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LVS100/200

SIEMENS

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

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

Unit Repair and Excluded Liability:

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

Warning: Cardboard shipping package provides limited humidity and moisture protection. This product can only function properly and safely if it is correctly transported, stored, installed, set up, operated, and maintained.

This product is intended for use in industrial areas. Operation of this equipment in a residential area may cause interference to several frequency based communications.

Note: Always use product in accordance with specifications.

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Technical Publications
 Siemens Milltronics Process Instruments Inc.
 1954 Technology Drive, P.O. Box 4225
 Peterborough, Ontario, Canada, K9J 7B1
 Email: techpubs.smpi@siemens.com

European Authorized Representative

Siemens AG
 Industry Sector
 76181 Karlsruhe
 Deutschland

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Safety Notes

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



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







WARNING¹: 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.

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

Safety marking symbols

In Manual	On Product	Description
		(Label on product: yellow background.) Caution: refer to accompanying documents (manual) for details.
		Earth (ground) Terminal
		Protective Conductor Terminal

The Manual

Notes:

- Please follow the installation and operating procedures for a quick, trouble-free installation and to ensure the maximum accuracy and reliability of your SITRANS LVS100/200
- This manual applies to SITRANS LVS100 and SITRANS LVS200 only.
- Product details and instructions in this manual relate to both SITRANS LVS100 and SITRANS LVS200 unless otherwise stated.
- 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.

This manual will help you set up your SITRANS LVS100/200 for optimum performance. We always welcome suggestions and comments about manual content, design, and accessibility.

Please direct your comments to techpubs.smpi@siemens.com. For the complete library of Siemens Milltronics manuals, go to www.siemens.com/processautomation.

SITRANS LVS100 and LVS200

Introduction

Notes

- Installation, maintenance, and commissioning must be performed by qualified technical personnel.
- SITRANS LVS100/200 must be used only in the manner outlined in this instruction manual.

The SITRANS LVS100 and SITRANS LVS200 are available in a standard version, with the SITRANS LVS200 offering two additional versions.

SITRANS LVS100, SITRANS LVS200 - Standard Version

- SITRANS LVS100/200 standard version is a vibrating level switch that detects high or low levels of dry bulk solids in bins, silos, or hoppers. It has a compact design that allows it to be top or side mounted and the vibrating fork ensures that the tines are kept clean.
 - SITRANS LVS100 is an entry level solids fork with a bulk density limit starting at 60 g/l (3.8 lb/ft³). The LVS100 is available with rigid extension options to 4 000 mm (157").
 - SITRANS LVS200 provides several output options for indication of point level with products such as lime, styrofoam, flour, and plastic granules, starting at 20 g/l (1.2 lb/ft³). It handles a broader range of applications and is able to measure bulk densities of less than 5g/l. In addition, the LVS200 has a wider range of process configurations. SITRANS LVS200 standard length fork is available with variable cable extension lengths to a maximum of 20 000 mm (787") (cable extensions for top mount applications only). An optional longer fork is available for increased sensitivity.

SITRANS LVS200 - Liquid/Solid Interface Version

- The SITRANS LVS200, liquid/solid interface version, is a vibrating level switch that can also detect settled solids within liquids, or solids within confined spaces such as feed pipes. This version is designed to ignore liquids in order to detect the interface between a solid and a liquid. The design incorporates a short fork, and is also available with variable cable extension lengths to a maximum of 20 000 mm (787"), for top mount applications only.

SITRANS LVS200 - Pipe Extension Version

- The SITRANS LVS200, pipe extension version, is a vibrating level switch that incorporates a customer supplied pipe extension [maximum length 3800 mm (150")] with the standard or liquid/solid (short) LVS200 fork and electronics. This allows for separation of the electronics and tuning fork for applications requiring a rigid extension. Please see *SITRANS LVS200 Pipe Extended Version* on page 22 for information on assembly.

Product Features

- High resistance to mechanical forces
- Strong vibration resistance to high bulk material loads
- Rotatable enclosure
- LVS100: R 1½" (BSPT); 1¼" NPT (Taper) threaded connection
- LVS200: Stainless steel 1½" NPT or R 1½" (BSPT) threaded connection, or R 2" (BSPT) or NPT sliding sleeve. DN 100 and 2, 3, 4" ASME flange options available.
- Suitable for high or low density material

LVS100 standard version:	60 g/l (3.8 lb/ft ³) min.
LVS200 standard version:	20 g/l (1.2 lb/ft ³) min.
LVS200 standard version with low density fork:	5 g/l (0.3 lb/ft ³) min.
LVS200 liquid/solid interface version:	50 g/l (3.0 lb/ft ³) min.

Product Applications

- Dry lime, styrofoam, flour, plastic granules
- High or low density, dry bulk materials
- Interface detection of a solid within a liquid (filter beds)
- Flow or no flow detection in pipe using liquid/solid LVS200 version

Principle of Operation

A signal from the electronic circuit excites a crystal in the probe, causing the fork to vibrate. If the fork is covered by material, the change in vibration is detected by electronic circuitry which causes the relay to change state after a one second delay. When the material no longer reaches the tines, full vibration resumes and the relay reverts to its normal state.

! WARNINGS:

- **This product is designed as a Pressure Accessory per Directive 97 / 23 / EC and is not intended for use as a safety device.**
- **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.**

Specifications

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

Power

LVS100

- 19 to 230 V AC, +10 %, 50 to 60 Hz, 8 VA / 19 to 50 V DC, +10 %, 2 W

LVS200

- 19 to 230 V AC, +10 %, 50 to 60 Hz, 8 VA / 19 to 55 V DC, +10 %, 1.5 W
- 18 to 50 V DC 3-wire PNP
- 7 to 9 V DC (requires NAMUR switch amplifier) NAMUR IEC 60947-506, 2-wire
- 8/16 mA or 4 to 20 mA; 12.5 to 35 V DC, 2-wire

Performance

Measuring frequency

LVS100

- standard approx. 200 Hz

LVS200

- standard approx. 125 Hz
- liquid/solid interface version approx. 350 Hz
- enhanced sensitivity option approx. 90 Hz

Signal delay

- probe uncovered to covered approx. 1 second
- probe covered to uncovered approx. 1 to 2 seconds

Relay delay (DPDT version) (LVS200)

- adjustable up to 30 seconds

Sensitivity

- high or low, switch selectable

Minimum material density

LVS100

- standard version approx. 60 g/l (3.8 lb/ft³)

LVS200

- standard version approx. 20 g/l (1.2 lb/ft³)
- standard version with low density fork approx. 5 g/l (0.3 lb/ft³)
- liquid/solid interface version approx. 50 g/l (3 lb/ft³)

Maximum particle size

- LVS100 8 mm (0.32")
- LVS200 10 mm (0.39")

