SIEMENS

Point level

Capacitance switches Pointek CLS200/CLS300 digital

Operating Instructions

7ML5640 (CLS200, rod version)
7ML5641 (CLS200, cable version)
7ML5642 (CLS200, rod version, sanitary connection)
7ML5643 (CLS200, sliding coupling)
7ML5660 (CLS300, rod version)
7ML5661 (CLS300, cable version)

11/2023
A5E47904060-AC

Legal information

Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

⚠ DANGER

indicates that death or severe personal injury **will** result if proper precautions are not taken.

⚠ WARNING

indicates that death or severe personal injury **may** result if proper precautions are not taken.

⚠ CAUTION

indicates that minor personal injury can result if proper precautions are not taken.

NOTICE

indicates that property damage can result if proper precautions are not taken.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

Proper use of Siemens products

Note the following:

⚠ WARNING

Siemens products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Siemens. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.

Trademarks

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Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

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Table of contents

Safety notes

1

1.1 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
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.

1.2 Safety marking symbols

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

The manual

2

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 Digital models only.

Pointek CLS200/300 is available in two models, Standard and Digital. For information on the CLS200/300 Standard model, please see manual 7ML19985JH02.

This manual will help you set up your Pointek CLS200/300 Digital for optimum performance. There are two installation options:

- the unit can be used as a standalone device, controlled locally
- the unit can be installed on a network, and controlled either remotely via PROFIBUS PA, or locally using the local user interface (LUI)

Note

This manual applies to CLS200/300 Digital devices manufactured after August 2010. For Units manufactured prior to August 2010 please use Operating Instructions 7ML19985JJ01.

Sections in this manual are designated as follows:

1. Digital: Information is applicable to any CLS200/300 Digital unit (indicated by Digital in the page footers)
   - Pointek CLS200/300 (Page 13) - an introduction to Pointek CLS200/300 Digital model and to the manual
   - Technical data (Page 87)
   - Installation (Page 17)
   - Technical reference (Page 97)
   - Maintenance and repairs (Page 109)
   - Hazardous area installation (Page 115)
   - Dimensions (Page 127)
   - Shortening the cable (Page 149)
2. Standalone: Information is applicable to units installed as a standalone device (indicated by Standalone in the page footers), and to units installed on a PROFIBUS PA network:
   - Wiring (Page 31)
   - Local operation (Page 43)
3. PROFIBUS PA: Information is applicable only to units connected to PROFIBUS PA (indicated by PA on the side tabs and PROFIBUS PA in the page footers).
   - AUTOHOTSPOT
   - Remote operation (Page 67)
   - PROFIBUS PA Parameters (Page 77)
   - Profibus PA profile structure (Page 111)

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

2.1 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.

Abbreviations and identifications

3

3.1 Abbreviations and identifications

Short form	Long Form	Description	Units
CE / UKCA / FM / CSA	Conformitè Europèene / United Kingdom Conformity Assessment / 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

4

Note

- 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 Standard, please see manual 7ML19985JH02.
- 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.

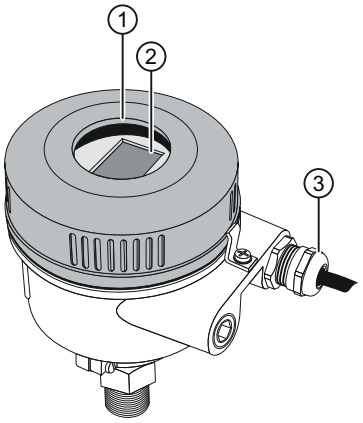
Pointek CLS200/300 is a versatile capacitance switch, ideal for level detection of interfaces, solids, liquids, slurries, and foam, and for simple pump control. The switch responds to the presence of any material with a relative dielectric constant of 1.5 or more by detecting a change in capacitance, 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 Digital 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 nonconductive vessel such as concrete or plastic[1)]. The CLS300 Digital requires a connection to earth/ground for effective capacitance measurement.

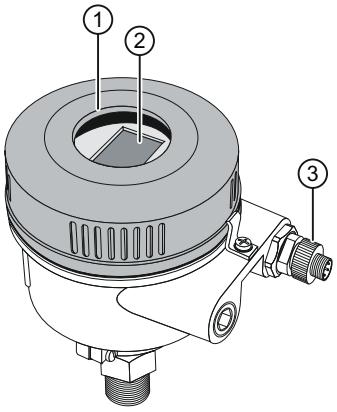
The power supply is galvanically isolated and can accept voltages in the range 12 to 30 V DC (12 to 24 V DC for Intrinsically Safe (IS) models), depending on the application. The materials used in the probe construction provide a high level of chemical resistance, and an excellent temperature rating 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.

Modular design and construction provide a wide choice of configurations, including rod, cable, and sanitary versions. Pointek CLS200/300 Digital can be used either:

- as a standalone unit, programmed locally using the local user interface, or
- installed as part of a network, programmed remotely using SIMATIC PDM on a Profibus PA network (or locally using the Local User Interface).



① Window lid
② Integral local display
③ Hub or gland



① Window lid
② Integral local display
③ Hub or gland/optional M12 plug

[1)] Refer to Approvals (Page 94) for CE and UKCA applications.

4.1 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

4.2 Alarm signalling

Alarm signalling

The solid-state switch can be set to react either to a diagnosed fault in the instrument, or to a change in the process level.

Fault Signalling

Pointek CLS200/300 can actively report information on its own status via PROFIBUS PA when used as part of a network, or by means of a pre-defined output status at the solid-state switch and on the Local User Interface (LUI).

4.3 Features

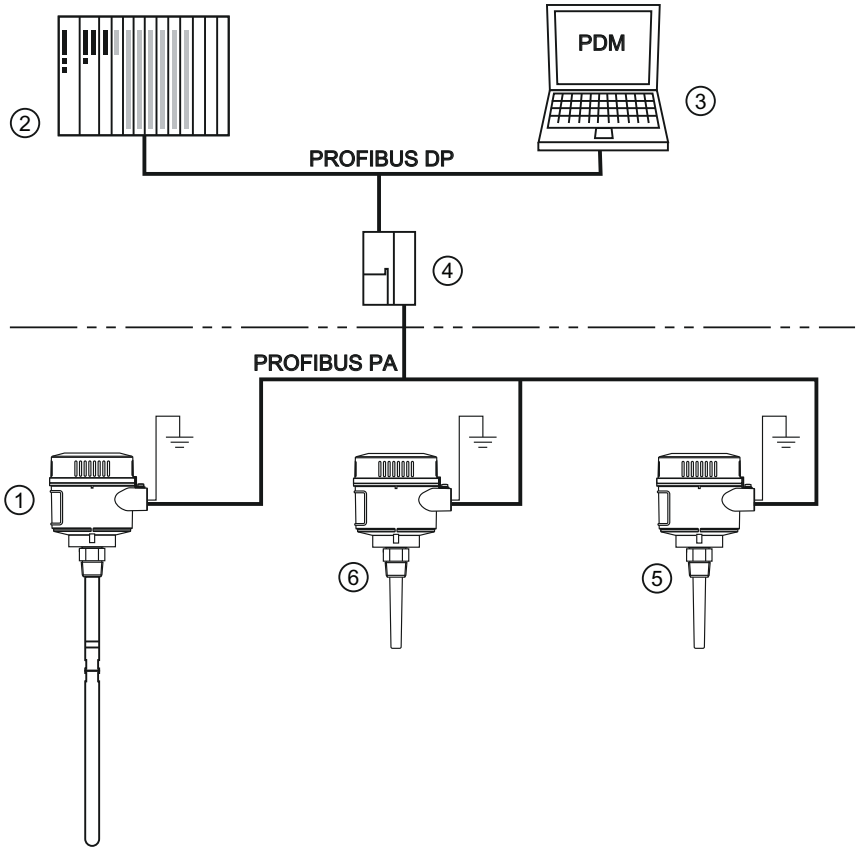
- Potted construction protects components from shock, vibration, humidity, and/or condensation
- High chemical resistance on probes
- Level detection independent of tank wall/pipe (CLS200 only)[1)]
- Freely programmable set up covers wide range of applications/materials
- Integrated Local User Interface (LUI) for ease of use
- Rigid and cable versions available
- Communication via PROFIBUS PA (profile version 3.0, Class B)
- Intrinsically Safe (IS) transmitter design for hazardous areas (requires external barrier or IS power supply)
- Patented Active Shield minimizes the effect of product build-up at the sensor mounting point (CLS300 only)

[1)] Refer to Approvals (Page 94) for CE and UKCA applications.

4.4 System implementation

Pointek CLS200/300 supports PROFIBUS communication protocol, and SIMATIC PDM software.

Basic PLC configuration with PROFIBUS PA



① Pointek CLS300 (PROFIBUS PA)
② Active PLC
③ PC/laptop
④ DP/PA coupler
⑤ Pointek CLS200 (PROFIBUS PA)
⑥ Pointek CLS200 (PROFIBUS PA)

4.4.1 Programming

Pointek CLS200/300 carries out its level measurement function according to the set of built-in parameters. You can make parameter changes locally via the local user interface, or from a remote location via a PC using SIMATIC PDM software.

Installation 5

5.1 Pressure equipment directive (PED) 2014/68/EU and Pressure Equipment (Safety) Regulations (PESR) SI 2016/1105

As the equipment does not have pressure-bearing housings of its own, it is not subject to the PED as "pressure accessory" (see 2014/68/EU Art. 2 (5) and PED Guidelines A-08, A-40). The equipment is not intended for use as "safety accessory" according to the PED (see 2014/68/EU Art. 2 (4) and PED Guidelines A-20, A-25).

5.2 Pointek CLS200

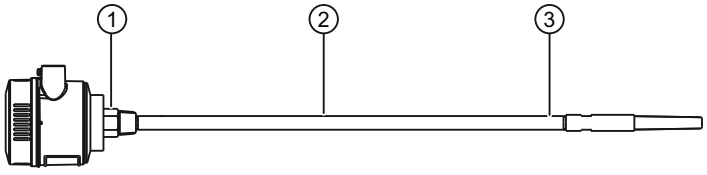
Note

- 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 and UKCA EMC regulations, please install in accordance with the testing details on Approvals (verify against product nameplate) in Approvals (Page 94).

5.2.1 Handling precautions

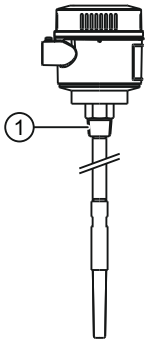
NOTICE
To prevent damage, all CLS200 units with a rod longer than 2 m (6.5 ft) must be handled as described below.

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



① At the process connection of flange
② Midway along the rod
③ At the end of the rod before the sensor

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



① At 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).

5.2.2 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 in Technical data (Page 87) for details).

5.2.3 Mounting

5.2.3.1 General safety instructions

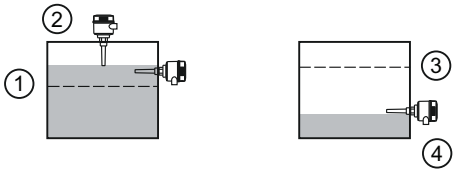
- Installation should only be performed by qualified personnel and in accordance with local governing regulations.
- This product is susceptible to electrostatic shock. Follow proper grounding procedures.
- The housing may only be opened for maintenance, local operation, or electrical installation.
- Before installing the instrument, verify that the environment complies with any restrictions specified on the product nameplate.
- To comply with CE and UKCA EMC regulations, where applicable, the CLS200 should be installed in accordance with the testing details listed in Approvals (Page 94).

For additional safety instructions for hazardous locations, see Notes for use in hazardous locations (Page 115).

5.2.3.2 Mounting

Pointek CLS200 (compact threaded probe shown)

High level alarm **Low level alarm**



① Normal process level
② Vertical
③ Normal process level
④ Horizontal

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

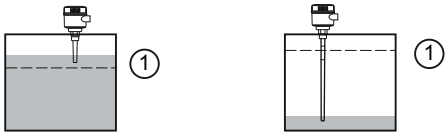
- normally mounted into the vessel top, or
- mounted through the tank wall at the detection level

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

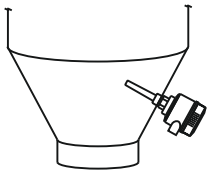
- mounted through the tank wall at the detection level

Pointek CLS200 typical configuration with extensions:

High level alarm **Low level alarm**



① Normal process level



For high or low level alarm:

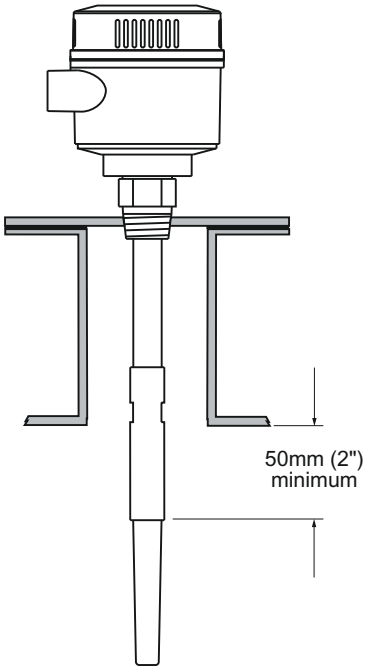
- designed for top mounting. The probe suspends vertically so that it reaches into the process at the desired detection level (high or low detection alarm).

5.2.3.3 Mounting restrictions

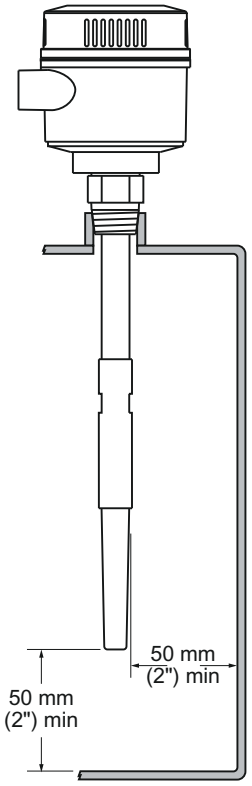
Note

- 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

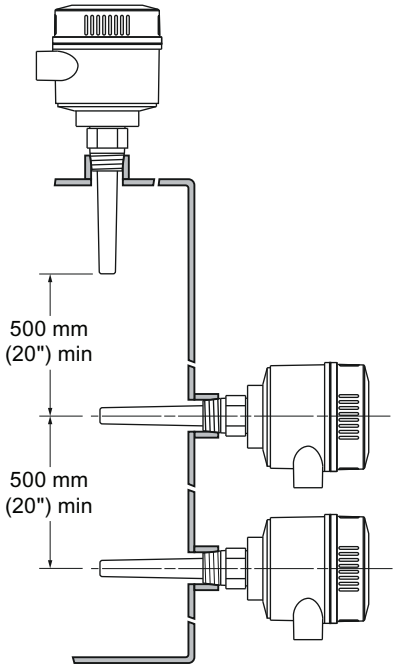


Close to tank walls

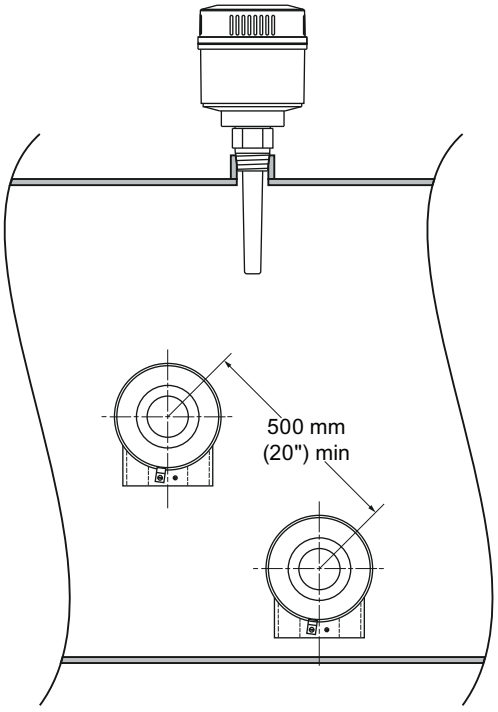


Multiple units

Side view



End view



Sensors must be at least 100 mm (4") apart. Mount diagonally if space is restricted

See also

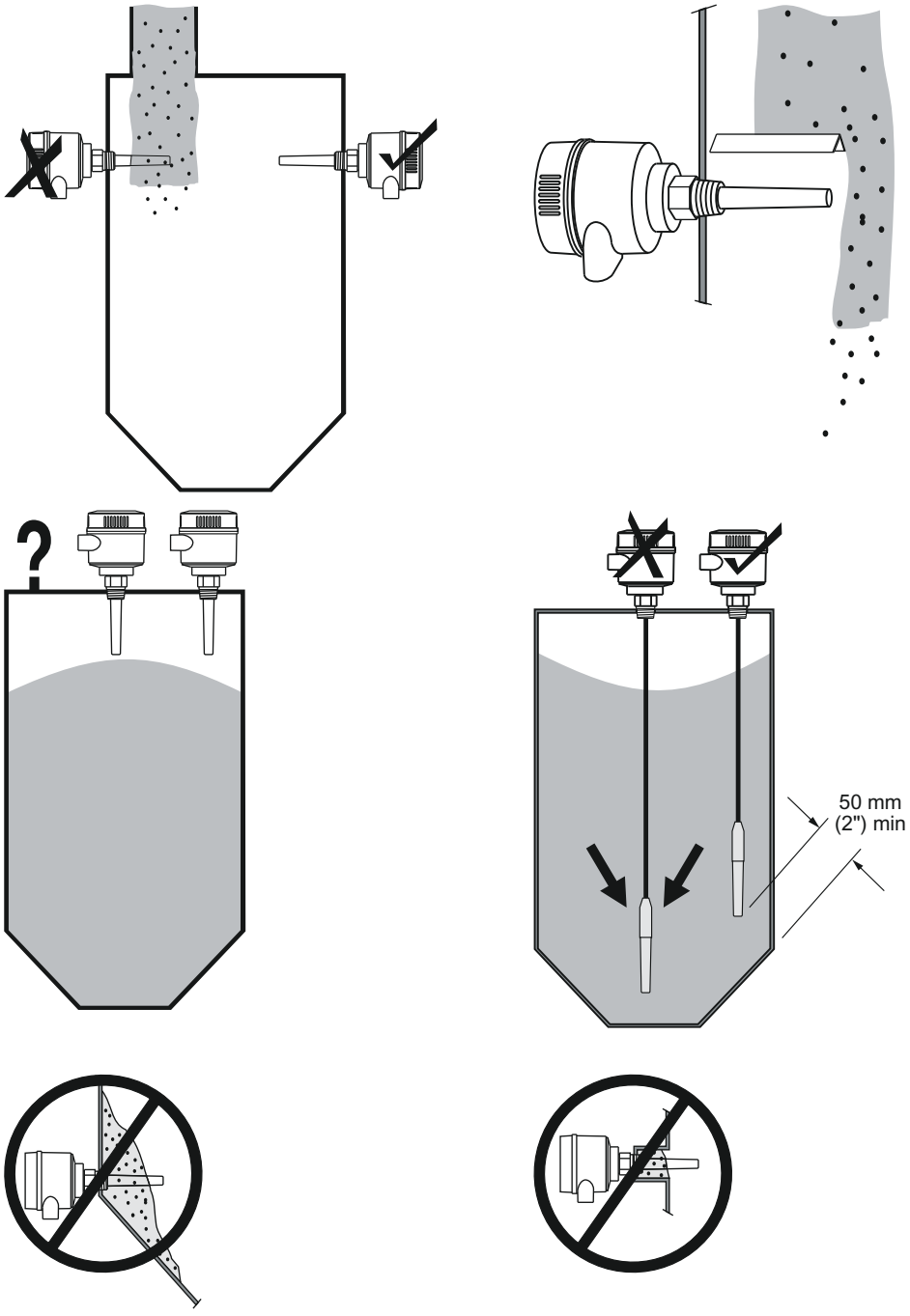
Mechanical (Page 90)

5.2.3.4 CLS200 Dimensions

Dimensions for all versions of the Pointek CLS200 Digital can be found in CLS200 (Page 127).

5.2.4 Process cautions CLS200

NOTICE
• 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 (See Tensile(max) under Electrode - CLS200 Standard table in Mechanical (Page 90)). • Avoid areas where material build up occurs.


50 mm
(2") min

5.3 Pointek CLS300

Note

- 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 comply with CE and UKCA EMC regulations, where applicable, the CLS300 should be installed in accordance with the testing details on Approvals (Page 94).

5.3.1 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 (Page 93) for details).

5.3.2 Mounting

5.3.2.1 Mounting

Pointek CLS300 typical configuration:

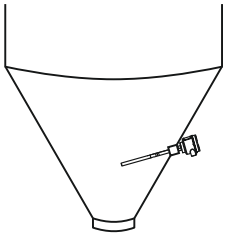
For high level alarm (level exceeds normal process level):

- 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:

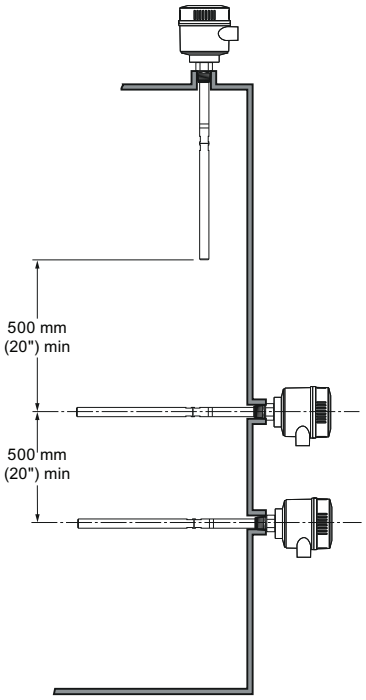
The cable version is designed for top mounting. The cable suspends vertically so that it reaches into the process at the desired detection level (high or low detection alarm).

5.3.2.2 Mounting restrictions

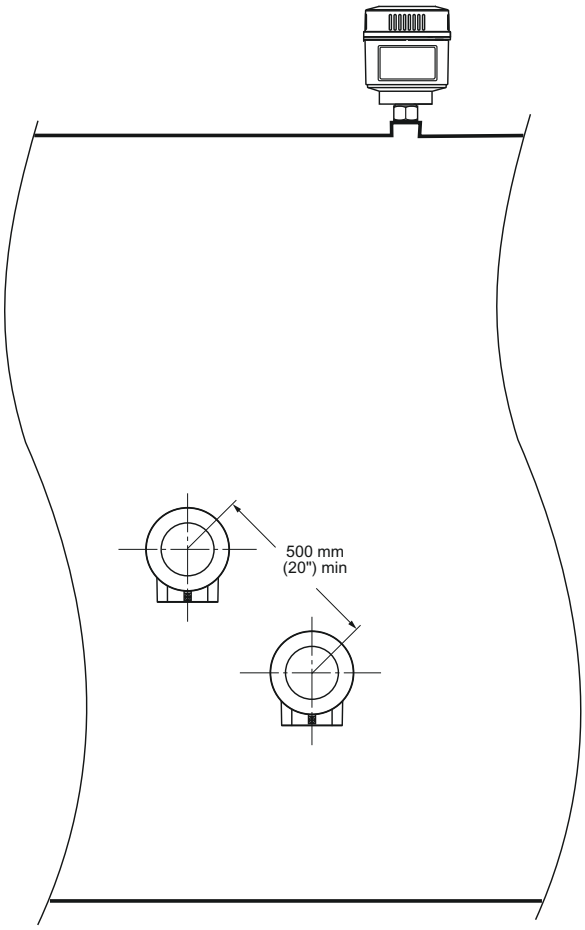
Note

- 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

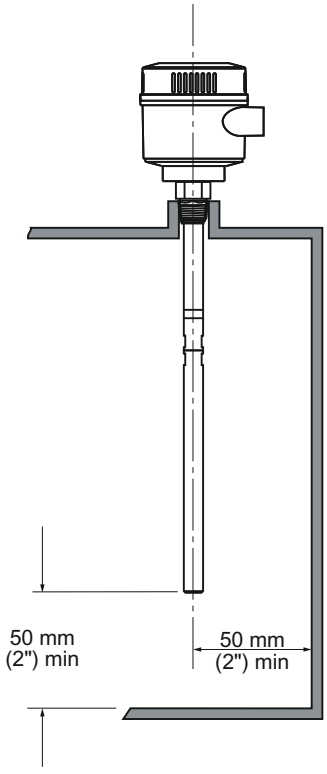


Sensors must be 500 mm (20") apart.



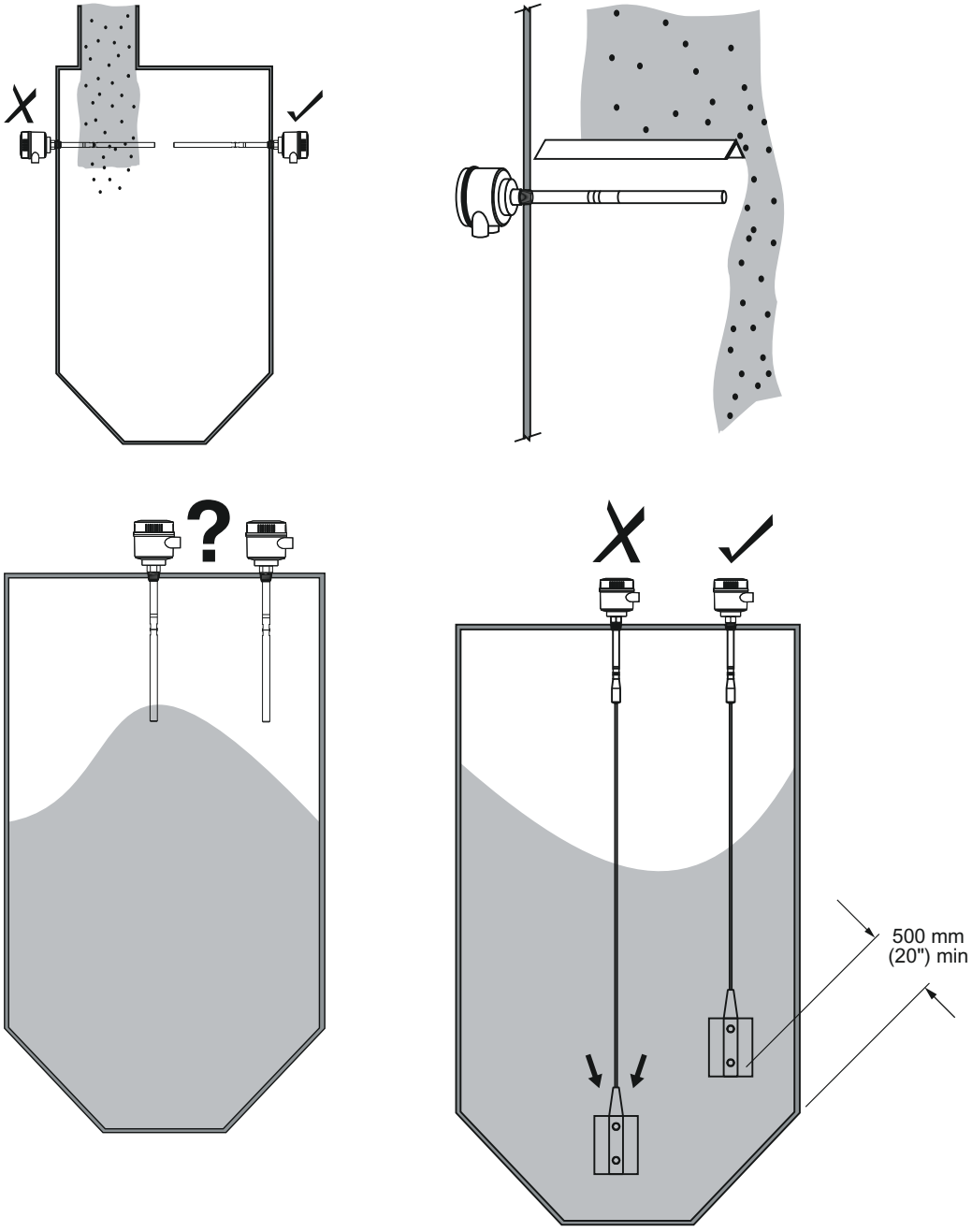
Mount diagonally is space is restricted.

Wall Restrictions



5.3.3 Process cautions CLS300

CAUTION
• 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.

5.3.4 CLS300 Dimensions

Dimensions for all versions of the Pointek CLS300 Digital can be found in CLS300 (Page 138).

