

SIEMENS

SITRANS L

Capacitance continuous level transmitter SITRANS LC300

Operating Instructions

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7ML5670 (LC300 standard, rod version)
7ML5671 (LC300 standard, stilling well version)
7ML5672 (LC300 standard, stainless steel cable version)
7ML5673 (LC300 standard, PFA cable version)

07/2023

A5E47904073-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

All names identified by ® are registered trademarks of Siemens Aktiengesellschaft. The remaining trademarks in this publication may be trademarks whose use by third parties for their own purposes could violate the rights of the owner.

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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Safety notes

Safety marking symbols

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

Note

Follow the installation and operating procedures for a quick, trouble-free installation and to ensure the maximum accuracy and reliability of your SITRANS LC300. This manual applies to the SITRANS LC300 model only.

This manual will help you set up your SITRANS LC300 for optimum performance.

Sections in this manual are designated as follows:

- SITRANS LC300 - an introduction to SITRANS LC300 and to the manual
- Technical specifications (Page 37)
- Installation (Page 10)
- Wiring
- Operation
- Appendix A: Technical References

Application examples

The application examples used in this manual illustrate typical installations using SITRANS LC300; 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.

See also

www.siemens.com/level (www.siemens.com/level)

Note

- SITRANS LC300 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.
-

SITRANS LC300 is a cost-effective instrument for level measurement in applications such as the processing of food and beverages, pharmaceuticals, detergents and pet food. It performs in liquids, bulk solids and slurries, including viscous (conductive or nonconductive) materials, even in challenging environments involving vapour and dust.

LC300 is a 2-wire instrument combining a sophisticated, yet easy-to-adjust, microprocessor transmitter with field-proven probes.

The electronic component contains the measurement module (driver) and the microprocessor module. This set of parts forms a calibrated pair that measures process capacitance in pico Farads (pF) which is proportional to the level of material in the tank. An optional safety barrier can be included in the electronic compartment for Hazardous Area applications.

The probe comprises a measurement section and an active shield section that is a fixed length. The probe is the primary system sensor, and it indicates the electrical capacitance value of the measurement section relative to the environment (tank wall, stilling well, or conductive material). This part of the probe connects to the electronic transmitter.

3.1 Applications

- Mining and cement
- Power
- Food and beverage
- Water
- Chemical
- Oil and gas

3.2 Features

- Threaded and flanged process connections: see "Process connections" under "Electrodes" in Technical specifications (Page 37)
- Corrosion resistant construction, PFA, PEEK^{TM 1)}, and 316L stainless steel wetted parts
- 5 m (16.4 ft) maximum insertion length for rod versions and 25 m (82 ft) maximum insertion length for cable versions
- Rugged shear and abrasion resistant probe
- Fully adjustable range: level, damping, diagnostics, etc.
- Field adjustable insertion length for cable probes without PFA insulation
- Probe input ESD protected
- Field proven and patented Active-Shield technology and variable frequency oscillator

¹⁾ PEEK is a registered trademark of Victrex plc.

Installation

4.1 Location



WARNING

- Never attempt to loosen, remove or disassemble process connection or instrument housing while vessel contents under pressure.
- Installation shall be performed only by qualified personnel and in accordance with local governing regulations.
- This device is to be used only in the manner outlined in this manual. Otherwise, protection provided by the device may be impaired.
- Materials of construction are chosen based on their chemical compatibility (or inertness) for general purposes. For exposure to specific environments, check with chemical compatibility charts before installing.
- Improper installation may result in loss of process pressure.
- Handle the device using the enclosure, not the antenna or the device tag, to avoid damage.

Note

- Refer to the device nameplate for approval information.
- SITRANS LC300 units are pressure tested, meeting or exceeding the requirements of the ASME Boiler and Pressure Vessel Code and the European Pressure Equipment Directive.
- The serial numbers stamped in each process connection body provides a unique identification number indicating date of manufacture.
- Example: MMDDYY - XXX (where MM = month, DD = day, YY = year, and XXX = sequential unit produced)
- Further markings (space permitting) indicate flange configuration, size, pressure class, material, and material heat code.
- This product is susceptible to electrostatic shock. Follow proper grounding procedures.

4.2 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).

SITRANS LC300 as supplied in the standard probe lengths is normally mounted on the vessel top or through the tank wall at the detection level (if used as Point Level switch).

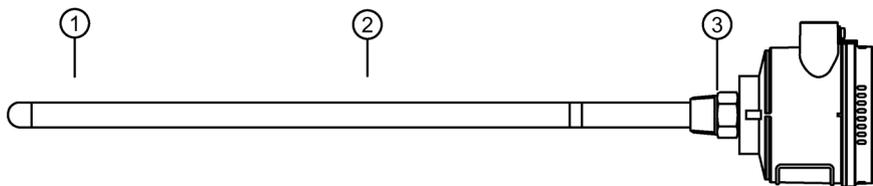
The cable version is designed for top mounting. The cable suspends vertically so that it reaches into the process with the end of the cable being the start of the measurement (dependant on probe option).

4.3 Handling Precautions

! WARNING

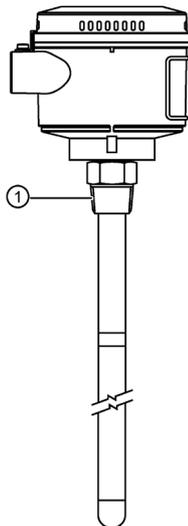
To prevent damage, all LC300 units with a rod longer than 2 m (6.5 ft) must be handled as described below.

When lifting LC300 from a horizontal position, support it at these three points:



- ① Towards the end of the rod
- ② Midway along the rod
- ③ At the process connection or flange

Once vertical, LC300 may be held by the process connection or flange:



- ① At the process connection or flange

Note

Unit shown is LC300 Threaded Rod Version. Handling precautions apply to all LC300 units with rods longer than 2 m (6.5 ft).

4.4 Mounting

4.4.1 General safety instructions

- Installation shall be performed only by qualified personnel and in accordance with local governing regulations.
- This device is to be used only in the manner outlined in this manual. Otherwise, protection provided by the device may be impaired.
- Materials of construction are chosen based on their chemical compatibility (or inertness) for general purposes. For exposure to specific environments, check with chemical compatibility charts before installing.
- The user is responsible for the selection of bolting and gasket materials which will fall within the limits of the flange and its intended use, and which are suitable for the service conditions.
- Refer to the device nameplate for approval information.
- This product is susceptible to electrostatic shock. Follow proper grounding procedures.
- Before inserting the instrument into its mounting connection, check to ensure the threads are matching to avoid damaging them.
- Cable entry devices and closing elements of unused apertures must meet a temperature range from min. -40 to 10 K above max. ambient temperature.

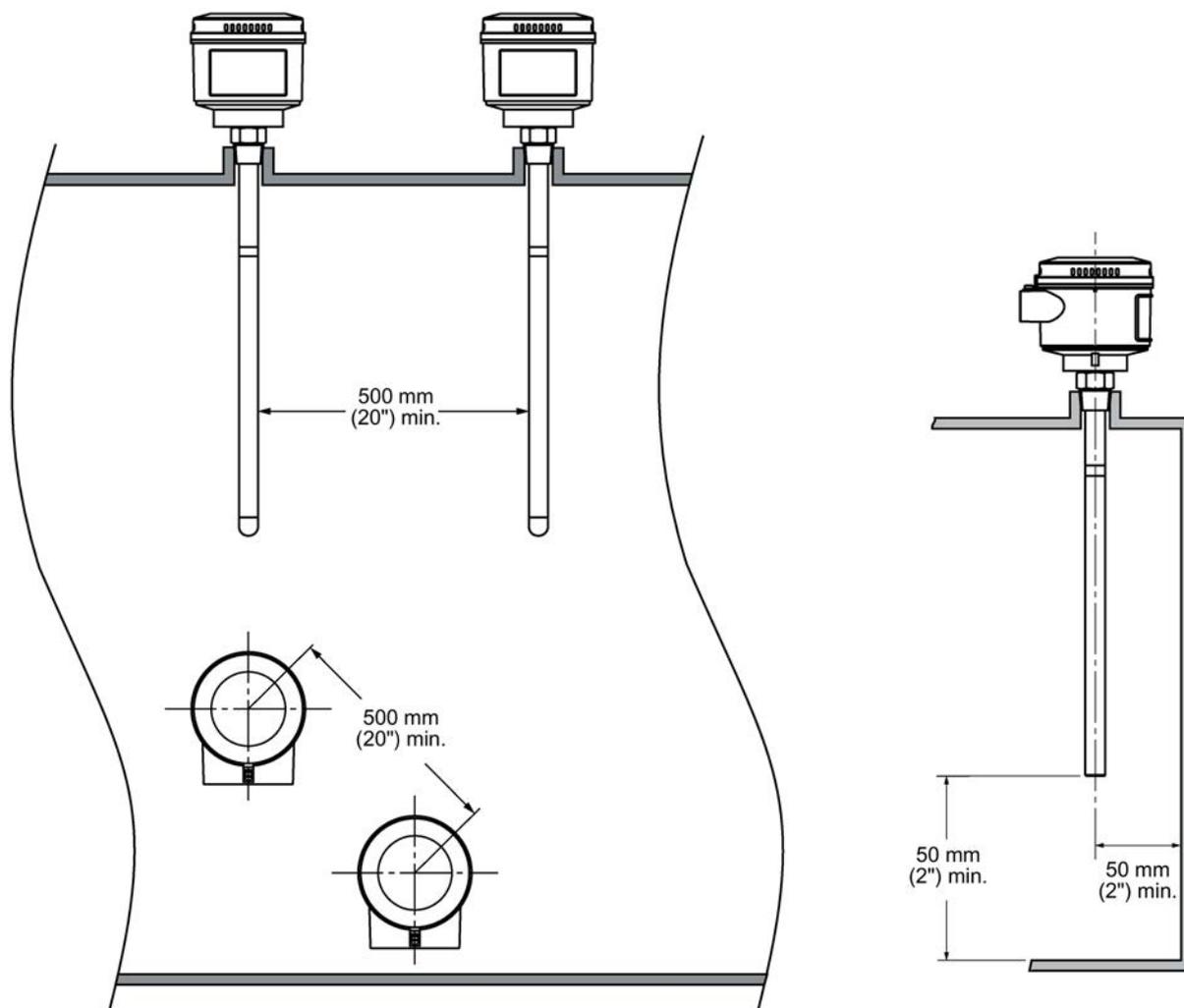
Pressure applications

- Never attempt to loosen, remove or disassemble process connection or instrument housing while vessel contents under pressure.
- Improper installation may result in loss of process pressure.
- For pressure applications, use PTFE tape or other appropriate thread sealing compound and tighten the process connection beyond hand-tight.
- LC300 units are pressure tested, meeting or exceeding the requirements of the ASME Boiler and Pressure Vessel Code and the European Pressure Equipment Directive.

