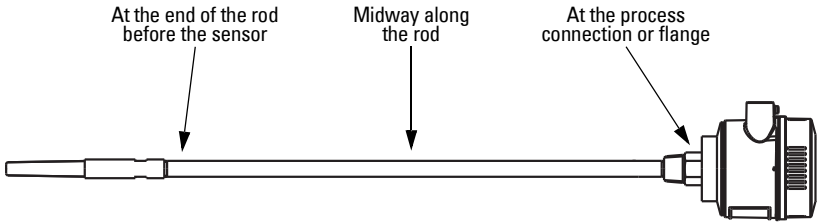
Notes:

- Installation shall only be performed by qualified personnel and in accordance with local governing regulations.
- This product is susceptible to electrostatic shock. Follow proper grounding procedures.
- The housing may only be opened for maintenance, local operation, or electrical installation.
- Before installing the instrument, verify that the environment complies with any restrictions specified on the product nameplate.
- To ensure compliance with CE EMC regulations, please install in accordance with the testing details on page 10.

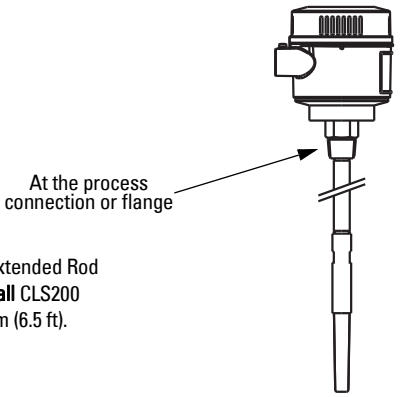
Handling Precautions

! WARNING: To prevent damage, all CLS200 Standard units with a rod longer than 2 m (6.5 ft) must be handled as described below.

When lifting CLS200 from a horizontal position, support it at these three points:



Once vertical, CLS200 may be held by the process connection or flange:



Note: Unit shown is CLS200 Standard Extended Rod Version. Handling precautions apply to **all** CLS200 Standard units with rods longer than 2 m (6.5 ft).

Location

Recommended:

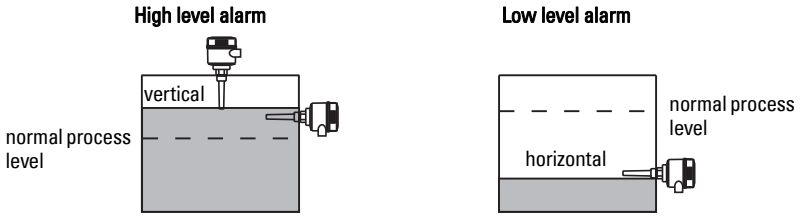
- Provide a sun shield to protect the transmitter from direct heat radiation.

Precautions:

- Avoid mounting Pointek CLS200 in locations subject to strong vibrations in the vicinity, whenever possible.
- Do not exceed the permissible ambient temperature limits (see *Environmental* on page 9 for details).

Mounting

Pointek CLS200 (compact threaded probe shown)



For high level alarm (level exceeds normal process level):

- normally mounted into the vessel top, or
- mounted through the tank wall at the detection level

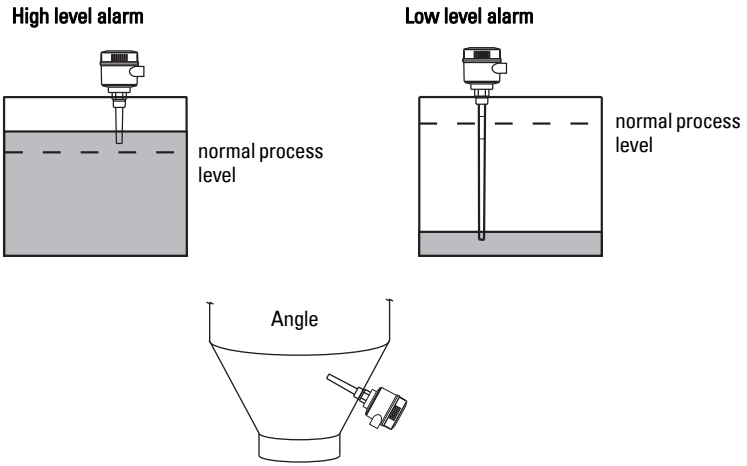
For low level alarm (level drops below normal process level):

- mounted through the tank wall at the detection level

Pointek CLS200 typical configuration with extensions:

For high or low level alarm:

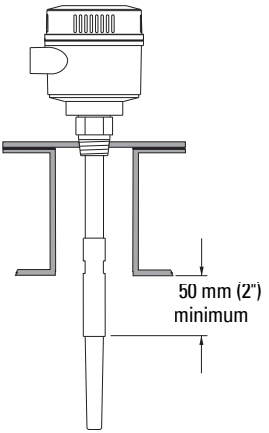
- designed for top mounting. The probe suspends vertically so that it reaches into the process at the desired detection level (high or low detection alarm).



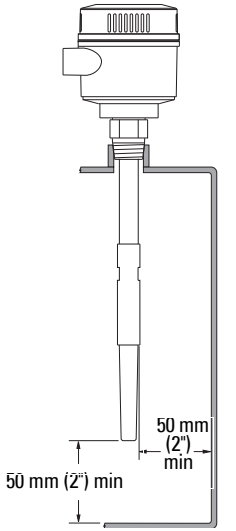
Mounting Restrictions

Note:
- Keep the sensor at least 50 mm (2") away from any nozzle or tank wall.
- If multiple units are used, allow at least 100 mm (4") between them, to prevent interference.

In nozzle

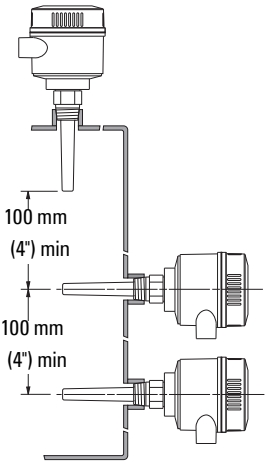


Close to tank walls



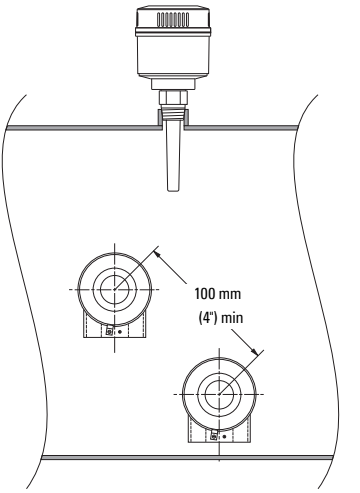
Multiple Units

Side View



Sensors must be at least 100 mm (4") apart.

End View



Mount diagonally if space is restricted

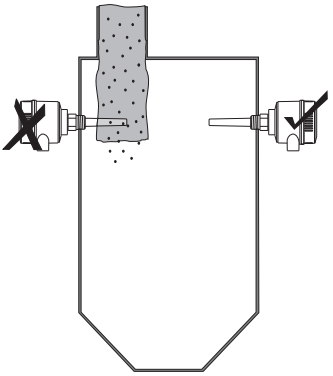
CLS200 Dimensions

Dimensions for all versions of the Pointek CLS200 Standard can be found in *Appendix E: Dimensions - CLS200* starting on page 57.

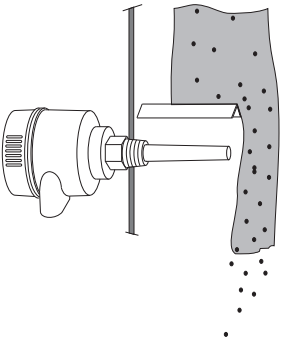
Process Cautions

Cautions:

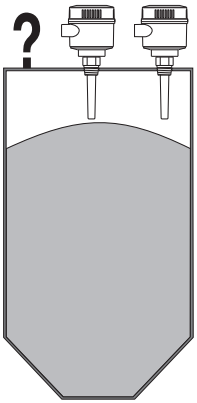
- The maximum allowable torque on a horizontally installed rod is 15 Nm.
- Keep unit out of path of falling material, or protect probe from falling material.

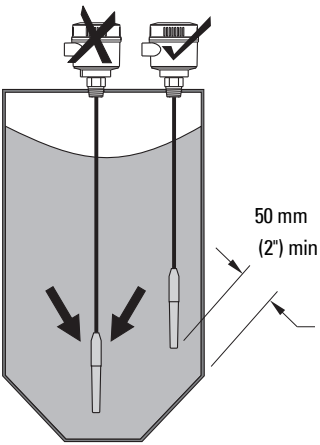


Caution: Consider material surface configuration when installing unit.

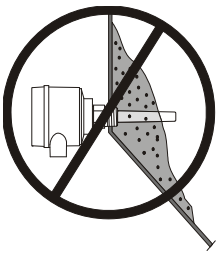


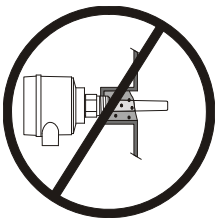
Caution: Tensile load must not exceed probe or vessel rating (See *Tensile (max)* on page 7.).





Caution: Avoid areas where material build up occurs.





Installation: Pointek CLS300 Standard

Notes:
- Installation shall only be performed by qualified personnel and in accordance with local governing regulations.
- This product is susceptible to electrostatic shock. Follow proper grounding procedures.
- The housing may only be opened for maintenance, local operation, or electrical installation.
- Before installing the instrument, verify that the environment complies with any restrictions specified on the product nameplate.
- To ensure compliance with CE EMC regulations, please install in accordance with the testing details on page 11.

Location

Recommended:

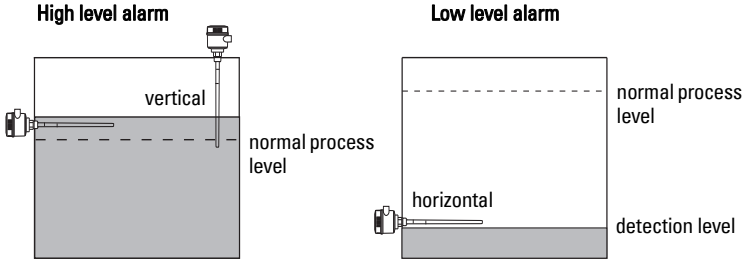
- Provide a sun shield to protect the transmitter from direct heat radiation.

Precautions:

- Avoid mounting Pointek CLS300 Standard in locations subject to strong vibrations in the vicinity, whenever possible.
- Do not exceed the permissible ambient temperature limits (see *Environmental* on page 9 for details).

Mounting

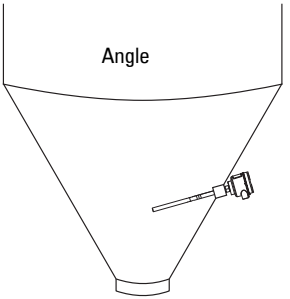
Pointek CLS300 typical configuration:



For high level alarm (level exceeds normal process level):
- normally mounted into the vessel top, or
- mounted through the tank wall at the detection level

For low level alarm (level drops below normal process level):
- mounted through the tank wall at the detection level

Angled mounting



Pointek CLS300 cable version:

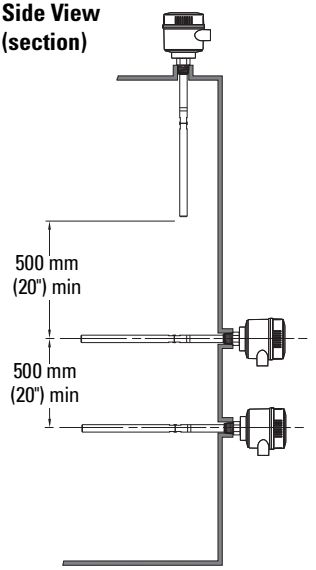
The cable version is designed for top mounting. The cable suspends vertically so that it reaches into the process at the desired detection level (high or low detection alarm).

Mounting Restrictions

Note:
- Keep the sensor at least 50 mm (2") away from any nozzle or tank wall.
- If multiple units are used, allow at least 500 mm (20") between them, to prevent interference.

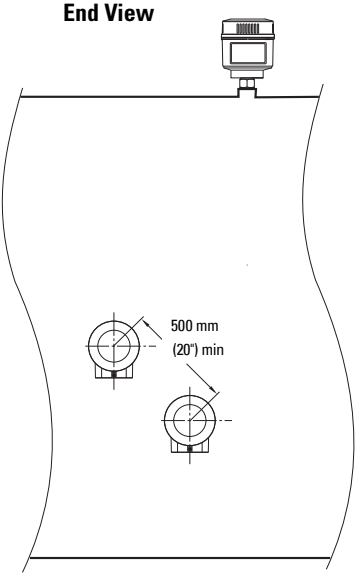
Multiple Units

Side View (section)



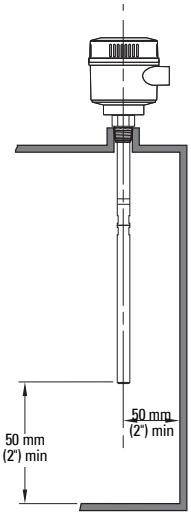
Sensors must be 500 mm (20") apart.

End View

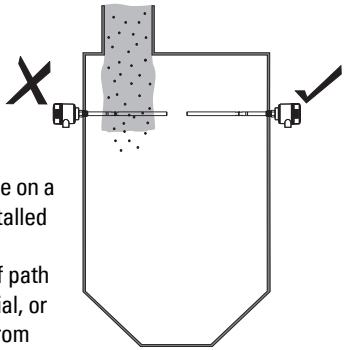


Mount diagonally if space is restricted.

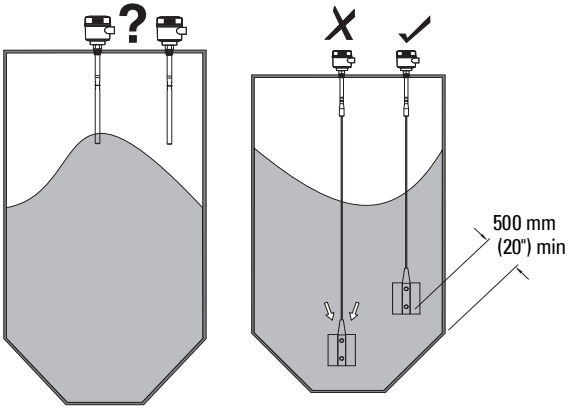
Wall Restriction



Process Cautions

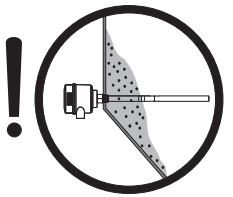


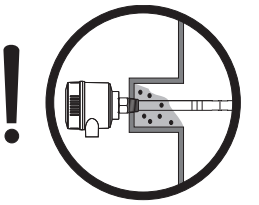
- The maximum allowable torque on a horizontally installed rod is 15 Nm.
- Keep unit out of path of falling material, or protect probe from falling material.



- Consider material surface configuration when installing unit.
- Tensile load must not exceed probe or vessel rating.

Note: Buildup of material in Active Shield area does not affect switch operation.





CLS300 Dimensions

Dimensions for all versions of the Pointek CLS300 Standard can be found in *Appendix F: Dimensions - CLS300* starting on page 65.

Wiring: Pointek CLS200/300 Standard

WARNING: All field wiring must have insulation suitable for at least 250 V.

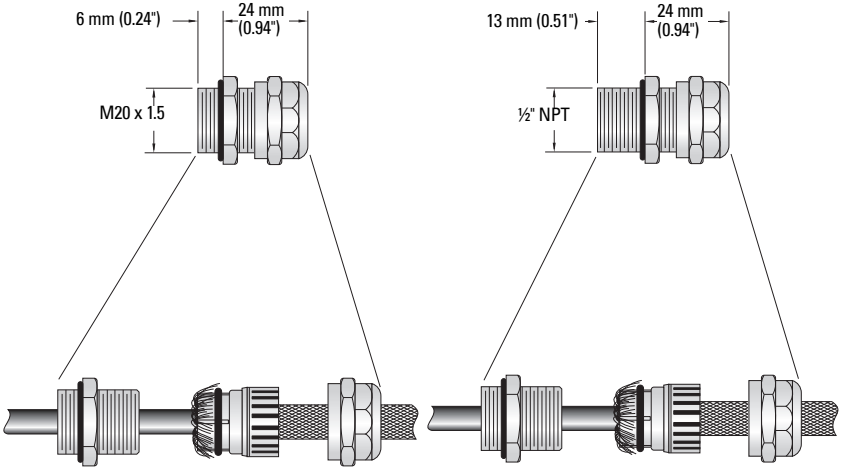
Notes:

- Only qualified personnel are authorized to install and operate this equipment in accordance with established safety practices and standards.
- The Protective Earth Terminal indicated by ⏚ must be connected to reliable ground. In case of non-metallic vessels, the external earth wire should be connected to an earthed component which is earthed near the vessel.
- All wiring must be done by qualified personnel in accordance with all governing regulations.
- The equipment must be protected by a 15A fuse or circuit breaker in the building installation.
- A circuit breaker or switch in the building installation, marked as a disconnect switch, shall be in close proximity to the equipment and within easy reach of the operator.
- Use shielded cable, wire gauge 20 AWG to 14 AWG (0.5 mm^2 to 2.0 mm^2). For CE installations use a cable with a braided metallic shield (or armoured cable where applicable).
- Maximum working voltage between adjacent relay contacts is 250 V.
- Relay contact terminals are for use with equipment which has no accessible live parts and wiring which has insulation suitable for at least 250 V.

1. Loosen the lid clip and remove the lid to access the connectors and electronics. (For quick reference, the diagram on the next page can also be found on the underside of the lid, together with a guide to switch function).
2. Connect the wires to the terminals (polarity is not important).
3. Ground the instrument according to local regulations.
4. Tighten the gland to form a good seal.
5. If you wish to carry out a function test, follow the test procedures on page 25.

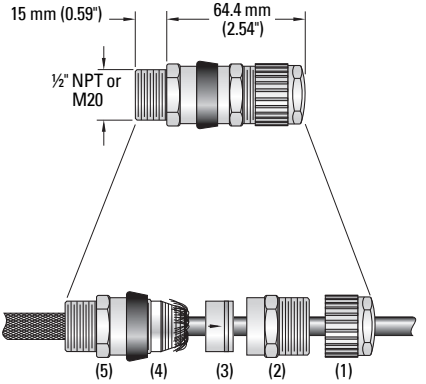
Recommended Cable Entries (equivalents can be used)

General Purpose Cable Entry: M20 (A5E03252531) and ½" NPT (A5E03252530)



1. Strip cable and expose braided shield.
2. Feed cable through dome nut and clamping insert. Fold braided shield over clamping insert. Make sure that braided shield overlaps the O-ring by 3/32" (2 mm) and covers the entry 360 degrees.
3. Push clamping insert into body and tighten dome nut. Assemble into housing.

