

INDUSTRIAL TWO-CHANNEL pH – METER

STI – pH2



USER'S MANUAL

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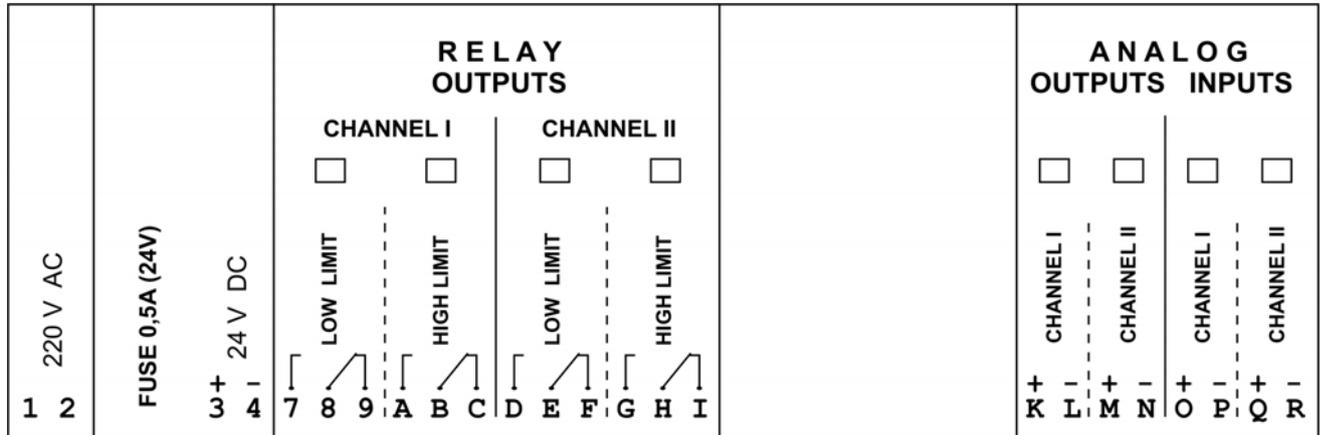
1. INTRODUCTION

Industrial pH - meter is a device with microprocessor, designed for pH and temperature measurement and indication. The device is situated in the industrial plastic box with transparent cover, intended for outside mounting (IP 54) or in the box for mounting in the command room panel (IP 40). The most important device characteristics are the following:

- pH-electrode calibration without detachment of the transmitter,
- provide operation in explosion-endangered media,
- two analog input channels (4 - 20mA) for measurement of pH and temperature or for measurement of two pH values,
- four relay inputs to provide protection when two analog inputs increase upper and lower limits,
- two analog galvanically separated current inputs - 4 - 20mA, 0 - 20mA or 0 - 5mA, the range is selected by keyboard,
- the basic indication for pH or temperature value in corresponding dimensions,
- secondary indicators activated on technological limits and operation mode violations,
- two barograph - displays to show the input values in percents,
- multifunctional keyboard.

The power supply of pH-transmitters, relay outputs and analog outputs are galvanically separated (by means of different transformers).

2. DESCRIPTION OF TERMINALS



The row of terminals for connection the input and output signals and power supply of the transmitters are placed on the back of the device. The terminal description is as follows:

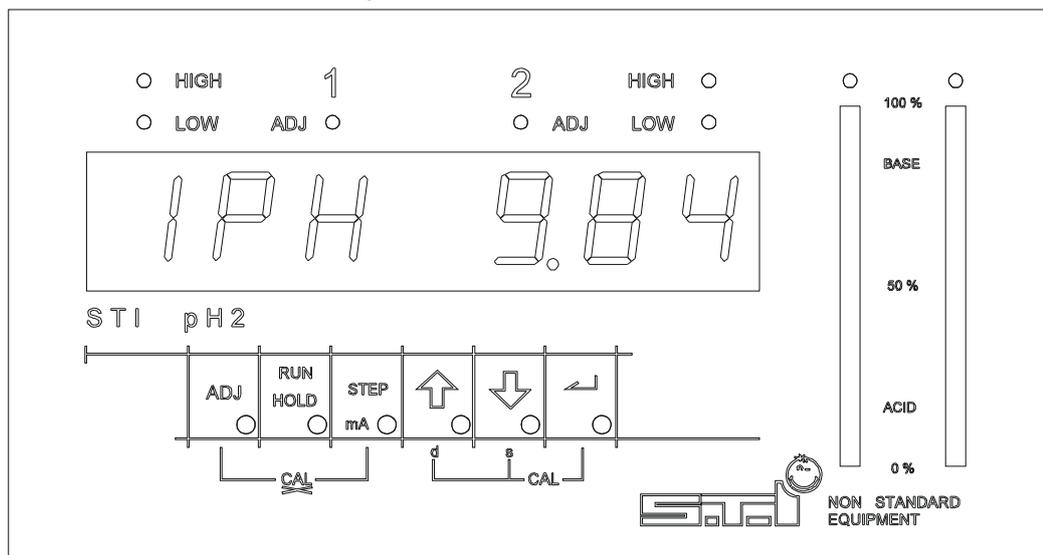
- terminals 1 and 2 - power supply - 220 V AC
- terminals 3 and 4 - power supply - +24 V DC for the first pH - transmitter with the corresponding polarity
- terminals 7, 8 and 9 - output "dry contact" type for the lower technological limit of the first channel, as 8 is common output, 7 is normally opened (NO) contact, and 9 is normally closed (NC) contact
- terminals A, B and C - output "dry contact" type for the upper technological limit of the first channel, as B - common, A - NO и C - NC
- terminals D, E and F - output "dry contact" type for the lower technological limit of the second channel, as E - common, D - NO и F - NC
- terminals G, H and I - output "dry contact" type for the upper technological limit of the second channel, as H - common, G - NO и I - NC
- terminals K and L - the first analog output with the corresponding polarity
- terminals M and N - the second analog output with the corresponding polarity
- terminals O and P - the first analog input with the corresponding polarity
- terminals Q and R - the second analog input with the corresponding polarity

