senseca

DO9403T-R1

DO9403T-R1
pH/mV TRANSMITTER

DO9403T-R1 pH transmitter converts the output of a pH electrode, with temperature compensation, into a 4…20 mA signal. The pH or Redox electrode input circuit is galvanically isolated from the 4…20 mA output signal.

An LCD indicator allows to display the value of the process signal and the various parameters. The accurate design and choice of the components make the instrument precise and reliable over time.

The instrument works with a pH or Redox electrode and a temperature probe (Pt100 sensor, 100 Ω at 0°C).

Key functions

PRG Programming of the parameters is activated by pressing the PRG key. The Δ symbol lights up on the display and the message P1 appears to indicate that the parameter P1 is being programmed. Continuing pressing the PRG key, the messages P2, P3, P4, P5, P6, P7, P8, P9, P10 and the corresponding parameters are displayed in sequence. After P10 the instrument returns to normal function.
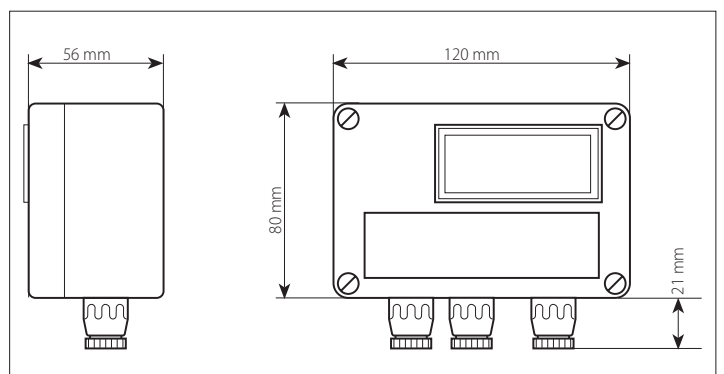After displaying the parameter of interest, it is possible to view the value by pressing the OK button. In order to change the parameter, use the ▲ and ▼ buttons. Press the OK button again to confirm the value of the parameter.

SET Key for setting the relay intervention threshold. The Δ symbol and the REL symbol appear on the display, fixed or flashing, indicating the switching on or off threshold of relay A or of relay B.

°C/°F - If this key is pressed it changes the temperature measuring unit to degrees Celsius or degrees Fahrenheit.
- When pressed together with the CAL key, it activates the manual temperature setting function.
- If pressed during the pH calibration function, it quits the calibration function without storing the calibration.

pH/mV - If this key is pressed, it changes the measuring unit to mV or pH.
- When pressed together with the CAL key, it activates the pH calibration function.

OK Confirms the programming parameters, or the relay SET values, and stores them.

CAL - When pressed together with the °C/°F key, it activates the manual temperature setting function.
- When pressed together with the pH/mV key it activates the pH calibration function.
- Key used to confirm pH calibration and manual temperature setting.

▲ - Key for increasing the value displayed in the parameter programming phase.
- During the relay SET point programming phase.
- During the calibration phase.

▼ - Key for decreasing the value displayed in the parameter programming phase.
- During the relay SET point programming phase.
- During the calibration phase.

Technical specifications

Combined electrode input	pH	-1.00 pH…15.00 pH (-500…+500 mV)
	ORP	-1999…+1999 mV
	Input impedance	$>10^{12}\,\Omega$
	Cable length	< 50 meters screened (about 5 nF)
	Accuracy	0.1% of reading ±1 digit ±0.01% of pH per °C of temperature drift
Temperature input	Pt100 2/4 wires	-50…199.9°C
	Transducer energizing	0.5 mA DC
	Cable length	<10 metres unscreened <20 metres screened (about 2 nF)
	Accuracy	0.2 °C ±0.1% of reading ±2 digits ±0.01°C/°C
pH electrode temp. compensation	Automatic or manual	According to Nernst
Current output	4…20 mA	Programmable and proportional to the pH or mV value
	Accuracy	0.5% of reading ±0.02 mA
	Insulation	2500 Vac 1 minute
R Load	Load resistance	$R_{Lmax} = \dfrac{Vdc-10}{0,022}$ $R_{Lmax} = 636\,\Omega$ @Vdc = 24 Vdc
Relay output	A and B	Bistable, contact 3 A/230 Vac free potential
Power supply	Active	24 or 230 Vac -15/+10% 1 VA, 48…62 Hz, see fig. 1
	Passive	4…20 mA, 2 wire configuration, 10…35 V, see fig. 2
Temperature	Operation	0…50°C
	Storage	-20…70 °C, no condensation
Case	External dimensions	120 x 80 x 56 mm
	Protection degree	IP64

