HFS - High Frequency Limit Level Sensor

Ultra-modern High-Frequency limit level sensor ignores build-up or foam on the electrode and flawlessly detects tank level.

• Designed for reliable limit level detection of a wide range of fluids, oils, paste-like materials, foam, fibers and solids (including plastic pellets) with either high or low densities or dielectric constants

• Generates a high frequency sensing field which is immune to product adhesion, making it an ideal solution for viscous or sticky media such as ketchup, yogurt, syrups, creams or pastes, tar like materials, alkalis, etc.

• An ideal replacement for other technologies such as vibrating forks, capacitive, ultrasonic or conductive level switches

• Direct mounting into tanks, vessels, pipes or containers

• Fully configurable sensitivity adjustment using a simple magnet pen

• Universal design for all types of fluids (electrically conductive and non-conductive) with a sensing tip made from PEEK

• High stability at high sensitivity (can be used in applications with substances with εr ≥ 1.5)

Sitron´s HFS high frequency limit level sensor is designed to effortlessy detect the level of fluids or paste-like media while ignoring the influence of deposits of viscous media (ketchup, yogurt, pastes, syrups, jams and jellies, creams, soap) as well as products such as detergents, alkalis, or various chemicals. The sensor works in the high frequency band, enabling reliable detection of the level of media without interference from coating or build-up on the electrode.

The HFS sensor is an excellent replacement technology for vibrating tuning forks, capacitance, ultrasonic, conductive or optic level sensors in either simple or more demanding applications. The media may be electrically conductive or non-conductive. It can be installed in either metal or plastic tanks, pipes, filling tanks, sumps, etc. and does not rely on a metalic referrence.

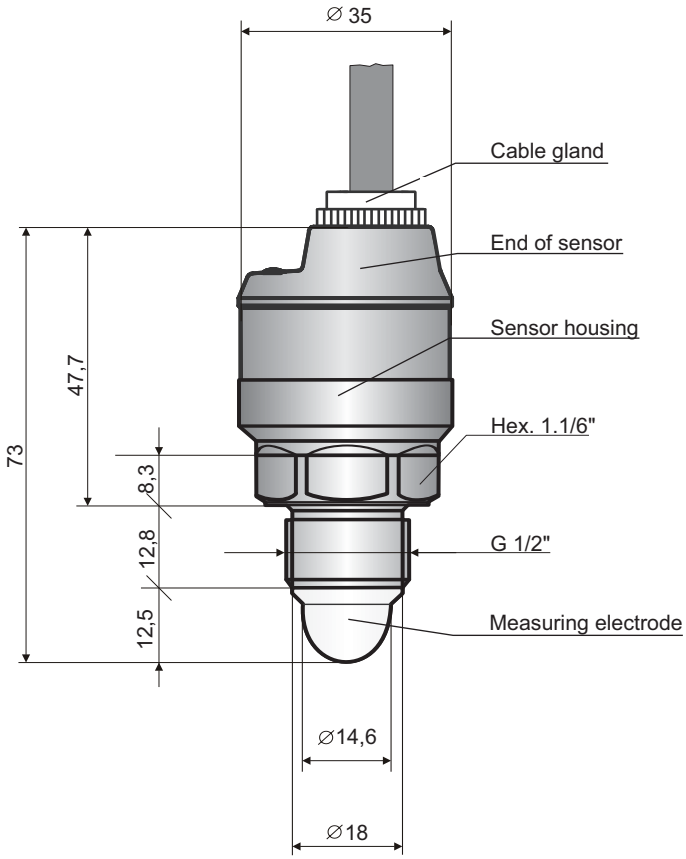
The sensor is made from an all stainless steel (AISI 316L) housing with a sensing electrode made from highly resistant PEEK. The top of the sensor features dual LED status indicators with magnetic point (+/-) sensitivity and calibration controls along with an M12 electrical connection. It is designed to be mounted into the wall of a tank or pipe, at the point where level detection is required and can operate at process temperatures up to 105°C.

