HD 2105.1
HD 2105.2

HD 2105.1, HD 2105.2
TEMPERATURE-pH METERS

The **HD2105.1** and **HD2105.2** are portable instruments with a large LCD display. They measure pH and redox potential (ORP) in mV. They measure temperature by using Pt100 or Pt1000 immersion, penetration or contact probes.
The electrode calibration can be carried out on one, two or three points and the calibration sequence can be chosen from a list of 13 buffers.
The temperature probes are equipped with an automatic recognition module and factory calibration data are stored inside.
The HD2105.2 is a **datalogger;** it stores up to 34,000 pH and temperature samples which can be transferred to a PC from the instrument connected via the RS232C and USB 2.0 serial ports. Storing interval, printing and baud rate can be configured by using the menu.
Both models are equipped with an RS232C serial port and can transfer the acquired measurements in real time to a PC or to a portable printer.
The Max, Min and *Avg* function calculate the maximum, minimum or average values. Other functions include: the relative measurement REL, the Auto-HOLD function, and the automatic turning off that can also be excluded.
The instruments have IP66 protection degree.

INSTRUMENT TECHNICAL CHARACTERISTICS
Measured quantities: pH, mV, °C, °F

Instrument

Dimensions (Length x Width x Height)	185x90x40mm
Weight	470g (complete with batteries)
Materials	ABS, rubber
Display	2x4½ digits plus symbols Visible area: 52x42mm

Operating conditions

Operating temperature	-5…50°C
Storage temperature	-25…65°C
Working relative humidity	0…90%RH without condensation
Protection degree	**IP66**

Power

Batteries	4 1.5V type AA batteries
Autonomy	200 hours with 1800mAh alkaline batteries
Power absorbed with instrument off	20µA
Mains-supply unit (SWD10)	Output mains adapter 12Vdc/1000mA

Security of stored data	Unlimited, independent of the state of charge of the batteries

Time

Date and time	Real time schedule
Accuracy	1min/month max drift

*Measured values storage - model **HD2105.2***

Type	2000 pages containing 17 samples each
Quantity	34000 pairs of measurements composed of (pH or mV) and (°C or °F)
Storage interval	1s, 5s, 10s, 15s, 30s, 1min, 2min, 5min, 10min, 15min, 20min, 30min and 1h.

RS232C serial interface

Type	RS232C electrically isolated
Baud rate	It can be set from 1200 to 38400 bauds
Data bit	8
Parity	None
Stop bit	1
Flow Control	Xon/Xoff
Serial cable length	Max 15m
Print interval	Immediate or selectable between: 1s, 5s, 10s, 15s, 30s, 1min, 2min, 5min, 10min, 15min, 20min, 30min and 1h.

*USB interface - model **HD2105.2***

Type	1.1 - 2.0 electrically isolated

Connections

Input module for the temperature probes	8-pole male DIN45326 connector
pH/mV input	Female BNC
Serial interface RS232	8-pole MiniDin connector
USB interface	MiniUSB B-type connector
Mains adapter	2-pole connector (positive at centre)

HD2110CSNM

CP23

pH measurement by the instrument

Measurement range	-2.000…+19.999pH
Resolution	0.01 or 0.001pH selectable from menu
Accuracy	± 0.001pH ±1 digit
Input impedance	> $10^{12}\Omega$
Calibration error @25°C	|Offset|>20mV Slope < 50mV/pH or Slope < 63mV/pH Sensitivity < 85% or Sensitivity < 106.5%
Temperature compensation automatic/manual	-50…+150°C

mV measurement by the instrument

Measurement range	-1999.9…+1,999.9mV
Resolution	0.1mV
Accuracy	±0.1mV ±1 digit
Drift after 1 year	0.5mV/year

temperature measurement by the instrument

Pt100 measurement range	-200…+650°C
Pt1000 measurement range	-200…+650°C
Resolution	0.1°C
Accuracy	±0.1°C ±1 digit
Drift after 1 year	0.1°C/year

TECHNICAL DATA OF PROBES AND MODULES EQUIPPED WITH INSTRUMENT
Temperature probes Pt100 sensor with SICRAM module

Model	Type	Application field	Accuracy
TP472I	Immersion	-196°C…+500°C	±0.25°C (-196°C…+300°C) ±0.5°C (+300°C…+500°C)
TP472I.0 1/3 DIN Thin Film	Immersion	-50°C…+300°C	±0.25°C (-50°C…+300°C)
TP473P.I	Penetration	-50°C…+400°C	±0.25°C (-50°C…+300°C) ±0.5°C (+300°C…+400°C)
TP473P.0 1/3 DIN Thin Film	Penetration	-50°C…+300°C	±0.25°C (-50°C…+300°C)
TP474C.I	Contact	-50°C…+400°C	±0.3°C (-50°C…+300°C) ±0.5°C (+300°C…+400°C)
TP474C.0 1/3 DIN Thin Film	Contact	-50°C…+300°C	±0.3°C (-50°C…+300°C)
TP475A.0 1/3 DIN Thin Film	Air	-50°C…+250°C	±0.3°C (-50°C…+250°C)
TP472I.5	Penetration	-50°C…+400°C	±0.3°C (-50°C…+300°C) ±0.6°C (+300°C…+400°C)
TP472I.10	Penetration	-50°C…+400°C	±0.30°C (-50°C…+300°C) ±0.6°C (+300°C…+400°C)
TP49A.0 Class A Thin Film	Immersion	-70°C…+250°C	±0.3°C (-70°C…-50°C) ±0.25°C (-50°C…+250°C)
TP49AC.0 Class A Thin Film	Contact	-70°C…+250°C	±0.3°C (-70°C…-50°C) ±0.25°C (-50°C…+250°C)
TP49AP.0 Class A Thin Film	Penetration	-70°C…+250°C	±0.3°C (-70°C…-50°C) ±0.25°C (-50°C…+250°C)
TP875.I	Globe-thermometer Ø150mm	-30°C…+120°C	±0.25°C
TP876.I	Globe-thermometer Ø50mm	-30°C…+120°C	±0.25°C
TP87.0 1/3 DIN Thin Film	Immersion	-50°C…+200°C	±0.25°C
TP878.0 1/3 DIN Thin Film TP878.1.0 1/3 DIN Thin Film	Photovoltaic	+4°C…+85°C	±0.25°C
TP879.0 1/3 DIN Thin Film	Compost	-20°C…+120°C	±0.25°C

Common characteristics
Temperature drift @ 20°C 0.003%/°C

4 wires Pt100 and 2 wires Pt1000 Probes

Model	Type	Application field	Accuracy
TP47.100.0 1/3 DIN Thin Film	4 wires Pt100	-50…+250°C	1/3 DIN
TP47.1000.0 1/3 DIN Thin Film	2 wires Pt1000	-50…+250°C	1/3 DIN
TP87.100.0 1/3 DIN Thin Film	4 wires Pt100	-50…+200°C	1/3 DIN
TP87.1000.0 1/3 DIN Thin Film	2 wires Pt1000	-50…+200°C	1/3 DIN

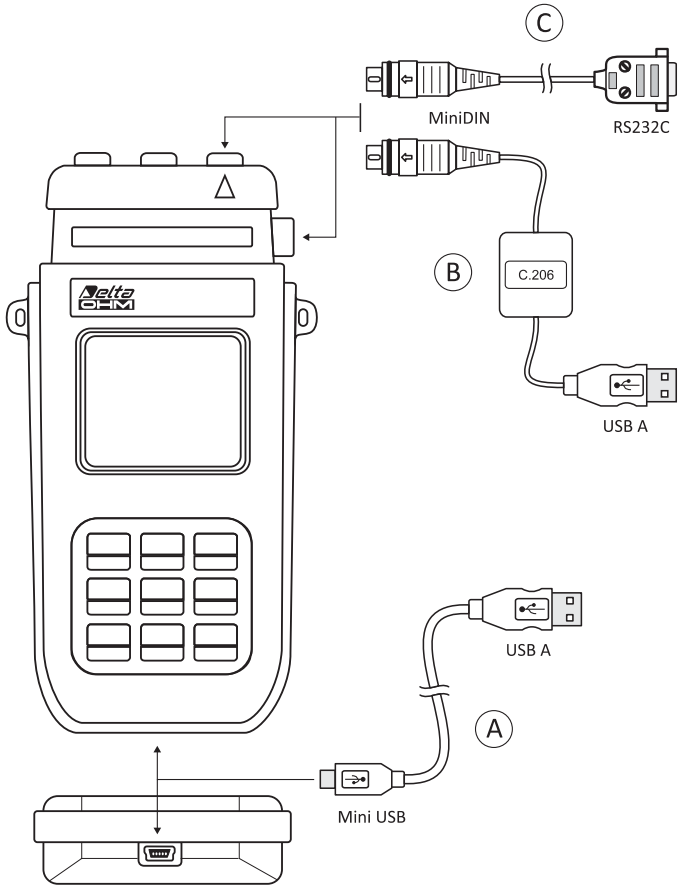
Common features
Temperature drift @20°C

Pt100	0.003%/°C
Pt1000	0.005%/°C

A For the models of portable data logger series **HD21XX.2** has been implemented with a new serial port miniUSB type HID (Human Interface Device).
When making the connection to the PC by the USB cable Type A - Mini USB B-type coded CP23, **no USB driver installation is requested**.

B For the connection of the models **HD21XX.1** to the RS232 port of your PC, the USB/serial converter is available (**code C.206**). The converter is equipped with its own drivers that have to be installed before connecting the converter to the PC (please see the details in the CDRom supplied with the converter).

C The port with the MiniDIN connector which is present on every model is an RS232C type. By means of the cable coded HD2110CSNM, an RS232 port of a PC or the HD40.1. printer can be connected.



ORDER CODES

HD2105.1: The kit is supplied with: instrument HD2105.1, 4 1.5V alkaline batteries, operating manual, case and DeltaLog9 software

HD2105.2: The kit is supplied with: instrument **data logger** HD2105.1, 4 1.5V alkaline batteries, operating manual, case and DeltaLog9 software

Electrodes, temperature probes, calibration solutions, cable for the data download (from PC or printer) have to ordered separately.

HD2110CSNM: 8-pole connection cable MiniDin - Sub D 9-pole female for RS232C.

C.206: Cable for instruments of the series HD21...1 for direct connection to the USB input of a PC.

CP23: USB 2.0 connection cable type A - MiniUSB type B.

DeltaLog9: Software for download and management of the data on PC using Windows operating systems.

SWD10: Stabilized power supply at 100-240Vac/12Vdc-1A mains voltage.
HD40.1: The kit includes: 24-columm portable thermal printer, serial interface RS232, 57mm paper width, four NiMh 1.2V rechargeable batteries, SWD10 power supply, instruction manual, 5 thermal paper rolls. It uses the optional cable HD2110 CSNM.
BAT-40: Spare battery pack for HD40.1 printer with built-in temperature sensor.
RCT: The kit includes 4 thermal paper rolls 57mm wide and 32mm diameter.
HD22.2: Laboratory electrode holder composed of base plate with built-in magnetic stirrer, shaft and replaceable electrode holder. Suitable diameter 12mm. Powered by power supplier SWD10 (optional).
HD22.3: Laboratory electrode holder composed of base plate. Flexible arm for free positioning. Suitable for electrodes with diameter 12mm.

pH Electrodes

KP 20: Gel pH combined electrode for general use, with S7 screw connector, EPOXY body.
KP 30: Gel pH combined electrode for general use, 1m cable with BNC, EPOXY body .
KP 50: Gel pH combined electrode, porous Teflon ring junction, suitable for emulsions, demineralised water and waste water with S7 screw connector, glass body.
KP 61: 3 diaphragm liquid filled pH combined electrode for wine, milk, cream, etc., S7 screw connector, liquid reference filling, glass body.
KP 62: 1 diaphragm gel pH combined electrode for general use, pure water, varnishes, gel filled, S7 screw connector, glass body.
KP 63: 1 liquid filled pH combined electrode for general use, varnishes, 1m cable with BNC, glass body.
KP 64: Liquid filled pH combined electrode,Teflon ring diaphragm, for wine, varnishes, emulsions, S7 screw connector, glass body.
KP 70: Pointed gel combined pH microelectrode diam. 6 x L=70 mm., with S7 screw connector, EPOXY body, glass tip, open junction for meat and cheese.
KP 80: Pointed gel pH combined electrode, with S7 screw connector, glass body, for cream, milk, viscous material, open junction.
KP100: Flat membrane gel combined pH electrode with S7 screw connector, glass body, for skin, leather, paper.
Characteristics and dimensions of the probes on page WA-76.

CP: 1.5m extension cable with BNC/S7 connector for electrode without cable, thread S7.
CP 5: 5m extension cable with BNC/S7 connector for electrode without cable, thread S7.
CP 10: 10m extension cable with BNC/S7 connector for electrode without cable, thread S7.
CP 15: 15m extension cable with BNC/S7 connector for electrode without cable, thread S7.
CE : S7 screw connector for pH electrode.
BNC: female BNC for extension cable

ORP Electrodes

KP 90: Redox Platinum liquid filled electrode with S7 screw connector, glass body.
KP 91: Gel Redox Platinum electrode, 1m cable with BNC, EPOXY body for general purpose light duty.
Characteristics and dimensions of the probes on page WA-76.

HD22.3

pH Buffer solutions

HD8642: Buffer solution 4.01pH - 200cc.
HD8672: Buffer solution 6.86pH - 200cc.
HD8692: Buffer solution 9.18pH - 200cc.

Redox Buffer solutions

HDR220: Redox buffer solution 220mV 0.5 l.
HDR468: Redox buffer solution 468mV 0.5 l.

Electrolyte solutions

KCL3M Ready to use solution for electrode refilling – 100 cc

Cleaning and maintenance

HD62PT: Diaphragm cleaning (tiourea in HCl) - 500ml.
HD62PP: Protein cleaning (pepsin in HCl) - 500ml.
HD62RF: Regeneration (fluorhydric acid) - 100ml.
HD62SC: Solution for electrode preservation - 500ml.

Temperature probes complete with SICRAM module

TP472I: Wire wound Pt100 sensor, immersion probe. Stem Ø 3 mm, length 300 mm. Cable length 2 m.
TP472I.0: Thin film Pt100 sensor, immersion probe. Stem Ø 3 mm, length 230 mm. Cable length 2 m.
TP473P.I: Wire wound Pt100 sensor, penetration probe. Stem Ø 4mm, length 150 mm. Cable length 2 m.
TP473P.0: Thin film Pt100 sensor, penetration probe. Stem Ø 4mm, length 150 mm. Cable length 2 m.
TP474C.I: Wire wound Pt100 sensor, contact probe. Stem Ø 4mm, length 230mm, contact surface Ø 5mm. Cable length 2 m.
TP474C.0: Thin film Pt100 sensor, contact probe. Stem Ø 4mm, length 230mm, contact surface Ø 5mm. Cable length 2 m.
TP475A.0:, Thin film Pt100 sensor, air probe. Stem Ø 4mm, length 230mm. Cable length 2 m.
TP472I.5: Thin film Pt100 sensor, penetration probe. Stem Ø 6mm, length 500 mm. Cable length 2 m.
TP472I.10: Thin film Pt100 sensor, penetration probe. Stem Ø 6mm, length 1000mm. Cable length 2 m.
TP49A.0: Thin film Pt100 sensor, immersion probe. Stem Ø 2,7mm, length 150mm. Cable length 2 m. Aluminium handle
TP49AC.0: Thin film Pt100 sensor, contact probe. Stem Ø 4 mm, length 150mm. Cable length 2 m. Aluminium handle
TP49AP.0: Thin film Pt100 sensor, penetration probe. Stem Ø 2,7mm, length 150mm. Cable length 2 m. Aluminium handle
TP875.I: Wire wound Pt100 sensor, 150mm diameter globe-thermometer equipped with handle and SICRAM module. Cable length 2 m.
TP876.I: Wire wound Pt100 sensor, 50mm diameter globe-thermometer equipped with handle and SICRAM module. Cable length 2 m.
TP87.0: Thin film Pt100 sensor, immersion probe. Stem Ø 3 mm, length 70 mm. Cable length 2 m.
TP878.0: Thin film Pt100 sensor, contact probe for solar panels. Cable length 2 m.
TP878.1.0: Thin film Pt100 sensor, contact probe for solar panels. Cable length 5 m.
TP879.0: Thin film Pt100 sensor, penetration probe for compost. Stem Ø 8 mm, length 1000 mm. Cable length 2 m.