The analog input 1 is always used for measurement of pH by means of suitable transmitter with output 4 – 20mA, and the analog input 2 is available for measurement of pH or temperature by means of suitable transmitters in connection of the configuration. The measurement is performed without temperature correction in case of two-channel pH measurement, and when the temperature is measured on the one channel the value of pH on the another channel is corrected according to temperature measurement.

3. DESCRIPTION OF THE INDICATION AND THE KEYBOARD

3.1. INDUCATION

The indication consists of two components: the basic indication and supporting indicators. The basic indication shows the following:



- label **PH** and corresponding value of pH with resolution ability to 0.01 pH
- label **t** and corresponding value of the temperature in degrees Celsius with resolution ability to 0.1 °C
- label **I** and corresponding value of the current fed on the both inputs in mA with resolution ability 0.01 mA
- label **PHUL** - that means the corresponding value of the current is less than 4 mA
- label **PHOL** - that means the corresponding value of the current is over 20 mA
- label **HL** - adjustment mode of upper technological limit
- label **LL** - adjustment mode of lower technological limit
- label **HY** - adjustment mode of hysteresis of limits
- label **rG** - range adjustment mode
- label **CO** - inputs configuration mode
- label **ou** - outputs adjustment mode
- label **OF** - adjustment mode of the offset of the electrode
- label **SL** - adjustment mode of the slope of the electrode
- label **oH** - pH corresponding to the maximum output current
- label **oL** - pH corresponding to the minimum output current

Four supporting light emitting diodes are intended for every analog input, signalling different violations:

- **HIGH** - a violation of the upper technological limit on the respective input is registered
- **LOW** - a violation of the lower technological limit on the respective input is registered
- **ADJ** - the device is in adjustment mode on the respective input
- **1** or **2** - the measured quantity on the respective input is shown on the basic indication.

The barograph indication is corresponding to the value of the basic indication, i.e. it shows the minimum for the minimum value of pH, and the maximum for the maximum value of pH for given calibration. For standard values of the electrode **OF = 0** и **SL = 59,16** the minimum indication is **- 4,00 pH**, and maximum - **+ 18,00 pH**.

3.2. KEYBOARD

The keyboard consists of six functional buttons, whose functions will be described bellow:

- **RUN/HOLD** button - on first switch on of the power supply the device is in RUN mode. This means that readouts of the both inputs are displayed one after the other in 10 seconds intervals. Pressing this button the decimal point of the first indicator is displayed on the basic indication and the measured value only of the selected input is shown for the arbitrarily long time period. Pressing this button again readouts to the both channels are displayed. Readouts of the both barograph-displays are independent of RUN/HOLD mode and adjustment mode.

- **STEP** button - this button can be used in two ways:

- press the STEP button. While the STEP button is pressed the label **mA** and the measured value of the current in mA of the selected input are displayed. If the measured value is over 20 mA the value 40.00 appears on the display. Thus, current values from 0 to 20 mA can be measured.

- in the set up mode pressing the STEP button with some of the arrow buttons simultaneously changes digits of the adjustment quantity i.s. if pH units are setting, by pressing STEP and ↓ button together pH decimals will be adjusted.

The rest buttons are used only in set-up mode.

4. SET-UP MODE

In order to enter set-up mode follow the next procedure:

- press **RUN/HOLD** button;
- enter set-up mode by pressing **ADJ** button. By pressing consecutively this button set-up parameters are selected: **HL** - the upper technological limit, **LL** - the lower technological limit, **HY** - hysteresis of limits, **rG** - range, **ou** - set-up the output current range, **OF** - offset of the pH-electrode and **SL** - slope of pH-electrode, **oH** and **oL** - pH corresponding to maximum and minimum output current.

The change of parameter values is made by use the arrow buttons. Digits of numeric value parameters are selected for setting by pressing STEP button and the arrow button together.

The hysteresis determines relays turn on and off for corresponding technological limits and it's in absolutely values. The relay for **HL** turns on when the value is over **HL + HY** and turns off when the value is less than **HL - HY**, the relay for **LL** turns on when the value is less than **LL - HY** and turns off when the value is over **LL + HY**.