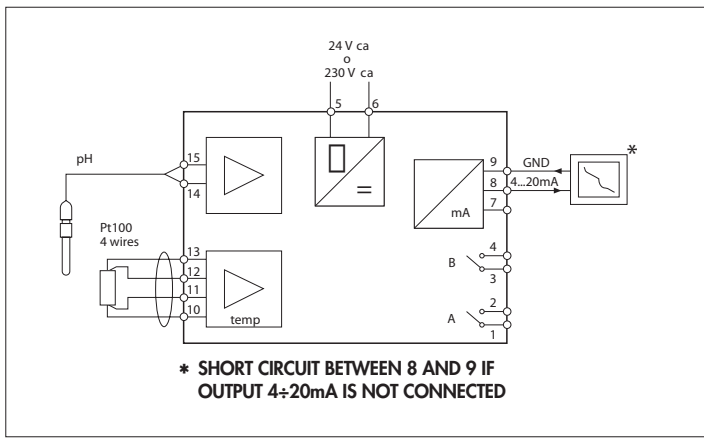56 mm — 120 mm — 80 mm — 21 mm
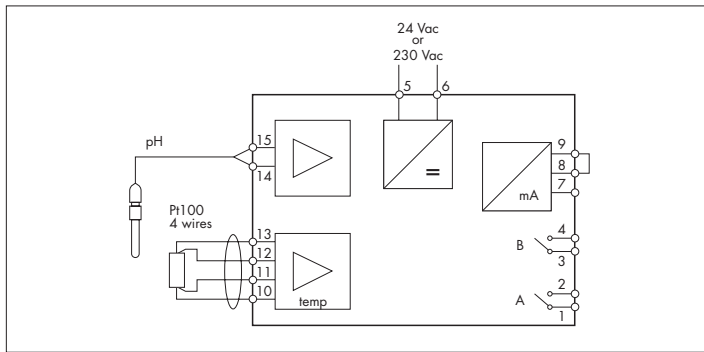
Dimensions

Fig.1 Active transmitter

Fig.2 Active indicator

Setting the relay SET point

- Press the SET button; the Δ symbol appears on the display.
- The REL symbol and the letter A also light up on the display to indicate that the value shown corresponds to the switching on threshold of relay A.
- To change this value press the ▲ and ▼ buttons.
- Press SET; the REL symbol flashes and the letter A remains lit to indicate that the value shown corresponds to the switching off threshold of relay A.
- To change this value press the ▲ and ▼ buttons.
- Press the SET button; the REL symbol and the letter B light up to indicate that the value shown corresponds to the switching off threshold of relay B.
- To change this value press the ▲ and ▼ buttons.
- Press SET; the REL symbol flashes and the letter B remains lit to indicate that the value shown corresponds to the switching off threshold of relay B.
- To change this value press the ▲ and ▼ buttons.
- Press SET, the instrument stores the set parameters and returns to normal function. The REL and Δ symbols disappear.

NOTE: During the SET point setting phase (REL symbol lit or flashing) the instrument returns to normal function if no key is pressed for 2 minutes.

Manual temperature setting

If the temperature probe is not connected or if the probe is broken the measuring unit °C or °F flashes. In this case it is possible to set the temperature compensation value manually.
- Press the CAL key and the °C/°F key together; the Δ symbol appears and the manual temperature is shown with the measuring unit flashing.
- By using the ▲ and ▼ buttons, set the temperature value corresponding to the temperature of the liquid in which you wish to measure the pH.
- Press CAL to confirm this value. The Δ symbol switches off and the instrument returns to the previous display.

