

## FUEL MEASUREMENT SYSTEMS "**STRUNA**"

**Measurement systems “Struna” – is automation of measurement of parameters of light petroleum products and LPG at reception, storage and operational control of reservoir park of petrol stations and storage depots.**

**Systems are intended for measurement of level, temperature, density, pressure, calculation of volume and mass of light petroleum products and light petroleum gas (LPG) in single-wall and double-wall reservoirs, signaling about presence of underproduct water, increase of a level of fire and ecological safety, automation of the process of account of petroleum products at petrol stations and storage depots. Systems can be applied in food and chemical industries.**

Measurement systems “Struna” are certificated as means of measurement in State register of the means of measurement of Ukraine and Russian Federation, have explosion proof.

Structure of measurement systems “*Struna*”:

### **Central part:**

- **Computing device (CD)** (dimensions of case 690 x 380 x 140 mm), installed inside a premise and consisting of:

- computing block (CB), that has a degree of explosion proof ExiallB, intended for collection, primarily conversion and processing of data on parameters of reservoirs (up to 16), preparation of information to indication in measurement units and communication with external systems, computer, networks;
- specialized power supply unit (PU), that has a degree of explosion proof ExiallB;
- blocks of clamp connections (BC), intended for connection of cables from primary parameters convertors (PPC).

- **Indication block (IB)**, desktop case installed inside a premise, intended for indication to operator parameters of petroleum products in reservoirs, providing signals on state of the system and also input from keyboard values of parameters settings and setting of operation modes. Dimensions: 190 x 135 x 52 mm;

- **Interblock cablings, interface convertors and exploitation documentation (ED).**

### **Peripheral part:**

- **Primary parameters convertor (PPC)** with sensors of level, temperature, density, pressure and underproduct water (according to variant of execution). Made in explosion proof case, has a degree of explosion proof ExiallB and is installed in reservoirs.

**Control unit (CU)**, which is installed inside the premise and is intended for programmable switching on and off of siren (notifiers) (light and sound) and also execution mechanisms (valves, pumps). Dimensions of a case: 305 x 178 x 75 mm.

### **Measurement systems “Struna” provide:**

- **Precise remote measurement** of level, temperature, pressure, density of fuel and LPG in reservoirs.
- **Calculation of volume** according to graduation charts of reservoirs.

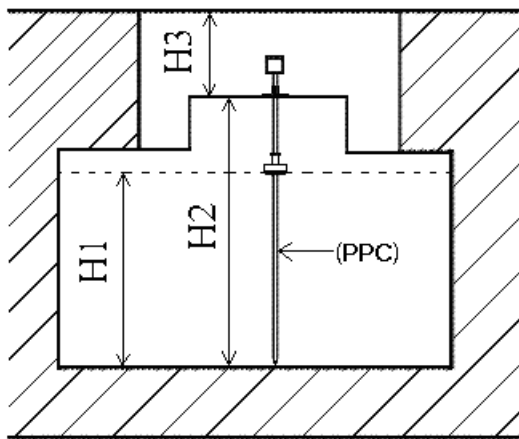
- **Calculation of mass** of petroleum products with limits of permissible relative error  $\pm 0,65\%$  (methodic of measuring is registered)
- **Possibility to automate account of movements of petroleum products** and LPG on one or several petrol stations (or storage depots) at simultaneous usage of delivery systems.
- **Automatic control over leaktightness** of single-wall and double-wall (with liquid filler) reservoirs with switching on of light and sound signaling.
- **Gas pressure control** in reservoirs with LPG or in interstitial space.
- **Control over presence of underproduct water** in reservoirs.
- **Prevention of overflow** of fuel at filling the reservoirs by giving control signals to switch off the pumps, switch on (off) light and sound signaling.
- **Self diagnostics** of functioning and metrological characteristics of the system in all modes of operation, including control over dynamics of level changing at reception of petroleum products that provides at failure possibility to switch off pumps or closing of electromagnetic valves and also giving signals on failure.
- **Indicating of measurement results** and calculation of parameters on autonomous indicator, output of information into the system or program of the user through a standard interface RS-232C, RS-485, USB .
- **Metrological checking** without dismantling of PPC with a help of internal means.
- **Significant reduction of downtime** of petrol stations at changing the working shifts.