Hazardous Location Cable Entry: M20 (A5E03252528) and ½" NPT (A5E03252527)



(1) Backnut
(2) Middle nut
(3) Reversible armour clamp
(4) Diaphragm seal/Armour spigot
(4.1) Cable guide
(5) Entry (with captive deluge seal)

1. Strip the cable to suit equipment and expose armour/braid.
2. Push the cable through the diaphragm shield/armour spigot (4). Pre-fitted cable guide (4.1) can now be discarded. The diaphragm seal can be rolled back to ease assembly as required. Spread armour/braid over the diaphragm seal/armour spigot

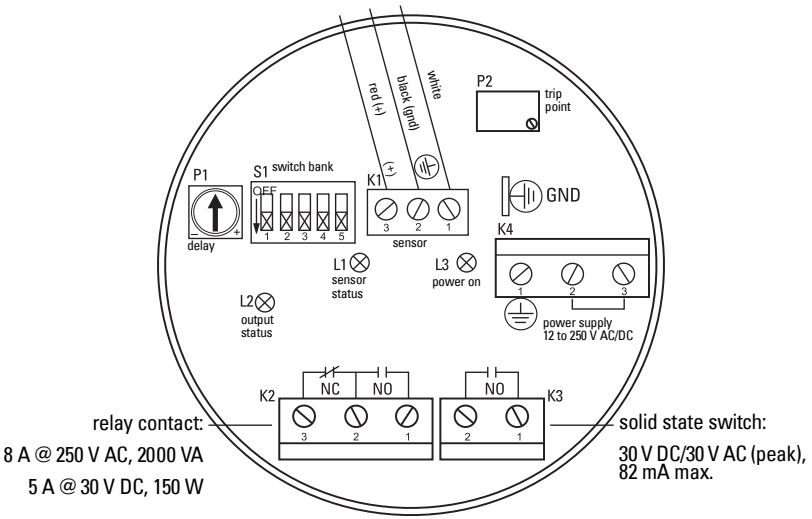
(4) until the end of the armour/braid is up against the shoulder of the armour cone. Position the armour clamping ring (3).

3. Place the entry (5) and position over the diaphragm seal/armour spigot (4). Move the sub-assembly (1) and (2) up to meet the entry (5).
4. Hold the entry (5) in position with a wrench to prevent rotation. Hand tighten the middle nut (2) to the entry (5), and turn a further 1/2 to 3/4 turn with a wrench.

Note: Support the cable to prevent it from twisting. To ease the wiring inside the enclosure, it may be beneficial to strip the inner sheath of the cable.

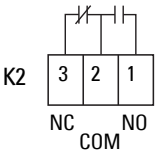
5. Unscrew the middle nut (2) and visually inspect that the armour/braid has been successfully clamped between the diaphragm seal/armour spigot and the armour clamping ring (3). If armour/braid is not clamped, repeat assembly. (Armour/braiding should be fitted 360 degrees around the entry.)
6. Reassemble the middle nut (2) onto the entry component (5). Tighten up the middle nut (2) until hand tight, then using a wrench, turn the nut through 1/4 turn. Tighten the backnut (1) to form a seal around the cable, then tighten a further full turn using a wrench. Ensure that the middle nut (2) does not rotate when tightening the backnut (1).

Note: The deluge seal on this gland locates on assembly and requires no further action. Locate shroud over cable gland, if applicable.



Note: Switch and potentiometer settings are for illustration purposes only.

Relay Output Connection



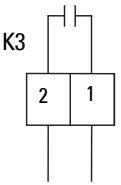
The relay is shown in a de-energized/unpowered state.

K2 contact ratings:

- max. switching voltage/current (DC): 30 V DC / 5 A
- max. switching voltage/current (AC): 250 V AC / 8 A
- max. switching capacity: 150 W / 2000 VA

Note: Switch and potentiometer settings are for illustration purposes only.

Solid-state Switch



Solid-state switch to customer's control or instrumentation device.

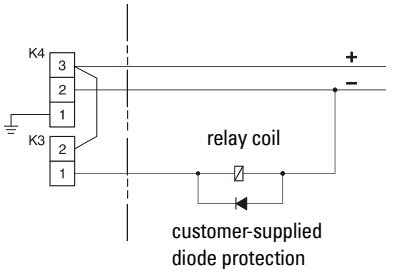
The switch is shown in de-energized/unpowered state.

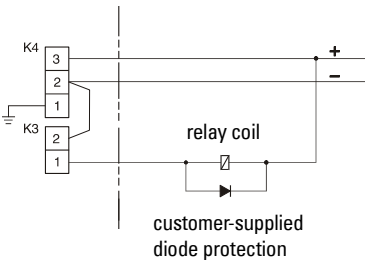
K3 contact ratings:

- Maximum Voltage: 30 V DC or peak AC
- Maximum Current: 82 mA
- Non-polarized

Diode Protection

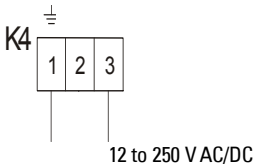
When driving an external relay with either the solid-state switch and/or relay outputs using DC power, protection diodes must be connected in the correct polarity across the relay coil to prevent possible switch/relay damage resulting from inductive spikes generated by the relay coil.





Power Connection

Nominal	24 V DC	48 V DC
V DC	22 to 26 V	46 to 50 V
R	120 Ω	234 Ω

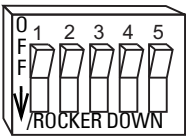


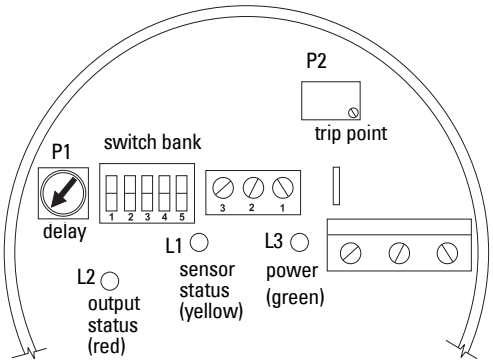
Connect protective earth wire to terminal provided in housing and marked with ⏚

Functionality Tests - CLS200

To test the basic functionality of the probe and potentiometers:

switches shown in OFF position





Preparation

1. Ensure the green power LED **L3** is on.
2. Set DIP switches **S1** to **S4** OFF (rocker down as shown in diagram above).
3. Set DIP switch **S5** ON (rocker up, opposite to diagram above).
4. Turn the delay potentiometer **P1** fully counter-clockwise.
5. If the yellow sensor status LED **L1** is not on, turn the trip-point potentiometer **P2** counter-clockwise until it just turns on.
6. Turn the trip-point potentiometer **P2** clockwise until LED **L1** just turns off.
7. Set DIP switch **S5** OFF (rocker down as shown in diagram above).

Test Procedures

Test the switch function:

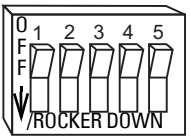
- Grasp the probe with your hand. LED **L1** should turn on. LED **L2** should turn on after a slight delay, and the output relay may provide an audible click.

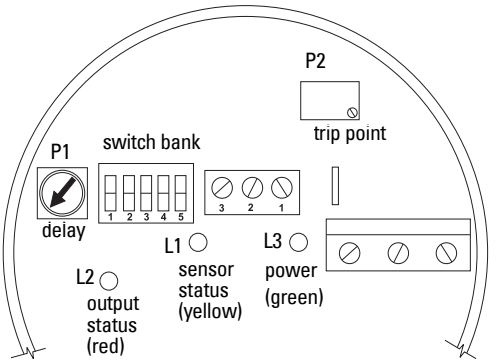
Test the delay:

1. Grasp the probe with your hand. **L1** should turn on (glow) immediately. The red output status LED **L2** should turn on after a delay.
2. Turn the delay potentiometer **P1** clockwise about 1/8 of a turn.
3. Grasp the probe with your hand. **L1** should turn on immediately, but **L2** should turn on after a longer delay than in Step 1.

Functionality Tests - CLS300

To test the basic functionality of the probe and potentiometers:





Preparation

1. Ensure green power light **L3** is on.
2. Turn the delay potentiometer **P1** fully clockwise (minimum delay).
3. Set dip switches **S1** to **S4 OFF** (full potentiometer control activated).
4. Set switch **S5 ON** (high sensitivity).

Test Procedures

Test the sensitivity of the sensor:

- If the yellow sensor status LED (**L1**) is on, turn potentiometer **P2** clockwise until it turns off.
- Slowly turn the trip point potentiometer **P2** counter-clockwise until the yellow sensor status light **L1** glows. Shortly afterwards, the red output status light **L2** will glow. This concludes the sensitivity test.

Test the delay:

1. Turn the trip point potentiometer **P2** clockwise, until the yellow sensor status LED **L1** turns off.
2. Turn the delay potentiometer **P1** about 1/8 turn clockwise (delay set point).
3. Slowly turn the trip point potentiometer **P2** counter-clockwise until the yellow sensor status light **L1** glows. After an appropriate delay the red output status light **L2** will glow. This concludes the delay test.

Test the switch function:

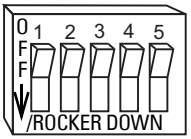
1. Turn the delay potentiometer **P1** fully counter-clockwise.
2. Turn the trip point potentiometer **P2** clockwise until the yellow sensor status LED **L1** is off.
3. Slowly turn the trip point potentiometer **P2** counter-clockwise until the yellow sensor status light glows.
4. Slowly turn the trip point potentiometer **P2** clockwise until the yellow sensor status light just stops glowing. Grasp the probe with your hand. The yellow sensor status light **L1** will glow, indicating switch function. After an appropriate delay the red output status light **L2** will glow. This concludes the switch function test.

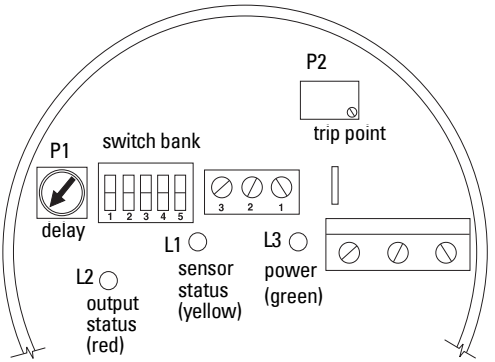
Operation: Pointek CLS200 Standard model

User Interface

- A switch bank of five dip switches allows you to control the settings for Pointek CLS200 (standard model).
- Three LEDs (**L2**, **L1**, and **L3**) indicate output status, sensor status, and power ON or OFF.
- Two potentiometers (**P1** and **P2)** adjust the alarm delay and trip point settings. Note: turning P2 clockwise decreases sensitivity; counter-clockwise increases sensitivity.

switches shown in OFF position





Indicators

Three LEDs (**L1**, **L2**, and **L3**) indicate power status, sensor status, and alarm output status:

LED status	Sensor status: L1 (yellow)	Output status: L2 (red)	Power status: L3 (green)
Lit	sensor contacting, or very close to, process material (material capacitance greater than setpoint for P2)	alarm OFF (relay energized/ switch closed)	power ON
Unlit	sensor not contacting process material (material capacitance less than setpoint for P2)	alarm ON (relay de-energized/ switch open)	no power

Alarm Output

The relay and solid-state switch are connected, and provide the alarm output:

	Relay	Solid-state switch	Output status/Red LED
Alarm OFF	energized	closed	lit
Alarm ON	de-energized	open	unlit

Alarm Output Status

There are two alarm options:

	Probe	Relay	Solid-state switch	Output status/ Red LED
Low Alarm	uncovered (level too low)	de-energized	open[a]	unlit
High Alarm	covered (level too high)	de-energized	open[a]	unlit

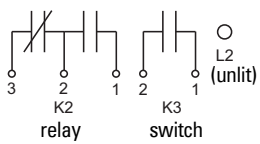
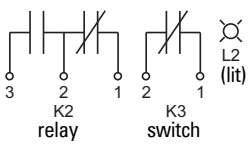
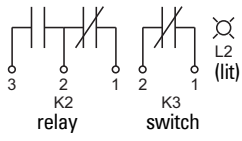
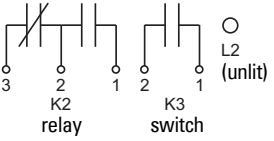
a. The manual assumes that the pump should be turned off in the event of a failure. If this is not the case in your process, please see the relay schematic below, and make the appropriate connections to suit your application.

Failsafe

The Failsafe function controls the response of Pointek CLS200 to a fault so that the process will be put into a safe mode of operation. (See *Fault Signaling* on page 80 for further details). Failsafe and Alarm mode are interconnected:

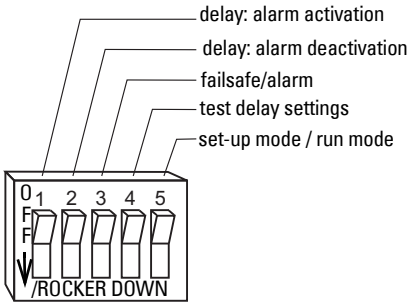
- High Alarm/Failsafe High
- Low Alarm/Failsafe Low

Relay and solid-state switch functionality

Alarm Mode	Dip Switch	Covered Probe	Uncovered Probe
Failsafe High	S3 ON		
Failsafe Low	S3 OFF		

Switch Bank

4 dip switches (S1, S2, S3, and S5) control settings for the alarm output. The fifth dip switch (S4) is used only to test the delay settings.



Dip switches shown in **OFF (open)** position.

Failsafe/Alarm Setting: S3

- When Failsafe switch S3 is ON, it inverts the relay function, and the functioning of S1 and S2.

Alarm Mode				
High	S3-ON	probe covered	alarm activated (ON)	relay de-energized
Low	S3-OFF	probe uncovered	alarm activated (ON)	relay de-energized

Delay Settings: S1 and S2

Use the delay function to slow the response, and compensate for turbulence or false readings.

- Delay potentiometer P1 can be adjusted to set a delay time from 1 to 60 seconds.
- Two separate delay settings are controlled by S1 and S2:
  - for alarm activation (alarm ON)
  - for alarm de-activation (alarm OFF)
- When switches are OFF (open) the delay is enabled.
- The position of Failsafe switch S3 determines how S1 and S2 function.

S3-ON	High alarm/ overfill protection	S1-ON	disables delay of alarm de-activation (alarm OFF)
		S2-ON	disables delay of alarm activation (alarm ON)
S3-OFF	Low alarm/dry run protection	S1-ON	disables delay of alarm activation (alarm ON)
		S2-ON	disables delay of alarm de-activation (alarm OFF)

Set-up mode / run mode: S5

S5-ON	Set-up mode	Use this setting only during trip-point set-up.
S5-OFF	Run mode	Use this setting during normal operation after set-up is complete.

Test settings: S4

- When S4 is set to ON, it inverts the signal, allowing you to test the delay settings from P1, or to verify that S1 and S2 are in the correct position.

S4-ON	Enable test	Observe the response of the output status and sensor status LEDs to verify the delay interval set by potentiometer P1.
S4-OFF	Normal operation	

Setup

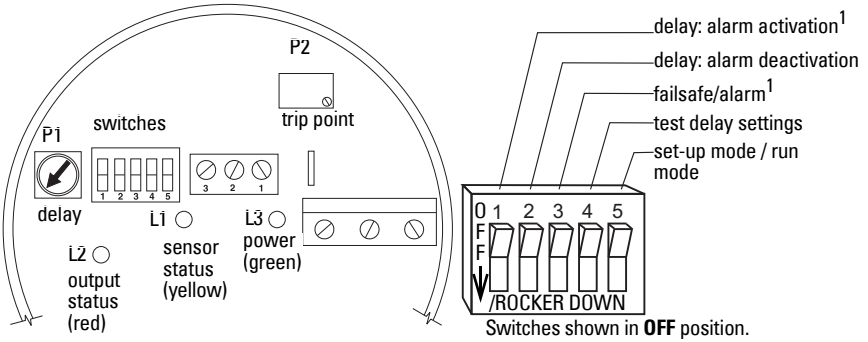
> **! WARNING: It is essential to check settings during the process itself, and confirm that they are correct, before regular operation commences.**

Initial setup can be carried out prior to mounting into the process, but it is extremely important to calibrate the unit and adjust the sensitivity on the product itself.

Start Up

After Pointek CLS200 is properly mounted apply power to the unit. The green LED (L3) glows, indicating the unit is powered and operational.

Setpoint Adjustment



Switches shown in **OFF** position.

Use the potentiometers **P1** and **P2** to adjust the alarm delay and setpoint. Follow the setup procedure for the application that most closely describes your operation:

Application	Material	Setup conditions
General	• dry solids • low viscosity liquids	sensor uncovered; min. 100 mm (4") free space all around
Demanding	• hygroscopic / wet solids • high viscosity and high conductivity liquids	sensor immersed then uncovered; but retaining max. possible material buildup
Interface detection	• liquid A / liquid B • foam / liquid	immerse sensor in whichever material has lowest dielectric constant

Calibration for general applications (Failsafe low, no delay)

1. Ensure the green power LED **L3** is on.
2. Set DIP switches **S1** to **S4** toOFF.
3. Set DIP switch **S5** ON (set-up mode).
4. Ensure the probe is uncovered. If the yellow sensor status LED **L1** is not on, turn the trip-point potentiometer **P2** counter-clockwise until it just turns on.
5. Turn the trip-point potentiometer **P2** clockwise until LED **L1** just turns off.
6. Set DIP switch **S5** to OFF (run mode).

Calibration for demanding applications (Failsafe low, no delay)

1. Ensure that the green power LED **L3** is on.
2. Set DIP switches **S1** to **S4** to OFF.
3. Set DIP switch **S5** to ON (set-up mode).
4. Turn the delay potentiometer **P1** fully counterclockwise.
5. Adjust the material level of the process so that the sensor is immersed.

1. When S3 is set to ON, it inverts the relay function, and the functioning of S1 and S2.

6. Adjust the material level of the process so that the sensor is uncovered, but retains as much buildup of material as possible on the sensor.
7. If the yellow sensor status LED **L1** is not on, turn the trip point potentiometer **P2** counter-clockwise until it just turns on.
8. Turn the trip point potentiometer **P2** clockwise until LED **L1** just turns off.
9. Set DIP switch **S5** to OFF (run mode).