The ranges can be changed only for pH measurement and depend on corresponding transmitter, included to the device. The lower technological limit higher than the upper technological limit can't be entered. The device takes care of this condition and doesn't permit limits change disturbing it. If the parameter value **rG** is **AUTO**, in this case pH-transmitter connected on the corresponding input is set-up as follows: **4 mA ÷ 20 mA** correspond to **- 4 pH ÷ + 18 pH**.

The parameters **OF** and **SL** can be set-up manually, as the rest parameters (**HL**, **LL**, **HY**) or automatically - trough pH-electrode calibration.

All setting parameters are entered by pressing the **ENTER** button. If in set-up mode the keyboard isn't used during 10 sec., the device turns back automatically to measuring mode.

If ENTER button is not pressed after the change of adjustment parameters and the device turns back to the measuring mode, then the device continues to use the last confirmed values of the parameters.

The configuration of the inputs is selected by pressing **ENTER** and **ADJ** buttons together. Two versions are enabled:

- **the first input measures pH, and the second input - temperature or**
- **the both inputs are used for pH measurement.**

CO.PHPH is displayed in the first case, and **CO.PHt** in another case.

5. CALIBRATION MODE

The calibration of pH-electrode for selected channel has to be made with configuration **CO.PHPH** (i.s. without temperature correction) and at temperature of used buffers nearest to 25 °C.

5.1. SINGLE POINT CALIBRATION

Press **HOLD** button for selected channel. Press both **ENTER** and ↓ buttons simultaneously. Then a **SinGL.P.C.** message appears for a few seconds, after that the value of the buffer is displayed (**bFA 7.00**). This value can be set by buttons ↑, ↓ and **STEP**, as the device parameters in set-up mode. The value is entered by **ENTER** button. Then the number of calibrated channel, an inscription **C.L** and current value of pH is displayed. Dip the electrode in corresponding buffer and press **HOLD** after readout settles. Thus the calibration is completed. The values of **OF** and **SL** of selected channel are stored and the device will work with them till the next calibration or manual change. After the device enters measuring mode.

When single point calibration is performed always **SL=59.16**.

5.2. DOUBLE POINT CALIBRATION

Press **HOLD** button for selected channel. Press together **ENTER** and ↑ buttons. Then a **doubL.P.C.** message appears for a few seconds, after that the values of buffers are displayed consecutively (**bFb 4.00** и **bFA 7.00**). These values can be set by ↑, ↓ and **STEP** buttons, as the device parameters in set-up mode. The value is entered by **ENTER** button. The entered values of **bFA** and **bFb** are stored as default values till the next change. After the values of the both buffers are entered the number of calibrated channel, an inscription **C L** and current readout of pH is displayed. Dip the electrode in the first buffer and press **HOLD** button after the readout settles. Then the inscription **C L** transforms in **C.L**, that means to dip the electrode in the second buffer. Press **HOLD** button after the readout settles. Thus the calibration is completed. The new values of **OF** and **SL** of selected channel are stored and device will work with them till the next calibration or manual change. After the device enters measuring mode.

The order of the electrode dip in the buffers does not matter.

In the both cases of calibration new settings of offset (**OF**) and slope (**SL**) are checked. Corresponding dimensions are as follows:

OF [mV] and **SL** [mV/pH]. If $+200 < \text{OF} < -200$ or $100 < \text{SL} < 20$ a **CAL_Err** message appears and changes are cancelled. The device continues to use the last confirmed values of **OF** and **SL**.

Calibration mode (it doesn't matter which one) can be cancelled by pressing simultaneously **ADJ** and **STEP** buttons.

The calibration mode continues up to completely performance or to be cancelled, for difference set-up mode is cancelled automatically if no button is pressed during 10 sec.

In calibration mode, so as in set-up mode the measurements continue in two channels of the device and indication of barographs, analog outputs and discrete outputs is updated according to (**HL, LL, HY**).

6. TECHNICAL DATA

- 6.1. Number of inputs: 2.
- 6.2. Input range: 4 - 20 mA
- when corresponding transmitters are connected:
 - **for pH:** 0 - 14 pH, 2 - 12 pH, 4 - 14 pH, 0 - 10 pH, -4 - 18 pH
 - **for temperature:** 0 - 100°C, Pt100.
- 6.3. Absolute electric accuracy: 0.1% ± 1LSB.
- 6.4. Resolution: 1/2000.
- 6.5. Number of outputs:
- 4 discrete (relay): "dry contact" type - 250 V/8 A AC
 - 2 analog: current: 4 - 20 mA, 0 - 20 mA, 0 - 5 mA according to corresponding pH
- 6.6. Minimum current at indication: ≤ 0 pH.
- 6.7. Maximum current at indication: ≥ 14 pH.
- 6.8. In range 0 - 14 pH, output current is proportional to the indication with coefficients 5/14 [mA/pH], 20/14 [mA/pH], 16/14 [mA/pH].
- 6.9. Power Supply: 220 VAC, 50 Hz.

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