Rope tensile strength

- Do not exceed the tensile strength of the rope at 1900 kg/4188 lbs.
- Always confirm that the load carrying capability of the silo/tank roof is sufficient to withstand the actual force on the rope conditions, especially where the force will be, or could be, as great as 1900/4188 lbs. A rope probe with a PFA jacket reduces the amount of possible product buildup on the probe as well as the tensile force on the rope.

4.4.2 Multiple units and wall restriction



Horizontally mounted units are configured as point level switches. Mount diagonally if vertical space is restricted.

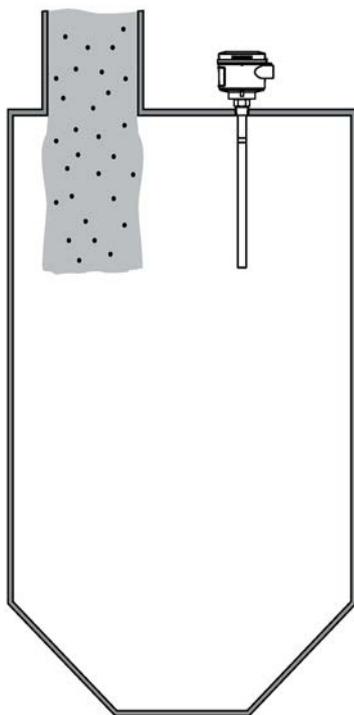
Note

These drawings are not to scale.

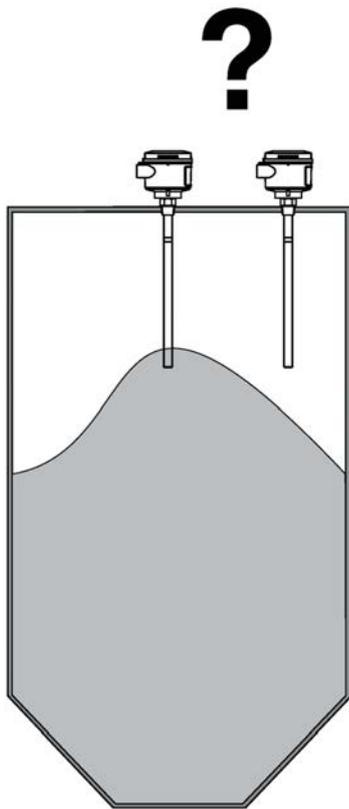
4.5 Process cautions

⚠ CAUTION

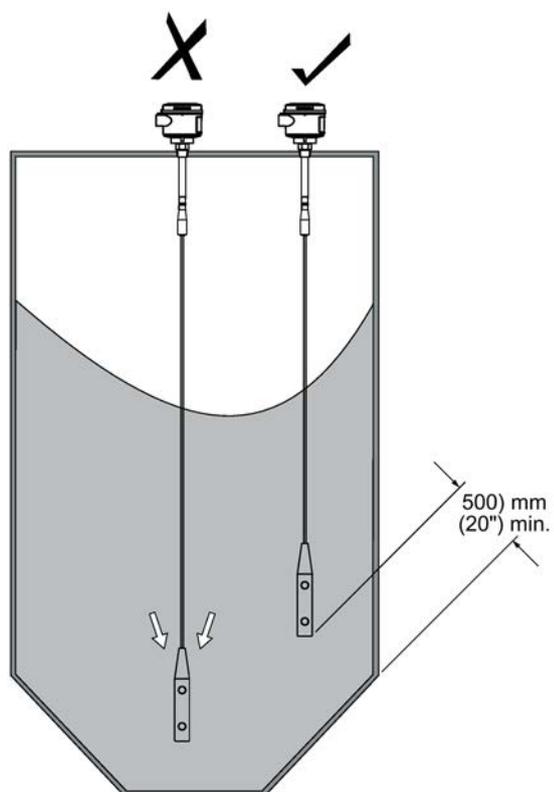
Keep unit out of path of falling material.

**⚠ CAUTION**

Consider material surface configuration when installing unit.

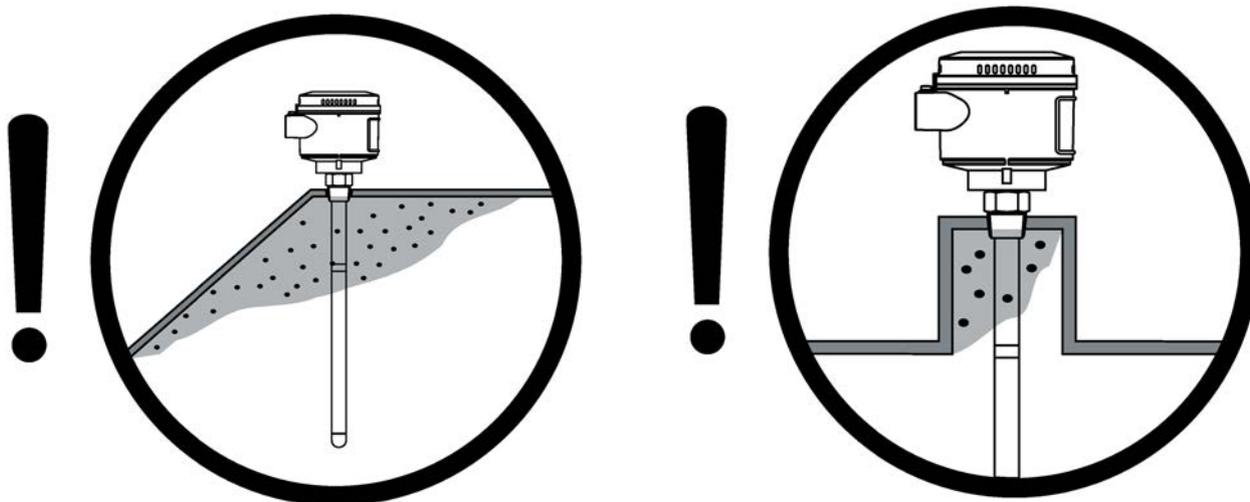


 CAUTION
Tensile load must not exceed probe or vessel rating.



Note

Buildup of material or condensation in active shield area does not affect operation.



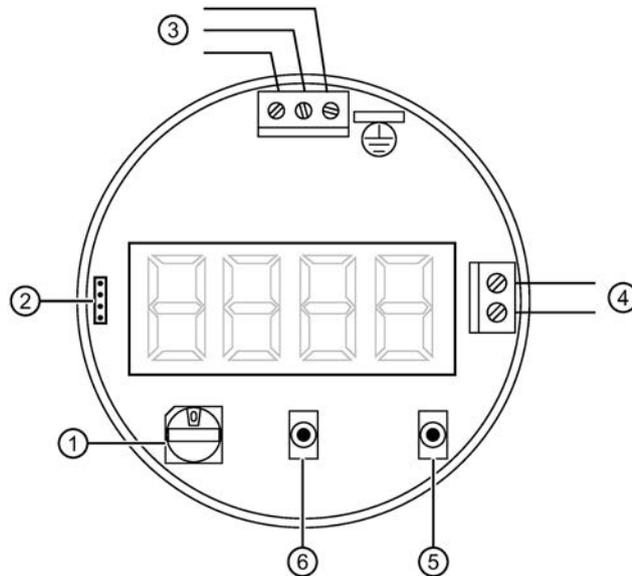
 **WARNING**

- Check the device nameplate and process device tag to verify the approval rating.
- Use appropriate conduit seals to maintain IP or NEMA rating.
- Read Instructions specific to hazardous area (Page 22).
- Cable entry devices and closing elements of unused apertures must meet a temperature range from min. -40°C to 10 K above max. ambient temperature.

5.1 Signal amplifier/power supply

SITRANS LC300 uses a switched power supply circuit that makes the most efficient use of the available power present on the terminals. If the signal current is low (4 mA), the terminal voltage will increase due to a voltage drop of other components in the loop, and if the signal current is high (20 mA), the terminal voltage will decrease.

Loosen the lid clip and remove the enclosure cover to access connectors and electronics.



