

CPK-HF-35

- high-frequency limit level sensors
- elimination of buildups and foam on the electrode
- designed for reliable limit sensing of the level height of wide-ranging fluids, mashed and paste like materials
- resistant to adhesion of viscous and sticky media
- replacement of a vibrating level sensor
- unique material type recognition function „Medium window“
- direct mounting into tanks, vessels, sumps, pipes or funnels and containers
- settings using the magnetic pen
- high stability at high sensitivity (possible to use for substances with $\epsilon_r \geq 1.5$)



The high-frequency level sensor **CPK-HF-35** is designed for industrial use for limit sensing of the level of liquid and paste-like 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.

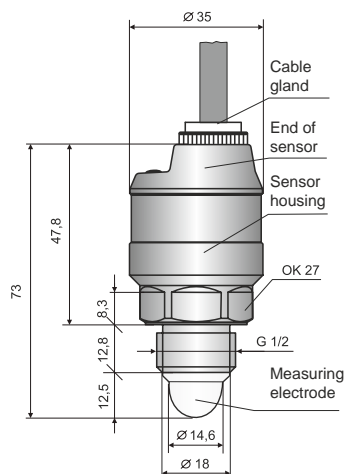
The sensor is made from a stainless steel housing at one end terminated by a sensing electrode, and terminated at the other end by an ending with a status indicator, control elements and electrical connection.

VARIANTS OF LEVEL SENSORS

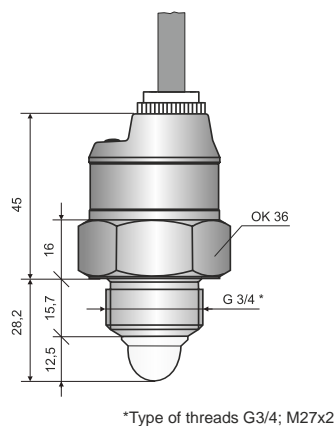
| | |
|-----------------------|--|
| CPK-HF-35N-1B | Insulated electrode (PEEK) with sealing O-ring NBR, for sensing various liquid, mashed and paste-like materials, appropriate also for fuel, oil or methanol, use from minimum temperature of -40°C. |
| CPK-HF-35N-11B | Insulated electrode (PEEK) extended 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-35N-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, from minimum temperature of -40°C. |
| CPK-HF-35N-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, from minimum temperature of -40°C |
| CPK-HF-35N-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-35N-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-35N-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-35N-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. |