Alarm Output

LVS100

- version with 2 relays

DPDT relay
 relay fail-safe: high or low,
 switch selectable
 relay 8 A at 250 V AC,
 non-inductive / relay 5 A at 30 V DC,
 non-inductive

LVS200

- version with 1 relay
- version with 2 relays
- 3-wire PNP
- mA output (build-up detection)

SPDT relay
 relay fail-safe: high or low,
 switch selectable
 relay 8 A at 250 V AC,
 non-inductive / relay 5 A at 30 V DC,
 non-inductive

DPDT relay
 relay fail-safe: high or low,
 switch selectable
 relay 8 A at 250 V AC,
 non-inductive / relay 5 A at 30 V DC,
 non-inductive

open collector: permanent load
 maximum 0.4 A, short circuit and
 overload protected;
 turn-on voltage: max. 50 V (reverse
 protection)
 8/16 mA or 4 to 20 mA;
 resolution 4 to 20 mA, ± 0.1 mA

Mechanical

Process Connection

LVS100

- thread R 1½" (BSPT); 1¼" NPT (Taper)
ANSI B 1.20.1
- thread material stainless steel 316 Ti (1.4581) or 304 (1.4301) for specific configurations

LVS200

- thread 1½" NPT (Taper), R 1½" (BSPT)
- thread material stainless steel 304 (1.4301) or optional stainless steel 316 Ti (1.4571)
- flanges DN 100 PN6, DN 100 PN16, 2", 3", 4" ASME 150 lb flanges
- optional sliding bushing with R 2" (BSPT) or NPT (Taper) thread

Tines

- tine material stainless steel 316Ti (1.4571)
(PTFE¹ coated tines are available upon special request. Contact your local Siemens representative for ordering information.)

Enclosure

- construction epoxy-coated aluminum
- conduit entry 2 x M20x1.5, or 2 x ½" NPT
- ingress protection Type 4X/NEMA 4X/IP66

Weight

- standard version, no extensions 2.0 kg (4.4 lb)
- solids/liquids, no extensions 1.9 kg (4.2 lb)

Environmental

- location indoor/outdoor
- altitude max. 2000 m (6562 ft)
- ambient temperature –40 to +60 °C (–40 to +140 °F)
- relative humidity 0 to 100% (suitable for outdoor: ingress protection: Type 4X/NEMA 4X/IP66)
- installation category III
- pollution degree 2

¹ Polytetrafluoroethylene

Process

Temperature

- All approvals except CSA Class II, Group G: –40 to +150 °C (–40 to +302 °F)
- CSA Class II, Group G: –40 to +140 °C (–40 to +284 °F), CSA temperature code T3B
- For applications with process temperature greater than +80 °C (+176 °F), the maximum threaded bushing surface temperature must not exceed +80 °C (+176 °F)
- Maximum enclosure surface temperature (Category 2D): +90 °C (+194 °F) (ATEX relevant)
- Maximum extension surface temperature (Category 1D): +150 °C (+302 °F) (ATEX relevant)

Pressure

- max 10 bar, gauge (145 psi, gauge)

Note: Pressure information for hazardous areas

The device construction allows over-pressure up to 10 bar. This pressure is allowed for test purposes. The ATEX approval applies to over-pressure between –0.2 and 0.1 bar in hazardous areas. For higher or lower pressures, the approval is not valid.

Approvals

LVS100

- CE
- ATEX II 1/2D
- CSA/FM Class II, III, Div. 1, Groups E, F, G
- C-TICK

LVS200

- CSA/FM General Purpose
- CE
- CSA/FM Dust Ignition Proof
- ATEX II 1/2D
- CSA/FM IS Class I, II, III, Div. 1, Groups A to G, FM Class I, Aex ia IIC, CSA Class 1, Ex ia IIC, available only with 7 to 9 V DC power supply with NAMUR switch amplifier
- ATEX II 1G and 1/2G Eex ia IIC; ATEX II 1D and 1/2D, available only with 7 to 9 V DC power supply with NAMUR switch amplifier
- C-TICK

Installation

Mounting

Notes:

- Installation shall be performed by qualified personnel and in accordance with local governing regulations.
- Do not bend, shorten or extend the tines.
- Position the tines using a 50 mm open-end wrench when installing the process connection (do not turn the housing). When side mounting SITRANS LVS100/200, position the tines vertically, with the tine orientation marking facing up or down.
- In pressure applications, use PTFE tape or other appropriate sealant to seal tapered threaded connections.
- After mounting, ensure the cable entries point downward to prevent water entering the housing.
- For the SITRANS LVS100/200 extended model, the torque due to material loading at the mounting point may not exceed 250 Nm.
- Mounting torque for the 1½" thread connection may not exceed 80 Nm.



WARNINGS:

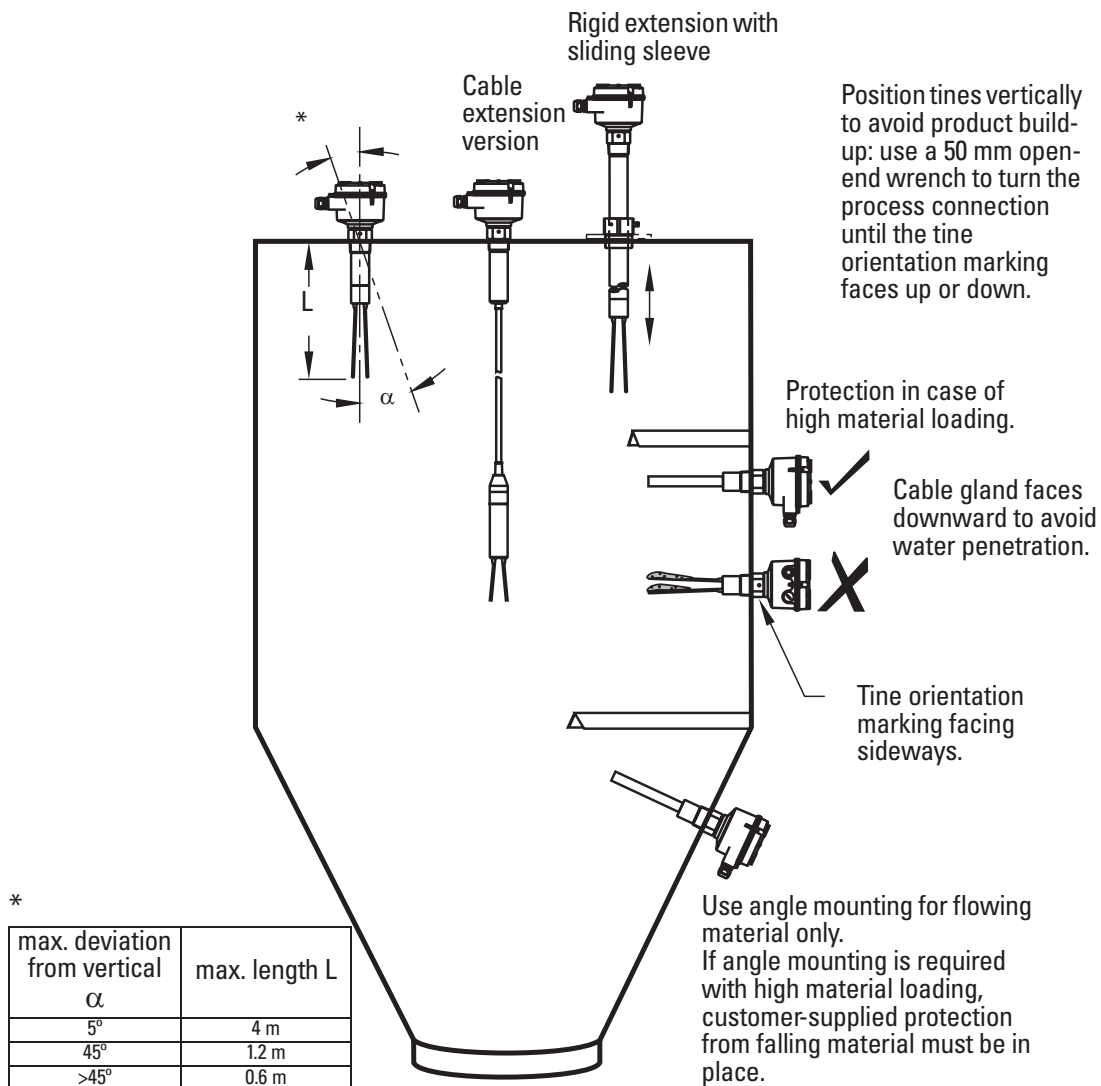
LVS100 and LVS200:

- **This product is designated as a Pressure Accessory per Directive 97 / 23 / EC and is not intended for use as a safety device.**
- **Improper installation may result in loss of process pressure.**
- **To install devices in hazardous locations, observe all valid installation regulations.**
- **For ATEX installations, observe the requirements of EN 50281-1-2 regarding dust deposits and temperatures. Before opening the device lid, ensure there are no deposits present.**
- **Do not remove lid while circuits are live.**
- **Install the SITRANS LVS100/200 so mechanical friction or impact does not cause sparks between the aluminium enclosure and steel vessel.**

LVS200:

- **Installation in Zone 0 (electronics: NAMUR): The intrinsic safe supply circuit must have galvanic isolation to a non- intrinsically safe area. Otherwise, provide protection for the device against lightning strikes (see EN 60079-14).**
- **Power supply (electronics: NAMUR): Intrinsically safe protection is only valid when connected to a certified intrinsically safe power supply.**
- **For the LVS Pipe extended and cable extended models with Namur electronics for gas hazardous approvals: When mounting the units on a vessel lid that separates Zone 0 (Cat. 1G) from Zone 1 (Cat 2G), the units have no safe separation between Zone 0 and Zone 1. Gas can pass from Zone 0 through the unit to Zone 1.**

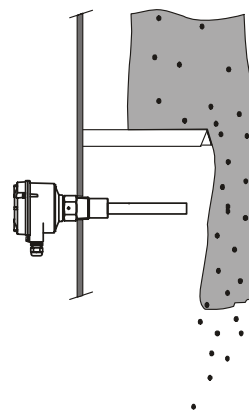
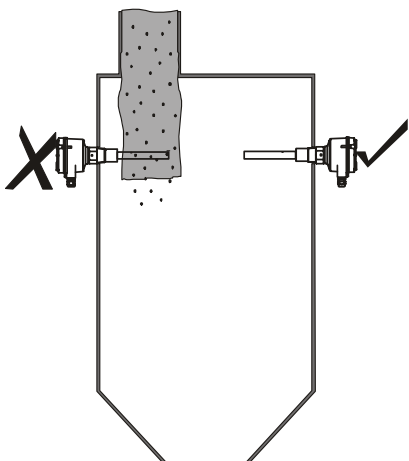
SITRANS LVS100/200 is normally mounted into the vessel top for full detection, or through the tank wall at the detection level, for full, demand, or empty detection.