- ① Menu/Function selector
- ② For factory software update use only
- ③ **With safety barrier**
 - White (S)
 - Black (O)
 - Red (+)
- ④ 4-20 mA (2-wire) current-loop
Measurement signal (non polarity sensitive)
- ⑤ Down / - button
- ⑥ Up / + button

Without safety barrier

- Orange (S)
- Black (O)
- Red (+)

5.2 Connecting the SITRANS LC300

1. Loosen the retaining lid clip and remove the enclosure cover.
2. Loosen the cable gland and thread the cable through it.
3. Connect the power/signal conductor wires to the current-loop terminal blocks (any polarity). The loop voltage must be between 12 and 30 V DC.
4. Ground the enclosure by connecting the housing and the process connection with either the stilling well and/or the tank wall, using the ground lug near the bottom of the housing.
5. Check that all connections are secure.
6. Replace enclosure cover and tighten retaining lid clip.

 **WARNING**

The sensor terminal block connects the electronics to the measurement module, providing the supply voltage and receiving the frequency signal from the measurement. The user should not alter these connections.

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

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

5.3 Wiring setups for hazardous area installations

 WARNING
<ul style="list-style-type: none"> • Turn off power before servicing any device. • Please check the ambient and operating temperatures under Environmental and Process in Technical specifications (Page 37) for the specific configuration you are about to use or install. • In potentially explosive atmospheres: <ul style="list-style-type: none"> – open the enclosure only when SITRANS LC300 is not energized.

Note

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

5.3.1 Flameproof / explosion proof configuration in hazardous areas

ATEX/UKEX/INMETRO

Flameproof and Dust Ignition Proof with intrinsically safe output to 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 +70°C (-40 to +158°F)	-40 to +75°C (-40 to +167°F) ¹⁾	T ₂₀₀ 80°C	T80°C	T6
-40 to +80°C (-40 to +176°F)	-40 to +90°C (-40 to +194°F) ¹⁾²⁾	T ₂₀₀ 95°C	T90°C	T5
-40 to +80°C (-40 to +176°F)	-40 to +125°C (-40 to +257°F) ¹⁾²⁾	T ₂₀₀ 130°C	T90°C	T4
-40 to +80°C (-40 to +176°F)	-40 to +190°C (-40 to +374°F) ¹⁾²⁾	T ₂₀₀ 195°C	T90°C	T3
-40 to +80°C (-40 to +176°F)	-40 to +200°C (-40 to +392°F) ¹⁾²⁾	T ₂₀₀ 205°C	T90°C	T2

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

FM/CSA

Explosion proof/Dust ignition proof

Ambient Temperature Range	Temperature Class
-40 to +85°C (-40 to +185°F)	T4

Process temperature is not considered for definition of Temperature class.

5.4 Instructions specific to hazardous area

5.4.1 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 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 practise (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

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

See EU-Declaration of Conformity for the list of standards valid for ATEX 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

ATEX/UKEX: Ex-marking

Devices with ATEX/UKEX approval are marked on the nameplate as follows.

If both Flameproof and Dust Ignition proof are present on the same nameplate, a tick box is present where the end user needs to select the protection method at the time of installment.

Dust ignition proof

with intrinsically safe output to probe

II 1/2 D Ex ia/tb [ia Da] IIIC TX Da/Db

Flameproof / Dust ignition proof

with intrinsically safe output to probe

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

5.4.2 Specific condition of use

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.

Flameproof joints

The flameproof joints are not intended to be repaired

Ambient and process temperature range

The relation between ambient and process temperature ranges and the surface temperature or temperature class is shown in thermal data tables. See Flameproof / explosion proof configuration in hazardous areas (Page 21).

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.

5.4.3 Warnings for installation

Process pressure

The device construction allows process over-pressure upto 10 or 35 bar (146 or 511 psi). This pressure is allowed for test purposes. The definition of the Ex approvals is only valid for a container-over-pressure between -0.2 .. +0.1 bar (-2.9 .. +1.45 psi).

For higher or lower pressures, the approvals are not valid.

Process and ambient temperature

Please check the Flameproof / explosion proof configuration in hazardous areas (Page 21) 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 general

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 in 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.

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

Cable gland M20 X 1.5 (Dust ignition proof)

Cable diameter: 6 mm to 12 mm

Tightening torque: Depending on the used cable and therefore to be determined by the user

Cable gland M20 X 1.5 (Flameproof)

Cable diameter: Bedding 3.1 mm to 8.6 mm / Overall 6.1 mm to 13.1 mm

Tightening torque: Number of turns depending on the 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)

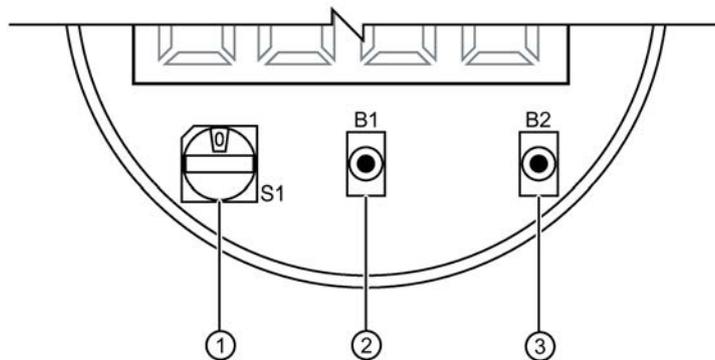
Blanking element M20 X 1.5 (all versions)

Tightening torque: 32.5 Nm

Operation

6.1 Start up

SITRANS LC300 user interface comprises the liquid crystal display (LCD), the 6-position rotary switch, and two push-buttons. Select a menu using the rotary switch; select and/or alter a readout or value using the push-buttons.



- ① Rotary switch
- ② Up button
- ③ Down button

The rotary switch can be set from 0 to 5. Each position represents a menu. The position wraps from 5 to 0.

The LCD (liquid crystal) displays settings altered by the rotary switch and the push buttons.

Note

Limits required with 3.6 mA fault protection setting

If the SITRANS LC300 is to be programmed for "fault protection setting to 3.6 mA" which is obtained by using the rotary switch position 3 and pushing the down button. Then, the following ambient temperature and input voltage limits must be observed:

- The device can operate on an input voltage minimum of 12 V DC and a maximum of 30 V DC between -30 °C and up to +85 °C (-22 °F and +185 °F)
 - To extend operation to -40 °C up to +85 °C (-40 °F and +185 °F) the input voltage must be increased to 15 V DC to a maximum of 30 V DC.
-

6.1.1 Menu functions

Rotary switch position	0	1	2	3	4	5
Display	Read PV (pF)	Read LRV (pF) (0% level)	Read URV (pF) (100% level)	Read mA loop-current	Diagnostics	Damping
Up button		Increase LRV	Increase URV	Set fault protection setting to 22 mA	Product version	Increase damping
Down button		Decrease LRV	Decrease URV	Set fault protection setting to 3.6 mA		Decrease damping
Both buttons		Set LRV from PV	Set URV from PV	Disable fault protection	Reset/ Acknowledge Fault	Set damping to 1.00

When you turn the rotary switch, the LCD shows the new menu selection for about 1 second followed by the data for that selection. When you alter a read-out or value, a colon (:) is displayed when the debounce delay timer has expired and the new value has been accepted.

Menu positions 0 (primary variable in pF) and 3 (corresponding loop-current values in mA) are the recommended positions during normal operation.

6.2 Menu position 0

Display	<ul style="list-style-type: none">• LCD displays the PV (Primary Variable) in pF.• In case of a system fault, the display alternates between PV value and Ft. View the fault details in menu 4.• Pressing either or both push-buttons in menu 0 has no effect.
---------	---

6.3 Menu position 1

Display	<ul style="list-style-type: none">• LCD displays the LRV (Lower Range Value) in pF, occurring when the range is at 0% and the loop-current is set to 4 mA.
Up button	<ul style="list-style-type: none">• Pressing the Up button for less than 1 second adjusts the LRV in the current step size (initially 0.01 pF).• Holding the Up or Down buttons for more than 1 second increases the step size to 0.1 pF. If you continue to hold the button, the step size increases to 10, 100, and 1000 (displayed as 1E3). When no button is pressed for 4 seconds, the step size decreases to the next smallest value. At each step size, press the buttons for less than 1 second to adjust the value.
Down button	<ul style="list-style-type: none">• Pressing the Down button for less than 1 second decreases the LRV in the current step size (initially 0.01 pF).• When held for more than 1 second, the Down Button will increase the step size by 0.1, 10, 100, and 1000. When no button is pressed for 4 seconds, the step size decreases to the next smallest value.
Both buttons	<ul style="list-style-type: none">• Pressing both buttons for more than 1 second sets the LRV to the current PV value.

6.4 Menu position 2

Display	<ul style="list-style-type: none"> LCD displays the URV (Upper Range Value) in pF, occurring when the range is at 100% and the loop-current is set to 20 mA.
Up button	<ul style="list-style-type: none"> Pressing the Up button for less than 1 second adjusts the URV in the current step size (initially 0.01 pF). Holding the Up or Down buttons for more than 1 second increases the step size to 0.1 pF. If you continue to hold the button, the step size increases to 10, 100, and 1000 (displayed as 1E3). When no button is pressed for 4 seconds, the step size decreases to the next smallest value. At each step size, press the buttons for less than 1 second to adjust the value.
Down button	<ul style="list-style-type: none"> Pressing the Down button for less than 1 second decreases the URV in the current step size (initially 0.01 pF). When held for more than 1 second, the Down Button will increase the step size by 0.1, 10, 100, and 1000. When no button is pressed for 4 seconds, the step size decreases to the next smallest value.
Both buttons	<ul style="list-style-type: none"> Pressing both buttons for more than 1 second sets the URV to the current PV value.