Wiring

6

6.1 Electrical connection

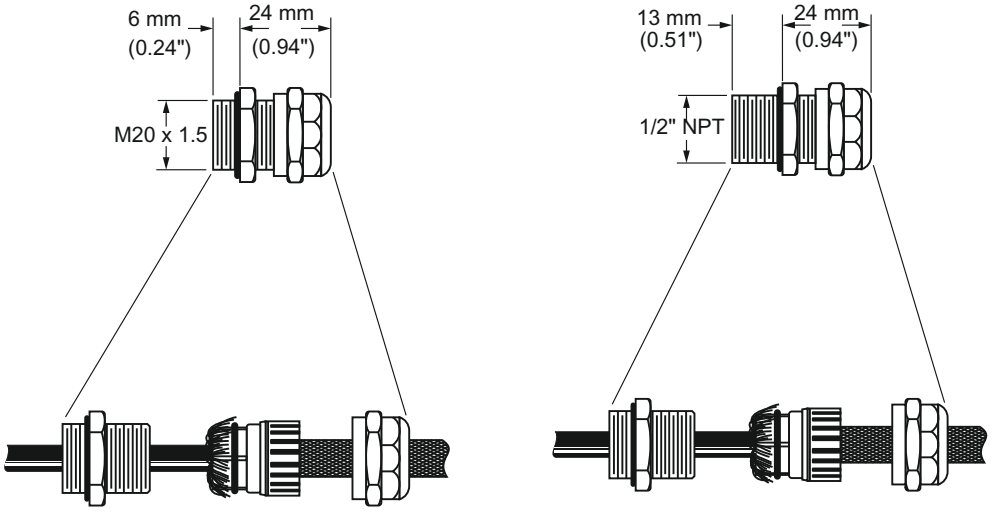
WARNING

- Observe the specifications of the examination certificate valid in your country.
- Observe the laws and regulations valid in your country for electrical installations in potentially explosive atmospheres.
- Refer to Hazardous area installation (Page 115) if applicable.
- Ensure that the available power supply complies with the power supply specified on the product nameplate and specified in the examination certificate valid in your country.
- Shipping plugs in the cable inlets must be replaced by suitable screw type glands or dummy plugs, which are appropriately certified for transmitters with explosion-proof protection.
- For CE and UKCA installations, use a cable with a braided metallic shield (or armoured cable where applicable).
- The lid must not be opened in wet locations while the unit is powered. (A wet location is a location where water or another conductive fluid may be present and is likely to increase the risk of electric shock.)
- Cable entry devices and closing elements of unused apertures must meet a temperature range from min. -40 to 10 K above maximum ambient temperature.

6.2 Cable entries

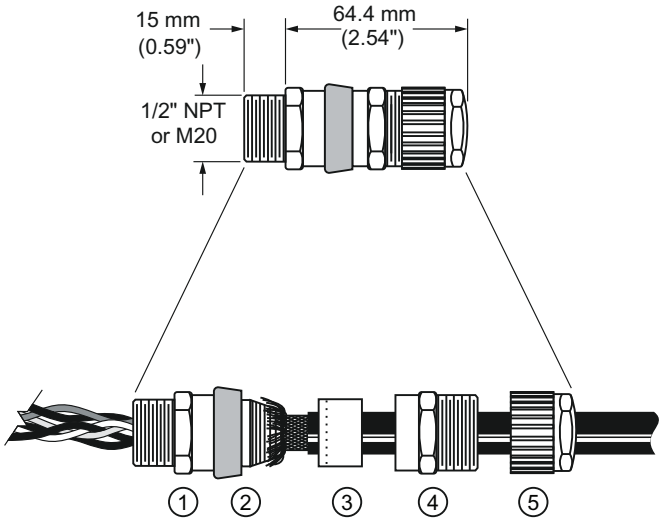
6.2.1 Recommended cable entries (equivalents can be used) (Digital)

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 Entry (with captive deluge seal)
② Diaphragm seal/armour spigot
③ Reversible armour clamp
④ Middle nut
⑤ Back nut

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.

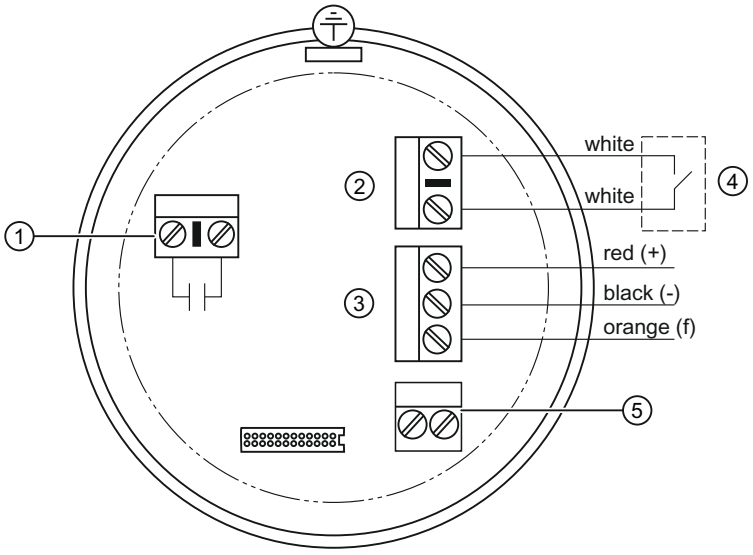
Note

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.

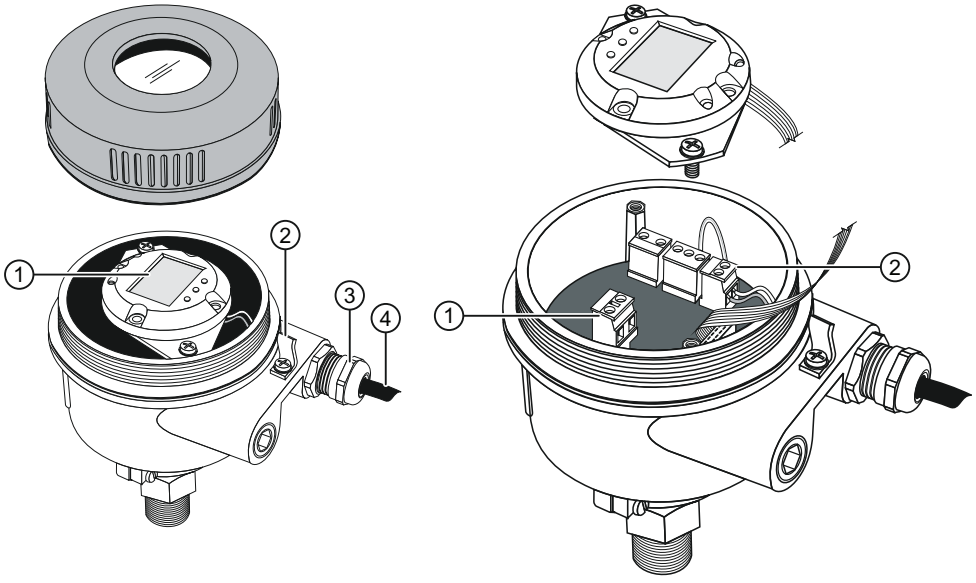


① Alarm output solid-state switch
② Test output
③ Sensor
④ Reed contact
⑤ Connect the power cable to these terminals. (Polarity is not important.)

Note

Switch and potentiometer settings are for illustration purposes only.

6.2.2 Connection to screw terminals



① Digital display
② Lid clip
③ Gland
④ Power cable

① Removable terminal block for alarm output/solid-state switch
② Removable terminal block for Profibus PA power connection

1. Loosen the lid clip and unscrew the lid of the enclosure.
2. Unscrew and lift up the digital display. (Loosen each screw two turns before completely loosening both, to keep the rubber retaining rings in place.)
3. Strip the cable jacket for approximately 70 mm (2.75") from the end of the power cable, and thread the wires through the gland.
4. Connect the wires to the Profibus PA/power connection terminals shown below; polarity is not important. The terminal can be removed and replaced to simplify connection.
5. If you want to use the Alarm Output, connect the wires of an optional input to the Alarm Output terminals (polarity is not important). The terminal can be removed and replaced to simplify connection.
6. Ground the instrument according to local regulations.
7. Tighten the gland to form a good seal.
8. Replace the Local User Interface (LUI).
9. To adjust the transmitter locally, using the keypad, see Programming via the Local User Interface (LUI) (Page 47). After adjustment, replace the enclosure lid and tighten the lid clip.

Power supply

12 ... 30 V DC, 12.5 mA

Intrinsically Safe:

12 ... 24 V DC, 12.5 mA

Intrinsically safe barrier required

For ATEX/UKEX/INMETRO: $U_i = 24$ V, $I_i = 380$ mA, $P_i = 5.32$ W, $C_i = 5$ nF, $L_i = 10$ uH

For FM/CSA: see FM/CSA connection drawing (Page 125)

Signal output

Solid state switch:

30 V DC or 30 V AC (peak), 82 mA

Intrinsically Safe:

For ATEX/UKEX/INMETRO: $U_i = 30$ V, $I_i = 200$ mA, $P_i = 350$ mW, $C_i = 0$, $L_i = 0$

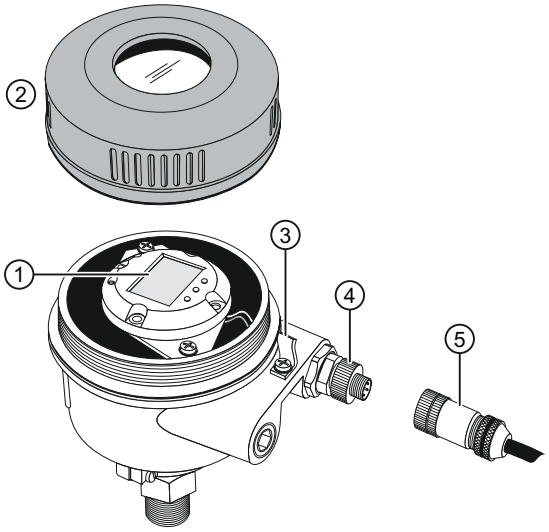
For FM/CSA: see FM/CSA connection drawing (Page 125)

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

Use a crimp type cable socket for 4 mm screw diameter, ring form, or U-form (e.g. DIN 46234)

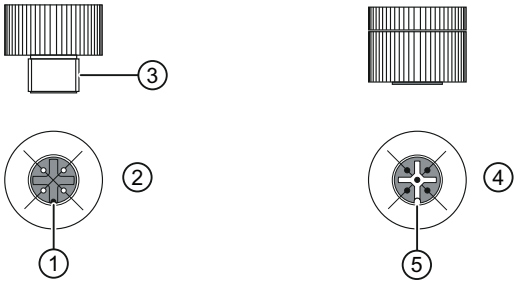
6.2.3 PROFIBUS PA connection via M12 plug

If an M12 connector is used, an M12 receptacle will be required to complete the bus connection to PROFIBUS PA.



① Digital display
② Lid
③ Lid clip
④ M12 plug (device side)
⑤ M12 receptacle (cable side)

Follow the instructions accompanying the female receptacle. The pin assignment is shown below.



① Positioning lug
② Front view of pin insert and pins
③ Thread M12x1
④ Front view of sleeve insert and sleeves
⑤ Positioning nut

[1)] Although the PROFIBUS PA recommendation is usually to ground the shield on both the device side and the cable side (to avoid interference), in some cases, it may be preferable to ground one side only, to avoid ground loops. This is particularly important if the device is mounted on cathodically protected tanks.

6.3 Connecting to a PROFIBUS PA network

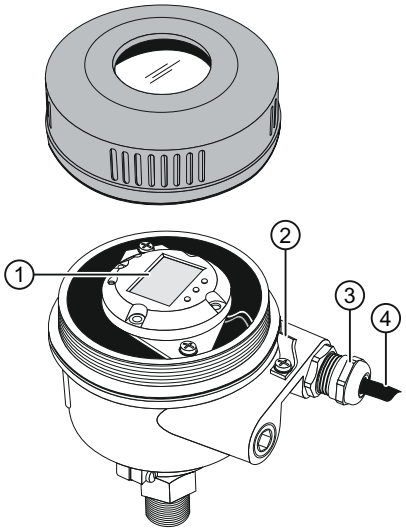
⚠ WARNING

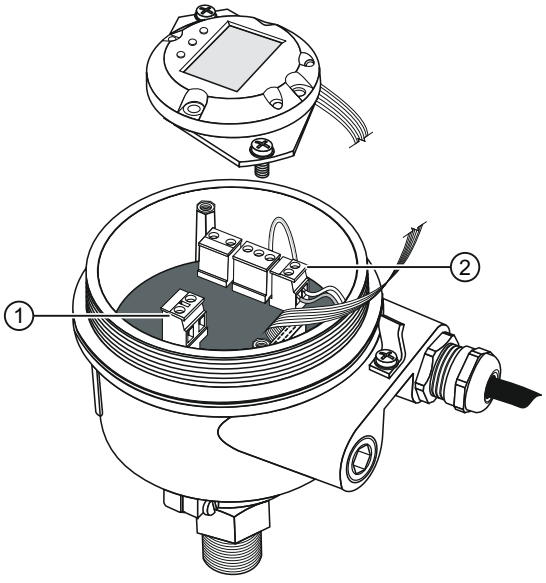
- Observe the specifications of the examination certificate valid in your country.
- Observe the laws and regulations valid in your country for electrical installations in potentially explosive atmospheres.
- Refer to Hazardous area installation (Page 115) if applicable.
- Ensure that the available power supply complies with the power supply specified on the product nameplate and specified in the examination certificate valid in your country.
- Shipping plugs in the cable inlets must be replaced by suitable screw type glands or dummy plugs, which are appropriately certified for transmitters with explosion-proof protection.
- The lid must not be opened in wet locations while the unit is powered. (A wet location is a location where water or another conductive fluid may be present and is likely to increase the risk of electric shock.)

Note

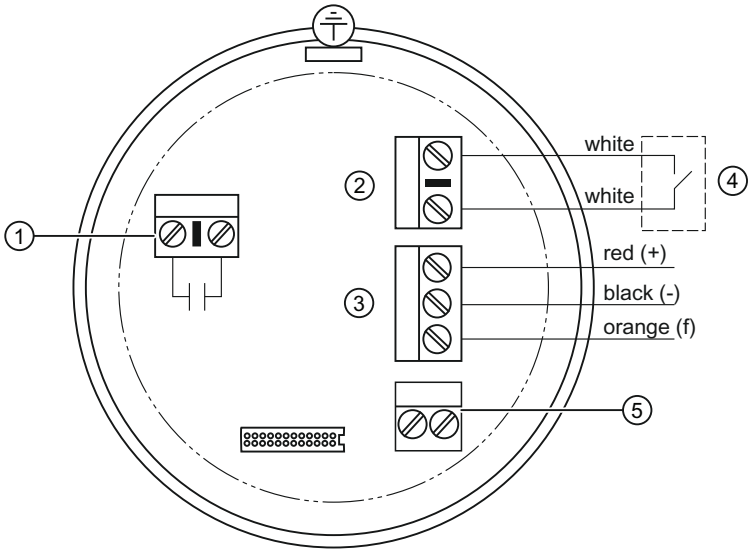
- Lay PROFIBUS PA cable separately from power cable with voltages greater than 60 V.
- Avoid locating Pointek CLS200/300 Digital near large electrical equipment wherever possible.
- Connect the cable shield to earth (for example, to the housing by means of a metallic screwed gland).

6.3.1 PROFIBUS PA connection to screw terminals





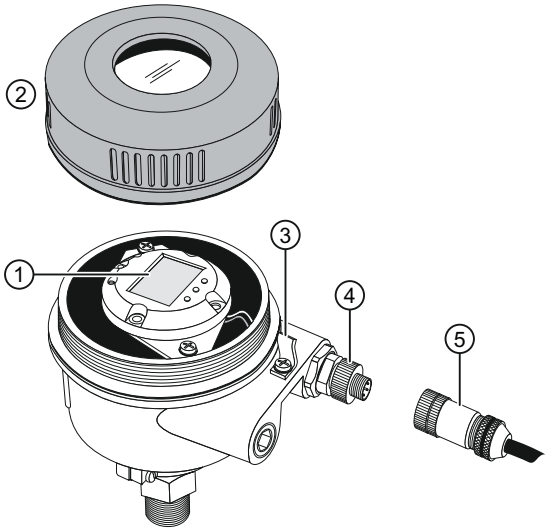
1. Loosen the lid clip and unscrew the lid of the enclosure.
2. Unscrew and lift up the digital display. (Loosen each screw two turns before completely loosening both, to keep the rubber retaining rings in place.)
3. Strip the cable jacket for approximately 70 mm (2.75") from the end of the cable, and thread the wires through the gland.
4. Connect the PROFIBUS PA wires to the terminals shown below (polarity is not important). The terminal block can be removed and replaced to simplify connection.
5. If you want to use the Alarm Output, connect the wires of an optional input to the Alarm Output terminals (polarity is not important). The terminal can be removed and replaced to simplify connection.
6. Ground the instrument according to local regulations.
7. Tighten the gland to form a good seal.
8. Replace the digital display.
9. If you want to adjust the transmitter locally using the keypad, go to Programming via the Local User Interface (LUI) (Page 47): if not, replace the enclosure lid.



① Alarm output solid-state switch
② Test output
③ Sensor
④ Reed contact
⑤ PROFIBUS PA

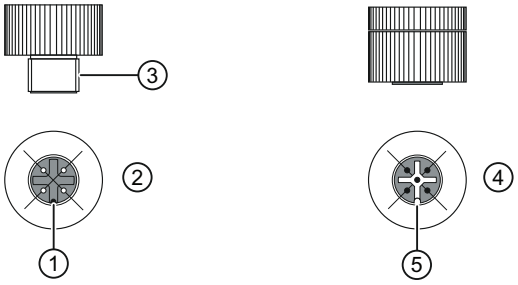
6.3.2 PROFIBUS PA connection via M12 plug

If an M12 connector is used, an M12 receptacle will be required to complete the bus connection to PROFIBUS PA.



① Digital display
② Lid
③ Lid clip
④ M12 plug (device side)
⑤ M12 receptacle (cable side)

Follow the instructions accompanying the female receptacle. The pin assignment is shown below.



① Positioning lug
② Front view of pin insert and pins
③ Thread M12x1
④ Front view of sleeve insert and sleeves
⑤ Positioning nut

[1)] Although the PROFIBUS PA recommendation is usually to ground the shield on both the device side and the cable side (to avoid interference), in some cases, it may be preferable to ground one side only, to avoid ground loops. This is particularly important if the device is mounted on cathodically protected tanks.

Local operation

7

- Local operation gives you access to all the functions listed in the table, Quick Reference: operating functions using input keypad.
- An extended range of functions is available only via remote operation using PROFIBUS PA: see PROFIBUS PA Parameters (Page 77).

7.1 Local User Interface (LUI)

You can program the transmitter using the input keypad, and view measuring results, error messages and modes of operation on the digital display.

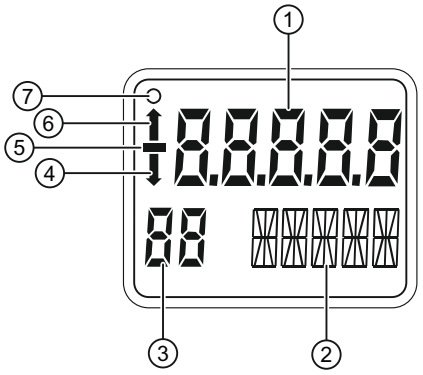
7.1.1 Input keypad

Three keys M, ⇑ and ⇓, are located below the display (see Programming via the Local User Interface (LUI) (Page 47)). The keys are accessible when you open the lid. The lid must be closed again after programming.

7.1.2 LCD display (local operation)

The local digital display shows one of the following:

- the measured value and associated units
- the logical level (sensor covered/ uncovered)
- the numerical value and mode number
- an error message and status information.
- software revision number[1)]



① Primary Reading (displays measured value, or logical level, or an error message)
② Auxiliary Reading (displays Units, or the Bar Graph, or Status [error code])
③ Indicator for Write Protection / Mode number/ Simulation
④ Down arrow indicates alarm output switch open
⑤ Negative sign
⑥ Up arrow indicates alarm output switch closed
⑦ Communication Indicator - visible only when communications are in progress

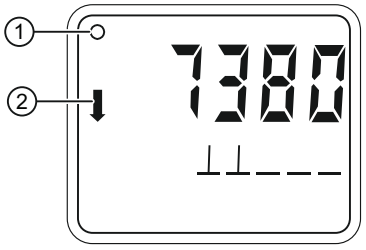
[1)] The current software revision is displayed for 1 to 2 seconds at startup on two successive screens which are immediately followed by RUN mode display.

7.1.2.1 RUN mode display

Measured value display

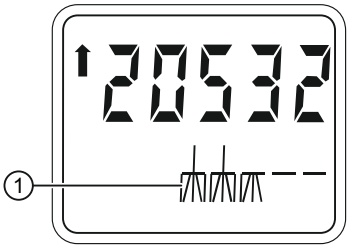
The default startup display is the measured value display. It shows the value (in counts[1)]) when Sensor (Sens) has been selected in Mode 13.

Sensor uncovered



① Communication indicator
② Down arrow indicates alarm output switch open

Sensor covered

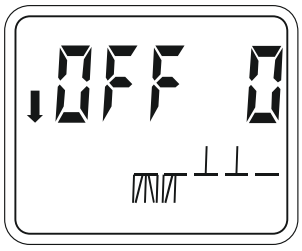


① Bar graph

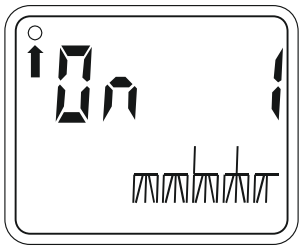
Logical level display (output status)

The logical level display shows the value when the OUT parameter of the Discrete Input Function Block is selected in Mode 13.

Sensor uncovered



Sensor covered



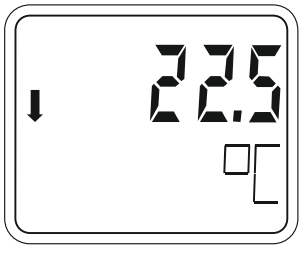
Error message display

If hardware or software errors occur in the transmitter, the error message appears in the primary reading field.

A status code is displayed in the auxiliary error message display which indicates the type of error (see Status (Page 69)). This information is also available via the PROFIBUS interface.

Units

The corresponding unit is displayed in the auxiliary reading field when Electronics Temperature is selected in Mode 13.



Bar graph

The bar graph represents the extent to which the sensor is covered during normal operation. It is displayed when one of the three following mode options is selected:

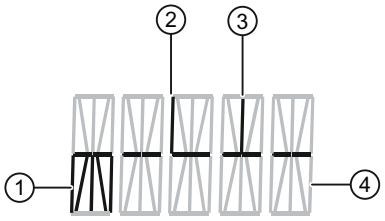
- OUT (output of the Discrete Input Function Block[2)])
- PRIM (the Primary Value of the Transducer Block[3)])
- SENS (the discrete Sensor Value of the Transducer Block[3)])

The 0% and 100% Application Range settings terminate the Bar Graph at each end and are represented on the lower part of the graph. The two Switch Points (Falling Edge and Rising Edge) are indicated as black vertical lines on the upper part of the graph; Rising Edge is the is the point where the output state is switched on and Falling Edge is the point where it is switched off.

Example:

Assume that a vessel is being filled and the sensor is slowly being covered. Because the level is rising, switch point 2 (falling edge) will be passed without any change in the output occurring. If the level continues to rise, eventually switch point 1 (rising edge) will be reached, resulting in a state changeover.

This new state will remain unchanged until the vessel is being emptied and the probe uncovered. If the level falls so that switch point 2 (falling edge) is passed again, the output state will change once more.

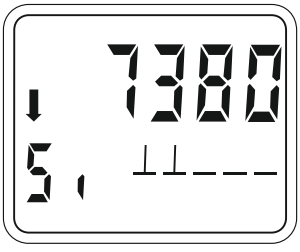


① 0% Application Range setting
② Falling Edge (Switch Point 2)
③ Rising Edge (Switch Point 1)
④ 100% Application Range setting

Lock/simulation indicator

(In PROGRAM mode, this field displays the Mode number.)

- When a lock is enabled, either Li, Lc, LA, LL, is displayed (see Lock (Page 85)).
- When simulation (via PROFIBUS PA) is active, Si is displayed (see Simulation in Filling level status (Page 78)).

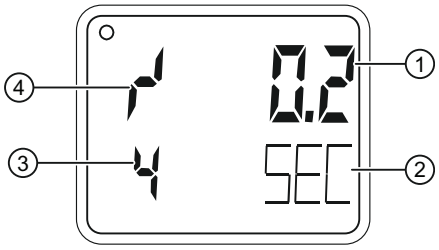


[1] See Counts in Counts (Page 98) for more details.

[2] See Discrete Input Function Block in Block model for recording and processing measured values (Page 111).

[3] See Transducer Block (TB) in Block model for recording and processing measured values (Page 111).

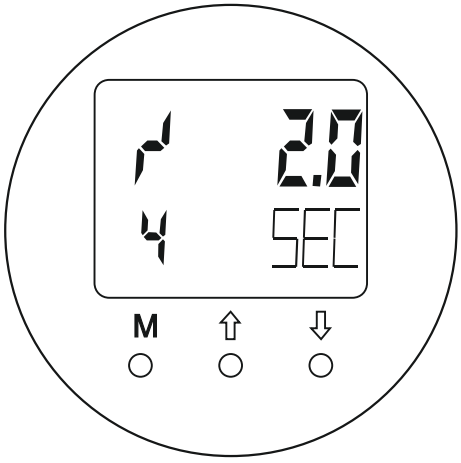
7.1.2.2 PROGRAM mode display (local operation).



① Numerical value
② Physical unit
③ Mode indicator
④ Rising (or Falling) indicator

7.2 Programming via the Local User Interface (LUI)

The keypad consists of three input keys below the display: M, ⇑ ,and ⇓ . A flashing digit indicates the position of the cursor.



M - Mode key

⇑ - increment key

⇓ - cursor movement/accept value

7.2.1 Mode selection and adjustment

Note

Master Reset function and Condensed Status Setup are available only via SIMATIC PDM software package.

Editing non-numerical values

- To select a mode, press M (mode key).
- To select an option in a mode, press ⇑ or ⇓ to scroll forwards or backwards through the options. Press M to select option.
- To switch to the next mode, press M again. To cycle forwards though the menu, press M repeatedly. To move backwards through the menu, hold M and tap ⇑.

Editing numerical values:

Numerical values are always edited from the most significant digit first, and the cursor position is indicated by a flashing digit.

- To enable Edit function and to activate the cursor press ⇑ or ⇓.
- To increment the value of the flashing digit, press ⇑.
- To move the cursor to the right press ⇓.
- After editing the least significant digit, press ⇓ once again to store the edited value.
- To switch to the next mode, press M.

Quick reference: operating functions using input keypad

Function	Mode		Key function			Display, or explanation
	#	M[1)]	⇑	⇓	⇑ and ⇓	
Measured value display[2)]						Measured value (selected in Mode 13)
Error display						Hardware or software error.
Sensor test	2		Either key activates test			Displays GOOd or FAILd.
Rise Time	4		Enable Edit function, or increment digit.	Move cursor to the right, or store edited value.		Time in seconds. Range: 0.0 to 100.0 s
Fall Time	5		Enable Edit function, or increment digit.	Move cursor to the right, or store edited value.		Time in seconds. Range: 0.0 to 100.0 s
HW Write Protection	10		Either key activates keylock.		Hold for 5 seconds to release[3)]	– – = disabled (parameter changes allowed) L = enabled (parameter changes inhibited)

Function	Mode		Key function			Display, or explanation
	#	M[1)]	⇑	⇓	⇑ and ⇓	
Display Source	13	*	Scroll up or down to select an option.			Source of measured value: 0 = OUT (output); 1 = PRIM (primary value); 2= SENS (sensor); 3 = TMP E (electronics temperature)
Unit	14	*	Scroll up or down to select an option.			Select K, °C, °F, °R (if electronics temperature selected in Mode 13).
Node address (PROFIBUS only)	15		Enable Edit function, or increment digit.	Move cursor to the right, or store edited value.		Assign slave address on the PROFIBUS network (0 to 126). Recommended setting range 1 to 125.
PROFIBUS Ident Number	16		Scroll up or down to select an option.			Select device mode: 1 =according to profile; or, 2 = according to profile with full device specific support.
Application Range, Lower Limit / 0%	19		Enable Edit function, or increment digit.	Move cursor to the right, or store edited value.		Adjust lower limit of application range.
Application Range, Upper Limit / 100%	20		Enable Edit function, or increment digit.	Move cursor to the right, or store edited value.		Adjust upper limit of application range.
Alarm output trigger	23	*	Scroll up or down to select an option.			Select the source event to switch the alarm output. See Mode 23: Alarm output trigger (default: dIAG) (Page 58).
Contact type	24	*	Scroll up or down to select an option.			Set contact functionality in case of event: (logical inversion of alarm output switch) - Make contact (CLOSE)/ Break contact (OPEn)
Switch Point 1 (Rising Edge) OFF to ON	25		Enable Edit function, or increment digit.	Move cursor to the right, or store edited value.		Set % of range at which switch will change from OFF to ON.
Switch Point 2 (Falling Edge) ON to OFF	26		Enable Edit function, or increment digit.	Move cursor to the right, or store edited value.		Set % of range at which switch will change from ON to OFF.
Local Status Text	27	*	Scroll up or down to select an option.			Select presentation of status text. See Mode 27: Local Status Text (default: U_075) (Page 60).

