

High frequency level sensor

CPK-HF-35

INSTRUCTION MANUAL



Read the user's manual carefully before starting to use the unit or software.
Producer reserves the right to implement changes without prior notice.

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Used symbols

To ensure maximum safety of control processes, we have defined the following safety instructions and information. Each instruction is labelled with the appropriate pictogram.



Alert, warning, danger

This symbol informs you about particularly important instructions for installation and operation of equipment or dangerous situations that may occur during the installation and operation. Not observing these instructions may cause disturbance, damage or destruction of equipment or may cause injury.



Information

This symbol indicates particularly important characteristics of the device.



Note

This symbol indicates helpful additional information.

Safety



All operations described in this instruction manual have to be carried out by trained personnel or by an accredited person only. Warranty and post warranty service must be exclusively carried out by the manufacturer.

Improper use, installation or adjustment of the sensor can lead to application failures (overfilling tanks or damage to system components).

The manufacturer is not responsible for improper use, loss of work caused by either direct or indirect damage, and for expenses incurred at the time of installation or during the period of use of the level sensors.

1. Basic description

The **high-frequency level sensor CPK-HF-35** is designed for industrial use for limit sensing of the level of liquid and pasty media. The high-frequency level sensor may be a direct replacement of a vibrating level sensor, or of a capacity level sensor in case of more demanding applications. The media may be electrically conductive or non-conductive with any permittivity. It can be installed in metal or plastic tanks, pipes, filling tanks, sumps, etc.

It is mainly designed for mounting into the wall of a tank or pipe, in which the actual detection of the level will take place. The sensor works in the high frequency band, enabling reliable detection of the level of media, and eliminating deposits or foam on the electrode. The sensor suppresses the influence of deposits of viscous media (ketchup, yoghurt, pastes, syrups, jams and jellies, creams, soap) as well as electrically conductive adhesive products (detergents, alkalis, chemicals).

Likewise, it is possible to utilize it to differentiate a specific media from others - the "Medium window" function. E.g. it can differentiate oil from water and air, detect only beer foam and ignore beer and air, etc.

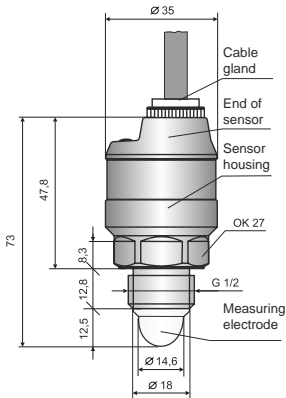
The sensor is made from a stainless steel housing at one end terminated by a sensing electrode, and terminated at the other and by an ending with a status indicator, control elements and electrical connection.

2. Variants of sensors

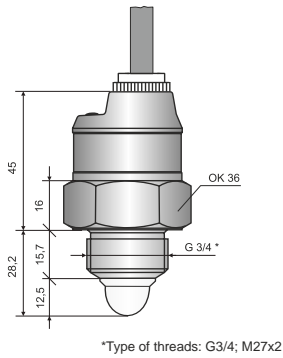
CPK-HF-35_-1B	Insulated electrode (PEEK) with sealing O-ring NBR , for sensing various liquid, mashed and paste-like materials, appropriate also for fuel, oil or methanol. Use from minimum temperature of -40 °C
CPK-HF-35_-11B	Insulated electrode (PEEK) extended version with sealing O-ring NBR , for sensing various liquid, mashed and paste-like materials, appropriate also for fuel, oil or methanol. Use from minimum temperature of -40 °C
CPK-HF-35_-1E	Insulated electrode (PEEK) with sealing O-ring EPDM , for sensing various liquid, mashed and paste-like materials, appropriate also for acids, bases or alcohol, ammonia, acetone, chlorine. Use from minimum temperature of -40 °C
CPK-HF-35_-11E	Insulated electrode (PEEK) extended version with sealing O-ring EPDM , for sensing various liquid, mashed and paste-like materials, appropriate also for acids, bases or alcohol, ammonia, acetone, chlorine. Use from minimum temperature of -40 °C
CPK-HF-35_-1V	Insulated electrode (PEEK) with sealing O-ring Viton , for sensing various liquid, mashed and paste-like materials, appropriate also for fuel, oil, acids, bases or asphalt, tar, toluene. Use from minimum temperature of -20 °C
CPK-HF-35_-11V	Insulated electrode (PEEK) extended version with sealing O-ring Viton , for sensing various liquid, mashed and paste-like materials, appropriate also for fuel, oil, acids, bases or asphalt, tar, toluene. Use from minimum temperature of -20 °C
CPK-HF-35_-2	Insulated electrode (PTFE) without O-ring , for sensing various liquid, mashed and paste-like materials, especially suitable for aggressive liquids. Use from minimum temperature of -40 °C.
CPK-HF-35_-21	Insulated electrode (PTFE) extended version without O-ring , for sensing various liquid, mashed and paste-like materials, especially suitable for aggressive liquids. Use from minimum temperature of -40 °C.

