



HIGH-FREQUENCY LIMIT LEVEL SENSOR RFLS-35

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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 set-up of the sensor can lead to crashes in the application, (overfilling of the tank or damage of 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

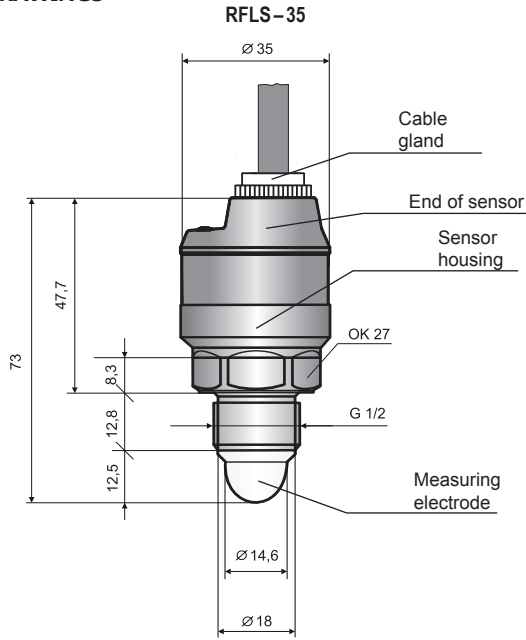
1. BRIEF DESCRIPTION OF SENSOR

The **high-frequency level sensor RFLS-35** is designed for industrial use for limit sensing of the level of fluid 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. The sensor is comprised of a stainless steel housing at one end terminated by a sensing electrode, and terminated at the other end by an ending with status indicator, control elements and electrical connection. It is mainly designed for mounting into the wall of a tank or pipe, in which the actual ascertaining 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).

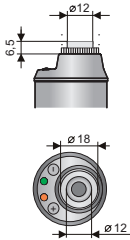
2. VARIANTS OF SENSORS

- RFLS-35_-1B** Insulated electrode (PEEK) with sealing O-ring NBR, for sensing various fluids, mashed and paste-like materials, appropriate also for fuel, oil or methanol, use from minimum temperature of -40°C
- RFLS-35_-1E** Insulated electrode (PEEK) with sealing O-ring EPDM, for sensing various fluids, mashed and paste-like materials, appropriate also for acids, bases or alcohol, ammonia, acetone, chlorine, from minimum temperature of -40°C
- RFLS-35_-1V** Insulated electrode (PEEK) with sealing O-ring Viton, for sensing various fluids, mashed and paste-like materials, appropriate also for fuel, oil, acids, bases or asphalt, tar, toluene, use from minimum temperature of -20°C

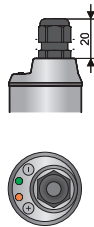
3. DIMENSIONAL DRAWINGS



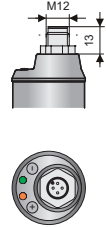
Design "A" with short stainless steel gland



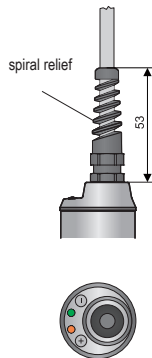
Design "B" with plastic threaded cable gland



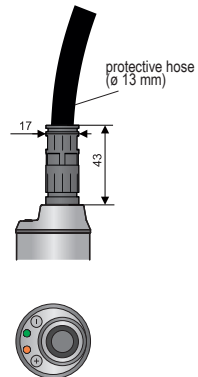
Design "C" with connector M12



Design "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.



4. MOUNTING RECOMMENDATIONS

RFLS 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 affixing 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 reading of an aggressive medium, we recommend that the producer be consulted.

