TFS.CS-25

APLISENS

PRESSURE TRANSDUCERS
AND MEASURING EQUIPMENT MANUFACTURER

TECHNO-FUNCTIONAL

SPECIFICATION

FUEL LEVEL PROBE
TYPE **CS-25**

WARSAW, JUNE 2009

APLISENS S.A., 03-192 Warszawa, ul. Morelowa 7
tel. (022) 814-07-77 fax. (022) 814-07-78,
www.aplisens.pl, e-mail: aplisens@aplisens.pl

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THE MANUFACTURER RESERVES A RIGHT TO MAKE MODIFICATIONS (NOT DETRIMENTAL TO USAGE OR METROLOGICAL PARAMETERS OF THE DEVICE) WITHOUT UPDATING THE CONTENTS OF THIS TECHNO–FUNCTIONAL SPECIFICATION.

1. TECHNICAL SPECIFICATION

1.1. Function.

The CS-25 Fuel level probe is used to measure fuel level in the tanks of motor vehicles, working-machines and locomotives. The probes are officially certified by the Ministry of Transport.

Certificate number:

- E20 10R-02 2086 for CS-25/I, CS-25/U
- E20 10R-02 2085 for CS-25/RS

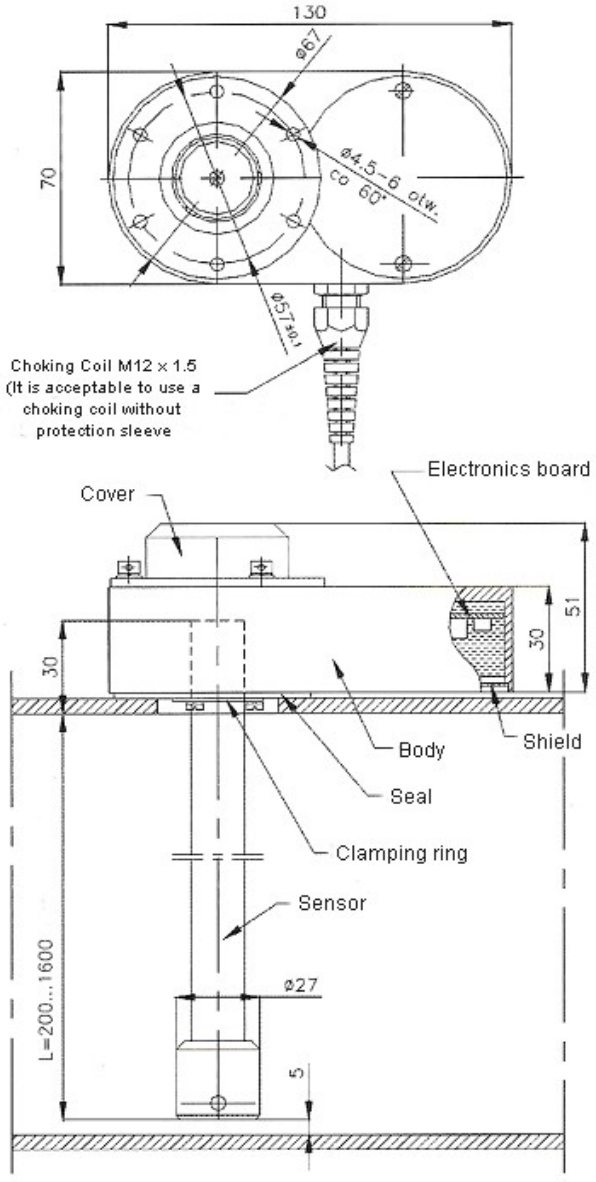


Fig. 1. CS-25 probe – overall dimensions.