HFS202-N
Insulated electrode (PEEK) with sealing O-ring NBR, for sensing various fluids, mashed and paste-like materials, also suitable for fuel, oil or methanol, use from -40°C

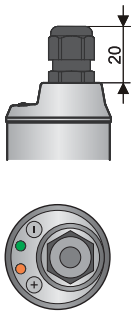
HFS202-E
Insulated electrode (PEEK) with sealing O-ring EPDM, for sensing various fluids, mashed and paste-like materials, suitable also for acids, bases or alcohol, ammonia, acetone, chlorine, from -40°C

HFS202-V
Insulated electrode (PEEK) with sealing O-ring Viton, for sensing various fluids, mashed and paste-like materials, suitable for fuel, oils, bases or asphalt, tar, toluene, from -20°C

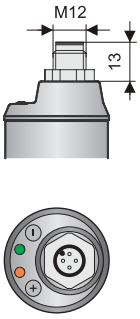
HFS202



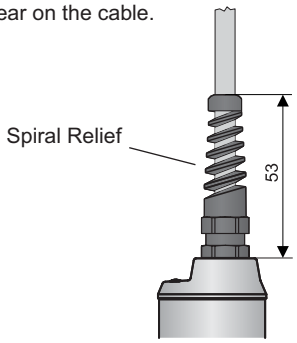
Design (B) with threaded cable gland



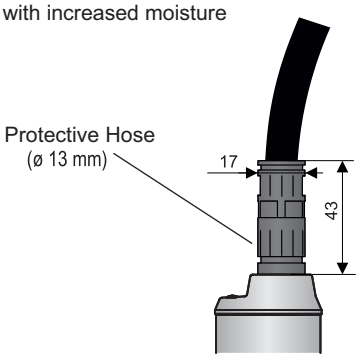
Design (M) with M12 connector



Design (V) with plastic cable gland with spiral relief - in case of increased mechanical wear on the cable.



Design (H) with cable gland for protected hoses - for use in an outdoor area or in area with increased moisture



Basic Technical Data

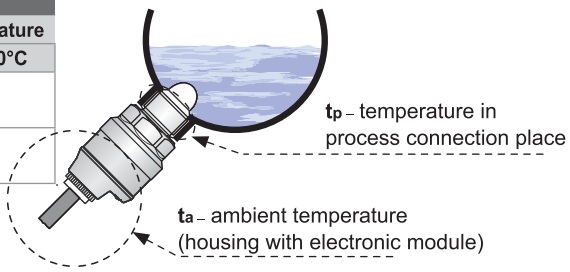
Supply voltage	7 ... 34 V DC
Power consumption	max. 5 mA DC
Max. switching current (NPN, PNP output)	300 mA
Residual voltage – ON state	max. 1.5 V
Coupling capacity (housing - power) / dielectric strength	5 nF / 500 V AC (50 Hz)
Ambient temperature range:	-40 ... +85°C
Protection class HFS202 - B/M HFS202 - (V/H)	IP67 IP68
Cable (versions with cable outlets)	PVC 3 x 0.5 mm^2
Weight (without cable)	approx. 0.15 kg

Used Material

Part of the sensor	standard material
Housing	stainless steel W.Nr. 1.4404 (AISI 316L)
End of sensor	stainless steel W.Nr. 1.4301 (AISI 304)
electrode coating	PEEK
Cable gland (design B)	stainless steel W.Nr. 1.4571 / NBR
Cable gland (design “B”, "V", “H”)	plastic PA / NBR
M12 connector (design M)	nickel-plated brass / PA