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

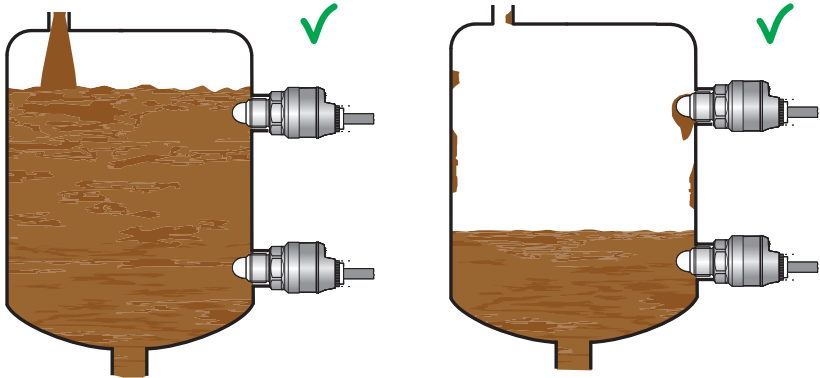


Image 1: Side installation of sensors into a tank with viscous medium

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 fluid at the bottom of the pipe.

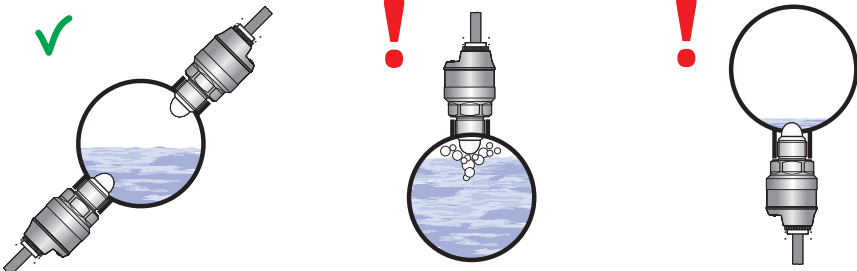


Image 2: Installation of the sensor in a pipe

In the case of **side wall mounting**, it is necessary to avoid long fitting tubes, where sensed medium could remain (image 3 on the right). We recommend mounting the sensor so that the whole measuring electrode is inside the tank (image 3 on the left).

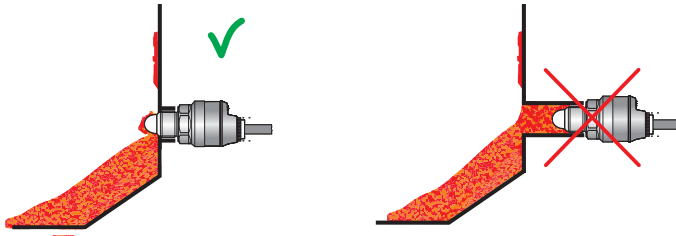


Image 3: Correct and incorrect installation with a long tube

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

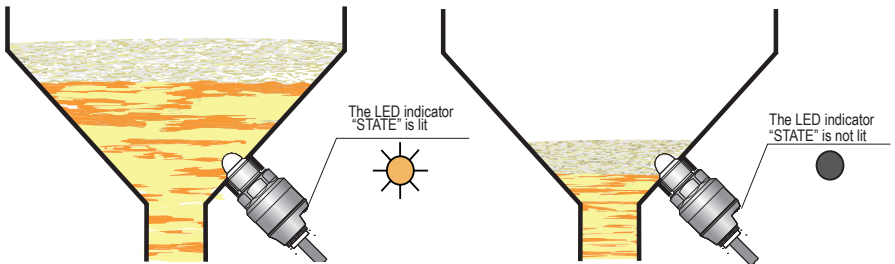


Image 4: Monitoring the level of foam media

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.

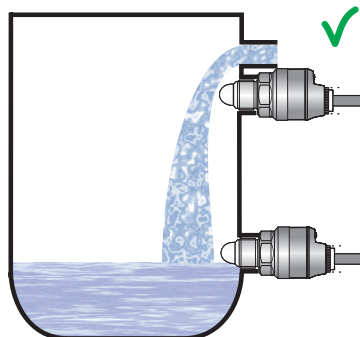


Image 5: Option of mounting the sensor in the medium inlet

5. ELECTRICAL CONNECTION

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 (0V) 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 and 7.

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

Sensors RFLS-35 with connection method type C (see page 4) 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 Figure 8. The recommended diameter of this cable is 4 to 6 mm (the recommended cross-sectional area is 0.5 to 0.75 mm²).