1.2 Technical data.

1.2.1 Measuring range:	0 – 200…1400 mm
pipe length:	230 – 1630 mm (standard 830 mm and 1230 mm).
maximum overload:	≤ 100kPa

1.2.2 Output data:

- output signal	: 4 – 20mA in twin-wire system
	: 0 – 10V, 0 – 5V, 0 – 4.5V, 0 – 2.5V
	: digital 100…3800 bit (acc. to protocols below)

a) 100…3800 bit with RS-485 interface (receiver sensitivity: +- 0.2V, emitter output: min +-1.5V

b) 100…3800 bit with RS-485 interface (receiver sensitivity: +- 0.2V, emitter output: min +-1.5V

c) 100…3800 bit with RS-232 interface (0…3.3V)

1.2.3. Temperature:

- working temperature range	-25 - 80°C
- compensation temperature range	-25 - 50°C

1.2.4. Processing errors:

- basic error	≤ 0.16%
- power voltage fluctuation error	0.05%
- hysteresis, replicability	0.05%
- temperature fluctuation error	0.1% / 10°C

1.2.5. Power: 10 – 36V in twin-wire system (for 4-20mA output)

12 – 30V for output = 0 – 10V
8 – 30V for output = 0 – 5V
5 – 5.5V for output = 0 – 4.5V
3 – 3.6V for output = 0 – 2.5V
3 – 3.3V (I ≤ 10mA) for RS-232 output
6.0 – 36V (I ≤ 10mA) for RS-485 output

1.2.6. Normal usage conditions:

- relative humidity	30 – 90%
- atmospheric pressure	80 – 120kPa
- maximum charring and vibration	up to 2.5 m/s²
- dustiness	any
- working position	vertical
- active constituents concentration in atmosphere	no aggressive constituents

1.2.7. Limiting transport and storage:

- environment temperature	0… +70°C
- relative humidity	up to 95% at 40°C
- strokes	up to 10g, 10ms.

1.2.8. Housing:

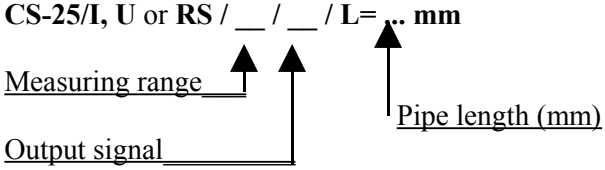
- type	aluminum box
- dimensions	according to Illustration 1
- housing protection degree	IP 67

1.2.9. Weight

- 1.8 kg (depending on pipe length)

1.2.10. Ordering

CS-25/I, U or **RS / __ / __ / L= ... mm**



1.3. Usage conditions

Usage conditions are set by this TFS.

1.4. Structure and functioning

The CS-25 fuel level probe operates by measuring hydrostatic pressure, the value of which is proportional to the height of liquid column. The measuring element is a piezoresistive sensor, separated from the medium by a separating membrane. Pressure measuring is performed at the separating membrane of the submerged probe (5-10 mm above tank bottom) and related either to atmospheric pressure or pressure inside the tank with the use of a small hose placed inside the pipe. The electronic system is placed inside aluminum housing. The housing can be sealed.

The compensation elements of the sensor are placed in the electronic system, therefore both the sensor and the system are strictly assigned to each other. There is a number of the mating sensor written inside the housing.

2. ASSEMBLY AND OPERATION

2.1. Assembly recommendations

The CS-25 probe should be used according to the conditions specified in 1.2.6. of this TFS.

Connection diagram has been presented on Illustration 2, 3 and 4 (depending on performance)

Note:

Connect probe sensor according to wire colors to the electronic system.
Put the venting hose onto the nozzle.
Put a 50 mA fuse into power circuit.

Be careful to follow the numbers while you complete the probe before assembly: the number of the sensor (stamped on the sensor's head) must correspond to the number of the sensor marked on the plate inside the housing.

The shield to the probe electronics power – measuring wire should be connected to PE protection wire in the first place, and disconnected from PE protection wire lastly.