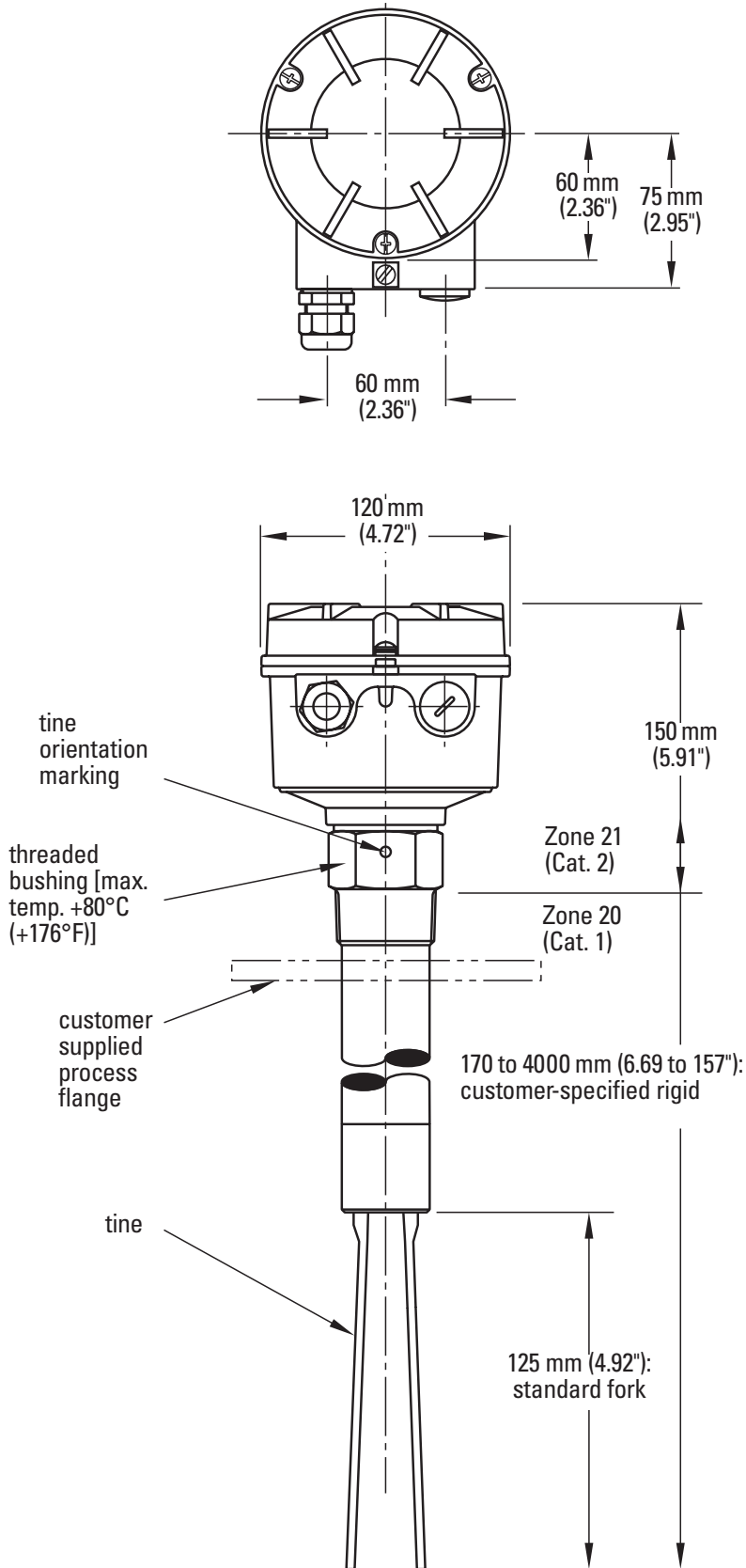
Process Cautions

Caution:

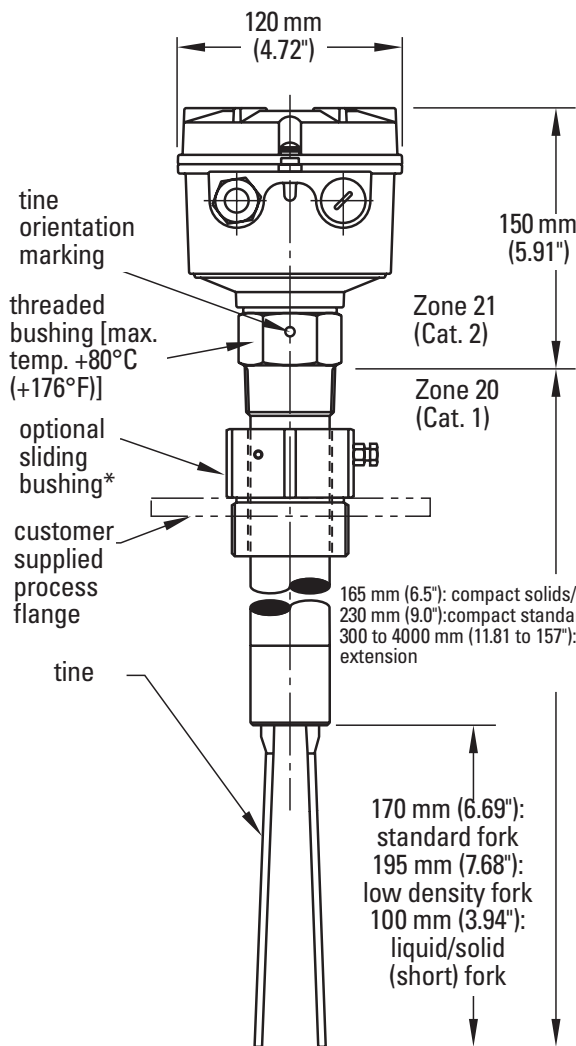
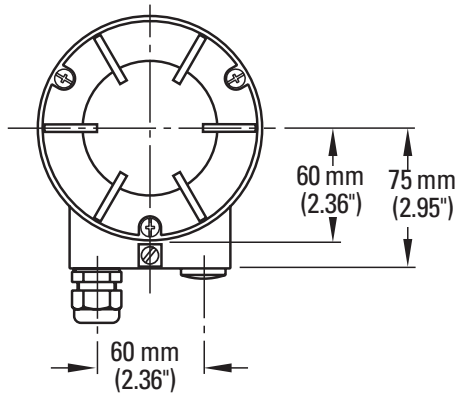
- Locate SITRANS LVS100/200 out of path of falling material
- OR
- Protect shaft and tines from falling material



Dimensions - SITRANS LVS100



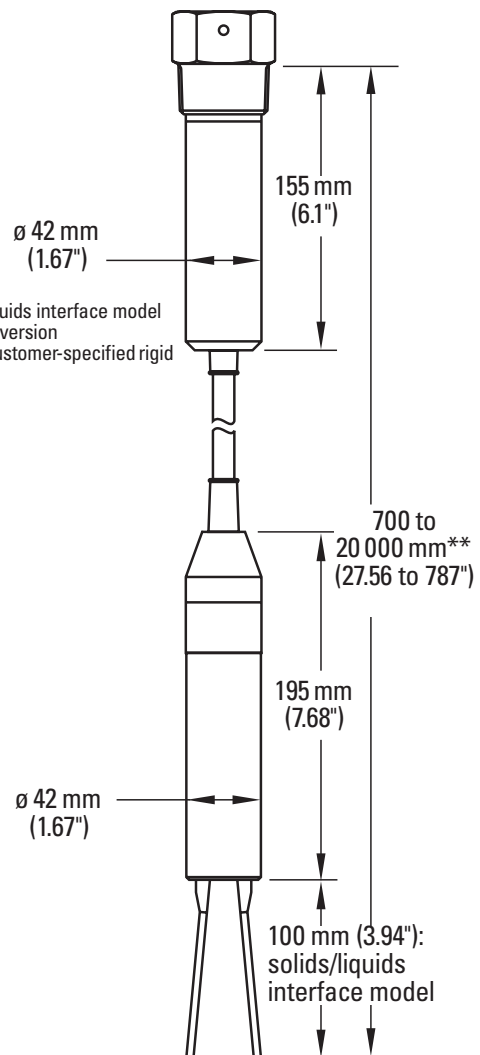
Dimensions - SITRANS LVS200



*Note: The clamping screws of the sliding bushing must be tightened to 10 Nm.

** Cable version with Liquids/solids interface model option length to 7000 mm (275.59")
Cable version with NAMUR electronics length to 10 000 mm (393.7")

Cable version



Wiring



! WARNINGS:

- **Open SITRANS LVS100/200 only when supply voltage is switched off.**
- **All field wiring must have insulation suitable for at least 250 V AC.**
- **A disconnect switch must be in close proximity to the equipment and within easy reach of the operator.**
- **Use appropriate conduit or cable glands in hazardous locations. Unused cable conduit fittings must be locked with a closing element or plug.**
- **Observe all pertinent rules and regulations in the country of installation.**

Notes:

European requirements

- When mounting SITRANS LVS100/200 in hazardous areas, make sure the customer supplied cable glands and/or plugs are certified ATEX 100a flameproof. The certified temperature range must be at least -40 to +70 °C (-40 to +158 °F). The minimum ingress protection requirement of IP6x according to European Standard EN 60529 must be satisfied. Observe special conditions for safe use of the cable gland described in the gland's approval documentation.
- The requirements of European Standard EN 50281-1-2 regarding dust deposits and temperature must be followed.