Temperature probes without SICRAM module

TP47.100.0: Thin film Pt100 sensor, immersion probe. Stem Ø 3mm, length 230mm. Connection cable 4 wires with connector, length 2 m.
TP47.1000.0: Thin film Pt1000 sensor, immersion probe. Probe's stem Ø 3mm, length 230mm. Connection cable 4 wires with connector, length 2 m.
TP47: Connector for Pt100 4-wire and Pt1000 2-wire probes without SICRAM module.
TP87.100.0: Thin film Pt100 sensor, immersion probe. Stem Ø 3mm, length 70mm. 4-wires connection cable with connector, length 1 m.
TP87.1000.0: Thin film Pt1000 sensor, immersion probe. Stem Ø 3mm, length 70mm. 2-wires connection cable with connector, length 1 m.

HD 2106.1
HD 2106.2

HD 2106.1, HD 2106.2
CONDUCTIVITY METERS - THERMOMETERS

The **HD2106.1** and **HD2106.2** are portable instruments with a large LCD display. They measure conductivity, liquid resistivity, total dissolved solids (TDS), and salinity using combined 4-ring and 2-ring conductivity/temperature probes. Temperature only is measured by Pt100 or Pt1000 immersion, penetration, contact or air probes. The probe calibration can be performed automatically in one or more than one of the 147µS, 1413µS, 12880µS or 111800µS/cm conductivity calibration solutions. The temperature probes are equipped with an automatic recognition module and factory calibration data are stored inside. The HD2106.2 is a **datalogger**. It memorizes up to 36,000 conductivity and temperature samples which can be transferred from the instrument connected to a PC via the RS232C and USB 2.0 serial ports. The storing interval, printing, and baud rate can be configured using the menu. Both models are fitted with an RS232C serial port and can transfer to a PC the acquired measurements or to a portable printer in real time. *The Max, Min* and *Avg* function calculates the maximum, minimum or average values. Other functions include: the relative measurement REL, the Auto-HOLD function, and the automatic turning off which can also be excluded.
The instruments have IP66 protection degree.


HD40.1


SWD10

INSTRUMENT TECHNICAL CHARACTERISTICS
Measured quantities: χ, Ω, TDS, NaCl, °C, °F

Instrument	
Dimensions (Length x Width x Height)	185x90x40mm
Weight	470g (complete with batteries)
Materials	ABS, rubber
Display	2x4½ digits plus symbols Visible area: 52x42mm
Operating conditions	
Working temperature	-5…50°C
Storage temperature	-25…65°C
Working relative humidity	0…90%RH without condensation
Protection degree	**IP66**
Power	
Batteries	4 1.5V type AA batteries
Autonomy	200 hours with 1800mAh alkaline batteries
Power absorbed with instrument off	20µA
Mains (SWD10)	Output mains adapter 12Vdc / 1A
Security of memorized data	Unlimited, independent of battery charge conditions
Time	
Date and time	In real time
Accuracy	1min/month max error
*Measured values storage - model **HD2106.2***	
Type	2000 pages containing 18 samples each
Quantity	36000 pairs of measurements [χ-°C], [Ω-°C], [TDS-°C] or [Sal-°C]
Selectable storage interval	1s, 5s, 10s, 15s, 30s, 1min, 2min, 5min, 10min, 15min, 20min, 30min and 1hour
Serial interface RS232C	
Type	RS232C electrically isolated
Baud rate	Can be set from 1200 to 38400 baud
Data bit	8
Parity	None
Stop bit	1
Flow Control	Xon/Xoff
Serial cable length	Max 15m
Print interval	Immediate or selectable between: 1s, 5s, 10s, 15s, 30s, 1min, 2min, 5min, 10min, 15min, 20min, 30min and 1hour
*USB interface - model **HD2106.2***	
Type	1.1 - 2.0 electrically isolated
Connections	
Conductivity input	8-pole male DIN45326 connector
Input module for the temperature probes	8-pole male DIN45326 connector
Serial interface and USB	8-pole MiniUSB type B
Mains adapter	2-pole connector (positive at centre)

Measurement of conductivity		*Resolution*
Measuring range Kcell=0.01	0.000…1.999µS/cm	0.001µS/cm
Measuring range Kcell=0.1	0.00…19.99µS/cm	0.01µS/cm
Measuring range Kcell=1	0.0…199.9µS/cm	0.1µS/cm
	200…1999µS/cm	1µS/cm
	2.00…19.99mS/cm	0.01mS/cm
	20.0…199.9mS/cm	0.1mS/cm
Measuring range Kcell=10	200…1999mS/cm	1mS/cm
Accuracy (conductivity)	±0.5%±1digit	

Measurement of resistivity		*Resolution*
Measuring range Kcell = 0.01	till 100GΩ·cm/(*)	
Measuring range Kcell=0.1	till 100MΩ·cm/(*)	
Measuring range Kcell	5.0…199.9Ω·cm	0.1Ω·cm
	200…999Ω·cm	1Ω·cm
	1.00k…19.99kΩ·cm	0.01kΩ·cm
	20.0k…99.9kΩ·cm	0.1kΩ·cm
	100k…999kΩ·cm	1kΩ·cm
	1…10MΩ·cm	1MΩ·cm
Measuring range Kcell=10	0.5…5.0Ω·cm	0.1Ω·cm
Accuracy (resistivity)	±0.5%±1digit	

Measurement of total dissolved solids (with coefficient χ/TDS=0.5)

Measuring range Kcell=0.01	0.000…19.999mg/l	0.005mg/l
Measuring range Kcell=0.1	0.00…19.99mg/l	0.05mg/l
Measuring range Kcell=1	0.0…199.9mg/l	0.5mg/l
	200…1999mg/l	1mg/l
	2.00…19.99g/l	0.01g/l
	20.0…99.9g/l	0.1g/l
Measuring range Kcell=10	100…999g/l	1g/l
Accuracy (total dissolved solids)	±0.5%±1digit	

Measurement of salinity

		Resolution
Measurement range	0.000…1.999g/l	1mg/l
	2.00…19.99g/l	10mg/l
	20.0…199.9g/l	0.1g/l
Accuracy (salinity)	±0.5%±1digit	

Temperature compensation automatic/manual 0…100°C with α_T selectable from 0.00 to 4.00%/°C

Reference temperature 20°C or 25°C

χ / TDS Conversion factor 0.4…0.8

Preset cell constant values: K=0,01 - K=0,1 - K=0,7 - K=1 - K=10

Standard solutions automatically detected @25°C
147µS/cm
1413µS/cm
12880µS/cm
111800µS/cm

Measurement of temperature

Pt100 measuring range	-50…+200°C
Pt1000 measuring range	-50…+200°C
Resolution	0.1°C
Accuracy	±0.5%±1digit
Drift after 1 year	0.1°C/year

(*) The resistivity measurement is obtained from the reciprocal of conductivity measurement. Close to the bottom of the scale, the indication of resistivity appears like reported in the table below:

K cell = 0.01 cm^{-1}		**K cell = 0.1 cm^{-1}**	
Conductivity (µS/cm)	Resistivity (MΩ·cm)	Conductivity (µS/cm)	Resistivity (MΩ·cm)
0.001 µS/cm	1000 MΩ·cm	0.01 µS/cm	100 MΩ·cm
0.002 µS/cm	500 MΩ·cm	0.02 µS/cm	50 MΩ·cm
0.003 µS/cm	333 MΩ·cm	0.03 µS/cm	33 MΩ·cm
0.004 µS/cm	250 MΩ·cm	0.04 µS/cm	25 MΩ·cm

TECHNICAL DATA OF PROBES AND MODULES EQUIPPED WITH INSTRUMENT

Temperature probes Pt100 sensor with SICRAM module

Model	Type	Application field	Accuracy
TP472I	Immersion	-196°C…+500°C	±0.25°C (-196°C…+300°C) ±0.5°C (+300°C…+500°C)
TP472I.0 1/3 DIN Thin Film	Immersion	-50°C…+300°C	±0.25°C (-50°C…+300°C)
TP473P.I	Penetration	-50°C…+400°C	±0.25°C (-50°C…+300°C) ±0.5°C (+300°C…+400°C)
TP473P.0 1/3 DIN Thin Film	Penetration	-50°C…+300°C	±0.25°C (-50°C…+300°C)
TP474C.I	Contact	-50°C…+400°C	±0.3°C (-50°C…+300°C) ±0.5°C (+300°C…+400°C)
TP474C.0 1/3 DIN Thin Film	Contact	-50°C…+300°C	±0.3°C (-50°C…+300°C)
TP475A.0 1/3 DIN Thin Film	Air	-50°C…+250°C	±0.3°C (-50°C…+250°C)
TP472I.5	Penetration	-50°C…+400°C	±0.3°C (-50°C…+300°C) ±0.6°C (+300°C…+400°C)
TP472I.10	Penetration	-50°C…+400°C	±0.30°C (-50°C…+300°C) ±0.6°C (+300°C…+400°C)
TP49A.0 Class A Thin Film	Immersion	-70°C…+250°C	±0.3°C (-70°C…-50°C) ±0.25°C (-50°C…+250°C)
TP49AC.0 Class A Thin Film	Contact	-70°C…+250°C	±0.3°C (-70°C…-50°C) ±0.25°C (-50°C…+250°C)
TP49AP.0 Class A Thin Film	Penetration	-70°C…+250°C	±0.3°C (-70°C…-50°C) ±0.25°C (-50°C…+250°C)
TP875.I	Globe-thermometer Ø150mm	-30°C…+120°C	±0.25°C
TP876.I	Globe-thermometer Ø50mm	-30°C…+120°C	±0.25°C
TP87.0 1/3 DIN Thin Film	Immersion	-50°C…+200°C	±0.25°C
TP878.0 1/3 DIN Thin Film TP878.1.0 1/3 DIN Thin Film	Photovoltaic	+4°C…+85°C	±0.25°C
TP879.0 1/3 DIN Thin Film	Compost	-20°C…+120°C	±0.25°C

Common characteristics
Temperature drift @ 20°C 0.003%/°C

4 wires Pt100 and 2 wires Pt1000 Probes

Model	Type	Application field	Accuracy
TP47.100.0 1/3 DIN Thin Film	4 wires Pt100	-50…+250°C	1/3 DIN
TP47.1000.0 1/3 DIN Thin Film	2 wires Pt1000	-50…+250°C	1/3 DIN
TP87.100.0 1/3 DIN Thin Film	4 wires Pt100	-50…+200°C	1/3 DIN
TP87.1000.0 1/3 DIN Thin Film	2 wires Pt1000	-50…+200°C	1/3 DIN

Common features
Temperature drift @20°C
Pt100 0.003%/°C
Pt1000 0.005%/°C

A For the models of portable data logger series **HD21XX.2** has been implemented with a new serial port miniUSB type HID (Human Interface Device).
When making the connection to the PC by the USB cable Type A - Mini USB B-type coded CP23, **no USB driver installation is requested**.

B For the connection of the models **HD21XX.1** to the RS232 port of your PC, the USB/serial converter is available (**code C.206**). The converter is equipped with its own drivers that have to be installed before connecting the converter to the PC (please see the details in the CDRom supplied with the converter).

C The port with the MiniDIN connector which is present on every model is an RS232C type. By means of the cable coded HD2110CSNM, an RS232 port of a PC or the HD40.1. printer can be connected.

ORDER CODES

HD2106.1: The kit is composed of: instrument HD2106.1, 4 1.5V alkaline batteries, operating manual, case and DeltaLog9 software.

HD2106.2: The kit is composed of: instrument HD2106.2 **datalogger**, 4 1.5V alkaline batteries, operating manual, case and DeltaLog9 software. **Conductivity probes, temperature probes, standard calibration solutions, cables for data transfer to PC or printer have to be ordered separately.**

HD2110CSNM: 8-pole connection cable MiniDin - Sub D 9-pole female for RS232C.

C.206: Serial connection cable for HD2106.1 instruments with USB connector for PC and 8-pole MiniDin male connector for the instrument.

CP23: Serial connection cable with USB connector type A - MiniUSB type B (not suitable for HD2106.1).

DeltaLog9: Software for download and management of the data on PC using Windows operating systems.

SWD10: Stabilized power supply 100-240 Vac/12Vdc-1A mains voltage

HD40.1: 24-column portable thermal printer, serial interface, 57mm paper width, four NiMH 1.2V rechargeable batteries, SWD10 power supply, instruction manual, 5 thermal paper rolls It uses the HD2110CSNM cable (optional).

RCT: The kit includes 4 thermal paper rolls 57mm wide and 32mm in diameter.

BAT-40: Spare battery pack for HD40.1 printer with built-in temperature sensor.

HD22.2: Laboratory electrode holder composed of base plate with built-in magnetic stirrer, shaft and replaceable electrode holder. Suitable diameter 12mm. Powered by bench-top meters of the series **HD22…**with cable HD22.2.1 **(optional)** or power supplier SWD10 **(optional).**

HD22.3: Laboratory electrode holder composed of base plate. Flexible arm for free positioning. Suitable for electrodes with diameter 12mm.

Conductivity probes

Please see the order codes reported in the probes' technical specifications.

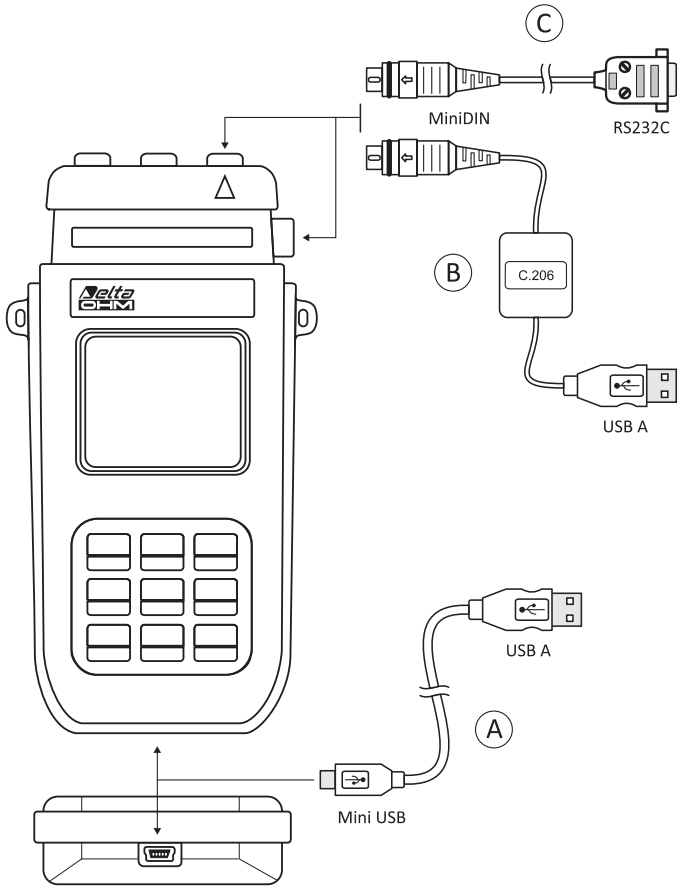
Standard conductivity calibration solutions

HD8747: Standard calibration solution 0.001mol/l equal to 147µS/cm @25°C, 200cc.

HD8714: Standard calibration solution 0.01mol/l equal to 1413µS/cm @25°C, 200cc.

HD8712: Standard calibration solution 0.1mol/l equal to 12880µS/cm @25°C, 200cc.

HD87111: Standard calibration solution 1mol/l equal to 111800µS/cm @25°C, 200cc.