3. Dimensional drawing

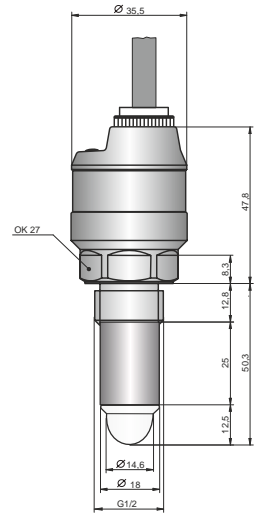
CPK-HF-35_-1-G1/2



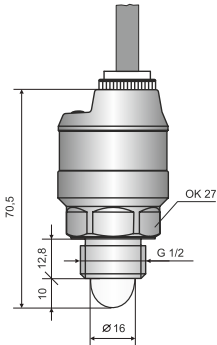
CPK-HF-35_-1-G3/4



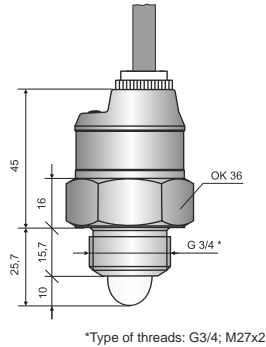
CPK-HF-35_-11-G1/2



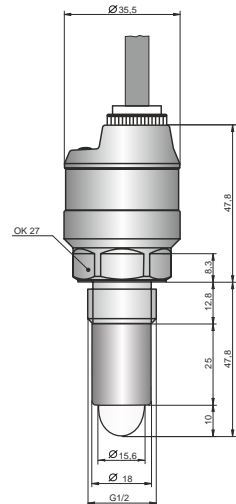
CPK-HF-35_-2-G1/2



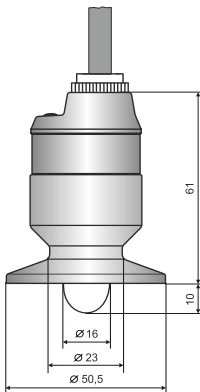
CPK-HF-35_-2-G3/4



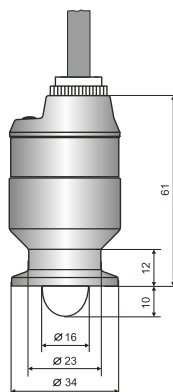
CPK-HF-35_-21-G1/2



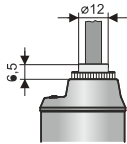
CPK-HF-35_-2-CI50
(Tri-clamp)



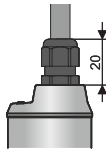
CPK-HF-35_-2-CI34
(Tri-clamp)



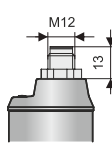
Variant "A" with short stainless steel gland



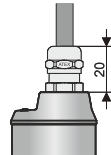
Variant "B" with plastic threaded cable gland



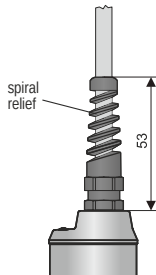
Variant "C" with connector M12



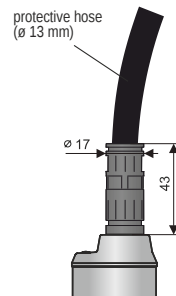
Variant "D" with dustproof cable outlet



Variant "V" with plastic cable gland with spiral relief – in case of increased mechanical wear on the cable.

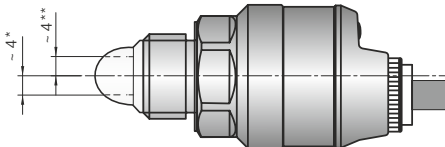


Variant "H" with cable gland for protected hoses – for using in an outdoor area or in area with increased moisture.

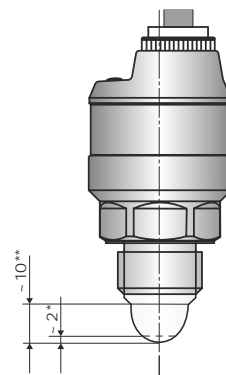


Sensor switching level

horizontal mounting



vertical mounting



* Typical switching point position for water (factory setting)

** Typical switching point position for oil.

4. Installation and putting into operation

Please follow next 3 steps:

- Installation instructions **see chapter 5**
- Electrical connection **see chapter 6**
- Settings **see chapter 8**

5. Installation instructions

CPK-HF-35 level sensors can be mounted in horizontal or inclined position into the shell of a container, storage tank or pipe by screwing into the welding flange, or by a xing using a nut. Basic application recommendations are mentioned below.



During assembly into the metal tank or the storage tank, it is not necessary to separately ground the base of the level sensor.



In the case of the use for an aggressive medium is necessary to prove the chemical compatibility of used materials of the sensor (Tab. Used materials on page 23). This guarantee ceases when the product is chemically damaged.