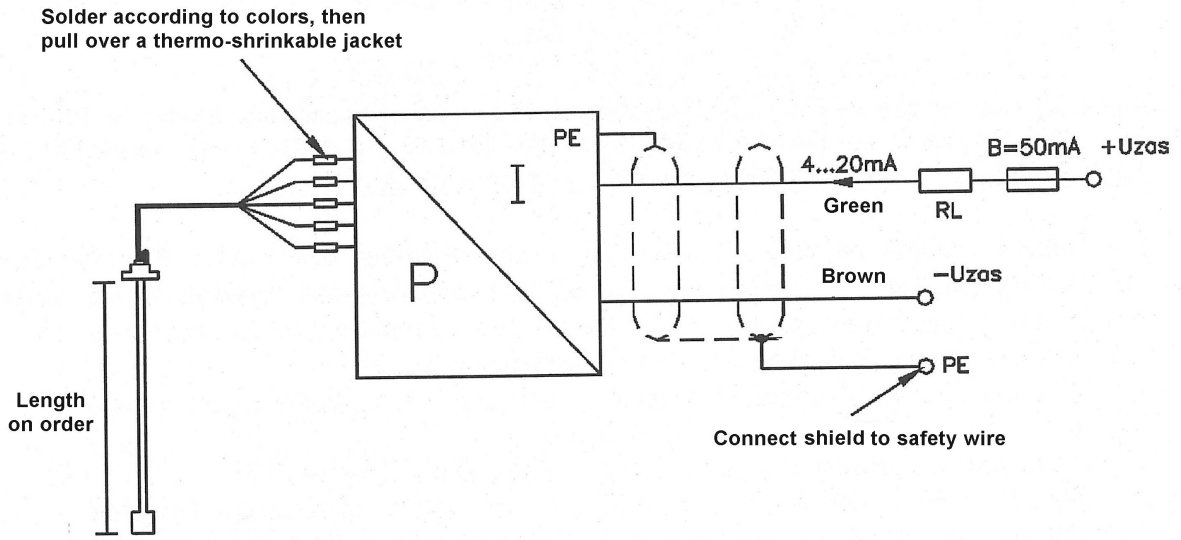


Fig. 2. Connecting CS-25/I probe with current output 4…20mA (diagram).

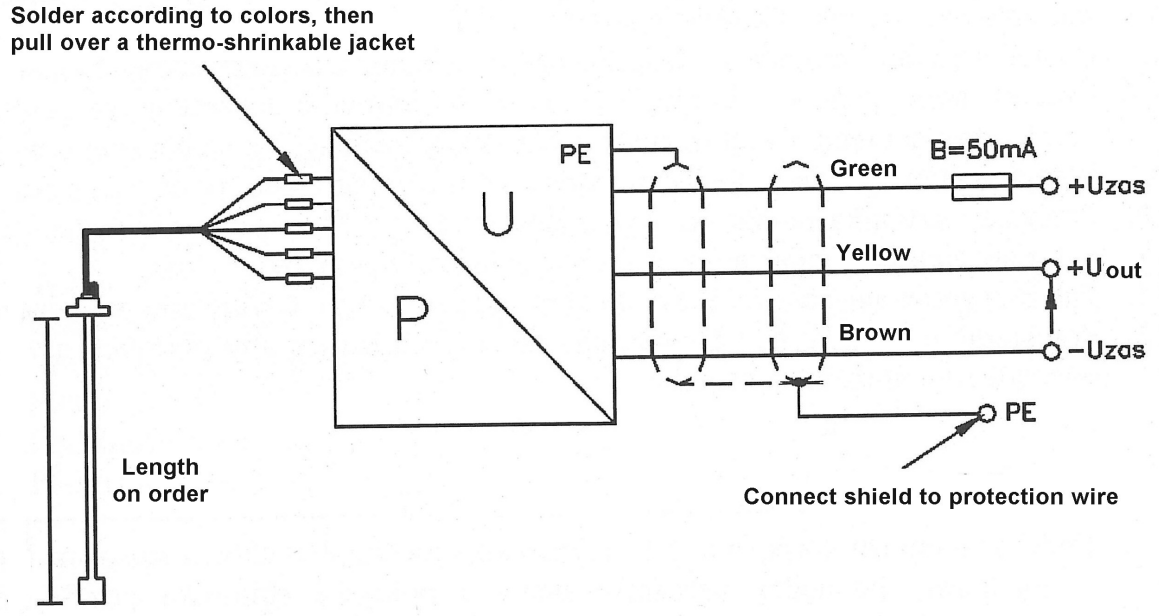


Fig. 3. Connecting CS-25/U probe with voltage output (diagram).