Temperature probes equipped with SICRAM module

TP472I: Wire wound Pt100 sensor, immersion probe. Stem Ø 3 mm, length 300 mm. Cable length 2 m.

TP472I.0: Thin film Pt100 sensor, immersion probe. Stem Ø 3 mm, length 230 mm. Cable length 2 m.

TP473P.I: Wire wound Pt100 sensor, penetration probe. Stem Ø 4mm, length 150 mm. Cable length 2 m.

TP473P.0: Thin film Pt100 sensor, penetration probe. Stem Ø 4mm, length 150 mm. Cable length 2 m.

TP474C.I: Wire wound Pt100 sensor, contact probe. Stem Ø 4mm, length 230mm, contact surface Ø 5mm. Cable length 2 m.

TP474C.0: Thin film Pt100 sensor, contact probe. Stem Ø 4mm, length 230mm, contact surface Ø 5mm. Cable length 2 m.

TP475A.0:, Thin film Pt100 sensor, air probe. Stem Ø 4mm, length 230mm. Cable length 2 m.

TP472I.5: Thin film Pt100 sensor, penetration probe. Stem Ø 6mm, length 500 mm. Cable length 2 m.

TP472I.10: Thin film Pt100 sensor, penetration probe. Stem Ø 6mm, length 1000mm. Cable length 2 m.

TP49A.0: Thin film Pt100 sensor, immersion probe. Stem Ø 2,7mm, length 150mm. Cable length 2 m. Aluminium handle

TP49AC.0: Thin film Pt100 sensor, contact probe. Stem Ø 4mm, length 150mm. Cable length 2 m. Aluminium handle

TP49AP.0: Thin film Pt100 sensor, penetration probe. Stem Ø 2,7mm, length 150mm. Cable length 2 m. Aluminium handle

TP875.I: Wire wound Pt100 sensor, 150mm diameter globe-thermometer equipped with handle. Cable length 2 m.

TP876.I: Wire wound Pt100 sensor, 50mm diameter globe-thermometer equipped with handle. Cable length 2 m.

TP87.0: Thin film Pt100 sensor, immersion probe. Stem Ø 3 mm, length 70 mm. Cable length 2 m.

TP878.0: Thin film Pt100 sensor, contact probe for solar panels. Cable length 2 m.

TP878.1.0: Thin film Pt100 sensor, contact probe for solar panels. Cable length 5 m.

TP879.0: Thin film Pt100 sensor, penetration probe for compost. Stem Ø 8 mm, length 1000 mm. Cable length 2 m.

Temperature probes without SICRAM module

TP47.100.0: Thin film Pt100 sensor, immersion probe. Stem Ø 3mm, length 230mm. Connection cable 4 wires with connector, length 2 m.

TP47.1000.0: Thin film Pt1000 sensor, immersion probe. Probe's Stem Ø 3mm, length 230mm. Connection cable 4 wires with connector, length 2 m.

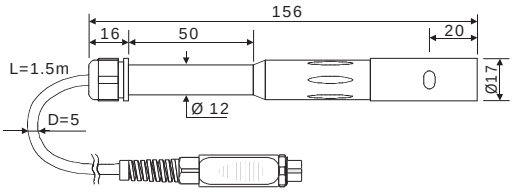
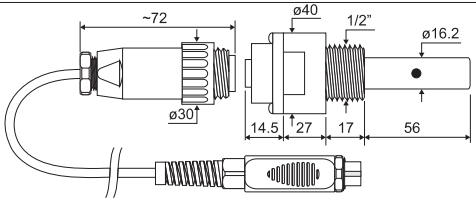
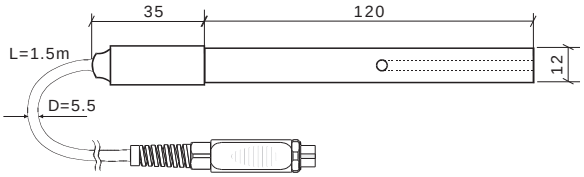
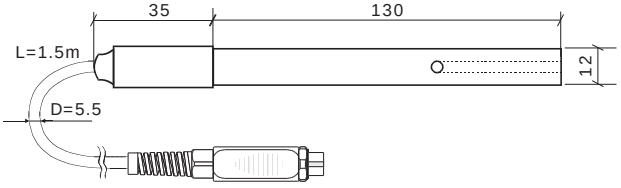
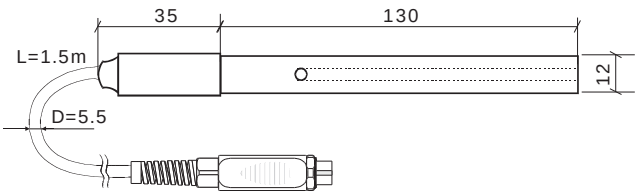
TP47: Connector for Pt100 4-wire and Pt1000 2-wire probes without SICRAM module.

TP87.100.0: Thin film Pt100 sensor, immersion probe. Stem Ø 3mm, length 70mm. 4-wires connection cable with connector, length 1 m.

TP87.1000.0: Thin film Pt1000 sensor, immersion probe. Stem Ø 3mm, length 70mm. 2-wires connection cable with connector, length 1 m.

TECHNICAL DATA OF PROBES AND MODULES EQUIPPED WITH INSTRUMENT

2 and 4 electrode conductivity probes

ORDER CODE	MEASUREMENT RANGE	DIMENSIONS
SP06T	K=0.7 5µS…200mS/cm 0…90°C 4-electrode cell in Pocan/Platinum Max pressure 5bar	
SPT 401.001 not suitable for HD 2306.0	K=0.01 0,04…20µS/cm 0…120°C 2-electrode cell AISI 316 - Teflon Max pressure 5bar	
SPT01G	K=0.1 0.1µS…500µS/cm 0…80°C 2-electrode cell in Glass/Platinum Max pressure 5bar	
SPT1G	K=1 10µS…10mS/cm 0…80°C 2-electrode cell in Glass/Platinum Max pressure 5bar	
SPT10G	K=10 500µS…200mS/cm 0…80°C 2-electrode cell in Glass/Platinum Max pressure 5bar	

HD 2109.1
HD 2109.2

HD 2109.1, HD 2109.2
DISSOLVED OXYGEN - TEMPERATURE METERS

The **HD2109.1** and **HD2109.2** are portable instruments with a large LCD display. They measure the concentration (in mg/l) of dissolved Oxygen in liquids, the saturation index (in %) and the temperature using SICRAM combined probes of polarographic and galvanic type with two or three electrodes and integrated temperature sensor. Temperature only is measured by Pt100–SICRAM or direct 4 wire–immersion, penetration, contact or air probes. Thanks to an internal pressure sensor, the instruments automatically compensate for barometric pressure. The instrument anticipates automatic compensation of the Oxygen probe membrane permeability and of the salinity of the liquid being examined. The dissolved Oxygen probe's quick calibration function guarantees timely correctness of the performed measurements. The dissolved Oxygen and the temperature probes are equipped with an automatic recognition module and factory calibration data are stored inside. The HD2109.2 is a **datalogger**. It stores up to 18,000 dissolved Oxygen concentration, saturation index measurements, barometric pressure and temperature samples which can be transferred from the instrument connected to a PC via the RS232C and USB 2.0 serial ports. The storing interval, printing, and baud rate can be configured using the menu. Both models are fitted with an RS232C serial port and can transfer to a PC the acquired measurements or to a portable printer in real time. *The Max, Min* and *Avg* function calculates the maximum, minimum or average values. Other functions include: the relative measurement REL, the Auto-HOLD function, and the automatic turning off which can also be excluded.

The instruments have IP66 protection degree.

INSTRUMENT TECHNICAL CHARACTERISTICS

Measured quantities: mg/l O_2, sat.% O_2, mbar, °C, °F

Instrument	
Dimensions (Length x Width x Height)	185x90x40mm
Weight	470g (complete with batteries)
Materials	ABS, rubber
Display	2x4½ digits plus symbols Visible area: 52x42mm
Operating conditions	
Working temperature	-5…50°C
Storage temperature	-25…65°C
Working relative humidity	0…90%RH without condensation
Protection degree	**IP66**
Power	
Batteries	4 1.5V type AA batteries
Autonomy	200 hours with 1800mAh alkaline batteries
Power absorbed with instrument off	20µA
With dissolved oxygen probe	40µA
Mains (SWD10)	Output mains adapter 12Vdc / 1A
Security of memorized data	Unlimited, independent of battery charge conditions
Time	
Date and time	Schedule in real time
Accuracy	1min/month max error
*Measured values storage - model **HD2109.2***	
Type	2000 pages containing 9 samples each
Quantity	18,000 samples composed of 4 parameters: mg/l O_2 - %O_2 - mbar - (°C or °F)
Selectable storage interval	1s, 5s, 10s, 15s, 30s, 1min, 2min, 5min, 10min, 15min, 20min, 30min and 1hour
Serial interface RS232C	
Type	RS232C electrically isolated
Baud rate	Can be set from 1200 to 38400 baud
Data bit	8
Parity	None
Stop bit	1
Flow Control	Xon/Xoff
Serial cable length	Max 15m
Print interval	Immediate or selectable between: 1s, 5s, 10s, 15s, 30s, 1min, 2min, 5min, 10min, 15min, 20min, 30min and 1hour
*USB interface - model **HD2109.2***	
Type	1.1 - 2.0 electrically isolated
Connections	
Input for Oxygen and temperature probes	8-pole male DIN45326 connector
RS232C serial interface	8-pole MiniDin connector
USB interface	MiniUSB type B
Mains adapter	2-pole connector (positive at centre)
Measurement of the concentration of dissolved Oxygen	
Measurement range	0.00…90.00mg/l
Resolution	0.01mg/l
Accuracy (0…90% 1013mbar, 20…25°C)	±0.03mg/l±1digit

HD40.1

SWD10

Measurement of the saturation index of dissolved Oxygen

Measurement range	0.0…600.0%
Resolution	0.1%
Accuracy	±0.3% ±1digit (in the range 0.0…199.9%) ±1% ±1digit (in the range 200.0…600.0%)

Measurement of barometric pressure

Measurement range	0.0…1100.0mbar
Resolution	0.1mbar
Accuracy	±2mbar±1digit between 18 and 25°C ±(2mbar+0.1mbar/°C) in the remaining range

Setting the salinity

Setting range	0.0…70.0g/l
Resolution	0.1g/l

Temperature measurement with the sensor inside the dissolved Oxygen probe

Measurement range	0…+45°C
Resolution	0.1°C
Accuracy	±0.1°C ±1digit
Drift after 1 year	0.1°C/year

Temperature measurement by Instrument with Pt100 probe

Pt100 measurement range	-200…+650°C
Resolution	0.1°C
Accuracy	±0.1°C ±1 digit
Drift after 1 year	0.1°C/year

Temperature compensation

Automatic	0…50°C

TECHNICAL DATA OF PROBES AND MODULES EQUIPPED WITH INSTRUMENT
Temperature probes Pt100 sensor with SICRAM module

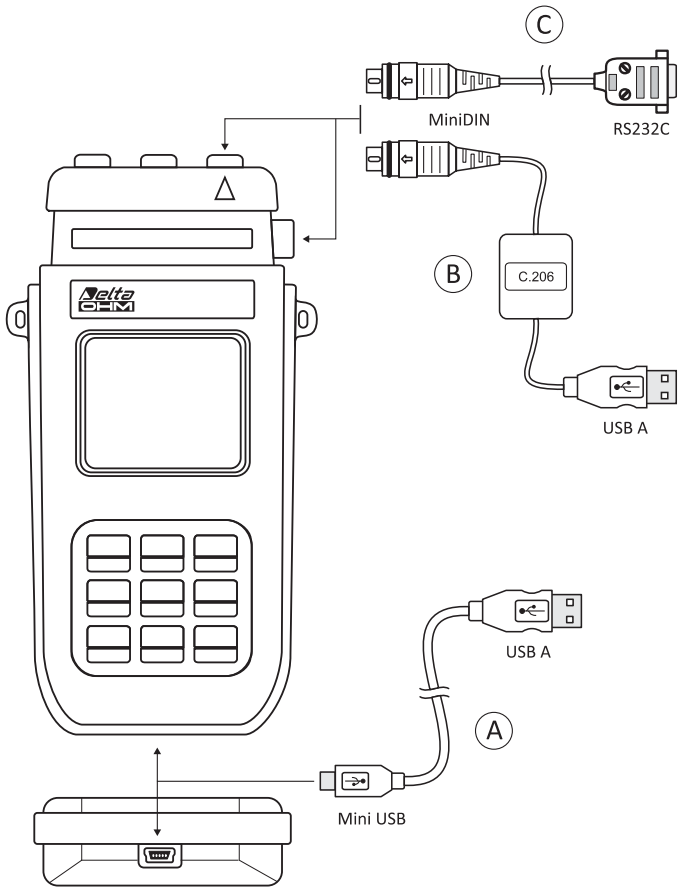
Model	Type	Application field	Accuracy
TP472I	Immersion	-196°C…+500°C	±0.25°C (-196°C…+300°C) ±0.5°C (+300°C…+500°C)
TP472I.0 1/3 DIN Thin Film	Immersion	-50°C…+300°C	±0.25°C (-50°C…+300°C)
TP473P.I	Penetration	-50°C…+400°C	±0.25°C (-50°C…+300°C) ±0.5°C (+300°C…+400°C)
TP473P.0 1/3 DIN Thin Film	Penetration	-50°C…+300°C	±0.25°C (-50°C…+300°C)
TP474C.I	Contact	-50°C…+400°C	±0.3°C (-50°C…+300°C) ±0.5°C (+300°C…+400°C)
TP474C.0 1/3 DIN Thin Film	Contact	-50°C…+300°C	±0.3°C (-50°C…+300°C)
TP475A.0 1/3 DIN Thin Film	Air	-50°C…+250°C	±0.3°C (-50°C…+250°C)
TP472I.5	Penetration	-50°C…+400°C	±0.3°C (-50°C…+300°C) ±0.6°C (+300°C…+400°C)
TP472I.10	Penetration	-50°C…+400°C	±0.30°C (-50°C…+300°C) ±0.6°C (+300°C…+400°C)
TP49A.0 Class A Thin Film	Immersion	-70°C…+250°C	±0.3°C (-70°C…-50°C) ±0.25°C (-50°C…+250°C)
TP49AC.0 Class A Thin Film	Contact	-70°C…+250°C	±0.3°C (-70°C…-50°C) ±0.25°C (-50°C…+250°C)
TP49AP.0 Class A Thin Film	Penetration	-70°C…+250°C	±0.3°C (-70°C…-50°C) ±0.25°C (-50°C…+250°C)
TP875.I	Globe-thermometer Ø150mm	-30°C…+120°C	±0.25°C
TP876.I	Globe-thermometer Ø50mm	-30°C…+120°C	±0.25°C
TP87.0 1/3 DIN Thin Film	Immersion	-50°C…+200°C	±0.25°C
TP878.0 1/3 DIN Thin Film TP878.1.0 1/3 DIN Thin Film	Photovoltaic	+4°C…+85°C	±0.25°C
TP879.0 1/3 DIN Thin Film	Compost	-20°C…+120°C	±0.25°C

Common characteristics
Temperature drift @ 20°C 0.003%/°C

4 wires Pt100 Probes

Model	Type	Application field	Accuracy
TP47.100.0 1/3 DIN Thin Film	4 wires Pt100	-50…+250°C	1/3 DIN
TP87.100.0 1/3 DIN Thin Film	4 wires Pt100	-50…+200°C	1/3 DIN

Common features
Temperature drift @20°C
Pt100 0.003%/°C



A For the models of portable data logger series **HD21XX.2** has been implemented with a new serial port miniUSB type HID (Human Interface Device).
When making the connection to the PC by the USB cable Type A - Mini USB B-type coded CP23, **no USB driver installation is requested**.