Thanks to its design, the sensor is appropriate for detection of the level of viscous and simultaneously electrically conductive media (yoghurt, jams and jellies, mayonnaise, spreads, liquid soap, creams or pastes). After setting the sensitivity of the given media, it reliably reacts to the presence or absence of a medium level. On the contrary, the sensor does not react to remnants and coatings of viscous media on the measuring electrode.

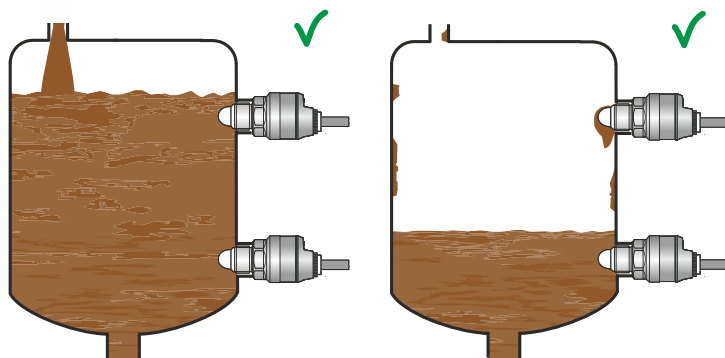
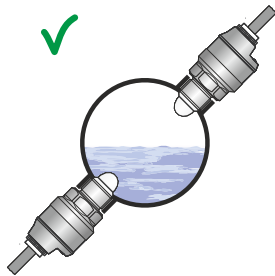
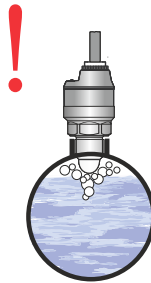


Fig. 1: Side installation of sensors into a tank with viscous medium

It is recommended to install sensors in a horizontal pipe **inclined from the side**.



Upon vertical installation of the sensor in a pipe, pay attention to potential formation of air pockets,



or adhering remnants of liquid at the bottom of the pipe.

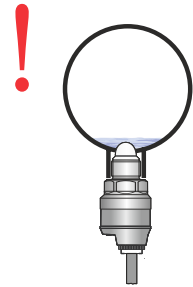


Fig. 2: Installation of the sensor in a pipe

In the case of side wall mounting, it is necessary to avoid long fitting tubes, where sensed medium could remain. We recommend mounting the sensor so that the whole measuring electrode is inside the tank.

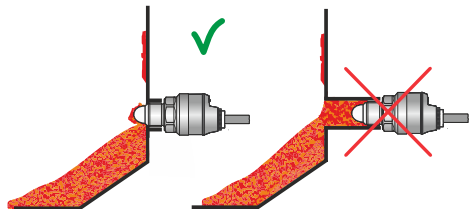


Fig. 3a: Correct and incorrect installation with a long tube

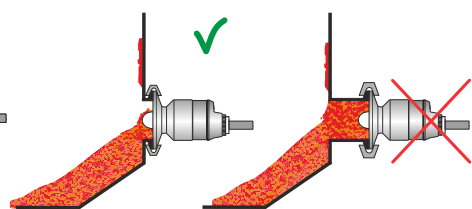


Fig. 3b: Correct and incorrect installation with a long tube for process connection with Tri-Clamp



Small Tri-clamp (ø 34 mm), only for liquids with low viscosity.

Installation of the sensor for reliable checking of the level of a liquid with foam on the surface. Sensitivity of the sensor can be set to detect the liquid interface with foam. After a drop in the liquid level, the sensor does not react to coatings of foam on the electrode.

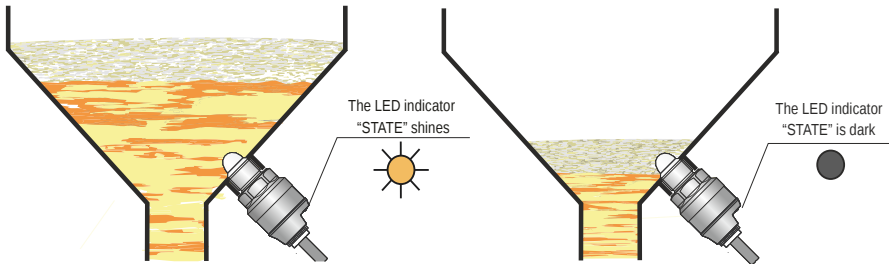


Fig. 4: Monitoring the level of foam media

The sensor can be mounted in a tank or at medium inlets. After setting to the level of the given media the sensor does not react to the current of flowing medium.

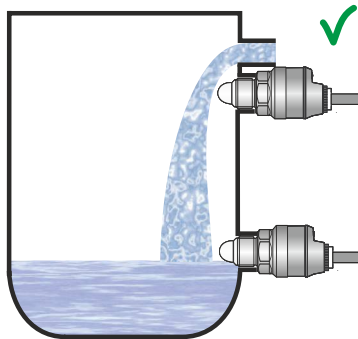


Fig. 5: Option of mounting the sensor in the medium inlet

6. Electrical connection

A sensor with 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 capacitive loads and low resistance loads (bulb) are evaluated by the sensor as a short circuit.