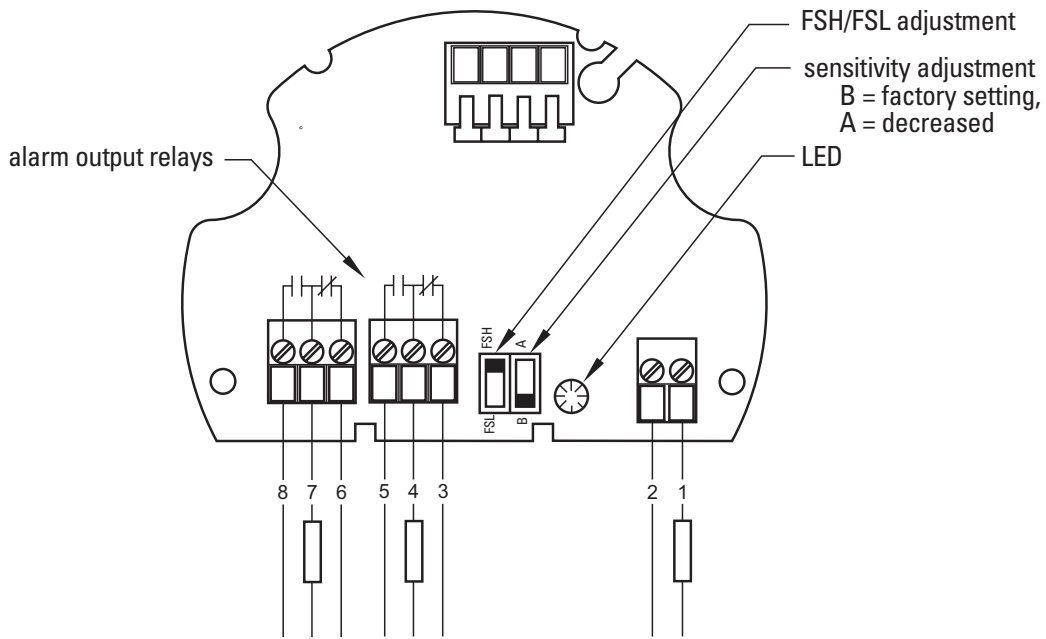
Connection recommendations

- Use a fuse for the signal output (max. 10 A).
- Provide protection for relay contacts to protect the device against spikes if inductive loads are connected.

Precautions

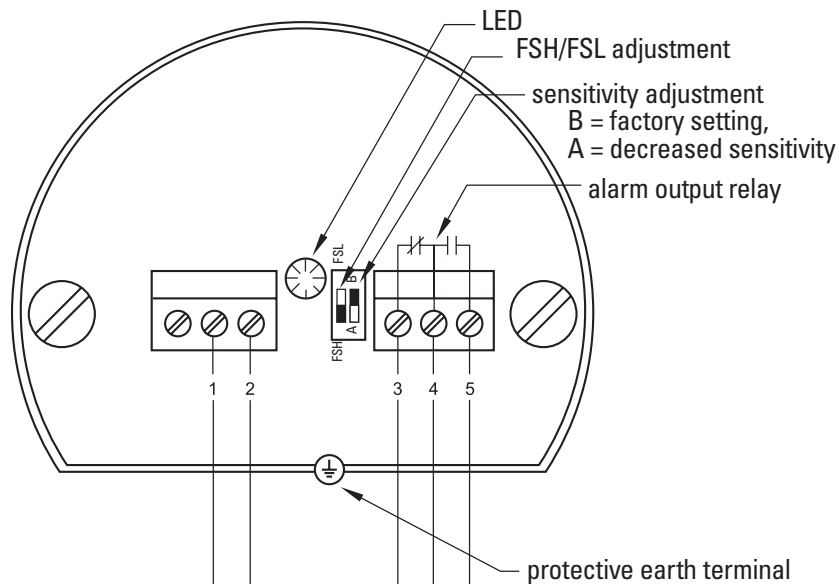
- Before opening the lid, ensure there are no dust deposits around SITRANS LVS100/200, and that the atmosphere around the instrument is settled.
- Make sure the main voltage does not exceed the maximum voltage listed on the product label.
- Ensure that no more than 8 mm of each wire is stripped (to avoid danger of contact with live parts).
- Ensure the boots for protecting cable terminations are no longer than 8 mm (to avoid danger of contact with live parts).

Universal voltage (DPDT relay) (LVS100)



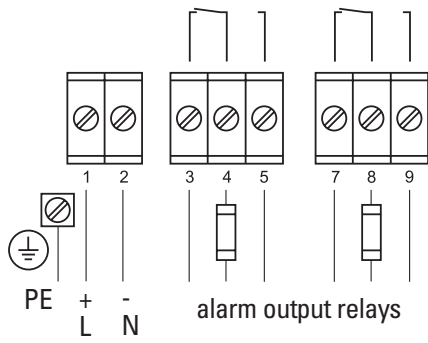
- AC: terminal 1: L
 terminal 2: N
 19 to 230 V AC, + 10 %, 50 to 60 Hz, 8 VA
- DC: terminal 1: +
 terminal 2: -
 19 to 50 V DC, + 10 %, 2 W

Universal voltage (SPDT relay) (LVS200)



- AC: terminal 1: L
 terminal 2: N
 19 to 230 V AC, + 10 %, 50 to 60 Hz, 8 VA
- DC: terminal 1: +
 terminal 2: -
 19 to 55 V DC, + 10 %, 1.5 W

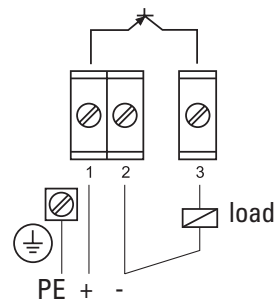
Universal voltage (DPDT relay) (LVS200)



AC: terminal 1: L
terminal 2: N
19 to 230 V AC, + 10 %, 50 to 60 Hz, 18 VA

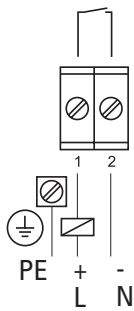
DC: terminal 1: +
terminal 2: -
19 to 55 V DC, + 10 %, 2 W

3-wire PNP (LVS200)



DC: terminal 1: +
terminal 2: -
18 to 50 V DC, + 10 %, 1.5 W

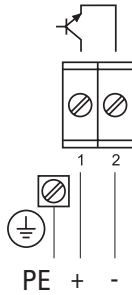
2-wire (LVS200)