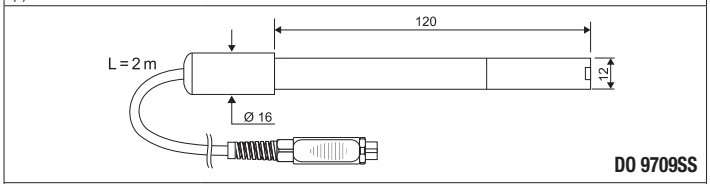
B For the connection of the models **HD21XX.1** to the RS232 port of your PC, the USB/serial converter is available (**code C.206**). The converter is equipped with its own drivers that have to be installed before connecting the converter to the PC (please see the details in the CDRom supplied with the converter).

C The port with the MiniDIN connector which is present on every model is an RS232C type. By means of the cable coded HD2110CSNM, an RS232 port of a PC or the HD40.1. printer can be connected.

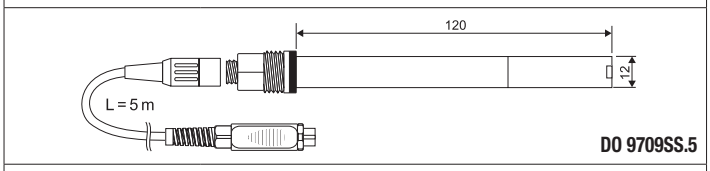
DO9700 **DO9701**

Oxygen probe – dimensions and characteristics

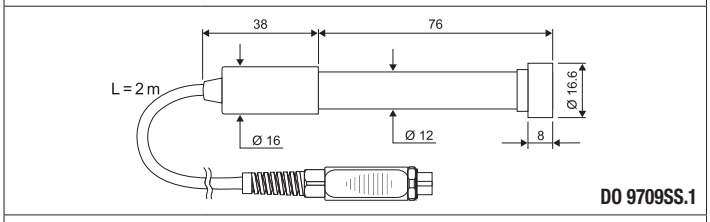
Model	DO9709SS	DO9709SS.5	DO9709SS.1	DO9709SS.5.1
Type	Polarographic probe, Silver anode, Platinum cathode		Galvanic probe, Zinc anode, Silver cathode	
O_2 measuring range	0.00…60.00mg/l		0.00…20.00mg/l	
Functioning temperature	0…45°C		0…50°C	
Accuracy instrument with probe	±1% f.s.		±2% f.s.	
Membrane	Replaceable		Replaceable	
Cable length	2m	5m(*)	2m	5m(*)
(*) Cable with connector				



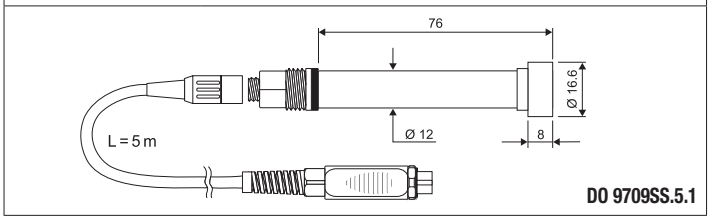
DO 9709SS



DO 9709SS.5



DO 9709SS.1



DO 9709SS.5.1

ORDER CODES

HD2109.1: The kit is composed of: instrument HD2109.1, calibrator DO9709/20 (for polarographic probe) or DO9709/21 (for galvanic probe), 4 1.5V alkaline batteries, operating manual, case and DeltaLog9 software.
The probes and data transfer cable must be ordered separately.

HD2109.2: The kit is composed of: instrument HD2109.2 **datalogger**, calibrator DO9709/20 (for polarographic probe) or DO9709/21 (for galvanic probe), 4 1.5V alkaline batteries, operating manual, case and DeltaLog9 software.
The probes and data transfer cable must be ordered separately.

HD2110CSNM: 8-pole connection cable MiniDin - Sub D 9-pole female for RS232C.

C.206: Cable for instruments of the series HD21...1 for direct connection to the USB input of a PC.

CP23: USB 2.0 connection cable type A - MiniUSB type B (not suitable for HD2109.1).

DeltaLog9: Software for download and management of the data on PC using Windows operating systems.

SWD10: Stabilized power supply 100-240 Vac/12Vdc-1A mains voltage

HD40.1: 24-column portable thermal printer, serial interface, 57mm paper width, four NiMH 1.2V rechargeable batteries, SWD10 power supply, instruction manual, 5 thermal paper rolls.

RCT: The kit includes 4 thermal paper rolls 57mm wide and 32mm in diameter.

BAT-40: Spare battery pack for HD40.1 printer with built-in temperature sensor.

HD22.2: Laboratory electrode holder composed of base plate with built-in magnetic stirrer, shaft and replaceable electrode holder. Suitable diameter 12mm. Powered by bench-top meters of the series HD22…with cable HD22.2.1 (**optional**) or power supplier SWD10 (**optional**).

HD22.3: Laboratory electrode holder composed of base plate. Flexible arm for free positioning. Suitable for electrodes with diameter 12mm.

Solutions

DO9700: zero oxygen solution.

DO9701: electrolyte solution for polarographic probes DO9709 SS and DO9709 SS.5.

DO9701.1: electrolyte solution for galvanic probes DO9709 SS.1 and DO9709 SS.5.1.

Combined dissolved Oxygen/temperature probes

DO 9709 SS Polarographic combined oxygen and temperature probe with possibility of membrane replacement. Ø12mm x 120mm. 2m cable. The code includes: probe, 2 membranes, electrolyte solution and zero point solution.

DO 9709 SS.5 Polarographic combined oxygen and temperature probe with possibility of membrane replacement. Ø12mm x 120mm. 5m cable. The code includes: probe, 2 membranes, electrolyte solution and zero point solution.

DO 9709 SS.1 Galvanic combined galvanic oxygen and temperature probe with possibility of membrane replacement. Ø12mm x 76mm. Ø16mm tip with membrane. 2m cable. The code includes: probe, 2 membranes in total, electrolyte solution and zero point solution.

DO 9709 SS.5.1 Galvanic combined galvanic oxygen and temperature probe with possibility of membrane replacement. Ø12mm x 76mm. Ø16mm tip with membrane. 5m cable. The code includes: probe, 2 membranes in total, electrolyte solution and zero point solution.

Accessories

DO 9709/20: Calibrator for polarographic probes DO 9709SS and DO 9709SS.5

DO 9709/21: Calibrator for galvanic probes DO 9709SS.1 and DO 9709SS.5.1

DO 9709 SSK: Kit of accessories for probes DO 9709SS and DO 9709SS.5: 3 membranes, zero point solution and electrolyte.

DO 9709/21K: Kit of accessories for probes DO 9709SS.1 and DO 9709SS.5.1: 3 membranes, zero point solution and electrolyte.

Temperature probes equipped with SICRAM module

TP472I: Wire wound Pt100 sensor, immersion probe. Stem Ø 3 mm, length 300 mm. Cable length 2 m.

TP472I.0: Thin film Pt100 sensor, immersion probe. Stem Ø 3 mm, length 230 mm. Cable length 2 m.

TP473P.I: Wire wound Pt100 sensor, penetration probe. Stem Ø 4mm, length 150 mm. Cable length 2 m.

TP473P.0: Thin film Pt100 sensor, penetration probe. Stem Ø 4mm, length 150 mm. Cable length 2 m.

TP474C.I: Wire wound Pt100 sensor, contact probe. Stem Ø 4mm, length 230mm, contact surface Ø 5mm. Cable length 2 m.

TP474C.0: Thin film Pt100 sensor, contact probe. Stem Ø 4mm, length 230mm, contact surface Ø 5mm. Cable length 2 m.

TP475A.0:, Thin film Pt100 sensor, air probe. Stem Ø 4mm, length 230mm. Cable length 2 m.

TP472I.5: Thin film Pt100 sensor, immersion probe. Stem Ø 6mm, length 500 mm. Cable length 2 m.

TP472I.10: Thin film Pt100 sensor, penetration probe. Stem Ø 6mm, length 1000mm. Cable length 2 m.

TP49A.0: Thin film Pt100 sensor, penetration probe. Stem Ø 2,7mm, length 150mm. Cable length 2 m. Aluminium handle

TP49AC.0: Thin film Pt100 sensor, contact probe. Stem Ø 4mm, length 150mm. Cable length 2 m. Aluminium handle

TP49AP.0: Thin film Pt100 sensor, penetration probe. Stem Ø 2,7mm, length 150mm. Cable length 2 m. Aluminium handle

TP875.I: Wire wound Pt100 sensor, 150mm diameter globe-thermometer equipped with handle. Cable length 2 m.

TP876.I: Wire wound Pt100 sensor, 50mm diameter globe-thermometer equipped with handle. Cable length 2 m.

TP87.0: Thin film Pt100 sensor, immersion probe. Stem Ø 3 mm, length 70 mm. Cable length 2 m.

TP878.0: Thin film Pt100 sensor, contact probe for solar panels. Cable length 2 m.

TP878.1.0: Thin film Pt100 sensor, contact probe for solar panels. Cable length 5 m.

TP879.0: Thin film Pt100 sensor, penetration probe for compost. Stem Ø 8 mm, length 1000 mm. Cable length 2 m.

Temperature probes without SICRAM module

TP47.100.0: Thin film Pt100 sensor, immersion probe. Stem Ø 3mm, length 230mm. Connection cable 4 wires with connector, length 2 m.

TP47: Connector for Pt100 4-wire probes without SICRAM module.

TP87.100.0: Thin film Pt100 sensor, immersion probe. Stem Ø 3mm, length 70mm. 4-wires connection cable with connector, length 1 m.

HD 2156.1
HD 2156.2

HD 2156.1, HD 2156.2
pH METER - CONDUCTIVITY METER - THERMOMETER

The **HD2156.1** and **HD2156.2** are portable instruments with a large LCD display. They measure pH, mV, redox potential (ORP), conductivity, liquid resistivity, total dissolved solids (TDS) and salinity using combined 4-ring and 2-ring conductivity/temperature probes. Temperature only is measured by Pt100 or Pt1000 immersion, penetration, contact or air probes.
The pH electrode calibration, as well as manual, can be carried out on one, two or three points and the calibration sequence can be chosen from a list of 13 buffers.
The calibration of the conductivity probe can be performed automatically in one or more of the 147µS/cm, 1413 µS/cm, 12880 µS/cm or 111800 µS/cm solutions.

The HD2156.2 instrument is a **datalogger.** It stores up to 20,000 sets of three measurements composed of pH or mV, conductivity or resistivity or TDS or salinity and temperature: these data can be transferred to a PC from the instrument connected via the RS232C or USB 2.0 serial ports. The storing interval, printing, and baud rate can be configured by the menu.

Both models are fitted with an RS232C serial port and can transfer the acquired measurements to a PC or to a portable printer in real time.
The Max, Min and *Avg* function calculates the maximum, minimum or average values.
Other functions include: the Auto-HOLD function and the automatic turning off which can also be excluded.
The instruments have IP66 protection degree.

INSTRUMENT TECHNICAL CHARACTERISTICS
Measured quantities: pH, mV, ℃, Ω, TDS, NaCl, °C, °F

Instrument

Dimensions (Length x Width x Height)	185x90x40mm
Weight	470g (complete with batteries)
Materials	ABS, rubber
Display	2x4½ digits plus symbols Visible area: 52x42mm

Operating conditions

Working temperature	-5…50°C
Storage temperature	-25…65°C
Working relative humidity	0…90%RH without condensation
Protection degree	**IP66**

Power

Batteries	4 1.5V type AA batteries
Autonomy	200 hours with 1800mAh alkaline batteries
Power absorbed with instrument off	20µA
Mains-supply unit	Output mains adapter 12Vdc/1000mA

Security of memorized data	Unlimited, independent of battery charge conditions

Time

Date and time	Real time schedule
Accuracy	1min/month max error

*Measured values storage - model **HD2156.2***

Type	2000 pages containing 10 samples each
Quantity	20,000 sets of three measurements composed of pH or mV, ℃, Ω or TDS or salinity and temperature.
Storage interval	1s, 5s, 10s, 15s, 30s, 1min, 2min, 5min, 10min, 15min, 20min, 30min and 1h.

Serial interface RS232C

Type	RS232C electrically isolated
Baud rate	Can be set from 1200 to 38400 bauds
Data bit	8
Parity	None
Stop bit	1
Flow Control	Xon/Xoff
Serial cable length	Max 15m
Print interval	Immediate or selectable between: 1s, 5s, 10s, 15s, 30s, 1min, 2min, 5min, 10min, 15min, 20min, 30min and 1h.

*USB interface - model **HD2156.2***

Type	1.1 - 2.0 electrically isolated

Connections

pH/mV input	Female BNC connector
Conductivity and Temperature input	8-pole male DIN45326 connector
Serial RS232C interface	8-pole MiniDin connector
USB interface	MiniUSB B-type connector
Mains adapter	2-pole connector (positive at centre)

Measurement of pH by Instrument

Measurement range	-2.000…+19.999pH
Resolution	0.01 or 0.001pH selectable from menu
Accuracy	± 0.001pH ±1 digit
Input impedance	$> 10^{12}\Omega$
Calibration error @25°C	|Offset|>20mV Slope < 50mV/pH or Slope > 63mV/pH Sensitivity < 85% or Sensitivity > 106.5%
Temperature compensation automatic/manual	-50…+150°C

Measurement of mV by Instrument

Measurement range	-1999.9…+1999.9mV
Resolution	0.1mV
Accuracy	±0.1mV ±1digit
Drift after 1 year	0.5mV/year

Measurement of conductivity		*Resolution*
Measuring range Kcell=0.01	0.000…1.999µS/cm	0.001µS/cm
Measuring range Kcell=0.1	0.00…19.99µS/cm	0.01µS/cm
Measuring range Kcell=1	0.0…199.9µS/cm	0.1µS/cm
	200…1999µS/cm	1µS/cm
	2.00…19.99mS/cm	0.01mS/cm
	20.0…199.9mS/cm	0.1mS/cm
Measuring range Kcell=10	200…1999mS/cm	1mS/cm
Accuracy (conductivity)	±0.5%±1digit	

Measurement of instrument's resistivity		
Measuring range Kcell=0.01	up to 1GΩ·cm (*)	
Measuring range Kcell=0.1	up to 100MΩ·cm (*)	
Measuring range Kcell=1	5.0…199.9Ω·cm	0.1Ω·cm
	200…999Ω·cm	1Ω·cm
	1.00k…19.99kΩ·cm	0.01kΩ·cm
	20.0k…99.9kΩ·cm	0.1kΩ·cm
	100k…999kΩ·cm	1kΩ·cm
	1…10MΩ·cm	1MΩ·cm
Measuring range Kcell=10	0.5…5.0Ω·cm	0.1Ω·cm
Accuracy (resistivity)	±0.5%±1digit	

(*) The resistivity measurement is obtained from the reciprocal of the conductivity measurement: the indication of the resistivity, in the vicinity of the full scale, appears as in the following table

K cell = 0.01 cm^{-1}		**K cell = 0.1 cm^{-1}**	
Conductivity (µS/cm)	Resistivity (MΩ·cm)	Conductivity (µS/cm)	Resistivity (MΩ·cm)
0.001 µS/cm	1000 MΩ·cm	0.01 µS/cm	100 MΩ·cm
0.002 µS/cm	500 MΩ·cm	0.02 µS/cm	50 MΩ·cm
0.003 µS/cm	333 MΩ·cm	0.03 µS/cm	33 MΩ·cm
0.004 µS/cm	250 MΩ·cm	0.04 µS/cm	25 MΩ·cm

Measurement of total dissolved solids (with coefficient χ/TDS=0.5)		*Resolution*
Measuring range Kcell=0.01	0.000…19.999mg/l	0.005mg/l
Measuring range Kcell=0.1	0.00…19.99mg/l	0.05mg/l
Measuring range Kcell=1	0.0…199.9mg/l	0.5mg/l
	200…1999mg/l	1mg/l
	2.00…19.99g/l	0.01g/l
	20.0…99.9g/l	0.1g/l
Measuring range Kcell=10	100…999g/l	1g/l
Accuracy (total dissolved solids)	±0.5%±1digit	