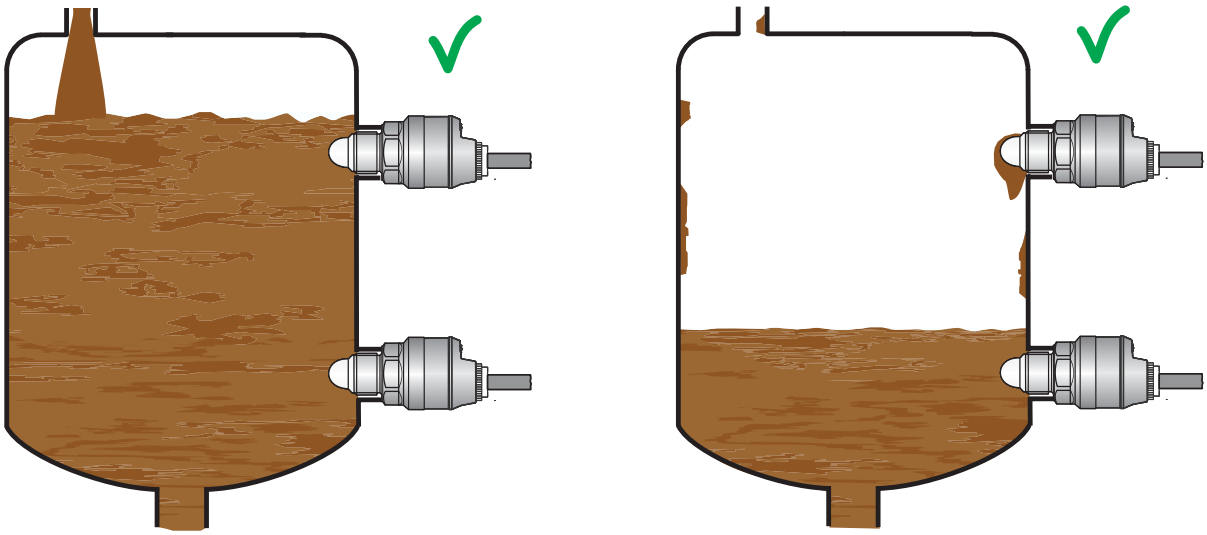
Temperature and Pressure Durability (design N, NT)

design variant	temperature t_p	temperature t_a	maximum overpressure for temperature		
			up to 30°C	up to 85°C	up to 120°C
HFS202-N/E	-40°C ... +105°C	-40°C ... +85°C	10 MPa	10 MPa	–
HFS202-V	-20°C ... +105°C	-40°C ... +85°C	10 MPa	10 MPa	–

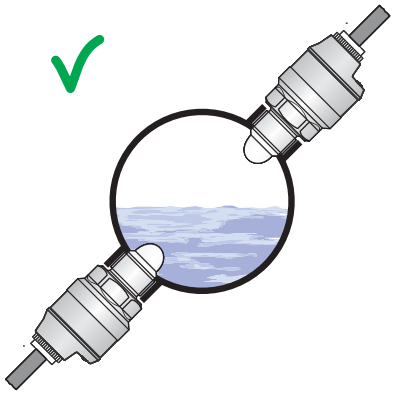


Mounting Recommendations and Calibration:

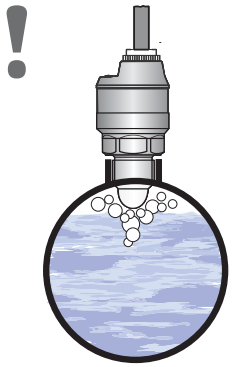
Thanks to its design, the sensor can be used for level detection of viscous and simultaneously electrically conductive media (yogurt, jams and jellies, mayonnaise, spreads, liquid soap, creams or pastes) or non-conductive materials such as oils, grease or tar/asphalt. Calibration is achieved by placing the unit in contact with the medium and activating the magnet + for about 3 seconds. Next, remove the unit from the medium (do not clean or remove any media that remains on the probe) and then activate the magnet - for about 3 seconds. Now the unit is calibrated. After setting the sensitivity of the unit to the medium, it will reliably react to the presence or absence of level. Even with product build up on the probe, the sensor will ignore this ´´false level´´ of viscous material that remains on the measuring electrode.



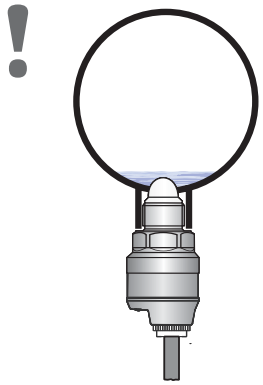
Its is recommended that the sensors are ijnstalled in a horizontal pipe **on an angle from the side.**