Connection diagrams are listed in Figures 6, 7 and 8.

Connection using connector socket shows in Figure 9 and 10.

Sensors CPK-HF-35 with type of cable outlet A, B, V, D or H are connected to assessing units permanently connected by PVC cable. Design diagrams are provided in images 6, 7 and 8.

Sensors CPK-HF-35 with connection method type C are connected to control units by means of a connector socket with compression cable (length 2 or 5 m), or by means of dismantable connector socket without cable (see accessories), connector socket is not part of the sensor. In this case the cable is connected to the inside pins of the socket according to Figure 9. The recommended diameter of this cable is 4 to 6 mm (the recommended cross-sectional area is 0.5 to 0.75 mm²).

The connection of the sensor to the connecting device is performed using a suitable three wire (variant N) cable.

In the event that dismantable connector sockets are used, the outer diameter of the cable is max. 6 mm.

A sensor with an NPN or PNP output can only be loaded with a resistive or inductive load.

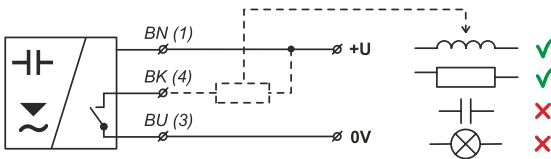


Fig. 6: Sensor connection with NPN output (N, NT version)

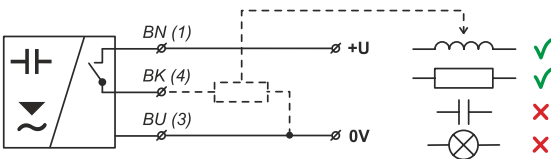


Fig. 7: Sensor wiring with PNP output (N, NT version)

Legend:

(1,...) – numbers of terminals inside the connector socket

BK – Black

BN – Brown

BU – Blue

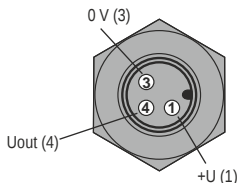


Fig. 9: Connecting the connector on the sensor

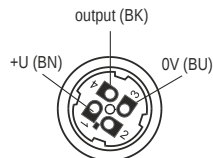


Fig. 10: Internal view of the connector socket



Electrical connection can only be made when de-energized!

The source of the power voltage must comprise of a stabilised safe low power source with galvanic separation. In the event that a switch-mode power supply is used, it is essential that its construction effectively suppresses common mode interference on the secondary side. In the event that the switch-mode power supply is equipped with a PE safety terminal, it must be unconditionally grounded!



In the event that the level meter (sensor) is installed in an outdoor environment at a distance greater than 20 m from the outdoor switchboard, or from an enclosed building, it is necessary to supplement the electrical cable leading to the level meter (sensor) with suitable overvoltage protection.

In the event of strong ambient electromagnetic interference, paralleling of conductors with power distribution, or for distribution to distances over 30 m, we recommend grounding the level meter (see above) and using a shielded cable.

7. Control elements

Settings are performed by placing the magnetic pen on the sensitive spot marked “+” or “-” located at the end of the sensor in two modes:

1. Quick settings - the user does not know precisely to what medium the sensor should be set, he only wants to put the sensor into operation (usually upon receiving it) and check to see if the sensor is generally functional
2. Basic settings - the user has the medium available and can perform on the sensor its flooding and drainage
3. Medium window settings - the user has the medium available and can perform on the sensor its flooding and drainage

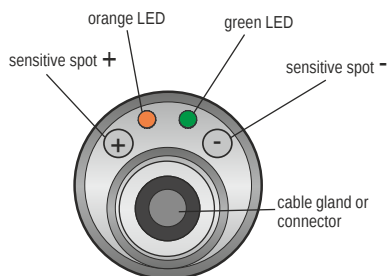



Fig. 10: Top view of sensor control elements

8. Settings


8.1. Quick settings

This function can be used for quick setting of the sensor, or in case it is not possible (or is very complicated) to change the level of the medium for setting the sensor. Suitable also before putting into operation.

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

1. The tank is empty or the level of measured medium in the tank is in a state where the sensor electrode is no longer submerged.
2. Place the magnetic pen for **at least 5 seconds*** on the sensitive spot  of the sensor (first both LEDs illuminate, after approx. 3 seconds the orange LED will flash 3 times, and after another approx. 2 seconds the orange LED flashes again 3 times - now you can remove the magnetic pen). The sensor is now set to the mode O (it is closed when submerged).

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

1. The tank is empty or the level of measured medium in the tank is in a state where the sensor electrode is no longer submerged.
2. Place the magnetic pen for **at least 5 seconds*** on the sensitive spot  of the sensor (first both LEDs illuminate, after approx. 3 seconds the orange LED will flash 3 times, and after another approx. 2 seconds the orange LED flashes again 3 times - now you can remove the magnetic pen). The sensor is now set to the mode C (it is open when submerged).