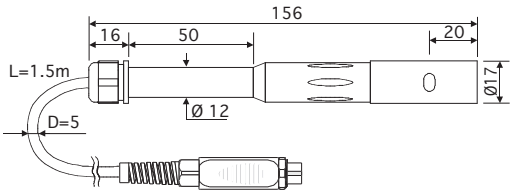
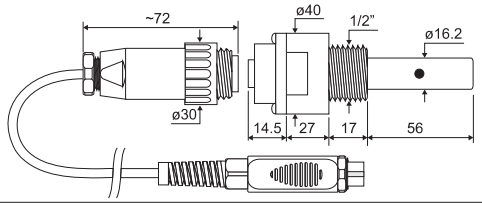
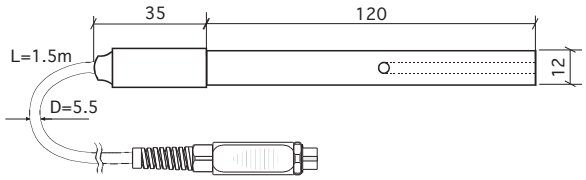
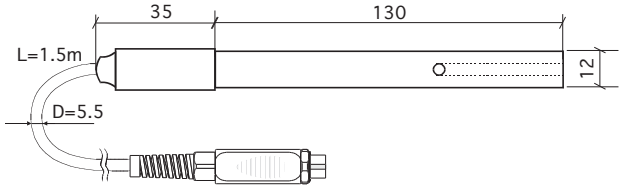
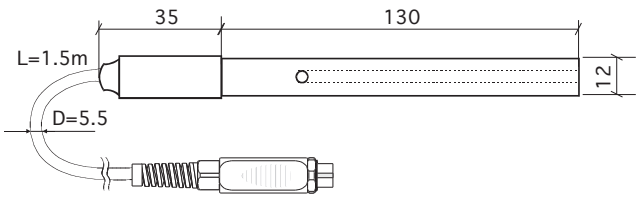
Measurement of salinity		*Resolution*
Measurement range	0.000…1.999g/l	1mg/l
	2.00…19.99g/l	10mg/l
	20.0…199.9g/l	0.1g/l
Accuracy (salinity)	±0.5%±1digit	

Temperature compensation automatic/manual	0…100°C with α_T selectable from 0.00 to 4.00%/°C
Reference temperature	20°C or 25°C
χ / TDS Conversion factor	0.4…0.8
Cell constant K (cm^{-1})	0.01, 0.7, 1.0 and 10.0

Standard solutions automatically detected @25°C	
	147µS/cm
	1413µS/cm
	12880µS/cm
	111800µS/cm

TECHNICAL DATA OF PROBES EQUIPPED WITH INSTRUMENT

2 and 4 electrode conductivity probes

ORDER CODE	MEASUREMENT RANGE	DIMENSIONS
SP06T	K=0.7 5µS…200mS/cm 0…90°C 4-electrode cell in Pocan/Platinum Max pressure 5bar	
SPT 401.001 not suitable for HD 2306.0	K=0.01 0,04…20µS/cm 0…120°C 2-electrode cell AISI 316 - Teflon Max pressure 5bar	
SPT01G	K=0.1 0.1µS…500µS/cm 0…80°C 2-electrode cell in Glass/Platinum Max pressure 5bar	
SPT1G	K=1 10µS…10mS/cm 0…80°C 2-electrode cell in Glass/Platinum Max pressure 5bar	
SPT10G	K=10 500µS…200mS/cm 0…80°C 2-electrode cell in Glass/Platinum Max pressure 5bar	

Temperature measurement of the instrument

Pt100 measuring range	-50…+200°C
Pt1000 measuring range	-50…+200°C
Resolution	0.1°C
Accuracy	±0.1°C ±1 digit
Drift after 1 year	0.1°C/year

TECHNICAL DATA OF PROBES AND MODULES EQUIPPED WITH INSTRUMENT
Temperature probes Pt100 sensor with SICRAM module

Model	Type	Application field	Accuracy
TP472I	Immersion	-196°C…+500°C	±0.25°C (-196°C…+300°C) ±0.5°C (+300°C…+500°C)
TP472I.0 1/3 DIN Thin Film	Immersion	-50°C…+300°C	±0.25°C (-50°C…+300°C)
TP473P.I	Penetration	-50°C…+400°C	±0.25°C (-50°C…+300°C) ±0.5°C (+300°C…+400°C)
TP473P.0 1/3 DIN Thin Film	Penetration	-50°C…+300°C	±0.25°C (-50°C…+300°C)
TP474C.I	Contact	-50°C…+400°C	±0.3°C (-50°C…+300°C) ±0.5°C (+300°C…+400°C)
TP474C.0 1/3 DIN Thin Film	Contact	-50°C…+300°C	±0.3°C (-50°C…+300°C)
TP475A.0 1/3 DIN Thin Film	Air	-50°C…+250°C	±0.3°C (-50°C…+250°C)
TP472I.5	Penetration	-50°C…+400°C	±0.3°C (-50°C…+300°C) ±0.6°C (+300°C…+400°C)
TP472I.10	Penetration	-50°C…+400°C	±0.30°C (-50°C…+300°C) ±0.6°C (+300°C…+400°C)
TP49A.0 Class A Thin Film	Immersion	-70°C…+250°C	±0.3°C (-70°C…-50°C) ±0.25°C (-50°C…+250°C)
TP49AC.0 Class A Thin Film	Contact	-70°C…+250°C	±0.3°C (-70°C…-50°C) ±0.25°C (-50°C…+250°C)
TP49AP.0 Class A Thin Film	Penetration	-70°C…+250°C	±0.3°C (-70°C…-50°C) ±0.25°C (-50°C…+250°C)
TP875.I	Globe-thermometer Ø150mm	-30°C…+120°C	±0.25°C
TP876.I	Globe-thermometer Ø50mm	-30°C…+120°C	±0.25°C
TP87.0 1/3 DIN Thin Film	Immersion	-50°C…+200°C	±0.25°C
TP878.0 1/3 DIN Thin Film TP878.1.0 1/3 DIN Thin Film	Photovoltaic	+4°C…+85°C	±0.25°C
TP879.0 1/3 DIN Thin Film	Compost	-20°C…+120°C	±0.25°C

Common characteristics

Temperature drift @ 20°C 0.003%/°C

4 wires Pt100 and 2 wires Pt1000 Probes

Model	Type	Application field	Accuracy
TP47.100.0 1/3 DIN Thin Film	4 wires Pt100	-50…+250°C	1/3 DIN
TP47.1000.0 1/3 DIN Thin Film	2 wires Pt1000	-50…+250°C	1/3 DIN
TP87.100.0 1/3 DIN Thin Film	4 wires Pt100	-50…+200°C	1/3 DIN
TP87.1000.0 1/3 DIN Thin Film	2 wires Pt1000	-50…+200°C	1/3 DIN

Common features

Temperature drift @20°C

Pt100	0.003%/°C
Pt1000	0.005%/°C

ORDER CODES

HD2156.1: The kit is supplied with: instrument HD2156.1, 4 1.5V alkaline batteries, operating manual, case and DeltaLog9 software.

HD2156.2: The kit is supplied with: instrument HD2156.2 **datalogger**, 4 1.5V alkaline batteries, operating manual, case and DeltaLog9 software.

pH/mV probes, conductivity probes, temperature probes, standard calibration solutions for various types of measures, connection cables for pH electrodes with S7 connector, cables for data transfer to PC or printer have to be ordered separately.

HD2110CSNM: 8-pole connection cable MiniDin - Sub D 9-pole female for RS232C.

C.206: Serial connection cable with USB connector for PC and 8-pole MiniDin male connector for the instrument HD2156.1.

CP23: USB 2.0 connection cable type A - MiniUSB type B (not suitable for HD2156.1).

DeltaLog9: Software for download and management of the data on PC using Windows operating systems.

SWD10: Stabilized power supply 100-240 Vac/12Vdc-1A mains voltage

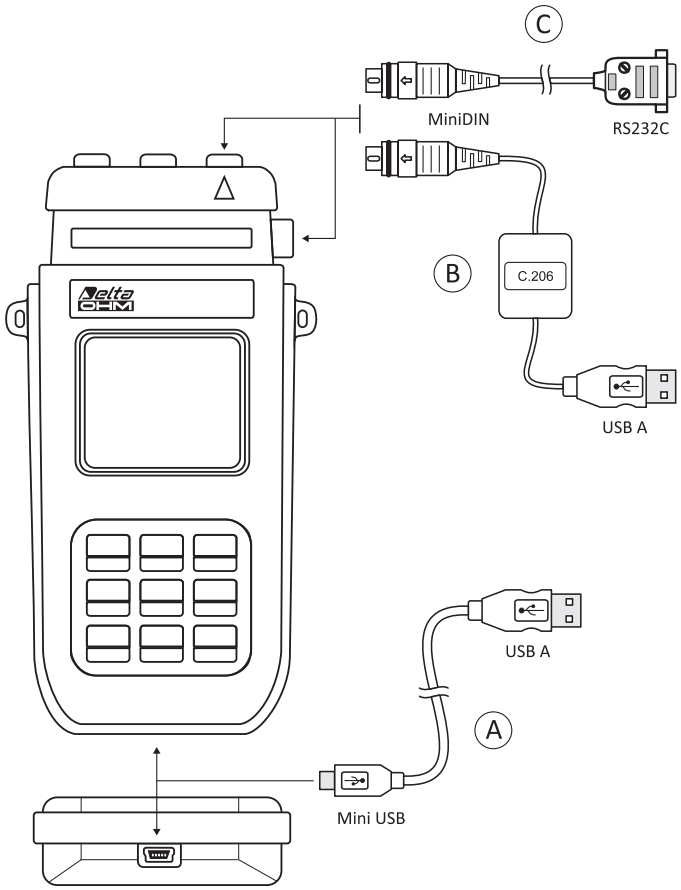
HD40.1: 24-column portable thermal printer, serial interface, 57mm paper width, four NiMH 1.2V rechargeable batteries, SWD10 power supply, instruction manual, 5 thermal paper rolls. It uses the cable HD2110CSNM (optional).

RCT: The kit includes 4 thermal paper rolls 57mm wide and 32mm in diameter.

BAT-40: Spare battery pack for HD40.1 printer with built-in temperature sensor.

HD22.2: Laboratory electrode holder composed of base plate with built-in magnetic stirrer, shaft and replaceable electrode holder. Suitable diameter 12mm. Powered by bench-top meters of the series HD22…with cable HD22.2.1 (**optional**) or power supplier SWD10 (**optional**).

HD22.3: Laboratory electrode holder composed of base plate. Flexible arm for free positioning. Suitable for electrodes with diameter 12mm.



A For the models of portable data logger series **HD21XX.2** has been implemented with a new serial port miniUSB type HID (Human Interface Device).
When making the connection to the PC by the USB cable Type A - Mini USB B-type coded CP23, **no USB driver installation is requested**.

B For the connection of the models **HD21XX.1** to the RS232 port of your PC, the USB/serial converter is available (**code C.206**). The converter is equipped with its own drivers that have to be installed before connecting the converter to the PC (please see the details in the CDRom supplied with the converter).

C The port with the MiniDIN connector which is present on every model is an RS232C type. By means of the cable coded HD2110CSNM, an RS232 port of a PC or the HD40.1. printer can be connected.

pH Electrodes

KP 20: Gel pH filled combined electrode for general use, with S7 screw connector, EPOXY body.
KP 30: Gel pH combined electrode for general use, 1m cable with BNC, EPOXY body .
KP 50: Gel pH combined electrode, porous Teflon ring junction, suitable for emulsions, demineralised water, waste water with S7 screw connector, glass body.
KP 61: 3 diaphragm liquid filled pH combined electrode for wine, milk, cream, etc., S7 screw connector, liquid reference filling, glass body.
KP 62: 1 diaphragm gel pH combined electrode for general use, pure water, varnishes, gel filled, S7 screw connector, glass body.
KP 63: liquid filled pH combined electrode for general use, varnishes, 1m cable with BNC, glass body.
KP 64: Liquid filled pH combined electrode,Teflon ring diaphragm, for wine, varnishes, emulsions, S7 screw connector, glass body.
KP 70: Pointed gel combined pH microelectrode diam. 6 x L=70 mm., with S7 screw connector, EPOXY body, glass tip, open junction for meat and cheese.
KP 80: Pointed gel pH combined electrode, with S7 screw connector, glass body, for cream, milk, viscous material, open junction.
KP100: Flat membrane gel combined pH electrode with S7 screw connector, glass body, for skin, leather, paper.
Characteristics and dimensions of the probes at page WA-76

CP: 1.5m extension cable with BNC/S7 connector for electrode without cable, thread S7.
CP 5: 5m extension cable with BNC/S7 connector for electrode without cable, thread S7.
CP 10: 10m extension cable with BNC/S7 connector for electrode without cable, thread S7.
CP 15: 15m extension cable with BNC/S7 connector for electrode without cable, thread S7.
CE : S7 screw connector for pH electrode.
BNC: female BNC for extension cable

ORP Electrodes

KP 90: REDOX PLATINUM liquid filled electrode with S7 screw connector, glass body.
KP 91: Gel REDOX PLATINUM electrode, 1m cable with BNC, EPOXY body for general purpose light duty.
Characteristics and dimensions of the probes at page WA-76

pH Buffer solutions

HD8642: Buffer solution 4.01pH - 200cc.
HD8672: Buffer solution 6.86pH - 200cc.
HD8692: Buffer solution 9.18pH - 200cc.

Redox Buffer solutions

HDR220: Redox buffer solution 220mV 0.5 l.
HDR468: Redox buffer solution 468mV 0.5 l.

Electrolyte solutions

KCL3M Ready to use solution for electrode refilling – 100 cc

Cleaning and maintenance

HD62PT: Diaphragm cleaning (tiourea in HCl) - 500ml.
HD62PP: Protein cleaning (pepsin in HCl) - 500ml.
HD62RF: Regeneration (fluorhydric acid) - 100ml.
HD62SC: Solution for electrode preservation - 200ml.

Conductivity probes

Please refer to the purchasing codes reported on the table of the probes on page WA-9.

Conductivity buffer solutions

HD 8747: Calibration solution 0.001 mol/l corresponding to 147 µS/cm at 25°C, 200cc.
HD 8712: Calibration solution 0.1 mol/l corresponding to 12,880 µS/cm at 25°C, 200cc.
HD 8714: Calibration solution 0.01 mol/l corresponding to 1413 µS/cm at 25°C, 200cc.
HD 87111: Calibration solution 1 mol/l corresponding to 111800 µS/cm at 25°c, 200cc.

Temperature probes equipped with SICRAM module

TP472I: Wire wound Pt100 sensor, immersion probe. Stem Ø 3 mm, length 300 mm. Cable length 2 m.
TP472I.0: Thin film Pt100 sensor, immersion probe. Stem Ø 3 mm, length 230 mm. Cable length 2 m.
TP473P.I: Wire wound Pt100 sensor, penetration probe. Stem Ø 4mm, length 150 mm. Cable length 2 m.
TP473P.0: Thin film Pt100 sensor, penetration probe. Stem Ø 4mm, length 150 mm. Cable length 2 m.
TP474C.I: Wire wound Pt100 sensor, contact probe. Stem Ø 4mm, length 230mm, contact surface Ø 5mm. Cable length 2 m.
TP474C.0: Thin film Pt100 sensor, contact probe. Stem Ø 4mm, length 230mm, contact surface Ø 5mm. Cable length 2 m.
TP475A.0:, Thin film Pt100 sensor, air probe. Stem Ø 4mm, length 230mm. Cable length 2 m.
TP472I.5: Thin film Pt100 sensor, penetration probe. Stem Ø 6mm, length 500 mm. Cable length 2 m.
TP472I.10: Thin film Pt100 sensor, penetration probe. Stem Ø 6mm, length 1000mm. Cable length 2 m.
TP49A.0: Thin film Pt100 sensor, immersion probe. Stem Ø 2,7mm, length 150mm. Cable length 2 m. Aluminium handle
TP49AC.0: Thin film Pt100 sensor, contact probe. Stem Ø 4mm, length 150mm. Cable length 2 m. Aluminium handle
TP49AP.0: Thin film Pt100 sensor, penetration probe. Stem Ø 2,7mm, length 150mm. Cable length 2 m. Aluminium handle
TP875.I: Wire wound Pt100 sensor, 150mm diameter globe-thermometer equipped with handle. Cable length 2 m.
TP876.I: Wire wound Pt100 sensor, 50mm diameter globe-thermometer equipped with handle. Cable length 2 m.
TP87.0: Thin film Pt100 sensor, immersion probe. Stem Ø 3 mm, length 70 mm. Cable length 2 m.
TP878.0: Thin film Pt100 sensor, contact probe for solar panels. Cable length 2 m.
TP878.1.0: Thin film Pt100 sensor, contact probe for solar panels. Cable length 5 m.
TP879.0: Thin film Pt100 sensor, penetration probe for compost. Stem Ø 8 mm, length 1000 mm. Cable length 2 m.