6.5 Menu position 3

Position 3 displays the Analog signal as it is set for the loop current. The Up and Down buttons set the system fault protection settings (according to NAMUR NE 43). System fault protection is used by control equipment to determine whether or not the LC300 is presenting a reliable signal.

When a system fault occurs:

Position 3 fault protection setting	Menu 3 LCD display	Current signal to D.C.S	Menu 0 reading
C:Hi	22 mA	22 mA	pF reading alternating with FLT
C:Lo	3.6 mA	3.6 mA	
C:An	mA value at time of fault	none	pF reading

Display	<ul style="list-style-type: none"> LCD shows the Analog Signal as it is set for the loop-current in mA. Normal primary variables would give mA values between 3.8 mA (lower saturation point) and 20.5 mA (upper saturation point). When the reading goes above the URV or below the LRV but still within the measurement range of the unit, it will remain at 20.5 or 3.8 respectively until the level returns between URV and LRV.
Up button	<ul style="list-style-type: none"> Pressing the Up button for less than 1 second shows the system fault protection setting. Holding the Up button for longer than 1 second will change the fault protection setting to C:Hi.^{a)}
Down button	<ul style="list-style-type: none"> Pressing the Down button for less than 1 second shows the system fault protection setting. Holding the Down button for longer than 1 second will change the fault protection setting to C:Lo.
Both buttons	<ul style="list-style-type: none"> Pressing both buttons for more than 1 second disables the system fault protection and the LCD will read C:An.

^{a)} System errors that would trigger a fault are a checksum error, an absence of measurement signal, or a primary variable beyond 1.66 pF (low) or 3300 pF (high).

6.6 Menu position 4

Display	<ul style="list-style-type: none"> LCD shows diagnostic information. A correctly operating device shows 0.00 on the LCD. See chart below for explanation of system fault values.
Up button	<ul style="list-style-type: none"> LCD shows revision information. Please note this information when calling Siemens Milltronics representatives for assistance.
Both buttons	<ul style="list-style-type: none"> Holding both buttons for more than 1 second will try to reset the error status. The LCD reads 0.00 when the status has been successfully reset. Monitor the LC300 more closely after a diagnostic error has occurred.

Fault values

128	The device is in calibration mode. The measurement values and the loop-current setting may no longer be trusted.
64	A checksum error has occurred in the program and/or data memory. The measurement values and the loop-current setting may no longer be trusted.
32	LC300 system watchdog has been activated. This fault can be combined with fault 64, resulting in fault 96. The measurement values and the loop-current setting may no longer be trusted.
8	An arithmetic error has occurred, perhaps caused by an incorrect value setting. This event type error will rarely affect the operation of the LC300.
4	An error occurred while trying to store settings in the local nonvolatile memory. The LC300 may not operate correctly.
2	The primary variable has exceeded the device limits (1.66 pF and 3300 pF). Check that the probe is correctly connected to the measurement module.
1	The measurement circuit no longer emits signal. Check the wiring to/from the measurement module or barrier circuit.

Note

It is possible for more than one fault to occur at the same time. The display will read the combined result of both fault values. For example: If fault value 1 and fault value 2 occur together, the display will read fault value 3. If the display reads fault value 10, it means fault value 8 and fault value 2 have occurred together.

6.7 Menu position 5

Display	<ul style="list-style-type: none"> LCD shows the damping value. The damping value alters the speed at which the primary variable will track the signal from the probe.
Up button	<ul style="list-style-type: none"> Pressing Up button for less than 1 second increases the damping value in 0.01 steps. Damping can be set to any value from 1.0 to 1000.0 Holding the Up or Down buttons for more than 1 second increases the step size to 0.1. If you continue to hold the button, the step size increases to 10, 100, and 1000 (displayed as 1E3). When no button is pressed for 4 seconds, the step size decreases to the next smallest value. At each step size, press the buttons for less than 1 second to adjust the value.
Down button	<ul style="list-style-type: none"> Pressing Down button for less than 1 second decreases the damping value in 0.01 steps. Damping can be set to any value from 1.0 to 1000.0 When held for more than 1 second, the Down Button will increase the step size by 0.1, 10, 100, and 1000. When no button is pressed for 4 seconds, the step size decreases to the next smallest value. At each step size, press the buttons for less than 1 second to adjust the value.
Both buttons	<ul style="list-style-type: none"> Holding both buttons for more than 1 second sets the damping value back to 1.0 (default).

6.8 Recommissioning

LC300 should be recommissioned whenever the transmitter or probes are replaced.

LC300 LRV will be programmed as factory default. The LRV can be re-adjusted in menu 1.

Setting URV	
If probe is fully covered in application:	
Set URV by pressing both buttons for more than 1 second in menu 2 when probe is fully covered.	
If probe is rarely or never fully covered, set the LC300 to your application based on the following example:	
LRV (0%)	Menu 1 reads 12.5 pF
Actual level is at 45% of the measurement length of probe:	
PV (45%)	Menu 0 reads 37 pF
The correct setting for URV:	
URV =	$[(PV - LRV) * 100 / \text{actual level in \%}] + LRV$ $[(37 - 12.5) * 100 / 45] + 12.5$ $= \mathbf{66.94 \text{ pF}}$

When calculating the URV, best results are achieved when using the highest possible actual level.

6.9 Maintenance

LC300 requires no regular maintenance or cleaning.

Note

Build-up of material on the active shield area has little or no effect on the performance of the LC300.

6.10 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.

Technical specifications

Note

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

Note

EMC testing

EN 61326 (CE and UKCA EMC) testing was conducted on the product while mounted in a metallic vessel and wired using shielded cable, where the cable **shield** 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.

Power

Supply voltage	12-30 V DC any polarity, 2-wire current loop circuit, max. resistance value 550 Ω @ 24 V DC
Measurement signal	4 – 20 mA or 20 – 4 mA according to NAMUR NE 43
Ex.approvals	Max.voltage which does not invalidate the intrinsically safe protection of the sensor (probe): $U_m = 250$ V AC

Environmental

location	indoor/outdoor
altitude	2000 m max.
ambient temperature	general purpose applications: – 40 to +85 °C (– 40 to +185 °F) hazardous locations: refer to applicable certificate
relative humidity	suitable for outdoors
installation category	I
pollution degree	4

Performance

measurement range	1.66 pF to 3300 pF
minimum span	3.3 pF
accuracy	< 0.5% of actual measurement value
non-linearity and reproducibility	< 0.4% full scale and actual measurement value
temperature stability	max. temperature drift of 0.25% of actual capacitance value
safety	<ul style="list-style-type: none"> • current signalling according to NAMUR NE 43, signal 3.8 to 20.5, fault ≤ 3.6 or ≥ 21 mA (22 mA) • probe input ESD protected • inputs/outputs fully galvanically isolated • polarity-insensitive current loop
diagnostics ¹⁾	<ul style="list-style-type: none"> • primary variable (PV) out of measurement limits • failure in measurement circuit • memory check sum • system watch dog

¹⁾ See Fault Values in Menu position 4 (Page 32) for detailed descriptions of Diagnostic messages.

Outputs

Current loop

continuous signal	4 to 20 mA / 20 to 4 mA
-------------------	-------------------------

User Interface

Display

local LCD	4-digit (each digit can be 0 to 9 or limited alpha characters)
-----------	--

Rotary Switch

menu position 0	Actual measurement value (in pF)
menu position 1	Lower Range Value (LRV) 0% of scale value and adjustment
menu position 2	Upper Range Value (URV) 100% of scale value and adjustment
menu position 3	Actual mA signal and system fault setting according to NAMUR NE 43
menu position 4	Diagnostic information/Software revision/reset
menu position 5	Damping

Electrodes

Process connections¹⁾

threaded rod mounting	3/4", 1", 1 1/4", 1 1/2" NPT [(Taper), ASME B1.20.1] R 3/4", 1", 1 1/2" [(BSPT), EN 10226; PT (JIS-T), JIS B 0203] G 3/4", 1", 1 1/2" [(BSPP), EN ISO 228-1; PF (JIS-P), JIS B 0202]
threaded cable mounting	1 1/2" NPT [(Taper), ASME B1.20.1] R 1 1/2" [(BSPT), EN 10226; PT (JIS-T), JIS B 0203] G 1 1/2" [(BSPP), EN ISO 228-1; PF (JIS-P), JIS B 0202]
flange mounting	1 to 4" NPS [ASME B16.5] DN 25 to 100 [EN 1092-1]

¹⁾ Others available on request

	Diameter	Length	Active Shield ^{a)}	Tensile (max)
rod probe	19 mm (0.75")	min. 300 mm (12") - max. 5000 mm (197")	120 mm for threaded process connections, 100 mm for flanged process connections	horizontal tensile load 30 Nm
cable probe	9 mm (0.35"), with PFA jacket 6 mm (0.24"), without PFA jacket	min. 1000 mm (39") - max. 25000 mm (984")	125 mm for threaded process connections, 105 mm for flanged process connections	1900kg (4188 lbs)

^{a)} Others available on request, see Dimensions (Page 41).

Wetted Parts

- AISI 316L/PEEK™/PFA¹⁾, FKM or FFKM O-ring

¹⁾ For a chemical resistance list for PFA/PEEK, contact your local distributor.

Enclosure

construction	aluminium, epoxy coated
ingress protection	Type 4/IP65/IP68 optional
cable inlet	2 X M20 X 1.5 or 2 X 1/2" NPT
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)

Note

The use of approved watertight conduit hubs/glands is required for Type 4/IP65 or IP68 (outdoor applications).