1) In Modes indicated by an asterisk (*), press M to store a selection. In other Modes, press to store numerical values.

2) If L appears in the Mode indicator field of the display, the HW Write Protection is activated.

3) If LA, LL, Lc or Li appears in the Mode indicator field of the display after releasing the HW Write Protection, there is an additional block on local operation via the bus. Lock, explains how to release this using SIMATIC PDM. In measuring mode, if neither L, LA, LL, Lc or Li, appears in the Mode indicator display field, local operation is possible.

7.2.2 Status codes

Every measured value which can be displayed is given a status to identify its quality. If it is classified as Bad or Uncertain the text Error alternates with the measured value in the display and the status code alternates with the unit or Bar Graph.

If the status is Bad or Uncertain, either a status code or a status message is displayed in the auxiliary display. If the selection for Local Status text is numeric a numeric code will be displayed. If a language is selected, a text message will be displayed. (For details see Mode 27: Local Status Text (default: U_075) (Page 60)).

The status display has priority, and neither the physical unit nor the Bar Graph is visible if the status is Bad or Uncertain.

Examples:

LUI Status Code	Quality	Error
Bar graph displayed	Good	
G_164	Good	Maintenance required
U_075	Uncertain	Substitute value - Constant output
B_016	Bad	Sensor failure

The status codes can be found in Status (Page 69).

7.2.3 Error messages

In the case of exceptional events, error messages can appear during local operation and are displayed for around 10 seconds after the occurrence of the error.

Error messages available		
Error code	**Meaning**	**Corrective Action**
F_001	Local operation disabled	Release HW Write Protection
F_002	Change of bus address not possible as the device is exchanging data with master class 1	End communication with master class 1
F_003	Change of PROFIBUS Ident Number not possible as the device is exchanging data with master class 1	End communication with master class 1
F_004	Value too large to fit in LCD display (>99999 or <-99999)	Change display value units
F_008	Local adjustment of parameters blocked by SIMATIC PDM	Enable “Local operation” with SIMATIC PDM

7.2.4 Mode 2: Sensor test (default: OFF)

Note

Sensor Test should only be initiated when the process value is stable. A dramatic change of level in the vessel could cause a sensor failure message.

The Sensor Test checks the circuitry including the sensor, the signal path from the sensor to the transmitter, and the transmitter itself. While the sensor test is active, the sensor value increases by a specific offset. This is verified by the electronics.

There are three methods of activating a sensor test:

- locally, using the keypad
- locally, using a magnet
- remotely, via PROFIBUS PA

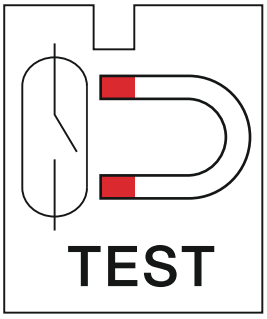
Keypad activated sensor test

- Select Mode 2.
- Press ⇑ or ⇓ to start the test.
- After a few seconds, the display shows GOOd or FAILd.
- Press M to exit.

Magnet-activated sensor test[1)]

To carry out a test without opening the lid or entering Mode 2, use a magnet.

- Bring the magnet close to the test area indicated on the housing.
- The sensor test starts and finishes automatically after 10 seconds.
- The auxiliary reading displays either SENSOR TEST SUCCESSFUL, or SENSOR TEST FAILED, as rolling text.



Sensor test using PROFIBUS PA

- Please see Sensor test (Page 85) for details.

Note

Output state does not change when sensor test is initiated.

[1)] Test magnet is supplied with the instrument.

7.2.5 Mode 4: Rise time (default: 0.0 s)

Rise Time is a delay setting which adjusts the response time of the signal[1)] to the sensor becoming covered (Rising Edge). It affects the Primary Value of the Transducer Block. Possible values range from 0.0 to 100.0 s, in 0.1 s intervals.

This symbol to the left of the numerical value on the display indicates a Rise Time setting.

To set Rise Time:

- Select Mode 4.
- Press ⇑ or ⇓ to open Edit Mode.

- Press ⇑ to adjust the value digit by digit.
- Press ⇓ to save the value.
- Press M to exit.

[1)] The bar graph, and numerical value in counts, continue to respond instantaneously to changes in level.

7.2.6 Mode 5: Fall time (default: 0.0 s)

Fall Time is a delay setting which adjusts the response time of the signal[1)] to the sensor becoming uncovered (Falling Edge). It affects the Primary Value of the Transducer Block. Possible values range from 0.0 to 100.0 s, in 0.1 s intervals.

This symbol to the left of the numerical value on the display indicates a Fall Time setting.

To set Rise Time:

- Select Mode 5.
- Press ⇑ or ⇓ to open Edit Mode.
- Press ⇑ to adjust the value digit by digit.
- Press ⇓ to save the value.
- Press M to exit.

[1)] The bar graph, and numerical value in counts, continue to respond instantaneously to changes in level.

7.2.7 Mode 10: HW Write Protection (default: OFF, display – –)

Note

When HW Write Protection is enabled, L appears in the Mode display field, in normal measuring mode.

Protects parameters from unintentional modification. This prevents parameter changes both locally via the keypad and remotely via SIMATIC PDM. The parameters are still readable.

To enable HW Write Protection:

- Select Mode 10.
- Press ⇑ or ⇓ to activate keylock and to disable operation: L appears in the numerical value field.
- Press M to exit.

To disable HW Write Protection:

- Select Mode 10.
- Hold ⇑ or ⇓ simultaneously for more than 5 seconds: L disappears from the numerical value field.
- Press M to exit.

7.2.8 Mode 13: Display Source (default: 0)

Determines which value will be displayed.

To select the display source from the options shown in the table below:

- Select Mode 13.
- Press ⇑ or ⇓ to select the value for the desired source.
- Press M to save the selection and exit.

You can assign the physical unit in Mode 14, if Electronics Temperature is selected as the display source.

Display Source	Value	Auxiliary Reading	Units	Displayed Value
From Discrete Input Function Block: OUT	0	OUT	none	Bar graph and ON or OFF
From Transducer Block: Primary Value	1	PRIM	none	Bar graph and ON or OFF
From Transducer Block: Sensor Value	2	SENS	none	Bar graph and counts value
From Transducer Block: electronics temperature: Electronics temperature	3	TMP E	K, °C, °F, or °R	Temperature in units

7.2.9 Mode 14: Unit (default: °C)

Note

Mode 14 becomes available only after Electronics Temperature is selected in Mode 13.

If Electronics Temperature is selected as the display source in Mode 13, you can change the corresponding physical unit by selecting one of the following options:

Physical Unit	Display
K	K
°C	°C

Physical Unit	Display
°F	°F
°R	°R

To set the physical unit:

- Select Mode 14: the primary reading field displays Unit, and the physical unit appears in the auxiliary reading field.
- Press ⇑ or ⇓ to select the desired physical unit.
- Press M to save the selection and exit.

7.2.10 Mode 15: Node address (default: 126)

Sets the node address[1)] of the device on PROFIBUS. The permitted range is from 0 to 126. We recommend setting the range between 1 and 125.

To set the PROFIBUS node address:

- Select Mode 15. The current node address is shown in the primary reading field.
- Press ⇑ or ⇓ to open Edit Mode.
- Enter the node address in the permitted range: press ⇑ to change the value of each digit, and press ⇓ to move the cursor to the next digit.
- Press ⇓ after editing the least significant digit, to terminate the procedure and to save the value.
- Press M to exit.

Note

- While the device is in cyclic data exchange with a class 1 Master, it is not possible to change the address. Abort the cyclic communication to change the address.
- Ensure that you set a unique node address to the device. Otherwise, the devices with the same addresses will cause confusion on the bus.

[1)] Applies to PROFIBUS PA applications only. If in standalone application (no network), leave the node address at the default value.

7.2.11 Mode 16: PROFIBUS Ident Number (default: 1)

Determines which of two device operating modes to select. Pointek CLS200/300 Digital recognizes two operating modes in relation to the DP Master:

Mode	Description	
0	Conforms to profile version 3.0 Class B device with no extensions.	Generic: can substitute transmitters conforming to PROFIBUS PA profile 3.0, one Discrete Input Function Block.
1	Conforms to profile version 3.0 Class B device with extensions.	Device-Specific: full functional range of Pointek CLS200/300 with Discrete Input Function Block.

To set the device operating mode:

- Select Mode 16. The current device operating Mode (0 or 1) appears in the primary reading field.
- Press ⇑ or ⇓ to select the desired operating mode.
- Press M to save the selection and exit.

[1)] Applies to PROFIBUS PA applications only. If in standalone application (no network), leave the node address at the default value.

7.2.12 Mode 19: 0% application range setting

This point corresponds to the left limit of the bar graph in the digital display.

CLS200 0% Application Range setting

To adjust the 0% Application Range setting for CLS200:

1. Install the device in the process.
2. Use the M button to navigate to Mode 19.
3. Set up the process to provide the recommended condition for your process from the table below:

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	sensor immersed in the material with the lowest dielectric constant

4. Press ⇑ or ⇓. The display switches to the current measured sensor value in counts. Record the count value.
5. Press ⇑ or ⇓ to enter Edit Mode; the sensor value is frozen and ready for editing.
6. Set the sensor value to approximately 300 counts below the value obtained in step 4. Press ⇑ to edit the value of each digit, and press ⇓ to move the cursor to the next digit.

7. After editing the least significant digit (or leaving it unchanged), press ⇓ to terminate the procedure and save the new value. The display now shows the new value for the 0% Application Range setting.
8. Press M to exit.

CLS300 0% Application Range setting

To adjust the 0% Application Range setting for CLS300:

1. Install the device in the process.
2. Use the M button to navigate to Mode 19.
3. Set up the process to provide the recommended condition for your process from the table below:

Application	Material	Setup conditions
General	• dry solids • low viscosity liquids	Material in tank should be at the lowest point it could reach during the normal process.
Demanding	• hygroscopic / wet solids • high viscosity and high conductivity liquids	Material in tank should be at the lowest point it could reach during the normal process. The sensor should have the minimum possible material build up.
Interface detection	• liquid A / liquid B • foam / liquid	Material in tank should be at the lowest point it could reach during the normal process.

4. Press ⇑ or ⇓ . The display switches to the current measured sensor value in counts. Record the count value.
5. Press ⇑ or ⇓ to enter Edit Mode; the sensor value is frozen and ready for editing.
6. Set the sensor value to 95% of the value obtained in step 4 (0.95 x counts). Press ⇑ to edit the value of each digit, and press ⇓ to move the cursor to the next digit.
7. After editing the least significant digit (or leaving it unchanged), press ⇓ to terminate the procedure and save the new value. The display now shows the new value for the 0% Application Range setting.
8. Press M to exit.

7.2.13 Mode 20: 100% Application Range setting

This point corresponds to the left limit of the bar graph in the digital display.

CLS200 100% Application Range setting

To adjust the 100% Application Range setting for CLS200:

1. Install the device in the process.
2. Use the M button to navigate to Mode 20.

3. Set up the process to provide the recommended condition for your process from the table below:

Application	Material	Setup conditions
General	• dry solids • low viscosity liquids	sensor fully covered
Demanding	• hygroscopic / wet solids • high viscosity and high conductivity liquids	sensor fully covered
Interface detection	• liquid A / liquid B • foam / liquid	sensor immersed in the material with the highest dielectric constant

4. Press ⇑ or ⇓. The display switches to the current measured sensor value in counts. Record the count value.
5. Press ⇑ or ⇓ to enter Edit Mode; the sensor value is frozen and ready for editing.
6. Set the sensor value to approximately 1000 counts below the value obtained in step 4. Press ⇑ to edit the value of each digit, and press ⇓ to move the cursor to the next digit.
7. After editing the least significant digit (or leaving it unchanged), press ⇓ to terminate the procedure and save the new value. The display now shows the new value for the 100% Application Range setting.
8. Press M to exit.

CLS300 100% Application Range setting

To adjust the 100% Application Range setting for CLS300:

1. Install the device in the process.
2. Use the M button to navigate to Mode 20.
3. Set up the process to provide the recommended condition for your process from the table below:

Application	Material	Setup conditions
General	• dry solids • low viscosity liquids	Material in tank should be at the highest point it could reach during the normal process.
Demanding	• hygroscopic / wet solids • high viscosity and high conductivity liquids	Material in tank should be at the highest point it could reach during the normal process.
Interface detection	• liquid A / liquid B • foam / liquid	Sensor immersed in the material with the highest dielectric constant

4. Press ⇑ or ⇓. The display switches to the current measured sensor value in counts. Record the count value.
5. Press ⇑ or ⇓ to enter Edit Mode; the sensor value is frozen and ready for editing.
6. Set the sensor value to 105% of the value obtained in step 4 (1.005 x counts). Press ⇑ to edit the value of each digit, and press ⇓ to move the cursor to the next digit.

7. After editing the least significant digit (or leaving it unchanged), press ⇓ to terminate the procedure and save the new value. The display now shows the new value for the 100% Application Range setting.
8. Press M to exit.

7.2.14 Mode 23: Alarm output trigger (default: dIAG)

The alarm output (solid-state switch) can be forced to switch for one of several reasons. The table below lists the possible triggers:

Selection message	Trigger description	Cause	Remark
OFF			
dIAG	Diagnosis (diagnostic interrupt)	Sensor Value above sensor range	
		Sensor Value below sensor range	
		Electronics temperature above nominal range	
		Electronics temperature below nominal range	
		Memory check of RAM, ROM, EEPROM not passed (test running in background)	
OUt_d	Output Value (process interrupt)	Logical Level (OUT parameter)	Affected by Application Range, upper and lower limits; Rise Time; Fall Time; and Inversion
ALErt	Diagnostic Alarm Limit exceeded	Sensor Value higher than Diagnostic Alarm upper limit.	Diagnostic Alarm Limits are set with SIMATIC PDM

To select the trigger which will force the alarm output to switch:

- Select Mode 23. The current selection (OFF, dIAG, Out_d, or ALErt) appears in the primary reading field.
- Press ⇑ or ⇓ until the desired selection message appears.
- Press M to save and exit.

7.2.15 Mode 24: Contact type (default: CLOSE)

The solid-state switch alarm output can function in one of two ways:

- Make contact (close)
- Break contact (open)

To select the contact type.

- Select Mode 24. The current contact type (OPEn or CLOSE) appears in the primary reading field.
- Press ⇑ or ⇓ to select the desired contact type.
- Press M to save and exit.

⚠ WARNING

If you change this parameter, the position of the switch changes immediately. Adapted applications or devices can react unintentionally.

Note

This adjustment is independent of the Inversion Output parameter of the Discrete Input Function Block, which can only be set remotely.

7.2.16 Mode 25: Switch Point Off to On/Switch Point 1/Rising Edge (default: 55%)

Note

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.

Allows you to adjust the switch behavior by setting the percentage of the Application Range (defined in Mode 19 and Mode 20) at which point the logical switch will change from Off to On.

This symbol appears to the left of the numerical value to indicate a Rising Edge value.

Switch Point 1 must have a value greater than or equal to the value for Switch Point 2. If you enter a lower value, Switch Point 2 will be adjusted to the same value.

The permitted range is limited by the distance of the Switch Point to the next Measuring Limit.

To view the current setting for Switch Point 1:

- Select Mode 25.
- The current setting appears in the primary reading field as a percent of the Application range (0 to 100%).
- Press M to exit, or:

To adjust the setting:

- Press ⇑ or ⇓.
- The display switches to the current measured Sensor Value as a percent of the Application Range (0 to 100%).
- Press ⇑ or ⇓ to open Edit mode: the Sensor value is frozen.

- Press ⇑ to edit the value of each digit, and press ⇓ to move the cursor to the next digit.
- After editing or leaving the least significant digit unchanged, press ⇓ to terminate procedure and save the new value.
- You see the new setting for Switch Point 1.
- Repeat the process, or press M to exit.

7.2.17 Mode 26: Switch Point On to Off/ Falling Edge (default: 45%)

Note

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.

Allows you to adjust the switch behavior by setting the percentage of the Application Range (defined in Mode 19 and Mode 20) at which point the logical switch will change from ON to OFF.

This symbol appears to the left of the numerical value to indicate a Falling Edge value.

Switch Point 2 must have a value less than or equal to the value for Switch Point 1. If you enter a higher value, Switch Point 1 will be adjusted to the same value.

To view the current setting for Switch Point 2:

- Select Mode 26.
- The current setting appears in the primary reading field as a percent of the Application range (0 to 100%).
- Press M to exit, or:

To adjust the setting:

- Press ⇑ or ⇓.
- The display switches to the current measured Sensor Value as a percent of the Application Range (0 to 100%).
- Press ⇑ or ⇓ to open Edit mode: the Sensor value is frozen.
- Press ⇑ to edit the value of each digit, and press ⇓ to move the cursor to the next digit.
- After editing or leaving the least significant digit unchanged, press ⇓ to terminate procedure and save the new value.
- You see the new setting for Switch Point 2.
- Repeat the process, or press M to exit.

7.2.18 Mode 27: Local Status Text (default: U_075)

Sets the format for representing Sensor Status. The default setting is a numeric format: one letter followed by an underscore and a decimal figure representing the status code (e.g. U_075).

You can select between the numeric format described above, or text as English, German, French, Spanish, or Italian strings. The strings are represented as rolling text.

Language format	**Display message**
numeric	U_075
Italian	ItALI
Spanish	ESPAn
French	FrAnC
German	dEUtS
English	EnGLI

To select the status format:

- Select Mode 27.
- The current setting is shown in the primary reading field.
- Press ⇑ or ⇓ to select a new format.
- Press M to save and exit.

7.3 CLS200 digital switching point setup

Use the following procedure to set up the switch point for the CLS200 Digital model.

1. Set the 0% Application Range Setting (Mode 19):
   - Install the device in the process.
   - Use the M button to navigate to Mode 19.
   - Set up the process to provide the recommended condition for your process from the table below:

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	sensor immersed in the material with the lowest dielectric constant

   - Press ⇑ or ⇓. The display switches to the current measured sensor value in counts.
   - Press ⇑ or ⇓ to enter Edit Mode; the sensor value is frozen and ready for editing.
   - Set the sensor value to approximately 300 counts below the value of the current reading. Press ⇑ to edit the value of each digit, and press ⇓ to move the cursor to the next digit.
   - After editing the least significant digit (or leaving it unchanged), press ⇓ to terminate the procedure and save the new value. The display now shows the new value for the 0% Application Range setting.
   - Press M to exit
2. Set the 100% Application Range setting (Mode 20):
   - Install the device in the process.
   - Use the M button to navigate to Mode 20.
   - Set up the process to provide the recommended condition for your process from the table below:

Application	Material	Setup conditions
General	• dry solids • low viscosity liquids	sensor fully covered
Demanding	• hygroscopic / wet solids • high viscosity and high conductivity liquids	sensor fully covered
Interface detection	• liquid A / liquid B • foam / liquid	sensor immersed in the material with the highest dielectric constant

   - Press ⇑ or ⇓. The display switches to the current measured sensor value in counts.

- Press ⇑ or ⇓ to enter Edit Mode; the sensor value is frozen and ready for editing.
- Set the sensor value to approximately 1000 counts above the value of the current reading. Press ⇑ to edit the value of each digit, and press ⇓ to move the cursor to the next digit.
- After editing the least significant digit (or leaving it unchanged), press ⇓ to terminate the procedure and save the new value. The display now shows the new value for the 100% Application Range setting.
- Press M to exit.

3. Adjust the Off to On switch point (Mode 25):
   - Use the M button to navigate to Mode 25.
   - Set the value to 55% as a starting point.
4. Adjust the On to Off switch point (Mode 26):
   - Use the M button to navigate to Mode 26.
   - Set the value to 45% as a starting point.

   Note

   A minimum hysteresis (difference between the Off to On switch point and the On to Off switch point) of 10% must be maintained for reliable operation. In some situations, it may be desirable to increase the hysteresis between the two switch points to prevent false tripping (e.g. turbulence in the process).
5. Adjust the other parameters of the device as desired.

7.4 CLS300 digital switching point setup

Use the following procedure to set up the switch point for the CLS200 Digital model.

1. Set the 0% Application Range Setting (Mode 19):
   - Install the device in the process.
   - Use the M button to navigate to Mode 19.
   - Set up the process to provide the recommended condition for your process from the table below:

Application	Material	Setup conditions
General	• dry solids • low viscosity liquids	Material in tank should be at the lowest point it could reach during the normal process.
Demanding	• hygroscopic / wet solids • high viscosity and high conductivity liquids	Material in tank should be at the lowest point it could reach during the normal process. The sensor should have the minimum possible material build up.
Interface detection	• liquid A / liquid B • foam / liquid	Material in tank should be at the lowest point it could reach during the normal process.

   - Press ⇑ or ⇓. The display switches to the current measured sensor value in counts. Record the count value.
   - Press ⇑ or ⇓ to enter Edit Mode; the sensor value is frozen and ready for editing.
   - Set the sensor value to 95% of the value obtained in step 1d (0.95 x counts). Press ⇑ to edit the value of each digit, and press ⇓ to move the cursor to the next digit.
   - After editing the least significant digit (or leaving it unchanged), press ⇓ to terminate the procedure and save the new value. The display now shows the new value for the 0% Application Range setting.
   - Press M to exit
2. Set the 100% Application Range setting (Mode 20):
   - Install the device in the process.
   - Use the M button to navigate to Mode 20.
   - Set up the process to provide the recommended condition for your process from the table below:

Application	Material	Setup conditions
General	• dry solids • low viscosity liquids	Material in tank should be at the highest point it could reach during the normal process.
Demanding	• hygroscopic / wet solids • high viscosity and high conductivity liquids	Material in tank should be at the highest point it could reach during the normal process.
Interface detection	• liquid A / liquid B • foam / liquid	Sensor immersed in the material with the highest dielectric constant

- Press ⇑ or ⇓. The display switches to the current measured sensor value in counts.
- Press ⇑ or ⇓ to enter Edit Mode; the sensor value is frozen and ready for editing.
- Set the sensor value to 105% of the value obtained in step 2d (1.05 x counts). Press ⇑ to edit the value of each digit, and press ⇓ to move the cursor to the next digit.
- After editing the least significant digit (or leaving it unchanged), press ⇓ to terminate the procedure and save the new value. The display now shows the new value for the 100% Application Range setting.
- Press M to exit.

3. Determine the switch point:
   - Bring the process material to the desired switching level in the process.
   - Record the count value displayed on the device.
   - Calculate the trip point as a percent of process range:

trip point (%) =	((counts recorded in step 3b – M19)/(M20 – M19))*100

4. Adjust the On to Off switch point (Mode 25):
   - Use the M button to navigate to Mode 25.
   - Set the value to 5% above the trip point percentage calculated in step 3c as a starting point.
5. Adjust the On to Off switch point (Mode 26):
   - Use the M button to navigate to Mode 26.
   - Set the value to 5% below the trip point percentage calculated in step 3c as a starting point.

Note

- A hysteresis (difference between the Off to On switch point and the On to Off switch point) of 10% is used as an example of a typical setup. In some situations it may be desirable to increase the hysteresis between the two switch points to prevent false tripping (e.g. turbulence in the process).
- All parameters should be set up to account for a possible deviation of ±1% of the actual measurement under reference conditions.

6. Adjust the other parameters of the device as desired.

Remote operation

8

Note

The following instructions assume that the user is familiar with PROFIBUS PA.

PROFIBUS PA is an open industrial protocol. Full details about PROFIBUS PA can be obtained from PROFIBUS International at www.profibus.com (www.profibus.com).

Pointek CLS200/300 Digital is a Class B, Profile Version 3.01, PA device. It supports Class 1 Master for cyclic and acyclic data exchange, and Class 2 for acyclic services: (see Cyclic versus acyclic data (Page 68) for details).

You will need a software package to configure Pointek CLS200/300. We recommend SIMATIC Process Device Manager (PDM) by Siemens. (You can find more information at www.siemens.com/processinstrumentation (www.siemens.com/processinstrumentation)).

8.1 SIMATIC PDM

SIMATIC PDM is a software package used to commission and maintain Pointek CLS200/ 300 and other process devices.

SIMATIC PDM monitors the process values, alarms and status signals of the device and allows you to display, compare, adjust, verify, and simulate process device data.

8.1.1 Electronic Device Description (EDD)

In order to use SIMATIC PDM with PROFIBUS PA, you will need the Device Description for Pointek CLS200/300 which will be included with new versions of PDM. You can locate the Device Description in **Device Catalog**, under **Sensors/Level/Capacitive/Siemens Milltronics**. If you do not see Pointek CLS200/300 under Siemens Milltronics, you can download it from the **Pointek CLS200 or CLS300** product page of our web site. Go to: http://pia.khe.siemens.com/index.asp?Nr=4924 (http://pia.khe.siemens.com/index.asp?Nr=4924) and click on **Downloads**. After downloading the DD file, you need to open PDM and click **Options/Manage Device Catalog**.

8.1.2 Configuration

To configure a PROFIBUS Class 1 Master (for example, a PLC), you will need a **GSD** file.

The GSD file

The GSD file can be downloaded from either the Pointek CLS200 or CLS300 product pages on our web site: Pointek CLS200 (https://new.siemens.com/global/en/products/automation/process-instrumentation/level-measurement/point-level/pointek-cls200.html) or Pointek

CLS300 (https://new.siemens.com/global/en/products/automation/process-instrumentation/level-measurement/point-level/pointek-cls300.html), under **Downloads**.

8.1.3 Setting the PROFIBUS address

When your instrument is shipped, the PROFIBUS PA address is set to 126. You can set it locally (see Mode 15: Node address (default: 126) (Page 54)) or remotely via the bus, using a parameterization tool such as SIMATIC PDM or HW-Config.

When cyclic data transfer with a Class 1 Master is in process, the address can only be changed via the bus.

Bus address (Device Address)

Values	Range: 0 to 126 (recommended setting between 1 and 125)
	Pre-set: 126

8.1.4 Bus termination

Note

PROFIBUS PA MUST be terminated at both extreme ends of the cable for it to work properly. Please refer to the PROFIBUS PA User and Installation Guidelines (order number 2.092), available from www.profibus.com (www.profibus.com).

8.1.5 Power demands

To determine how many devices can be connected to a bus line, calculate the combined maximum current consumption of all the connected devices (12.5 mA for Pointek CLS200/ 300). Allow a current reserve for safety.

8.1.6 Cyclic versus acyclic data

When data is requested from a device via PROFIBUS PA, there are two data transfer methods. Cyclic data is requested and provided at every bus scan: acyclic data is requested and provided as needed.

- Input and output information is always requested at every bus scan and is set up as cyclic data.
- Configuration and maintenance information is needed infrequently, and is set up as acyclic data.

Acyclic data transmission

Pointek CLS200/300 supports up to four simultaneous connections by a Class 2 Master (C2 connection). It supports one connection by a Class 1 Master (C1 connection).

Cyclic data transmission

Cyclic data transmission transfers the user data relevant for process automation between the Class 1 Master (control or automation system) and the transmitter.

When you configure Pointek CLS200/300 on the PROFIBUS PA bus, there is one slot available for modules, and the Level Status module is automatically inserted.

Transmission of user data via PROFIBUS PA

The user data is continuously updated by the cyclic service of PROFIBUS PA. The user data is the OUT parameter of the Discrete Input Function Block and is composed of the Logical Level and Status bytes.

The 2 bytes must be read consistently[1)] , in a contiguous chunk: they must not be read byte by byte, and must not suffer an interrupt. If you are using an S7-300 / 400, you will need to use SFC14 DPRD_DAT: Read Consistent Data of a Standard PD Slave.

