T pH transmitters convert the output of a pH electrode, with temperature compensation, into a signal at 4÷20 mA.

The pH electrode input circuit is galvanically insulated against the 4÷20 mA output signal.
An LCD indicator allows viewing of the process signal value and of the various parameters.
The accurate design and choice of components make the instrument precise and reliable for a long working life.
The instrument works in conjunction with a pH electrode or Redox and a temperature probe (Pt 100 sensor, 100 Ω at 0°C).

Characteristics

Technical characteristics

Combined electrode input	pH	-1.00 pH...15.00 pH (-500...+500 mV)
	ORP	-1999...+1999 mV
	Input impedance	>10 Tohm
	Cable length	<50 metres screened (about 5 nF)
	Accuracy	0.1% of reading ±1 digit ±0.01% pH per °C of drift in temperature
Temperature input	Pt100 2/4 wires	-50...199.9°C
	Transducer energizing	0.5 mA DC
	Cable length	<10 metres unscreened
		<50 metres screened (about 2 nF)
	Accuracy	0.2°C ±0.1% of reading ±2 digits ±0.01°C/°C
pH electrode compensation in temperature	Automatic	According to Nernst
	Manual	-50°C÷200°C
Current output	4.00...20.00 mA	Programmable and proportional to the pH or mV value
	Accuracy	0.5% of reading ±0.02 mA
	Insulation	2500 Vac 1 minute
Relay output	A and B	Bistable, contact 3A/230 Vac free potential
Power supply	Passive	4÷20 mA, 2 wire configuration, 10÷35 V, see fig. 2
	Active	24 or 230 Vac - 15/+10% 1 VA, 48...62 Hz, see fig. 1
DO 9765T container	External dimensions	120x122x56 mm
	Protection class	IP64
DO 9785T container	External dimensions	94x96x126 mm
	Protection class	IP54
CE conformity	Safety	EN61000-4-2, EN610120-1 level 3
	Electrostatic discharge	EN61000-4-2 level 3
	Fast electric transients	EN61000-4-4 level 3
		EN61000-4-5 level 3
	Voltage variation	EN61000-4-11 level 3
	Susceptibility to electromagnetic interference	IEC1000-4-3
	Emission of electromagnetic interference	EN55020 class B

Key functions

PRG   Programming of the parameters is activated by pressing the PRG key plus the ▲ and ▼ keys. The message P1 appears on the display, indicating that the parameter P1 is being programmed. When the PRG key is pressed continuously, the messages P2, P3, P4, P5, P6, P7 and the corresponding parameters are displayed in sequence. After P7 the instrument returns to normal function.

SET   Key for setting the relay intervention threshold. The ON or OFF symbol appears on the display, 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 conductivity 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 calibration.

▲   - 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.

Setting the relay SET point

- Press the SET button; the ON symbol appears on the display with the letter A to indicate that the value shown corresponds to the switching on threshold of relay A.
- To change this value press the ▲ and ▼ keys.
- Press SET; the OFF symbol appears with the letter A to indicate that the switching off threshold of relay A is being displayed.
- To change this value press the ▲ and ▼ keys.
- Press the SET button; the ON symbol appears on the display with the letter B to indicate that the value shown corresponds to the switching on threshold of relay B.
- To change this value press the ▲ and ▼ keys.
- Press SET; the OFF symbol appears with the letter B to indicate that the switching off threshold of relay B is being displayed.
- To change this value press the ▲ and ▼ keys.
- Press SET, the instrument stores the values and returns to normal function.

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

Temperature setting for manual compensation

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 message CAL appears at the bottom of the display.
- Using the ▲ and ▼ keys, set the temperature value corresponding to the temperature of the liquid in which you wish to measure the pH value.
- Press CAL to confirm this value. The message CAL disappears.

Calibration of the with 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 message CAL appears at the top of the display.
- Using the ▲ and ▼ keys, adjust the pH value measured as a function of the liquid temperature.
- Press CAL to confirm this value. The message CAL disappears.

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 message CAL appears at the top of the display.
- Using the ▲ and ▼ keys, adjust the pH value measured as a function of the liquid temperature.
- Press CAL to confirm this value. The message CAL disappears.