Calibration for interface detection (Failsafe low, no delay)

1. Ensure that the green power LED **L3** is on.
2. Set DIP switches **S1** to **S4** to OFF.
3. Set DIP switch **S5** to ON (set-up mode).
4. Turn the delay potentiometer **P1** fully counter-clockwise.
5. Adjust the material level of the process so that the sensor is covered by the material with the lowest relative dielectric constant.
6. If the yellow sensor status LED **L1** is not on, turn the trip point potentiometer **P2** counter-clockwise until it just turns on.
7. Turn the trip point potentiometer **P2** clockwise until LED **L1** just turns off.
8. Set DIP switch **S5** to OFF (run mode).

Delay alarm output

If you want to slow the Pointek CLS200 response, to compensate for turbulence or false readings, set a delay interval using potentiometer **P1**, and set **S1** and/or **S2** to OFF, to enable the delay for either alarm activation, alarm de-activation, or both.

If an immediate alarm output is critical, set the appropriate switch to ON, to disable the delay.

The functioning of **S1** and **S2** depends on the alarm setting:

High alarm/ overfill protection	S1-ON	disables delay of alarm de-activation (alarm OFF)
	S2-ON	disables delay of alarm activation (alarm ON)
Low alarm/ dry run protection	S1-ON	disables delay of alarm activation (alarm ON)
	S2-ON	disables delay of alarm de-activation (alarm OFF)

To test the delay function, follow the test procedure on page 25.

Operation

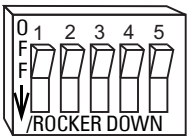
After completing the setup, replace the lid and secure the lid clip. Pointek CLS200 Standard model is now ready to operate.

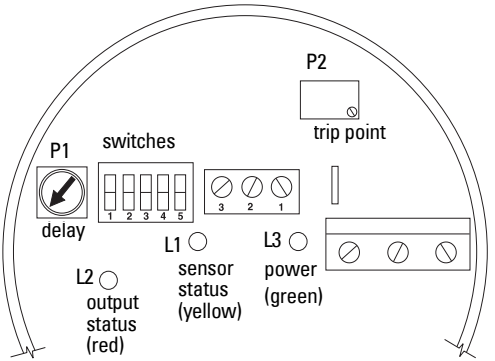
Operation: Pointek CLS300 Standard model

User Interface

- A switch bank of five dip switches allows you to control the settings for Pointek CLS300 (standard model).
- Three LEDs (**L2**, **L1**, and **L3**) indicate output status, sensor status, and power ON or OFF.
- Two potentiometers (**P1** and **P2)** adjust the alarm delay and trip point settings.

switches shown in OFF position





Indicators

Three LEDs (**L1**, **L2**, and **L3**) indicate power status, sensor status, and alarm output status:

LED status	Sensor status: L1 (yellow)	Output status: L2 (red)	Power status: L3 (green)
Lit	sensor contacting, or very close to, process material (material capacitance greater than setpoint for P2)	alarm OFF (relay energized/ switch closed)	power ON
Unlit	sensor not contacting process material (material capacitance less than setpoint for P2)	alarm ON (relay de-energized/ switch open)	no power

Alarm Output

The relay and solid-state switch are connected, and provide the alarm output:

	Relay	Solid-state switch	Output status/Red LED
Alarm OFF	energized	closed	lit
Alarm ON	de-energized	open	unlit

Alarm Output Status

There are two alarm options:

	Probe	Relay	Solid-state switch	Output status/ Red LED
Low Alarm	uncovered (level too low)	de-energized	open[a]	unlit
High Alarm	covered (level too high)	de-energized	open[a]	unlit

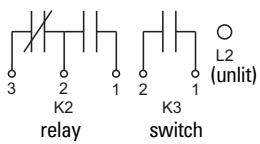
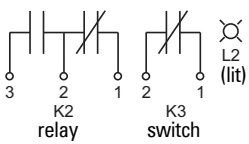
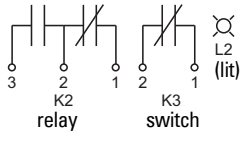
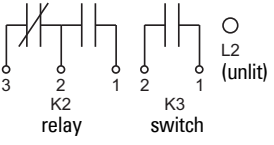
a. The manual assumes that the pump should be turned off in the event of a failure. If this is not the case in your process, please see the relay schematic below, and make the appropriate connections to suit your application.

Failsafe

The Failsafe function controls the response of Pointek CLS300 to a fault so that the process will be put into a safe mode of operation. (See *Fault Signaling* on page 80 for further details). Failsafe and Alarm mode are interconnected:

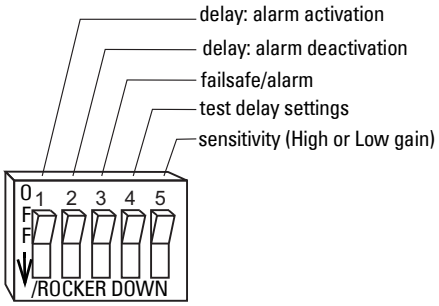
- High Alarm/Failsafe High
- Low Alarm/Failsafe Low

Relay and solid-state switch functionality

Alarm Mode	Dip Switch	Covered Probe	Uncovered Probe
Failsafe High	S3 ON		
Failsafe Low	S3 OFF		

Switch Bank

4 dip switches (S1, S2, S3, and S5) control settings for the alarm output. The fifth dip switch (S4) is used only to test the delay settings.



Dip switches shown in **OFF (open)** position.

Failsafe/Alarm Setting: S3

- When Failsafe switch S3 is ON, it inverts the relay function, and the functioning of S1 and S2.

Alarm Mode				
High	S3-ON	probe covered	alarm activated (ON)	relay de-energized
Low	S3-OFF	probe uncovered	alarm activated (ON)	relay de-energized

Delay Settings: S1 and S2

Use the delay function to slow the response, and compensate for turbulence or false readings.

- Delay potentiometer P1 can be adjusted to set a delay time from 1 to 60 seconds.
- Two separate delay settings are controlled by S1 and S2:
  - for alarm activation (alarm ON)
  - for alarm de-activation (alarm OFF)
- When switches are OFF (open) the delay is enabled.
- The position of Failsafe switch S3 determines how S1 and S2 function.

S3-ON	High alarm/ overfill protection	S1-ON	disables delay of alarm de-activation (alarm OFF)
		S2-ON	disables delay of alarm activation (alarm ON)
S3-OFF	Low alarm/dry run protection	S1-ON	disables delay of alarm activation (alarm ON)
		S2-ON	disables delay of alarm de-activation (alarm OFF)

Sensitivity setting (high or low): S5

S5-ON	High sensitivity	Use this setting for measuring dry solids or non-conductive liquids.
S5-OFF	Low sensitivity	Use this setting for measuring conductive liquids, or viscous conductive solids that can build up on the sensor.

Test settings: S4

- When S4 is set to ON, it inverts the signal, allowing you to test the delay settings from P1, or to verify that S1 and S2 are in the correct position.

S4-ON	Enable test	Observe the response of the output status and sensor status LEDs to verify the delay interval set by potentiometer P1.
S4-OFF	Normal operation	

Setup

> **! WARNING: It is essential to check settings during the process itself, and confirm that they are correct, before regular operation commences.**

Initial setup can be carried out prior to mounting into the process, but it is extremely important to calibrate the unit and adjust the sensitivity on the product itself.

For a simple application, set Pointek CLS300 to Low alarm/no delays:

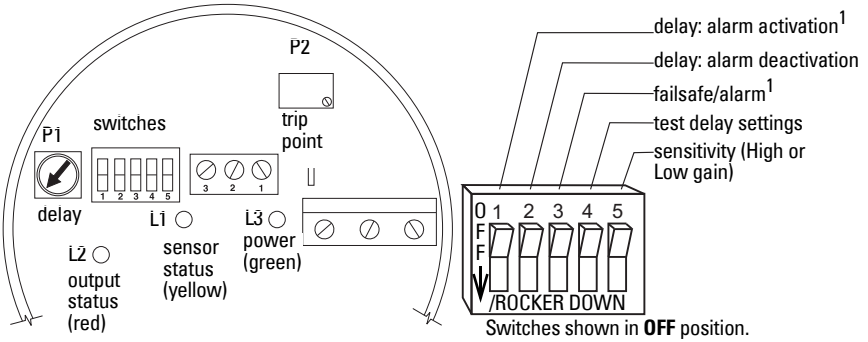
- turn P1 fully counter-clockwise (no delay interval)
- set dip switches S1, S2 and S5 to ON, S3 and S4 to OFF

S1-ON	Delay disabled	
S2-ON	Delay disabled	
S3-OFF	Low alarm	• probe uncovered = alarm ON/relay de-energized
S4-OFF	Test function disabled	• normal operation
S5-ON	High sensitivity	• default setting • for dry solids or non-conductive liquids

Start Up

After Pointek CLS300 is properly mounted and the switch bank is set up, apply power to the unit. The green LED (L3) glows, indicating the unit is powered and operational.

Setpoint Adjustment



Switches shown in **OFF** position.

Use the potentiometers **P1** and **P2** to adjust the alarm setpoints. Follow the setup procedure for the application that most closely describes your operation:

Application	Material	Setup conditions	S5
General	• dry solids • low viscosity liquids	sensor uncovered; min. 100 mm (4") free space all around	ON (high)
Demanding	• hygroscopic / wet solids • high viscosity and high conductivity liquids	sensor immersed then uncovered; but retaining max. possible material buildup	OFF (low)
Interface detection	• liquid A / liquid B • foam / liquid	immerse sensor in whichever material has lowest dielectric constant	OFF (low)

General applications (Failsafe Low, no delay)

Preparation

- Ensure that **L3** (green) is lit.
- If the yellow sensor status LED **L1** is on, turn trip point potentiometer **P2** clockwise until it is off.
- Turn the delay potentiometer **P1** fully counter-clockwise (to minimum).
- Set dip switches **S1** to **S4** to **OFF**, and **S5** to **ON** (high sensitivity).

Configuration

1. With sensor uncovered and a minimum 100 mm (4") free space all around, turn the trip point potentiometer **P2** counter-clockwise until **L1** (yellow) glows.
2. Turn **P2** back (clockwise) until **L1** stops glowing.

1. When S3 is set to ON, it inverts the relay function, and the functioning of S1 and S2.

Demanding applications (Failsafe Low, no delay, sensitivity adjusted for viscous, conductive material)

Preparation

- Ensure that **L3** (green) is lit.
- Turn the delay potentiometer **P1** fully counter-clockwise (to minimum).
- Turn trip point potentiometer **P2** fully counter-clockwise (to maximum).
- Set dip switches **S1** to **S4** to **OFF** (full potentiometer control).
- Set **S5** to **OFF** (low sensitivity).

Configuration

1. Adjust the material level of the process so that the sensor is immersed: **L1** (yellow) should glow. If **L1** does not glow, reset **S5** to **ON** (high sensitivity) The appropriate position of **S5** depends on the dielectric properties of the material).
2. Adjust the material level of the process so that the sensor is uncovered, but retains as much buildup of material as possible on the sensor.
3. Adjust trip point **P2** clockwise until **L1** stops glowing. To get the true feel for the correct position, adjust **P2** counter-clockwise then clockwise several times to ensure that **L1** stops glowing. (This adjustment is very sensitive, and we recommend repeating this exercise to fine tune **P2**, until a very small adjustment causes **L1** to stop glowing.)

Interface detection (Failsafe Low, no delay, sensitivity adjusted to detect an interface)

Preparation

- Ensure that **L3** (green) is lit.
- Turn delay potentiometer **P1** fully counter-clockwise (to minimum).
- Turn trip point potentiometer **P2** fully counter-clockwise (to maximum).
- Set dip switches **S1** to **S4** to **OFF** (full potentiometer control).
- Set **S5** to **OFF** (low sensitivity).

Configuration

1. Immerse the sensor in the material that has the lowest dielectric constant. **L1** (yellow) should glow. If not, reset **S5** to ON (high sensitivity).
2. Adjust **P2** clockwise until **L1** stops glowing.
3. Immerse the sensor in the material that has the highest dielectric constant. **L1** should glow.

Delay alarm output

If you want to slow the Pointek CLS300 response, to compensate for turbulence or false readings, set a delay interval using potentiometer **P1**, and set **S1** and/or **S2** to OFF, to enable the delay for either alarm activation, alarm de-activation, or both.

If an immediate alarm output is critical, set the appropriate switch to ON, to disable the delay.

The functioning of **S1** and **S2** depends on the alarm setting:

High alarm/ overfill protection	S1-ON	disables delay of alarm de-activation (alarm OFF)
	S2-ON	disables delay of alarm activation (alarm ON)
Low alarm/ dry run protection	S1-ON	disables delay of alarm activation (alarm ON)
	S2-ON	disables delay of alarm de-activation (alarm OFF)

To test the delay function, follow the test procedure on page 25.

Operation

After completing the setup, replace the lid and secure the lid clip. Pointek CLS300 Standard model is now ready to operate.

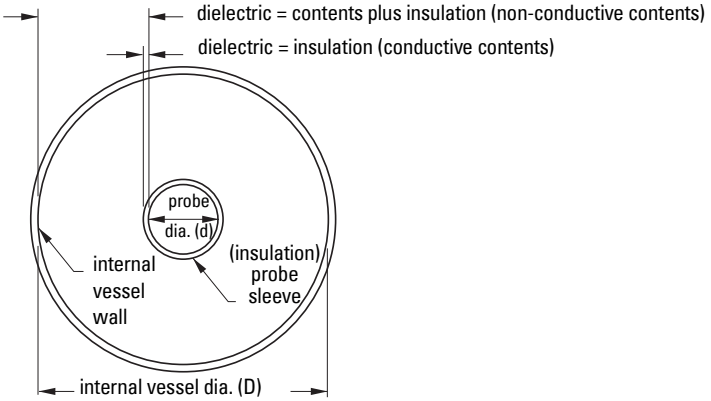
Troubleshooting: Pointek CLS200/300 Standard model

Symptom	Observation	Action
No Alarm Response	**L3** (green) off.	Check power supply voltage.
Alarm doesn't switch when sensor is uncovered.	**L1** (yellow) doesn't respond when sensor is uncovered.	CLS200: Readjust trip point potentiometer **P2**. CLS300: Check sensitivity switch **S5**. Readjust trip point potentiometer **P2**.
	L1 (yellow) responds when sensor is uncovered.	Check that relay changes state when **S3** is toggled ON and OFF.
Alarm doesn't switch on when sensor is covered.	**L1** (yellow) doesn't respond when sensor is covered.	CLS200: Readjust trip point potentiometer **P2**. CLS300: Check sensitivity switch **S5**. Readjust trip point potentiometer **P2**.
	L1 (yellow) responds when sensor is covered.	Check that relay changes state when **S3** is toggled ON and OFF.
	L1 (yellow) flashes when material level approaches the alarm setpoint.	

Appendix A: Technical References

Operating Principles

In capacitance measurement[1] inside a vessel or silo, the environment (typically, the vessel wall) acts as the reference electrode of a variable capacitor, and the probe supplies the measurement electrode. The dielectric[2] is composed of the vessel contents (air, vapor, liquid, solid, or a combination) and, if the measurement electrode is insulated, the insulating layer.



The capacitance when the probe is uncovered (capacitance in air) will be different from the capacitance when the probe is covered (for example, capacitance in water). If the product is two immiscible liquids with different relative dielectric constants, (for example, oil and water) the capacitance will change at the interface between the two liquids.

High Frequency Oscillator

The Pointek CLS200/300 probe is equipped with a high frequency oscillator which responds to the capacitance. The inverse of frequency is proportional to the capacitance. A small change in capacitance results in a large change in frequency which is easy to detect, resulting in high resolution and accuracy.

Detection Range

The functional detection range depends on the relative dielectric constant of the material monitored. The detection range will be shorter when the material has a lower relative dielectric constant, and longer when it has a higher relative dielectric constant.

1. For definitions relating to capacitance, see the glossary, page 81
2. The relative dielectric constant of air (vacuum) is 1: all other materials have a higher value.

See *Specifications: Standard model*, page 6, for performance information; also check the product nameplate on the enclosure, for details of your particular instrument.

The Pointek CLS200 electrode

The Pointek CLS200 electrode is the primary sensor of the system. It supplies the electrical capacitance value. The reference is the environment at the time of setup.

The design of the Pointek CLS200 probe makes it very sensitive to changes in capacitance in the immediate vicinity of the electrode tip.

$$R = \frac{Ca_1 + Ca_2}{Ca_1 + Ca_2 + Cm_1 + Cm_2}$$

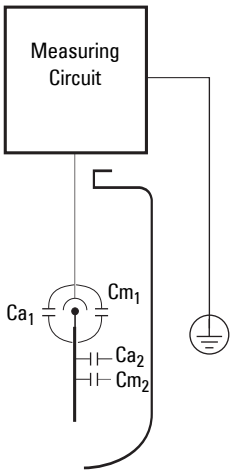
R = Ratio between initial capacitance and total capacitance

Ca_1 = Initial capacitance of the CLS200

Ca_2 = Initial capacitance (air) between the probe and the installation

Cm_1 = Capacitance increase of the CLS200 caused by product replacing air

Cm_2 = Capacitance increase between the probe and the installation caused by product replacing air.



The initial capacitance of the CLS200 itself makes it possible to operate the CLS200 in a plastic tank where the Ca_2 and Cm_2 terms would disappear. However, a properly grounded metal tank will reduce the effects of external influences on the sensor.

The sensor can be set to detect either the change in capacitance as the product level approaches the electrode tip, or the change when the probe becomes covered.

The Pointek CLS300 electrode

The Pointek CLS300 electrode is the primary sensor of the system. It supplies the electrical capacitance value.

The Pointek CLS300 patented Active Shield Technology electrically isolates the measurement section and reduces the effect of any non-measurement capacitance on the measurement capacitance. (Capacitance changes could result from uncontrolled variations occurring in the connection cable, process connection, and non-active parts of the probe.) This gives a better ratio of initial capacitance to total capacitance, resulting in higher accuracy.