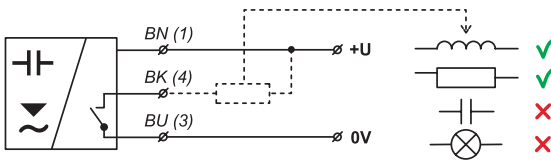


Image 6: NPN output type sensor connection

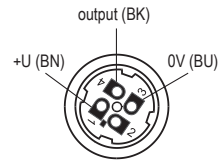


Image 8: Inside of the connector socket

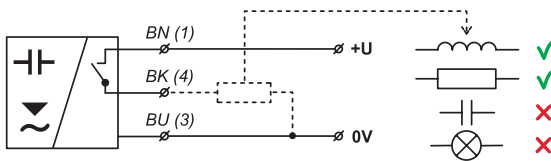


Image 7: PNP output type sensor connection

Legend:

- (1,...) – numbers of terminals inside the connector socket
- BK – Black
- BN – Brown
- BU – Blue



Electrical connection can only be made when de-energized!

For switching supply sources, it is necessary to check that the input is galvanically separated from the network side and that they are fitted with a filter suppressing the conforming interference (terminals + a – collectively oscillate against ground potential), or the interference is removed in another manner.



In case of strong ambient electromagnetic interference, paralleling of conductors with power distribution, or for distribution to distances over 30 m, we recommend using shielded cable.

6. SENSOR 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. Presets - 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

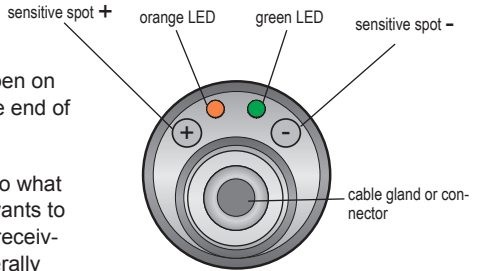


Image 9: Top view of sensor control elements

1. PRESETS

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 s 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 s 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 Presets, 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.

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. 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 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.

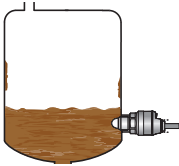

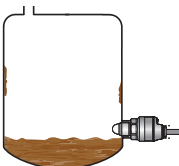



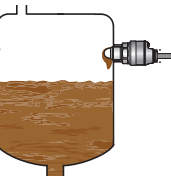

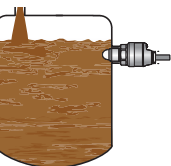

For safety reasons, we recommend setting the mode "O" for level sensing (the sensor is closed upon immersion). It is for failure safety reasons – eventual failure of sensor behaves similarly as an exceeding of the limit state. Analogically, for the maximum level it is recommended to set the mode "C"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

***) Maximum 4 seconds.*

7. FUNCTION AND STATUS SIGNALIZATION

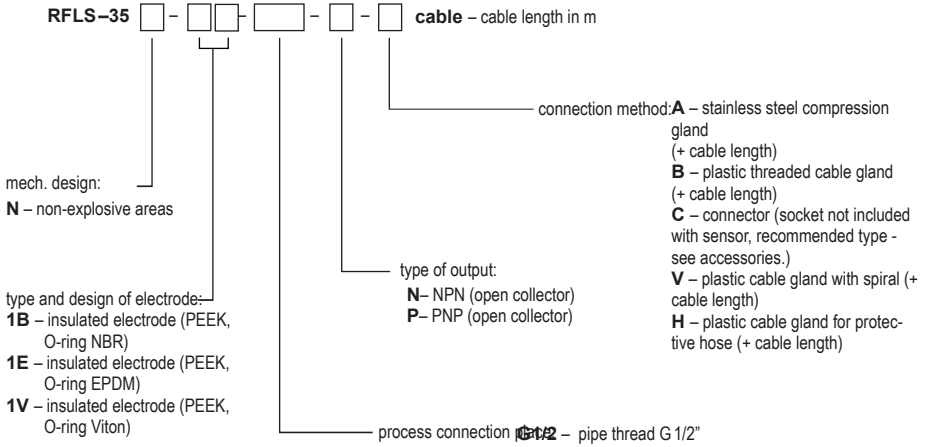
| LED indicator | colour | function |
|---------------|--------|--|
| "RUN" | green | <p>Measuring function indication</p> <p>flashing – (approx. 0.4 s) – correct function of level detection</p> <p>dark – incorrect installation or malfunction.</p> <p>alternating flashing of the green and orange LED –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

| | 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).

