STÜBBE

Leakage/Overfilling sensor

Original operating manual

Series
CGS Level limit switch
CLS Leakage probe

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Subject to technical modifications.

Read carefully before use.
Save for future use.

CE

Table of contents

List of figures

List of tables

1 About this document

This manual

- is part of the equipment
- applies to all series referred to
- describes safe and proper operation during all operating phases

1.1 Target groups

Operating company

- Responsibilities:
  - Always keep this manual accessible where the device is used on the system.
  - Ensure that employees read and observe this document, particularly the safety instructions and warnings, and the documents which also apply.
  - Observe any additional country-specific rules and regulations that relate to the system.

Qualified personnel, fitter

- Mechanics qualification:
  - Qualified employees with additional training for fitting the respective pipework
- Electrical qualification:
  - Qualified electrician
- Transport qualification:
  - Qualified transport specialist
- Responsibility:
  - Read, observe and follow this manual and the other applicable documents, especially all safety instructions and warnings.

1.2 Other applicable documents

To download: **Resistance lists** Resistance of materials used to chemicals www.asv-stuebbe.de/pdf_resistance/300051.pdf
To download: **Data sheet CGS** Technical data and conditions of operation www.asv-stuebbe.de/pdf_datasheets/301166.pdf
To download: **Data sheet CLS** Technical data and conditions of operation www.asv-stuebbe.de/pdf_datasheets/301172.pdf
To download: **CE declaration of conformity** Conformity with standards www.asv-stuebbe.de/pdf_DOC/301190.pdf
To download: **DIBt approval, CGS**[1] Type approval www.asv-stuebbe.de/pdf_DOC/301191.pdf
To download: **DIBt approval, CLS**[1] Type approval www.asv-stuebbe.de/pdf_DOC/301424.pdf

Tab. 1 Other application documents, purpose and where found

1) DIBt approval is valid only in Germany

1.3 Warnings and symbols

Symbol	Meaning
⚠ DANGER	• Immediate acute risk • Death, serious bodily harm
⚠ WARNING	• Potentially acute risk • Death, serious bodily harm
⚠ CAUTION	• Potentially hazardous situation • Minor injury
NOTE	• Potentially hazardous situation • Material damage
	Safety warning sign ► Take note of all information highlighted by the safety warning sign and follow the instructions to avoid injury or death.
►	Instruction
1., 2., ...	Multiple-step instructions
✓	Precondition
→	Cross reference
	Information, notes

Tab. 2 Warnings and symbols

2 General safety instructions

The manufacturer accepts no liability for damages caused by disregarding any of the documentation.

2.1 Intended use

The device is part of a safety system. If the sensor comes into contact with a fluid medium it trips a relay with a potential-free changeover contact (SPDT). This can be used to trigger a downstream device (such as a warning indicator or a PLC).

- Only use the device with suitable media (→ Resistance lists).
- Adhere to the operating limits (→ Data sheet).
- Do not use the device for media that have a tendency to foaming.
- Do not use the device for media that form insulating or conductive deposits.
- Do not use the device for media that can form separation layers.
- Do not use the device for media that can degrade into resins.

2.2 General safety instructions

Observe the following regulations before carrying out any work.

2.2.1 Obligations of the operating company

Safety-conscious operation

- Only operate the device if it is in perfect technical condition and only use it as intended, staying aware of safety and risks, and in adherence to the instructions in this manual.
- Ensure that the following safety aspects are observed and monitored:
  – Intended use
  – Statutory or other safety and accident-prevention regulations
  – Safety regulations governing the handling of hazardous substances
  – Applicable standards and guidelines in the country where the pump is operated
- Make personal protective equipment available.

Qualified personnel

- Make sure all personnel tasked with work on the device have read and understood this manual and all other applicable documents, especially the safety, maintenance and repair information, before they start any work.
- Organize responsibilities, areas of competence and the supervision of personnel.
- The following work should be carried out by specialist technicians only:
  – Installation, repair and maintenance work
  – Work on the electrical system
- Make sure that trainee personnel only work on the device under supervision of specialist technicians.

Use of qualified personnel for storage of liquids classed as hazardous to water (Germany)

The following work on the overfill prevention system must be performed by licensed companies employing personnel certified in accordance with the water management regulations:

- Installation
- Maintenance
- Cleaning

The obligation to use certified personnel does not arise if the water management regulations specify that the work in question is excluded from the obligation to use certified personnel.