Byte	Out
Byte 1	Logical Level
Byte 2	Status[2)]

[1)] Consistent in this context means all-at-one-time.

[2)] If Condensed status is turned on (default), then the condensed status appears here.

Logical Level

The Logical Level indicates the level of the material.

Inversion	Sensor Status	Logical Level
OFF	uncovered	= 0 (zero)
OFF	covered	= 1

8.2 Status

Status provides information via the status byte, on the usability of the measured value in the PLC/DCS[1)], the device status, and additional process information (for example, process alarms).

[1)] Programmable Logic Controller/Distributed Control System

8.2.1 Status byte

The status byte is a standardized code returned by a PROFIBUS slave on every bus scan, along with the main process variable (output of the Analog Input Function Block).

- The status code indicates whether the process variable is valid or not.
- It also indicates other process-related information.

Status codes

The codes for the Status bytes are listed in the following tables. Possible causes for an error are shown, along with measures to correct it.

If the language selected for the display is numeric, a status code will be displayed. If any other language has been selected, a status description will be displayed.

Note

For more detail, please consult the PROFIBUS PA User and Installation Guideline (order number 2.092), available for download from www.profibus.com (www.profibus.com).

Status codes for good quality				
Hex	**Digital display**	**PDM display**	**Possible cause**	**Corrective measure**
80	_ _ _	Good	Normal operation	_ _ _
84	G_132	Good; Active block alarm	A parameter relevant for the behavior of the device has been changed. The display is extinguished after 10 seconds.	Note to the control system
8D	G_141	Good; Active critical alarm; Limit underflow	The Sensor Value exceeds the Lower Diagnostic Alarm Limit [1)]	Check installation and sensor adjustment.
8E	G_142	Good; Active critical alarm; Limit overflow	The Sensor Value exceeds the Upper Diagnostic Alarm Limit [1)]	Check installation and sensor adjustment.
A4	G_164	Good; Maintenance required	Maintenance interval has expired	Maintenance work, electronics servicing, or sensor servicing, is required.

[1)] Set via PROFIBUS PA, in counts (see Counts in Counts (Page 98) for details).

Status codes for bad quality				
Hex	**Digital display**	**PDM display**	**Possible cause**	**Corrective Measure**
00	---	Bad	Is used if no other information is available	
0F	B_015	Bad; Device failure; Value constant	Device has an irreparable Error.	Replace the electronics.
10	B_016	Bad; Sensor failure	Sensor test failed	Check sensor

Status codes for bad quality				
Hex	**Digital display**	**PDM display**	**Possible cause**	**Corrective Measure**
11	B_017	Bad; Sensor failure; Limit underflow	Sensor shows an error. Measured level too small	Check sensor
12	B_018	Bad; Sensor failure; Limit overflow	Sensor shows an error. Measured level too high	Check sensor
1F	B_031	Bad; Out of service; Value constant	The function block is put out of order with a target mode command. A parameterized safety value is supplied.	For normal operation, reset the target mode to AUTO
40	U_064	Uncertain	Sensor test in progress; no error detected.	To return to normal operation, deactivate sensor test.
47	U_071	Uncertain, Last usable value, Value constant	"Fail Safe" input condition is met; the parameterized safety setting is set to "keep last valid value"	Consult the log of measured data.
4B	U_075	Uncertain, Substitute value, Value constant	Value is not an automatic measured value. This identifies a parameterized, static substitute value or a preset value.	Consult the log of measured data.
4F	U_079	Uncertain, initial value, Value constant	After run-up, an initial value is entered in the device memory.	Reject the value in the user program.
50	U_080	Uncertain, Value inaccurate	Unreliable operating parameters or maintenance alarm	Check the operating parameters, e.g. the permitted ambient temperature. Immediate maintenance work required.

Diagnostics

In addition to information on the usability of the measured value, Pointek CLS200/300 can actively report information on its own status. Diagnostics are important information, which an automation system can use to introduce remedial measures.

Standard PROFIBUS DP mechanisms are used to transport diagnostic information and actively report it to the Class 1 Master. For this, PROFIBUS DP provides a protocol to transmit information ranked higher than user data to the Class 1 Master.

The content of the "Device status" parameter from the physical block is reported and, in addition, information on whether a change of status has occurred (event arrived/ event gone). The diagnostic object consists of 10 bytes (4 bytes standard diagnostics and 6 bytes Extended diagnostics).

Standard diagnostics

Diagnostic messages				
Byte	**Bit**	**Meaning when value = 1**	**Possible cause**	**Corrective measure**
Byte 0	0	---		
	1	---		
	2	---		
	3	Electronics temperature is too high	The temperature of the measuring transducer electronics (which is monitored by the measuring transducer) exceeds 85°C.	Reduce the ambient temperature to within the permissible range
	4	Memory error	An error has been found. (During operation, the memories are constantly checked for check sum errors and read/ write errors.)	Replace the electronics.
	5	Measurement failure	Either the sensor has failed, or the sensor limits are being exceeded.	Have the sensor checked by the service department
	6	---		
	7	---		
Byte 1	0	---		
	1	---		
	2	---		
	3	Restart (goes to 0 after 10 s)	The supply current has been fed to the device; or a warm start[1)] has been triggered using SIMATIC PDM; or the internal watchdog has expired.	Check the cabling and the power unit
	4	Coldstart [2)] (goes to 0 after 10 s)	The device has been reset to its factory settings.	
	5	Maintenance required	A service interval has expired.	Service the device, and reset the messages using SIMATIC PDM.
	6	---		
	7	Ident Number violation	You have changed the parameter PROFIBUS Ident Number during cyclic operation. The device is reporting the violation of the Ident number and showing you a preliminary failure warning. In the case of a warm restart, the device will no longer participate in cyclical communication of reference data without a change in the system configuration.	Adjust the configuration data (change of GSD), so that it is consistent with the Ident number set in the device.

Diagnostic messages				
Byte	**Bit**	**Meaning when value = 1**	**Possible cause**	**Corrective measure**
Byte 2	0	Maintenance alarm	Device requires maintenance	Maintenance action required
	1	Maintenance demanded	Device requires immediate maintenance or a failure will occur.	
	2	Function check		
	3	Invalid process conditions		
Byte 3	7	Extended diagnostics available		

[1] With a warm start, the volatile data is preserved.

[2] With a cold start, all volatile data is lost.

Extended diagnostics

Extended diagnostic messages			
Meaning	**Corrective action**	**Byte**	**Bit**
Electronic temperature exceeds permissible range	Bring temperature of electronics module to within allowed range	0	0
Sensor value exceeds diagnostic alarm limits	Either adjust diagnostic alarm limits or remove cause of out of range sensor value		2
Calibration timer, unacknowledged alarm	Perform calibration and timer will automatically be reset		3
Calibration timer, unacknowledged warning			4
Service timer, unacknowledged alarm	Perform service and reset timer using SIMATIC PDM		5
Service timer, unacknowledged warning			6
Sensor value exceeds sensor limits	Perform service on sensor or replace unit	2	6
Sensor Test Running	Wait for sensor test to finish, then remove test magnet from device housing		7
Memory checksum error	Device is defective; replace unit	3	1
Sensor test failed	Sensor is defective; replace sensor		2
Sensor value simulation	To return to normal operation, disable the simulation with SIMATIC PDM		3
Simulation: Electronic temperature	To return to normal operation, disable the simulation with SIMATIC PDM		4
Simulation: Digital input in simulation	To return to normal operation, disable the simulation with SIMATIC PDM		5
Digital Input in Manual mode	To return to normal operation, disable the simulation with SIMATIC PDM; reset the block mode of the Digital Input Function Block		6
Simulation: Diagnosis	To return to normal operation, disable the simulation with SIMATIC PDM		7

Note

The instrument status can be simulated using SIMATIC PDM. This allows you to test the reaction of the automation system to errors.

Self tests

Pointek CLS200/300 carries out the following self tests:

Self Tests				
Self test function	**Algorithm**	**Frequency**	**Diagnostic error message**	**Corrective measure**
Measure the electronics temperature	If electronics temperature exceeds 85 °C	Every measurement cycle/ 60 ms	Electronics temperature too high	Reduce ambient temperature to within permissible range
RAM test	Writing and verifying every cell with a byte (walking one and walking zero[1)]) to detect defect cells and crosstalk	45 s	Memory error	Replace the electronics.
Code test	Summarizing the bytes and comparison with a checksum	45 s	Memory error	Replace electronics and, if necessary, measuring cell.
Sensor test	If measurement returns a value outside the sensor range determined by Measuring Limits	every measurement cycle/ 60 ms	Measurement failure	Have sensor checked by service department.
Check service timers	If a service timer reaches the parameterized warning or alarm limit	60 ms	Maintenance required	Carry out servicing and reset messages using SIMATIC PDM.
Watchdog trigger	The program must pass specific checkpoints. If all checkpoints are not passed within a specific time, the watchdog timer expires and a restart will be carried out	2 s	Restart	Check cabling and power unit to ensure the power supply to Pointek CLS200/ 300

[1)] A walking one and zero is a method of checking each bit in each location of volatile memory.

Values of the DIAGNOSIS bit:

- 0 = not set
- 1 = set

8.2.2 Configuration example

To configure and use PROFIBUS PA with an S7-300/400 PLC

1. If Pointek CLS200/300 is not listed in the STEP 7 device catalog, you can download the DeviceInstall file from the Siemens Milltronics website and run it from your computer. Go to CLS200 web page (https://new.siemens.com/global/en/products/automation/process-instrumentation/level-measurement/point-level/pointek-cls200.html) and click Downloads.
2. Add the Pointek CLS200/300 "rack": click and drag the Pointek CLS200/300 folder from the hardware catalog.
3. Fill the rack with desired modules, by dragging and dropping them from the hardware catalog.
4. After configuring PROFIBUS PA in steps 2 and 3, download it to the PLC.

Add code to the PLC program to read data consistently using the SFC14.

PROFIBUS PA Parameters

9

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

The full range of Pointek CLS200/300 functions is available only via remote operation using PROFIBUS PA.

To use PROFIBUS PA, you will need a PC configuration tool: we recommend SIMATIC PDM. For more information see SIMATIC PDM (Page 67).

9.1 Measured Values

In measuring operations, measured values, such as the logical level, are provided via PROFIBUS PA. They can be viewed via PROFIBUS PA, and on the LCD display. To view values via PROFIBUS PA, open the menu **View - Display**, and select one of the following tabs:

Measured value source	Description
Output	Output value On (covered) or Off (uncovered)
TB[2] Discrete Input Part 2	Discrete Sensor Value On (covered) or Off (uncovered) as well as Primary Value (On or Off)
TB[2] Discrete Input Part 1	Sensor value represented in counts[1] as well as a dynamic representation of level as a percentage of the application range.
Electronics Temperature	Internal temperature of the electronics.

For instructions on selecting the display source for the LCD, see Display source for local operation (Page 86).

[1)] For more detail see Counts in Counts (Page 98).

[2)] TB - Transducer Block

9.1.1 Functions

The device menu gives you access to the following functions:

- Upload from/Download to the device
- Set Address
- Master Reset
- Write Locking
- Sensor Test

- Simulation
- Condensed Status Setup

9.1.2 Changing parameter settings

Note

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.

- First launch SIMATIC PDM, connect to Pointek CLS200/300, and upload data from the device (the status fields change to **Loaded**).
- Adjust parameter values in the parameter value field.
- After adjusting the value, press **Enter** (the status fields read **Changed**).
- When you have completed the adjustments, open the menu **Device – Download data to Device** then go to **File – Save** to save parameter settings offline (the status fields are cleared).

9.1.3 Filling level status

Adjust 0 % application range setting

The lower limit of the application range (0%) corresponds to the left limit of the bar graph in the digital display.

For reliable and accurate detection of the process material, select the example in the table below, and follow the succeeding steps.

Application	Material	Setup procedure
General applications	dry solids low viscosity liquids	Sensor uncovered and a minimum of 100 mm (4") free space all around
Demanding applications	hygroscopic / wet solids high viscosity and high conductivity liquids	Sensor immersed and then uncovered, but retaining as much build up of material as possible on the sensor.
Interface detection	liquid A / liquid B foam / liquid	Immerse the sensor in the material that has the lowest relative dielectric constant.

1. Follow the Setup procedure that most closely resembles your application.
2. Open the menu **View – Display** and select the tab **Transducer Block: Discrete Input (Part 1)**. Make a note of the Sensor_Value (digits)

3. Close the **Display** window, and enter the sensor value (recorded in the previous step) to the Value field:
   > Input > Transducer Block: Discrete Input > Range of Application> 0%. Then, press **Enter**.
   The Status field reads "Changed".
4. If no more settings need adjusting, download the data to the device and save the parameter settings offline (the status fields go blank). Otherwise, continue to adjust other parameters as required.

Adjust 100 % application range setting

Adjusts the upper limit of the application range (100%) corresponds to the right limit of the bar graph in the digital display.

For reliable and accurate detection of the process material, select the example in the table below, and follow the succeeding steps.

Application	Material	Setup procedure
General applications	dry solids low viscosity liquids	Sensor fully covered
Demanding applications	hygroscopic / wet solids high viscosity and high conductivity liquids	Sensor fully covered
Interface detection	liquid A / liquid B foam / liquid	Immerse the sensor in the material that has the highest relative dielectric constant.

1. Follow the Setup procedure that most closely resembles your application.
2. Open the menu **View – Display** and select the tab **Transducer Block: Discrete Input (Part 1)**. Make a note of the Sensor_Value (digits).
3. Close the **Display** window, and copy the sensor value to the parameter View field: **> Input > Transducer Block: Discrete Input > Range of Application > 100%**. Then, press **Enter**.
   The Status field reads "Changed".
4. If no more settings need adjusting, download the data to the device and save the parameter settings offline (the status field goes blank). Otherwise, continue to adjust other parameters as required.

Inversion

When Inversion Output = **On**, the level status undergoes a logical inversion. If you want to invert the logic of the level status, do the following:

1. Go to **Output > Function Block: Discrete Input > Inversion Output > Off or On**
2. Press **Enter**.
   The Status field reads "Changed".

Delay

You can adjust the timing behavior of the transmitter using two independent delay times:

- **Rise Time (Off to On)** determines the delay of the signal flow from the moment the sensor becomes covered until the Primary Value is set.
- **Fall Time (On to Off)** determines the delay of the signal flow from the moment the sensor becomes uncovered until the Primary Value is reset.

The delay timers have a range of values from 0.0 to 100.0 seconds:

- Go to **Input > Transducer Block: Discrete Input > Delay > Rise Time (Off to On)** and set the value from 0 to 100 seconds.
- Go to **Fall Time (On to Off)**, and set the value from 0 to 100 seconds.
- Press **Enter**.
  The Status field reads "Changed".

Note

If the sensor status changes before the delay interval is complete, the timer is reset to its initial value and restarted.

Failsafe mode

If the Transducer Block delivers a measured value accompanied by a status message classifying the quality as bad (for example **Bad, sensor failure**), the Discrete Input Function Block can react with one of three possible preset options:

Failsafe Mode	Description
The default value is used as the output value.	The predefined preset safety value is output (status code U_075).
Store the last valid output value.	The last valid output value is output (status code U_071).
The calculated output value is incorrect.	The bad output value is accompanied by the status which the Transducer Block assigns to it (B_0xx).

To set the fault behavior in the Discrete Input Function Block:

1. Go to **Output > Function Block: Discrete Input > Fail Safe Mode > Fail Safe Mode**, and select one of the 3 options.
2. Press **Enter**.
   The Status field reads "Changed".

You can use SIMATIC PDM to determine the fault location by looking at the Input and Sensor Values of the Transducer Block.

Simulation

Simulation functions are helpful when installing the transmitter, by allowing you to do the following:

- Create process values without recording actual values
- Use the full range of values of the simulated process values
- Simulate errors

The LCD displays "SI" in the Mode display when Simulation is activated.

Output simulation

Output simulation allows you to provide process values for the cyclic class 1 Master.

To test how the automation program processes those values, do the following:

1. Open the Device Menu **Simulation**.
2. Select the register **Output**.
3. Set the target mode to **MAN** (manual).
4. Enter the desired output value, the quality, and the status.
5. Transfer the settings to the device.
6. To view the output behavior, for example, with SIMATIC PDM, open the View Menu **Display**.
7. To return to normal operation, reset the target mode to **AUTO** and press **Transfer**.

Input (Primary Value) simulation

Input Value simulation allows you to test the effects on the Primary Variable of your preset inversion and failsafe settings.

To see how the output value is affected, do the following:

1. Open the Device Menu **Simulation**.
2. Select the register **Input**.
3. Set the simulation mode to **Enabled**.
4. Enter the desired input value, the quality, and the status.
5. Transfer the settings to the device.
6. To view the output behavior, for example, with SIMATIC PDM, open the View Menu **Display**.
7. To return to normal operation, reset the simulation mode to **Disabled** and press **Transfer**.

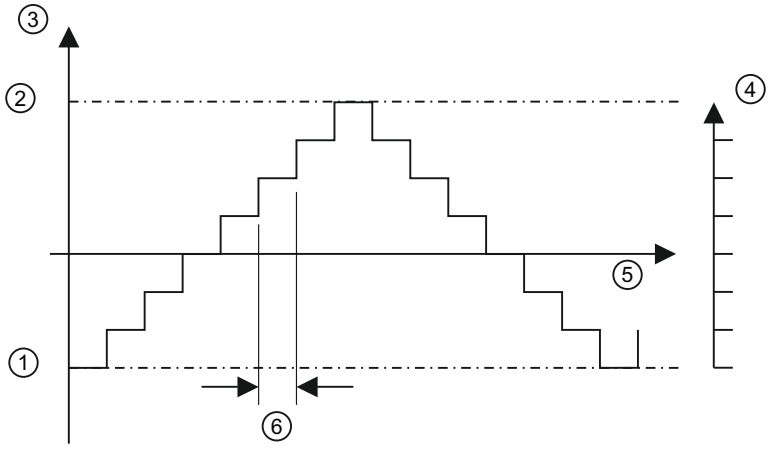
Sensor value simulation

By simulating the Sensor Value as a fixed value or as a parameterizable slope, you can test the following:

- Reaction to the Measuring Limits being exceeded
- Logic switch behavior
- Behavior of the delay timers

With a parameterizable slope, you can make the simulation value dynamic. It runs from a starting value to an end value in a step function, dwelling on each step for the preset period of time. At the end value, the direction is reversed.

Parameterizable slope



① Start
② End
③ Value
④ Number of steps
⑤ Time
⑥ Step length

To make the simulation value dynamic, do the following:

1. Open the Device Menu **Simulation**.
2. Select the register **Sensor Value**.
3. Set **Simulation Sensor Value**, then set the parameters:
   – for simulation mode **fixed**, enter a Sensor Value
   – for simulation mode **ramp**, adjust the ramp parameters
4. Transfer the settings to the device.
5. To view the behavior of the Sensor Value Discrete, the Input (Primary) Value, and the Output, in SIMATIC PDM, open the View Menu **Display**, and select the register **Transducer Block: Discrete Input Part I**).
6. To return to normal operation, turn off **Simulation Sensor Value** and press **Transfer**.

Electronics temperature simulation

By simulating the electronics temperature, you can test the effect of excessive temperatures on the measuring results.

To test these effects, do the following:

1. Open the Device Menu **Simulation**.
2. Select the register **Electronics Temperature**.
3. Set **Simulation Electronic Temperature**, then set the parameters:
   – either enter a fixed value for Electronics Temperature **fixed**
   – or adjust the ramp parameters for Electronic Temperature **ramp**
4. Transfer the settings to the device.
5. To view the reaction in the status of the measured values (input and secondary variables), and the output, using SIMATIC PDM, open the View Menu **Display** and select the appropriate register.
6. To return to normal operation, turn off **Simulation Electronic Temperature** and press **Transfer**.

Drag indicators (Peak indicators)

Two pairs of drag indicators allow you to monitor the negative and positive peak values for the measured values Sensor Value and Electronics Temperature.

To reset the peaks to the actual measured value, do the following:

1. Open the View Menu **Drag Indicators**.
2. Click the appropriate **Reset** button.
3. Press **Enter**.
   The Status field reads "Changed".

Operating hours

An operating hours meter for the electronics is activated when the transmitter is first started.

To see the operating hours meter, open the View Menu **Operating hours**.

Switch point adjustment

There are two switch points:

- Switch point 1 (Off to On)
- Switch point 2 (On to Off)

To adjust the switch behavior, set the percentage of the application range[1)] at which point the logic switch will change from OFF to ON, or from ON to OFF.

1. The application range must be defined first (see the above subchapters Adjust 0 % application range setting and Adjust 100 % application range setting). Ensure your setup procedure follows the guidelines for the application which most resembles your operation.
2. To view the actual Sensor Value, the Sensor Value Discrete, the actual valid Switch Point, and Hysteresis, open the menu **View–Display**, and select the register **Transducer Block: Discrete Input**.
3. Go to **Input > Transducer Block: Discrete Input > Switch behavior**.
4. Edit the value of Switch Point 1 in the “Switch Point” field.
5. Edit the value of Switch Point 2 to adjust the Hysteresis.
6. Click **Transmit**.
7. Track the effect of the adjustment by looking at the Sensor Value Discrete.

[1)] The application range is defined by the 0% and 100% settings.

Device reset

To reset the device, open the Device Menu **Master Reset**. The three reset options are:

- Factory reset (Restart/cold startup)
- Warm start (new start-up)
- Resetting the PROFIBUS address to 126

Factory reset (Restart/cold startup)

If Pointek CLS200/300 has been adjusted to such an extent that it can no longer fulfil its measuring tasks, you can use **Factory Reset** to recreate the delivery status. It resets most parameters to the factory setting.

During a Factory Reset, a check mark appears against the diagnostic message **Restart (cold startup) carried out** for about ten seconds, and the LCD displays "UPDATE ALERT", as rolling text in the auxiliary reading field.

Warm start (new startup)

A Warm start (new start-up) disconnects Pointek CLS200/300, and restarts it. Communication is interrupted and re-established.

You will need this function if, for example, during communication with a cyclic Master, the PROFIBUS address has been changed.

During a Warm start, a check mark appears against the diagnostic message **New startup (warm startup) carried out** for a few seconds. If there is no measured value result, the automation or control system records the status **Uncertain, initial value, Value constant**.

Resetting the PROFIBUS address to 126

If no other device in your system has the preset address "126", you can extend the PROFIBUS PA line during operation of the automation or control system, with an additional Pointek CLS200/300 under the address "126". The only requirement is to change the address of the new integrated device to another value lower than "126".

If you remove a Pointek CLS200/300 from the PROFIBUS channel, you should use this function to reset its address to "126" so that, if required, it can be reintegrated into this or another system.

9.1.4 Lock

Secures Pointek CLS200/300 from changes.

Lock Options			
Parameter name	**Effect**	**Turn on/off**	**Digital display**
HW Write Protection	Parameter changes using SIMATIC PDM, and settings via local operation, are both disabled. Independent of the other lock functions.	Keypad Mode 10	L
Write locking	Prevents parameter changes via the bus. Local operation is possible.	SIMATIC PDM Online dialog: Write locking	Lc
Local Operation	If local operation is disabled, no access is possible using the keypad. Independently of this parameter, local operation is automatically enabled 30 s after a communication failure. Once communication has been reestablished, the parameter **Local Operation** in the device is reset to the original setting.	SIMATIC PDM Local Operation	LA

You can also combine the locking functions

HW Write Protection	Write locking	Local Operation	Digital display
Off	Off	enabled	
On	On or Off	enabled or disabled	L
Off	Off	disabled	LA
Off	On	disabled	LL
Off	On	disabled	Lc

9.1.5 Sensor test

Open the Device Menu to find and activate the Sensor Test via PDM, and to see the results (**test successful**, or **test failed**).

9.1.6 Display source for local operation

You can select one of four options for the value to be displayed on the LCD:

- Output value
- Primary Value
- Sensor Value
- Electronics Temperature.

Go to **Local Display and Operation > Display Source** and select from the pull-down tab.

The measured value display shows the value (in counts) when **Sensor value** is selected.
The logical level display shows the value On or Off when **Output value** is selected.
When communication with a master is in progress, this is indicated by the communication character **o** on the digital display. (For more details see RUN mode display (Page 44).)

Technical data

10

Note

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

10.1 Pointek CLS200/300

10.1.1 Power

Bus voltage	general purpose	12 to 30 V DC, 12.5 mA
	intrinsically Safe	12 to 24 V DC, 12.5 mA, FISCO field device Intrinsically safe barrier required • for ATEX/UKEX/INMETRO: U_i = 24V I_i= 380mA P_i = 5.32W C_i=5nF L_i=10µH • for FM, see FM/CSA connection drawing (Page 125)
Ex approvals (flameproof, dust ignition proof)		Max. voltage which does not invalidate the intrinsically safe protection of the sensor (probe): Um = 250V AC
Starting current ≤ current of normal operation		yes
Fault current (max. uninterrupted current minus current of normal operation)		0 mA
Fault disconnect equipment (FDE)		yes
Auxiliary source		bus powered
Separate supply necessary		no

10.1.2 Performance

Repeatability	approx. ± 2 mm for a conductive fluid

10.1.3 Interface

Configuration

- locally, using local user interface (LUI), for standalone operation, or
- remotely, using SIMATIC PDM on a Profibus PA network

Local Digital Display

- LCD

Output (bus)

	PROFIBUS PA (IEC 61158 CPF3 CP3/2) Bus physical layer: IEC 61158-2 MBP(-IS)
polarity-independent	yes
simultaneous communication with Master Class 2	4 (max.)

Cyclic User data (normal operation)

byte output	2 bytes representing one value
byte input	0
device profile	PROFIBUS PA Profile for Process Control Devices Version 3.0, Class B
function blocks	1
discrete input	1
logical inversion	parameterizable

Simulation functions

output	yes
input	yes
failsafe	parameterizable (last usable value, substitute value, erroneous value)

Block Structure

physical block	1
transducer block	1
transducer block discrete input	yes
monitoring measuring limits	yes

10.1.4 Alarm outputs

solid-state switch	galvanically isolated non-polarity sensitive transistor rated 30V DC or peak AC max., 82mA max voltage drop below 1 V typical @ 50 mA
	With intrinsically safe: barrier required • for ATEX/UKEX/INMETRO: U_i= 30V I_i= 200mA P_i=350mW C_i=0 L_i=0 • for FM/CSA: FM/CSA connection drawing (Page 125)
time delay	controlled by software with 2 delay timers: alarm ON delay and alarm OFF delay
hysteresis	100% adjustable, in 1 count increments[1)] on the display
failsafe operation	Failsafe High or Failsafe Low
terminal	removable terminal block, 2.5 mm^2 max

[1)] Counts: The frequency value is always represented in 'counts', see Counts (Page 98).

10.1.5 Diagnostics

input	reed contact: for test function

10.1.6 Mechanical

Electrode - CLS200 digital

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 (optional PFA coating) • FKM seals (optional FFKM) • PPS probe (optional PVDF)
Cable	30000 mm/ 1181.1"	• 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 (optional PFA coating) • FEP jacketed cable • FKM seals (optional FFKM) • PPS probe (optional PVDF)

[1)] Or 1.4404 material.

Electrode - CLS300 digital

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: 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	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

[1)] Or 1.4404 material.

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, 2.5 mm2 max.	
	Tightening torque of terminal screws: 0.5 to 0.6 Nm	
	Conductor cross section: 1 conductor • solid: 0.2 to 2.5 mm^2 • flexible: 0.2 to 2.5 mm^2 • flexible, with ferrule with or without plastic sleeve: 0.25 to 2.5 mm^2 • AWG 24 to 12	2 conductors with same cross section • solid: 0.2 to 1.0 mm^2 • stranded: 0.2 to 1.5 mm^2 • stranded, with ferrule without plastic sleeve: 0.25 to 1.0 mm^2 • stranded, TWIN ferrule with plastic sleeve: 0.5 to 1.0 mm^2
Construction	powder-coated aluminum with gasket	
Optional thermal isolator	316L[1)] stainless steel	
Cable entry	2 x M20 thread With Ex approval: • Default: 2x M20x1.5 • With selection of option Pos. 33a: 2x NPT 1/2" tapered ANSI B1.20.1	
Ingress protection	Type 4 / IP65 standard, IP68 optional (depending on cable entry option) Note: the use of approved watertight conduit hubs/glands is required for Type 4/ IP65 or IP68 (outdoor applications).	
Separation between Zone 0 and Zone 1 EPL Ga/Gb)	Material of the separation element (partition wall) • Stainless steel, 1.4404 (316L) • Glass, Inconel 600 (Glass seal)	

1) Or 1.4404 material.