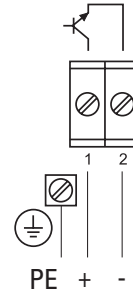
AC: terminal 1: L
terminal 2: N
19 to 230 V AC, + 10 %, 50 to 60 Hz, 1.5 VA

DC: terminal 1: +
terminal 2: -
19 to 230 V DC, + 10 %, 1 W

NAMUR IEC 60947-5-6 8/16 mA or 4 to 20 mA (LVS200)



ca. 7 to 9 V DC,
intrinsically safe
(IEC 60947-5-6)



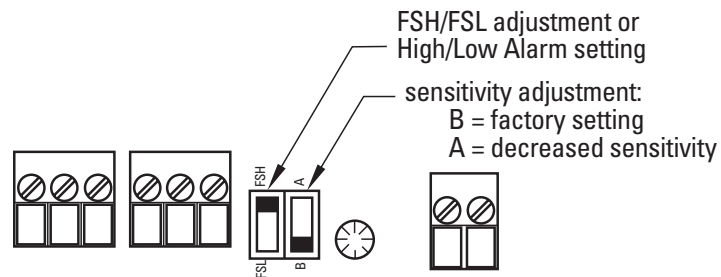
DC: terminal 1: +
terminal 2: -
12.5 to 36 V DC, + 0 %

Sensitivity

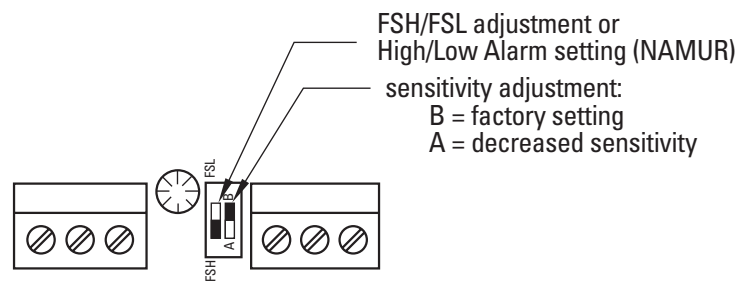
If the measured material tends to cake or build up, the sensitivity adjustment switch can be set to position A to decrease the sensitivity of the probe (factory setting is position B).

The sensitivity for interface applications should be set to position B, while the setting for high-flow applications should be position A.

LVS100



LVS200

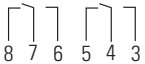



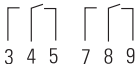
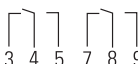














Switching Logic

Probe uncovered

Model	Signal Output	
	Failsafe low	Failsafe high
LVS100		
DPDT relay		
LVS200		
SPDT relay		
LVS200		
DPDT relay		
3-wire PNP		
2-wire		
8/16 mA	I = 16 mA	I = 8 mA
Signal Output LED		
	Low alarm setting	High alarm setting
NAMUR IEC 60947-5-6	I < 1 mA	I > 2.2 mA
Signal Output LED		

Probe covered

Model	Signal Output Failsafe low	Failsafe high
LVS100		
DPDT relay		
LVS200		
SPDT relay		
LVS200		
DPDT relay		
3-wire PNP		
2-wire		
8/16 mA	I = 8 mA	I = 16 mA
Signal Output LED		
	 Low alarm setting	 High alarm setting
NAMUR IEC 60947-5-6	 I > 2.2 mA	 I < 1 mA
Signal Output LED		

Signal output and test options (LVS200)

Note: The signal output and test options listed below apply **only** to specific power supply options.

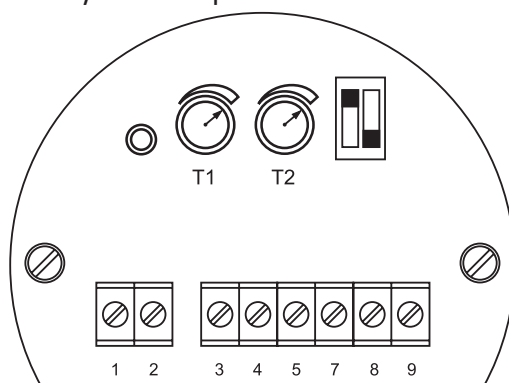
Signal Output Delay

Universal voltage (DPDT) model

The signal output can be delayed and is adjustable from 0 to 30 seconds. Turn the potentiometer clockwise to increase the delay time.

Potentiometer T1: Delay when output switches from fork covered to uncovered.

Potentiometer T2: Delay when output switches from fork uncovered to covered.