The use of qualified personnel to perform work on systems relating to storage of liquids classed as hazardous to water should also be complied with in other countries.

2.2.2 Obligations of personnel

Only complete work on the device if the following requirements are met:

- System is empty
- System has been flushed
- System is depressurized
- System has cooled down
- System is secured against being switched back on again
- Do not make any modifications to the device.

2.3 Specific hazards

2.3.1 Hazardous media

- When handling hazardous media, observe the safety regulations for the handling of hazardous substances.
- Use personal protective equipment when carrying out any work on the device.
- Collect leaking pumped liquid and residues in a safe manner and dispose of in accordance with environmental regulations.

3 Layout and Function

3.1 Name plate

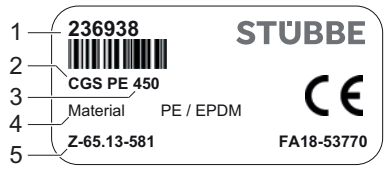


Fig. 1 Name plate (CGS example)

1 ID number
2 Device type
3 Length of pipe for CGS sensor / Length of cable for CLS
4 Material
5 DIBT approval number

Device types

- CGS – Level limit switch, relay output
- CLS – Leakage probe, relay output

3.2 Description

The device is part of a safety system. If the probe comes into contact with a liquid medium, the device switches the downstream devices (such as a pump) off.

Versions available:

- CGS Level limit switch
  - Installation from above into a tank or container
- CLS Leakage probe
  - Installation suspended vertically in a receiving vessel
  - Connection and sensor housing separate

3.3 Assembly

3.3.1 CGS Level limit switch

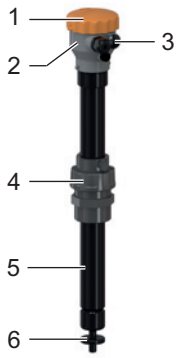


Fig. 2 Installation of the CGS Level limit switch

1 Housing cover
2 Casing with electronics
3 Cable gland
4 Process connection
5 Sensor rod
6 Sensor

3.3.2 CLS Leakage probe

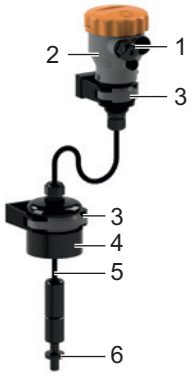


Fig. 3 Installation of the CLS Leakage probe

1 Cable gland
2 Connector head
3 Pipe clamp
4 Attachment cap
5 Special TPE cable
6 Sensor

4 Transport, Storage and Disposal

4.1 Unpacking and inspection on delivery

1. Unpack the device when received and inspect it for transport damage and completeness.
2. Check that the information on the type plate agrees with the order/design data.
3. Report any transport damage to the manufacturer immediately.
4. If fitted immediately: Dispose of packaging material according to local regulations.
   – If fitted at a later point: leave device in its original packaging.

4.2 Transportation

► Device should preferably be transported in the original packaging.

4.3 Storage

NOTE

Material damage due to inappropriate storage!

► Store the device properly.

1. Make sure the storage room meets the following conditions:
   – Dry
   – Frost-free
   – Vibration-free
   – Not in direct sunlight
   – Storage temperature +10 °C to +60 °C
2. Device should preferably be stored in the original packaging.

4.4 Disposal

Plastic parts can be contaminated by poisonous or radioactive media to such an extent that cleaning will not be sufficient.

⚠ WARNING

Risk of poisoning and environmental damage from medium!

► Use personal protective equipment when carrying out any work on the device.

► Prior to the disposal of the device: Neutralize residues of medium in the device.

1. Remove electronic parts and dispose of in accordance with local regulations.
2. Dispose of plastic parts in accordance with local regulations.

5 Installation and connection

5.1 Testing under operating conditions

5.1.1 Performing tests under general operating conditions

1. Ensuring the following operating conditions are satisfied:
   – Resistance of body and seal material to the medium (→ Resistance lists).
   – Media temperature (→ Data sheet)
   – Operating pressure (→ Data sheet)
2. Make sure that the devices and other parts of the overfill protection system / leakage detection system shut down the filling process and raise the alarm in the event of the following occurrences:
   – Power supply failure
   – Connection cable open circuit
3. Protect the devices and other parts of the overfill protection system / leakage detection system according to the closed circuit principle or other suitable safety measures for fault detection.
4. Consult with the manufacturer regarding any other use of the device.