Weight

- Depends on configuration.

Process

Note

- See SITRANS LC300 Pressure versus temperature curves (Page 53).
- Not recommended for direct steam contact

Pressure range ¹⁾	-1 to 35 bar g (-14.6 to 511 psi g)
Temperature range	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 With Ex approval: Depending on Surface Temperature and Temperature Class, refer to Flameproof / explosion proof configuration in hazardous areas (Page 21).
	Min. relative dielectric constant (εr)1.5

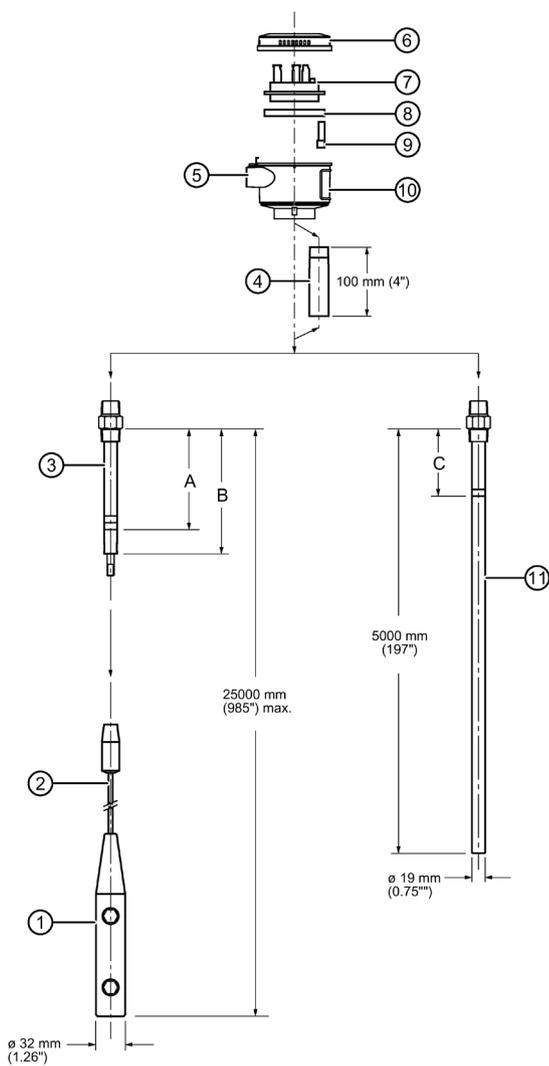
¹⁾ See SITRANS LC300 Pressure versus temperature curves (Page 53).

Approvals ²⁾

General	CSA, FM, CE, UKCA	
Hazardous	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
Marine	Lloyd's Register of Shipping, Categories ENV1, ENV2 and ENV5 ABS Type Approval	
Overfill Protection	AIB-Vincotte	

²⁾ Please verify against device nameplate.

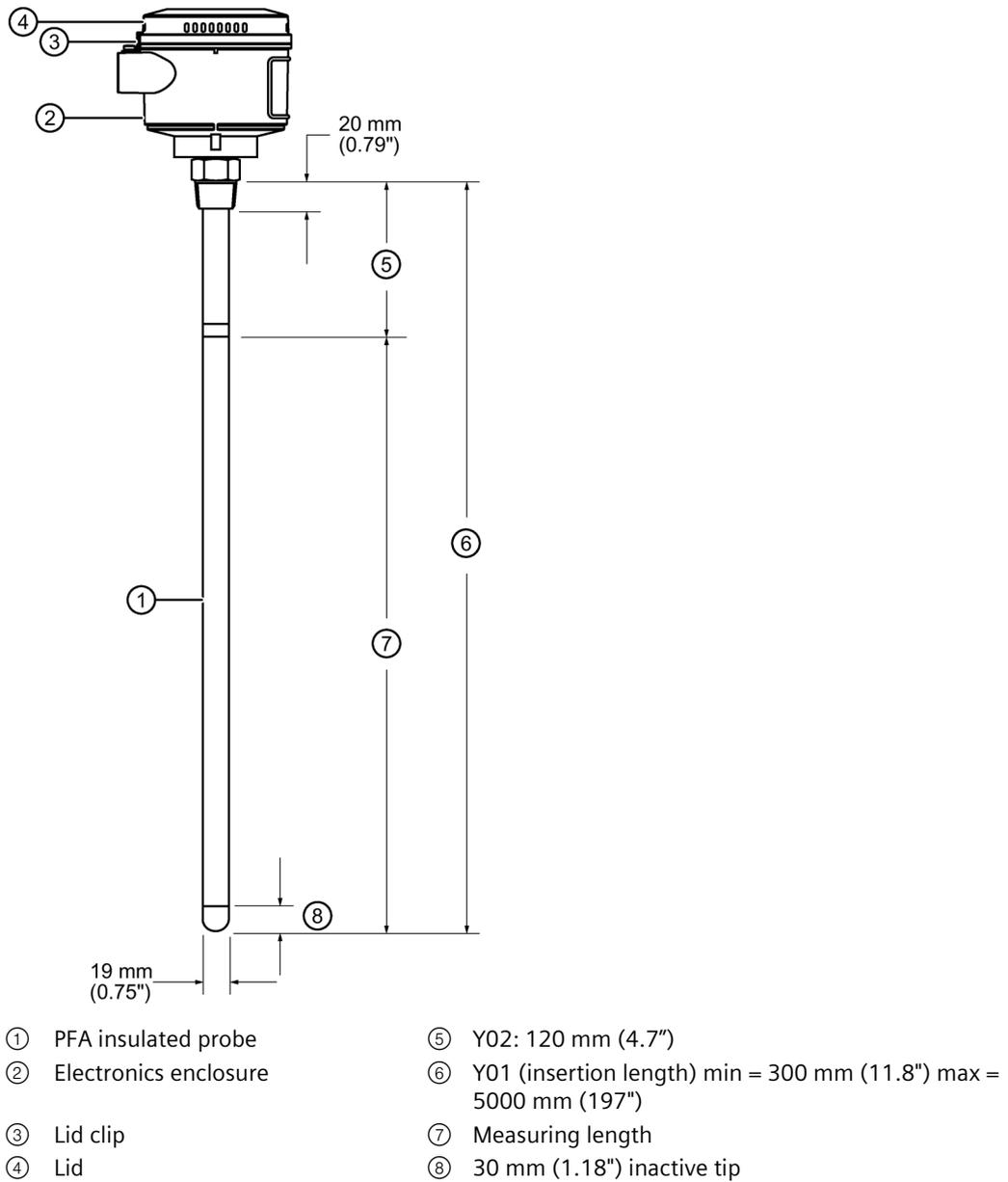
Dimensions



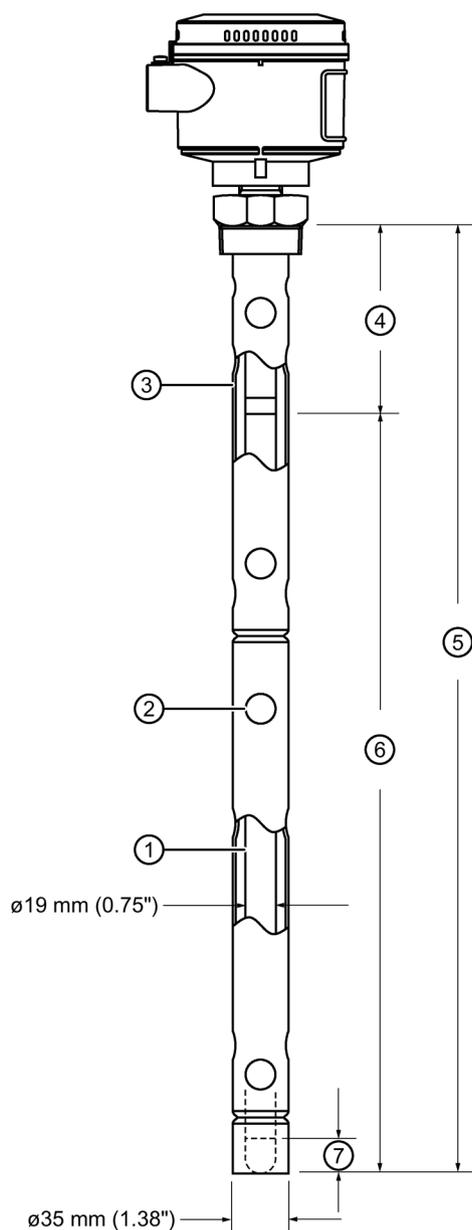
- ① Tensile weight
- ② Cable with PFA jacket 9 mm (0.35") without PFA jacket 6 mm (0.25")
- ③ PFA Insulation
- ④ Thermal Isolator (option)
- ⑤ Cable gland, 1/2" NPT (X2) OR 2 x M20 via adapters
- ⑥ Access lid to electronics and operation buttons
- ⑦ Electronics (power supply and signal processing)
- ⑧ Driver
- ⑨ Safety barrier (not applicable for General Purpose)
- ⑩ Aluminum enclosure (Type 4/ NEMA 4/IP 65, IP68 optional)
- ⑪ Rod with PFA insulation

	Threaded	Flanged
A	125 mm (4.9")	105 mm (4.1")
B	170 mm (6.7")	150 mm (5.9")
C	120 mm (4.7")	100 mm (3.9")