If no other agreement the mode "O" is set on all sensors straight from the factory.



When using the function "Quick settings", the sensor does not eliminate the presence of deposits and foam on the electrode.



The manufacturer recommends performing Basic Settings as soon as possible.

*) Maximum 10 seconds.



8.2. BASIC SETTINGS

For setting the sensitivity and switching mode, where it is possible 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.

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 sensor electrode would be covered.
2. 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 sensor electrode 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 whether 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 sensor electrode would be covered.
2. 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 sensor electrode 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. Settings are confirmed by three flashes of the orange LED.
5. Check the state of indicators:
 - 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 whether the minimum and maximum levels are not set too close to one another and possible repeat the settings.




For safety reasons, we recommend setting the mode "O" for 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 maximum level it is recommended to set the mode "C" (the sensor is open upon immersion).

**) Maximum 4 seconds.

8.3. SETTINGS „Medium window“ - media differentiation function

To set the sensitivity and switching mode for the required medium. With this setting, the sensor does not react to being submerged in a medium with a different permittivity.

a) Setting the mode O (i.e. when submerged in the required medium, the sensor is closed)


1. Bring the level of the measured medium in the tank to a state so that the sensor electrode would be covered.
2. Place the magnetic pen for **at least 10 seconds** on the sensitive spot  sensor LEDs are lit, after approx. 3 seconds the orange LED will flash 3 times, and after another approx. 2 seconds the orange LED flashes again 3 times, and after another 5 s the orange LED flashes again 3 times - now the magnetic pen can be removed).

The sensor is now set to mode O (it is unswitched when submerged in the required medium).

3. Check the state of indicators:

- If the orange LED is not illuminated and the green LED is flashing, the sensor is correctly set.

b) Setting the mode C (i.e. when submerged in the required medium, the sensor is open)

1. Bring the level of the measured medium in the tank to a state so that the sensor electrode would be covered
2. Place the magnetic pen for **at least 10 seconds** on the sensitive spot  sensor (first both LEDs are lit, after approx. 3 seconds the orange LED will flash 3 times, and after another approx. 2 seconds the orange LED flashes again 3 times, and after another 5 seconds the orange LED flashes again 3 times - now the magnetic pen can be removed).

The sensor is now set to mode C (it is unswitched when submerged in the required medium).

3. Check the state of indicators:

- If the orange LED is not illuminated and the green LED is flashing, the sensor is correctly set.

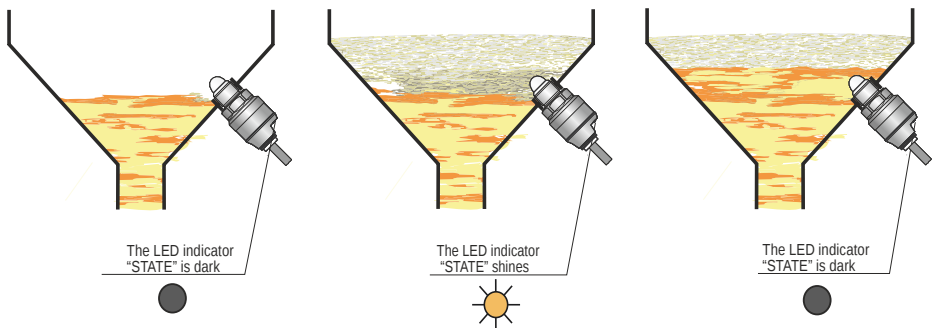
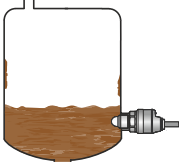

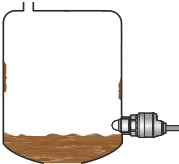

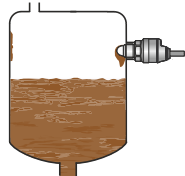

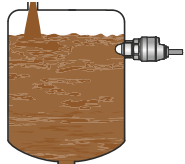



Fig 11: Mode "Medium window" - only detection of required medium (for example: only beer foam, beer and air are ignored)

9. Function and status indication

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	state indicator
minimum level sensing		O	CLOSED (in type N)	 (illuminated)
		O	OPEN (in type N)	 (not illuminated)
	level state	mode	output state	state indicator
maximum level sensing		C	CLOSED (in type N)	 (illuminated)
		C	OPEN (in type N)	 (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).

10. Sensor variant with output "PD" with Diagnostic

The sensor type CPK-HF-35_--PD has a diagnostic built in its firmware with which it monitors functional reliability. In order for the diagnostic to be active, i.e. the error notification to be indicated even if the control or output circuit is not functional, the microprocessor generates short pulses to the output signal, the so-called diagnostic pulses. Negative pulses are generated when the output is closed and positive pulses are generated when the output is open. This ensures faultless operation of all HW and SW components of the sensor.