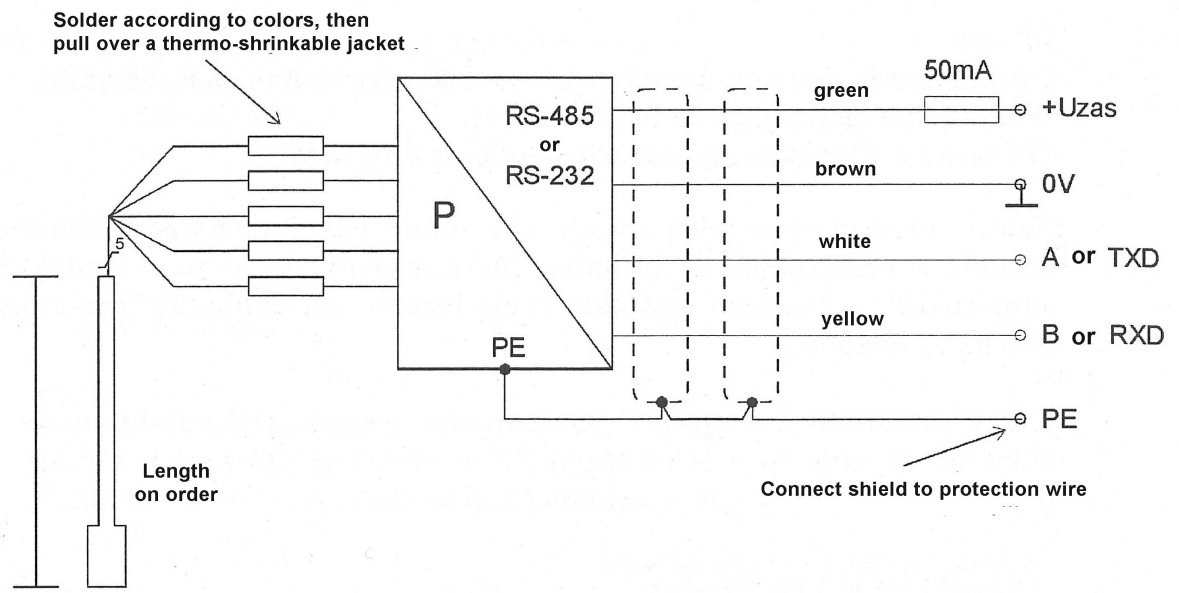


Fig. 4. Connecting CS-25/RS probe with digital output in RS-485 or RS-232 standard (diagram). RS-485: clamp A – DATA+, clamp B – DATA- ; RS-232: clamp RXD – in, clamp TXD – out.