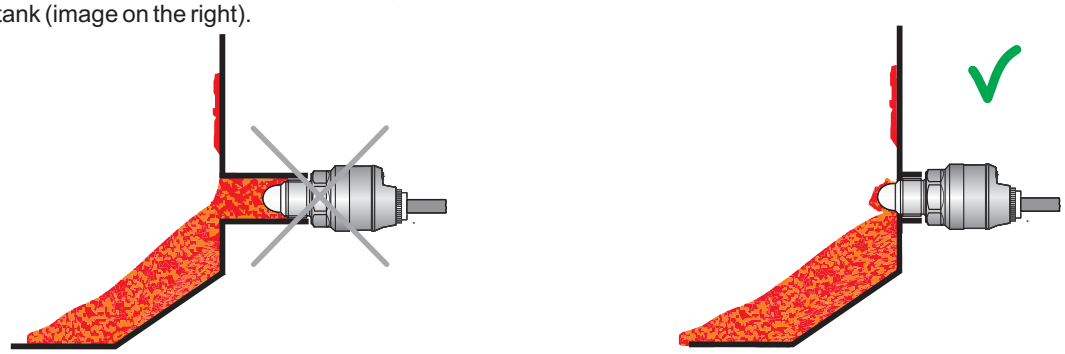
Upon vertical installation of the sensor in a pipe, beware of the potential formation of air pockets.



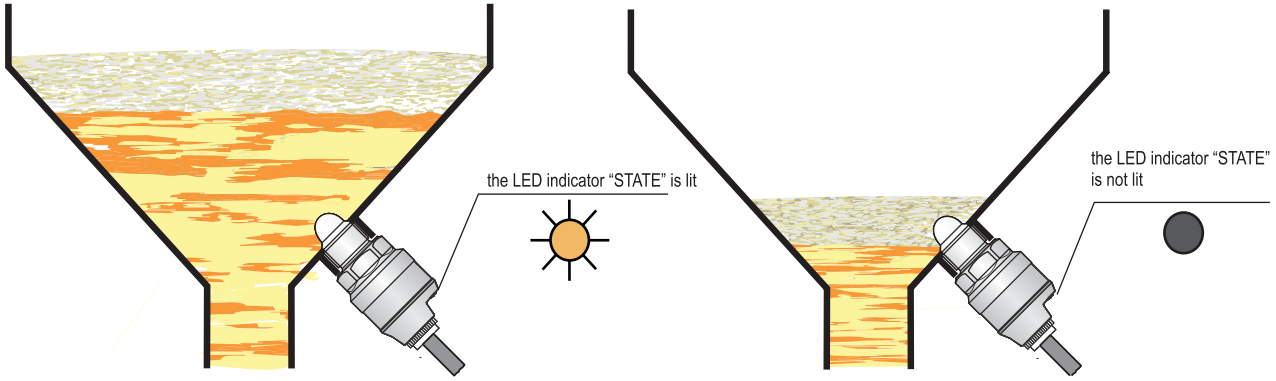
Or, the remains of product or viscous media at the bottom of the pipe



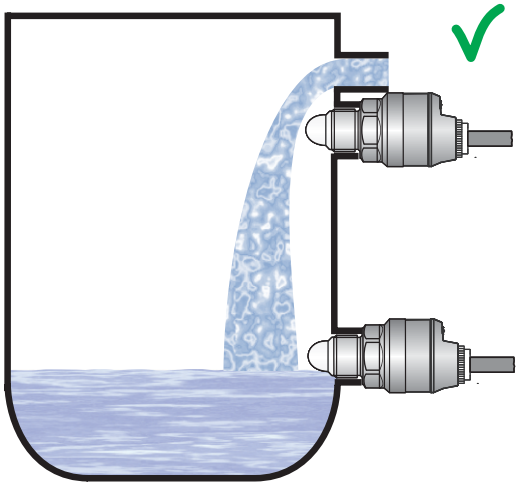
In the case of side wall mounting it is necessary to avoid connection necks where the medium could enter and create a blockiage of product in front of the sensor (image on the left). We recommend mounting the sensor so that the whole measuring electrode is inside the tank (image on the right).



When installing the probe with the presence of foam, care should be taken to calibrate the unit in the non active state when in contact with the foam (if the user wants the sensor to ignore the foam level). By setting the sensitivity of the sensor in this way, it can be set to detect the liquid interface with foam. After a drop in the fluid level, the sensor will ignore the foam level or coating and show a non-contact state of level.



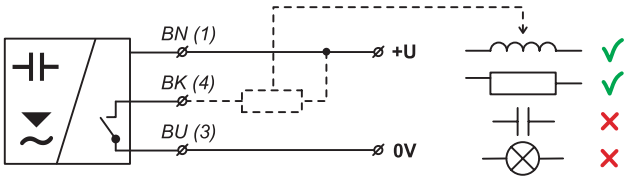
Another advantage of the HFS level switch is that it can be mounted at the inlets of the tank. After calibrating the switch to the level of the given media, the sensor will not react to the current of flowing medium making contact with the sensor tip.