### Technical characteristics of the system

Range of level measurement (without density), mm	from 120 to 4000
Range of level measurement (with "surface" density meter), mm	from 200 to 4000
Range of level measurement (with "submersible" density meter), mm	from 120 to 18000
Margins of allowed absolute error in a range up to 4 meters, mm	$\pm 1,0$
Margins of allowed absolute error in a range more than to 4 meters, mm	$\pm 2,0$
Threshold of sensitivity, mm	$\pm 0,2$
Exploitation temperature range of PPC, °C	from -40 to +55
Limits of permissible absolute error of temperature measurement, centigrade degrees	$\pm 0,5$
<b>Ranges of density measurement, kg/m<sup>3</sup> :</b>	
- 1 range (LPG)	from 499 to 599
- 2 range (petrol with 80 octane number)	from 690 to 760
- 3 range (petrol with octane numbers 92, 95, 98)	from 715 to 785
- 4 range (diesel fuel)	from 810 to 880
Limits of permissible absolute error of density measurement (with "surface" density meter), kg/m <sup>3</sup>	$\pm 1,5$
Limits of permissible absolute error of density measurement (with "submersible" density meter), kg/m <sup>3</sup>	$\pm 1,0$
Signalling at presence of underproduct water at level (for fuel stations), mm	25
Range of measurement of underproduct water level (for petroleum storage depots), mm	from 80 to 300
Limits of permissible absolute error of water level measurement (for petroleum storage depots), mm	$\pm 1,0$
Range of overpressure measurement, MPa	from 0 to 1,6
Limits of permissible reduced error of pressure measurement, %	$\pm 1,0$
Quantity of controlled reservoirs (by 1 central part)	up to 16
Cable length from each reservoir to the operators' room, not more, m	1200
<b>Parameters of control channels in a Control Unit (CU):</b>	
■ power circuits (optosemistor)	$\sim 220V$ ; 0,5A
■ low power relay circuits (dry contact)	(=27 V ; 0,5A), (=12 V ; 1,0A), ( $\sim 220V$ ; 0,1A)
System feed	220V <sup>+10</sup> <sub>-15</sub> %; 50 Hz ; 0,6A

## CONDITIONS OF MANUFACTURE AND COMMISSIONING of measurement systems “Struna”

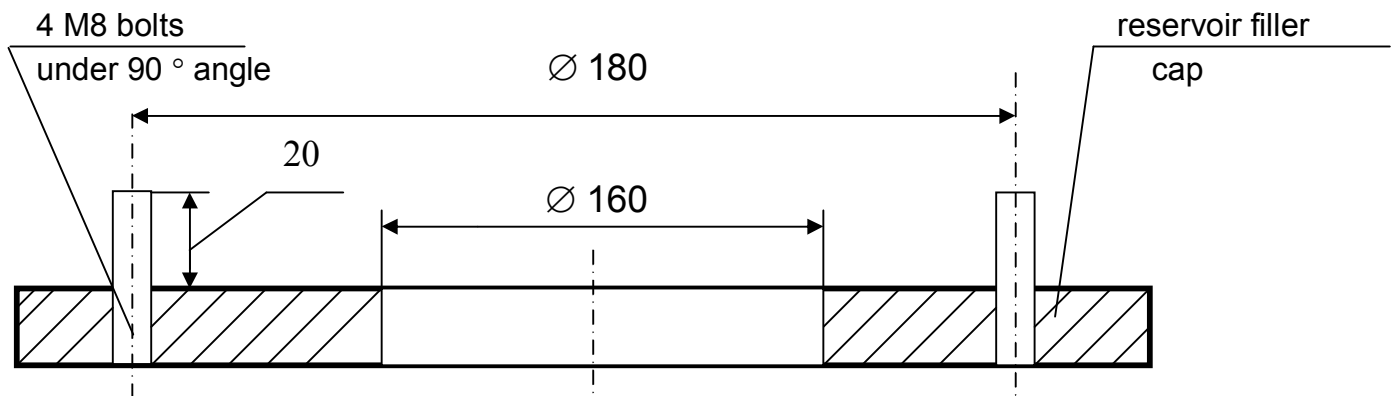
1. For manufacture of sensors (PPC) of Struna system the customer provides in the “**Blank of order**” the following information on reservoirs:



Picture 1

- a). Maximum height of filling of reservoirs with fuel (LPG) **H1**, (picture 1).
- b). Distance from bottom of reservoir to filler cap **H2**.
- c). Distance from a reservoir filler cap to cap of sump or roof of bulkhead in container petrol stations - **H3**.
- d) Graduation charts for each reservoir (at necessity).
- e) Type of petrol and appropriate number of reservoir.

2. PPC sensors are supplied with a mounting flange that provides leaktightness and verticality of its installation in reservoir. The customer himself makes modification of his reservoirs for petroleum products at petrol stations under installation dimensions of the PPC mounting flange (picture 2). Installation dimensions of the PPC mounting flanges for LPG reservoirs and storage depots are sent upon an order..



Picture 2

3. Customer lays inside pipes cables from each reservoir to operator’s premise. Free edges of cables in sumps must be protected by armored shield.
4. External notifiers (light, sound), execution mechanisms and also cable from them the Customer installs on his own.
5. Warranty period on operation of a level meter is 1,5 year from the moment of leading it into exploitation, but it starts not later than after 3 month from the date of supply. After-warranty service is provided under a separate agreement..

**BLANK OF ORDER ON MEASUREMENT SYSTEMS "STRUNA"**

## 1. Customer

Company, city, country	
Tel/Fax	
Order date	
Address	
Post address	
Director	

2. Characteristics of system and reservoirs (**presence: +, absence: - , quantity**):

	1 reser.	2 reser.	3 reser.	4 reser.	5 reser.	6 reser..	7 reser.	8 reser.
<b>PPC</b> with surface density sensor								
<b>PPC</b> with submersible density sensor								
<b>PPC</b> for LPG								
Quantity of submersible density sensors in reservoir								
<b>PPC</b> without density sensors								
<b>H1</b> (size in mm)								
<b>H2</b> (size in mm)								
<b>H3</b> (size in mm)								
Distance between flanges (at PPC on 2 flanges)								
Reservoir (horizontal/vertical)								
Type of fuel								

## 3. Additional information on the system and services:

Interface for connection to PC: <b>RS-232; RS-485; USB</b>	
Distance from computing device (CD) to PC (meters)	
Software "ARM STRUNA" for indication on PC, (+/-)	
Quantity of power control channels in control unit (CU) (~ 220 V, 0,5 A)	
Quantity of relay control channels in control unit (CU) (~ 220 V, 0,1 A, Normally Closed and normally Opened)	
Quantity of relay control channels in control unit (CU) ( = 27 V, 0,5 A , Normally Closed and normally Opened)	
Quantity of light/sound notifiers (for power channels)	
Quantity of level sensors of interstitial space filling	
Quantity of pressure sensors (for interstitial space or LPG)	
Quantity of sensors of combustible gases	
PPC for graduation of reservoirs	
Inout of graduation charts on stage of the system manufacture (+/-)	
Length of cable from reservoirs to computing device (CD) (meters)	

## Note:

- 1). For more than 8 reservoirs fill in additional Blank of Order
- 2). H1 – maximum height of filling of reservoirs with fuel (LPG), H2 - distance from bottom of reservoir to filler cap, H3 - distance from a reservoir filler cap to cap of sump.
- 3) (H2 - H1) min = 170 mm, H3 min = 460 mm, (H2 + H3 - H1)min = 760 mm
- 4) Computing devices (CD) are supplied in a case 690 x 380 x 140 mm