2.1.1. CS-25 probe assembly procedure steps

1.Glue the template onto the tank and make a ϕ39 hole accordingly. In case of steel tanks, you should make 6 ϕ3.2 holes at a ϕ57 spacing (according to template), next make M4 screw threads in the holes. If the tank is aluminum, you can screw the self-piercing screw (no.14), without drilling the lead hole.
2. Place sensor pipe (no.6) in probe housing (no.1), then put it into the tank together with gasket (no.9) in such a way, so that the sensor touches the bottom.
3. Mark the part on the sensor, which juts out over "P" surface.
4. Take the sensor out of the tank. Cut the pipe 5mm below the marking (be very careful not to damage wire insulation or venting hose). Use stainless steel pipe cutter for cutting.
5. After cutting the pipe to a desired size, put a rubber pass (no.12) on the cut pipe end to protect the wires and the venting hose from damage.
6. Put a clamping ring (no.3) and a sealing ring (no.10) on the pipe, then install the sensor in the body (no.1).
7. Set 1mm measure over "P" surface, according to the illustration below.
8. Fix the sensor in the body by equally screwing 3 M3 tap bolts (no.13) diagonally and tighten the M8 screw, located on the side wall of the body.
9. Cut the venting hose to a right size and put on the nozzle (no.4).
10. Cut sensor wires to a right length and solder with wires from the electronics, according to the colors, securing the soldered spots with a thermo-shrinkable jacket.
11. The probe is now ready. Put it into the tank and fix it with fixing screws (no.14).
12. Screw the cover (no.2). Pay special attention so that the clamping ring (no.11) is properly placed in the duct.

While mounting the body (no.1) to the tank, you can also use oil-resistant silicone adhesive between the gasket (no.9) and the tank cover (no.8). Adhesive layer should be so thin that after tightening the adhesive is not pushed out of the gasket.

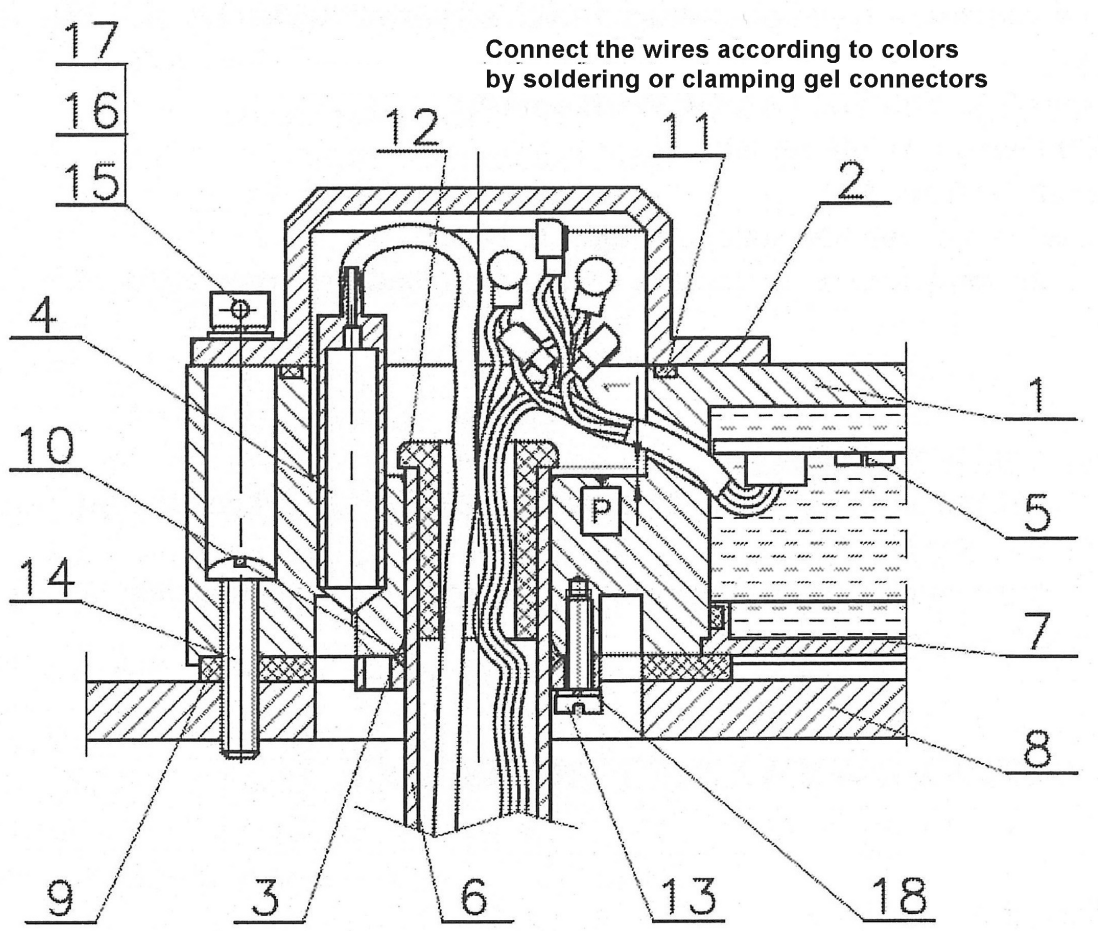


Fig. 5. Mounting the probe onto the tank.