Calibration of the pH electrode

Calibration of the offset of the pH electrode:
- Immerse the electrode in the buffer solution used for calibrating the offset (6.86 pH).
- Press the CAL key and the pH/mV key together; the Δ symbol lights up on the display.
- By using the ▲ and ▼ buttons, adjust the pH value measured as a function of the liquid temperature.
- Press CAL to confirm this value. The Δ symbol switches off.

Calibration of the slope of the pH electrode:
- Immerse the electrode in the buffer solution used for calibrating the slope (4.01 or 9.18 pH).
- Press the CAL key and the pH/mV key together; the Δ symbol lights up on the display.
- By using the ▲ and ▼ buttons, adjust the pH value measured as a function of the liquid temperature.
- Press CAL to confirm this value. The Δ symbol switches off.

NOTE: If you want to quit without storing the new calibration, press the °C/°F key.
N.B.: The instrument can automatically recognize three standard calibration solutions: 4.01 pH, 6.86 pH and 9.18 pH.

Programming the parameters

P1   Control of relay unit and analog output, pH or mV.
P2   pH/mV value corresponding to 4 mA at output. May be set between -1.00 pH and 15.00 pH or between -1999 mV and +1999 mV.
P3   pH/mV value corresponding to 20 mA at output. May be set between -1.00 pH and 15.00 pH or between -1999 mV and +1999 mV.
P4   Delay time in the intervention of relay A. May be set between 0 and 255 seconds.
P5   Delay time in the intervention of relay B. May be set between 0 and 255 seconds.
P6   Calibration of Pt100 probe.
P7   4 mA output current calibration.
P8   20 mA output current calibration.
P9   Input voltage calibration.
P10 Display of the offset voltage value and of the slope value of the electrode.

To change one of these parameters press key PRG until the message corresponding to the parameter to be changed appears on the screen.
Press OK to show the value of the parameter.
By using the ▲ and ▼ buttons, bring the parameter displayed to the desired value.
Press OK again to confirm.

Parameter P10 cannot be altered, it can only be displayed.
NOTE P6-P7-P8-P9: calibration procedure to be carried out at a laboratory by skilled workers.

Pt100 probe calibration (100 Ω at 0°C)
Calibration procedure to be carried out at a laboratory by skilled workers.

- Connect the Pt100 probe to the instrument. Press the PRG key until the message P6 appears on the display.
- Press the OK key; the currently measured temperature appears on the display.
- Immerse the Pt100 probe and a precision thermometer for reference in the zero calibration bath. Wait long enough for the reading to become stable.
- By using the ▲ and ▼ buttons, adjust the value of the temperature measured by the Pt100 probe so that it corresponds with the value on the reference thermometer.
- Immerse the Pt100 probe and a precision thermometer in the full scale calibration bath. Wait long enough for the reading to become stable.
- By using the ▲ and ▼ buttons, adjust the value of the temperature measured by the Pt100 probe so that it corresponds with the value on the reference thermometer.

- Press OK to confirm. To quit programming, press PRG repeatedly.

N.B.: If the temperature shown by the instrument is between ±12 °C, the instrument calibrates the probe offset, otherwise it calibrates the gain.

Calibrating the analog output
Calibration procedure to be carried out at a laboratory by skilled workers.

- Connect a precision milliamperometer to the analog output.
- Press the PRG key until the message P7 appears on the display.
- Press OK; the message 4.0 appears on the display, indicating calibration at 4 mA.
- By using the ▲ and ▼ buttons, adjust the value of the output current so as to have an indication of 4,00 mA on the precision milliammeter.
- Press the PRG key until the message P8 appears on the display.
- Press OK; the message 20.0 appears on the display, indicating calibration at 20 mA.
- Using the ▲ and ▼ keys, adjust the value of the output current so as to have an indication of 20,00 mA on the precision milliammeter.
- Press OK to confirm. To quit programming, press PRG repeatedly.