10.1. Diagnostic modes

The diagnostic has one mode of error-free operation and three modes indicating a malfunction or incorrect setting.

10.1.1. Correct measurement

INDICATION: - **green** LED flashes (approx. 0.4 s)
 - **orange** LED: when the output is closed, the LED shines
 when the output is open, the LED is dark

OUTPUT: a 300 μ s wide pulse with a period of **30 ms** is generated into the output signal

SENSOR STATUS: the diagnostic does not indicate any problem, the measuring curve and the sensor settings are correct

10.1.2. Incorrect setting

INDICATION: alternating flashing **green and orange** LEDs

OUTPUT: a 300 μ s wide pulse with a period of **20 ms** is generated into the output signal

SENSOR STATUS: the measuring curve is OK, but the sensor setting is incorrect (decision levels are close to each other)

10.1.3. Incorrect measurement

INDICATION: - **green** LED is dark
 - **orange** LED: in the event of closed output the LED shines with periodic dimming (0.1 s)
 in the event of open output the LED is dark with periodic lighting up (0.1 s)

OUTPUT: a pulse with a width of 300 μ s with a period of **10 ms** is generated into the output signal

SENSOR STATUS: the sensor setting is OK, but the diagnostic indicates a problem with the measuring curve, which can be caused by a failure of any element of the sensor

10.1.4. Another failure of sensor

INDICATION: the state of both LEDs cannot be specified, as their function may be affected by a control circuit error

OUTPUT: the sensor does not generate any diagnostic pulses in the output signal

SENSOR STATUS: either it is a fault in the control circuit or a failure in the output part of the electrical circuit and these faults can be diagnosed only by a special version of the SSU-1212-D

10.2. Evaluation unit

A special unit SSU-1212-D is designed for the evaluation of diagnostic modes, which can evaluate the pulses generated by the sensor. It does not matter what state the sensor output is in (closed or open). Based on the period of the generated pulse, the unit determines in which diagnostic mode the sensor is and communicates information to the user.

10.3. Function and status indication with diagnostic

LED indicator	colour	function
"RUN"	green	<u>Measuring function indication</u> 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	<u>Settings indication</u> 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 periodic extinction (0,1 s) in closed mode - diagnosed function error periodic lighting (0,1 s) in open mode - diagnosed function error

11. Order code

CPK-HF-35N - - - - - K

cable length in [m]

connection method:

- A** : stainless steel compression gland (+ cable length)
- B** : plastic threaded cable gland (+ cable length)
- C** : connector (socket not included with sensor, recommended type see: accessories)
- D** : nickel-plated brass threaded cable gland (+ cable length)
- V** : plastic cable gland with spiral (+ cable length)
- H** : plastic cable gland for protective hose (+ cable length)

type of output:

- N** : NPN (open collector)
- P** : PNP (open collector)
- PD** : PNP (open collector) with diagnostic

process connection:

- G1/2** : pipe thread G ½"
- G3/4** : pipe thread G ¾", not for 11B, 11E, 11V and 21
- M27** : metric thread M27 x 2, not for 11B, 11E, 11V and 21
- CI34** : Tri-clamp (ø 34 mm), only for 2
- CI50** : Tri-clamp (ø 50,5 mm), only for 2

type of electrode:

- 1B** : insulated electrode (PEEK, O-ring NBR), not for process connection CI34, CI50
- 11B** : insulated electrode (PEEK, O-ring NBR) - extended version, not for process connection G¾, M27, CI34, CI50
- 1E** : insulated electrode (PEEK, O-ring EPDM), not for process connection CI34, CI50
- 11E** : insulated electrode (PEEK, O-ring EPDM) - extended version, not for process connection G¾, M27, CI34, CI50
- 1V** : insulated electrode (PEEK, O-ring Viton), not for process connection CI34, CI50
- 11V** : insulated electrode (PEEK, O-ring Viton) - extended version, not for process connection G¾, M27, CI34, CI50
- 2** : insulated electrode (PTFE, without O-ring)
- 21** : insulated electrode (PTFE, without O-ring) - extended version, not for process connection G¾, M27, CI34, CI50

12. Correct specification examples

CPK-HF-35N-2-CI50-P-B-K5

(2) insulated electrode (PTFE, without O-ring); (**CI50**) Tri-clamp (ø 50,5 mm) process connection; (**P**) PNP (open collector) output; (**B**) plastic threaded cable gland; (**K5**) cable length 5 m.

13. Accessories

standard – included in the sensor price

- 1 pcs. magnetic pen
- 1 pcs. seal (asbestos free)

optional – for a surcharge

(see catalogue sheet of accessories)

- cable (over the standard length 2m)
- connector socket (type ELWIKA or ELKA)
- standard steel welding flange or stainless steel welding flange
- protective hose (for type of cable outlet H)
- stainless steel fixing nut
- various types of seals (PTFE, Al, etc.)

