



# ULTRASONIC FLOWBOX FLOW METER

## MANUAL



Wrocław 2016

Thank you for choosing product of our firm.  
The DI-BOX company guarantees the big quality  
of the purchased device and its proper operation.

The guarantee period for the purchased apparatus covers: **18 months**

Niniejsze urządzenie spełnia wszelkie wymogi w zakresie zgodności z normami dla urządzeń cyfrowych klasy B.

This manual was issued only in order for information purposes. All information included can be changed. The **DI-BOX** does not bear the responsibility for any direct and indirect defects arisen as a result of using this manual.

**BHP**

HEALTH AND SAFETY. The assembly, starting, service, maintenance and repairs can be made exclusively by the qualified personnel in accordance with the obligatory safety principles.

The device is safe and works properly, if it is properly transported, stored, installed, started up, serviced and maintained. The product should be used in accordance with the manual.

**BHP**

HEALTH AND SAFETY. CAUTION: The improper service may cause getting hurt or serious device damage.



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## 1. INITIAL INFORMATION

Ultrasonic FLOWBOX flow meter serves as liquid intensity measure flow in the gravitation conditions and total amount of sewage flowing through the measuring flume or measuring weir.

Measuring set consists of:

- Flow measuring converter M1600
- Ultrasonic level sensor SPA 380

Options:

- Data logger module.
- Data transmission module GSM.
- Additional qualitative measurement of a parameter of the liquid.
- Battery version.
- Support it with a solar.
- Seal protection.



The basic condition to apply the method is to provide free, undisturbed inflow and outflow of liquid from the measuring flume.

## 2. TECHNICAL DATA

### 2.1. Flow measuring transmitter M1600



→ **MEASURING SCOPES**

Intensity flow measurement

- in the entities m<sup>3</sup>/h: Q<sub>max</sub> = adjusted to application
- in the entities m<sup>3</sup> (summary): 0...1.000 000

→ **PROGRAMMING**

Local, programmed to chosen measuring flume or measuring weir

→ **OUTPUTS SIGNALS:** (electroplating separation in/out)

- Current output: 0/4...20mA, load 500 Ω max.
- Impulse output: every 1m<sup>3</sup>, type: opencollector
- Digital output: RS485/MODBUS RTU

→ **OTHER DATA:**

- Power supply: 230/24/12V
- Power consumption for 24/12V DC: <50mA
- Power consumption for 230V AC: ≤ 10 VA
- Mass: ~1,5 kg
- Material: ABS
- Protection class: IP65
- Work temperature scope (without protective case): -10 do 55 °C

## 2.2. Ultrasonic level sensor

SPA 380 is the ultrasonic inlet of distance for standard current signal intended for measuring the liquid level changes.

The basic usage is situated at measuring level in industrial and municipal sewage treatment plants, batch and reserve tanks, wells, sewage wet wells, measuring instruments in open channels, etc.

The device is made in the form of measuring probe having the microprocessor measuring instrument and ultrasound sensor.



The casing of the probe is made of PVC what assures the wide scope of usages in different environment conditions.

The membrane of ultrasound sensor is situated inside the casing and communicates with frontal surface of the probe by the acoustic coupler what protects it against the influence of environment conditions (humidity, caustic fumes, etc.)

The probe has the function of automatic cleaning of frontal surface of radiator with gathering sediments by the instant increase of the ultrasound wave emitted power.

## **SPECIFICATION**

### **Technical parameters:**

- Accuracy: 0.10% of the scope in the laboratory conditions  
0.25% of the scope in the field conditions
- Resolution: 0,7mm
- Measuring scope: 0,25...4,0m.
- Signal beam curve: 5-7° with decrease of the power of 3d
- Temperature compensation: automatic

### **Output:**

- Analogue output: : 4...20mA or 20...4mA
- Max. load:  $R=(U_{zas.-6})24mA$

**Feeding:** 18 to 30VDC max. 0.07A

**Protection class:** IP68

**Thread diameter:** 2.0" NPT

## 3. INSTALLATION OF MEASURING SET

### 3.1. Assembly recommendations

#### ULTRASONIC LEVEL SENSOR:

- SPA 300 sensor should be installed in the durable and safe way in the given measuring handle. The handle screwed to the reducer by means of 2x4 M5 should guaranteed solid and safe placement of the sensor during work.
- Put the measuring sensor in the handle. Use the washers. Screw the nuts 2,0".
- The way of ultrasonic signal should be free of any disturbances.
- The surface of the assembly should be free of vibrations.
- The surrounding temperature should be between -20°C...+70°C
- There should not be the electric power cables or electric power converters nearby.