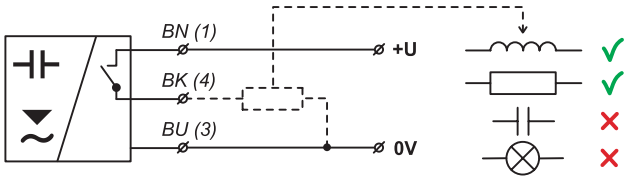
A sensor with NPN or PNP output can be loaded only by resistive or inductive load. The positive pole of the supply voltage (+U) is connected to the brown wire BN or pin connector no.1, the negative pole (0 V) is connected to the blue wire BU or pin connector no. 3 and load on the black wire BK or pin connector no. 4. The capacitative loads and low resistance loads (bulb) are evaluated by the sensor as a short circuit. Wiring diagrams are provided in the figures on the right. Note: In case of strong ambient electromagnetic interference, paralleling of conductors with power distribution, or for the distribution to distance over 30 m, we recommend using shielded cable.

Sensors HFS with type of cable outlet B, V or H are connected to assessing units permanently connected by PVC cable. Design diagrams are provided on page 3.

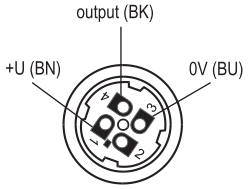
Sensors HFS with connection method type M (see page 3) are connected to assessing units by means of a connector socket with compression cable (length 2 or 5 m), or by means of a connector socket without cable (see accessories). In this case the cable is connected to the inside pins of the socket according to the figure on the right. The recommended diameter of this cable is 4 to 6 mm (the recommended cross-sectional area is 0.5 to 0.75 mm2).



NPN output type sensor connection



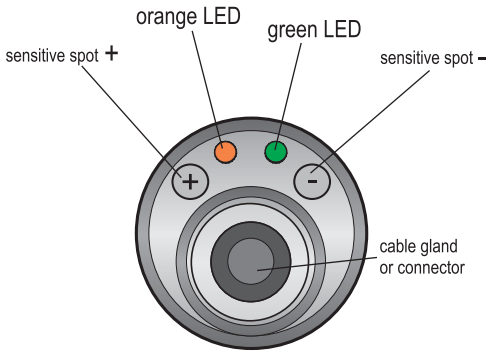
PNP output type sensor connection



Legend: (1...) – terminal numbers connector sockets
BN – brown
BU – blue
BK – black

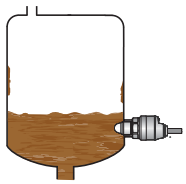
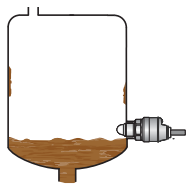
Inside of the connector socket
(Variant M)

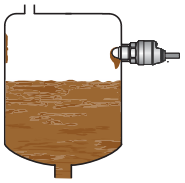
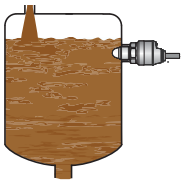
Sensor settings Settings are performed by placing the magnetic pen on the sensitive spot marked “+” or “–” located beside the connector or cable gland. This method is used to set the sensitivity to the measured medium, switching (O, C), with or without the presence of medium. The third function is designed for fine-tuning the sensor sensitivity. Upon a change in the measured medium, it is necessary to perform new limit settings.



Top view of sensor

LED indicator	*colour*	*function*
"RUN"	green	**Measuring function indication** **flashing** – (approx. 0.4 s) – correct function of level detection **dark** – incorrect installation or malfunction. **alternating flashing of the green and orange LED** – error in settings **simultaneous shine of green and orange LED** – when applying the mag. pen, when the setting is confirmed
"STATE"	orange	**Settings indication** **permanent shine** – the sensor is closed **dark** – the sensor is open **3 short flashes** – settings confirmed **alternating flashing of the green and orange LED** – error in settings **simultaneous shine of green and orange LED** – when applying the mag. pen, when the setting is confirmed

	level state	mode	output state	LED indicator
minimum level sensing		O	CLOSED	 illuminated
		O	OPEN	 not illuminated

	level state	mode	output state	LED indicator
maximum level sensing		C	CLOSED	 illuminated
		C	OPEN	 not illuminated

For safety reasons, we recommend using the setting of the mode "O" for min. level sensing (the sensor is closed upon immersion). It is for failure safety reasons – eventual failure of sensor behaves similarly as an exceeding of the limit state. Analogically, for the max. level it is recommended to set the mode "C" (the sensor is open upon immersion).