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   Relay control 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, calibration of output in current, calibration of output in voltage.
P7   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. Using the ▲ and ▼ keys, bring the parameter displayed to the desired value. Press OK to confirm.
Parameter P7 cannot be altered.

Pt100 probe calibration (100 Ω at 0°C)

- Connect the Pt100 probe to the instrument. Press the PRG key until the message P6 appears on the display.
- Press the CAL key; the message CAL appears at the bottom of the display and the temperature is shown at the top.
- Immerse the Pt100 probe and a precision thermometer for reference in the zero calibration bath. Wait long enough for the reading to become stable.
- Using the ▲ and ▼ keys, 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.
- Using the ▲ and ▼ keys, 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.

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

- Press the PRG key until the message P6 appears on the display.
- Connect a precision milliammeter to the analog output.
- Press the **CAL key twice**; the message CAL appears at the top of the display and the message 4.0 at the bottom, indicating calibration at 4 mA.
- Using the ▲ and ▼ keys, adjust the value of the output current so as to have an indication of 4.0 mA on the precision milliammeter.
- Press the CAL key; the message CAL appears at the top of the display and the message 20.0 at the bottom, indicating calibration at 20 mA.
- Using the ▲ and ▼ keys, adjust the value of the output current so as to have an indication of 20.0 mA on the precision milliammeter.
- Press OK to confirm.

Calibrating the voltage input

- Press the PRG key until the message P6 appears on the display.
- Press the **CAL key four times**; the message CAL appears at the top of the display and the mV value of the input at the bottom.
- 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 the **SET** button, the **ON** symbol appears on the display to indicate that the instruments is measuring the voltage of the input using the second scale of measurement.
- Using the ▲ and ▼ keys adjust the voltage value so as to have the correct voltage value on the display.
- Press the set button, on the display the symbol **ON** disappears
- Simulate a voltage of 450 mV at the input, corresponding to the full value of the first scale.
- Using the ▲ and ▼ keys, adjust the voltage value so as to have the correct voltage value on the display.
- Simulate a voltage of 1800 mV at the input, corresponding to the full value of the second scale.
- Using the ▲ and ▼ keys, adjust the voltage value so as to have the correct voltage value on the display.
- Press OK to confirm.

Display

Symbol	description
°C	the value shown is in °C.
°F	the value shown is in °F.
pH	the unit of the value shown is pH.
mV	the unit of the value shown is milli Volts.
A	the relay A is in closed status.
B	the relay B is in closed status.
ON	the value shown corresponds to the closing thresholds of the contacts of relay A or B.
OFF	the value shown corresponds to the opening thresholds of the contacts of relay A or B.

Error signal

- **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% higher than the nominal value.

Order code

DO 9785T:	pH transmitter 4÷20 mA passive or active, power supply 24 Vac with double display **96x96 mm, for panel mounting**.
DO 9765T:	pH transmitter 4÷20 mA passive or active, power supply 24 Vac with double display **122x120, for use on the field**.
HD 882 M100/300:	Temperature probe with Pt100 sensor, miniature head, shaft ⌀ 6x300 mm.
HD 8642:	Buffer solution 4.01 pH.
HD 8672:	Buffer solution 6.86 pH.
HD 8692:	Buffer solution 9.18 pH.
KPI 10	Combined industrial electrode, S7 PG13.5 connector, refillable, glass body, Ag/AgCl sat KCl ⌀ 12x120 mm, temperature 0÷130°C, porous Teflon fitting.
KPI 11	Combined industrial electrode, S7 brass 1" connector, refillable, Rytron body, Ag/AgCl sat KCl, temperature 0÷100°C, porous Teflon fitting.
KPI GB 210	Electrode for biotechnology, S7 PG13.5 connector, glass body, gel, ⌀ 12x210 mm, temperature 0÷135°C, max 10 bar.
CP5	Extension for connecting the electrode to the DO 9403T-R1 or to the DO 9765T (BNC-wire-TERMINAL BOARD) L=5m.
CP5S	Extension for connecting the electrode to the DO 9785T (BNC-S7) L=5m.

* SHORT CIRCUIT BETWEEN 10 AND 11 IF NOT CONNECTED
Fig. 1

Fig. 2

Fig. 3