14. Safety, protections, compatibility

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 according to 33 2000-4-41. Electromagnetic compatibility is provided by conformity with standards EN 55011 / B, EN 61000-4-2 to -6 and -8.

A declaration of conformity was issued for this device in the wording of Act No. 90/2016 Coll., as amended. Supplied electrical equipment matches the requirements of valid European directives for safety and electromagnetic compatibility.

15. Functional safety

The high-frequency level sensors CPK-HF-35 meet the safety integrity level requirements according to standard EN 61508. The sensors are intended for level height detection applications of liquid and pasty media with increased safety demands in modes:

- Overfill protection
- Dry run protection

In both modes, the sensors meet the requirements for functional safety at level SIL 2.

The sensor electronics have 1oo1 architecture (according to the output variant single-channel - without P (R) diagnostics, or single-channel with PD diagnostics).

It is recommended to perform a function test of the sensor's safety function 1 per year.

16. Use, manipulation and maintenance

The level meter does not require any personnel for its operation. Maintenance of this equipment consists in verification of integrity of the level meter and of the supply cable.



It is forbidden to make any changes or interventions to the CPK-HF-35 sensor without the consent of the producer. Any repairs must only be carried out by the producer or authorized service organisations.

Assembly, installation, commissioning, service and maintenance of the CPK-HF-35 level sensor must be carried out in accordance with this manual and the provisions of valid standards for the installation of electrical equipment must be complied with.

Activity during the operation:

- If the sensor is connected to the automatic control system or to emergency signalling, it must not be infringed in its setting during the operation.
- If a change of the sensor settings is necessary, the whole system must be temporarily switched off and the process held in a safe condition using other means and measures.
- Signalling of failure conditions is described in chapter 9. *Function and status indication* or chapter 10.3. *Function and status indication with diagnostic*.

Activity in case of a failure:

- In the event of detected faults or fault signals, the whole system must be shut down and the process held in a safe condition using other means and measures.
- If the replacement of the sensor is needed due to the fault, it is necessary to notify the manufacturer (including a description of the fault).

Repairs of the sensors:

If you need to send the sensor for repair, proceed as follows:

- Remove and clean the sensor or perform its decontamination and wrap it well.
- Write a description of the fault as detailed as possible, attach also a detailed description of the application and of the installation location and everything together with the sensor send please to the manufacturer's address.
- Please provide maximum synergy in finding the root cause of the fault. Your satisfaction is our top priority!

17. Putting out of operation or disposal

Disassembly:

Before commencing disassembly, consider possible risks, such as for example pressure in the tank, high temperatures, corrosive properties or toxicity of products, etc.

Carefully read the product manual chapter "Installation instructions" and "Electrical connection" and perform the described steps in reverse sequence.

Disposal:

The high-frequency level sensors CPK-HF-35 are made from materials that can be recycled by specialised companies. Mark the device as waste and dispose of it according to the respective government directive for handling electronic waste. Materials: see "Technical specifications".

18. General, conditions and warranty

Manufacturer guarantees for the period of three (3) years that the product has the characteristics as mentioned in the technical specification.

Manufacturer is liable for defects ascertained within the warranty period and were claimed in writing.

This guarantee does not cover the damages resulting from misuse, improper installation or incorrect maintenance.

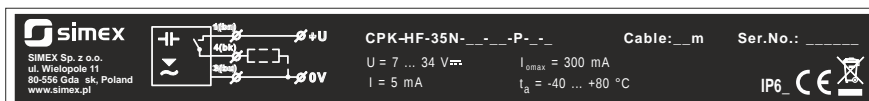
This guarantee ceases when the user or the other person makes any changes on the product or the product is mechanically or chemically damaged, or the serial number is not readable.

The warranty certificate must be presented to exercise a claim.

In the case of a rightful complaint, we will replace the product or its defective part. In both cases, the warranty period is extended by the period of repair.

19. Marking of labels

Labels for device of the type **CPK-HF-35N-__-__-P-__-__**



Symbol of producer: logo and contact address

Connection scheme and labelling of wires: +U, 0V

Level meter type: CPK-HF-35N-__-__-P-__-__

Cable length: Cable: __ m

Serial number: Ser. No.: _____ – (from the left: production year, serial production number)

Supply voltage: $U = 7 \dots 34 \text{ V DC}$

Supply current: $I = 5 \text{ mA}$

Maximum output current: $I_{omax} = 300 \text{ mA}$

Ambient temperature range: $t_a = -40 \dots +80^\circ\text{C}$

Protection class: IP6_ (Protection class according to electrical connection)

Compliance mark: **CE**

Electro-waste take-back system mark:

20. Technical specifications

Basic technical data		
Supply voltage		7 ... 34 V DC
Power consumption		max. 5 mA DC
Max. switching current (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 ... +80 °C
Protection class	type CPK-HF-35_ _ _C- _ _	IP 67
	type CPK-HF-35_ _ _A(B,V,H,D)- _ _	IP 68
Cable (versions with cable outlets)	Variant (P, N)	PVC 3 x 0,5 mm ²
Weight (without cable)		cca 0,15 kg