8. ORDER CODE



9. CORRECT SPECIFICATION EXAMPLES

RFLS-35N-1B-G1/2-N-B cable 5m

(N) designed for normal areas; (1B) insulated electrode with O-ring NBR, (G1/2) process connection place by thread G1/2"; (N) output type NPN ; (B) plastic cable gland;

RFLS-35N-1E-G1/2-P-C

(N) designed for normal areas; (1) insulated electrode with O-ring EPDM, (G1/2) process connection place by thread G1/2"; (P) output type PNP; (C) connector;

10. ACCESSORIES

standard – included in sensor price

- 1pcs. magnetic pen MP-8
- 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, AI, etc.)

11. 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 according to ČSN 33 2000-4-41. Electromagnetic compatibility is provided by conformity with standards EN 55022/B, EN 61326-1, EN 61000-4-2, -3, -4, -5 and -6.

A declaration of conformity was issued for this device in the wording of Act No. 22/1997 Coll., as amended. Supplied electrical equipment matches the requirements of valid European directives for safety and electromagnetic compatibility.

12. 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 RFLS-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 RFLS-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.

13. GENERAL CONDITIONS AND WARRANTY

Dinel, s.r.o. guarantees for the period of three (3) years that the product has the characteristics as mentioned in the technical specification.

Dinel, s.r.o. 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.

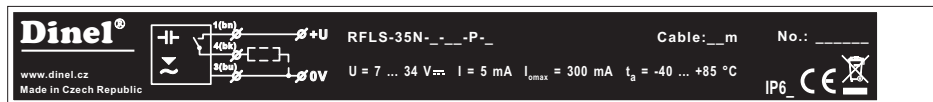
This guarantee ceases when the user or the other person makes any changes on the product or the product is mechanically or chemically damaged, or the serial number is not readable.

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.

14. MARKING OF LABELS

Labels for device of the type RFLS-35N-_-_-P-_-



Symbol of producer: logo Dinel

Internet address: www.dinel.cz

Country of origin: Made in Czech Republic

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

type of level meter: RFLS-35N-_-_-P-_-

electrode length: E _____

cable length: Cable: __ m

product serial number: No.: _____ - (from left: year of manufacture, serial number)

supply voltage range: U = 7 ... 34 mA

supply current: I = 5 mA

maximum output current: I_{max} = 300 mA

ambient temperature range: t_a = -40 ... +85°C

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

compliance mark: **CE**

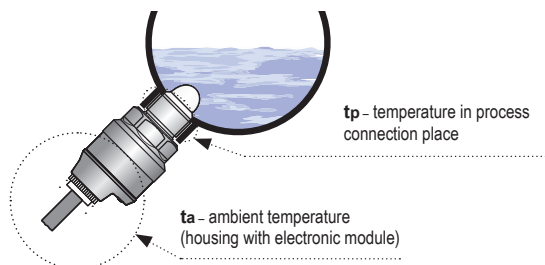
electro-waste take-back system mark:

15. SPECIFICATIONS

| 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 | type DLS-35-_-_-C-_- type DLS-35-_-_-A(B,V,H)-_- |
| Cable (versions with cable outlets) | PVC 3 x 0.5 mm ² |
| Weight (without cable) | approx. 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 | PEEK |
| Sealing O-ring RFLS-35_-1B RFLS-35_-1E RFLS-35_-1V | NBR EPDM Viton |
| Cable gland (design "A") | stainless steel W.Nr. 1.4571 / NBR |
| Cable gland (design "B", "V", "H") | plastic PA / NBR |
| Connector M12 (design "C") | nickel-plated brass / PA |

| TEMPERATURE AND PRESSURE DURABILITY – designs 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 |
| RFLS-35-1B (1E) | -40°C ... +105°C | -40°C ... +85°C | 10 MPa | 10 MPa | – |
| RFLS-35-1V | -20°C ... +105°C | -40°C ... +85°C | 10 MPa | 10 MPa | – |



16. PACKAGING, SHIPPING AND STORAGE

The device RFLS–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°C.

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version: 1/2016



QMS
ISO 9001