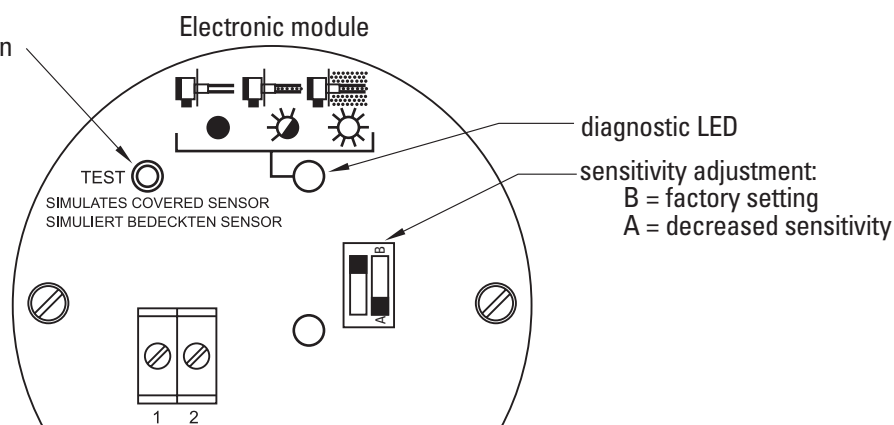
Test function

NAMUR model (IEC 60947-5-6) and 8/16 mA or 4 to 20 mA model

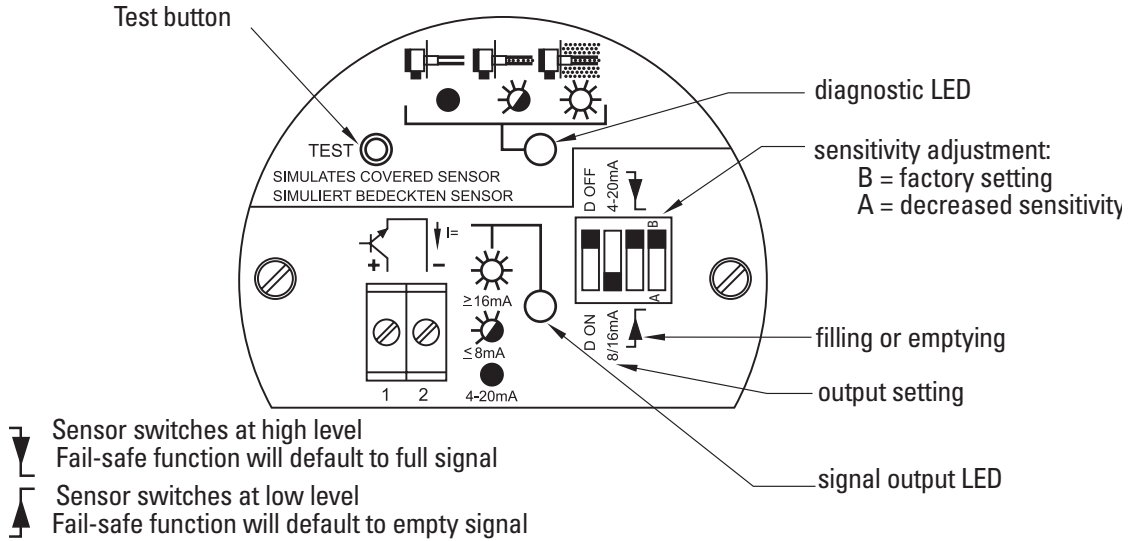
If the fork is uncovered, pressing this button will stop the vibration and the signal output will switch to indicate a **covered fork**. You can test the vibration and the electronics without removing the LVS200 from the vessel. If the fork is covered, pressing the button has no effect.

NAMUR model

Test button



8/16 or 4 to 20 mA model



Vibration amplitude diagnosis

NAMUR module (IEC 60947-5-6) and 8/16 mA or 4 to 20 mA model

Measurement quality is related to the vibration amplitude of the fork. The diagnostic LED indicates the quality of the vibration being sent to the LVS200 electronics.

- Diagnostic LED off: measurement quality is good. The vibration amplitude is strong.
- Diagnostic LED blinking: measurement quality is poor and vibration amplitude is decreasing as fork becomes encrusted. When this happens, set the sensitivity switch to decreased sensitivity.
- Diagnostic LED on: vibration has stopped and fork is fully encrusted with material.

Current output setting

8/16 mA

The chart below illustrates the output current when:

- Fork is clean
- Fork is encrusted: weak vibration amplitude is shown
- Fork is fully encrusted and vibration has stopped.

Diagnosis Setting	D Off	I = 16 mA	I = 8 mA	I = 16 mA	I = 8 mA	I = 16 mA
	D On			I = 20 mA	I = 6 mA	
Signal output LED						
Diagnosis LED						

The output current can indicate weak vibration amplitude with the diagnosis setting **D ON**. If the diagnosis is set to **D OFF**, the output will be either 8 mA or 16 mA depending on high or low level settings.

If the diagnosis is set to **D ON**, the output will change from 16 to 20 mA and from 8 to 6 mA if the vibration is weak. This output can be passed to an external 4 to 20 mA output. There is an internal delay of 10 seconds before the change happens, so that the external output does not indicate a weak vibration when the vibration is stopped and started during normal measurement operation.

Buildup Detection (8/16 mA or 4 to 20 mA version)

With the 4 to 20 mA setting, you can recognize material buildup on the fork using a PLC or data logger.

In this mode, the Diagnostic setting has no influence. The LED showing signal output is off.

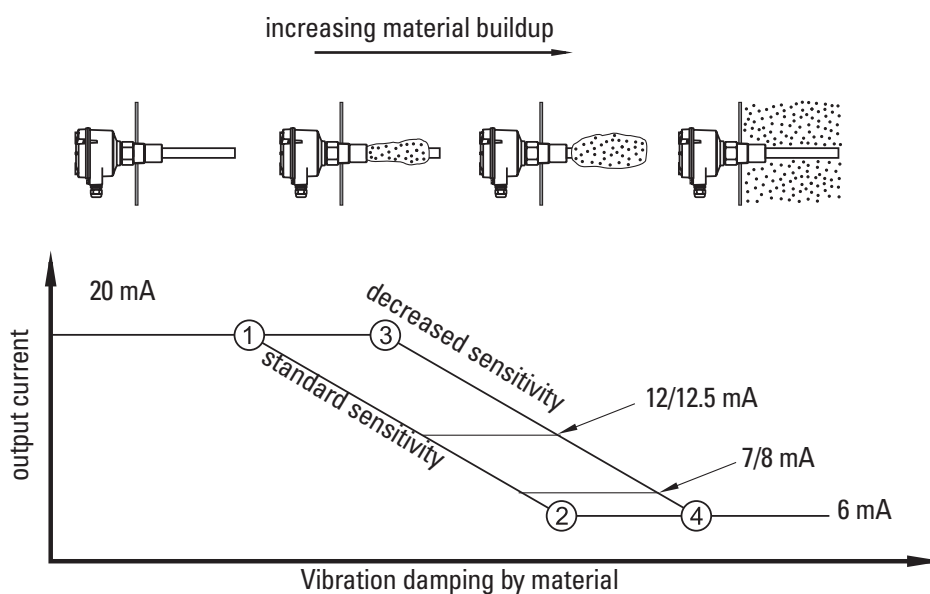
20 mA: The fork is clean.

<20 mA and >12/12.5 mA: The vibration amplitude is decreased by the material buildup.

<12/12.5 mA and >7/8 mA: This range indicates a weak vibration. The internal LED showing diagnosis begins blinking to indicate a weak signal. If you are using a PLC to evaluate the echo, delay the response time to this indicator for approximately 10 seconds. A hysteresis of 0.5 mA (between 12 and 12.5 mA) is recommended.

7/8 mA: This point indicates that the fork is mostly encrusted.

6 mA: This point indicates that the fork is fully encrusted.



With standard sensitivity setting With decreased sensitivity setting

① Amplitude is 100%

③ Amplitude is 100%

② Amplitude is 0%

④ Amplitude is 0%

Maintenance

SITRANS LVS100/200 require no maintenance or cleaning under normal operating conditions. Under severe operating conditions, the tines may require periodic cleaning. Brush off any accumulated deposits, taking care not to bend the tines.

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:

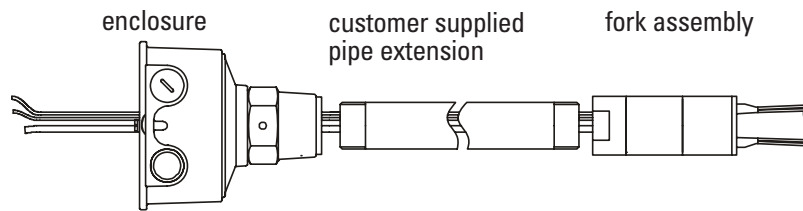
- The user is responsible for all changes and repairs made to the device.
- All new components must be provided by Siemens Milltronics Process Instruments Inc.
- Restrict repair to faulty components only.
- Do not re-use faulty components.