DIMENSION DRAWINGS

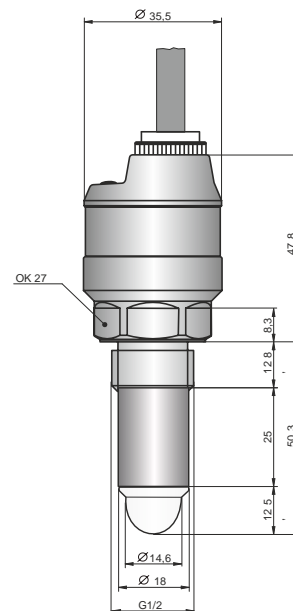
CPK-HF-35_-1-G1/2



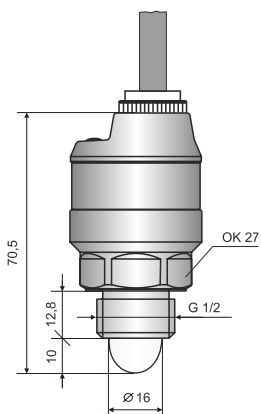
CPK-HF-35_-1-G3/4



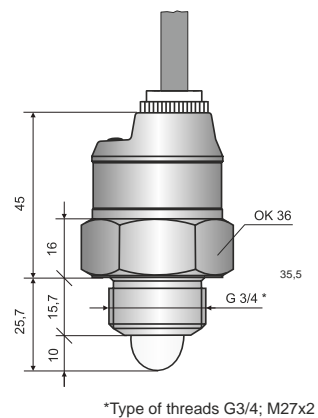
CPK-HF-35_-11-G1/2



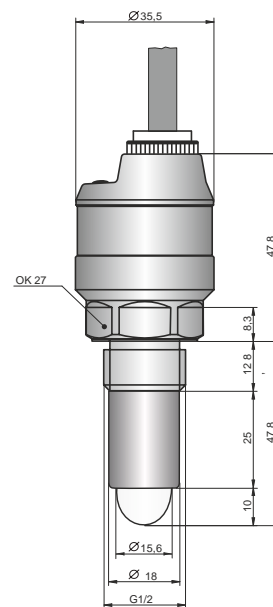
CPK-HF-35_-2-G1/2



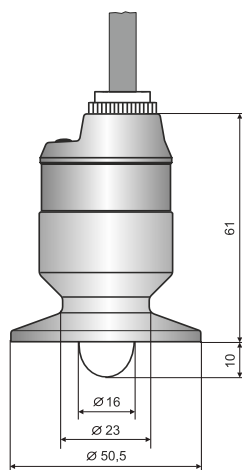
CPK-HF-35_-2-G3/4



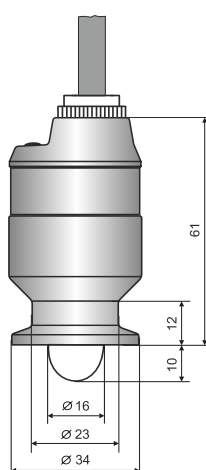
CPK-HF-35_-21-G1/2



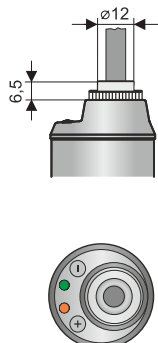
CPK-HF-35_-2-CI50
(Tri-clamp)



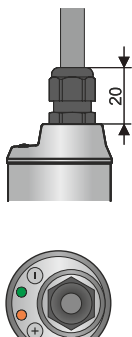
CPK-HF-35_-2-CI34
(Tri-clamp)



Variant "A" with short stainless steel gland



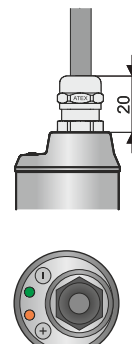
Variant "B" with plastic threaded cable gland



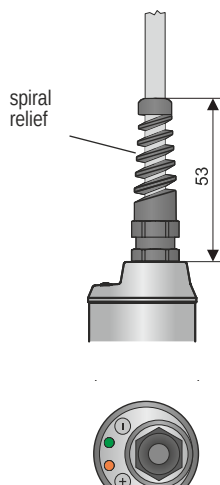
Variant "C" with connector M12



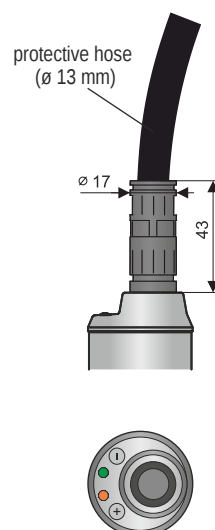
Variant "D" with dustproof cable outlet



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

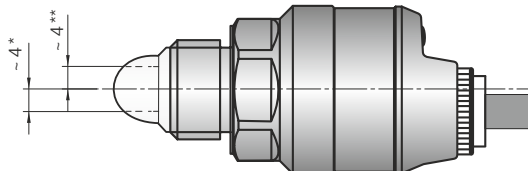


Variant "H" with cable gland for protected hoses – for using in an outdoor area or in area with increased moisture.



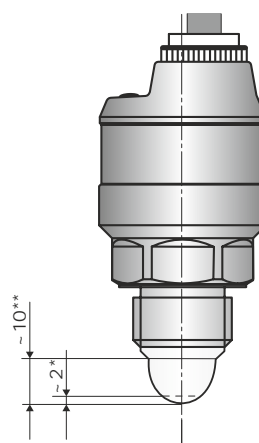
Sensor switching levels

horizontal mounting



* Typical switch point position for water (factory setting).
** Typical switch point position for oil.