8.1 Threaded rod version with PFA probe



8.2 Threaded rod version with PFA probe and stilling well



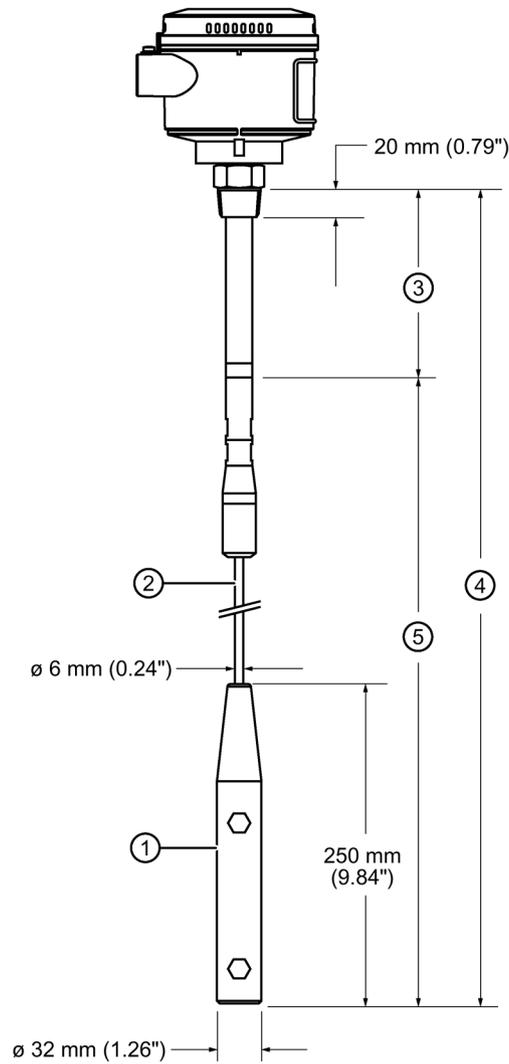
- ① PFA insulated probe
- ② Vent
- ③ Stainless steel stilling well
- ④ Y02: 120 mm (4.7")

- ⑤ Y01 (insertion length) min = 300 mm (11.8")
max = 5000 mm (197")
- ⑥ Measuring length
- ⑦ 30 mm (1.18") inactive tip

8.3 Cable version, non-insulated, threaded

Note

For non-conductive applications only. Non-insulated cable can be shortened on site. Weight is included in measuring length.



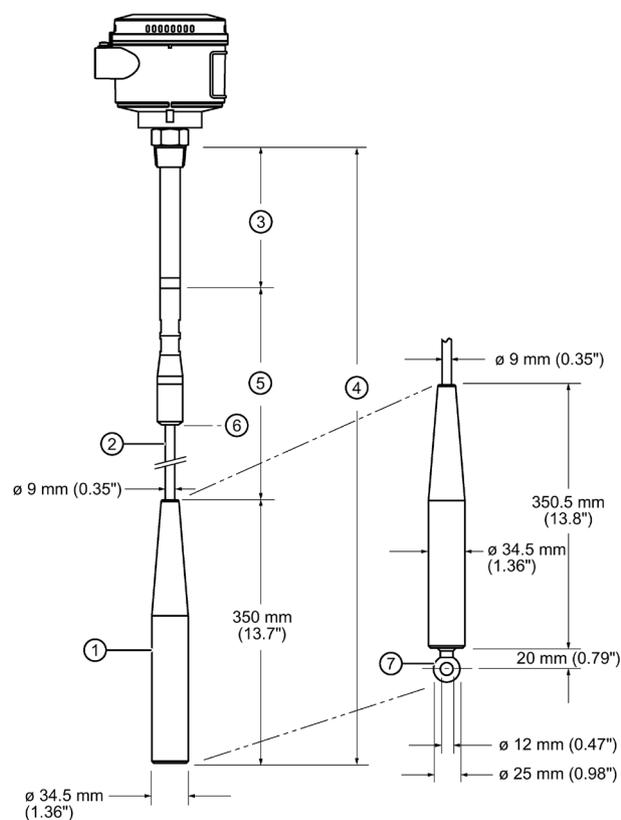
- ① Stainless steel weight
- ② Stainless steel cable
- ③ Y02 = 125 mm (4.9")

- ④ Y01 (insertion length) min. = 1000 mm (40")
max. = 25000 mm (984")
- ⑤ Measuring length

8.4 Cable version, insulated, threaded

Note

For liquids and solids applications. Insulated cable cannot be shortened. Weight is **not** included in measuring length.

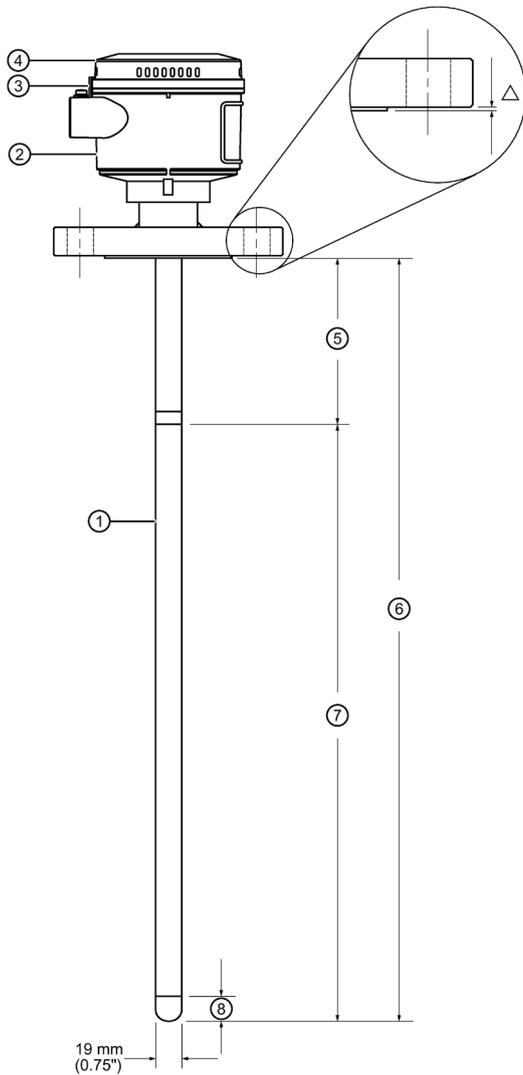


- | | |
|--|--------------------|
| ① Stainless steel weight (electrically isolated but not PFA insulated) | ⑤ Measuring length |
| ② PFA insulated cable | ⑥ See note |
| ③ Y02 = 125 mm (4.9") | ⑦ Mounting eye |
| ④ Y01 (insertion length) min. = 1000 mm (40") max. = 25000 mm (984") | |

Note

For conductive materials, the measuring length includes the exposed PFA insulated cable only. Any fluid contact with the upper rod assembly will result in a short circuit and incorrect readings.

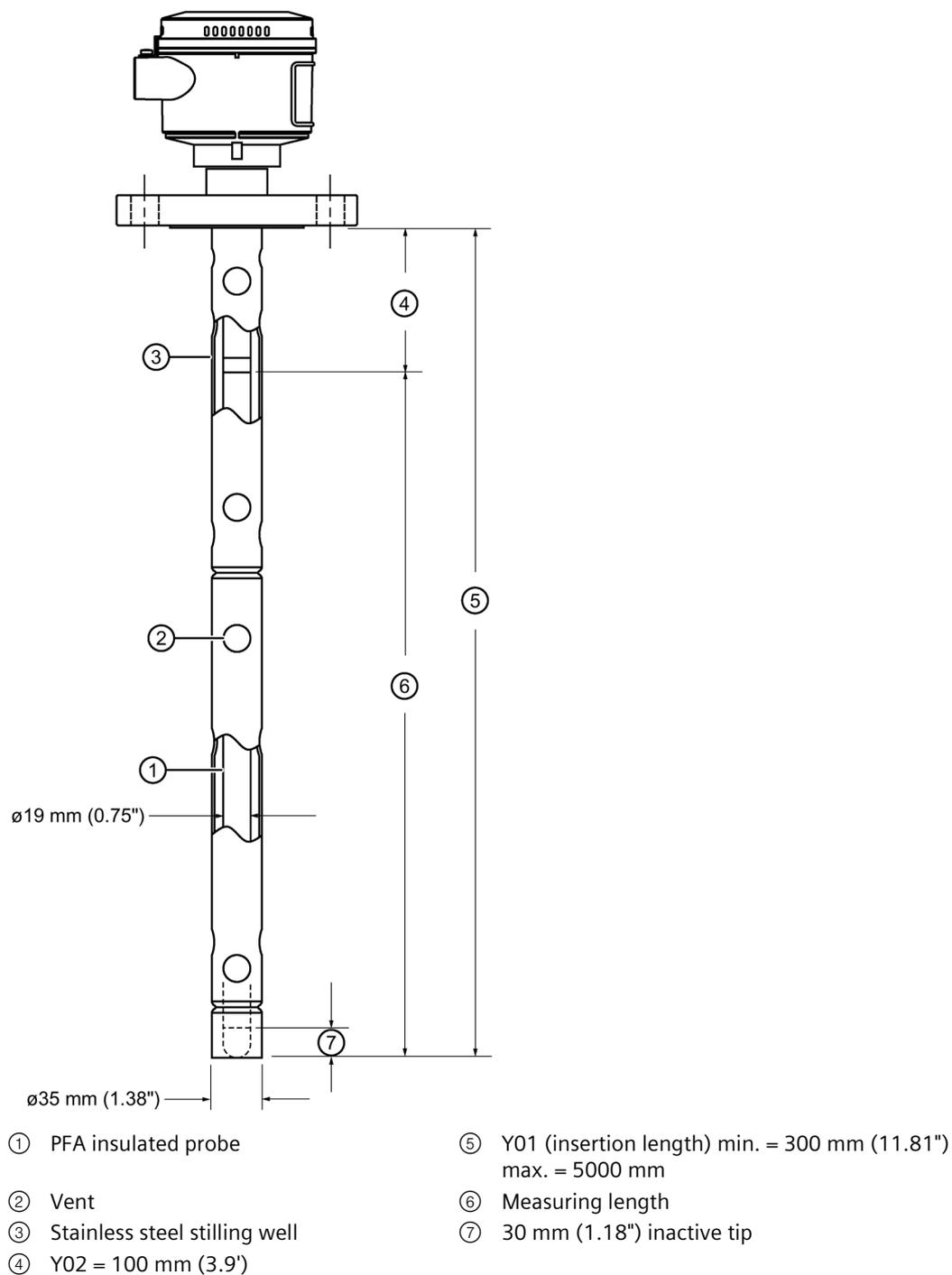
8.5 Welded flange



- ① PFA insulated probe
- ② Electronics enclosure
- ③ Lid clip
- ④ Lid
- ⑤ Y02 = 100 mm (3.9')
- ⑥ Y01 (insertion length) min. = 300 mm (11.81") max. = 5000 mm
- ⑦ Measuring length
- ⑧ 30 mm (1.18") inactive tip