5.1.2 Performing tests under specific operating conditions

Performance under specific operating conditions must be tested for storage of liquids classed as hazardous to water (Germany). The tests under specific operating conditions should also be performed in other countries.

✓ Tests under general operating conditions must have been performed

► Ensure correct performance under the following specific operating conditions:
   – The operational readiness of the overfill protection should be displayed visually, e.g. by a indicator display
   – Electrical illuminated displays should be clearly recognizable on the front of the indicator device at an angle of 45° to the vertical
   – The sound level of an acoustic alarm must be at least 70 dB(A) and a distance of 1 m from a hard wall that reflects sound
   – The acoustic alarm must be suitable for continuous operation and capable of being acknowledged.
   – After the acoustic alarm has been acknowledged the visual display of the alarm condition must persist until the level has fallen below the alarm limit
   – The signals from the overfill alarm devices must be clearly differentiated from other filling level information.

5.2 Installing the CGS level limit switch in a tank

✓ Carefully select the installation location in the tank:
- within the range perpendicular to the surface of the liquid to an inclination of max. 45° from the perpendicular.
- Comply with the minimum distance from the maximum filling level (→ Data sheet)

✓ Test the installation location for disturbing influences:
- Do not install over turbulence or the vortex caused by agitators.
- Do not install near filling pipes

✓ The degree of fill must be correctly calculated (→ 9.5 Calculation of the degree of fill, Page 12). In doing so, comply with the following:
- the vessel must not overflow
- the vessel must not suffer overpressure which could affect the seals and structural integrity of the vessel
- Thermal expansion of the medium

✓ The run-on quantity after the overfill protection has tripped must be correctly determined (→ 9.6 Determining the run-on quantity, Page 12). In doing so, comply with the following:
- Maximum delivery flow of the pump and its run-on time
- Switch response delay of the device (→ data sheet)
- Switch response delay and switch response times of the downstream devices and fittings

✓ The triggering level in the tank must be correctly calculated (→ 9.7 Calculating the length of the level limit switch, Page 13).

NOTE

Damage to the device.

► The device must screwed to the tank using only the correct wrench.

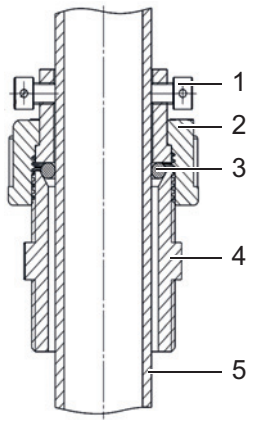
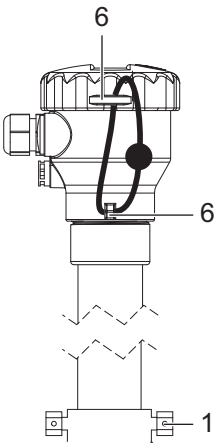


Fig. 4 Installing the CGS level limit switch in a tank

1 Fixing screw
2 Union nut
3 O-ring
4 Tank gland (double nipple)
5 Sensor rod

1. Before installation in the tank, check the trigger height of the device as follows:
   - Make sure that the insertion depth of the sensor rod (5) is set correctly.
   - If necessary, mark the trigger height on the vessel.
2. Make sure that the O-ring (3) for sealing the process connection is inserted.
3. Screw the tank gland (4) into the tank, using a wrench (65 mm across flats) (→ 9.3 Tightening torques, Page 12).
4. Tighten the union nut (2) (→ 9.3 Tightening torques, Page 12).
5. Tighten the fixing screw (1) (→ 9.3 Tightening torques, Page 12).

   The triggering height is now fixed.



6. Protect the device against unauthorized adjustment:
   - Seal the hole in the fixing screw (1) to lock the height adjustment.
   - Seal the cover and casing together to the lugs (6) in order to ensure the electrical adjustment.