1. Probe body
2. Cover
3. Pressure ring
4. Nozzle
5. Electronics board
6. Sensor pipe
7. Shield
8. Tank cover
9. Gasket
10. 16x2 sealing ring
11. 42x2 sealing ring
12. Rubber pass
13. M3x12 tap bolt
14. 4.2x32 plate screw or M4x18 screw
15. M4x12 screw
16. 4.3 washer
17. 4.1 elastic washer
18. 3.1 elastic washer

2.2. Repair and starting up.

Because of significant influence of quality and type of elements on overall quality of the device, we strongly recommend performing all guarantee and post-guarantee repairs by APLISENS service and manufacturer – Ostrów Wielkopolski department.
The address:
Aplisens S.A. Oddział Ostrów Wielkopolski
ul. Krotoszyńska 35
63-400 Ostrów Wielkopolski
The device does not require constant maintenance.
We recommend checking the device while performing inspection of the entire facility.

2.3 Safety conditions.
All actions (inspection, checking) must be performed after reading this TFS carefully.
Before you perform any connection, the power source must be totally disconnected.

3. STORAGE AND TRANSPORT

3.1. Storage.

The probe must be stored in the manufacturing package in closed compartment, free of aggressive constituents that cause corrosion, at temperature of 0°C to 70°C with relative humidity not higher than 80%, with shock and vibration protection.

3.2 Transport.

Probe transport should be carried out with covered means of transport. The packages should be protected against displacing. Limiting transport conditions are presented in 1.2.7.

4. ILLUSTRATIONS

7. DIAGNOSTICS

7.1. Probe visual inspection.

A) Perform external visual inspection of the probe by:

a) checking the securing seal,
b) checking for any visible physical damage, i.e. cracks, housing indentation etc.,
c) checking the probe's power – signal wire (rubs, cuts etc.),
d) checking the venting hose: the hose should be placed firmly on the venting nozzle, it should not have any cracks and there should be no fuel inside it,
e) checking if the nozzle is clear,
f) checking the soldered joints and clamping connectors of the sensor,
g) checking the probe sensor wire insulation,
h) checking the presence of the rubber pass in sensor pipe, that contains sensor wires.

B) Check the probe's power voltage with a voltmeter

C) Check output signal (voltage or current) with a universal digital meter with accuracy class ≤ 0.1%

7.2. Checking the probe's measuring sensor.

A) Sensor disconnected from the electronic system.

Check the sensor with resistance method using an ohmmeter.

Perform resistance measuring between clamp – wires:

a) brown – black, brown – white, black – blue, white – green; resistance R1 = 4…5 kΩ
b) brown – blue, brown – green; R2 = 8…10 kΩ

B) Sensor connected to the electronic system.

Check the sensor with voltage method using a voltmeter.

Perform resistance measuring between clamp – wires:

a) brown – blue, brown – green; voltage U1 = 3.0…4.5V
b) brown – black, brown – white, black – blue, white – green; voltage U2 = 1.50…2.25V
c) black – white; voltage U3 = 0 mV when tank is empty, U4 = 5…100V when tank is full

NOTE 1: With digital probe, voltage U3 ≠ 0 mV when tank is empty, when tank is full voltage U4 > U3 (Example: U3 = -30mV, U4 = -10mV).

NOTE 2: Short-circuit in probe sensor wires will not cause any damage while probe is working (with normal power).