Note

The use of approved watertight conduit hubs/glands is required for Type 4/IP65 or IP68 (outdoor applications). For CE and UKCA requirements the use of EMC rated cable entries is required for all CLS200 devices.

Weight

Weight varies based on configuration. For example:

compact Pointek CLS200, 100 mm (4") insertion length, ¾" process connection	1 kg (2.20 lb.) approx.

10.1.7 Environmental

Location	indoor/outdoor
Altitude	2,000 m (6,565 ft.) max
Ambient temperature	–40 to 85 °C (–40 to 185 °F) With Ex approval: Depending on surface temperature and temperature class
LUI (local user interface)	–30 to 85 °C (–22 to 185 °F)
Storage temperature	–40 to 85 °C (–40 to 185 °F)
Relative humidity	suitable for outdoor
Installation category	I
Pollution degree	4

10.1.8 Process

Note

Refer to Pointek CLS200 digital pressure versus temperature curves (Page 102) and Pointek CLS300 digital pressure versus temperature curves (Page 105).

Relative dielectric constant (ϵ_r)		1.5 minimum
CLS200 temperature:[1)2)]	without temperature extended shaft	–40 to 85 °C (–40 to 185 °F) –20 to 85 °C (–4 to +185 °F) with option FFKM seal O-ring
	with temperature extended shaft	–40 to 125 °C (–40 to 257 °F) –20 to 125 °C (–4 to +257 °F) with option FFKM seal O-ring
	With Ex approval: Depending on surface temperature and temperature class, see Hazardous area installation (Page 115).	
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)2)]	without temperature extended shaft	–40 to 85 °C (–40 to 185 °F) –20 to 85 °C (–4 to +185 °F) with option FFKM seal O-ring
	with temperature extended shaft	–40 to 200 °C (–40 to 392 °F) –20 to 200 °C (–4 to +392 °F) with option FFKM seal O-ring
	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)

1) At process connection

2) With Ex approval: Depends on temperature, surface temperature, and temperature class.

10.1.9 Approvals

CLS200

General Purpose	CSA, FM, CE, UKCA
Dust Ignition Proof	ATEX II 1/2 D, IIIC UKEX II 1/2 D, IIIC CSA/FM Class II, Div. 1, Gr. E, F, G, Class III INMETRO
Flame proof/explosion proof	ATEX II 1/2 G, IIC UKEX II 1/2 G, IIC CSA/FM Class I, Div. Gr. A, B, C, D INMETRO
Intrinsically Safe[1)]	ATEX II 1G, IIC UKEX II 1G, IIC ATEX II 1/2D, IIIC UKEX II 1/2D, IIIC CSA/FM Class I, Div. 1 Gr. A, B, C, D INMETRO
Type of protection n Non-incendive	ATEX II 3G, IIC UKEX II 3G, IIC CSA/FM Class I, Div. 2 Gr. A, B, C, D INMETRO
Marine	Lloyds Register of Shipping, Categories ENV1, ENV2 and ENV5

1) Barrier or Intrinsically Safe power supply required for Intrinsically Safe protection

Note

EN 61326 (CE and UKCA 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. In addition, units with a flange process connection were mounted using a metallic gasket.

CLS300

General Purpose	CSA, FM, CE, UKCA
Dust Ignition Proof	ATEX II 1/2D, IIIC UKEX II 1/2D, IIIC CSA/FM Class II, Div. 1, Gr. E, F, G Class III INMETRO
Flame proof/ explosion proof	ATEX II 1/2G, IIC UKEX II 1/2G, IIC CSA/FM Class I, Div. 1, Gr. A, B, C, D INMETRO
Intrinsically Safe[1)]	ATEX II 1G, IIC UKEX II 1G, IIC CSA/FM Class I, Div. 1, Gr. A, B, C, D INMETRO
Marine	Lloyds Register of Shipping, Categories ENV1, ENV2 and ENV5

1) Barrier or Intrinsically Safe power supply required for Intrinsically Safe protection

Note

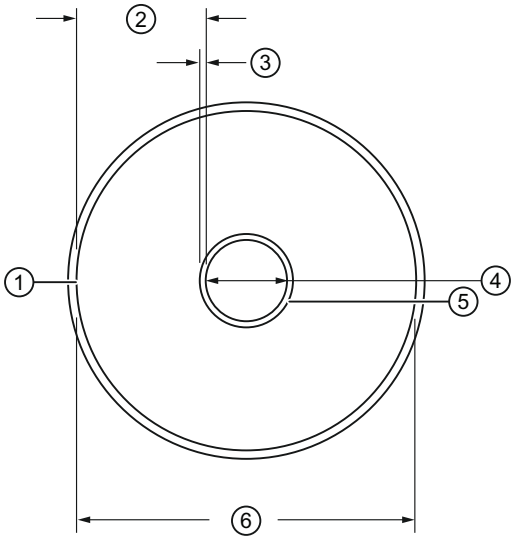
EN61326 (CE and UKCA EMC) testing was conducted on the Pointek CLS300 rod version while mounted in a metallic vessel and wired using shielded cable. Units with flange process connections were tested while mounted in a metallic vessel with a metallic gasket and with shielded cables.

Technical reference

A

A.1 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.



① Internal vessel wall
② Dielectric = contents plus insulation (non-conductive contents)
③ Dielectric = insulation (conductive contents)
④ Probe diameter (d)
⑤ Insulation (probe sleeve)
⑥ Internal vessel diameter (D)

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.

[1] For definitions relating to capacitance, see the Glossary.

[2] The relative dielectric constant of air (vacuum) is 1: all other materials have a higher value.

A.2 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.

A.3 Counts

Frequency is always represented in "counts", a dimensionless, uncalibrated value generated from the inverse of frequency. The measured value is displayed in counts. (If you are using PROFIBUS PA, you can set the measuring limits, in counts.)

A.4 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.

See Technical data (Page 87), for performance information; also check the product nameplate on the enclosure, for details of your particular instrument.

A.5 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 = (Ca1 + Ca2)/(Ca1 + Ca2 + Cm1 + Cm2)

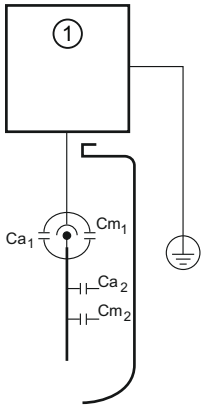
R = Ratio between initial capacitance and total capacitance

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.



① Measuring circuit

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.

A.6 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.

R = Ratio between initial capacitance and total capacitance

Ca = Initial capacitance (air)

Cm = Capacitance Increase (product)

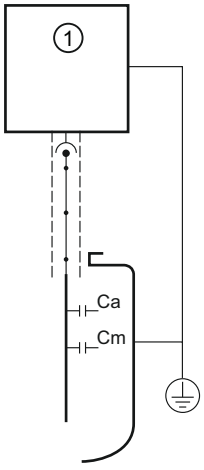
C1 = Capacitance connection point

C2 = Capacitance connection cable

C3 = Capacitance Process connection (includes active part)

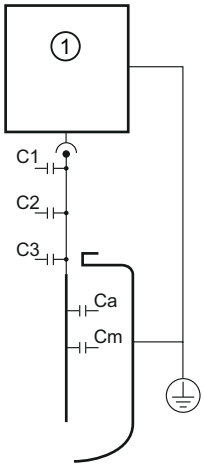
Pointek CLS300 with active shield

R = Ca/(Ca + Cm)



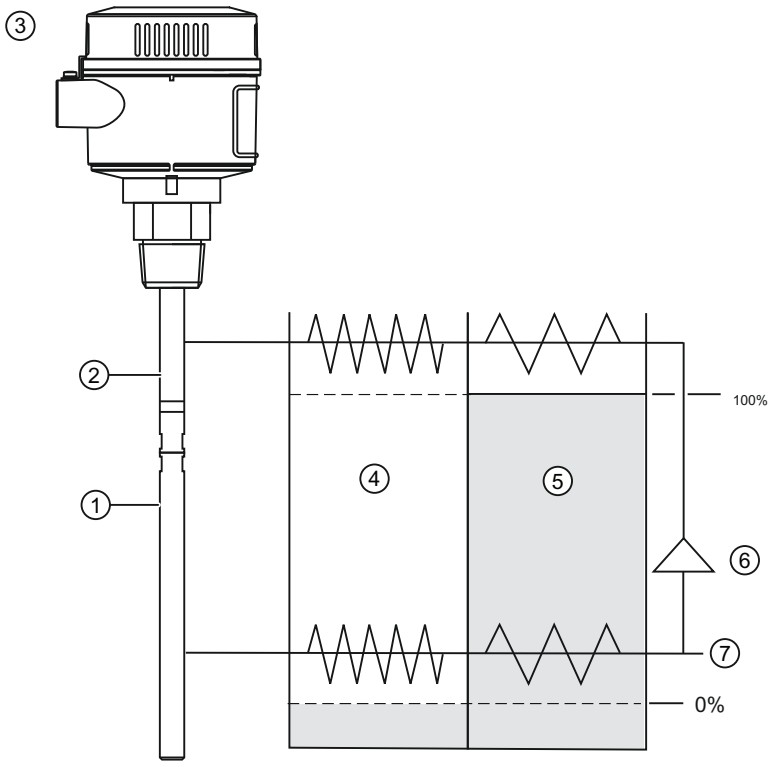
Conventional capacitance measurement

R = ((C1 + C2 + C3) + Ca) /((C1 + C2 + C3) + Ca + Cm)



① Measuring circuit

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.



① Active measurement section
② Active shield
③ Pointek CLS300
④ Empty tank
⑤ Full tank
⑥ Buffer
⑦ Frequency (f) ≈ K / capacitance (C)

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.

A.7 Sensor test

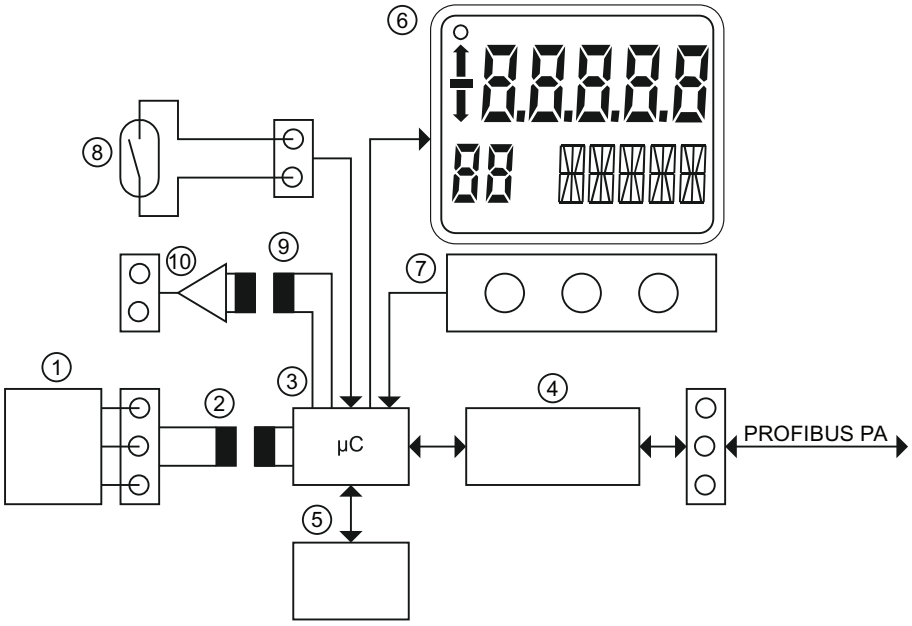
You can initialize a sensor test by activating the reed contact with a magnet [1] from outside the housing. For details, see Magnet-activated sensor test in Mode 2: Sensor test (default: OFF) (Page 50).

[1] A test magnet will be supplied with the instrument.

A.8 PROFIBUS PA electronics: mode of operation

The process variable to be measured is generally referred to as the input variable.

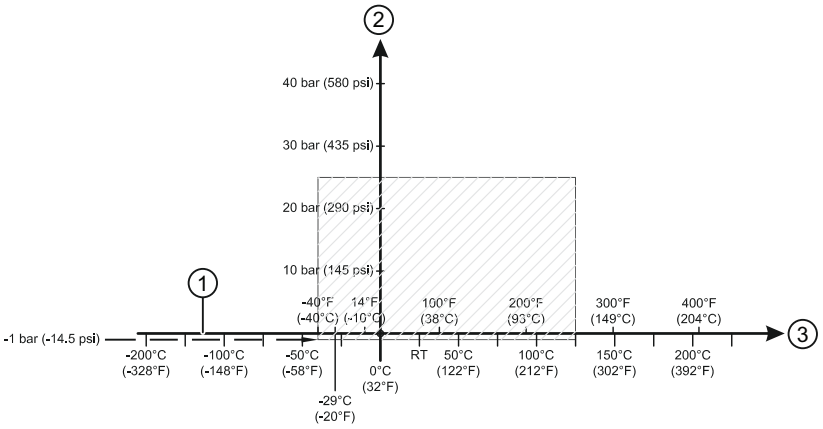
The input variable provided by the sensor is an isolated digital frequency signal. This is evaluated in a microprocessor and made available via PROFIBUS PA. The data for transmitter parameterization is stored in non-volatile memory.



① Sensor
② Isolation
③ Micro controller
④ PROFIBUS PA interface
⑤ Non-volatile memory
⑥ Digital display
⑦ Keyboard for local operation
⑧ Reed relay
⑨ Isolation
⑩ Alarm output solid-state switch

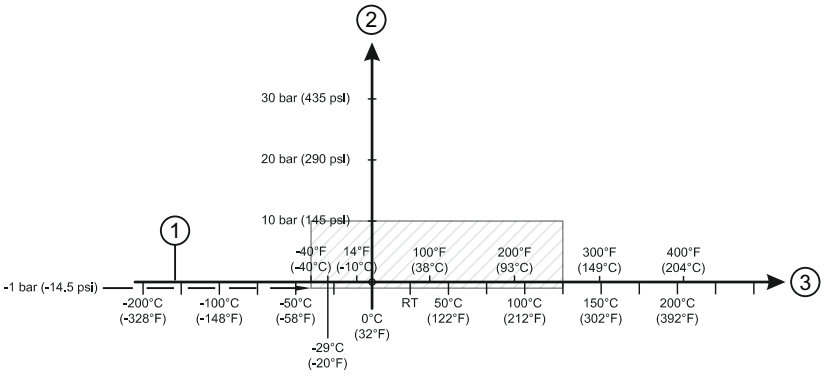
A.9 Pointek CLS200 digital pressure versus temperature curves

A.9.1 CLS200 compact and extended rod versions, threaded



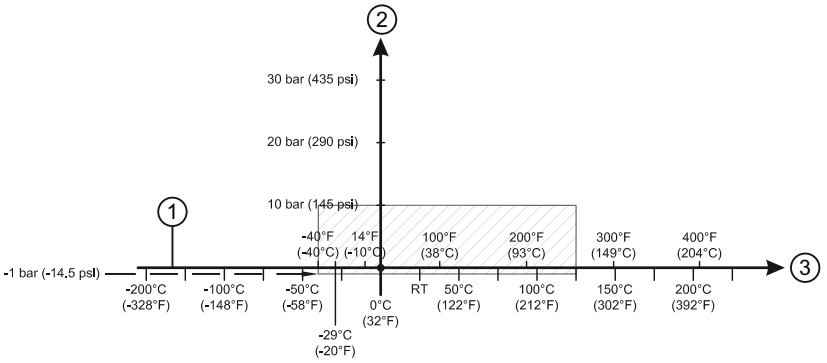
① Atmospheric
② Permitted operating pressure
③ Permitted operating temperature

A.9.2 CLS200 cable version, threaded



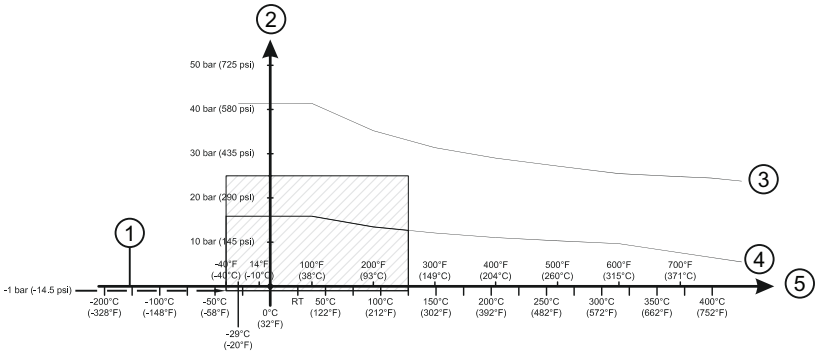
① Atmospheric
② Permitted operating pressure
③ Permitted operating temperature

A.9.3 CLS200 sanitary compact and extended rod versions



① Atmospheric
② Permitted operating pressure
③ Permitted operating temperature

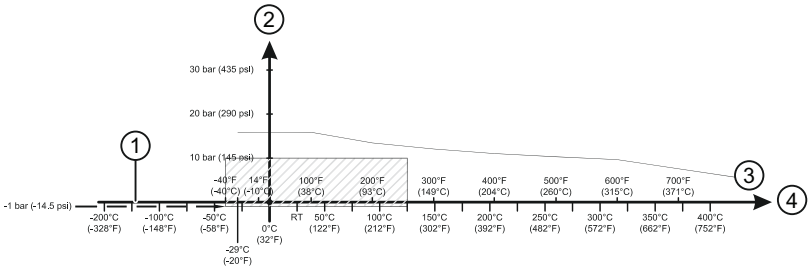
A.9.4 CLS200 compact and extended rod, ASME welded flange



① Atmospheric
② Permitted operating pressure
③ ASME 300 lb[1)]
④ ASME 150 lb[1)]
⑤ Permitted operating temperature

[1)] The curves denote the minimum allowable flange class for the shaded area below.

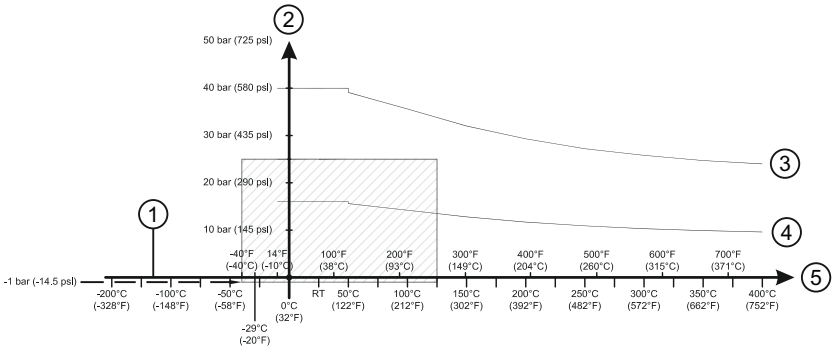
A.9.5 CLS200 cable, ASME welded flange



① Atmospheric
② Permitted operating pressure
③ ASME 150 lb[1)]
④ Permitted operating temperature

[1)] The curve denotes the minimum allowable flange class for the shaded area below.

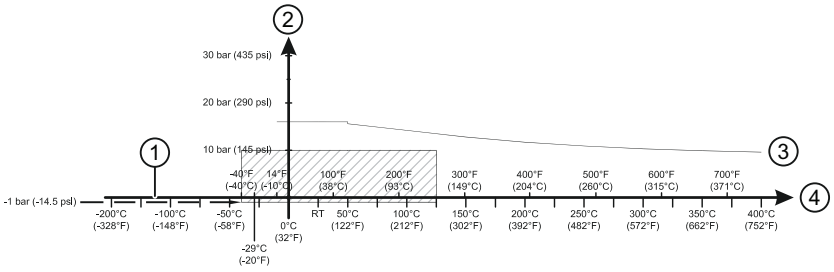
A.9.6 CLS200 compact and extended rod, EN welded flange



① Atmospheric
② Permitted operating pressure
③ PN 40[1)]
④ PN 16[1)]
⑤ Permitted operating temperature

[1)] The curves denote the minimum allowable flange class for the shaded area below.

A.9.7 CLS200 cable, EN welded flange

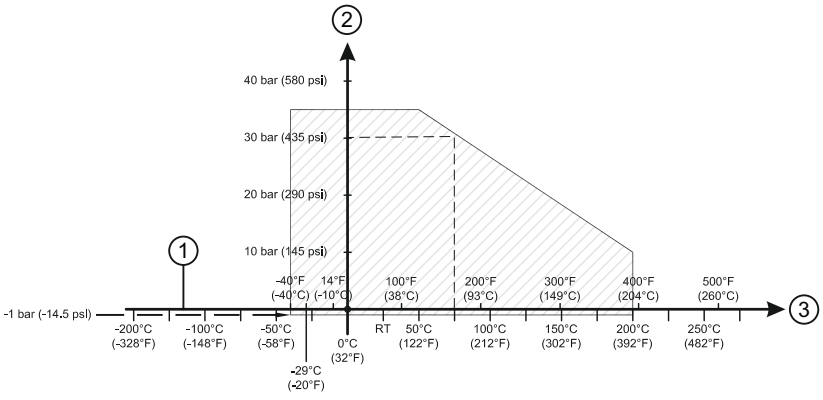


① Atmospheric
② Permitted operating pressure
③ PN 16[1)]
④ Permitted operating temperature

[1)] The curve denotes the minimum allowable flange class for the shaded area below.

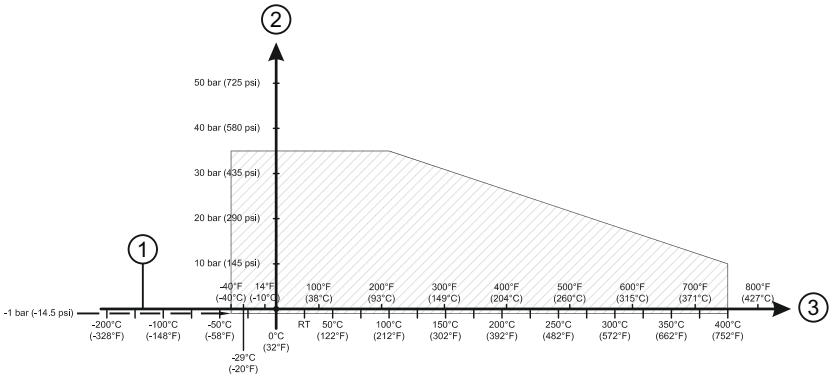
A.10 Pointek CLS300 digital pressure versus temperature curves

A.10.1 CLS300 standard, extended rod and cable versions, threaded



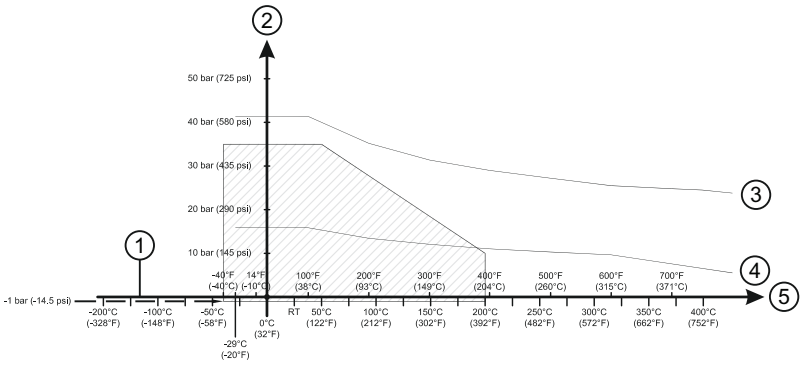
① Atmospheric
② Permitted operating pressure
③ Permitted operating temperature

A.10.2 CLS300 high temperature rod version, threaded



① Atmospheric
② Permitted operating pressure
③ Permitted operating temperature

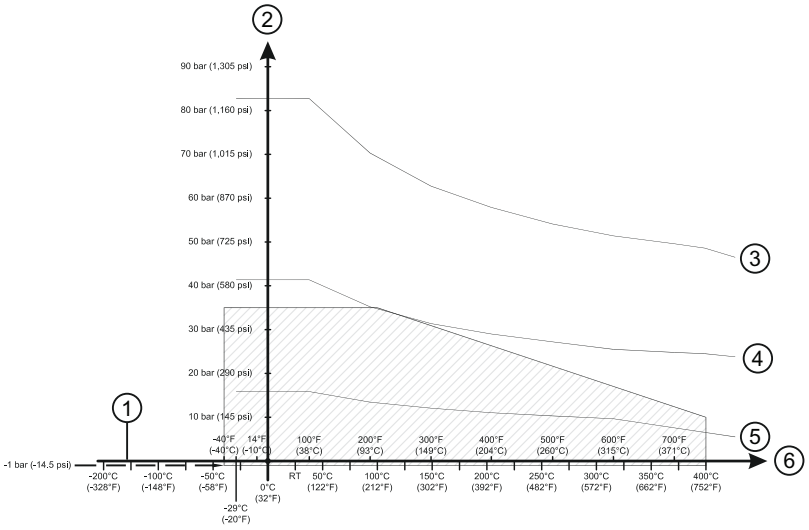
A.10.3 CLS300 standard, extended rod and cable versions, ASME welded flange



① Atmospheric
② Permitted operating pressure
③ ASME 300 lb[1)]
④ ASME 150 lb[1)]
⑤ Permitted operating temperature

[1)] The curves denote the minimum allowable flange class for the shaded area below.

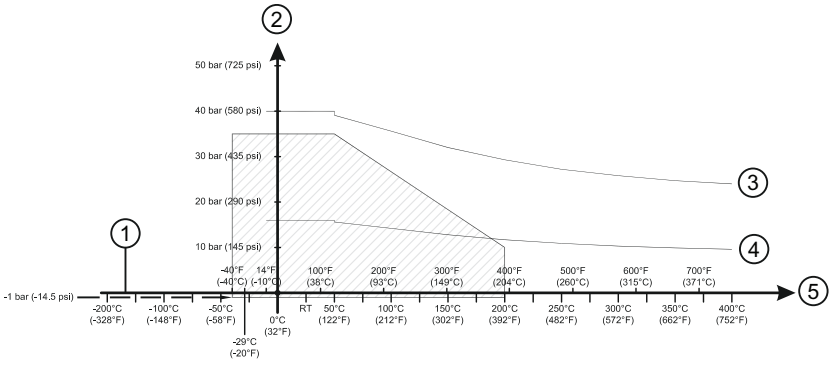
A.10.4 CLS300 high temperature rod version, ASME welded flange



① Atmospheric
② Permitted operating pressure
③ ASME 600 lb[1)]
④ ASME 300 lb[1)]
⑤ ASME 150 lb[1)]
⑥ Permitted operating temperature

[1)] The curves denote the minimum allowable flange class for the shaded area below.

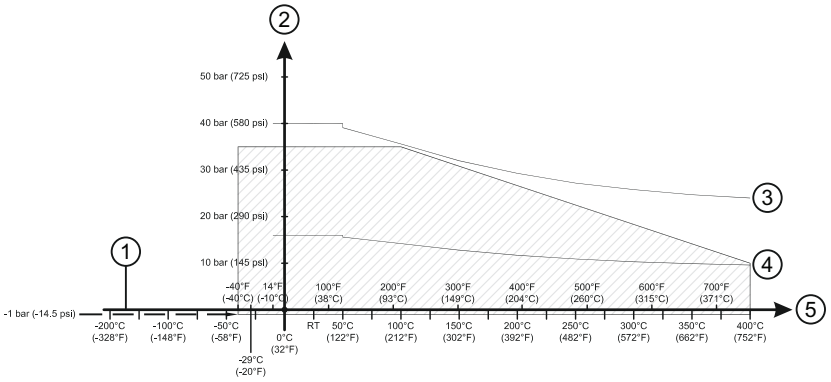
A.10.5 CLS300 standard, extended rod and cable versions, EN welded flange



① Atmospheric
② Permitted operating pressure
③ PN 40[1)]
④ PN 16[1)]
⑤ Permitted operating temperature

[1)] The curves denote the minimum allowable flange class for the shaded area below.

A.10.6 CLS300 high temperature rod version, EN welded flange



① Atmospheric
② Permitted operating pressure
③ PN 40[1)]
④ PN 16[1)]
⑤ Permitted operating temperature

[1)] The curves denote the minimum allowable flange class for the shaded area below.

Maintenance and repairs

B

Pointek CLS200/300 requires no maintenance or cleaning.

B.1 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.