Pointek CLS300 with Active Shield

$$R = \frac{Ca}{Ca + Cm}$$

Conventional Capacitance Measurement

$$R = \frac{(C1 + C2 + C3) + Ca}{(C1 + C2 + C3) + Ca + Cm}$$

R = Ratio between initial capacitance and total capacitance

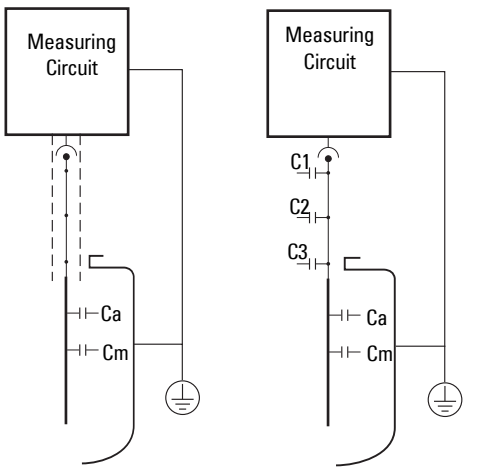
Ca = Initial capacitance (air)

Cm = Capacitance Increase (product)

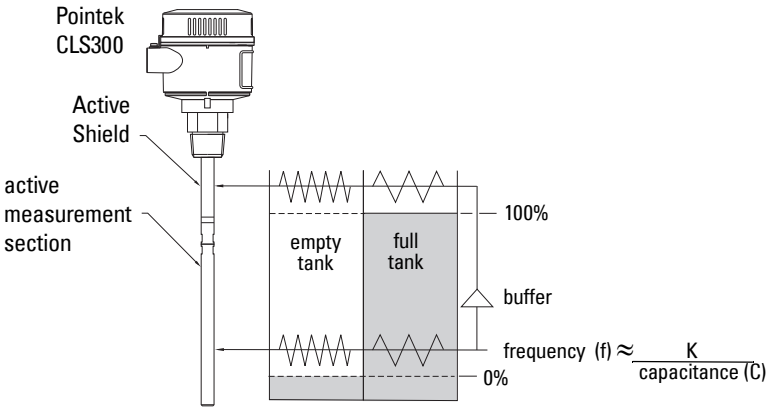
C1 = Capacitance connection point

C2 = Capacitance connection cable

C3 = Capacitance Process connection (includes active part)



The measurement is further protected from interference by a buffer, which applies the frequency signal from the measurement section to the Active Shield section. This effectively eliminates any electrical potential difference between the shield and the measurement section and prevents additional changes in capacitance occurring, especially when material builds up at the probe entrance to the tank.

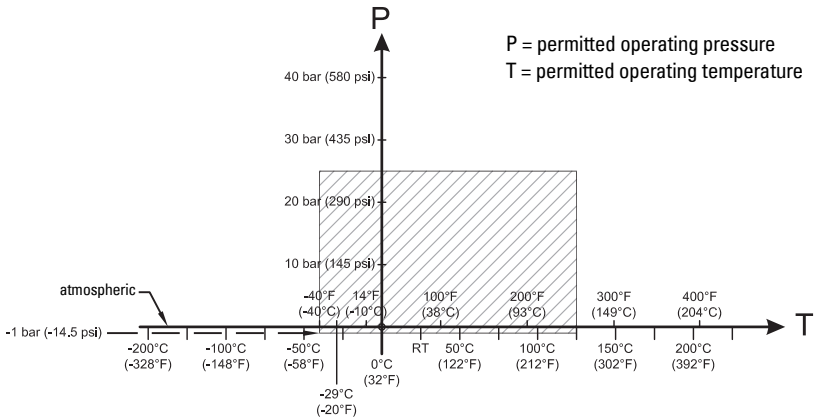


The relative lengths of the measurement section and Active Shield section can be specified to suit a particular application. If the measured range will be short relative to the total length of the electrode, specify a short measurement section. This increases the achievable resolution of the measurement, since any change in level will be greater relative to the length of the measurement section.

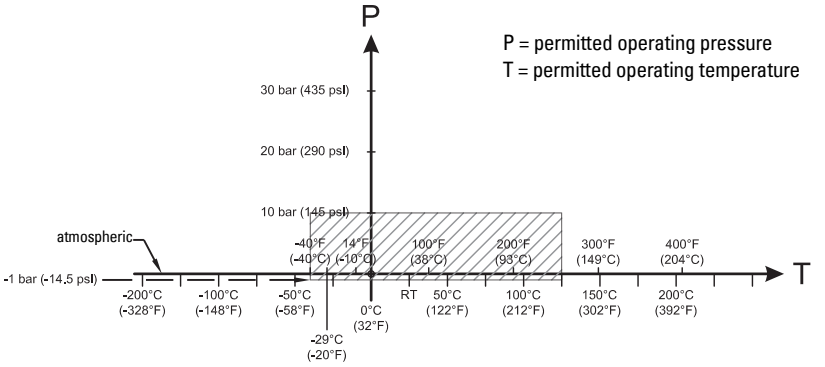
The powder-coated aluminum enclosure provides reliable operation in environments with dust, moisture, and high-frequency interference.

Pointek CLS200 Standard Pressure versus Temperature Curves

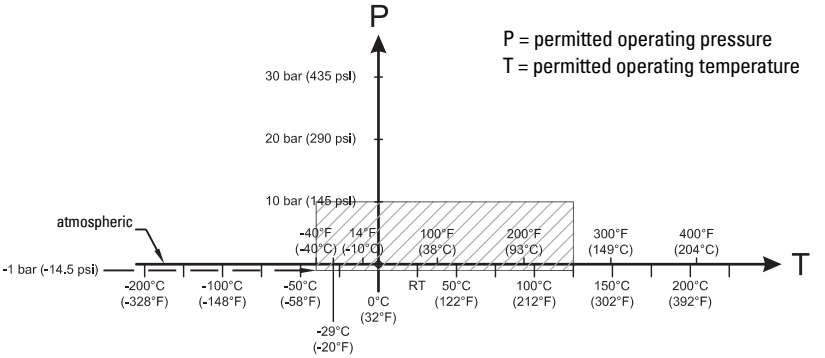
CLS200 compact and extended rod versions, threaded



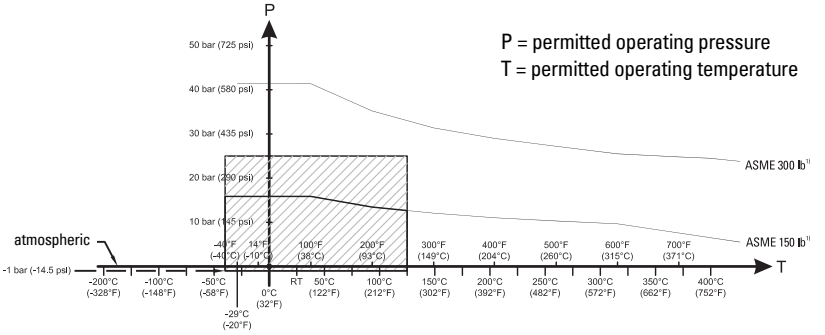
CLS200 cable version, threaded



CLS200 sanitary compact and extended rod versions

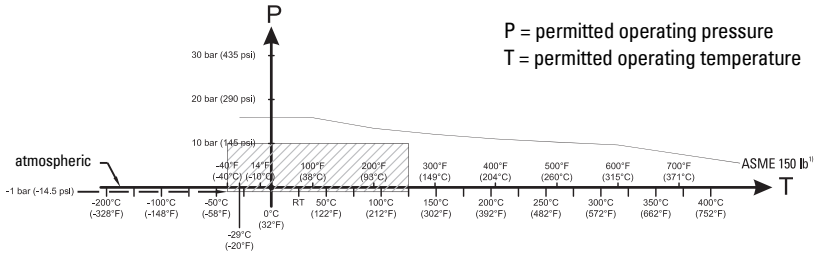


CLS200 compact and extended rod, ASME welded flange



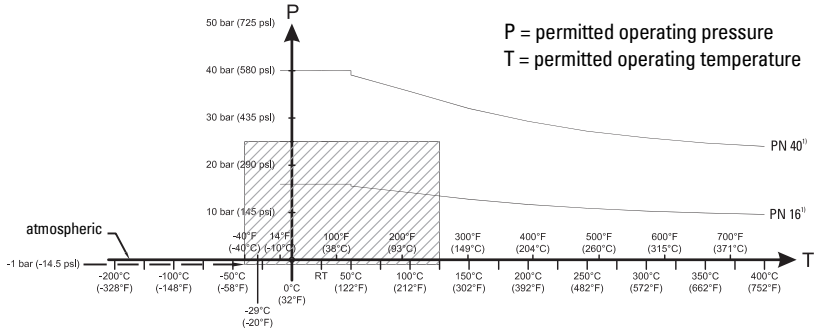
1) The curve denote the minimum allowable flange class for the shaded area below.

CLS200 cable, ASME welded flange



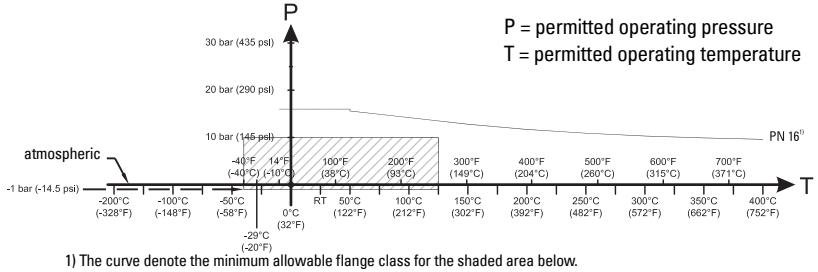
1) The curve denote the minimum allowable flange class for the shaded area below.

CLS200 compact and extended rod, EN welded flange



1) The curve denote the minimum allowable flange class for the shaded area below.

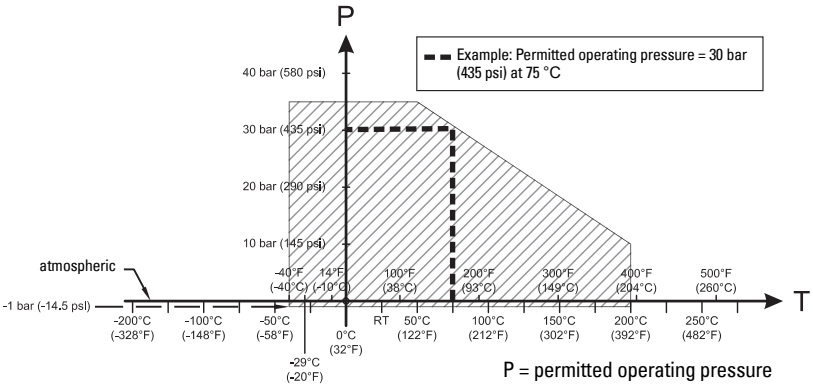
CLS200 cable, EN welded flange



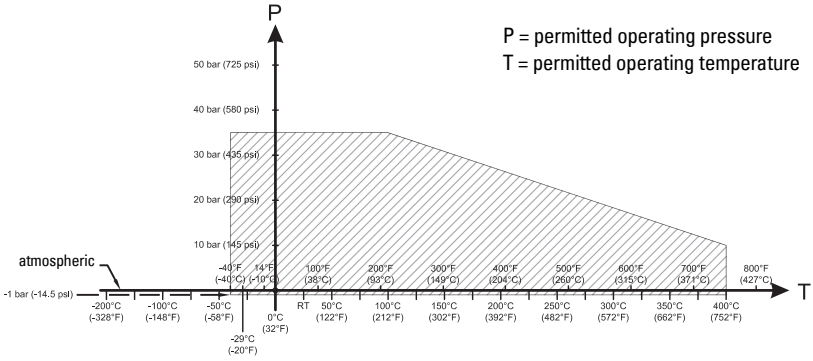
1) The curve denote the minimum allowable flange class for the shaded area below.

Pointek CLS300 Standard Pressure versus Temperature Curves

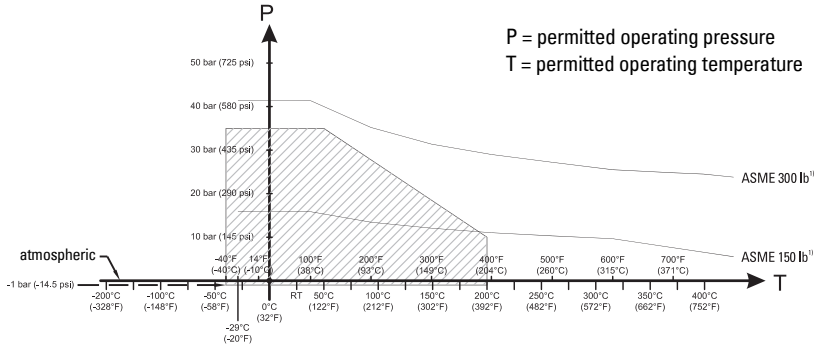
CLS300 standard, extended rod and cable versions, threaded



CLS300 high temperature rod version, threaded

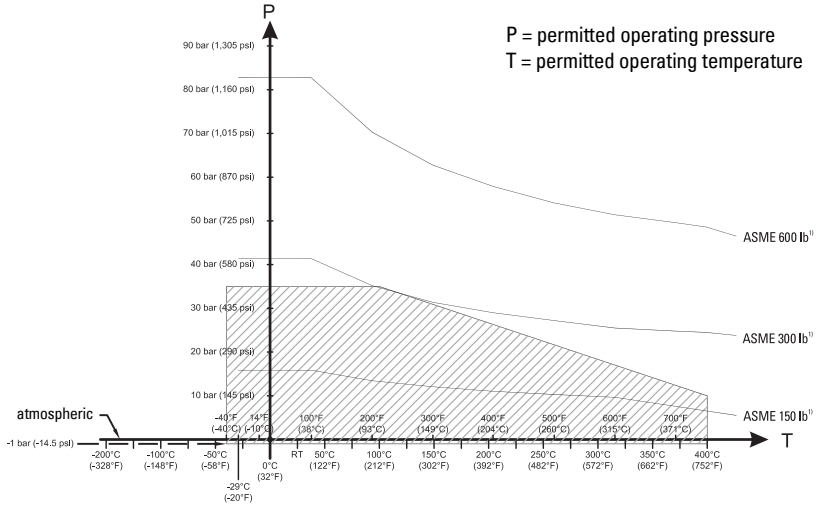


CLS300 standard, extended rod and cable versions, ASME welded flange



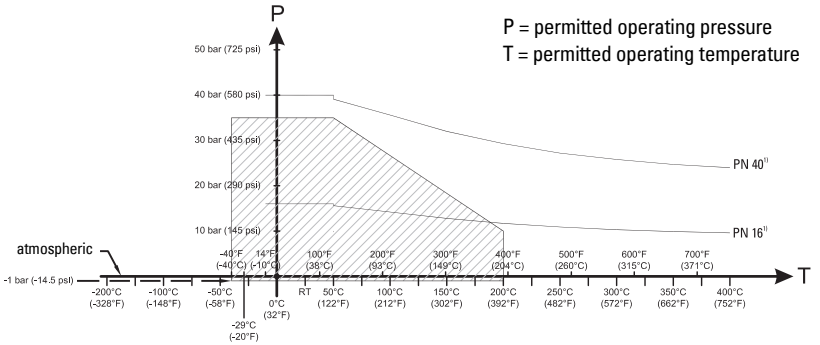
1) The curve denote the minimum allowable flange class for the shaded area below.

CLS300 high temperature rod version, ASME welded flange



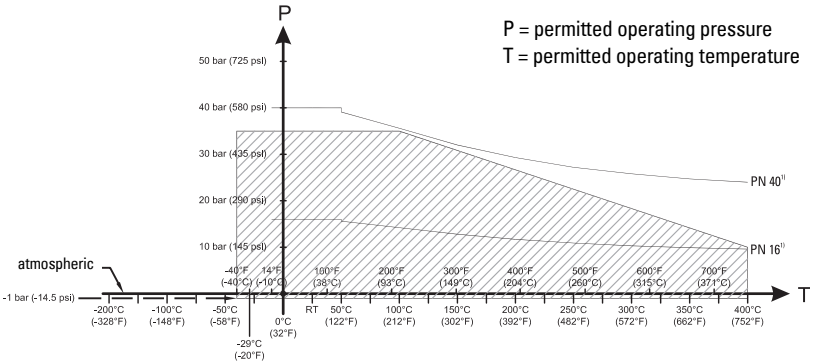
1) The curve denote the minimum allowable flange class for the shaded area below.

CLS300 standard, extended rod and cable versions, EN welded flange



1) The curve denote the minimum allowable flange class for the shaded area below.

CLS300 high temperature rod version, EN welded flange



1) The curve denote the minimum allowable flange class for the shaded area below.

Appendix B: Maintenance and Repairs

Pointek CLS200/300 requires no maintenance or cleaning.

Unit Repair and Excluded Liability

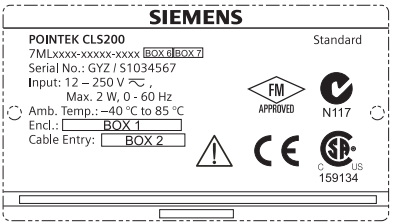
All changes and repairs must be done by qualified personnel, and applicable safety regulations must be followed. Please note the following:

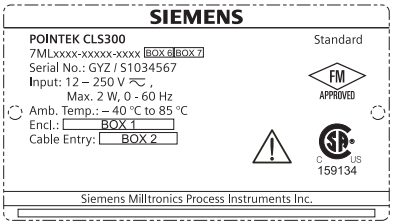
- The user is responsible for all changes and repairs made to the device.
- All new components must be provided by Siemens Milltronics Process Instruments Inc.
- Restrict repair to faulty components only.
- Do not re-use faulty components.

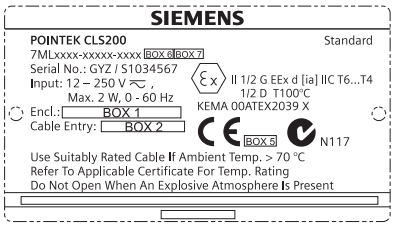
Appendix C: Product Nameplates

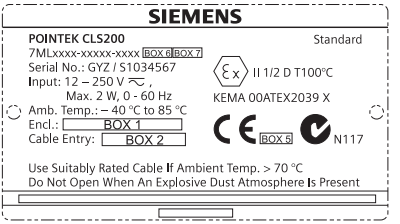
Note: Information in boxes 1 through 7 changes based on customer order.