Temperature probes without SICRAM module

TP47.100.0: Thin film Pt100 sensor, immersion probe. Stem Ø 3mm, length 230mm. Connection cable 4 wires with connector, length 2 m.
TP47.1000.0: Thin film Pt1000 sensor, immersion probe. Probe's Stem Ø 3mm, length 230mm. Connection cable 4 wires with connector, length 2 m.
TP47: Connector for Pt100 4-wire and Pt1000 2-wire probes without SICRAM module.
TP87.100.0: Thin film Pt100 sensor, immersion probe. Stem Ø 3mm, length 70mm. 4-wires connection cable with connector, length 1 m.
TP87.1000.0: Thin film Pt1000 sensor, immersion probe. Stem Ø 3mm, length 70mm. 2-wires connection cable with connector, length 1 m.

HD 22569.2

HD 22569.2
BENCH-TOP METER FOR pH - CONDUCTIVITY - DISSOLVED OXYGEN

The instrument **HD22569.2** is a bench top instrument for electrochemical measures: **pH**, **conductivity**, **dissolved oxygen,** and **temperature**. It is are fitted with a large backlighted LCD display.
The **HD22569.2** measures **pH**, **mV**, **redox potential** (ORP) with pH, redox electrodes or electrodes with separate reference; **conductivity**, **resistivity** in liquids, **total dissolved solids** (TDS) and **salinity** with combined 4-ring and 2-ring conductivity/ temperature probes with direct input or SICRAM module; **concentration of dissolved oxygen in** liquids (in mg/l) and **saturation index** (in %), using SICRAM combined probes of polarographic type with two or three electrodes or galvanic type, and integrated temperature sensor.

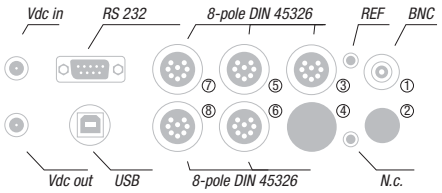
The instruments is fitted with an input for the measurement of t**emperature** with Pt100 or Pt1000 immersion, penetration or contact probes. The temperature probes are equipped with an automatic recognition module and factory calibration data are stored inside.

- The pH electrode calibration can be carried out on up to five points and the calibration sequence can be chosen from a list of 13 buffers. Temperature compensation can be automatic or manual.
- The conductivity probe calibration can be performed automatically with automatically detected conductivity calibration solutions: 147µS/cm, 1413µS/cm, 12880µS/cm or 111800µS/cm or manually with calibration solutions having different values.
- The dissolved Oxygen probe's quick calibration function guarantees timely correctness of the performed measurements.
- Conductivity, dissolved oxygen and temperature probes fitted with SICRAM module can store factory and calibration data inside.

The instruments HD22569.2 is a **datalogger**, it can memorize up to 2,000 samples of data: pH or mV, conductivity or resistivity or TDS or salinity, concentration of dissolved oxygen and temperature.
The data can be transferred from the instrument connected to a PC via the RS232C or USB 2.0 serial ports. The storing parameters can be configured using the menu.
The RS232C serial port can be used to transfer the acquired measurements to a 24 column portable printer in real time (HD40.1 or HD40.2).
The instruments equipped with **HD22BT** (Bluetooth) option can transfer data without any connection to a PC or printer fitted with Bluetooth input or through Bluetooth/RS232C converter.
The software DeltaLog11 allows instrument management and configuration, and data processing on PC.
The instruments have IP66 protection degree.

Technical characteristics of HD22569.2
pH - mV - ℃ - Ω - TDS - NaCl - mg/l O_2 - %O_2 - mbar - °C - °F measurement

Instrument	
Dimensions (Length x Width x Height)	265x185x70mm
Weight	490g
Materials	ABS, rubber
Display	Back lighted, matrix point display. 240x64 points, visible area: 128x35mm
Operating conditions	
Working temperature	-5 … 50°C
Storage temperature	-25 … 65°C
Working relative humidity	0 … 90% R.H. without condensate
Protection degree	**IP66**
Power	Mains adapter (cod. SWD10) 12Vdc/1A
Auxiliary socket	For supplying of electrode holder with built-in stirrer HD22.2
Security of memorized data	Unlimited



Time

Date and hour	Real time schedule with backup battery 3.6V - ½AA
Accuracy	1min/month max drift

Measured values storing

Quantity	2000 screens
Storage interval	1s … 999s

Calibration storage

Quantity	Last 8 calibrations of each physical quantity

RS232C serial interface

Type	RS232C electrically isolated
Baud rate	Can be set from 1200 to 115200 baud
Data bit	8
Parity	None
Stop bit	1
Flow Control	Xon/Xoff
Length of serial cable	Max 15m

Serial data Interface

USB	1.1 - 2.0 electrically isolated
Bluetooth	optional

Connections

Input for temperature probes with SICRAM modules⑤	8-pole male DIN45326 connector
pH/mV input ①	BNC female
Input for SICRAM module pH/ temperature ③	8-pole male DIN45326 connector
2/ 4- electrode direct conductivity input ⑧	8-pole male DIN45326 connector
Conductivity SICRAM module input ⑦	8-pole male DIN45326 connector
Dissolved Oxygen input ⑥	8-pole male DIN45326 connector
Serial interface	DB9 connector (9- pole male)
USB interface	USB connector type B
Bluetooth	Optional
Mains adapter	2- pole connector (Ø5.5mm-2.1mm). Positive at centre
Outlet for power supply of electrode holder with built-in magnetic stirrer	2-pole connector (Ø5.5mm-2.1mm). Positive at centre (output 12Vdc/200mA max).

Measurement of pH by instrument

Measuring range	-9.999…+19.999pH
Resolution	0.01 o 0.001pH selectable from menu
Accuracy	±0.001pH ±1digit
Input impedance	$>10^{12}\Omega$
Calibration error @25°C	|Offset| > 20mV Slope > 63mV/pH or Slope < 50mV/pH Sensitivity > 106.5% or Sensitivity < 85%
Calibration points	Up to 5 points from a list of 8 automatically detected buffers
Temperature compensation	-50...150°C
Automatically detected standard solutions @25°C	1.679pH - 4.000pH - 4.010pH 6.860pH - 7.000pH - 7.648pH 9.180pH - 10.010pH

Measurement of mV by instrument

Measuring range	-1999.9…+1999.9mV
Resolution	0.1mV
Accuracy	±0.1mV ±1digit
Drift after 1 year	0.5mV/year

Measurement of conductivity by instrument		Resolution
Measurement range (K cell=0.01)	0.000…1.999µS/cm	0.001µS/cm
Measurement range (K cell=0.1)	0.00…19.99µS/cm	0.01µS/cm
Measurement range (K cell=1)	0.0…199.9µS/cm	0.1µS/cm
	200…1999µS/cm	1µS/cm
	2.00…19.99mS/cm	0.01mS/cm
	20.0…199.9mS/cm	0.1mS/cm
Measurement range (K cell=10)	200…1999mS/cm	1mS/cm
Accuracy (conductivity) instrument	±0.5% ±1digit	

Measurement of resistivity by instrument		*Resolution*
Measurement range (K cell=0.01)	Up to 1GΩcm	
Measurement range (K cell=0.1)	Up to 100MΩ·cm	(*)
Measurement range (K cell=1)	5.0…199.9Ω·cm	0.1Ωcm
	200…999Ω·cm	1Ω·cm
	1.00k…19.99kΩ·cm	0.01kΩcm
	20.0k…99.9kΩ·cm	0.1kΩcm
	100k…999kΩ·cm	1kΩcm
	1…10MΩ·cm	1MΩ·cm
Measurement range (K cell=10)	0.5…5.0Ω·cm	0.1Ωcm
Accuracy (resistivity) instrument	±0.5% ±1digit	

Measurement of total dissolved solids (with coefficient χ/TDS=0.5)		*Resolution*
Measurement range (K cell=0.01)	0.00…1.999mg/l	0.005mg/l
Measurement range (K cell=0.1)	0.00…19.99mg/l	0.05mg/l
Measurement range (K cell=1)	0.0…199.9 mg/l	0.5 mg/l
	200…1999 mg/l	1 mg/l
	2.00…19.99 g/l	0.01 g/l
	20.0…199.9 g/l	0.1 g/l
Measurement range (K cell=10)	100…999 g/l	1 g/l
Accuracy (total dissolved solids) instrument	±0.5% ±1digit	

Measurement of salinity		*Resolution*
Measurement range	0.000…1.999g/l	1mg/l
	2.00…19.99g/l	10mg/l
	20.0…199.9 g/l	0.1 g/l
Accuracy (salinity) instrument	±0.5% ±1digit	

Automatic/manual temperature compensation

	0...100°C with α_T = 0.00…4.00%/°C
Reference temperature	0…50°C
Conversion factor χ/TDS	0.4…0.8
Admitted cell constants K (cm^{-1})	0.01- 0.1 - 0.5 - 0.7 - 1.0 - 10.0
Cell constants K (cm^{-1}) that can be set by user	0.01…20.00

Automatically detected standard solutions (@25°C)

	147µS/cm
	1413µS/cm
	12880µS/cm
	111800µS/cm

Measurement of concentration of dissolved oxygen

Measurement range	0.00…90.00mg/l
Resolution	0.01mg/l
Accuracy instrument	±0.03mg/l ±1digit (0...90%,1013mbar, 20...25°C)

Measurement of saturation index of dissolved oxygen

Measurement range	0.0…600.0%
Resolution	0.1%
Accuracy instrument	±0.3% ±1digit (in the range 0.0…199.9%) ±1% ±1digit (in the range 200.0…600.0%)

Measurement of barometric pressure

Measuring range	0.0…1100.0mbar
Resolution	0.1mbar
Accuracy	±2mbar±1digit between 18 and 25°C ±(2mbar+0.1mbar/°C) in the remaining range

Salinity setting

Setting	directly from menu or automatically by conductivity measurement
Setting range	0.0…70.0g/l
Resolution	0.1g/l

Temperature measurement with the sensor inside the O_2 probe

Measurement range	0.0…50.0°C
Resolution	0.1°C
Accuracy instrument	±0.1°C ±1digit
Drift after 1 year	0.1°C/year
Automatic temperature compensation	0…50°C

Measurement of temperature by instrument

Pt100 Measurement range	-50…+150°C
Pt1000 Measurement range	-50…+150°C
Resolution	0.1°C
Accuracy instrument	±0.1°C ±1digit
Drift after 1 year	0.1°C/year

(*) The resistivity measurement is obtained from the reciprocal of conductivity measurement. Close to the bottom of the scale, the indication of resistivity appears like reported in the table below:

K cell = 0.01 cm^{-1}		K cell = 0.1 cm^{-1}	
Conductivity (µS/cm)	Resistivity (MΩ·cm)	Conductivity (µS/cm)	Resistivity (MΩ·cm)
0.001 µS/cm	1000 MΩ·cm	0.01 µS/cm	100 MΩ·cm
0.002 µS/cm	500 MΩ·cm	0.02 µS/cm	50 MΩ·cm
0.003 µS/cm	333 MΩ·cm	0.03 µS/cm	33 MΩ·cm
0.004 µS/cm	250 MΩ·cm	0.04 µS/cm	25 MΩ·cm

ORDERING CODES

HD22569.2: The kit is composed of: instrument HD22569.2 for the measurement of pH - redox - conductivity - resistivity - TDS - salinity - concentration of dissolved oxygen, saturation index - temperature, **datalogger**, stabilized power supply at mains voltage 100-240Vac/12Vdc-1A, calibrator HD9709/20 (for polarographic probe) or DO9709/21 (for galvanic probe), instructions manual and software DeltaLog11.

pH/mV electrodes, conductivity probes, dissolved oxygen probes, temperature probes, standard reference solutions for different measurement types, connection cables for pH electrodes with S7 connector, cables for data download to PC or printer have to be ordered separately.

Accessories

9CPRS232: Connection cable SubD female 9- pole for serial output RS232C.
CP22: USB 2.0 connection cable - connector typo A - connector type B.
DeltaLog11: Software for download and management of the data on PC using Windows operating systems.
SWD10: Stabilized power supply at 100-240Vac/12Vdc-1A mains voltage.
HD40.1: 24-column portable thermal printer, serial interface, 57mm paper width, four NiMH 1.2V rechargeable batteries, SWD10 power supply, instruction manual, 5 thermal paper rolls. Requires the cable 9CPRS232 (optional).
HD40.2: 24-column portable thermal printer, **Bluetooth and serial interface**, 57mm paper width, four NiMH 1.2V rechargeable batteries, SWD10 power supply, instruction manual, 5 thermal paper rolls. Requires the module HD22BT (**optional**) or the cable 9CPRS232 (**optional**).
HD22.2: Laboratory electrode holder composed of basis plate with incorporated magnetic stirrer, staff and replaceable electrode holder. Height max. 380mm. Powered by bench-top meters of the series HD22… with cable HD22.2.1 (**optional**) or supplier SWD10 (**optional**).
HD22.3: Laboratory electrode holder with metal basis plate. Flexible electrode holder for free positioning. For Ø 12mm probes.
HD22BT: Bluetooth module for wireless data transmission from instrument to PC. **The fitting of the module into the instrument is made exclusively by Delta Ohm, at the time of placing the order.**
TP47: Connector for Pt100 4-wire and Pt1000 2-wire probes without SICRAM module.

pH electrodes without SICRAM module *(Inputs ①)*

KP 20: Gel pH combined electrode for general use, with S7 screw connector, EPOXY body.
KP 30: Gel pH combined electrode for general use, 1m cable with BNC, EPOXY body .
KP 50: Gel pH combined electrode, porous Teflon ring junction, suitable for emulsions, demineralised water and waste water with S7 screw connector, glass body.
KP 61: 3 diaphragm liquid filled pH combined electrode for wine, milk, cream, etc., S7 screw connector, liquid reference filling, glass body.
KP 62: 1 diaphragm gel pH combined electrode for general use, pure water, varnishes, gel filled, S7 screw connector, glass body.
KP 63: liquid filled pH combined electrode for general use, varnishes, 1m cable with BNC, glass body.
KP 64: Liquid filled pH combined electrode,Teflon ring diaphragm, for wine, varnishes, emulsions, S7 screw connector, glass body.
KP 70: Pointed gel combined pH microelectrode diam. 6 x L=70 mm., with S7 screw connector, EPOXY body, glass tip, open junction for meat and cheese.
KP 80: Pointed gel pH combined electrode, with S7 screw connector, glass body, for cream, milk, viscous material, open junction.
KP100: Flat membrane gel combined pH electrode with S7 screw connector, glass body, for skin, leather, paper.

Characteristics and dimensions of the probes on page WA-76.