vertical mounting



| 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 |
| Output | | PNP (PC; PO) |
| Cable (versions with cable outlets) | | 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 | PEEK |
| | type el. 2, 21 | PTFE |
| Sealing O-ring | CPK-HF-35_-1B, 11B | NBR |
| | CPK-HF-35_-1E, 11E | EPDM |
| | CPK-HF-35_-1V, 11V | (FPM) Viton |
| | CPK-HF-35_-2, 21 | – |
| 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.

| 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 | CI34 |
| | ø 50,5 mm | CI50 |

* only for type electrode 2

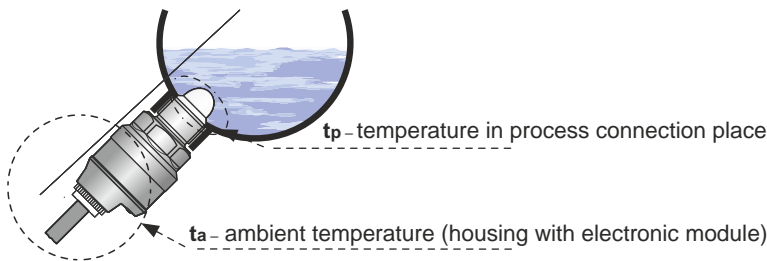
| Parameters of functional safety | | |
|-----------------------------------|--------------------------|--------------------------|
| variant of sensor | CPK-HF-35N-_-_-P | CPK-HF-35N-_-_-PD |
| according to standard | EN 61508 ed.2 | |
| Safety function | MIN, MAX | |
| Hardware architecture | 1oo1 without diagnostic | 1oo1 with diagnostic |
| DC | 0 % | 99 % |
| PFH (T _{Proof} = 1 year) | 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:

- DC** Diagnostic 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





| Temperature and pressure durability | | | | |
|-------------------------------------|------------------|-----------------|------------------------------------|---------------------------------------|
| design variant | temperature tp | temperature ta | maximum overpressure | temperature tp for ta <50°C and t <1h |
| CPK-HF-35N-1B (1E, 11B, 11E) | -40°C ... +105°C | -40°C ... +80°C | 10 MPa | max. 120 °C |
| CPK-HF-35N-1V (11V) | -20°C ... +105°C | -40°C ... +80°C | 10 MPa | max. 120 °C |
| CPK-HF-35N-2 (21) | -40°C ... +105°C | -40°C ... +80°C | 5 MPa to 50°C 2,5 MPa over 50°C | max. 120 °C |

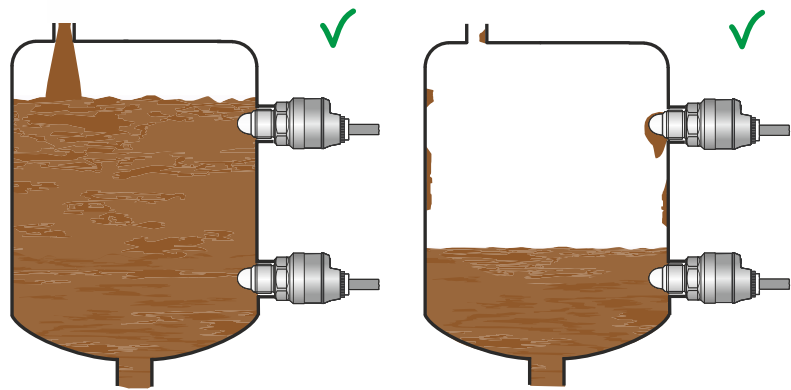


INSTALLATION INSTRUCTIONS

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). This guarantee ceases when the product is chemically damaged.

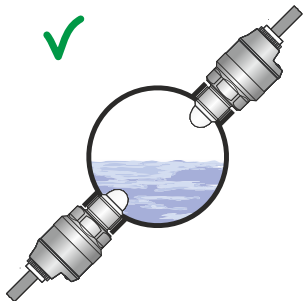
Thanks to its design, the sensor is appropriate for detection of the level of **viscous and simultaneously electrically conductive media** (yoghurt, jams and jellies, mayonnaise, spreads, liquid soap, creams or pastes). After setting the sensitivity of the given media, it reliably reacts to the presence 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.