In case of sensor installation outside you should cover it against the sunbeams and environment conditions.



The delivered sensor 380 SPA is calibrated for the determined type of flume and does not require any settings by the user. The change of factory settings will cause error of measuring converter.

#### MEASURING CONVERTER:

- It is recommended to use the roofing of the converter protecting it against direct influence of the atmospheric factors (for instance: rain, snow) or installation in safety case.
-  HEALTH AND SAFETY. In order to assure the safety of service (for instance: during the starting up, maintenance and cleaning) the converter should be mounted in the easy available place.
- All connections of electric wires should be placed as to prevent from their mechanical damage.
-  The installation of the device must meets with electromagnetic compatibility rules.

-  The influence of the disturbances of the other devices on the flow meter work **must be strictly eliminated!**



Rys. Dimensions of converter and span of holes for mounting bolts

#### NOTES REFERRING TO SET FUNCTIONING:

In order to assure the proper functioning of the measuring set, please to work in accordance with the manual.

### 3.2. Connecting the wires to the converter M1600

In order to connect the signal, output and power supply wires to the converter strip terminal in accordance electric scheme (chapter 3.3), you should:

- Unscrew two screws visible on the frontal board,
- Insert signal, power supply and output wires into the proper throttles,
- Connect the wires to the terminal strip and immobilize them screwing the throttles to the end.

**BHP** **HEALTH AND SAFETY:** All electric connections should be made during switched off power supply of the measuring converter.

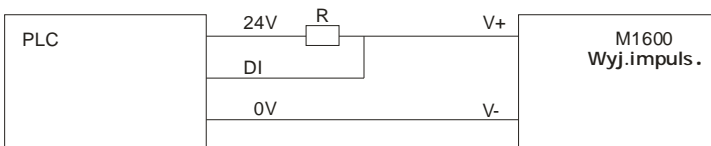
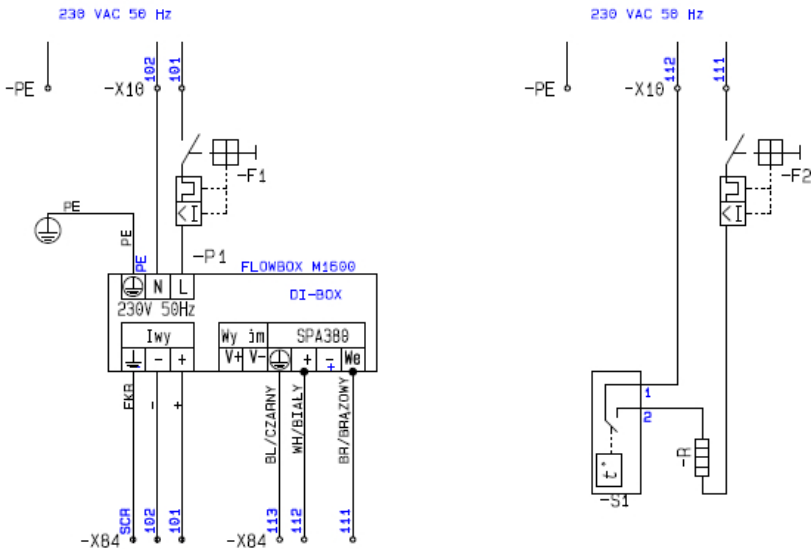
Do not touch the strip joints while making the connection of the wires to the terminal strips (use the screwdrivers with the isolations, hang the wires on isolation).