BASIC SETTINGS

To set the sensitivity and switching mode of the HFS it will be necessary to submerge the sensor in or remove it from the medium. When using this setting, the sensor eliminates the presence of deposits and foam on the electrode. This is necessary for putting into operation.

a) Setting the mode O (It is closed when submerged)

1. Bring the level of the measured medium in the tank to a state so that the electrode sensor would
2. be covered.
   Place the magnetic pen for at least 2 seconds ** on the sensitive spot "+" of the sensor (until both LEDs illuminate) and then remove the magnetic pen. Settings are confirmed by three flashes of the orange LED.
3. Bring the level of the measured medium in the tank to a state so that the electrode sensor would be uncovered. Leave possible deposits on the electrode.

4. Place the magnetic pen for at least 2 seconds on the sensitive spot "-" of the sensor until both LEDs illuminate and then remove the magnetic pen. Settings are confirmed by three flashes of the orange LED.

5. Check the state of indicators:
- If the orange LED is not illuminated and the green LED is flashing, the sensor is correctly set.
- If alternating flashing of the orange and green LED occurs, the sensor did not recognize the limits for closing and opening. In this case, find out if the minimum and maximum levels are not set too close to one another.

b) Setting the mode C (it is open when submerged)

1. Bring the level of the measured medium in the tank to a state so that the electrode sensor would
2. be covered.
   Place the magnetic pen for at least 2 seconds ** on the sensitive spot "-" of the sensor until both LEDs illuminate and then remove the magnetic pen.
   Settings are confirmed by three flashes of the orange LED.
3. Bring the level of the measured medium in the tank to a state so that the electrode sensor would be uncovered.
4. Leave possible deposits on the electrode.
   Place the magnetic pen for at least 2 seconds ** on the sensitive spot "+" of the sensor until both LEDs illuminate and then remove the magnetic pen.
- If the orange LED is illuminated and the green LED is flashing, the sensor is correctly set.
- If alternating flashing of the orange and green LED occurs, the sensor did not recognize the limits for closing and opening. In this case, find out if the minimum and maximum levels are not set too close to one another and possible to repeat the settings.

**) Maximum 4 seconds.

For safety reasons, we recommend setting the "O" for level sensing (the sensor is closed upon immersion). It is for failure safety reasons - eventual failure of sensor behaves similarly to an exceeding of the limit state. Analogically, for the maximum level it is recommended to set the "C" mode (the sensor is open upon immersion).

Safety, Protections, Compatibility and Explosion Proof
The level sensor is equipped with protection against electric shock on the electrode, reverse polarity, output current overload, short circuit and against current overload on output. Protection against dangerous contact is provided by low safety voltage. Electromagnetic compatibility is provided by conformity with standards EN 55022/B, EN 61326-1,EN 61000-4-2, -3 ,-4, -5 and 6.

Order Code

HFS202 ☐ ☐ ☐ ☐ ☐ ☐ ☐

Output Type:
P - PNP
N - NPN

Size:
3 - 1/2"
X - Other specify

Process Connection Type:
B - BSP
X - Other specify

Type of O'ring Seal:
N - O'Ring NBR
E - O' Ring EDPM
V - O'Ring Viton

Insertion Length:
L25 - 25mm STANDARD

Electrical Connection:
B - Threaded Cable Gland
M - M12 Connector (316SS)
V - Spiral Relief Cable Gland
H - Cable Gland w Protective Hose

Acessories:
M - Magnetic Pen

Example: HFS202-N-3-B-N-L25-M-M
HFS202 with output PNP, Process connection 1/2" BSP, O'ring seal with NBR, Insertion length 25mm, M12 Connector and Magnetic Pen for adjustment

Notes:
Tri-Clamp connection from 1" / SMS - female from 1" / Flange only 3/4" or 1"
Magnet Pen comes standard with the each unit. Charge only applies to replacement pen.