Calibrating the voltage input
Calibration procedure to be carried out at a laboratory by skilled workers.

- Press the PRG key until the message **P9** appears on the display.
- Press OK; the mV value of the input appears on the display.
- Simulate a voltage of 0 mV at the input (if the value is between ±25 mV the zero is calibrated, otherwise the full scale value is calibrated).
- Using the ▲ and ▼ keys, adjust the voltage value so as to have the correct voltage value on the display.
- Press OK to confirm the value.
- The instrument shows **P9** on the display.
- Simulate a voltage of 1800 mV at the input.
- Press OK; the mV value of the input appears on the display.
- Using the ▲ and ▼ keys, adjust the voltage value so as to have the correct voltage value on the display.
- Press OK to confirm. To quit programming, press PRG repeatedly.

Display

Symbol	Description
°C	indicates that the value shown is in °C.
°F	indicates that the value shown is in °F.
pH	indicates that the unit of the value shown is pH.
mV	Indicates that the unit of the value shown is milli Volts.
A	indicates that the relay A is in closed status.
B	indicates that the relay B is in closed status.
REL	- indicates that the value shown corresponds to the closing thresholds of the contacts of relay A or B; - indicates that the offset of the second voltage measurement scale is being calibrated.
REL flashing	indicates that the value shown corresponds to the opening thresholds of the contacts of relay A or B.
Δ	- indicates that the instrument is in the parameter setting phase; - indicates that the closing and opening thresholds of relays A and B are being changed; - indicates that the manual compensation temperature is being changed; - indicates that the pH electrode is being calibrated.

Error signals

OFL - Warning which appears during measurement when the value to be displayed is out of scale.

E1 - Error warning which appears during pH calibration to indicate that the offset value of the electrode is too high in absolute value.

E2 - Error warning which appears during pH calibration to indicate that the difference between the mV readings given by the two buffer solutions used for calibration is too great.

E3 - Error warning which appears during pH calibration to indicate that the mV readings given by the two buffer solutions used for calibration are too close (about 50 mV at 25°C).

E4 - Reading error on the EEPROM.

E5 - Error warning indicating that the slope calculation gives a value 20% lower than the nominal value or gives a negative value.

E6 - Error warning indicating that the slope calculation gives a value 150% lower than the nominal value.

ORDERING CODES

DO9403T-R1: pH or mV transmitter, completely configurable, for use on the field 80 x 120 x 56 mm, output 4…20mA insulated with 2 wires passive or 4 wires active. **Power supply in active mode 24 Vac, (on request 230 Vac - code: DO9403TR-R1), in passive mode 10…35 Vdc.**

HD882/L106: Temperature probe for industrial use, Pt100 sensor, shaft Ø6 x 45 mm.

HD882DM100/600: Temperature probe with Pt100 sensor, DIN B head, stem lenght 600 mm.

HD8600C: ACCREDIA ISO 17025 certified buffer solutions kit: pH 4.01+ pH 7.00 + pH 10.01. Two 50 ml bottles for each type (6 bottles in total).

KPI10: Combined industrial electrode, S7 PG13.5 connector, glass body, Ag/AgCl sat KCl Ø 12 x 120 mm, temperature 0…130°C.

KPI11: Combined industrial electrode, S7 ¾" NPT connector, Rytron body, Ag/AgCl sat KCl, temperature 0…100°C.

KPI12: Platinum electrode for Redox measurement, connector S7 PG13.5 pressure 6 bar, glass body, Ag/AgCl sat KCl.

KPI13: Platinum electrode for Redox measurement, Rytron body, S7 ¾" NPT connector, Ag/AgCl sat KCl

CP5T: 5 m extension cable for connecting the electrode to the transmitter. S7 on one side, wires on the other side.