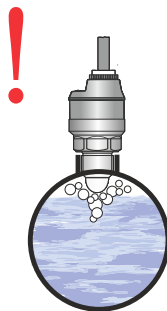
Side installation of sensors into a tank with viscous medium



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

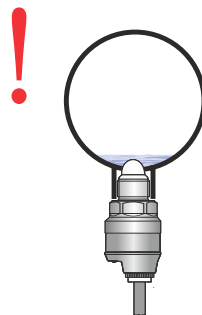


Upon vertical installation of the sensor in a pipe, pay attention to potential formation of air pockets,

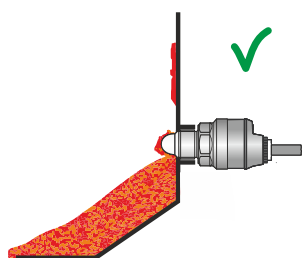


Installation of the sensor in a pipe

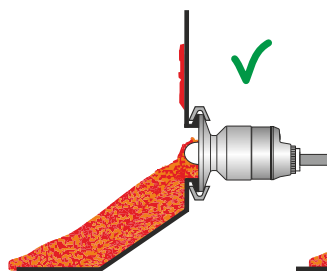
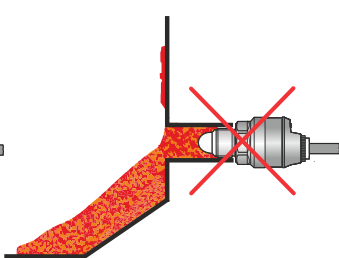
or adhering remnants of liquid at the bottom of the pipe.



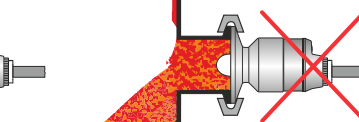
In the case of **side wall mounting** it is necessary to avoid long fitting tubes, where sensed medium could remain. We recommend mounting the sensor so that the whole measuring electrode is inside the tank.



Correct and incorrect installation with a long tube

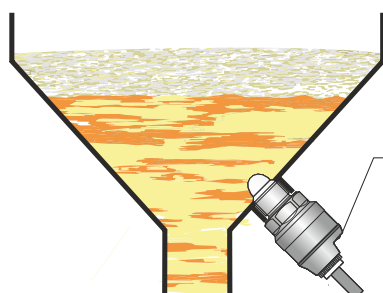


Correct and incorrect installation with a long tube for process connection with Tri-Clamp

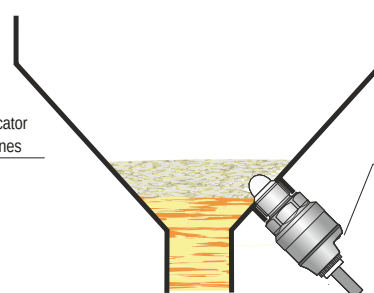


Small Tri-clamp (ø 34 mm), only for liquids with low viscosity.

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.



The LED indicator "STATE" shines

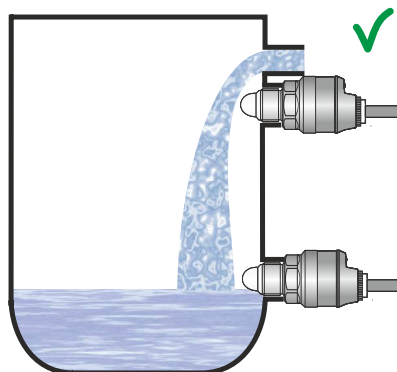


The LED indicator "STATE" is dark



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.



Option of mounting the sensor in the medium inlet

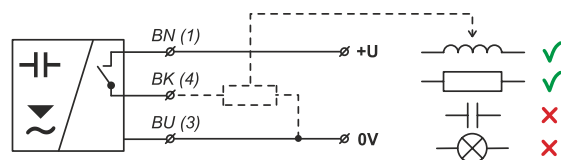
ELECTRICAL CONNECTION

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.