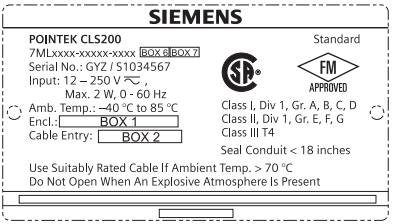
Pointek CLS200

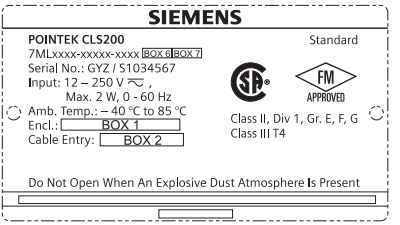




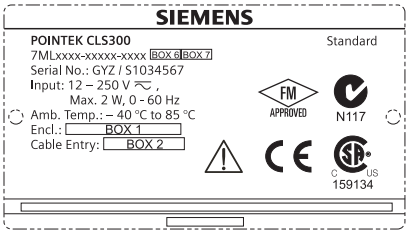


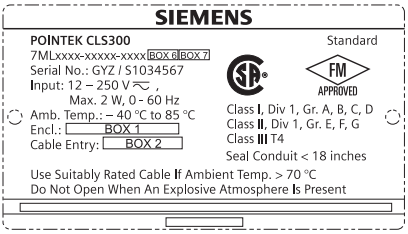


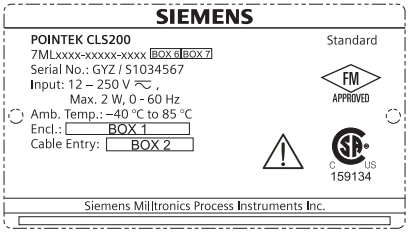


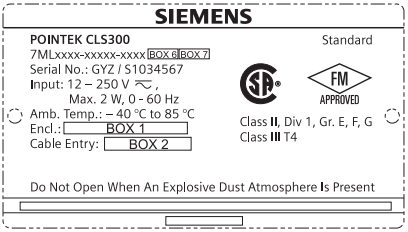


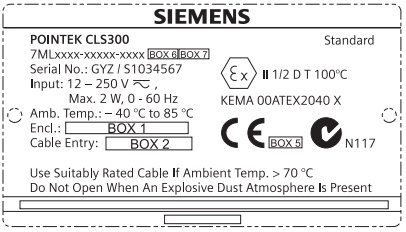
Pointek CLS300

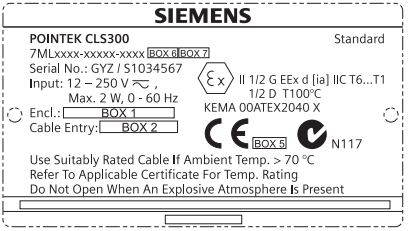












Appendix D: Hazardous Area Installation

! WARNINGS:

- **Turn off power before servicing any device.**
- **Please check the ambient and operating temperatures under *Environmental* on page 9, and *Process* on page 10 for the specific configuration you are about to use or install.**
- **In potentially explosive atmospheres:**
  - open the enclosure only when Pointek CLS200/300 is not energized.
  - if a transmitter is to be used as category 1/2 equipment, please check the product nameplate, and see *Appendix C: Product Nameplates*, page 52 onwards, to verify the protection type.

Note: The transmitter is in operation when the power supply is switched on.

Instructions specific to hazardous area installations

(Reference European ATEX Directive 94/9/EC, Annex II, 1/0/6)

The following instructions apply to equipment covered by certificate number KEMA 00ATEX2039X and KEMA 00ATEX2040X:

1. For use and assembly, refer to the main instructions.
2. The equipment is certified for use as Category 1/2G, 1/2D. Refer to appropriate certificate.
3. Refer to appropriate certificate for application in specific hazardous environment.
4. Refer to appropriate certificate for ambient temperature range.
5. The equipment has not been assessed as a safety related device (as referred to by Directive 94/9/EC Annex II, clause 1.5).
6. Installation and inspection of this equipment shall be carried out by suitably trained personnel in accordance with the applicable code of practice (EN 60079-14 and EN 60079-17 in Europe).
7. Repair of this equipment shall be carried out by suitably trained personnel in accordance with the applicable code of practice (e.g. EN 60079-19 within Europe).
8. Components to be incorporated into or used as replacements in the equipment shall be fitted by suitably trained personnel in accordance with the manufacturer's documentation.
9. The certificate numbers have an 'X' suffix, which indicates that special conditions for safe use apply. Those installing or inspecting this equipment must have access to the certificates.
10. If the equipment is likely to come into contact with aggressive substances, then it is the responsibility of the user to take suitable precautions that prevent it from being adversely affected, thus ensuring that the type of protection is not compromised.

    Aggressive substances: e.g. acidic liquids or gases that may attack metals, or solvents that may affect polymeric materials.

Suitable precautions: e.g. establishing from the material's data sheet that it is resistant to specific chemicals.

Note: Please see www.siemens.com/pointek for the latest approval certificates.

Operating the CLS200 Flameproof / Explosion Proof configuration in hazardous areas

ATEX

Maximum permissible ambient temperature range in potentially explosive atmospheres:
For category II 1 G:
–20 °C to maximum +60 °C (–4 °F to maximum +140 °F)
For category II 2 G:
–40 °C to maximum +85 °C (–40 °F to maximum +185 °F): T4
–40 °C to maximum +85 °C (–40 °F to maximum +185 °F): T5
–40 °C to maximum +70 °C (–40 °F to maximum +158 °F): T6

- Maximum permissible process temperature range in potentially explosive atmospheres:
  For category II 1 G:
  –20 °C to maximum +60 °C (–4 °F to maximum +140 °F)
  For category II 2 G:
  –40 °C to maximum +125 °C (–40 °F to maximum +257 °F): T4
  –40 °C to maximum +95 °C (–40 °F to maximum +203 °F): T5
  –40 °C to maximum +80 °C (–40 °F to maximum +176 °F): T6

CSA/FM

- Maximum permissible ambient temperature range in potentially explosive atmospheres:
  –40 °C to maximum +85 °C (–40 °F to maximum +185 °F): T4
- Maximum permissible process temperature range in potentially explosive atmospheres:
  –40 °C to maximum +125 °C (–40 °F to maximum +257 °F)

Operating the CLS300 Flameproof / explosion proof configuration in hazardous areas

ATEX

Maximum permissible ambient temperature range in potentially explosive atmospheres:
For category II 1 G:
–20 °C to maximum +60 °C (–4 °F to maximum +140 °F)
For category II 1 G:
–40 °C to maximum +85 °C (–40 °F to maximum +185 °F): T1
–40 °C to maximum +85 °C (–40 °F to maximum +185 °F): T2
–40 °C to maximum +85 °C (–40 °F to maximum +185 °F): T3
–40 °C to maximum +85 °C (–40 °F to maximum +185 °F): T4
–40 °C to maximum +85 °C (–40 °F to maximum +185 °F): T5

–40 °C to maximum +70 °C (–40 °F to maximum +158 °F): T6

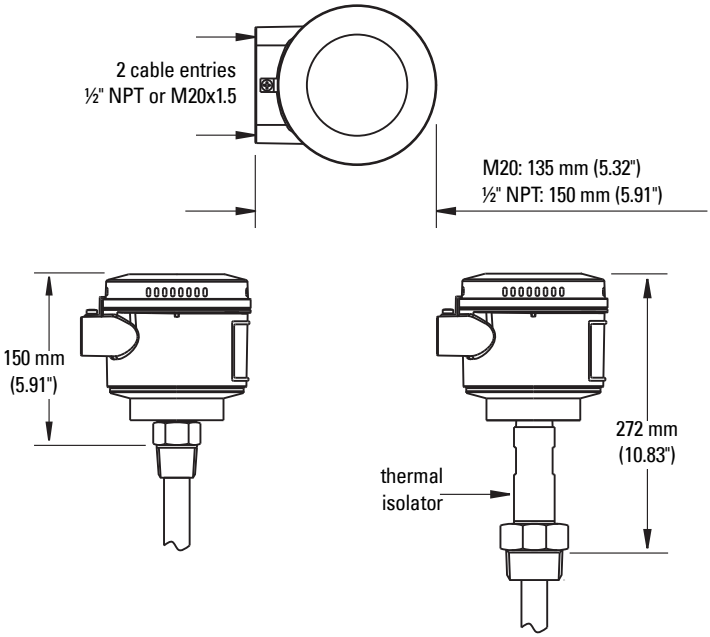
- Maximum permissible process temperature range in potentially explosive atmospheres:
  For category II 1 G:
  –20 °C to maximum +60 °C (–4 °F to maximum +140 °F)
  For category II 2 G:
  –40 °C to maximum +400 °C (–40 °F to maximum +752 °F): T1
  –40 °C to maximum +300 °C (–40 °F to maximum +572 °F): T2
  –40 °C to maximum +200 °C (–40 °F to maximum +392 °F): T3
  –40 °C to maximum +135 °C (–40 °F to maximum +275 °F): T4
  –40 °C to maximum +100 °C (–40 °F to maximum +212 °F): T5
  –40 °C to maximum +80 °C (–40 °F to maximum +176 °F): T6

CSA/FM

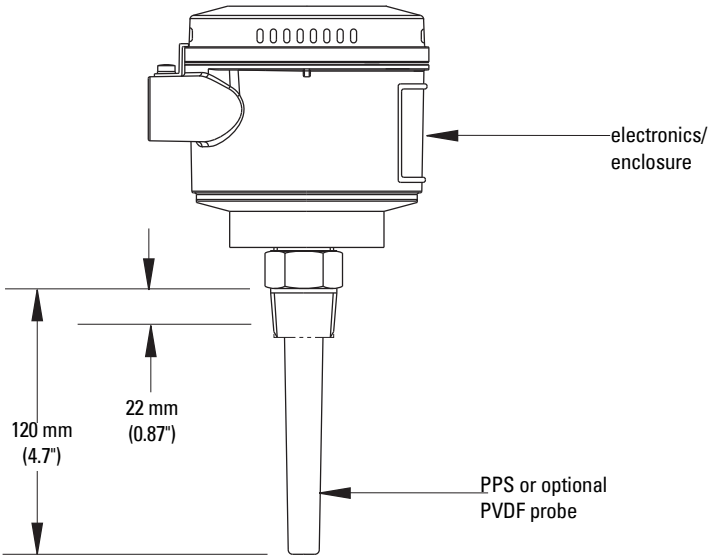
- Maximum permissible ambient temperature range in potentially explosive atmospheres:
  –40 °C to maximum +85 °C (–40 °F to maximum +185 °F): T4
- Maximum permissible process temperature range in potentially explosive atmospheres:
  –40 °C to maximum +200 °C (–40 °F to maximum+ 392 °F)
  –40 °C to maximum +400 °C (–40 °F to maximum +752 °F):
  high temperature version