CP5/10T: 10 m extension cable for connecting the electrode to the transmitter. S7 on one side, wires on the other side.
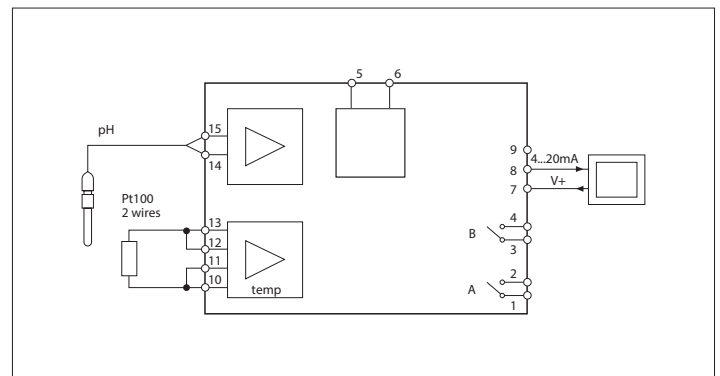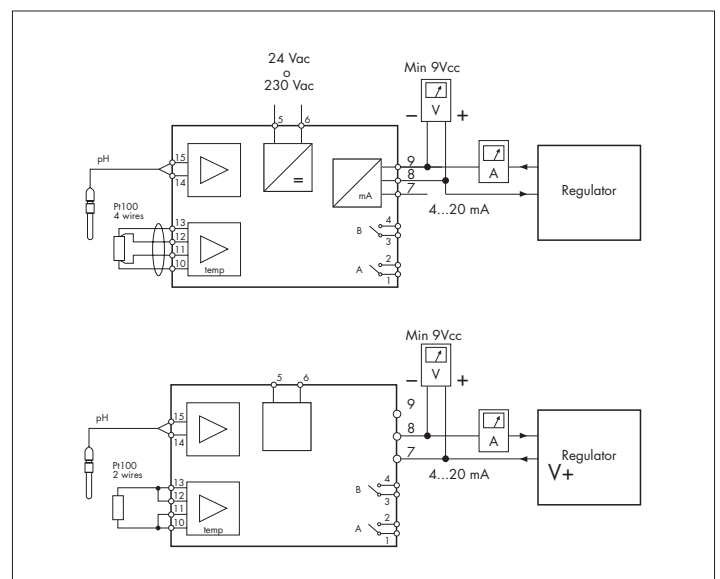
Fig.3 Passive transmitter

Fig.4

WARRANTY

The manufacturer is required to respond to the "factory warranty" only in those cases provided by Legislative Decree 6 September 2005 - n. 206. Each instrument is sold after rigorous inspections; if any manufacturing defect is found, it is necessary to contact the distributor where the instrument was purchased from. During the warranty period (24 months from the date of invoice) any manufacturing defects found will be repaired free of charge. Misuse, wear, neglect, lack or inefficient maintenance as well as theft and damage during transport are excluded. Warranty does not apply if changes, tampering or unauthorized repairs are made on the product. Solutions, probes, electrodes and microphones are not guaranteed as the improper use, even for a few minutes, may cause irreparable damages. The manufacturer repairs the products that show defects of construction in accordance with the terms and conditions of warranty included in the manual of the product. For any dispute, the competent court is the Court of Padua. The Italian law and the "Convention on Contracts for the International Sales of Goods" apply

TECHNICAL INFORMATION

The quality level of our instruments is the result of the continuous product development. This may lead to differences between the information reported in the manual and the instrument you have purchased. We reserves the right to change technical specifications and dimensions to fit the product requirements without prior notice.

DISPOSAL INFORMATION

 Electrical and electronic equipment marked with specific symbol in compliance with 2012/19/EU Directive must be disposed of separately from household waste. European users can hand them over to the dealer or to the manufacturer when purchasing a new electrical and electronic equipment, or to a WEEE collection point designated by local authorities. Illegal disposal is punished by law.

Disposing of electrical and electronic equipment separately from normal waste helps to preserve natural resources and allows materials to be recycled in an environmentally friendly way without risks to human health.