Profibus PA profile structure

C

C.1 PROFIBUS PA electronics: mode of operation

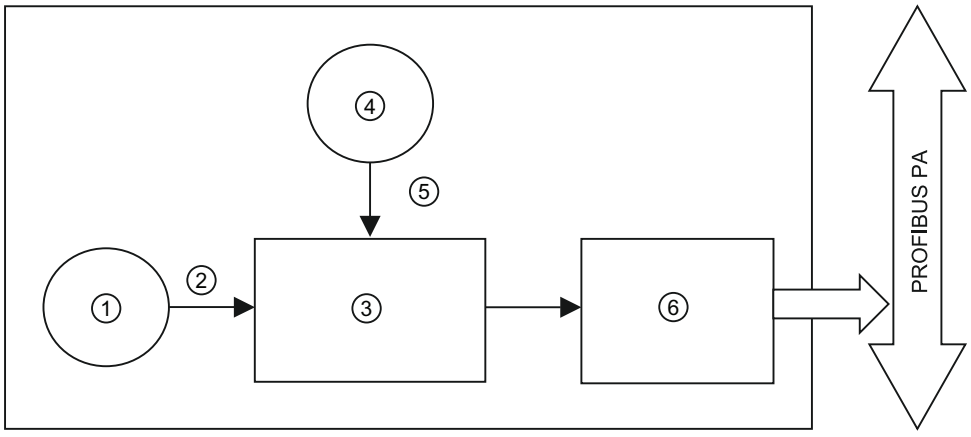
The process variable to be measured is generally referred to as the input variable.

The input variable provided by the sensor is an isolated digital frequency signal. This is evaluated in a microprocessor and made available via PROFIBUS PA. The data for transmitter parameterization is stored in non-volatile memory.

C.2 Block model for recording and processing measured values

The functions of the device are divided into blocks for different areas of responsibility. They can be parameterized by acyclic data transfer via PDM

Block connection diagram for recording and processing measured values



① Sensor
② Level
③ Transducer block
④ Sensor
⑤ Electronics temperature
⑥ Discrete input function block

Transducer Block (TB)

The Transducer Block carries out adjustments to the sensor. Its output value (Primary Value) is the status of the switch that indicates whether the sensor is covered by the medium or not.

The Transducer Block also carries out the required temperature measurement functions and monitors the permitted temperature limits.

Discrete Input Function Block

In the Discrete Input Function Block, the Primary Value is processed further and is adjusted to the automation task: that is, it looks after conversion, and operations.

The output of this block supplies the measured value and the associated status information to PROFIBUS PA.

C.2.1 Parameters for local digital display

The values of the following parameters from the measuring and function blocks can be presented on the digital display. One of the options shown below must be selected in Mode 13: Display Source (default: 0) (Page 53).

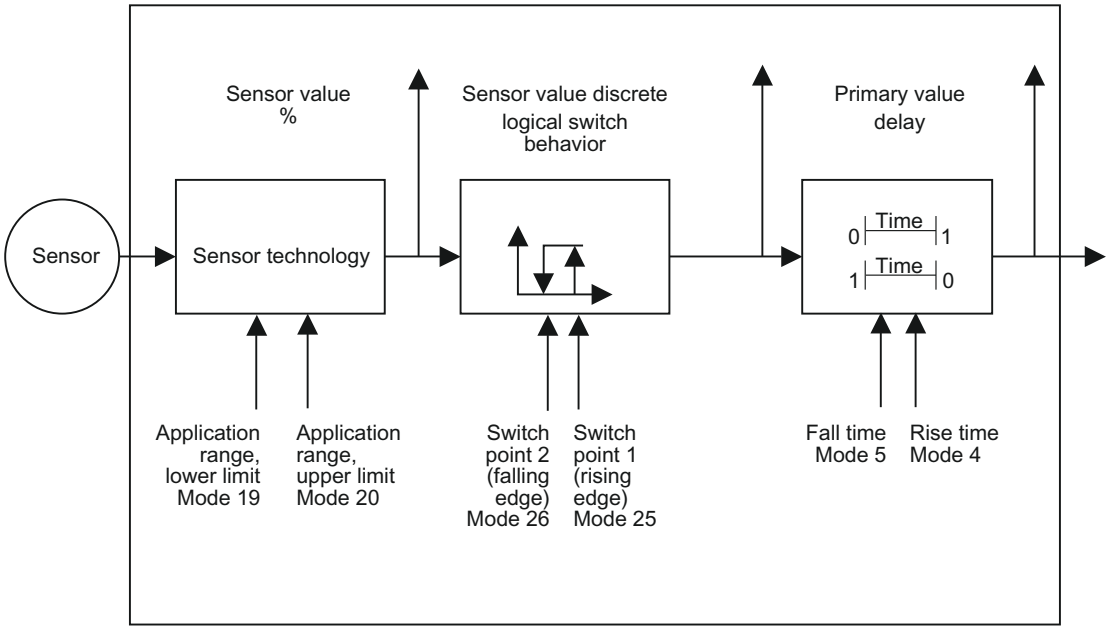
Block	Parameter	Can be displayed locally
Transducer Block	Primary Value	yes
	Sensor Value discrete	no
	Sensor Value	yes
Transducer Block Electronics temperature	Electronic temperature	yes
Discrete Input Function Block	Output	yes

C.3 Description of the blocks

C.3.1 Transducer Block

The figure below shows the signal flow of measured values from the sensor through the Transducer Block into the output value (Primary Value). The parameters of the individual functions (switch behavior and delay) can be changed via acyclic access (SIMATIC PDM).

Transducer Block function groups



How it works

The frequency value (represented in 'counts' [1)]) is checked to see if it is within its measuring limits. If the limit is exceeded, this results in a **Bad** status and the error message **Failure in measurement**. The frequency value is stored in Sensor Value.

The analog signal from the sensor is transformed into a discrete signal which controls the behavior of the switch point. The switch point is provided with a hysteresis.

A delay function provides the discrete signal with individual delay times for rising and falling delay (Rise Time and Fall Time). The delay function acts as a filter that, for example, compensates for a medium with an agitated surface. The result of this smoothed signal is the Primary Value.

Electronics temperature

The Transducer Block also monitors the internal temperature of the device electronics. If the temperature exceeds permitted limits, it does not change the sensor value, but it does change the status. Permitted limits correspond to those of the permitted ambient temperature for the electronics components. Temperatures in excess of these limits may damage the components or cause them to become unstable.

If a temperature limit is exceeded, the status changes to **GOOD – Active Critical Alarm – Limit Overflow/Underflow**. The status of the Sensor Value, the Sensor Value discrete, and the Primary Value in the Transducer Block Discrete input, receive the status **UNCERTAIN – Value inaccurate**. This action is accompanied by a PROFIBUS diagnostic message **Electronics temperature too high**.

Drag indicators[2)] allow you to check the maximum and minimum temperatures that have occurred.

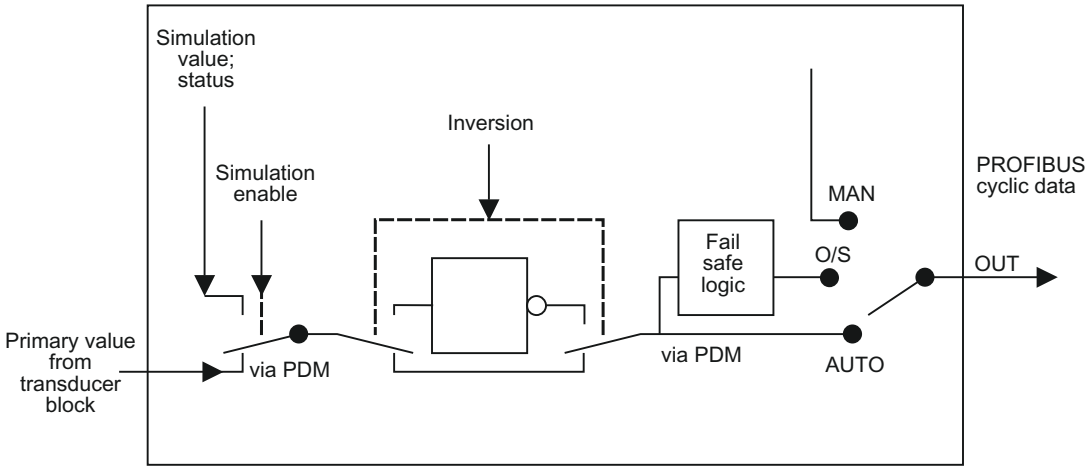
[1] See Counts in Counts (Page 98) for more detail.

[2] See Drag indicators (Peak indicators) in Filling level status (Page 78) for more detail.

C.3.2 Discrete Input Function Block

The figure below shows how measured values are processed within the Discrete Input Function Block.

Discrete Input Function Block function groups



How it works

The Discrete Input Function Block allows you to control modifications to the output value (PROFIBUS cyclic data):

- Select Inversion ON or OFF: when ON, the Primary Value from the Transducer Block, or a simulation value given by the simulation switch, will be inverted.
- Select Failsafe behavior options: if the status of the Primary Value or Simulation Value is **bad**, the fault logic can output either the last usable measured value (Mode 22 = LUv), a given substitute value (0 or 1), or the last usable measure value with the status **Bad, sensor failure**.
- Select one of 3 settings:

Setting	Description	Output value
AUTO	automatic	the automatically recorded measured value
MAN	manual	a manually set, fixed simulation value
O/S	function block disabled	the preset safety value.

- The result is the output parameter (OUT).

Hazardous area installation

D

D.1 Notes for use in hazardous locations

Use of this manual

For use and assembly, refer to the instructions in this manual. It contains all instructions required by ATEX Directive 2014/34/EU, Annex II, 1/0/6 and UKEX Regulations SI 2016/1107 and Ordinance INMETRO n°179/2010.

General notes

Refer to the appropriate certificate for application in specific hazardous environments. The equipment has not been assessed as a safety related device (as referred to by Directive 2014/34/EU Annex II, clause 1.5) or UKEX Regulations SI 2016/1107.

The certificate numbers have an "X" suffix, which indicates that specific condition of use apply. Those installing or inspecting this equipment must have access to the certificates.

Qualifications of personnel / servicing / repair

- Installation and inspection of this equipment shall be carried out by suitably trained personnel in accordance with the applicable code of practice (ABNT NBR IEC/EN 60079-14 and ABNT/NBR IEC/EN 60079-17 in Europe).
- Repair of this equipment shall be carried out by suitably trained personnel in accordance with the applicable code of practice (e.g. ABNT NBR IEC/EN 60079-19 within Europe). Repair of flameproof path is not intended.
- 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.
- In potentially explosive atmospheres open the enclosure only when the device is not energized. Turn off power before servicing any device (the transmitter is in operation when the power supply is switched on). In case of removing the unit from vessel, take care of process pressure and material passing the opening.

ATEX/UKEX list of certificates / list of standards

Certificate numbers: See EU-Declaration of Conformity for the list of standards valid for ATEX certificates.

Certificate numbers: See UK-Declaration of Conformity for the list of standards valid for UKEX certificates.

ATEX/UKEX year of manufacturing

Year of manufacture	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2029
Marking code	K	L	M	N	P	R	S	T	U	W	X

Intrinsically safe supply

For intrinsically safe models, power must be supplied from an Intrinsically Safe power source, otherwise protection is no longer guaranteed.

Process pressure

The device construction allows process over-pressure up to 10 or 25 bar (146 or 365 psi). This pressure is allowed for test purposes. The definition of the Ex approvals are only valid for a container-over-pressure between -0.2 to +0.1 bar (-2.9 to +1.45 psi). For higher or lower pressures, approvals are not valid.

Process and ambient temperature

Please check the ambiment and process temperatures at ATEX/UKEX/INMETRO: Flame Proof and Dust Ignition Proof (CLS200) (Page 120) for the specific configuration you are about to use or install.

Chemical resistance against the medium

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.

Cable entry devices / blanking elements

- **Dust Ignition proof.** For use in potentially explosive dust atmospheres: The cable entry devices and the blanking elements of unused apertures shall be of a certified type, suitable for the conditions of use and correctly installed. The minimum ingress protection requirement of IP6X according to EN 60529 must be satisfied.
- **Flameproof.** For use with potentially explosive gas atmospheres: the cable entry devices and the blanking elements of unused apertures shall be of a certified flameproof type, suitable for the conditions of use and correctly installed.
- **Intrinsically Safe / Type of protection n.** The cable entry devices and the blanking elements of unused apertures shall be of a certified type, suitable for the conditions of use and correctly installed. The minimum ingress protection requirement of IP64 according to EN 60529 must be satisfied.
- **Versions with cable gland mounted by default.** The used cable gland is only suitable for fixed installations. The installer is responsible for providing appropriate strain-relief to prevent pulling or twisting.
- **Versions with blanking element mounted by default.** Blanking elements are not to be used with any form of adaptors or reducers.

Versions with cable gland / blanking element mounted by default

Below-mentioned cable diameters and tightening torques of the nut resp. blanking element shall be observed for the installation.

- Cable gland M20x1.5 (Dust Ignition proof, Intrinsically Safe, Type of protection n)
  - Cable diameter: 6 mm to 12 mm
  - Tightening torque - depending on the cable used and therefore to be determined by the user
- Cable gland M20x1.5 (Flameproof)
  - Cable diameter: bedding 3.1 mm to 8.6 mm / overall 6.1 mm to 13.1 mm
  - Tightening torque - number of turns depends on overall cable diameter of the used cable (e.g. 1 turn/cable diameter 12.5 mm to 5.5 turns/cable diameter 6.5 mm).
- Blanking element M20x1.5 (all versions)
  - Tightening torque: 32.5 Nm

Electrostatic charge

The user shall ensure that the equipment is not installed where it may be subjected to external conditions which might cause a build-up of electrostatic charge on non-conducting surfaces.

Impact / Friction

Because the enclosure and optionally the process connection of the equipment is made of aluminum alloy, the apparatus must be installed so that even in the event of rare incidents, an ignition source due to impact or friction between enclosure and iron/steel is excluded, when used in potentially explosive atmosphere requiring apparatus of equipment 1G.

Flameproof joints

The flameproof joints are not intended to be repaired.

Transient limitation for type of protection n

A transient protection device shall be used, set at a level not exceeding 140% of the peak related voltage of 85 V.

Ambient and process temperature range

The relation between the ambient and process temperature ranges and the surface temperature or temperature class is shown in the thermal data tables.

Max. permitted temperature close to the enclosure

If the process temperature exceeds the max. permissible ambient temperature, the max, resulting temperature at the connection of the sensor head shall not exceed the related max. permissible ambient temperature, taking the worst case conditions into account. This shall be verified by measurement when installed.

D.2 CLS200 approvals

D.2.1 ATEX/UKEX: Ex-marking (CLS200)

Dust Ignition Proof

With intrinsically safe output to probe

Integral version		II 1/2 D Ex ia/tb [ia Da] IIIC TX Da/Db
Remote version	Electronics enclosure	II 2(1) D Ex ia tb [ia Da] IIIC TX Db
	Level probe	II 1 D Ex ia IIIC TX Da II 1/2 D Ex ia IIIC TX Da/Db

Flameproof / Dust Ignition Proof

With intrinsically safe output to probe

Integral version		II 1/2 G Ex ia/db [ia Ga] IIC TX Ga/Gb II 1/2 D Ex ia/tb [ia Da] IIIC TX Da/Db
Remote version	Electronics enclosure	II 2(1) G Ex db ia [ia Ga] IIC TX Gb II 2(1) D Ex ia tb [ia Da] IIIC TX Db
	Level probe	II 1 G Ex ia IIC TX Ga II 1 D Ex ia IIIC TX Da II 1/2 D Ex ia IIIC TX Da/Db

Intrinsically safe

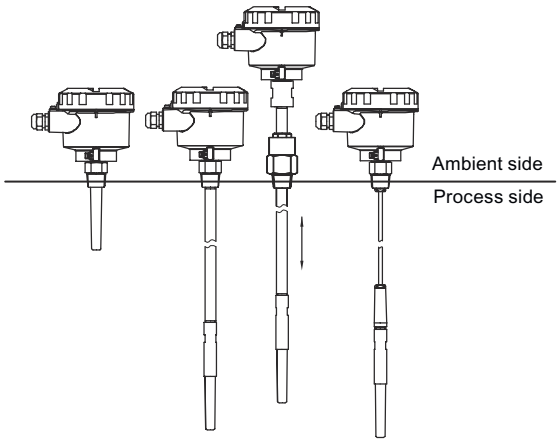
Integral version		II 1 G Ex ia IIC TX Ga II 1/2 D Ex ia IIIC TX Da/Db
Remote version	Electronics enclosure	II 1 G Ex ia IIC TX Ga II 2D Ex ia IIIC TX Db
	Level probe	II 1 G Ex ia IIC TX Ga II 1 D Ex ia IIIC TX Da II 1/2 D Ex ia IIIC TX Da/Db

Type of protection n

Integral version		II 3 G Ex ic nA IIC TX Gc
Remote version	Electronics enclosure	II 3 G Ex ic nA IIC TX Gc
	Level probe	II 3 G Ex ic IIC TX Gc

D.2.2 ATEX/UKEX/INMETRO: Permitted zones for installation (CLS200)

Rod version



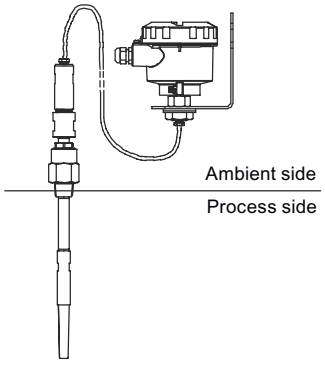
Ambient side

	Dust applications	Gas applications		
Marking	Da/Db	Ga/Gb	Ga	Gc
EPL	Db	Gb	Ga	Gc
Category	2D	2G	1G	3G
Zone	21	1	0	2

Process side

	Dust applications	Gas applications		
EPL	Da	Ga	Ga	Gc
Category	1D	1G	1G	3G
Zone	20	0	0	2

Cable version



Ambient side

	Dust applications		Gas applications	
Marking (electronics enclosure)	Db	Db	Ga	Gb
EPL	Db	Db	Ga	Gb
Category	2D	2D	1G	2G
Zone	21	21	0	1
Marking (sensor probe)	Da/Db	Da	Ga	Ga
EPL	Db	Da	Ga	Ga
Category	2D	1D	1G	1G
Zone	21	20	0	0

Process side

	Dust applications		Gas applications	
Marking	Da	Da	Ga	Ga
Category	1D	1D	1G	1G
Zone	20	20	0	0

D.2.3 ATEX/UKEX/INMETRO: Flame Proof and Dust Ignition Proof (CLS200)

Applies to integral version and level probe of remote version

Ambient temperature range	Process temperature range	Max. surface temp (EPL Da)	Max. surface temp (EPL Db)	Temp class (EPL Ga or Gb)
-40 to +45 °C (-40 to +113 °F)	-40 to +45 °C (-40 to +113 °F)[2]	T_{200} 95 °C	T55 °C	T6
-40 to +60 °C (-40 to +140 °F)	-40 to +60 °C (-40 to +140 °F)[2]	T_{200} 110 °C	T70 °C	T5
-40 to +80 °C (-40 to +176 °F)	-40 to +95 °C (-40 to +203 °F)[1][2]	T_{200} 145 °C	T90 °C	T4
-40 to +80 °C (-40 to +176 °F)	-40 to +125 °C (-40 to +257 °F)[1][2]	T_{200} 175 °C	T90 °C	T3

Remote version: electronics enclosure

Ambient temperature range	Max. surface temperature (EPL Db)	Temperature class (EPL Gb)
-40 to +45 °C (-40 to +113 °F)	T55 °C	T6
-40 to +60 °C (-40 to +140 °F)	T70 °C	T6
-40 to +80 °C (-40 to +176 °F)	T90 °C	T5

[1] For process temperature > 85 °C: only applicable for versions with thermal isolator

[2] With option FFKM O-ring seal: lower process temperature limited to - 20 °C (-4 °F)

D.2.4 ATEX/UKEX/INMETRO: Intrinsically safe

Integral version

Remote version: level probe

Ambient temperature range	Process temperature range	Max. surface temperature (EPL Da)	Max. surface temperature (EPL Db)	Temperature class (EPL Ga or Gb)
-40 to +45 °C (-40 to +113 °F)	-40 to +45 °C (-40 to +113 °F)[2)]	T_{200} 95 °C	T55 °C	T6
-40 to +60 °C (-40 to +140 °F)	-40 to +60 °C (-40 to +140 °F)[2)]	T_{200} 110 °C	T70 °C	T5
-40 to +60 °C (-40 to +140 °F)	-40 to +95 °C (-40 to +203 °F)[1)2)]	T_{200} 145 °C	T90 °C	T4
-40 to +60 °C (-40 to +140 °F)	-40 to +125 °C (-40 to +257 °F)[1)2)]	T_{200} 175 °C	T90 °C	T3

Remote version: electronics enclosure

Ambient temperature range	Max. surface temperature	Temperature class (EPL Gb)
-40 to +45 °C (-40 to +113 °F)	T55 °C	T6
-40 to +60 °C (-40 to +140 °F)	T70 °C	T4

[1)] For process temperature > 85 °C: only applicable for versions with thermal isolator

[2)] With option FFKM O-ring seal: lower process temperature limited to - 20 °C (-4 °F)

D.2.5 ATEX/UKEX/INMETRO: Type of protection n

Integral version

Remote version: level probe

Ambient temperature range	Process temperature range	Temperature class (EPL Gb)
-40 to +45 °C (-40 to +113 °F)	-40 to +75 °C (-40 to +167 °F)[2)]	T6
-40 to +60 °C (-40 to +140 °F)	-40 to +90 °C (-40 to +194 °F)[1)2)]	T5
-40 to +60 °C (-40 to +140 °F)	-40 to +125 °C (-40 to +257 °F)[1)2)]	T4

Remote version: electronics enclosure

Ambient temperature range	Temperature class (EPL Gc)
-40 to +45 °C (-40 to +113 °F)	T6
-40 to +60 °C (-40 to +140 °F)	T4

[1)] For process temperature > 85 °C: only applicable for versions with thermal isolator

[2)] With option FFKM O-ring seal: lower process temperature limited to - 20 °C (-4 °F)

D.2.6 FM/CSA (CLS200)

Explosion Proof / Dust Ignition Proof

Ambient temperature range	Process temperature range	Temperature class
-40 to +85 °C (-40 to +185 °F)	-40 to +125 °C (-40 to +257°F)	T4

Intrinsically safe

Installation shall be done according to FM/CSA connection drawing (Page 125).

Ambient temperature range	Process temperature range	Temperature class
-40 to +40 °C (-40 to +40 °F)	-40 to +40 °C (-40 to +40 °F)	T6
-40 to +85 °C (- 40 to +185 °F)	-40 to +125 °C (- 40 to +257°F)	T4

D.3 CLS300 approvals

D.3.1 ATEX/UKEX: Ex-marking (CLS300)

Dust Ignition Proof

With intrinsically safe output to probe

CLS300	II 1/2 D Ex ia/tb [ia Da] IIIC TX Da/Db
High temperature version	II 1/2 D Ex ia/tb [ia Da] IIIC TX Da/Db

Flameproof / Dust Ignition Proof

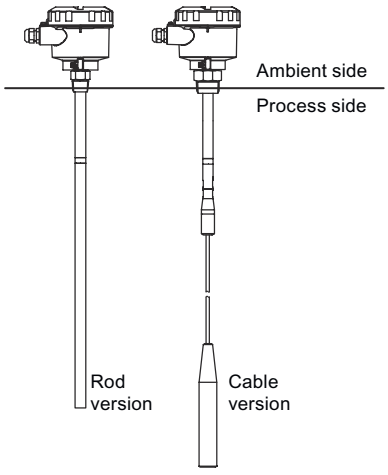
With intrinsically safe output to probe

CLS300	II 1/2 G Ex ia/db [ia Ga] IIC TX Ga/Gb II 1/2 D Ex ia/tb [ia Da] IIIC TX Da/Db
High temperature version	II 1/2 G Ex ia/db [ia Ga] IIC TX Ga/Gb II 1/2 D Ex ia/tb [ia Da] IIIC TX Da/Db

Intrinsically safe

CLS300	II 1 G Ex ia IIC TX Ga II 1/2 D Ex ia IIIC TX Da/Db
High temperature version	II 1 G Ex ia IIC TX Ga II 1/2 D Ex ia IIIC TX Da/Db

D.3.2 ATEX/UKEX/INMETRO: Permitted zones for installation (CLS300)



Ambient side

	Dust applications	Gas applications	
Marking	Da/Db	Ga/Gb	Ga
EPL	Db	Gb	Ga
Category	2D	2G	1G
Zone	21	1	0

Process side

	Dust applications	Gas applications
EPL	Da	Ga
Category	1D	1G
Zone	20	0

D.3.3 ATEX/UKEX/INMETRO: Flame Proof, Dust Ignition Proof and Intrinsically Safe (CLS300)

Flameproof and Dust Ignition proof

Ambient temperature range	Process temperature range	Max. surface temperature (EPL Da)	Max. surface temperature (EPL Db)	Temperature class (EPL Ga or Gb)
-40 to +70 °C (-40 to +158 °F)	-40 to +75 °C (-40 to +167 °F)	T_{200} 80 °C	T80 °C	T6
-40 to +80 °C (-40 to +176 °F)	-40 to +90 °C (-40 to +194 °F)	T_{200} 95 °C	T90 °C	T5
-40 to +80 °C (-40 to +176 °F)	-40 to +125 °C (-40 to +257 °F)	T_{200} 130 °C	T90 °C	T4
-40 to +80 °C (-40 to +176 °F)	-40 to +190 °C (-40 to +374 °F)	T_{200} 195 °C	T90 °C	T3
-40 to +80 °C (-40 to +176 °F)	-40 to +285 °C (-40 to +545 °F)	T_{200} 290 °C	T90 °C	T2
-40 to +80 °C (-40 to +176 °F)	-40 to +400 °C (-40 to +752 °F)	T_{200} 405 °C	T90 °C	T1

Intrinsically safe

Ambient temperature range	Process temperature range	Max. surface temperature (EPL Da)	Max. surface temperature (EPL Db)	Temperature class (EPL Ga or Gb)
-40 to +60 °C (-40 to +140 °F)	-40 to +75 °C (-40 to +167 °F)[1]	T_{200} 80 °C	T70 °C	T6
-40 to +60 °C (-40 to +140 °F)	-40 to +90 °C (-40 to +194 °F)[1][2]	T_{200} 95 °C	T70 °C	T5
-40 to +60 °C (-40 to +140 °F)	-40 to +125 °C (-40 to +257 °F)[1][2]	T_{200} 130 °C	T70 °C	T4
-40 to +60 °C (-40 to +140 °F)	-40 to +190 °C (-40 to +374 °F)[1][2]	T_{200} 195 °C	T70 °C	T3
-40 to +60 °C (-40 to +140 °F)	-40 to +290 °C (-40 to +554 °F)[3]	T_{200} 295 °C	T70 °C	T2
-40 to +60 °C (-40 to +140 °F)	-40 to +400 °C (-40 to +752 °F)[3]	T_{200} 405 °C	T70 °C	T1

[1] With option FFKM O-ring seal: lower process temperature limited to -20 °C (-4 °F)

[2] For process temperature > 85 °C. Only applicable for versions with thermal isolator or for High temperature version

[3] Only applicable for High Temperature version

D.3.4 FM/CSA (CLS300)

Explosion Proof / Dust Ignition Proof

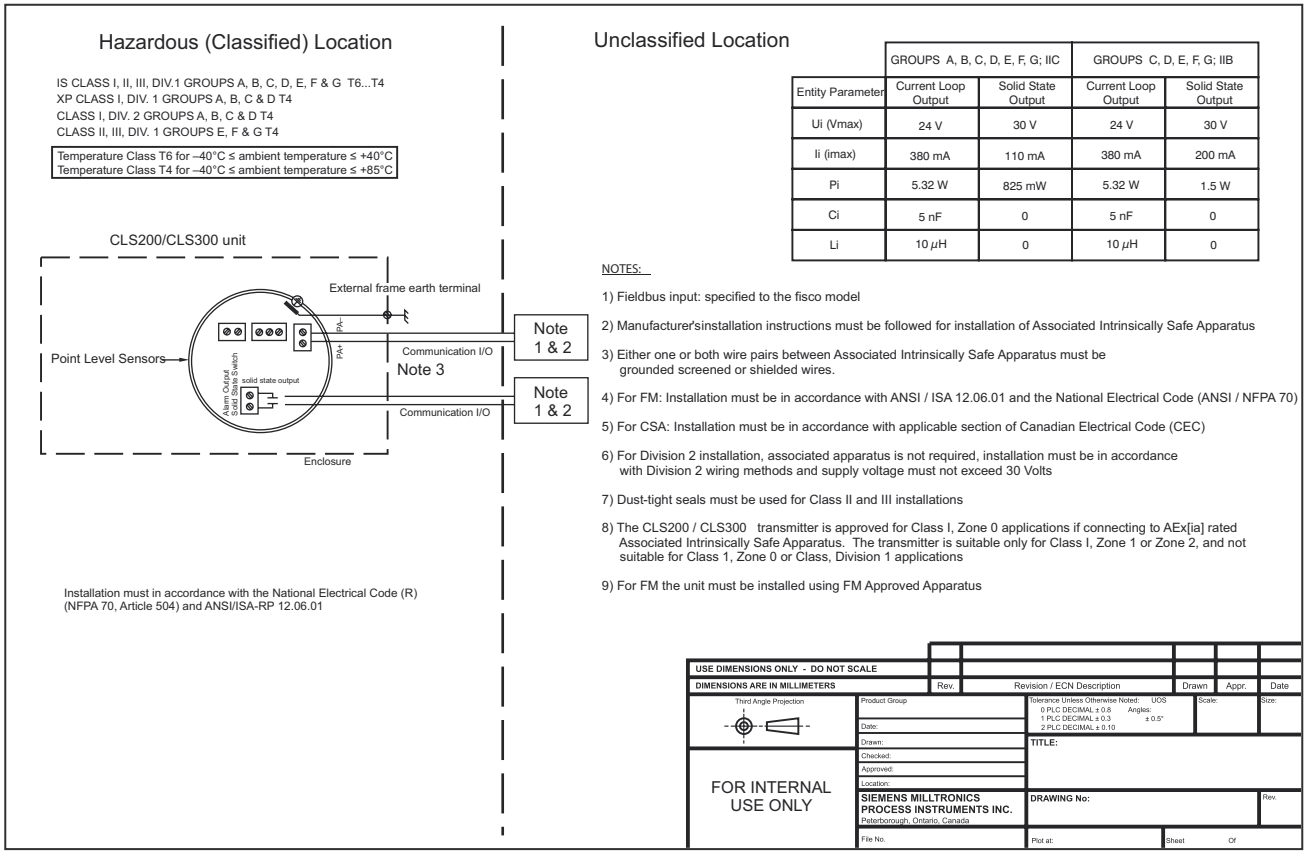
Ambient temperature range	Temperature class
-40 to +85 °C (-40 to +185 °F)	T4

Intrinsically safe

Installation shall be done according to FM/CSA connection drawing (Page 125).