Appendix E: Dimensions - CLS200

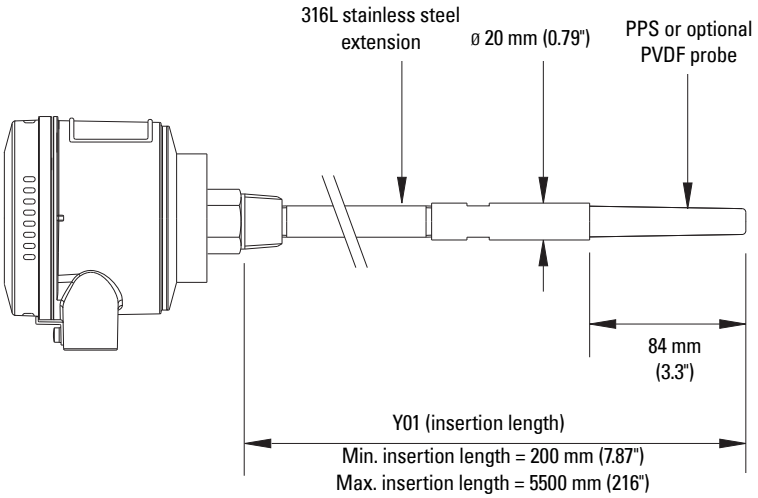
Enclosure, threaded process connection



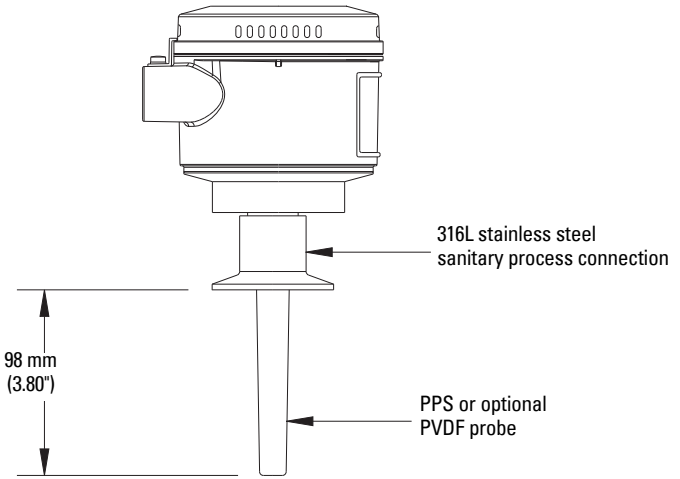
Compact Version, threaded



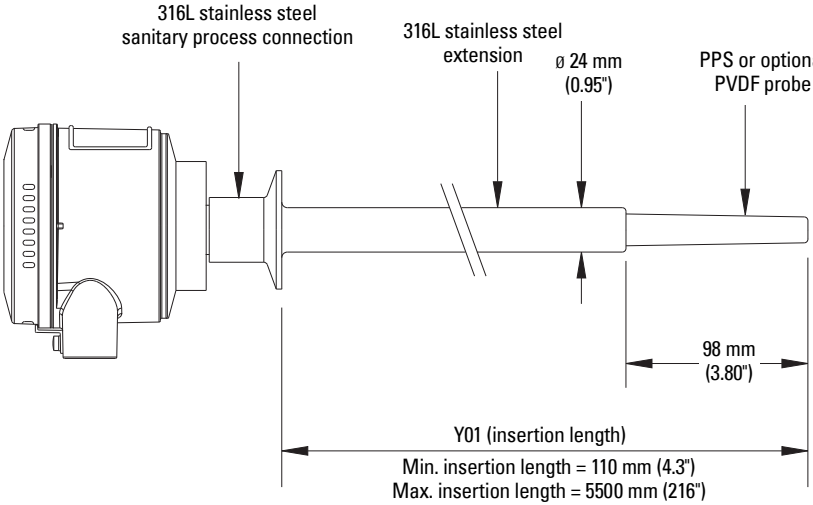
Extended Rod Version, threaded



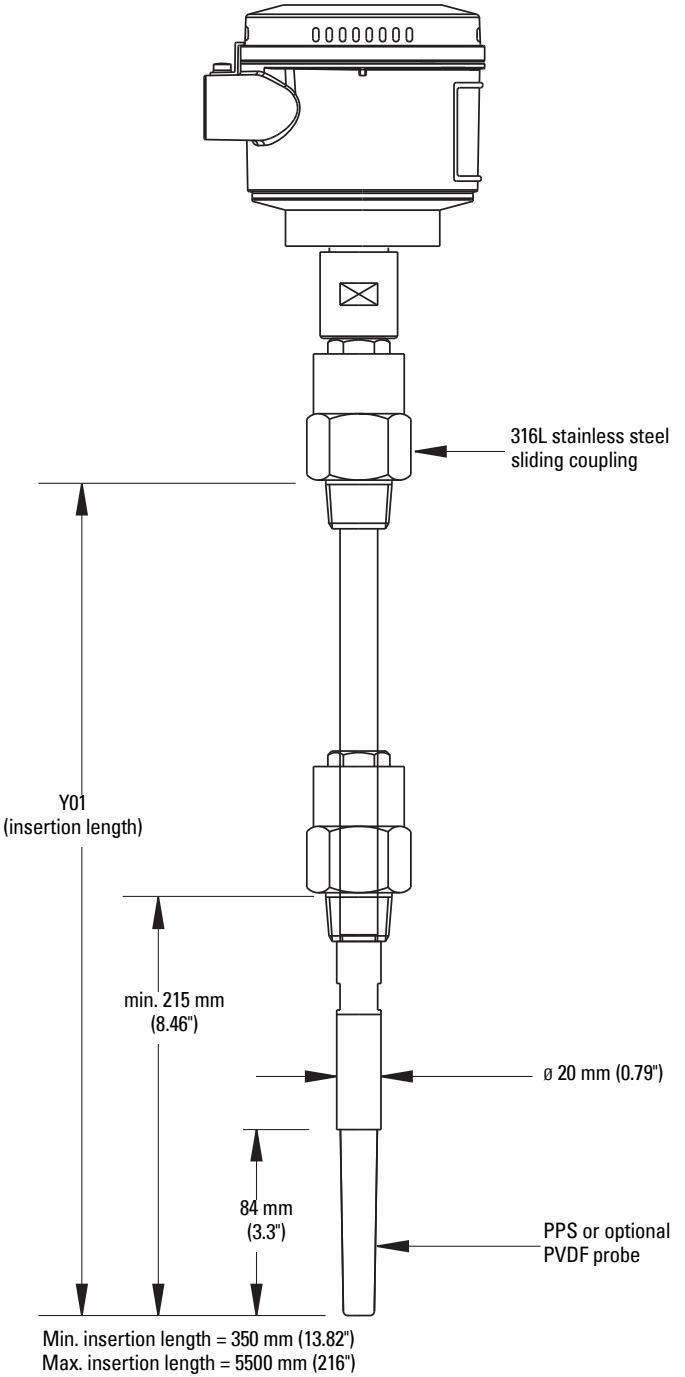
Sanitary Compact Version



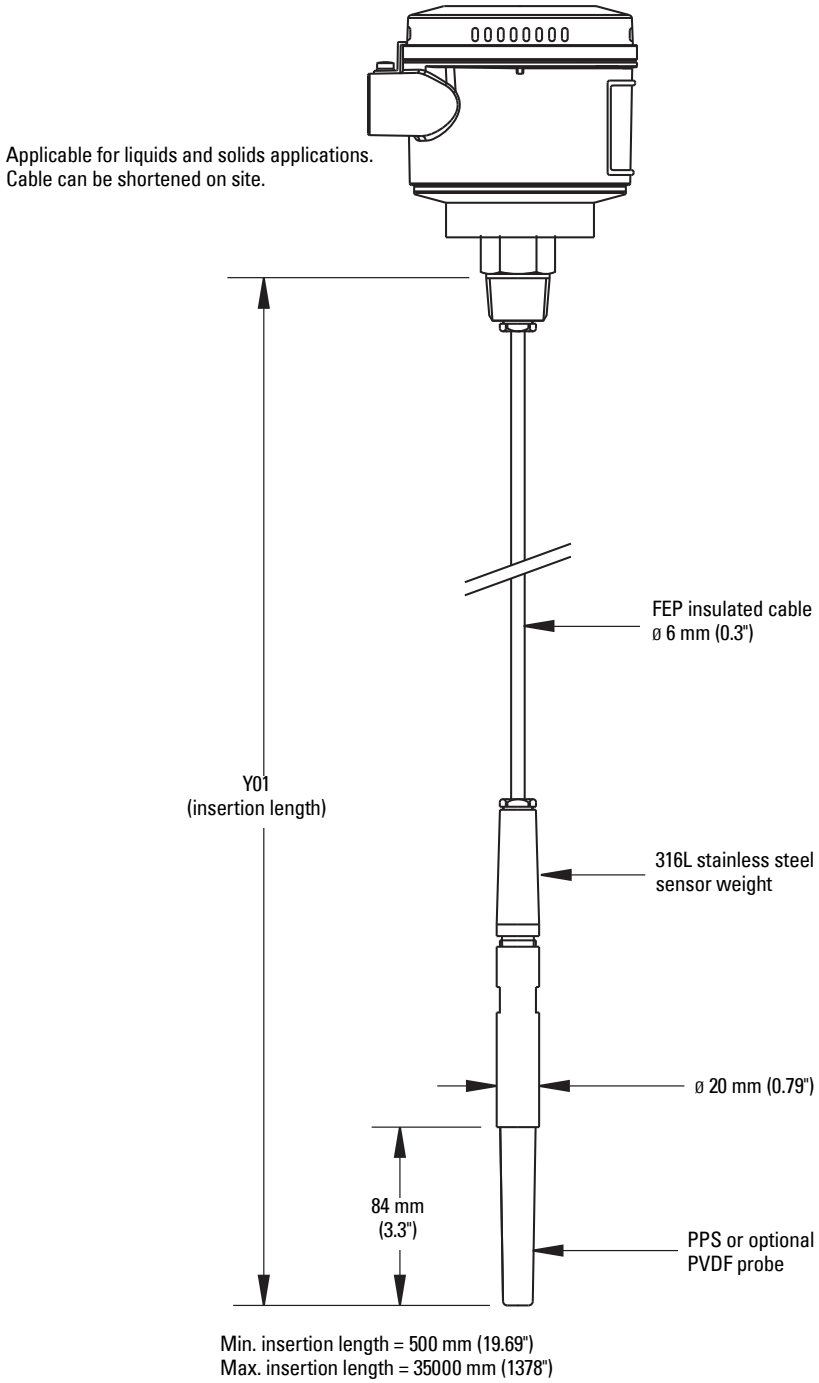
Sanitary Extended Version



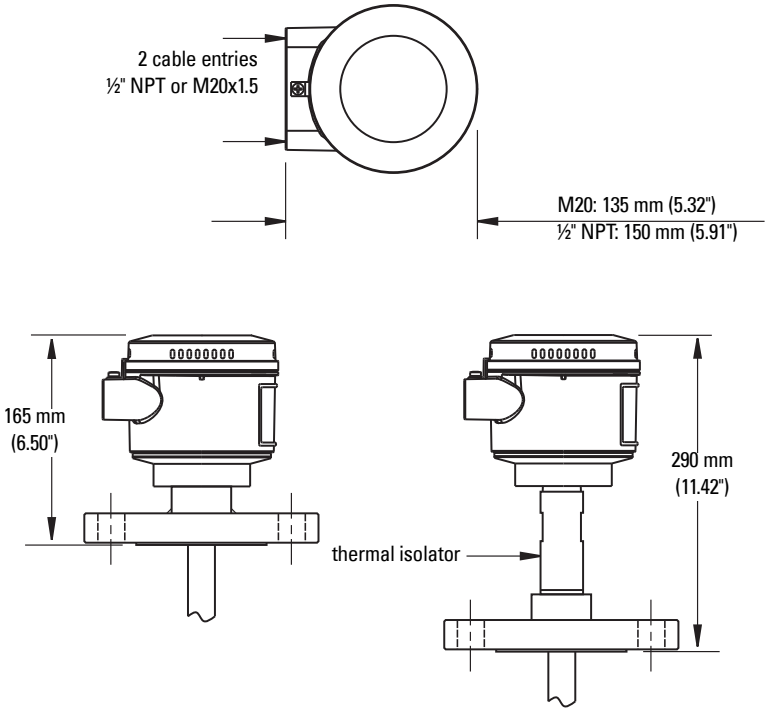
Sliding Coupling Version, threaded



Extended Cable Version, threaded



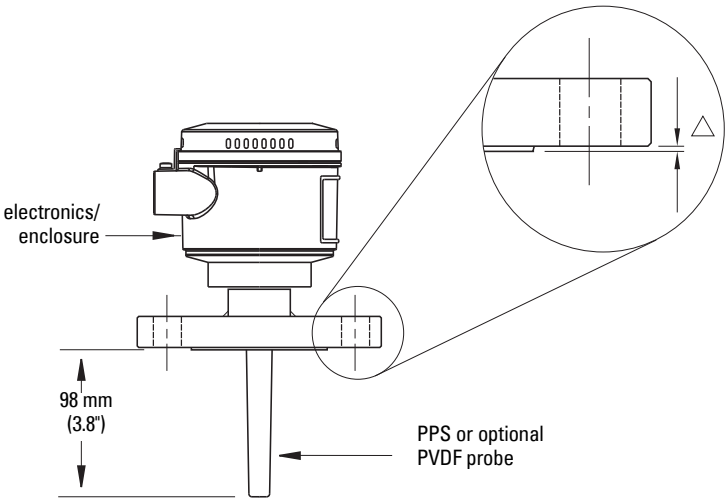
CLS200 - Flanged Process Connections



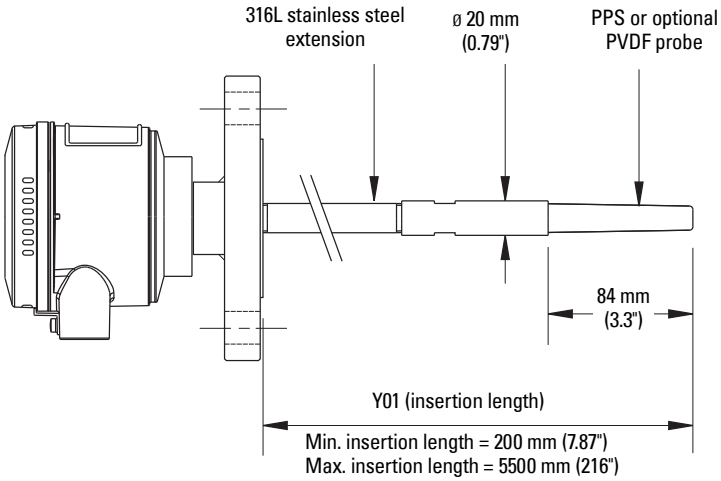
Flange Facing Table

Flange Facing (raised face)	
Flange Class	Facing thickness
△ ASME150/300	2 mm (0.08")
△ ASME600/900	7 mm (0.28")
△ PN16/40	2 mm (0.08")