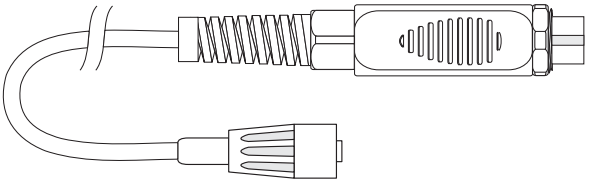
CP: Extension cable 1.5m with BNC connectors on one side and S7 on the other side for electrode with S7 connector.
CP5: Extension cable 5m with BNC connectors on one side and S7 on the other side for electrode with S7 connector.
CP 10: 10m extension cable with BNC/S7 connector for electrode without cable, thread S7.
CP 15: 15m extension cable with BNC/S7 connector for electrode without cable, thread S7.
CE: S7 screw connector for pH electrode.
BNC: Female BNC for cable extension.

pH electrodes with SICRAM module *(Input ③)*

KP63TS: Combined pH/temperature electrode with SICRAM module, body in glass, 1m cable, 1 diaphragm, for general use, internal liquid reference.

SICRAM Module with S7 input for pH electrodes *(Input ③)*

pH 471.1: SICRAM module for pH electrodes with S7 standard connection, cable L=1m.
pH 471.2: SICRAM module for pH electrodes with S7 standard connection, cable L=2m.
pH 471.5: SICRAM module for pH electrodes with S7 standard connection, cable L=5m.



ORP Electrodes (Inputs ① and ②)

KP90: Redox Platinum electrode, with screw connector S7, liquid electrolyte, body in glass.
KP91: Redox Platinum electrode with 1m cable with BNC, GEL filled, body in Epoxy.

Electrode dimensions and characteristics at page WA-76

pH buffer solutions

HD8642: Buffer solution 4.01pH - 200cc.
HD8672: Buffer solution 6.86pH - 200cc.
HD8692: Buffer solution 9.18pH - 200cc.

Redox buffer solutions

HDR220: Redox buffer solution 220mV 0,5 l.
HDR468: Redox buffer solution 468mV 0,5 l.

Electrolyte solutions

KCL 3M: Ready for use solution for refilling of the electrodes.

Cleaning and maintenance

HD62PT: Diaphragm cleaning (tiourea in HCl) - 500ml.
HD62PP: Protein cleaning (pepsin in HCl) - 500ml.
HD62RF: Regeneration (fluorhydric acid) - 100ml.
HD62SC: Solution for electrode preservation - 500ml.

Conductivity probes and combined conductivity and temperature probes without SICRAM module (Input ①)

SP06T: Combined conductivity and temperature 4-electrode cell, body in Pocan. Cell constant K=0.7. Measurement range 5µS/cm…200mS/cm, 0…90°C. Max pressure 5bar.
SPT401.001: Combined conductivity and temperature 2-electrode cell in stainless steel AISI 316. Cell constant K=0.01. Cable 2m. Measurement range 0.04µS/cm …20µS/cm, 0…120°C. Measurement in closed-cell. Max pressure 5bar.
SPT01G: Combined conductivity and temperature 2-electrode Platinum-wire cell, body in glass. Cell constant K=0.1. Measurement range 0.1µS/cm …500µS/cm, 0…80°C. Max pressure 5bar.
SPT1G: Combined conductivity and temperature 2-electrode Platinum-wire cell, body in glass. Cell constant K=1. Measurement range 10µS/cm …10mS/cm, 0…80°C. Max pressure 5bar.
SPT10G: Combined conductivity and temperature 2-electrode Platinum-wire cell, body in glass. Cell constant K=10. Measurement range 500µS/cm …200mS/cm, 0…80°C. Max pressure 5bar.

Probe dimensions and characteristics at page WA-77

Combined conductivity / temperature probes with SICRAM module (Input ®)

SPT1GS: Combined conductivity /temperature 2-electrode Platinum- wire cell, body in glass with SICRAM module. Cell constant K = 1. Measuring range 10µS/cm … 10mS/cm, 0…80°C.

Probe characteristics at page WA-77

Standard calibration solutions

HD8747: Standard calibration solution 0.001mol/l equal to 147µS/cm @25°C - 200cc.
HD8714: Standard calibration solution 0.01mol/l equal to 1413µS/cm @25°C - 200cc.
HD8712: Standard calibration solution 0.1mol/l equal to 12880µS/cm @25°C - 200cc.
HD87111: Standard calibration solution 1mol/l equal to 111800µS/cm @25°C - 200cc.

Combined dissolved Oxygen/temperature probes

DO 9709 SS Polarographic combined oxygen and temperature probe with possibility of membrane replacement. Ø12mm x 120mm. 2m cable. The code includes: probe, 2 membranes, electrolyte solution and zero point solution.

DO 9709 SS.5 Polarographic combined oxygen and temperature probe with possibility of membrane replacement. Ø12mm x 120mm. 5m cable. The code includes: probe, 2 membranes, electrolyte solution and zero point solution.

DO 9709 SS.1 Galvanic combined oxygen and temperature probe with possibility of membrane replacement. Ø12mm x 120mm. Ø16mm tip with membrane. 2m cable. The code includes: probe, 2 membranes in total, electrolyte solution and zero point solution.

DO 9709 SS.5.1 Galvanic combined oxygen and temperature probe with possibility of membrane replacement. Ø12mm x 120mm. Ø16mm tip with membrane. 5m cable. The code includes: probe, 2 membranes in total, electrolyte solution and zero point solution.

Probe dimensions and characteristics at page WA-79

Accessories

DO 9709/20: Calibrator for polarographic probes DO 9709SS and DO 9709SS.5
DO 9709/21: Calibrator for galvanic probes DO 9709SS.1 and DO 9709SS.5.1
DO 9709 SSK: Kit of accessories for probes DO 9709SS and DO 9709SS.5: 3 membranes, zero point solution and electrolyte.
DO 9709/21K: Kit of accessories for probes DO 9709SS.1 and DO 9709SS.5.1: 3 membranes, zero point solution and electrolyte.
DO9700: zero oxygen solution.
DO9701: electrolyte solution for polarographic probes DO9709 SS and DO9709 SS.5.
DO9701.1: electrolyte solution for galvanic probes DO9709 SS.1 and DO9709 SS.5.1.

Temperature probes equipped with SICRAM module

TP472I: Wire wound Pt100 sensor, immersion probe. Stem Ø 3 mm, length 300 mm. Cable length 2 m.
TP472I.0: Thin film Pt100 sensor, immersion probe. Stem Ø 3 mm, length 230 mm. Cable length 2 m.
TP473P.I: Wire wound Pt100 sensor, penetration probe. Stem Ø 4mm, length 150 mm. Cable length 2 m.
TP473P.0: Thin film Pt100 sensor, penetration probe. Stem Ø 4mm, length 150 mm. Cable length 2 m.
TP474C.I: Wire wound Pt100 sensor, contact probe. Stem Ø 4mm, length 230mm, contact surface Ø 5mm. Cable length 2 m.
TP474C.0: Thin film Pt100 sensor, contact probe. Stem Ø 4mm, length 230mm, contact surface Ø 5mm. Cable length 2 m.
TP475A.0:, Thin film Pt100 sensor, air probe. Stem Ø 4mm, length 230mm. Cable length 2 m.
TP472I.5: Thin film Pt100 sensor, penetration probe. Stem Ø 6mm, length 500 mm. Cable length 2 m.
TP472I.10: Thin film Pt100 sensor, penetration probe. Stem Ø 6mm, length 1000mm. Cable length 2 m.
TP49A.0: Thin film Pt100 sensor, immersion probe. Stem Ø 2,7mm, length 150mm. Cable length 2 m. Aluminium handle
TP49AC.0: Thin film Pt100 sensor, contact probe. Stem Ø 1mm, length 150mm. Cable length 2 m. Aluminium handle
TP49AP.0: Thin film Pt100 sensor, penetration probe. Stem Ø 2,7mm, length 150mm. Cable length 2 m. Aluminium handle
TP875.I: Wire wound Pt100 sensor, 150mm diameter globe-thermometer equipped with handle. Cable length 2 m.
TP876.I: Wire wound Pt100 sensor, 50mm diameter globe-thermometer equipped with handle. Cable length 2 m.
TP87.0: Thin film Pt100 sensor, immersion probe. Stem Ø 3 mm, length 70 mm. Cable length 2 m.
TP878.0: Thin film Pt100 sensor, contact probe for solar panels. Cable length 2 m.
TP878.1.0: Thin film Pt100 sensor, contact probe for solar panels. Cable length 5 m.
TP879.0: Thin film Pt100 sensor, penetration probe for compost. Stem Ø 8 mm, length 1000 mm. Cable length 2 m.

Temperature probes without SICRAM module

TP47.100.0: Thin film Pt100 sensor, immersion probe. Stem Ø 3mm, length 230mm. Connection cable 4 wires with connector, length 2 m.
TP47.1000.0: Thin film Pt1000 sensor, immersion probe. Probe's Stem Ø 3mm, length 230mm. Connection cable 4 wires with connector, length 2 m.
TP47: Connector for Pt100 4-wire and Pt1000 2-wire probes without SICRAM module.
TP87.100.0: Thin film Pt100 sensor, immersion probe. Stem Ø 3mm, length 70mm. 4-wires connection cable with connector, length 1 m.
TP87.1000.0: Thin film Pt1000 sensor, immersion probe. Stem Ø 3mm, length 70mm. 2-wires connection cable with connector, length 1 m.

HD 2259.2

HD 2259.2
BENCH-TOP DISSOLVED OXYGEN AND pH METER

The **HD2259.2** a bench top instrument for electrochemical measures: **pH**, **dissolved oxygen,** and **temperature**. It is fitted with a large backlighted LCD display.
The **HD2259.2** measures **pH**, **mV**, **redox potential** (ORP) with pH, redox electrodes or electrodes with separate reference; the **concentration of dissolved oxygen in** liquids (in mg/l), and **saturation index** (in %), using SICRAM combined probes of polarographic type with two or three electrodes or galvanic type, and integrated temperature sensor.
The instrument fitted with an input for the measurement of t**emperature** with Pt100 or Pt1000 immersion, penetration or contact probes. The temperature probes are equipped with an automatic recognition module and factory calibration data are stored inside.

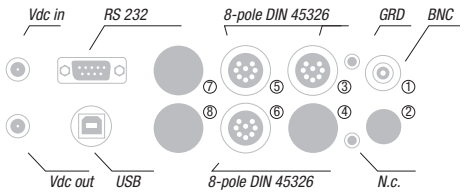
- The pH electrode calibration can be carried out on up to five points and the calibration sequence can be chosen from a list of 13 buffers Temperature compensation can be automatic or manual.
- The dissolved Oxygen probe's quick calibration function guarantees timely correctness of the performed measurements.

- Conductivity, dissolved oxygen and temperature probes fitted with SICRAM module can store factory and calibration data inside.

The instrument HD2259.2 is a **datalogger**, it can memorize up to 2,000 samples of data: pH or mV, concentration of dissolved oxygen or saturation index and saturation index and temperature:
The data can be transferred from the instrument connected to a PC via the RS232C and USB 2.0 serial ports. The storing parameters can be configured using the menu.
The RS232C serial port can be used to transfer the acquired measurements to a 24 column portable printer in real time (HD 40.1, HD 40.2).
The instruments equipped with **HD22BT** (Bluetooth) option can transfer data without any connection to a PC or printer fitted with Bluetooth input (HD40.2) or through Bluetooth/ RS232C converter.
The software DeltaLog11 allows instrument management and configuration, and data processing on PC.
The instruments have IP66 protection degree.

Technical characteristics HD2259.2
pH - mV - mg/l O_2 - %O_2 - mbar - °C - °F measurement

Instrument	
Dimensions (Length x Width x Height)	265x185x70mm
Weight	490g
Materials	ABS, rubber
Display	Back lighted, matrix point display. 240x64 points, visible area: 128x35mm
Operating conditions	
Working temperature	-5 … 50°C
Storage temperature	-25 … 65°C
Working relative humidity	0 … 90% R.H. without condensate
Protection degree	**IP66**
Power	Mains adapter (cod. SWD10) 12Vdc/1A
Auxiliary output socket	For supplying of electrode holder with built-in stirrer HD22.2
Security of memorized data	Unlimited
Time	
Date and hour	Real time schedule with backup battery 3.6V - ½AA
Accuracy	1min/month max drift
Measured values storing	
Quantity	2000 screens
Storage interval	1s … 999s
Calibration storage	
Quantity	Last 8 calibrations of each physical quantity
RS232C serial interface	
Type	RS232C electrically isolated



Baud rate	Can be set from 1200 to 115200 baud
Data bit	8
Parity	None
Stop bit	1
Flow Control	Xon/Xoff
Length of serial cable	Max 15m

USB Interface

Type	1.1 - 2.0 electrically isolated
Bluetooth Interface	optional

Connections

Input for temperature probes with SICRAM modules ⑤	8-pole male DIN45326 connector
pH/mV inputs ①	BNC female
Input SICRAM module pH/ temperature probes ③	8-pole male DIN45326 connector
Input dissolved oxygen ⑥	8-pole male DIN45326 connector
Serial interface	DB9 connector (9- pole male)
USB interface	USB connector type B
Bluetooth	Optional
Mains adapter	2-pole connector (Ø5.5mm-2.1mm). Positive at centre
Outlet for power supply of electrode holder with built-in magnetic stirrer	2- pole connector (Ø5.5mm-2.1mm). Positive at centre (output 12Vdc/200mA max).

Measurement of pH by instrument

Measuring range	-9.999…+19.999pH
Resolution	0.01 o 0.001pH selectable from menu
Accuracy	±.001pH ±1digit
Input impedance	$>10^{12}\Omega$
Calibration error @25°C	|Offset| > 20mV Slope > 63mV/pH o Slope < 50mV/pH Sensitivity < 85% or sensitivity < 85%
Calibration points	Up to 5 points with 13 automatically detected buffer solutions
Automatically detected pH standard solutions (@25°C)	1.679pH - 2.000pH - 4.000pH - 4.008pH 4.010pH - 6.860pH - 6.865pH - 7.000pH 7.413pH - 7.648pH - 9.180pH - 9.210pH 10.010pH

mV measurement by instrument

Measuring range	-1999.9…+1999.9mV
Resolution	0.1mV
Accuracy	±0.1mV ±1digit
Drift after 1 year	0.5mV/year

Measurement of dissolved oxygen by instrument

Measuring range	0.00…90.00mg/l
Resolution	0.01mg/l
Accuracy	±0.03mg/l±1digit (0...90%RH,±1013mbar, 20...25°C)

Measurement of saturation index of dissolved oxygen

Measuring range	0.0…600.0%
Resolution	0.1%
Accuracy	±0.3% ±1digit (in the range 0.0…199.9%) ±1% ±1digit (in the range 200.0…600.0%)

Automatic temperature compensation	0…50°C

Measurement of barometric pressure

Measuring range	0.0…1100.0mbar
Resolution	0.1mbar
Accuracy	±2mbar±1digit between 18 and 25°C ±(2mbar+0.1mbar/°C) in the remaining range

Salinity setting

Setting range	0.0…70.0g/l
Resolution	0.1g/l

Temperature measurement with the sensor inside the dissolved oxygen probe

Measuring range	0.0…50.0°C
Resolution	0.1°C
Accuracy	±0.1°C ±1digit
Drift after 1 year	0.1°C/year

Measurement of temperature by instrument

Pt100 measuring range	-50…+150°C
Pt1000 measuring range	-50…+150°C
Resolution	0.1°C
Accuracy	±0.1°C ±1digit
Drift after 1 year	0.1°C/year

Ordering codes

HD2259.2: The kit is composed of: instrument HD2259.2 for the measurement of pH - redox - concentration of dissolved oxygen, saturation index - temperature, **datalogger,** stabilized power supply at mains voltage 100-240Vac/12Vdc-1A, calibrator HD9709/20 (for polarographic probe) or DO9709/21 (for galvanic probe), instructions manual and software DeltaLog11.

pH/mV electrodes, dissolved oxygen probes, temperature probes, standard reference solutions for different measurement types, connection cables for pH electrodes with S7 connector, cables for data download to PC or printer have to be ordered separately.