Unscrew and take off a cover



### 3.3. Scheme of electric connections of converter M1600



PLC connection to impulse output.

Resistor should limit a current to max 150mA.

For PLC  $R = \sim 2\text{-}3\text{k}\Omega$ .



Installation of the device must meet the electromagnetic compatibility rules.



The influence of the disturbances of the other devices on the flow meter work must be strictly eliminated!

## 4. DEVICE SERVICE



The measuring set was configured to measurement the intensity and amount of sewages by using the measuring channel element and level sensor SPA-380. The characteristics of measuring channel and proper measuring formula was implemented to the transmitter M1600 memory. The user should only set the parameter h0 in accordance with the point. 4.2.

In the event of change the sensor or measuring channel the transmitter M1600 should be programmed in the company DI-BOX.

### 4.1. Display of device

The four-buttons keyboard and liquid-crystal unit are to communicate with the user.

After connecting the measuring set in accordance with the electric scheme, to the factor of the converter there will be projected the following issues: indications of liquid flow intensity in  $\text{m}^3/\text{h}$ , summary amount flowing through the liquid channel and actual value of the liquid level in the channel.



V = 819 m<sup>3</sup>/h    39.4  
Q = 20 m<sup>3</sup>

Flow intensity  
Summary liquid amount

V = 819 m<sup>3</sup>/h    39.4  
Q = 20 m<sup>3</sup>

Value of the liquid level in  
the flume [cm]

By pressing the button  $\wedge$  or  $\vee$  you may switch a main display for an information of unit time duration and power stoppage.

Time duration	czas pracy 1:25	L_p 11	Number of power stoppage
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Projecting the announcement:

CZUJNIK ?	h	0.0
Q = 20 m3		

→ means incorrect connection of ultrasonic sensor with a M1600 converter.

Projecting the announcement:

V = !!!	10.0
Q = 20 m3	13.4

→ means exceeding a flume's flow range.

## 4.2. Correction of ultrasonic sensor placement

After proper installation of measuring set you should make the measurement of the setting of ultrasound sensor with relation to piling up element (measuring feet of flume).

In order to change the setting the following should be performed:

→ Press the button **CAL** through about 20-30 seconds until the announcement displays:

h0 = 50.0cm	◆ ?
POZIOM ZEROWY	

It means that the ultrasound sensor front - in accordance with factory settings - is 50.0cm from (measuring feet of flume).

- Buttons  $\vee$  or  $\wedge$  set the new, with reference to factory settings, **proper distance**.
- After measuring and setting the proper distance **h0** you should press button **SAVE**, what will be confirmed by **OK**.

### 4.3. Measuring scope and input electric current set

Wanting to read out or set the measuring scope or outflow current, one should:

- Press the button **SAVE** through about 5 seconds until the announcement displays:

0.0 – xxxx\*.0      4mA  
zakres pomiarowy

It means that the flow intensity measuring scope within the scope **0-xxxx\*m<sup>3</sup>/h** for the current scope **4-20mA** was manufactured set. If there is a necessity to change it, you should press button **CAL** and then chose one of the scope by buttons  $\vee$  or  $\wedge$ .

0-xxxx*m <sup>3</sup> /h	0-20mA
0- xxxx*m <sup>3</sup> /h	0-20mA
0- xxxx*m <sup>3</sup> /h	0-20mA
0- xxxx*m <sup>3</sup> /h	0-20mA
0- xxxx*m <sup>3</sup> /h	4-20mA
0- xxxx*m <sup>3</sup> /h	4-20mA
0- xxxx*m <sup>3</sup> /h	4-20mA
0- xxxx*m <sup>3</sup> /h	4-20mA

\* different values depending on a kind of piling up element used

You should press **SAVE** what will be confirmed by **OK**.

## 5. MAINTENANCE RECOMMENDATIONS

### 5.1. Palmer Bowlus ZPB flume and ultrasonic sensor

Check the permeability and clearness of the liquid piling up depending on needs. The maintenance of the sensor refers to the occasional check of sensor surface clearness and possible wiping the sensor frontal surface with the soft cloth.