Used materials		
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	type el. 1, 11 type el. 2, 21	PEEK PTFE
Sealing O-ring	CPK-HF-35_-1B, 11B CPK-HF-35_-1E, 11E CPK-HF-35_-1V, 11V CPK-HF-35_-2, 21	NBR EPDM (FPM) Viton –
Cable gland (variant "A")		stainless steel W.Nr. 1.4571 / NBR
Cable gland (variant "B", "V", "H")		plastic PA / NBR
Cable gland (variant „D“)		nickel-plated brass / PA / CR / NBR
Connector M12 (variant "C")		nickel-plated brass / PA

* Verify chemical compatibility with the media. Upon agreement it is possible to select a different type of material.

Parameters of functional safety		
variant of sensor	CPK-HF-35_ _ _-P(R)	CPK-HF-35N_ _ _-PD
according to standard	EN 61508 ed.2	
Safety function	MIN, MAX	
Hardware architecture	1oo1 without diagnostic	1oo1 with diagnostic
DC	0 %	99 %
PFH ($T_{Proof} = 1 \text{ rok}$)	$2,218 * 10^{-7}$	$2,218 * 10^{-9}$
DD	0 FIT	219,6 FIT
DU	221,8 FIT	2,2 FIT
MTTF _D	514 years	
valid version FW	v2	v3-diagnostic

Explanations:

DCDiagnostic cover

PFH Average frequency of dangerous failure per hour

T_{Proof} Functional control period of the device safety function

$DD(DU)$ Detected (resp. undetected) dangerous failure rate per hour

MTTF_D Mean Time To dangerous Failure

Process connection		
type	size	marking
Pipe thread	G 1/2"	G1/2
Pipe thread	G 3/4"	G3/4
Metric thread	M27x2	M27
Jointless connection (Tri-Clamp) *	ø 34 mm ø 50,5 mm	CI34 CI50

* only for type electrode 2

Type of output
Output
NPN (N)
PNP (PC; PO)

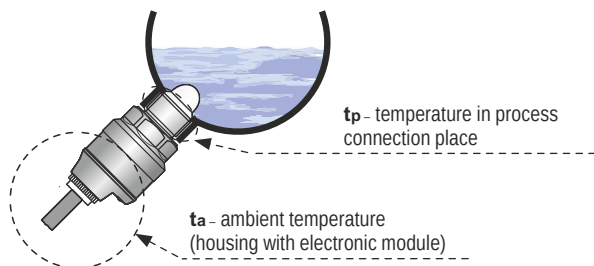
Device classification	
Sensor performance	Device classification and their use in atmosphere
CPK-HF-35N	Basic performance
	For non-explosive atmosphere

Factory settings

switching mode	O (switches on when flooded)
sensitivity	for water sensing

Temperature and pressure durability

design variant	temperature t_p	temperature t_a	maximum overpressure	temperature t_p at $t_a < 50^\circ\text{C}$ and $t < 1\text{h}$
CPK-HF-35N-1B (1E, 11B, 11E)	$-40^\circ\text{C} \dots +105^\circ\text{C}$	$-40^\circ\text{C} \dots +80^\circ\text{C}$	10 MPa	max. 120°C
CPK-HF-35N-2 (21)	$-40^\circ\text{C} \dots +105^\circ\text{C}$	$-40^\circ\text{C} \dots +80^\circ\text{C}$	5 MPa to 50°C 2,5 MPa over 50°C	max. 120°C
CPK-HF-35N-1V (11V)	$-20^\circ\text{C} \dots +105^\circ\text{C}$	$-40^\circ\text{C} \dots +80^\circ\text{C}$	10 MPa	max. 120°C



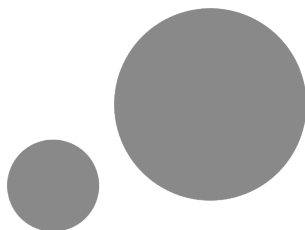
21. Packings, shipping and storage

The device CPK-HF-35 is packaged in a polyethylene bag, and the entire consignment is placed into a cardboard box. A suitable filler material is used in the cardboard box to prevent mechanical damage during transport. Remove the device from the packaging only just before using, thereby protecting it from potential damage.

A forwarding company will be used to ship goods to the customer. Upon prior agreement, ordered goods can be picked up in person at company headquarters. When receiving, please check to see that the consignment is complete and matches the order, or to see if any damage has occurred to the packaging and device during transport. Do not use a device clearly damaged during transport, but rather contact the manufacturer in order to resolve the situation.

If the device is to be further shipped, it must be wrapped in its original packaging and protected against impact and weather conditions.

Store the device in its original packaging in dry areas covered from weather conditions, with humidity of up to 85% without effects of chemically active substances. The storage temperature range is -10°C to $+50^\circ\text{C}$.



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