Flange Facing	
Flange class	Flange thickness
Δ ASME 150/300	2 mm (0.08")
Δ ASME 600/900	7 mm (0.28")
Δ PN 16/40	2 mm (0.08")

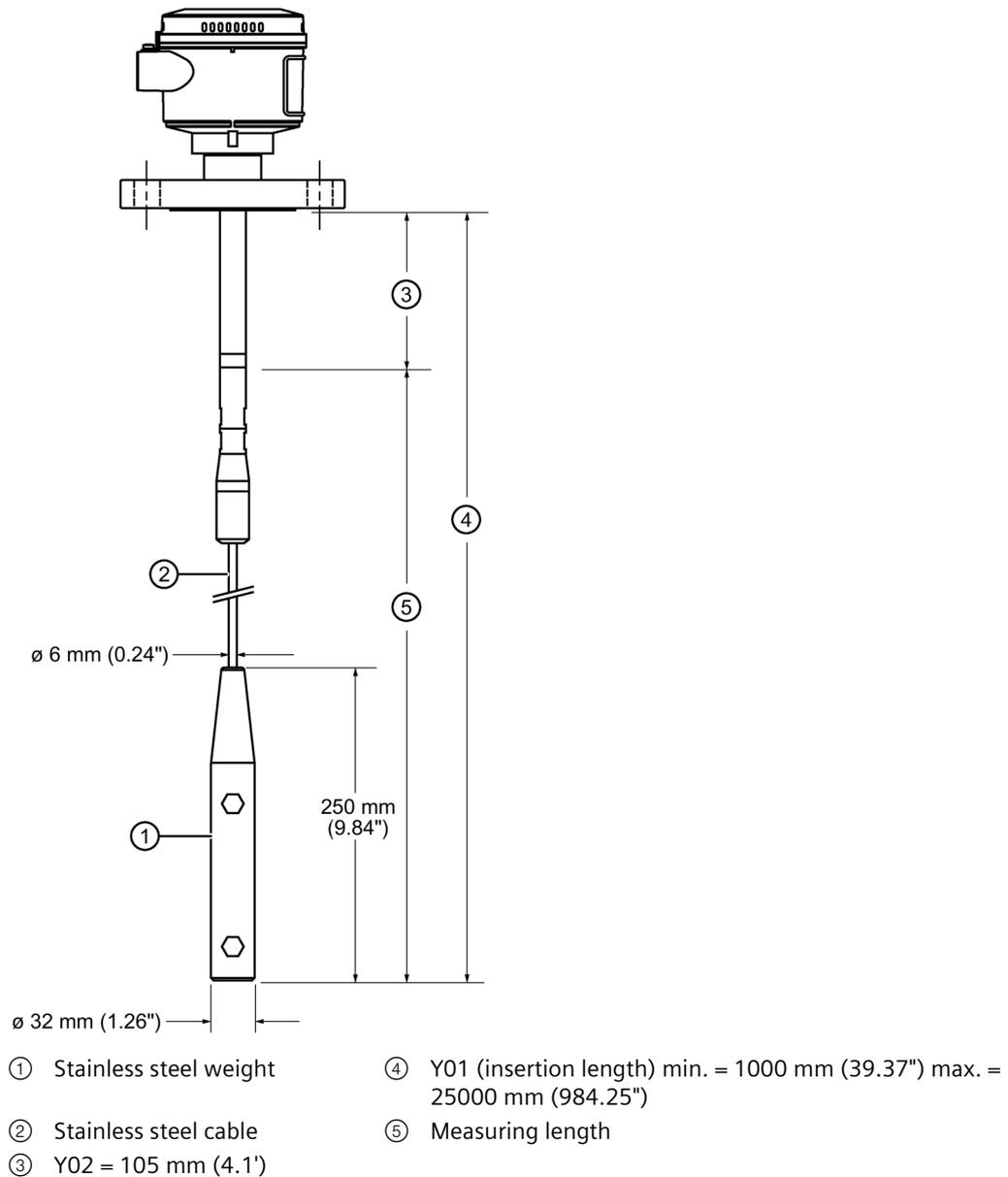
8.6 Welded flange, threaded, with stilling well



8.7 Cable version, non-insulated, welded flange

Note

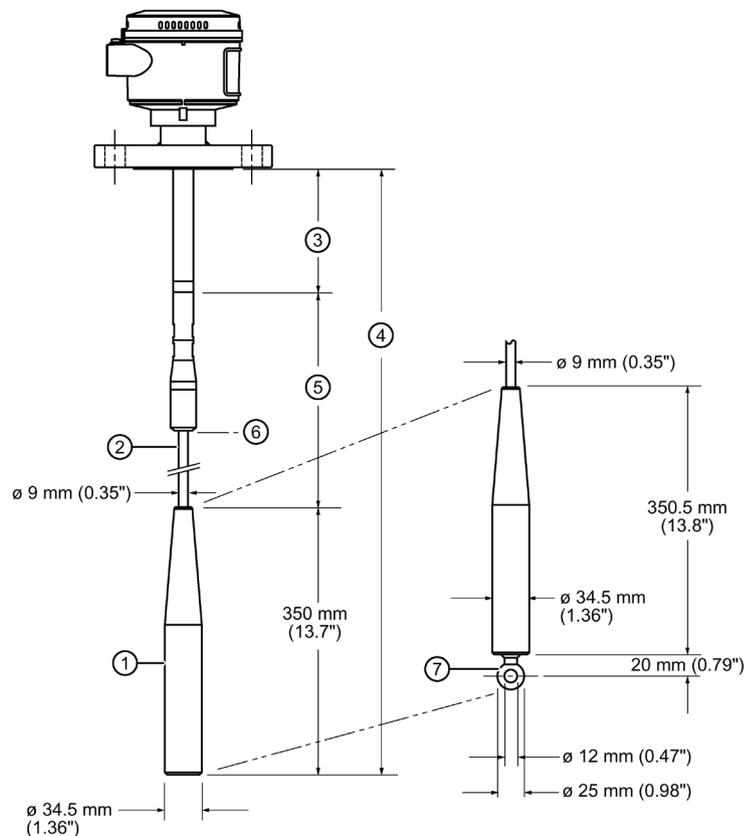
For non-conductive applications only. Non-insulated cable can be shortened on site. Weight is included in measuring length.



8.8 Cable version, insulated, welded flange

Note

For liquids and solids applications. Insulated cable cannot be shortened. Weight is **not** included in measuring length.



- | | |
|---|--------------------|
| ① Stainless steel weight (electrically isolated but not PFA insulated) | ⑤ Measuring length |
| ② PFA insulated cable | ⑥ See note |
| ③ Y02 = 105 mm (4.1') | ⑦ Mounting eye |
| ④ Y01 (insertion length) min. = 1000 mm (39.37")
max. = 25000 mm (984.25") | |

Note

For conductive materials, the measuring length includes the exposed PFA insulated cable only. Any fluid contact with the upper rod assembly will result in a short circuit and incorrect readings.

8.9 Cable tensile strength

 **CAUTION**

Do not exceed the tensile strength of the cable at 1900 kg/ 4188 lbs.

Always confirm that the load carrying capability of the silo/tank roof is sufficient to withstand the actual force on the cable conditions, especially where the force will be, or could be, as great as 1900 kg/4188 lbs. A cable probe with a PFA jacket reduces the amount of possible product build-up on the probe as well as the tensile force on the cable.

8.10 Shortening the cable

Methods

- An angle grinder (preferably with a disc suitable for stainless steel)
- or
- Wire cutters [suitable for piano cable \varnothing 6 to 9 mm (\varnothing 0.24 to 0.35")].

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.

Technical references

A.1 Technical References

⚠ WARNING

- Never attempt to loosen, remove or disassemble process connection or instrument housing while vessel contents under pressure.
- Installation shall be performed only by qualified personnel and in accordance with local governing regulations.
- This device is to be used only in the manner outlined in this manual. Otherwise, protection provided by the device may be impaired.
- Materials of construction are chosen based on their chemical compatibility (or inertness) for general purposes. For exposure to specific environments, check with chemical compatibility charts before installing.
- Improper installation may result in loss of process pressure.
- Handle the device using the enclosure, not the antenna or the device tag, to avoid damage.