5.3 Installing the CLS leakage probe

✓ The collection vessel must be properly prepared.
✓ Carefully select the installation location in the collection vessel:
  – Ensure the sensor cannot move (displacement, shifting, swinging, tipping) and cannot float
  – Maintain a triggering height of at least 25 mm
  – Install the sensor vertically either suspended or supported
  – Select the deepest point for installation of the sensor
  – Enable contact between the escaping stored liquid and the probe
  – Void continuous contact between the media and the sensor

⚠ WARNING

Risk of injury and poisoning due to medium spraying out!

► Use personal protective equipment when carrying out any work on the fitting.

1. Install the connector head
   – Either attach a spacer piece to the vessel wall or select an installation point close to the vessel wall.
   – Attach a pipe clamp to the spacer.
   – Fasten the connector head to the pipe clamp.
2. Install the sensor on the roof of the vessel or close to the vessel wall: Mount the sensor with the attachment cap to the existing piece of pipe.
3. When installing the sensor on the vessel wall:
   – Attach the pipe clamp to the vessel wall.
   – Attach the sensor to the pipe clamp.
4. Adjusting the height of the sensor:
   – Slacken the cable gland on the cap of the probe.
   – Adjust the height of the sensor. When doing so, ensure that the sensor is vertical, be it suspended or standing on the floor of the vessel.
   – Tighten the cable gland on the cap of the probe (→ 9.3 Tightening torques, Page 12).

5.4 Electrical connection of device

✓ Power supply must be switched off and secured against being switched back on again.

⚠ DANGER

Risk of electrocution

► All electrical work must be carried out by qualified electricians only.
► Switch off the system power supply and secure it against being switched back on again.

1. Unscrew the housing cover from the connection housing.
2. Feed the connection cable through the cable gland and connect it:
   – Cables (→ Data sheet).
   – Connection diagram (→ 9.4 Connection diagram, Page 12).
3. Tighten the cable gland (→ 9.3 Tightening torques, Page 12).
4. Screw on the housing cover.

6 Operation

6.1 Manually calibrating the device

✓ The device is installed properly.
✓ Device is connected properly with the power supply and ready for operation.

ⓘ The device is factory calibrated.
Manual calibration is necessary if the device is installed at a distance < 150 mm from the vessel wall and fittings

1. Remove the casing cover.
2. Set the dip switches 1 and 2 to ON. (→ 9.4 Connection diagram, Page 12).

   The relay and LED2 will go dark.

   If after 30 seconds the alarm relay trips 3 times and the LED2 lights up.
3. Set the sensitivity (→ 6.2 Set the sensitivity, Page 10).
4. Screw on the housing cover.

6.2 Set the sensitivity

✓ The device is installed properly.
✓ Device is connected properly with the power supply and ready for operation.
✓ The device is now calibrated.

If necessary 2 sensor sensitivity settings can be set on the device:
– Sensitivity 1: normal
– Sensitivity 2: high (for media with a very low dielectric constant, e.g. media containing oil)

1. Remove the casing cover.
2. To set sensitivity setting 1 (normal), set the switches as follows (→ 9.4 Connection diagram, Page 12).:
   – Dip switch 1: ON
   – Dip switch 2: OFF
3. To set sensitivity setting 2 (high), set the switches as follows (→ 9.4 Connection diagram, Page 12).:
   – Dip switch 1: OFF
   – Dip switch 2: ON
4. Screw on the housing cover.

6.3 Commissioning / recommissioning

✓ The device is installed properly.
✓ Device is connected properly with the power supply and ready for operation.
✓ The device must have been manually calibrated.
✓ Sensitivity must have been adjusted if necessary

The device must be connected to the control system via the relay output. If contact occurs between the sensor contact and a liquid medium, the relay must trip. The relay must be closed when de-energized.

1. Make sure that the sensor is not covered by a liquid medium!
2. Remove the casing cover.
3. Connect the power supply to the device and check that LED2 lights up green. (→ 9.4 Connection diagram, Page 12).

   The sensor is free.
   The device is in normal operating mode.
   The relay is activated.
4. Screw on the housing cover.
5. Testing the device (→ 6.4 Testing the device after commissioning / recommissioning, Page 10).