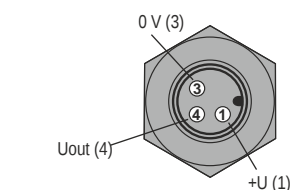
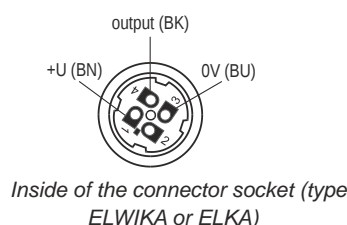
Connection diagrams are listed in figures below. Sensors CPK-HF-35 with type of cable outlet A, B, V, D or H are connected to assessing units permanently connected by PVC cable.

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



PNP output type sensor connection



Connection of the connector socket on sensor

Legend:
(1,...) - numbers of terminals inside the connector socket
BK - black
BN - brown
BU - blue



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!



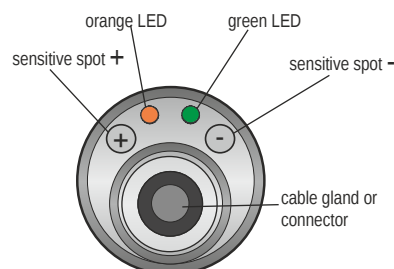
In the event that the level meter (sensor) is installed in an outdoor environment at a distance greater than 20 m from the outdoor switchboard, or from an enclosed building, it is necessary to supplement the electrical cable leading to the level meter (sensor) with suitable overvoltage protection.

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.

SETTINGS

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

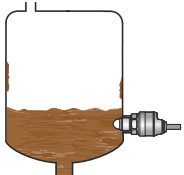

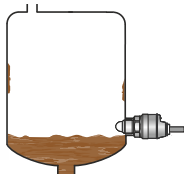



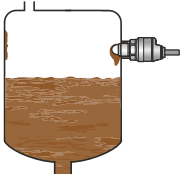

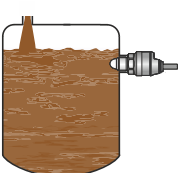

Top view of sensor control elements

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 periodic extinction (0,1 s) in closed mode - diagnosed function error periodic lighting (0,1 s) in open mode - diagnosed function error |

*) Function accessible for variant PD (electronic with diagnostic).

| | level state | mode | output state | state indicator |
|-----------------------|---|------|--------------|--|
| minimum level sensing |  | O | CLOSED |  (illuminated) |
| |  | O | OPEN |  (not illuminated) |

| | level state | mode | output state | state 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).



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:

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

process connection:

- G1/2** : pipe thread G 1/2"
- G3/4** : pipe thread G 3/4", not for 11B, 11E, 11V and 21
- M27** : metric thread M27x2, 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 G3/4, 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 G3/4, 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 G3/4, M27, CI34, CI50
- 2** : insulated electrode (PTFE, without O-ring)
- 21** : insulated electrode (PTFE, without O-ring) - extended version, not for process connection G3/4, M27, CI34, CI50

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.

ACCESSORIES

standard - included in the sensor price

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

optional - for a surcharge

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



SAFETY, PROTECTIONS AND 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.

FUNCTIONAL SAFETY

CPK-HF-35 high-frequency level sensors meet the requirements of the safety integrity level according to the EN 61508 series of standards. The sensors are designed for liquid level detection applications with higher safety requirements:

- Overfill protection mode
- Anti-idle protection mode

The sensor electronics have a 1oo1 architecture (single channel without P diagnostics or single channel with PD diagnostics depending on the output variant).

It is recommended to perform a functional safety function check of the sensor once a year.

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.

Activity in tra c:

- If the sensor is connected to an automatic control system or an emergency alarm system, its settings must not be interfered with during operation.
- If it is necessary to change the sensor settings, the entire system must be temporarily shut down and the process kept in a safe state by other means and measures.
- The signalling of fault conditions is described in the chapters.
- Signalling conditions or signalling sensor conditions with diagnostics.

Action in the event of a fault:

- In the event of detected faults or fault signals, the entire system must be shut down and the process held in a safe state by other means and measures.
- If, as a result of a fault, sensor replacement is required, the manufacturer must be notified (including a description of the fault).