SITRANS LVS200 Pipe Extended Version

Assembly

Suggested tools:

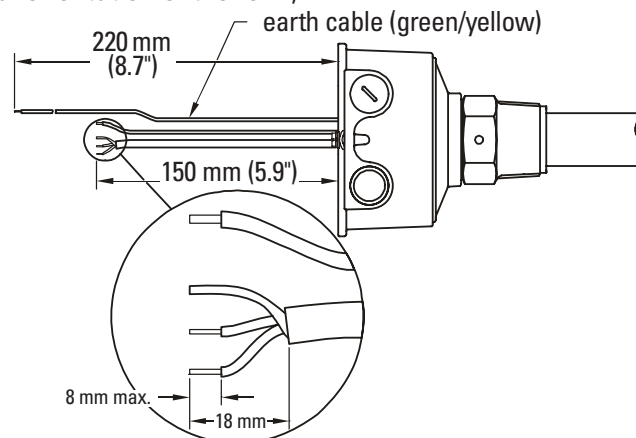
- medium Phillips or 6 to 8 mm (¼") flat screwdriver
- 3 mm (1/8") flat screwdriver
- wire cutters
- wire strippers
- terminal crimper
- 36 mm open end wrench
- pipe wrench



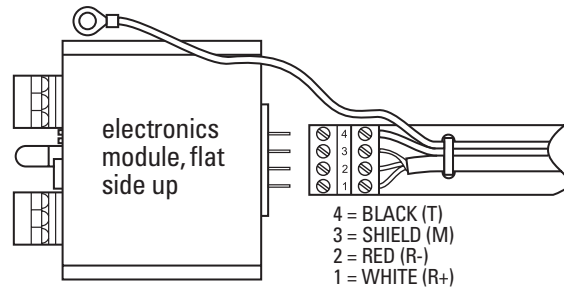
1. Open the enclosure lid; remove electronics module.
2. Lead the sensor cable through the customer supplied 1" tube and enclosure.
3. Assemble the fork assembly, the pipe extension, and the enclosure using the 36 mm open end wrench. Seal the pipe threads with an appropriate sealant.

Note: Do not turn fork assembly. Do not bend the fork during assembly.

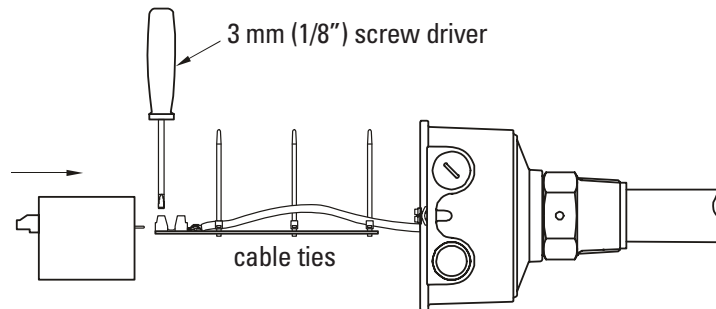
4. Line up the fork and the tine orientation marking as shown in dimension drawing on page 12. (The tine orientation marking on the process connection is to identify the vertical orientation of the fork.)



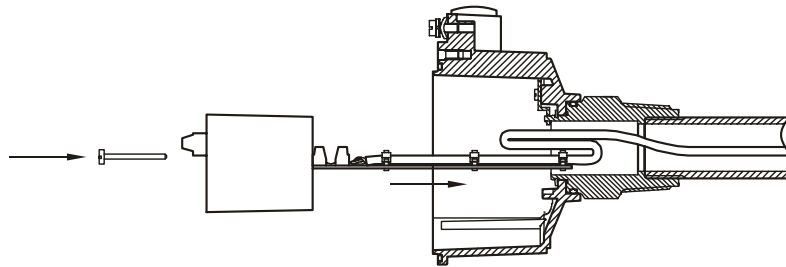
5. Shorten sensor cable to a free length of 150 mm (5.9").
6. Shorten earth cable to a free length of 220 mm (8.7").
7. Prepare sensor cable as shown above, stripping a maximum of 8 mm from each wire.



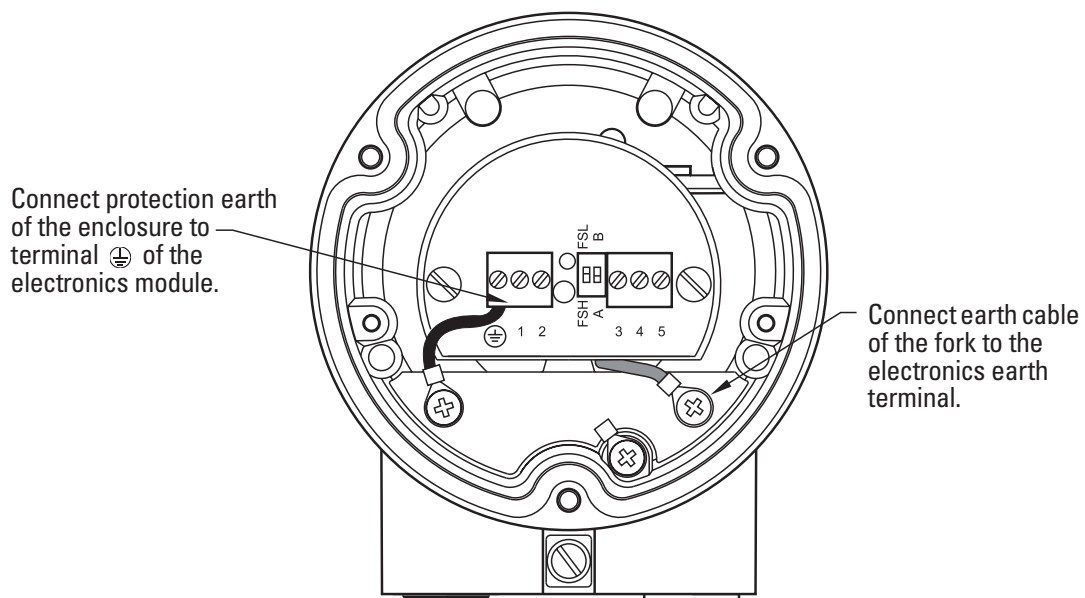
8. Connect the sensor cable to the terminal connection board shown above.
9. Secure the sensor cable with cable ties.
10. Crimp the ring terminal 4 mm (0.19") to sensor earth cable.



11. Connect electronics module and terminal connection board. Be sure that all terminals are tight.



12. Insert the electronics module into the housing. The terminal connection board is used to guide the cable into the extension tube.
13. Fold cable as shown in diagram above.
14. Secure the electronics module as shown in diagram below.



Assembly Overview Drawing