Ambient temperature range	Temperature class
-40 to +40 °C (-40 to +40 °F)	T6
-40 to +85 °C (- 40 to +185 °F)	T4

D.4 FM/CSA connection drawing



	GROUPS A, B, C, D, E, F, G; IIC		GROUPS C, D, E, F, G; IIB	
Entity Parameter	Current Loop Output	Solid State Output	Current Loop Output	Solid State Output
Ui (Vmax)	24 V	30 V	24 V	30 V
Ii (imax)	380 mA	110 mA	380 mA	200 mA
Pi	5.32 W	825 mW	5.32 W	1.5 W
Ci	5 nF	0	5 nF	0
Li	10 μH	0	10 μH	0

NOTES:

1) Fieldbus input: specified to the fisco model

2) Manufacturer'sinstallation instructions must be followed for installation of Associated Intrinsically Safe Apparatus

3) Either one or both wire pairs between Associated Intrinsically Safe Apparatus must be grounded screened or shielded wires.

4) For FM: Installation must be in accordance with ANSI / ISA 12.06.01 and the National Electrical Code (ANSI / NFPA 70)

5) For CSA: Installation must be in accordance with applicable section of Canadian Electrical Code (CEC)

6) For Division 2 installation, associated apparatus is not required, installation must be in accordance with Division 2 wiring methods and supply voltage must not exceed 30 Volts

7) Dust-tight seals must be used for Class II and III installations

8) The CLS200 / CLS300 transmitter is approved for Class I, Zone 0 applications if connecting to AEx[ia] rated Associated Intrinsically Safe Apparatus. The transmitter is suitable only for Class I, Zone 1 or Zone 2, and not suitable for Class 1, Zone 0 or Class, Division 1 applications

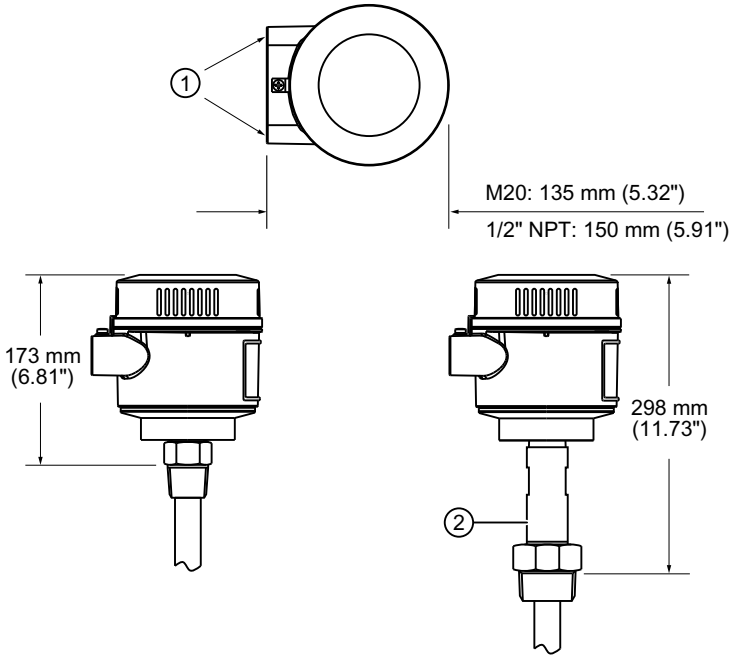
9) For FM the unit must be installed using FM Approved Apparatus

USE DIMENSIONS ONLY - DO NOT SCALE					
DIMENSIONS ARE IN MILLIMETERS	Rev.	Revision / ECN Description	Drawn	Appr.	Date
Third Angle Projection	Product Group	Tolerance Unless Otherwise Noted: UOS 0 PLC DECIMAL ± 0.8 Angles: 1 PLC DECIMAL ± 0.3 ± 0.5° 2 PLC DECIMAL ± 0.10	Scale:	Size:	
	Date:				
	Drawn:	TITLE:			
FOR INTERNAL USE ONLY	Checked:				
	Approved:				
	Location:				
	SIEMENS MILLTRONICS PROCESS INSTRUMENTS INC. Peterborough, Ontario, Canada	DRAWING No:			Rev.
	File No.	Plot at:	Sheet Of		

Dimensions

E.1 CLS200

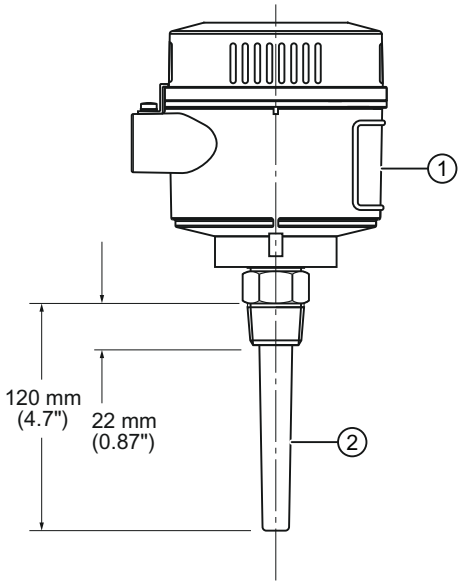
Enclosure, threaded process connection



① 2 cable entries
1/2" NPT or M20x1.5

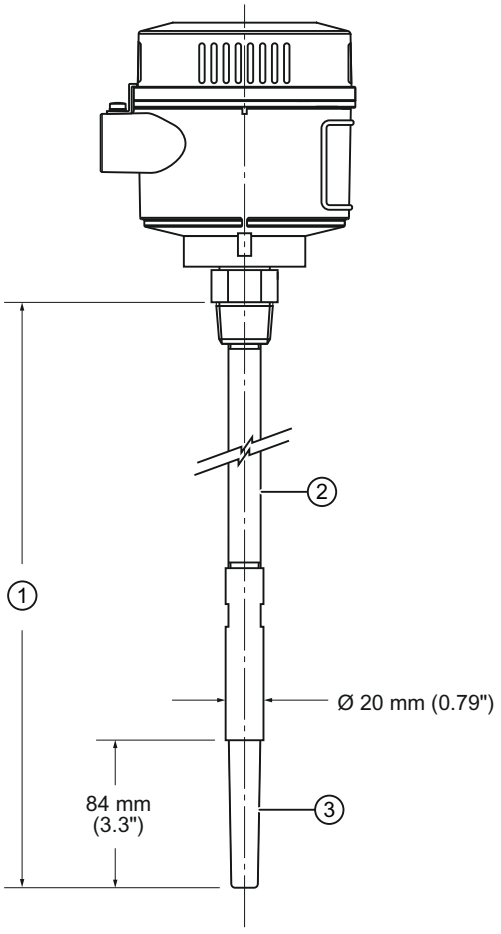
② Thermal isolator

Compact version, threaded



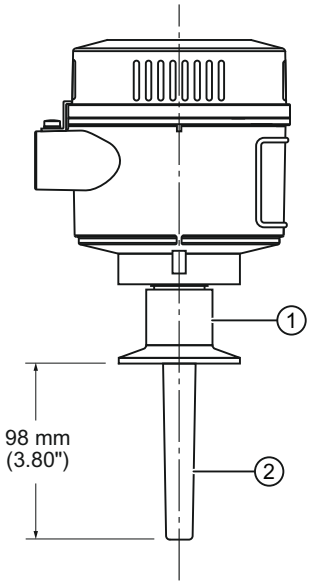
① Electronics/enclosure
② PPS or optional PVDF probe

Extended rod version, threaded



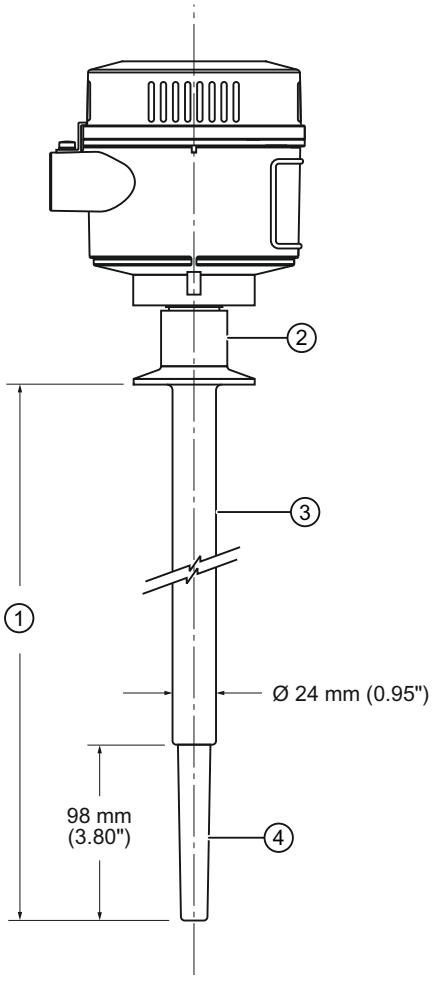
① Y01 (insertion length)
Min. insertion length = 200 mm (7.87")
Max. insertion length = 5500 mm (216")
② 316L stainless steel extension
③ PPS or optional PVDF probe

Sanitary compact version



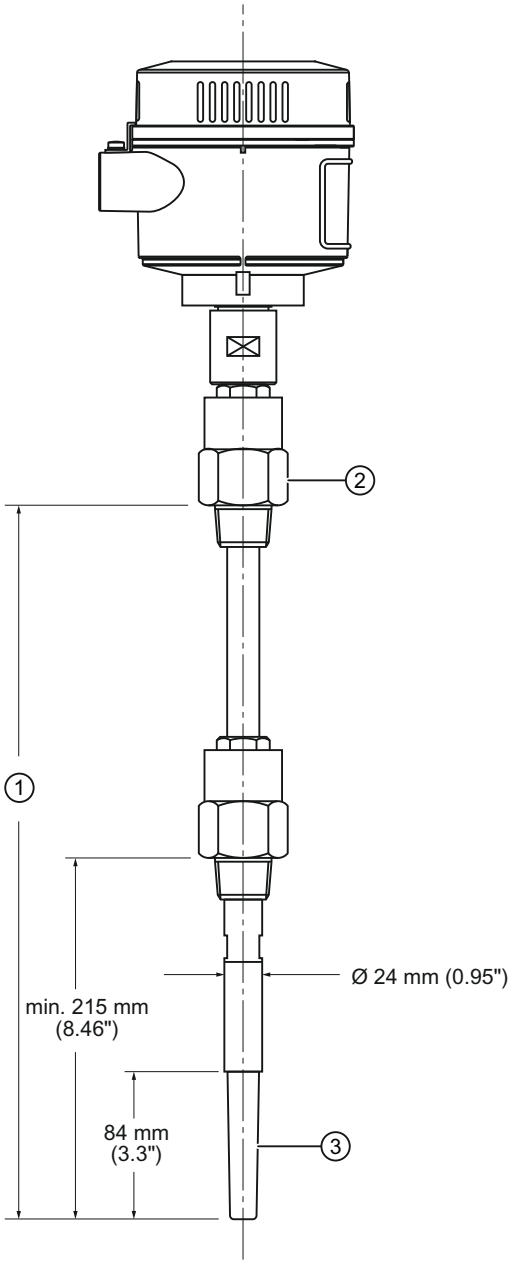
① 316L stainless steel sanitary process connection
② PPS or optional PVDF probe

Sanitary extended version



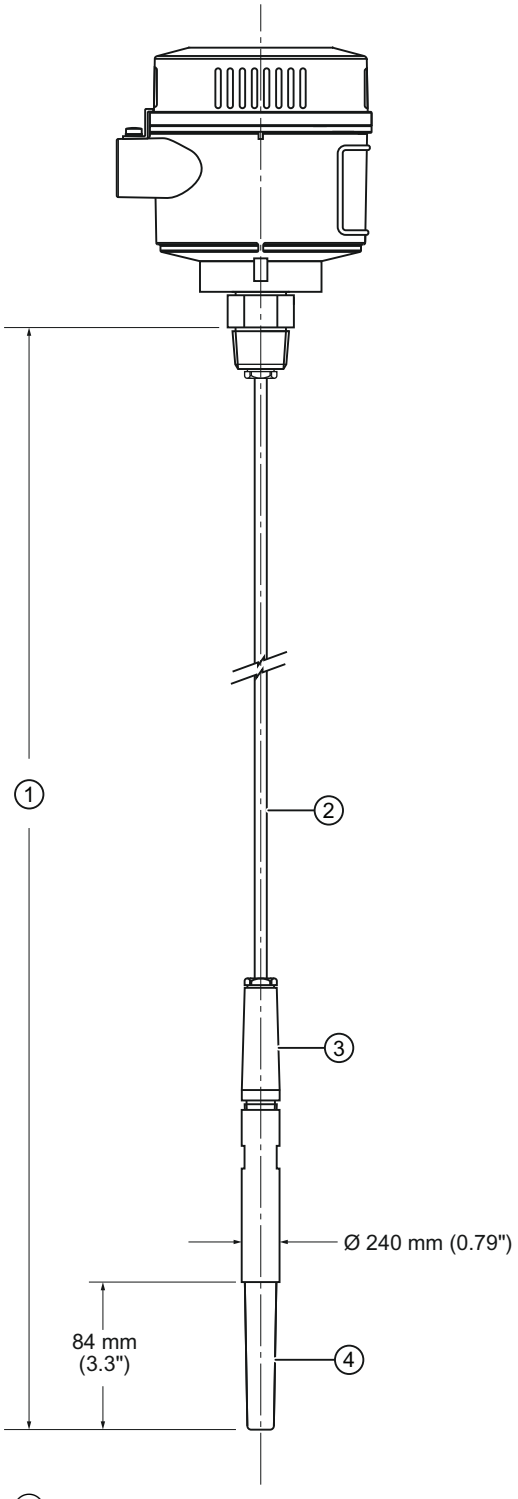
① Y01 (insertion length)
Min. insertion length = 110 mm (4.3")
Max. insertion length = 5500 mm (216")
② 316L stainless steel sanitary process connection
③ 316L stainless steel extension
④ PPS or optional PVDF probe

Sliding coupling version, threaded



① Y01 (insertion length)
Min. insertion length = 350 mm (13.82")
Max. insertion length = 5500 mm (216")
② 316L stainless steel sliding coupling
③ PPS or optional PVDF probe

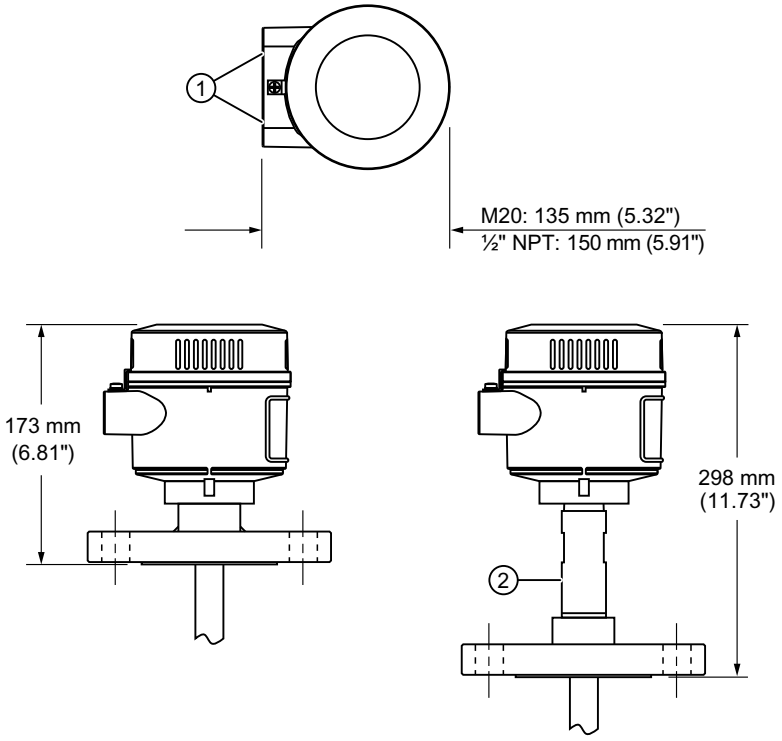
Extended cable version, threaded



① Y01 (insertion length)
Min. insertion length = 500 mm (19.69")
Max. insertion length = 3500 mm (1378")

② FEP insulated cable Ø 6 mm (0.3")
③ 316L stainless steel sensor weight
④ PPS or optional PVDF probe

CLS200 - flanged process connections



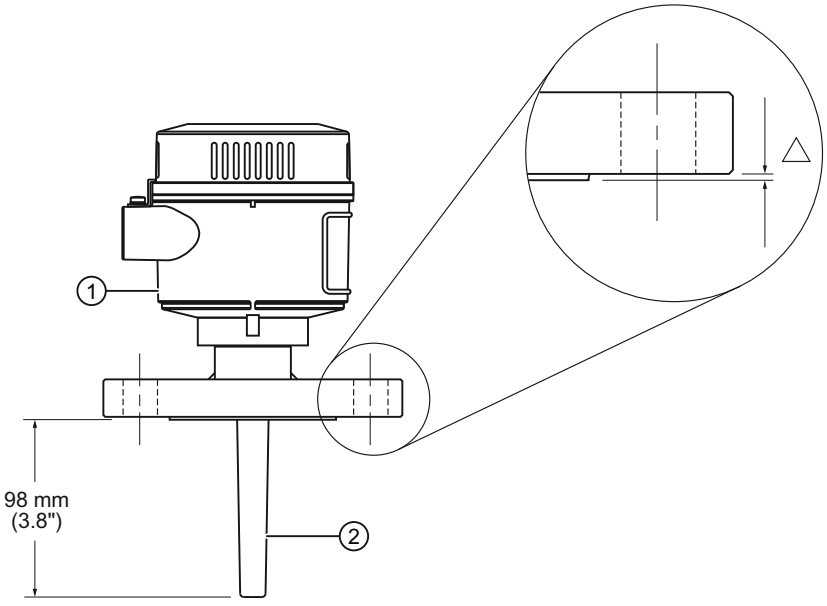
① 2 cable entries
1/2" NPT or M20x1.5

② Thermal isolator

Flange facing table

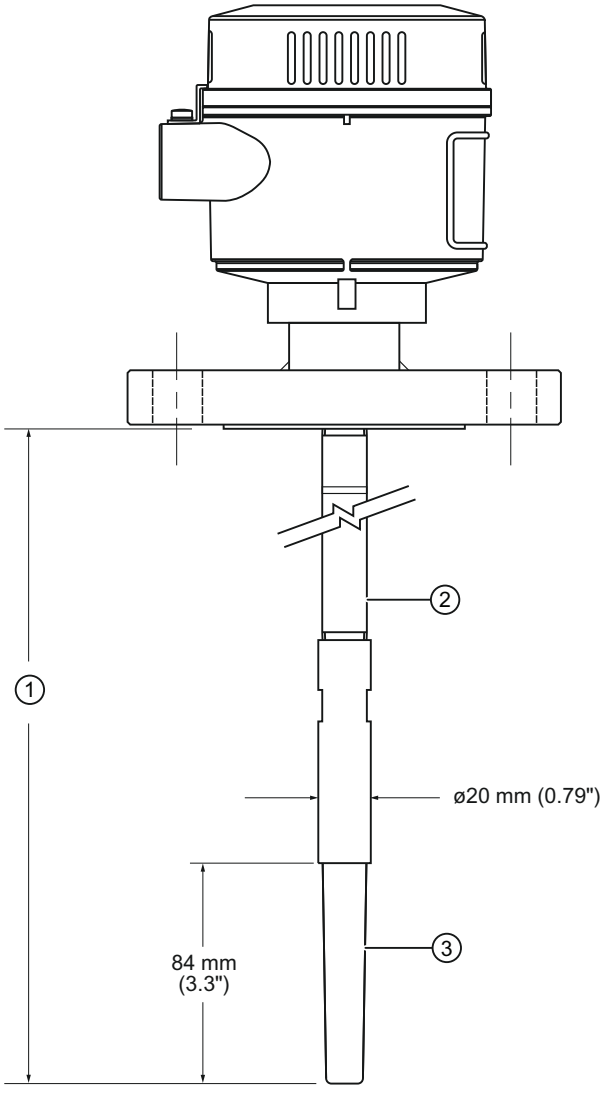
Flange facing (raised face)	
Flange class	**Facing thickness**
Δ ASME150/300	2 mm (0.08")
Δ ASME600/900	7 mm (0.28")
Δ PN16/40	2 mm (0.08")

Compact version, welded flange



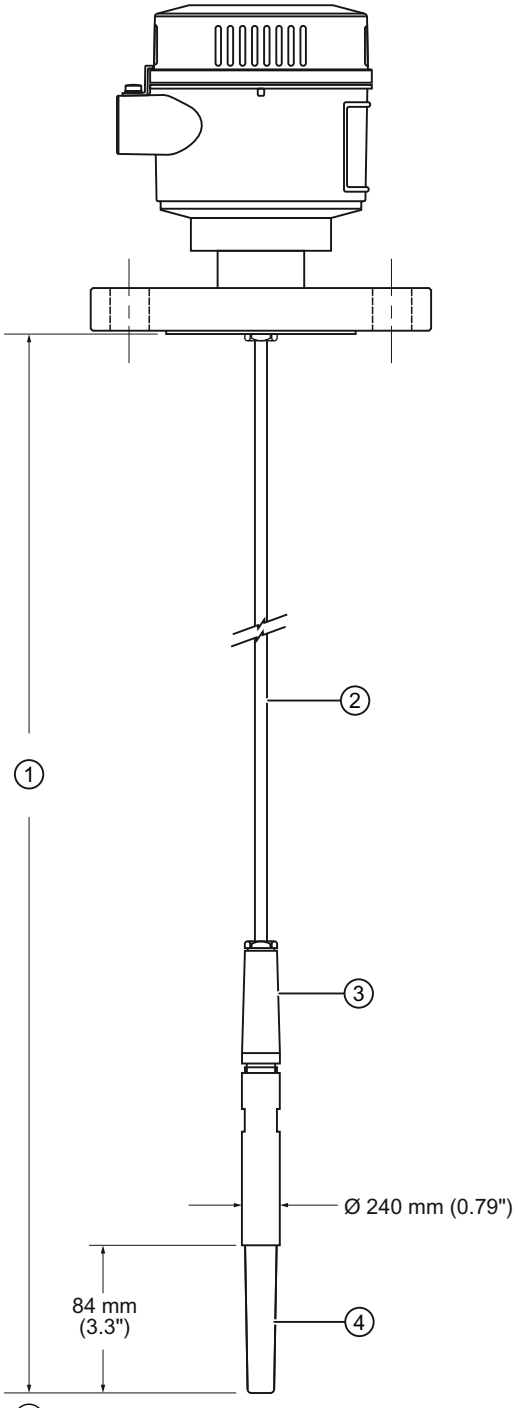
① Electronics/enclosure
② PPSor optional PVDF probe

Extended rod version, welded flange



① Y01 (insertion length)
Min. insertion length = 200 mm (7.87")
Max. insertion length = 5500 mm (216")
② 316L stainless steel extension
③ PPS or optional PVDF probe

Extended cable version, welded flange

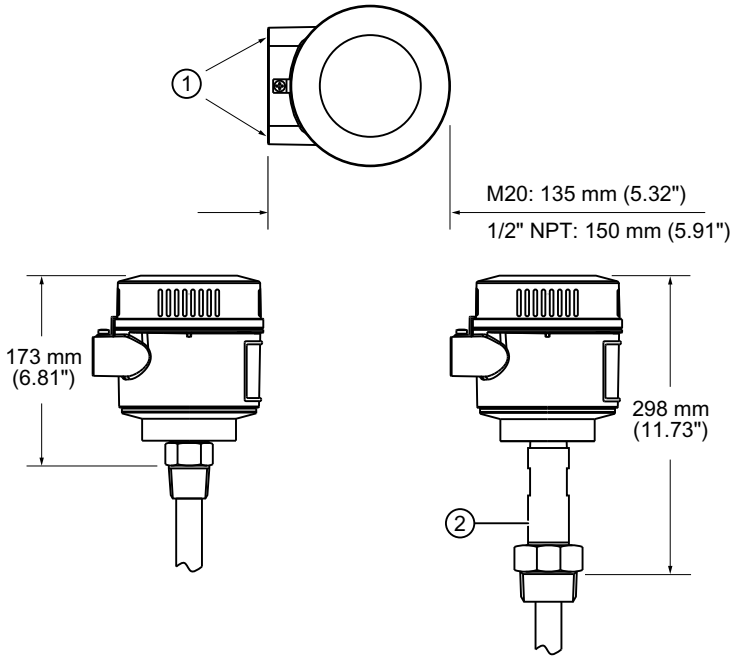


① Y01 (insertion length)
Min. insertion length = 500 mm (19.69")
Max. insertion length = 30000 mm (1181")

② FEP insulated cable ⌀ 6 mm (0.3")
③ 316L stainless steel sensor weight
④ PPS or optional PVDF probe