Note

- Refer to the device nameplate for approval information.
- SITRANS LC300 units are pressure tested, meeting or exceeding the requirements of the ASME Boiler and Pressure Vessel Code and the European Pressure Equipment Directive and the UK Pressure Equipment (Safety) Regulations.
- The serial numbers stamped in each process connection body provides a unique identification number indicating date of manufacture.
- Example: MMDDYY - XXX (where MM = month, DD = day, YY = year, and XXX = sequential unit produced)
- Further markings (space permitting) indicate flange configuration, size, pressure class, material, and material heat code.
- This product is susceptible to electrostatic shock. Follow proper grounding procedures.

A.2 SITRANS LC300 Pressure versus temperature curves

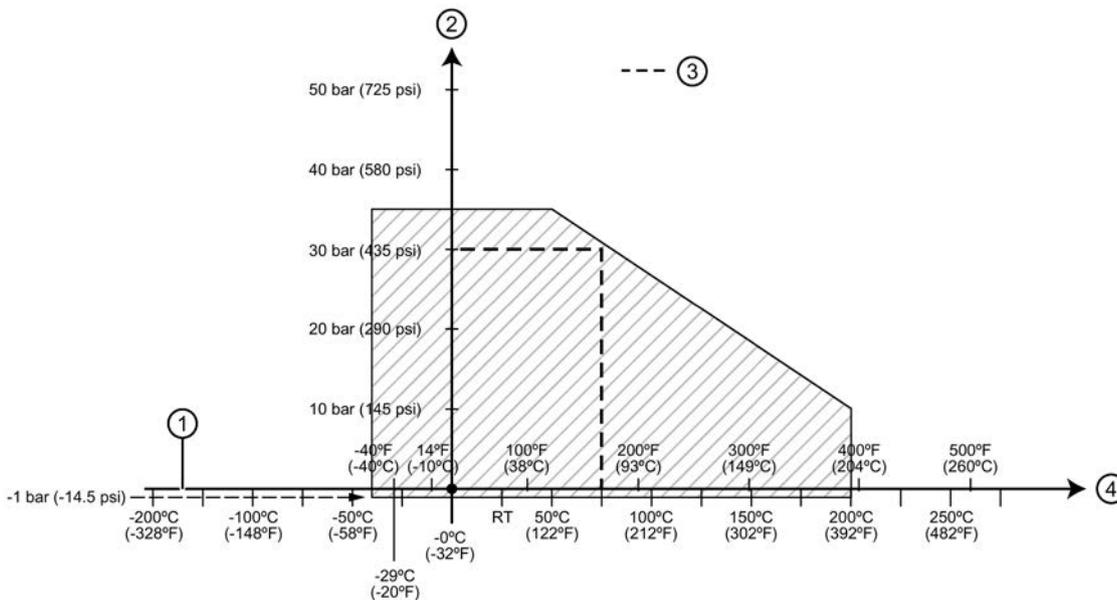
A.2.1 LC300 Standard, extended rod, and cable versions, threaded

⚠ WARNING

- For pressure applications, use PTFE tape or other appropriate thread sealing compound and tighten the process connection beyond hand-tight.
- The use of PTFE tape or other appropriate sealant may be used to aid in sealing the threads for use in pressure applications.

Note

- Before inserting the instrument into its mounting connection, check to ensure the threads are matching to avoid damaging them.
- Simply screw the instrument into the process connection and tighten.

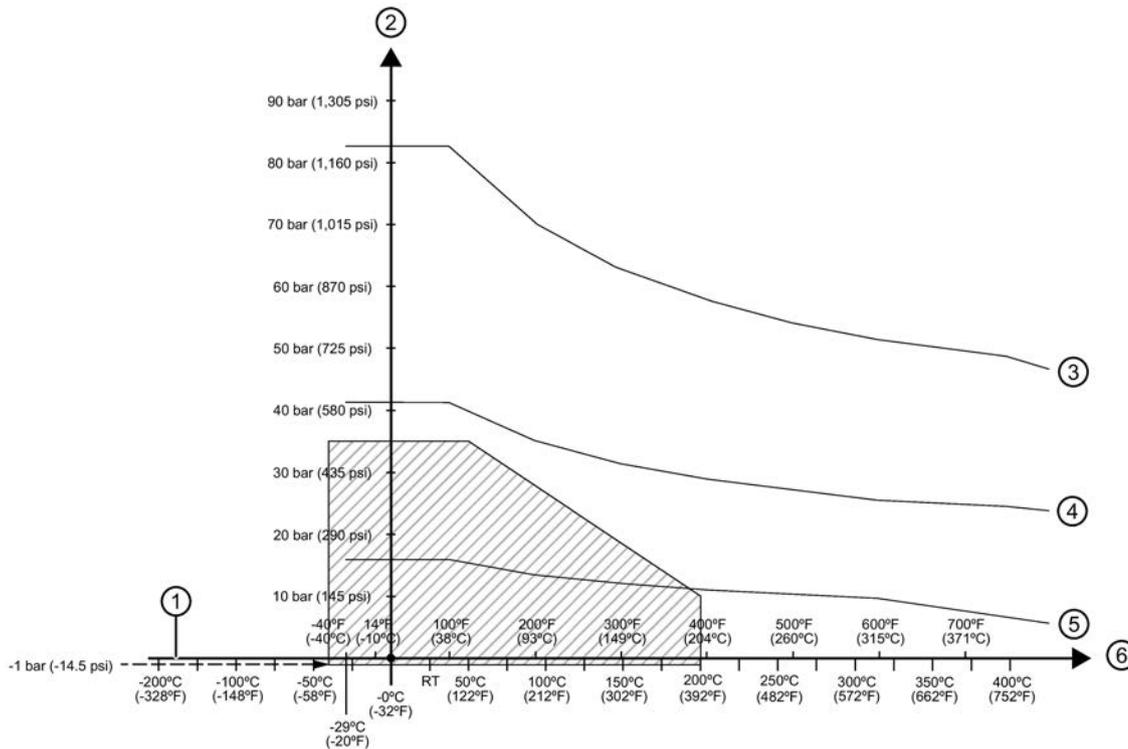


- ① Atmospheric
- ② P = Permitted Operating Pressure
- ③ Example: Permitted Operating Pressure = 30 bar (435 psi) at 75 °C
- ④ T = Permitted Operating Temperature

A.2.2 LC300 Standard, extended rod, and cable versions, ASME flanged

⚠ WARNING

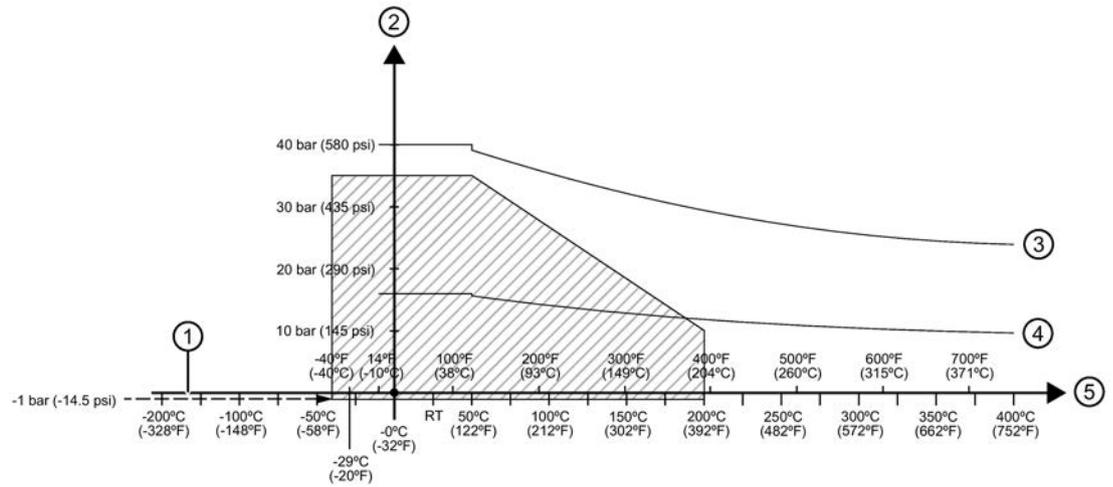
- The user is responsible for the selection of bolting and gasket materials which will fall within the limits of the flange and its intended use, and which are suitable for the service conditions.



- ① Atmospheric
- ② P = Permitted Operating Pressure
- ③ ASME 600 lb¹⁾
- ④ ASME 300 lb¹⁾
- ⑤ ASME 150 lb¹⁾
- ⑥ T = Permitted Operating Temperature

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

A.2.3 LC300 Standard, extended rod, and cable versions, EN flanged



- ① Atmospheric
- ② P = Permitted Operating Pressure
- ③ PN 40¹⁾
- ④ PN 16¹⁾
- ⑤ T = Permitted Operating Temperature

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

Product documentation and support

B.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.

B.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/serviceandsupport>).

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

Abbreviations and identifications

Short form	Long Form	Description	Units
CE / UKCA / FM / CSA	Conformité Européene / United Kingdom Conformity Assessment / Factory Mutual / Canadian Standards Association	safety approval	
DCS	Distributed Control System	control room apparatus	
Ex	Explosion Proof		
Exd	Flame Proof		
ESD	Electrostatic Discharge		
LRV	Lower Range Value	value for 0 % (in pF)	4 mA
PED	Pressure Equipment Directive	safety approval	
PESR	Pressure Equipment (Safety) Regulations	safety approval	
pF	pico Farads	10^{-12}	Farad
PV	Primary Variable	measured value	
Stilling Well	Grounded metal tube with openings		
URV	Upper Range Value	value for 100% (in pF)	20 mA

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