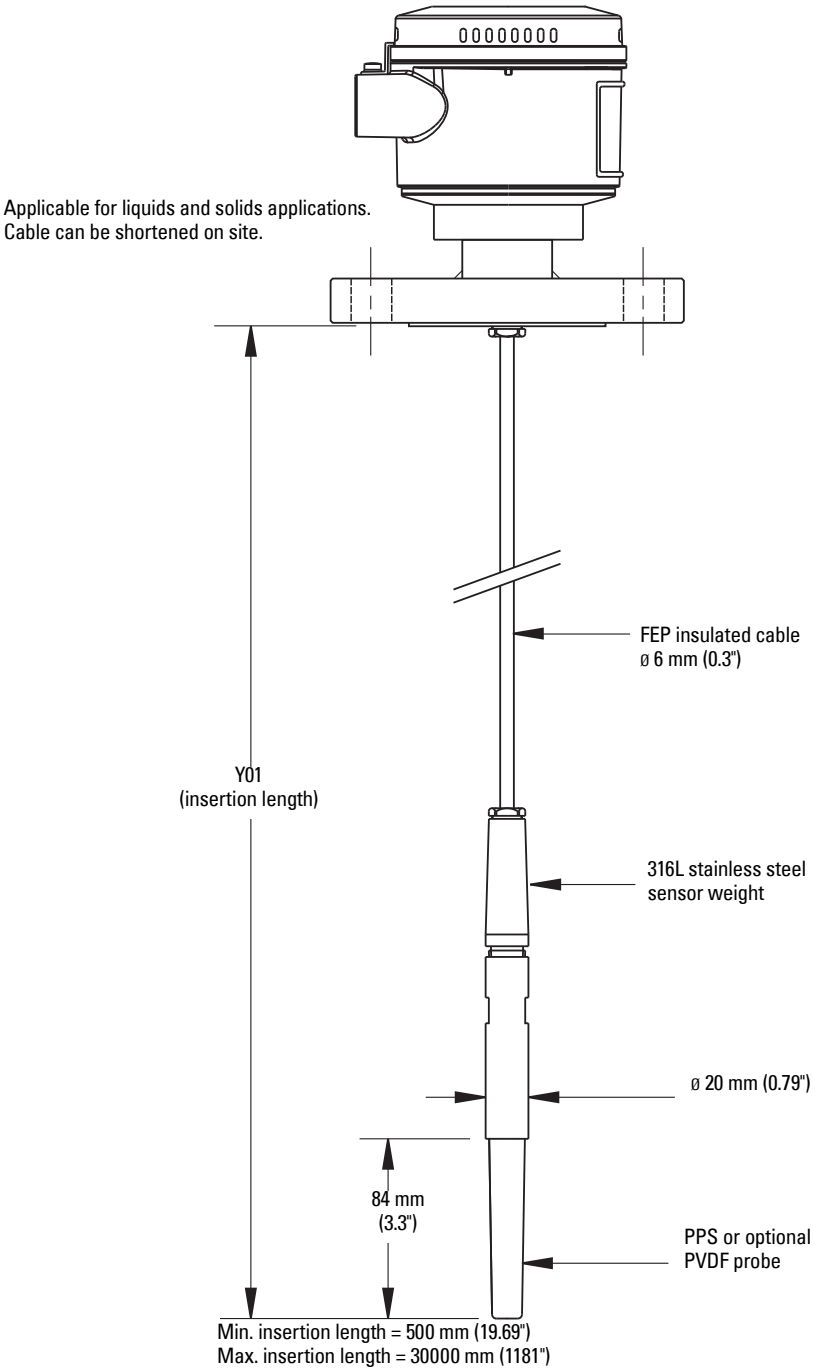
Compact Version, welded flange



Extended Rod Version, welded flange

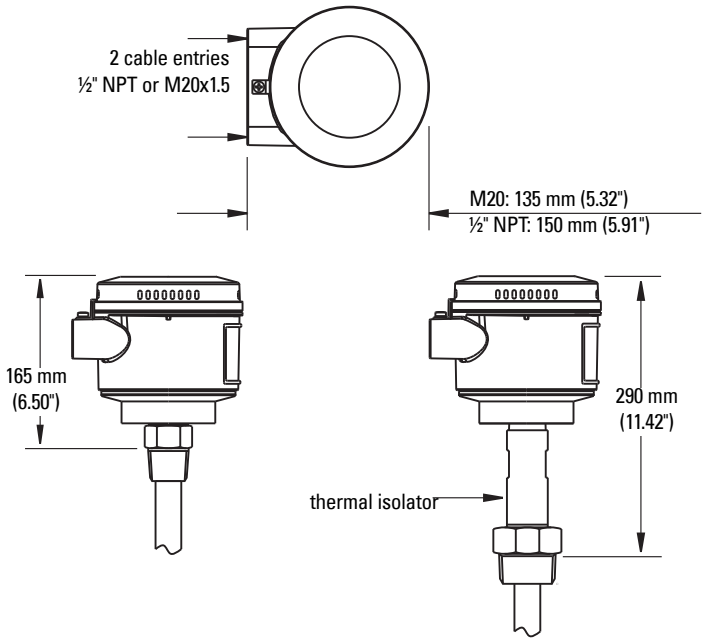


Extended Cable Version, welded flange

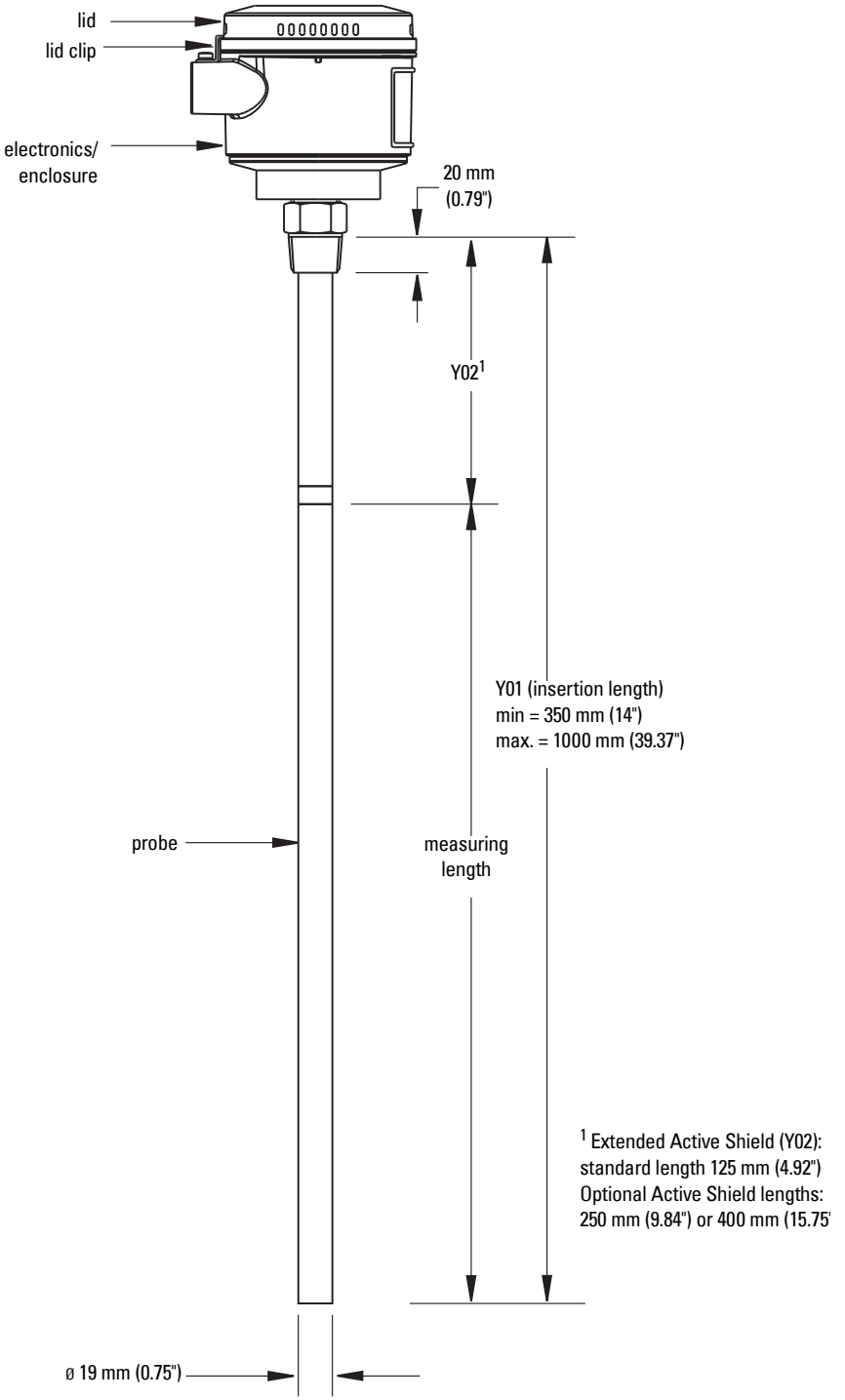


Appendix F: Dimensions - CLS300

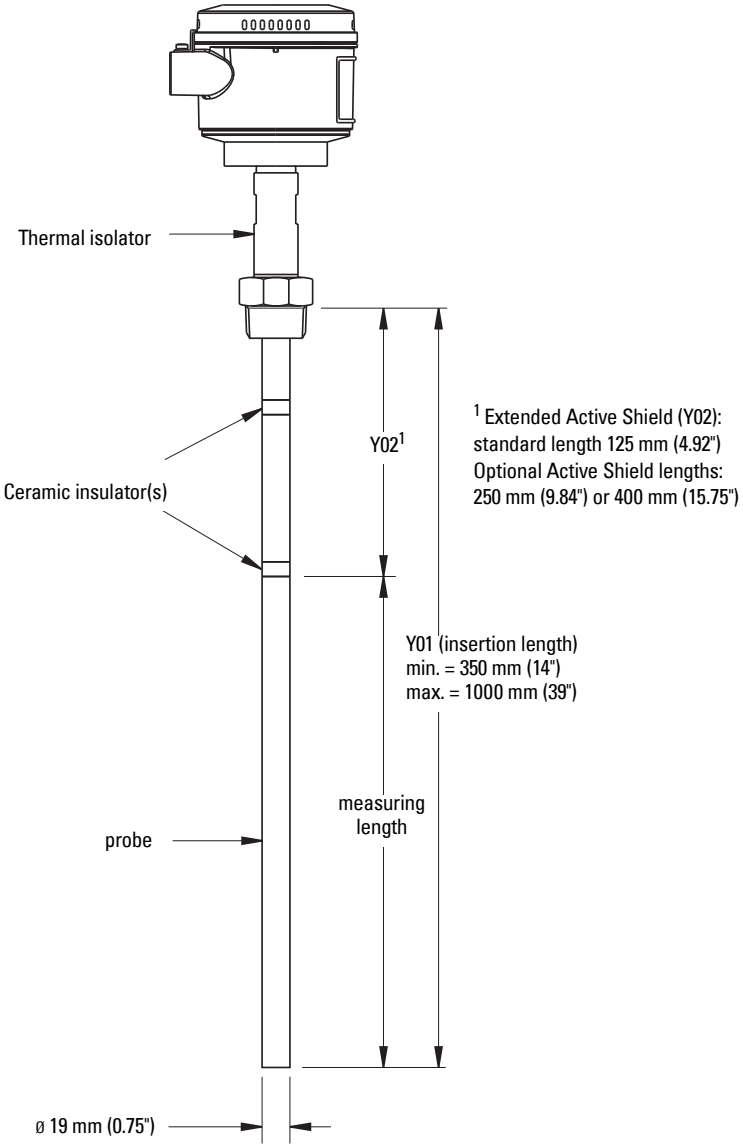
Threaded Processs Connection



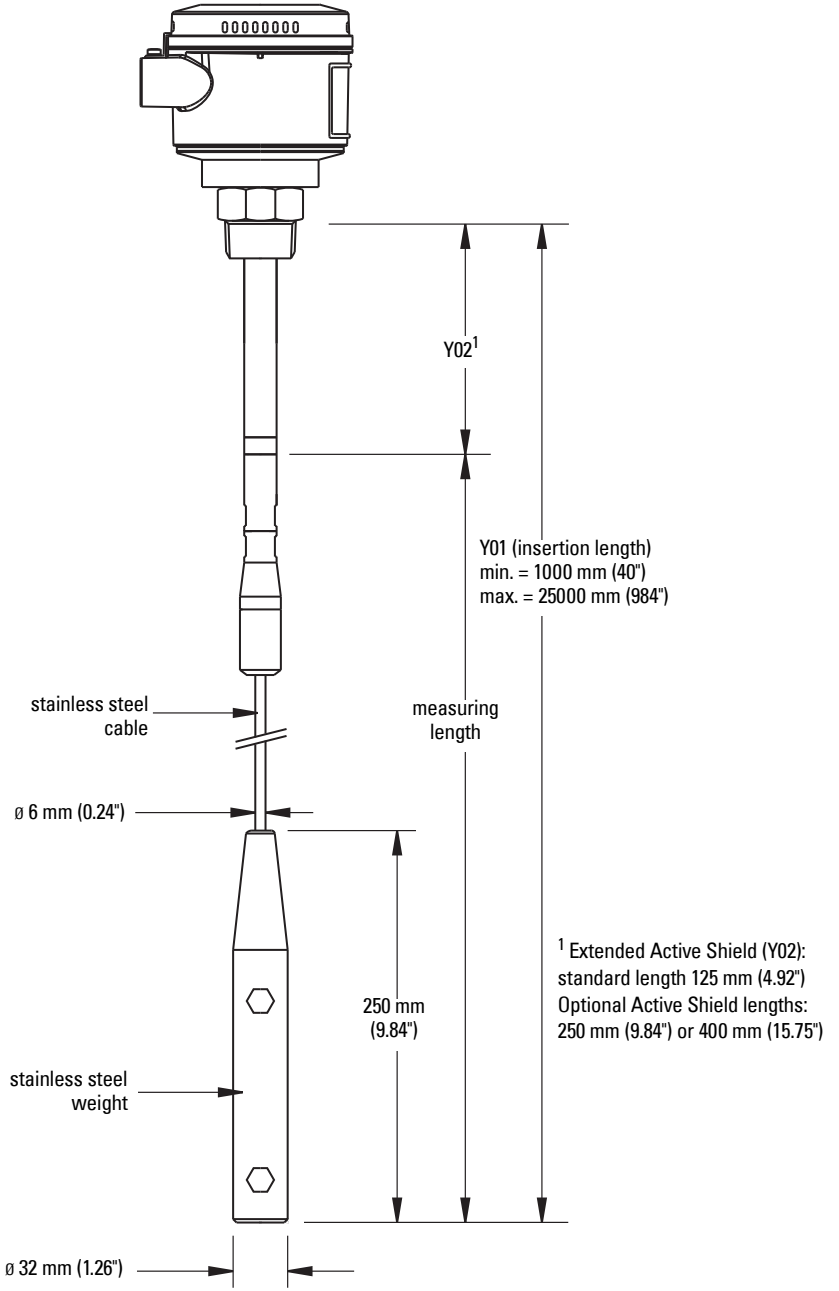
Rod Version, threaded



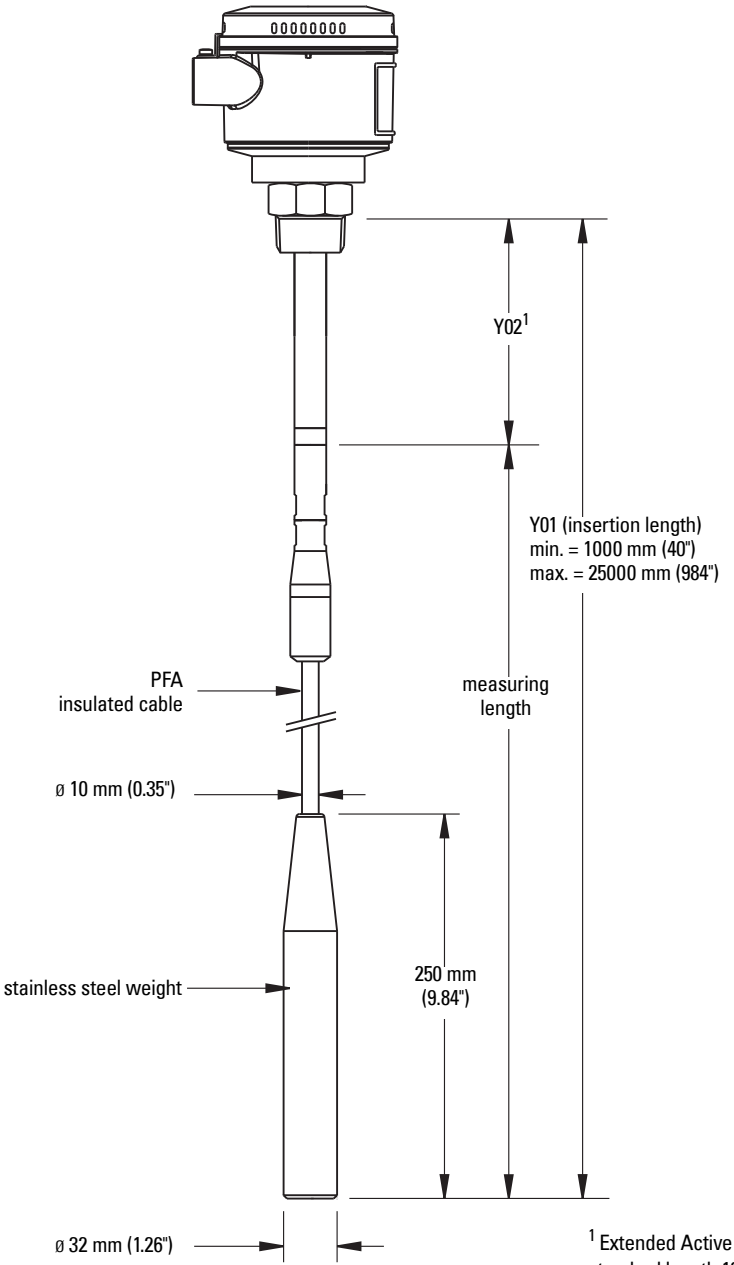
High Temperature Rod Version, threaded



Non-insulated Cable Version, threaded

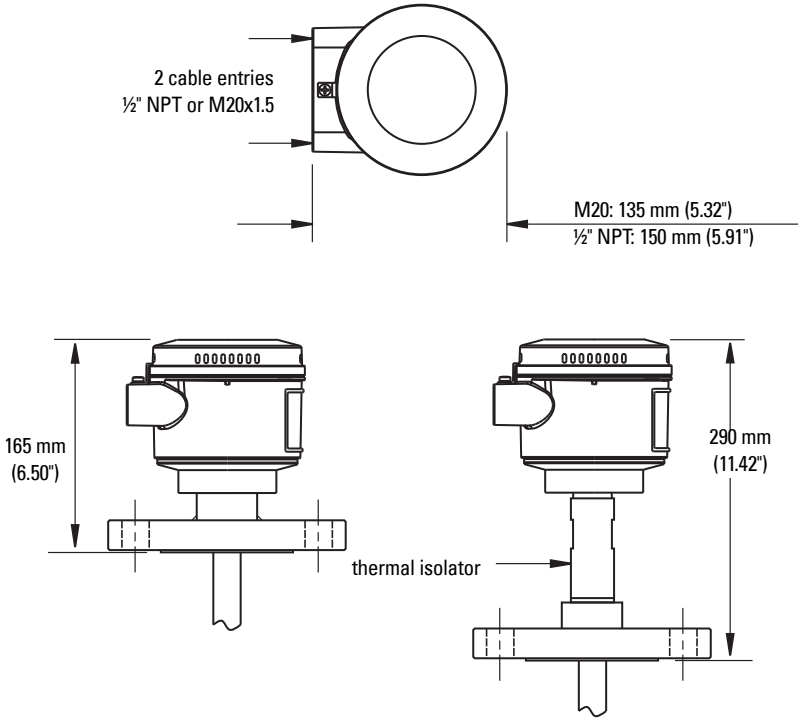


Insulated Cable Version, threaded



[1] Extended Active Shield (Y02):
standard length 125 mm (4.92")
Optional Active Shield lengths:
250 mm (9.84") or 400 mm (15.75")

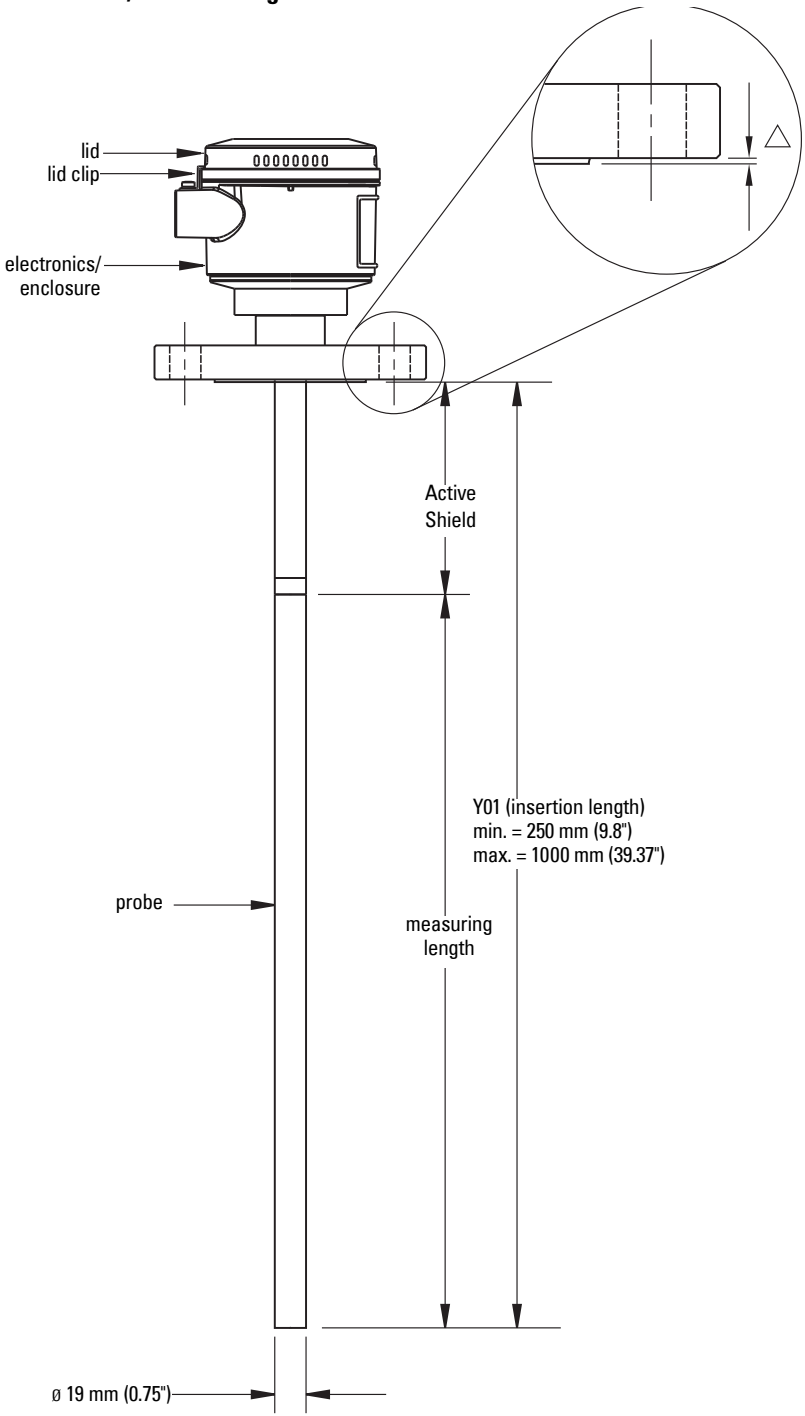
CLS300 - Flanged Process Connections



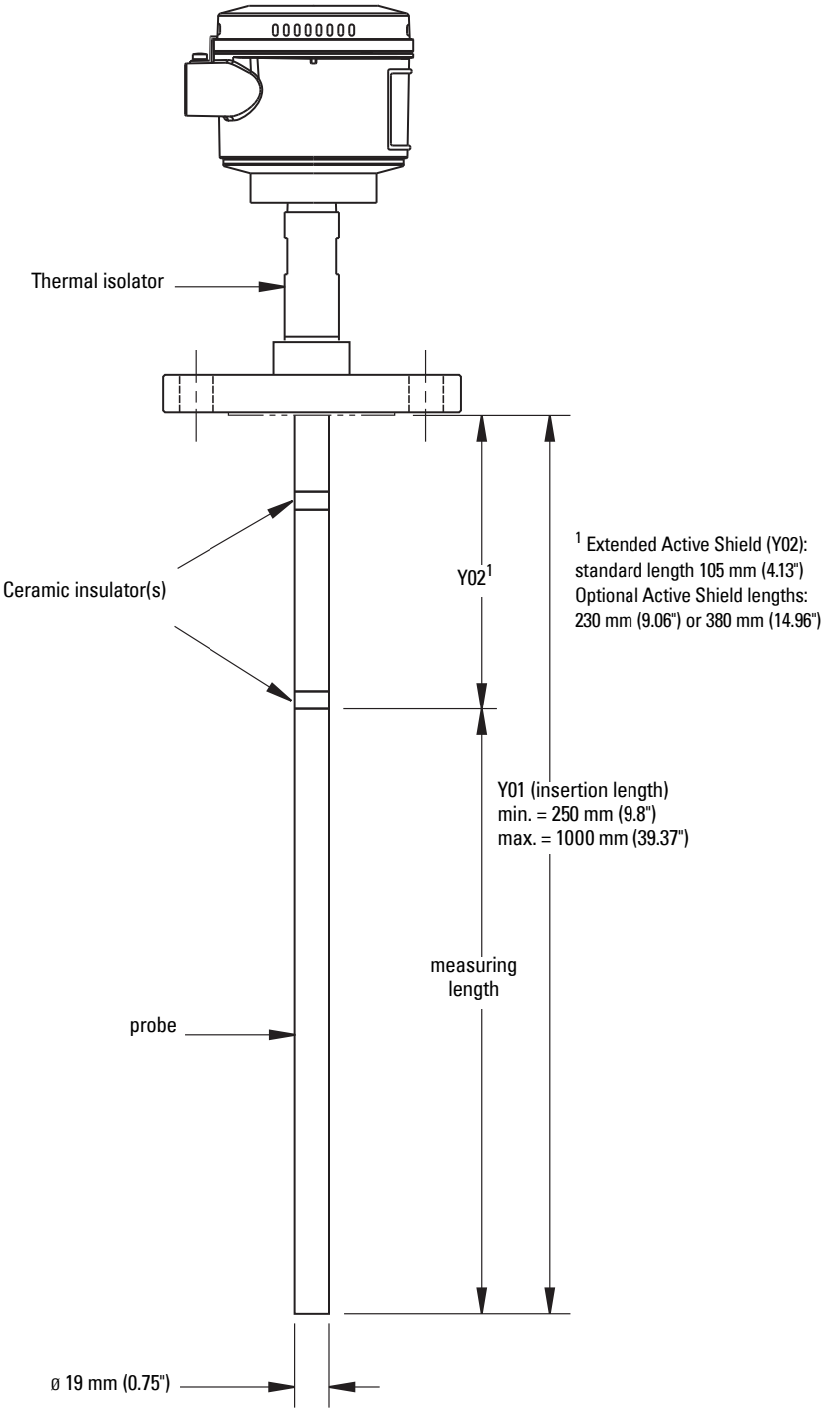
Flange Facing Table

Flange Facing (raised face)	
Flange Class	Facing thickness
△ ASME150/300	2 mm (0.08")
△ ASME600/900	7 mm (0.28")
△ PN16/40	2 mm (0.08")