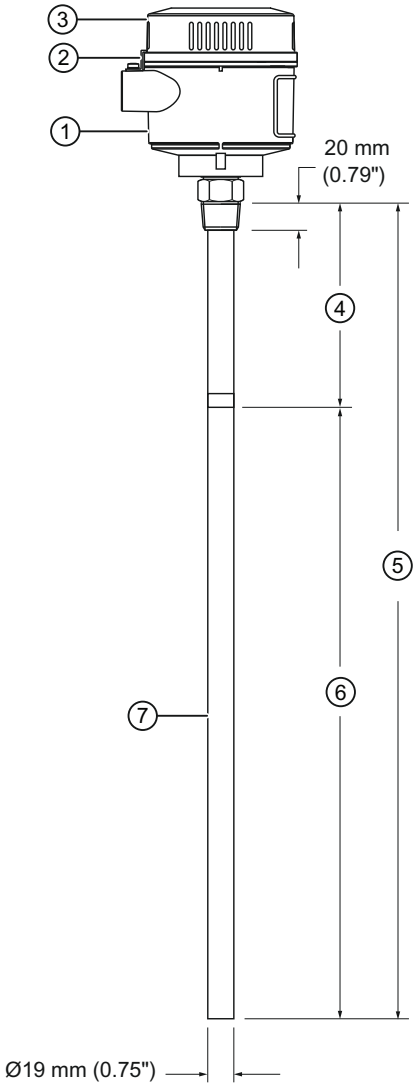
E.2 CLS300

Threaded process connection



① 2 cable entries 1/2 NPT or M20x1.5
② Thermal isolator

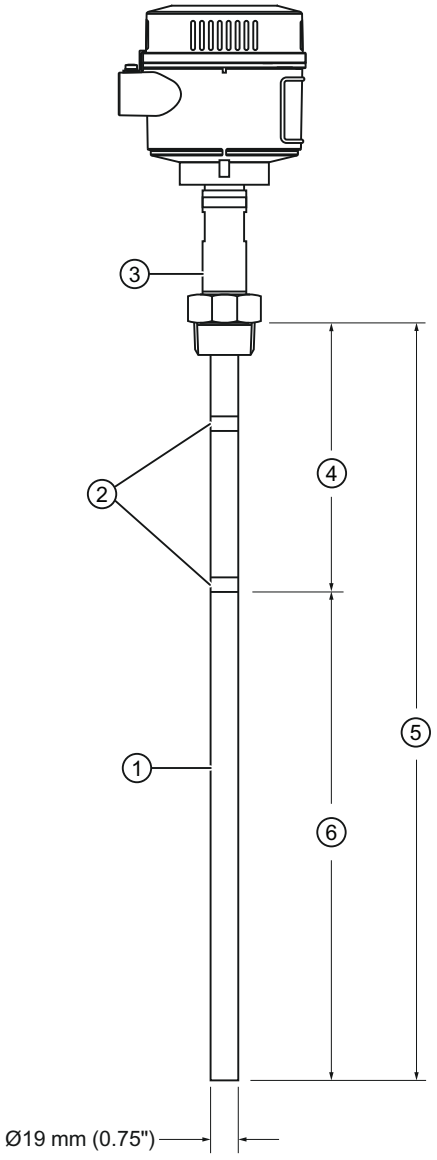
Rod version, threaded



① Electronics/enclosure
② Lid clip
③ Lid
④ Y02[1)]
⑤ Y01 (insertion length)
Min. = 350 mm (14")
Max. = 1000 mm (39.37")
⑥ Measuring length
⑦ Probe

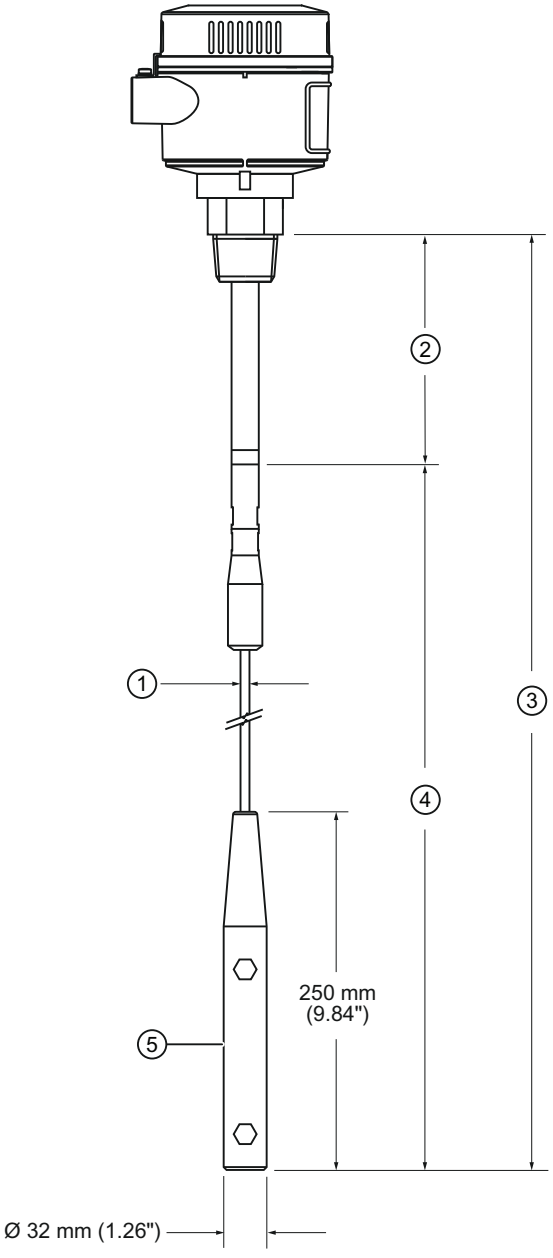
[1)] Extended Active Shield (Y02): standard length 125 mm (4.92"). Optional Active Shield lengths: 250 mm (9.84") or 400 mm (15.75").

High temperature rod version, threaded



① Probe
② Ceramic insulator(s)
③ Thermal isolator
④ Y02
Extended Active Shield: standard length 125 mm (4.92")
Optional Active Shield lengths: 250 mm (9.84") or 400 mm (15.75")
⑤ Y01 (insertion length)
Min.= 350 mm (14")
Max.= 1000 mm (39")
⑥ Measuring length

Non-insulated cable version, threaded



① Stainless steel cable Ø 6 mm (0.24")

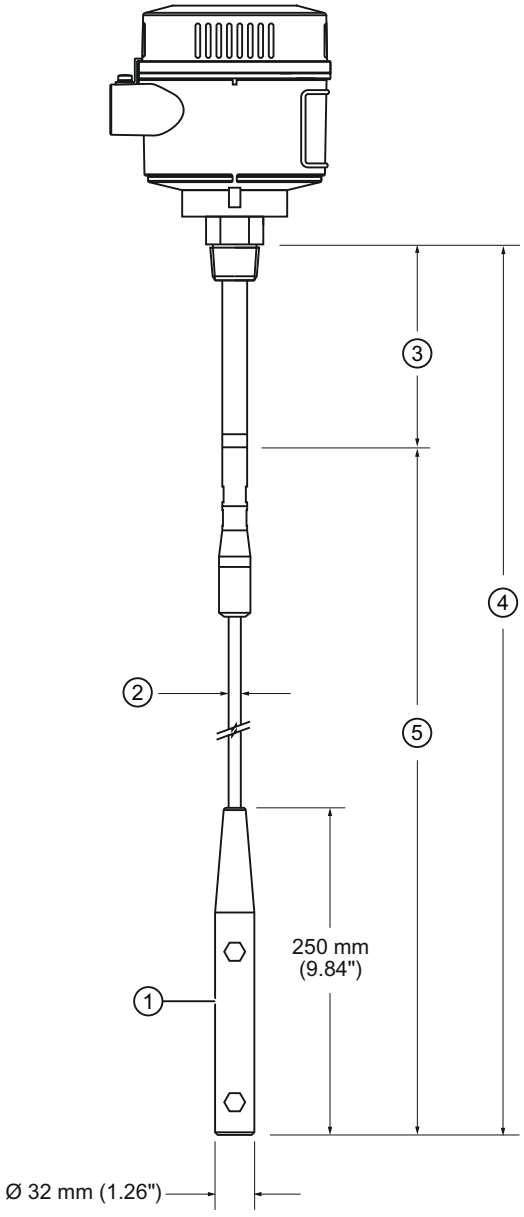
② Y02
Extended Active Shield: standard length 125 mm (4.92")
Optional Active Shield lengths: 250 mm (9.84") or 400 mm (15.75")

③ Y01 (insertion length)
Min. = 1000 mm (40")
Max. = 25000 mm (984")

④ Measuring length

⑤ Stainless steel weight

Insulated cable version, threaded



① Stainless steel weight

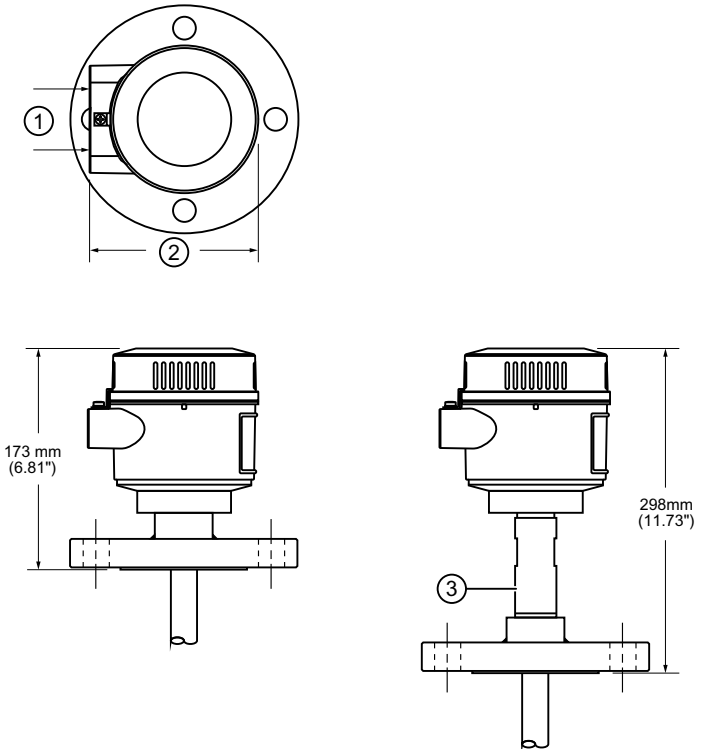
② PFA insulated cable
Ø 10 mm (0.35")

③ Y02
Extended Active Shield: standard length 125 mm (4.92")
Optional Active Shield lengths: 250 mm (9.84") or 400 mm (15.75")

④ Y01 (insertion length)
Min. = 1000 mm (40")
Max. = 25000 mm (984")

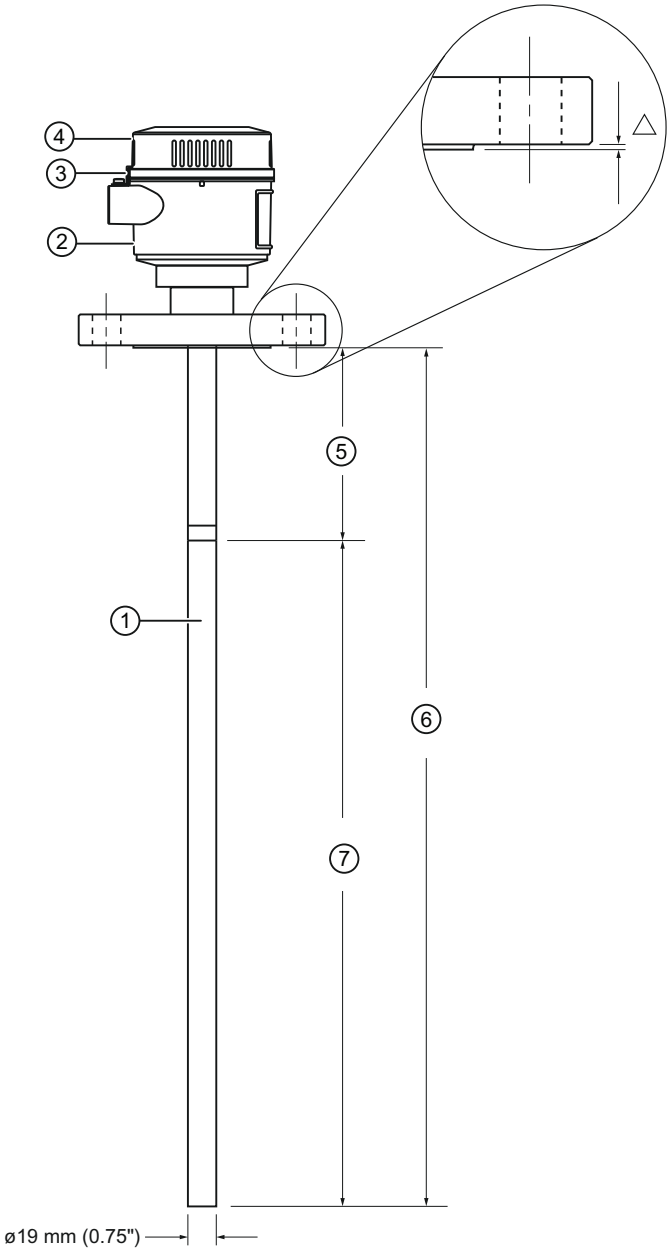
⑤ Measuring length

Flanged process connections



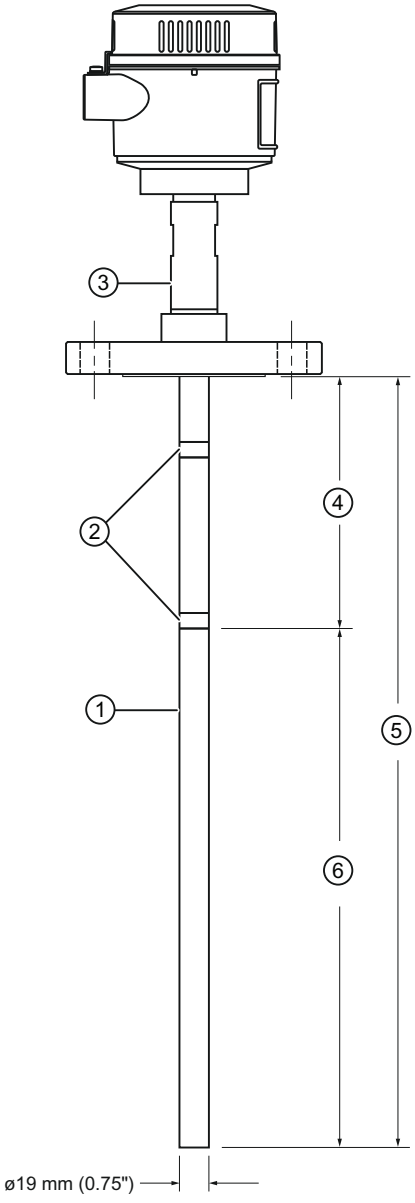
① 2 cable entries
1/2" NPT or M20x1.5
② M20: 135 mm (5.32")
1/2" NPT: 150 mm (5.91")
③ Thermal isolator

Rod version, welded flange



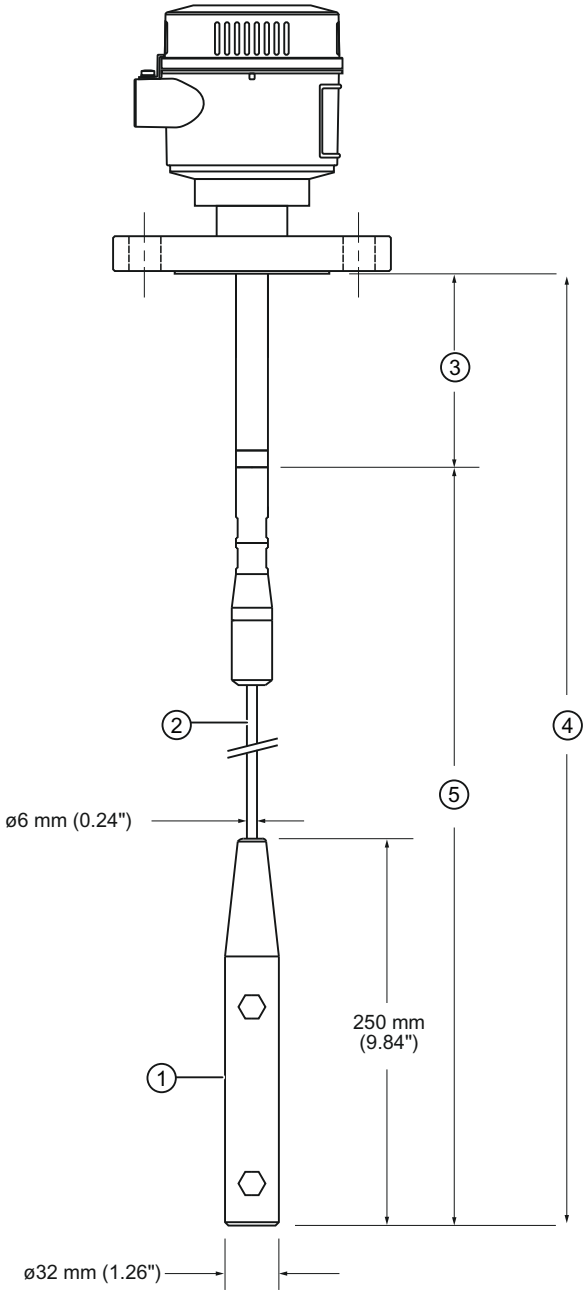
① Probe
② Electronics/enclosure
③ Lid clip
④ Lid
⑤ Y02
Extended Active Shield: standard length 105 mm (4.13")
Optional Active Shield lengths: 230 mm (9.06") or 380 mm (14.96")
⑥ Y01 (insertion length)
Min. = 250 mm (9.8")
Max. = 1000 mm (39.37")
⑦ Measuring length

High temperature rod version, welded flange



① Probe
② Ceramic insulator(s)
③ Thermal isolator
④ Y02
Extended Active Shield: standard length 105 mm (4.13")
Optional Active Shield lengths: 230 mm (9.06") or 380 mm (14.96")
⑤ Y01 (insertion length)
Min. = 250 mm (9.8")
Max. = 1000 mm (39.37")
⑥ Measuring length

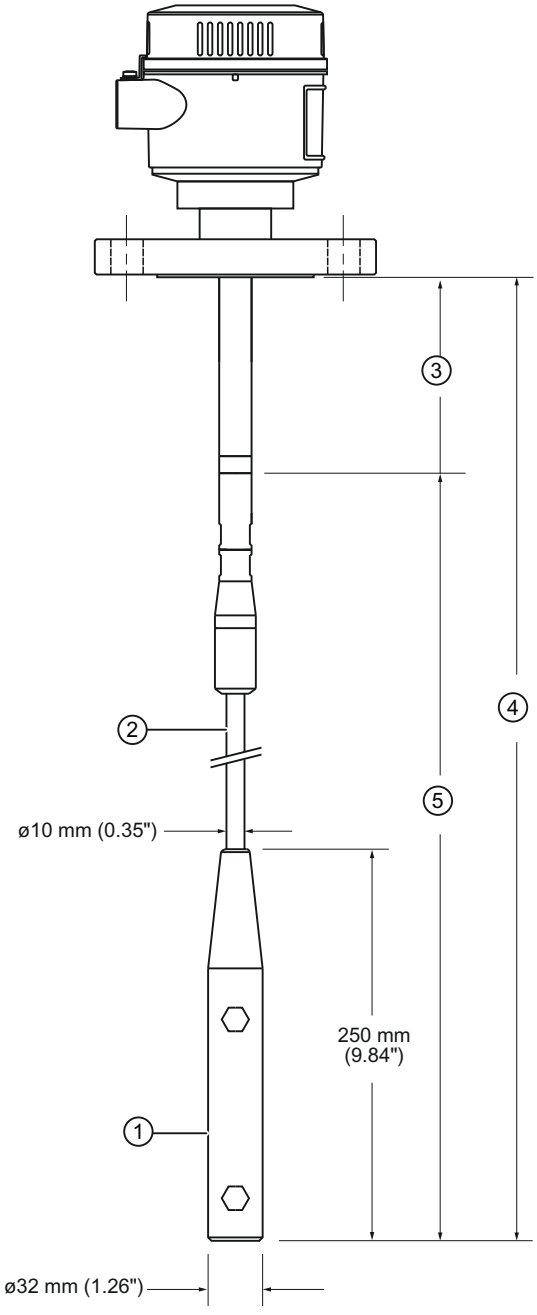
Non-insulated cable version, welded flange



① Stainless steel weight
② Stainless steel cable
③ Y02
Extended Active Shield: standard length 105 mm (4.13")
Optional Active Shield lengths: 230 mm (9.06") or 380 mm (14.96")
④ Y01[1] (insertion length)
Min = 1000 mm (39.37")
Max. = 2500 mm (984")
⑤ Measuring length

[1] Insertion length does not include any raised face/gasket face dimension, see Flange Facing table.

Insulated cable version, welded flange



① Stainless steel weight
② PFA insulated cable
③ Y02
Extended active shield: standard length 105 mm (4.13")
Optional active shield lengths: 230 mm (9.06") or 380 mm (14.96")
④ Y01
Insertion length does not include any raised face/gasket face dimensions.
⑤ Measuring length

Shortening the cable

F

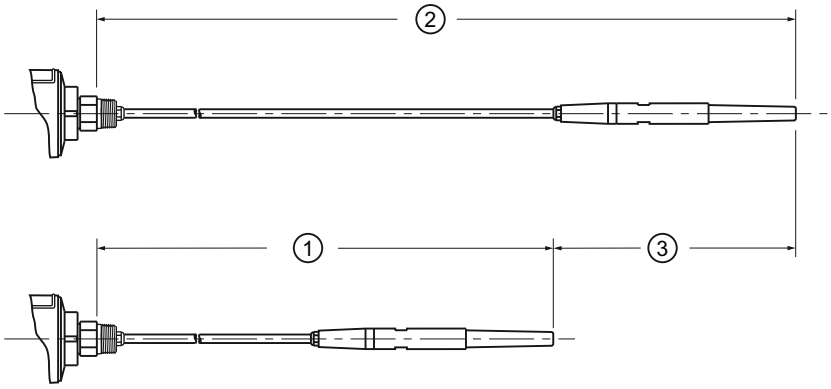
F.1 Pointek CLS200 Digital, cable version

⚠ 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.

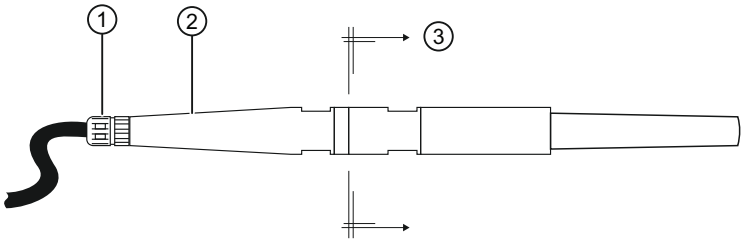
For example: 10 m (actual length) minus 9 m (required length) = 1 m (excess)



① Required length
② Actual length
③ Excess length

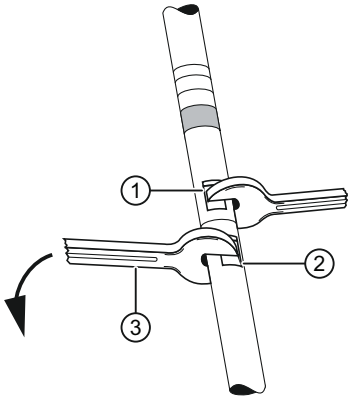
Steps

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



① Cable gland compression nut
② Probe sleeve
③ Probe, lower assembly

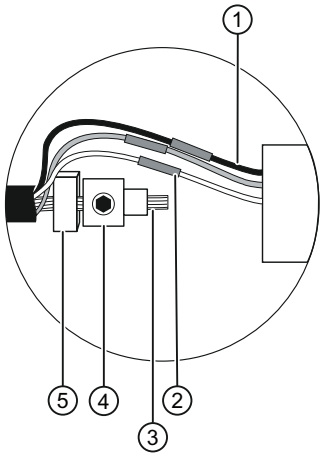
2. Unscrew the probe sleeve from the lower assembly using two 17 mm (0.67") wrenches across the flat surfaces, as shown below.



① Flat surface
② Flat surface
③ Lower wrench

– 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.
– 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.



① Lead
② 9.5 mm (0.37") heat shrink insulation
③ Cable core
④ Tension block
⑤ Steel spacer

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.

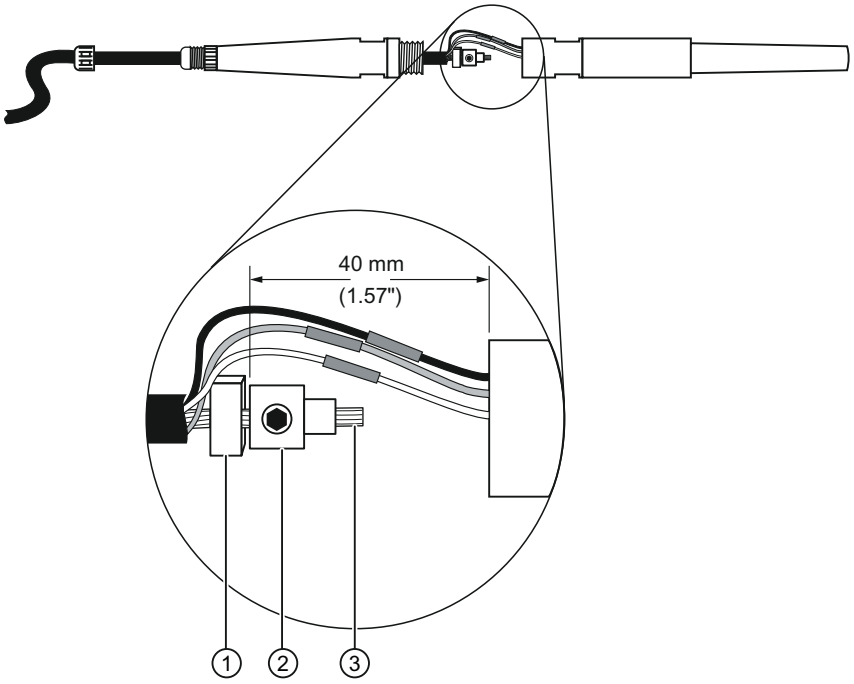
5. Remove the tension block, and save it for re-use in step 7.
6. Calculate the excess cable, then add back an allowance of 75 mm (3") for making the connections:
   For example, 1000 mm = excess
   less 75 mm = allowance for connections
   925 mm = excess cable to be removed 7.
7. Cut off the excess 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.



① Steel spacer
② Tension block
③ Core

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.

F.2 Pointek CLS300 Digital, 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.

Product documentation and support

G

G.1 Product documentation

Process instrumentation product documentation is available in the following formats:

- Certificates (http://www.siemens.com/processinstrumentation/certificates)
- Downloads (firmware, EDDs, software) (http://www.siemens.com/processinstrumentation/downloads)
- Catalog and catalog sheets (http://www.siemens.com/processinstrumentation/catalogs)
- Manuals (http://www.siemens.com/processinstrumentation/documentation)
  You have the option to show, open, save, or configure the manual.
  - "Display": Open the manual in HTML5 format
  - "Configure": Register and configure the documentation specific to your plant
  - "Download": Open or save the manual in PDF format
  - "Download as html5, only PC": Open or save the manual in the HTML5 view on your PC

You can also find manuals with the Mobile app at Industry Online Support (https://support.industry.siemens.com/cs/ww/en/sc/2067). Download the app to your mobile device and scan the device QR code.

Product documentation by serial number

Using the PIA Life Cycle Portal, you can access the serial number-specific product information including technical specifications, spare parts, calibration data, or factory certificates.

Entering a serial number

1. Open the PIA Life Cycle Portal (https://www.pia-portal.automation.siemens.com).
2. Select the desired language.
3. Enter the serial number of your device. The product documentation relevant for your device is displayed and can be downloaded.

To display factory certificates, if available, log in to the PIA Life Cycle Portal using your login or register.

Scanning a QR code

1. Scan the QR code on your device with a mobile device.
2. Click "PIA Portal".

To display factory certificates, if available, log in to the PIA Life Cycle Portal using your login or register.

G.2 Technical support

Technical support

If this documentation does not completely answer your technical questions, you can enter a Support Request (http://www.siemens.com/automation/support-request).

For help creating a support request, view this video here (www.siemens.com/opensr).

Additional information on our technical support can be found at Technical Support (http://www.siemens.com/automation/csi/service).

Service & support on the Internet

In addition to our technical support, Siemens offers comprehensive online services at service & support (http://www.siemens.com/automation/service&support).

Contact

If you have further questions about the device, contact your local Siemens representative, by doing the following:

1. Visit Contact at Siemens (http://www.automation.siemens.com/partner).
2. Select "All Products and Branches" > "Products & Services" > "Industrial automation".
3. Choose either "Process analytics" or "Process instrumentation", depending on your product.
4. Select the product category ("Pressure measurement", for example), then select your product.
5. Click "Search".
   The contacts for your product in all regions display.

Contact address for business unit:
Siemens AG
Digital Industries
Process Automation
Östliche Rheinbrückenstr. 50
76187 Karlsruhe, Germany

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.

condensed status byte

a new form of the status byte introduced with PROFIBUS Profile standard 3.01. Includes improved error codes and improved bit mapping to allow easier filtering of messages.

derating

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

dielectric

a nonconductor of electric current.

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.

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 usually given relative to a vacuum /dry air: the relative dielectric constant of air is 1.

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.

status byte

standardized code returned by a PROFIBUS slave on every bus scan, along with the main process variable (output of the Analog Input Function Block).

stillpipe

a grounded metal tube with openings.

Index

K

L

M

O

P

R

S

T

W