6.4 Testing the device after commissioning / recommissioning

Test systems for storage of liquids classed as hazardous to water as follows (Germany):

- The testing must be performed by certified personnel employed by a licensed company. (→ Use of qualified personnel for storage of liquids classed as hazardous to water (Germany), Page 4).
- Certification by certified personnel employed by a licensed company must cover the following points:
  – Confirmation that the overflow protection system is capable of correct operation
  – Statement of the required settings for the overflow protection system

✓ The device must be in operation.
1. After commissioning / recommissioning, perform the following tests:
   – Test the device for correct operation.
   – Check that the device is correctly installed on the vessel.
   – Check the electrical power supply to the device and t the downstream devices.
2. Repeat the tests if there is to be a change in the liquid being stored or if there are any changes to the settings (for instance to the trigger height or function).

7 Maintenance

⚠ DANGER

Risk of electrocution!

► All electrical work must be carried out by qualified electricians only.

⚠ WARNING

Risk of injury and poisoning due to hazardous or hot media!

► Use personal protective equipment when carrying out any work on the device.
► Provide warning of maintenance and repair work and set up warning signs.

7.1 Servicing

Interval	Action
In the event of leakage	• Remove the device from the medium • Clean the device • Perform a visual and functional check: – Normal operating conditions unchanged
As necessary	• Clean device with a damp cloth.
Six-monthly	Perform a visual and functional check: • Normal operating conditions unchanged

Tab. 3 Servicing activities

► Perform maintenance tasks according to the table.

7.2 Testing the device

The operating company must test the operation of the overfill prevention system at least once a year. If the device is installed outdoors, ASV Stübbe recommends the system is tested every six months. It is the responsibility of the operating company to define the type of test and the intervals within the specified time frame.

Test systems for storage of liquids classed as hazardous to water as follows (Germany):

- The testing must be performed by certified personnel employed by a licensed company. (→ Use of qualified personnel for storage of liquids classed as hazardous to water (Germany), Page 4).
- The results of the test must be documented and archived

► During the test, make sure that the overfill prevention system is operating correctly, including all its system components. Test the system as follows:
  – Testing the CGS: Test the level limit switch by causing it to trip, either by appropriate simulation of the filling level or by the physical measurement effect.
  – Testing the CLS: Test the leakage probe by causing it to trip, either by appropriate simulation of a leak or by the physical measuring effect.

7.3 Maintenance

7.3.1 Removing the device

✓ System is empty.
✓ System has been flushed.
✓ System is depressurized.
✓ System has cooled down.
✓ System must be secured against being switched back on again.

1. Unplug the connection cable.
2. Take the device out of the vessel.
3. Decontaminate device if required.

7.3.2 Replacement parts and return

1. Have the following information ready to hand when ordering spare parts (→ 3.1 Name plate, Page 6).
   – Device type
   – ID number
   – Connection and gasket material
2. Please complete and enclose the document of compliance for returns (→ www.asv-stuebbe.com/service/downloads).
3. Only use spare parts from ASV Stübbe.

8 Troubleshooting

⚠ WARNING

Risk of injury and poisoning due to hazardous media liquids!

► Use personal protective equipment when carrying out any work on the device.

Error	Possible cause	Corrective action
Failure to commission the device	Liquid medium adhering in the sensor area	► Remove the device and clean it.

Tab. 4 Troubleshooting

9 Appendix

9.1 Technical specifications

Technical data (→ Data sheet).

9.2 Dimensions

Dimensions (→ Data sheet).

9.3 Tightening torques

Description	Torque [Nm]
Fixing screw	0.5
Cable gland	4
Tank gland (double nipple)	8
Union nut	8

Tab. 5 Tightening torques

9.4 Connection diagram

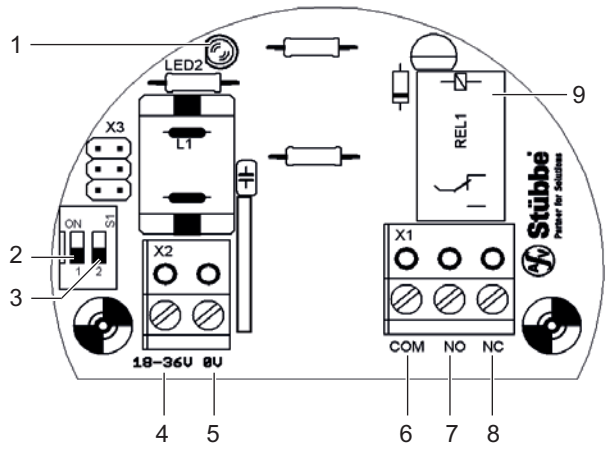


Fig. 5 Connection diagram

Item	Connection
1	LED2 (green)
2	Dip switch 1
3	Dip switch 2
4	Voltage supply (+)
5	Power supply (–)
6	Relay output COM
7	Relay output NO (closes on alarm)
8	Relay output NC (opens on alarm)
9	Relay

Tab. 6 Connection diagram

9.5 Calculation of the degree of fill

In order to ascertain the permissible degree of fill, allowance must be made for the increase in volume resulting from the rise in temperature that might possibly occur, applied to the cubic coefficient of expansion of the liquid used for filling the vessel.