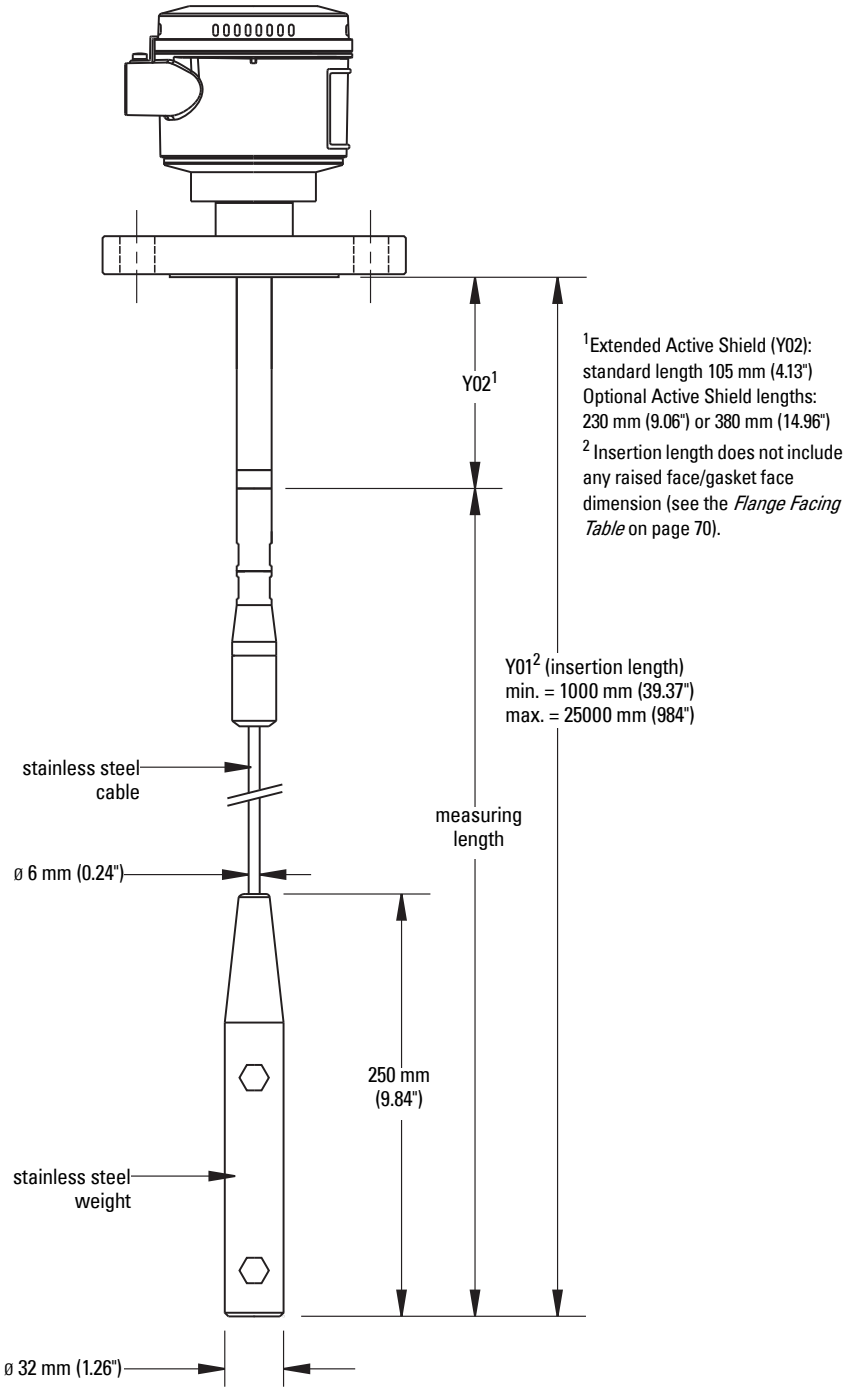
Rod Version, welded flange



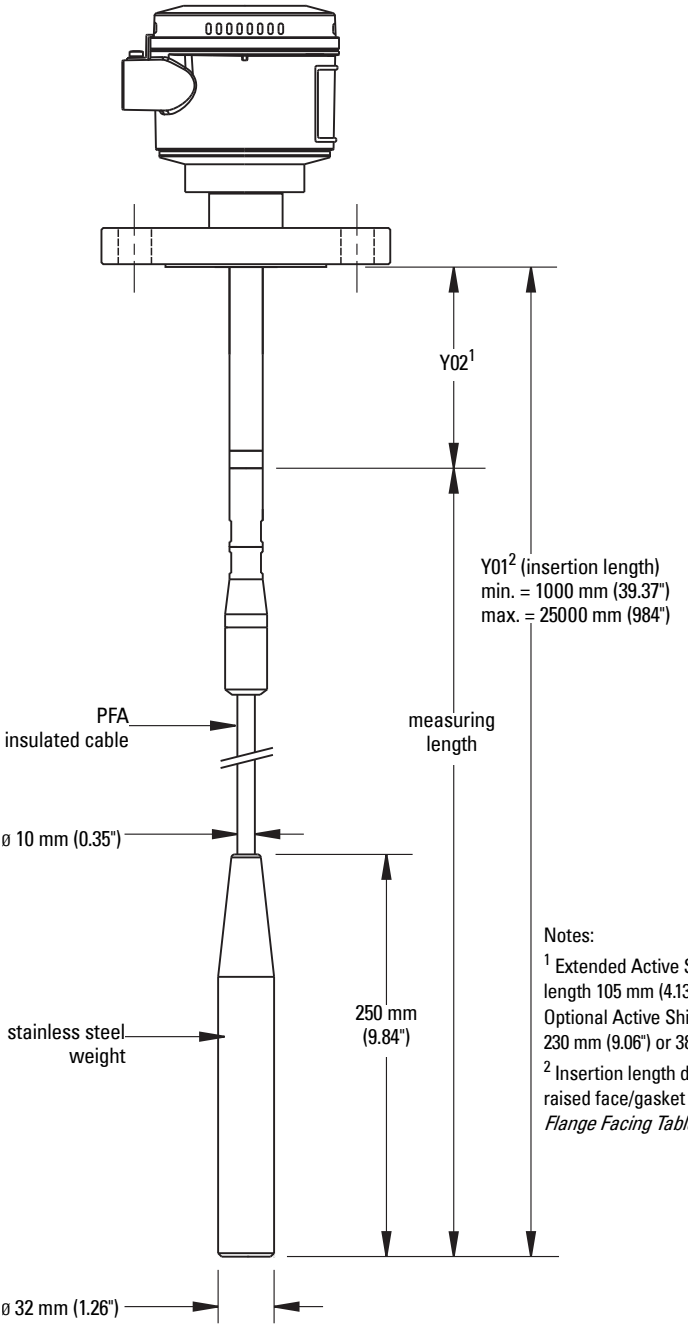
High Temperature Rod Version, welded flange



Non-insulated Cable Version, welded flange



Insulated Cable Version, welded flange



Notes:

[1] Extended Active Shield (Y02): standard length 105 mm (4.13")
Optional Active Shield lengths:
230 mm (9.06") or 380 mm (14.96")

[2] Insertion length does not include any raised face/gasket face dimension (see *Flange Facing Table* on page 70).

Appendix G: Shortening the cable

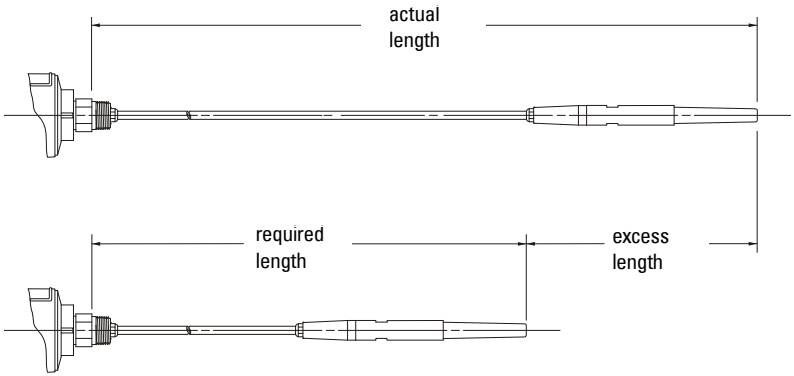
Pointek CLS200 Standard, Cable Version

CAUTION: Possible only with the general purpose configuration; please verify against product nameplate.

Preparation

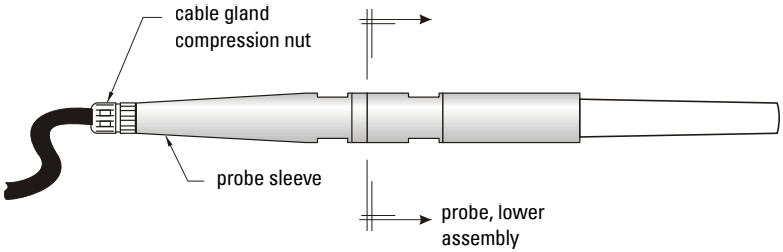
Determine the required cable length, and subtract that amount from the actual length, to find the excess length to cut off.

For example: 10 m (actual length) minus 9 m (required length) = 1 m (excess)

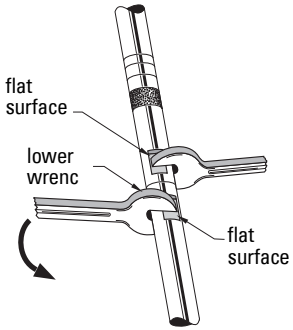


Steps

1. Unscrew the cable gland compression nut to relieve the sealing cone and release the cable.



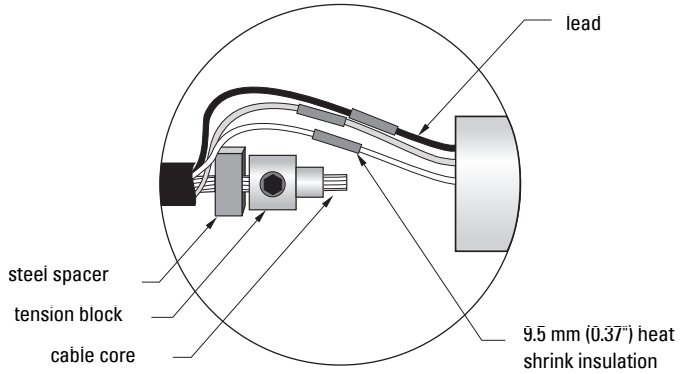
2. Unscrew the probe sleeve from the lower assembly using two 17 mm (0.67") wrenches across the flat surfaces, as shown below.



a. Place two wrenches on the flat surfaces of the probe as shown: hold the probe sleeve still, and turn the lower wrench counter-clockwise to loosen the probe lower assembly.

b. Remove the lower assembly by turning the threaded electrode end counter-clockwise: this exposes the three leads, the tension block, and the steel spacer.

3. Remove the heat shrink insulation covering the solder connections.



4. Unsolder the connections.

Note: Do not cut the connections to the probe leads, as this can render them too short to work with later.

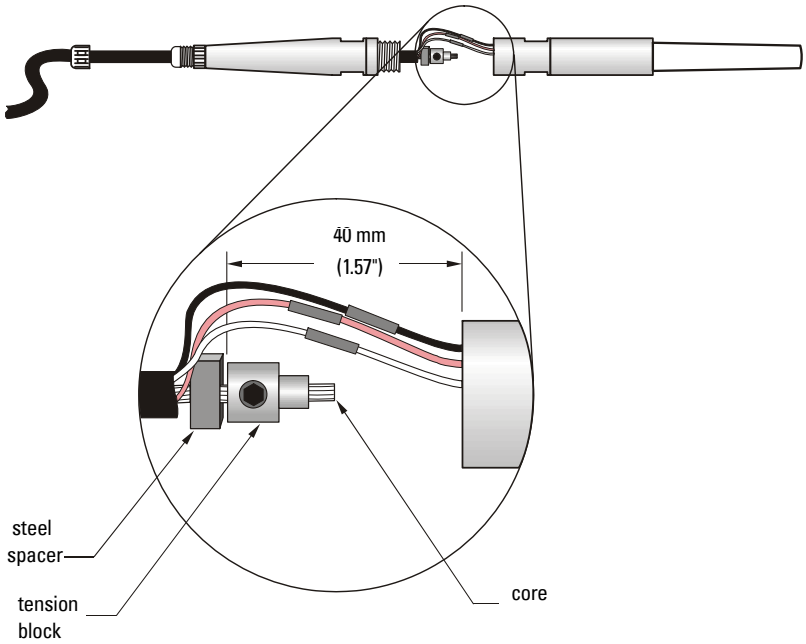
5. Remove the tension block, and save it for re-use in step 7.
6. Calculate the excess cable, then add back an allowance of 75 mm (3") for making the connections:

For example, 1000 mm	= excess
less 75 mm	= allowance for connections
925 mm	= excess cable to be removed

7. Cut off the excess cable.

Caution: To prevent wires from being pulled through the cable bundle, secure each wire close to where the outer black jacket stops **prior** to stripping cable insulation from it.

8. Remove approximately 75 mm (3") of cable jacket, shield, and filler strands.
9. Cut off the excess cable core, making sure the cut is clean and square
10. Replace the steel spacer and tension block, then shorten the leads to approximately 40 mm (1.6").
11. Prepare the leads for soldering, and if heat shrink is used to insulate splices, remember to slip on the heat shrink before soldering the leads.
12. Make the solder connections and position the heat shrink to completely insulate each solder connection before shrinking it.



13. Remove any excess cable core, if necessary.
14. Apply PTFE type tape/sealant to all threads.
15. Add a pre-twist to the wires before screwing the probe sleeve and lower probe assembly together: hold the probe sleeve still, and gently turn the lower probe assembly counter-clockwise about 5 full turns. This avoids the wires being broken when the probe and probe sleeve are assembled.
16. Screw the lower probe assembly clockwise into the probe sleeve, and tighten it with a 17 mm (0.67") wrench.
17. Check that the instrument is operating correctly, using the test procedure on page 25.

Pointek CLS300 Standard, Cable Version

Caution: When shortening a PFA cable, be sure to take extra care not to damage the PFA coating.

Methods

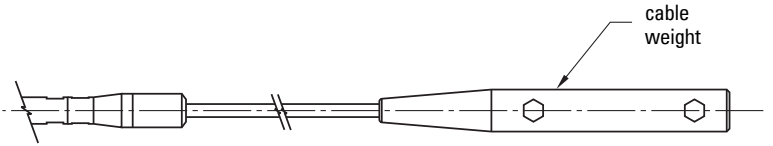
1. An angle grinder (preferably with a disc suitable for stainless steel)

or

2. Wire cutters (suitable for piano cable ø 6 to 9 mm).

Procedure

1. Loosen the three set screws and pull weight from the cable.
2. Grind/cut the cable to the required length, and then remove rough edges from the cable.
3. Ensure that cable strands are properly seated in the lay of the cable (i.e. no wire strands sticking outside the normal cable profile). Make sure **ALL** strands are properly seated before continuing the assembly.
4. Push the weight onto the cable while simultaneously **rotating it counter-clockwise** around the cable. Make sure that no cable strands are pushed out of their position in the cable and that the cable is fully inserted.
5. Re-fasten the weight by tightening the three set screws.



Appendix H: Application for Pointek CLS200/300 Standard

Level Detection

Note:
- For a more detailed explanation, please see *Operating Principles* on page 42.
- For more detailed instructions on setting the dip switches and potentiometers, please see *Operation: Pointek CLS200 Standard model* (starting on page 28) or *Operation: Pointek CLS300 Standard model* (starting on page 34).

The difference in capacitance between a covered probe and an uncovered probe (for example, between a probe in water and a probe in air), is used to detect level, and to protect the process from a level that is either too high or too low.

The trip point is set by potentiometer P2. This determines how large the difference in capacitance needs to be before the output is switched. The sensitive electronics can be set to detect the change in capacitance either as the level approaches the probe tip, or when the probe is covered.

Alarm Signaling

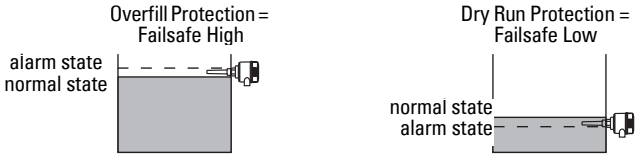
Relay and Solid-state Switch

The relay and solid-state switch are interlinked: when the change in capacitance is greater than the setting at the trip point, the output switches. (For a diagram illustrating the relay and solid-state switch contacts, see page 29 for the CLS200 or page 35 for the CLS300.)

Relay	Red LED	Solid-state switch	Alarm state
Energized	On	Closed	OFF
De-energized	Off	Open	ON

Alarm settings

The alarm can be set to protect the process from a level that is either too high or too low.



- high alarm: alarm ON/switch open when level is higher than the set point (probe becomes covered[1])
- low alarm: alarm ON/switch open when level is below the set point (probe becomes uncovered)

The setting is selected by turning dip switch 3 on or off.

Fault Signaling

The Failsafe function puts the process into a safe mode of operation in the event of a fault or failure (such as a loss of power). When the Pointek CLS200/300 standard model responds to a failure, the output switches according to the Failsafe setting[2]. There are two Failsafe options:

- Failsafe High
- Failsafe Low

Note: The following examples assume that the pump should be turned off in the event of a failure. If this is not the case in your process, please see the relay diagram on page 29 (for CLS200) or page 35 (for CLS300), and make the appropriate connections to suit your application.

Failsafe High is used in applications where Pointek CLS200/300 is set to turn off a pump when the level becomes too high (probe covered, or level too close to probe). When Failsafe High is selected, the device will respond to a failure (regardless of the true level) as if it were a high level alarm (alarm ON/solid-state switch open). The pump will stop, preventing an overfill.

Failsafe Low is used in applications where CLS200/300 is set to turn off a pump when the level becomes too low (probe uncovered). When Failsafe Low is selected, CLS200/300 will respond to a failure (regardless of the true level) as if it were a low level (alarm ON/ solid-state switch open). The pump will stop, preventing the pump from running dry.

	Failsafe High				Failsafe Low			
	no fault		fault		no fault		fault	
probe	uncovered	covered	uncovered	covered	uncovered	covered	uncovered	covered
switch	CLOSED	OPEN	OPEN		OPEN	CLOSED	OPEN	
alarm	OFF	ON	ON		ON	OFF	ON	

1. Or, if the trip point is set to detect the approaching level, when that trip point is reached.
2. See *Failsafe/Alarm Setting: S3* on page 30 (for CLS200) or on page 36 (for CLS300) for details.

Glossary

capacitance: the property of a system of conductors and dielectrics that permits the storage of electricity when potential differences exist between the conductors. Its value is expressed as the ratio of a quantity of electricity to a potential difference, and the unit is a Farad.

capacitor: a device in a circuit that has the potential to store an electric charge. Typically a capacitor has 2 conductors or electrodes separated by a layer of a nonconducting material called a dielectric. With the conductors on opposite sides of the dielectric layer oppositely charged by a source of voltage, the electrical energy of the charged system is stored in the polarized dielectric.

derating: to decrease a rating suitable for normal conditions according to guidelines specified for different conditions.

dielectric: a nonconductor of electric current.[1]

relative dielectric constant: the ability of a dielectric to store electrical potential energy under the influence of an electric field. This is measured by the ratio of the capacitance of a condenser with the material as dielectric to its capacitance with vacuum as dielectric. The value is given relative to a vacuum /dry air: the relative dielectric constant of air is 1[1].

immiscible: incapable of mixing or attaining homogeneity.

implicit: for example in "the units are implicit in pF," the units are implied, or assumed to be pF, because there is no other option.

miscible: capable of being mixed.

repeatability: the closeness of agreement among repeated measurements of the same variable under the same conditions.

saturation: a condition in which any further change of input no longer results in a change of output. For example, "the loop-current will saturate to 3.8 or 20.5 if the level exceeds the Range settings."

solid-state device: a device whose function is performed by semi-conductors or the use of otherwise completely static components such as resistors and capacitors.

stilling-well: a grounded metal tube with openings.

1. Many conductive liquids/electrolytes exhibit dielectric properties; the relative dielectric constant of water is 80.

Notes

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