(1) For storage in fixed vessels of liquids that have no additional hazardous characteristics, the permissible degree of fill with liquid at the filling temperature should be determined as follows:

- For overground vessels and underground vessels with a ground coverage less than 0.8 m.
  Degree of fill = 100 / (1 + α x 35) in % of the available volume
- For underground vessels with a ground coverage of 0.8 mm or more:
  Degree of fill = 100 / (1 + α x 20) in % of the available volume
- The average cubic coefficient of expansion α can be determined as follows:
  $\alpha = (d_{15} - d_{50}) / (35 \times d_{50})$
  Where d_{15} and d_{50} are the densities of the liquid at 15 °C and 50 °C.

(2) If the liquid is heated to a temperature higher than 50 °C in storage, or if it is filled in a cool condition, the expansion arising as a result of this must additionally be considered in determining the degree of fill.

(3) For vessels for storage of liquids with toxic or corrosive characteristics, the degree of fill should be at least 3 % lower than the values obtained from paragraphs (1) to (2).

9.6 Determining the run-on quantity

9.6.1 Maximum volumetric fill rate of the delivery pump.

The maximum volumetric fill rate can be determined either by measurement (pumping a defined quantity of liquid) or by reference to the pump performance curve.

9.6.2 Shut-off delay times

(1) If the response times, switching times and running times of the individual components cannot be found in the associated data sheets they must be measured.

(2) If shutdown of the filling process fittings is performed manually, the time between the overfilling system trip and the cessation of the filling process should be estimated according to the local conditions.

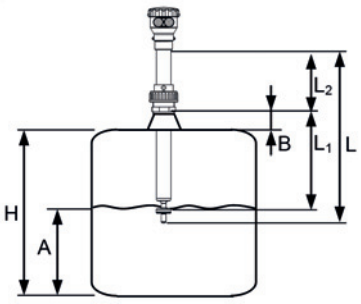
9.6.3 Run-on quantity

The sum of the shut-off delay times yields the overall run-on delay time. Multiplication of the overall run-on delay time by the measured rate of volumetric flow, plus the volumetric capacity of the delivery pipework that has still to be drained after the overfill system shut-off delay yields the run-on quantity.

9.7 Calculating the length of the level limit switch

The run-on quantity thus determined is subtracted from the volume of liquid represented by the permissible degree of fill. (→ 9.6 Determining the run-on quantity, Page 12). The trigger level is determined from the difference using the filling curve, by calculating or by measuring the trigger level. The determination must be documented.

9.7.1 Vertical installation



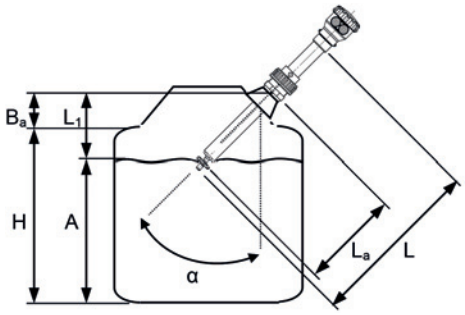
$L_1 = H + B - A$

$L > L_1$

Fig. 6 Calculation for vertical installation

H Vessel height
A Trigger height
B Support height including seal (if fitted)
L Ordering size of the level limit switch
L_1 Heights to the switching point
L_2 Visible length of the level limit switch

9.7.2 Oblique installation



$L_1 = H + B_a - A$

$L_a = \frac{L_1}{\cos \alpha}$ (α = 0–45°)

$L > L_a$

Fig. 7 Calculation for oblique installation

H Vessel height
A Trigger height
B_a Height above vessel for installation
L Ordering size of the level limit switch
L_1 Heights to the switching point
L_a Length of the level limit switch to the installed switching point (oblique installation)