Accessories

9CPRS232: Connection cable SubD female 9- pole for serial output RS232C.
CP22: USB 2.0 connection cable - connector typo A - connector type B.
DeltaLog11: Software for download and management of the data on PC using Windows operating systems.
SWD10: Stabilized power supply at 100-240Vac/12Vdc/1A mains voltage.
HD40.1: 24-column portable thermal printer, serial interface, 57mm paper width, four NiMH 1.2V rechargeable batteries, SWD10 power supply, instructions manual, 5 thermal paper rolls. Requires the cable 9CPRS232 (optional).
HD40.2: 24-column portable thermal printer, **Bluetooth and serial interface**, 57mm paper width, four NiMH 1.2V rechargeable batteries, SWD10 power supply, instructions manual, 5 thermal paper rolls. Requires the module HD22BT (**optional**) or the cable 9CPRS232 (**optional**).
HD22.2: Laboratory electrode holder composed of basis plate with incorporated magnetic stirrer, staff and replaceable electrode holder. Height max. 380mm. Powered by bench-top meters of the series HD22… with cable HD22.2.1 (**optional**) or supplier SWD10 (**optional**).
HD22.3: Laboratory electrode holder with metal basis plate. Flexible electrode holder for free positioning. For Ø 12mm probes.
HD22BT: Bluetooth module for wireless data transmission from instrument to PC. **The fitting of the module into the instrument is made exclusively by Delta Ohm, at the time of placing the order.**
TP47: Connector for Pt100 4-wire and Pt1000 2-wire probes without SICRAM module.

Accessories

pH electrodes without SICRAM module *(Inputs ①)*

KP 20: Gel pH combined electrode for general use, with S7 screw connector, EPOXY body.
KP 30: Gel pH combined electrode for general use, 1m cable with BNC, EPOXY body .
KP 50: Gel pH combined electrode, porous Teflon ring junction, suitable for emulsions, demineralised water and waste water with S7 screw connector, glass body.
KP 61: 3 diaphragm liquid filled pH combined electrode for wine, milk, cream, etc., S7 screw connector, liquid reference filling, glass body.
KP 62: 1 diaphragm gel pH combined electrode for general use, pure water, varnishes, gel filled, S7 screw connector, glass body.
KP 63: liquid filled pH combined electrode for general use, varnishes, 1m cable with BNC, glass body.
KP 64: Liquid filled pH combined electrode,Teflon ring diaphragm, for wine, varnishes, emulsions, S7 screw connector, glass body.
KP 70: Pointed gel combined pH microelectrode diam. 6 x L=70 mm., with S7 screw connector, EPOXY body, glass tip, open junction for meat and cheese.
KP 80: Pointed gel pH combined electrode, with S7 screw connector, glass body, for cream, milk, viscous material, open junction.

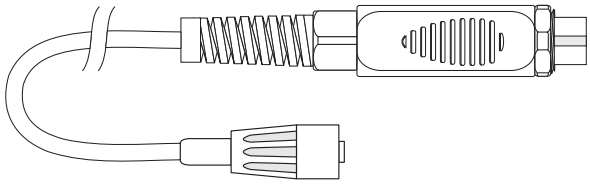
pH

mg/l

KP100: Flat membrane gel combined pH electrode with S7 screw connector, glass body, for skin, leather, paper.
Characteristics and dimensions of the probes on page WA-76.

pH electrodes with SICRAM module *(Input ③)*
KP63TS: Combined pH/temperature electrode with SICRAM module, body in glass, 1m cable, 1 diaphragm, for general use, internal liquid reference.

SICRAM Module with S7 input for pH electrodes *(Input ③)*
pH 471.1: SICRAM module for pH electrodes with S7 standard connection, cable L=1m.
pH 471.2: SICRAM module for pH electrodes with S7 standard connection, cable L=2m.
pH 471.5: SICRAM module for pH electrodes with S7 standard connection, cable L=5m.



ORP Electrodes (Inputs ① and ②)
KP90: Redox Platinum electrode, with screw connector S7, electrolyte KCl 3M, body in glass.
KP91: Redox Platinum electrode with 1m cable and BNC connector, GEL filled, body in Epoxy.
Electrode dimensions and characteristics at page WA-76

CP: Extension cable 1.5m with BNC connectors on one side and S7 on the other side for electrode with S7 connector.
CP5: Extension cable 5m with BNC connectors on one side and S7 on the other side for electrode with S7 connector.
CP 10: 10m extension cable with BNC/S7 connector for electrode without cable, thread S7.
CP 15: 15m extension cable with BNC/S7 connector for electrode without cable, thread S7.
CE: S7 screw connector for pH electrode.
BNC: Female BNC for cable extension.

pH buffer solutions
HD8642: Buffer solution 4.01pH - 200cc.
HD8672: Buffer solution 6.86pH - 200cc.
HD8692: Buffer solution 9.18pH - 200cc.

Redox buffer solutions
HDR220: Redox buffer solution 220mV 0,5 l.
HDR468: Redox buffer solution 468mV 0,5 l.

Electrolyte solutions
KCL 3M: Ready for use solution for refilling of the electrodes.

Cleaning and maintenance
HD62PT: Diaphragm cleaning (tiourea in HCl) - 500ml.
HD62PP: Protein cleaning (pepsin in HCl) - 500ml.
HD62RF: Regeneration (fluorhydric acid) - 100ml.
HD62SC: Solution for electrode preservation - 500ml.

Solutions
DO9700: zero oxygen solution.
DO9701: electrolyte solution for polarographic probes DO9709 SS and DO9709 SS.5.
DO9701.1: electrolyte solution for galvanic probes DO9709 SS.1 and DO9709 SS.5.1.

Combined dissolved Oxygen/temperature probes
DO 9709 SS Polarographic combined oxygen and temperature probe with possibility of membrane replacement. Ø12mm x 120mm. 2m cable. The code includes: probe, 2 membranes, electrolyte solution and zero point solution.
DO 9709 SS.5 Polarographic combined oxygen and temperature probe with possibility of membrane replacement. Ø12mm x 120mm. 5m cable. The code includes: probe, 2 membranes, electrolyte solution and zero point solution.
DO 9709 SS.1 Galvanic combined oxygen and temperature probe with possibility of membrane replacement. Ø12mm x 120mm. Ø16mm tip with membrane. 2m cable. The code includes: probe, 2 membranes in total, electrolyte solution and zero point solution.
DO 9709 SS.5.1 Galvanic combined oxygen and temperature probe with possibility of membrane replacement. Ø12mm x 120mm. Ø16mm tip with membrane. 5m cable. The code includes: probe, 2 membranes in total, electrolyte solution and zero point solution.
Probes' specifications at page WA-79.

Accessories
DO 9709/20: Calibrator for polarographic probes DO 9709SS and DO 9709SS.5
DO 9709/21: Calibrator for galvanic probes DO 9709SS.1 and DO 9709SS.5.1
DO 9709 SSK: Kit of accessories for probes DO 9709SS and DO 9709SS.5: 3 membranes, zero point solution and electrolyte.
DO 9709/21K: Kit of accessories for probes DO 9709SS.1 and DO 9709SS.5.1: 3 membranes, zero point solution and electrolyte.

Temperature probes equipped with SICRAM module
TP472I: Wire wound Pt100 sensor, immersion probe. Stem Ø 3 mm, length 300 mm. Cable length 2 m.
TP472I.0: Thin film Pt100 sensor, immersion probe. Stem Ø 3 mm, length 230 mm. Cable length 2 m.
TP473P.I: Wire wound Pt100 sensor, penetration probe. Stem Ø 4mm, length 150 mm. Cable length 2 m.
TP473P.0: Thin film Pt100 sensor, penetration probe. Stem Ø 4mm, length 150 mm. Cable length 2 m.
TP474C.I: Wire wound Pt100 sensor, contact probe. Stem Ø 4mm, length 230mm, contact surface Ø 5mm. Cable length 2 m.
TP474C.0: Thin film Pt100 sensor, contact probe. Stem Ø 4mm, length 230mm, contact surface Ø 5mm. Cable length 2 m.
TP475A.0:, Thin film Pt100 sensor, air probe. Stem Ø 4mm, length 230mm. Cable length 2 m.
TP472I.5: Thin film Pt100 sensor, penetration probe. Stem Ø 6mm, length 500 mm. Cable length 2 m.
TP472I.10: Thin film Pt100 sensor, penetration probe. Stem Ø 6mm, length 1000mm. Cable length 2 m.
TP49A.0: Thin film Pt100 sensor, immersion probe. Stem Ø 2,7mm, length 150mm. Cable length 2 m. Aluminium handle
TP49AC.0: Thin film Pt100 sensor, contact probe. Stem Ø 4mm, length 150mm. Cable length 2 m. Aluminium handle
TP49AP.0: Thin film Pt100 sensor, penetration probe. Stem Ø 2,7mm, length 150mm. Cable length 2 m. Aluminium handle
TP875.I: Wire wound Pt100 sensor, 150mm diameter globe-thermometer equipped with handle. Cable length 2 m.
TP876.I: Wire wound Pt100 sensor, 50mm diameter globe-thermometer equipped with handle. Cable length 2 m.
TP87.0: Thin film Pt100 sensor, immersion probe. Stem Ø 3 mm, length 70 mm. Cable length 2 m.
TP878.0: Thin film Pt100 sensor, contact probe for solar panels. Cable length 2 m.
TP878.1.0: Thin film Pt100 sensor, contact probe for solar panels. Cable length 5 m.
TP879.0: Thin film Pt100 sensor, penetration probe for compost. Stem Ø 8 mm, length 1000 mm. Cable length 2 m.

Temperature probes without SICRAM module
TP47.100.0: Thin film Pt100 sensor, immersion probe. Stem Ø 3mm, length 230mm. Connection cable 4 wires with connector, length 2 m.
TP47.1000.0: Thin film Pt1000 sensor, immersion probe. Probe's Stem Ø 3mm, length 230mm. Connection cable 4 wires with connector, length 2 m.
TP47: Connector for Pt100 4-wire and Pt1000 2-wire probes without SICRAM module.
TP87.100.0: Thin film Pt100 sensor, immersion probe. Stem Ø 3mm, length 70mm. 4-wires connection cable with connector, length 1 m.
TP87.1000.0: Thin film Pt1000 sensor, immersion probe. Stem Ø 3mm, length 70mm. 2-wires connection cable with connector, length 1 m.

HD 25.2
BENCH-TOP TURBIDITY METER

The **HD25.2** is a digital turbidity meter for laboratory and mobile use, suitable for measurements in drinking water, waste water and process liquids. The working principle is based on the nephelometric (90° scattered light sensor) method.
It is equipped with three light detectors and two LED light sources (white and infrared) which are permanently kept under control in order to guarantee long-term stability. The instrument performs measurements according to the standards **EPA 180.1, ISO-NEPH (ISO 7027), EBC and ASBC.** It is also able to carry out measures of transmission factor percentage of white and infrared light.

The initial factory calibration is based on Formazin primary standard. For routine calibration a set of stabilized secondary standard solutions is available: **STCAL** (Turbidity standards for calibration):
- **STCAL 1** less than 0,05 NTU
- **STCAL 2** equal to 8 NTU
- **STCAL 3** equal to 80 NTU
- **STCAL 4** equal to 800 NTU

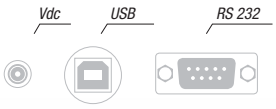
User Calibration is automatic on one or four points, depending on the measuring variable.
Stabilized power supply and advanced electronics guarantees optimal performances over time.
The HD25.2 is a **datalogger** that stores up to 999 samples.
The data can be transferred from the instrument connected to a PC via the RS232C and USB 2.0 serial ports.
The RS232C serial port can be used to transfer the acquired measurements to a 24 column printer (i.e. HD40.1)

The Print function allows to print labels with progressive and automatically incrementing numeration, with all data related to the sample being examined. The dedicated software **DeltaLog11** allows instrument management and data processing on PC.

The use of the HD25.2 by more users is facilitated by the "User Management" function, which allows, according to the case, to enable or disable some advanced functions of the instrument through password.
The protection degree is IP66.

Technical characteristics

Instrument	
Dimensions (Length x Width x Height)	220x120x55mm
Weight	400g (batteries included)
Materials	ABS, rubber
Display LCD	4½ characters plus symbols Visible area: 52x42mm
Operating conditions	
Instrument working temperature	0 … 50°C
Storage temperature instrument	-25 … 65°C
Working relative humidity	0 … 90% R.H. without condensation
Storing of Calibration standards	5…25°C (temperature should not exceed, protect from light)
Protection degree	**IP66**
Power supply	
Batteries	3 1,5 V AA type batteries
Autonomy	100 hours with 1800mAh alkaline
Mains	Mains adapter (cod. SWD10) 100-240Vac/12Vdc-1A
Measuring methods	
Standard	EPA180.1, ISO-NEPH (ISO 7027), EBC, ASBC, WHITE %T e IR %T
Light source	LED IR (850nm) and white LED (470nm)
Receiver	Silicium photodiode
Sample cell	Ø24mm - height 68mm, 20cc



Measurement of turbidity

Method / Measuring range	EPA180.1	(0…1000 NTU)
	ISO-NEPH	(0…1000 FNU)
	EBC	(0…250 EBC)
	ASBC	(0…9999 ASBC)
	WHITE %T	(0…100 %T)
	IR %T	(0…100 %T)
Resolution	0.01 NTU	(0…9.99 NTU)
	0.1 NTU	(10.0…99.9 NTU)
	1 NTU	(100…1000 NTU)
Accuracy	±2% reading + 0.01 NTU (0…500 NTU)	
	±3% reading (500…1000 NTU)	
Repeatability	±2% reading or 0.01 NTU (the major one)	

Security of memorized data	Unlimited
Time	
Date and hour	real time schedule
Accuracy	1min/month max error
Measured values storing	
Quantity	999 samples
Serial interface RS232C	
Type	RS232C electrically isolated
Baud rate	Can be set from 1200 to 38400 baud
Data bit	8
Parity	None
Stop bit	1
Flow Control	Xon/Xoff
Serial cable length	Max 15m
USB interface	
Type	1.1 - 2.0 electrically isolated
Connections	
Serial interface	DB9 connector (9- pole male)
USB interface	USB connector type B
Mains adapter	2- pole connector (Ø5.5mm-2.1mm). Positive at centre.

Ordering codes

HD 25.2: The kit is composed of: instrument HD25.2, 4 empty cells, 4 calibration standards STCAL, 3 1.5Vdc alkaline batteries, lubricant rag, 25cc Silicon oil, instructions manual, carrying case and software DeltaLog11 for PCs running Windows operating systems.

Accessories

9CPRS232: Connection cable SubD female 9- pole for serial output RS232C
CP22: Connection cable USB 2.0 connector type A - type B
SWD10: Stabilized power supply at 230Vac/9Vdc-300mA mains voltage.
HD40.1: 24-column portable thermal printer, serial interface, 57mm paper width, four NiMH 1.2V rechargeable batteries, SWD10 power supply, instruction manual, 5 thermal paper rolls. Requires the cable 9CPRS232 (optional).
PL: Lubricant rag
OS1: Silicon oil - 25cc.
KCV: 4 empty sample cells Ø24x68mm

Turbidity calibration standards

STCAL 1: Calibration standard with low turbidity Formazin reference less than 0,05 NTU.
STCAL 2: Calibration standard with Formazin reference 8 NTU - 20cc.
STCAL 3: Calibration standard with Formazin reference 80 NTU - 20cc.
STCAL 4: Calibration standard with Formazin reference 800 NTU - 20cc.
KS: Kit 4 calibration standard with Formazin reference STCAL 1, STCAL 2, STCAL 3, STCAL 4.

HD40.1

ASBC

FNU

EBC

NTU

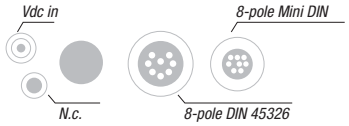
HD 3409.2
BENCH-TOP DISSOLVED OXYGEN METER

The **HD3409.2** is a bench top instrument for electrochemical measures: **dissolved oxygen** and **temperature**.
The displayed data can be stored **(datalogger)** and can be transferred to PC or serial printer thanks to the multi-standard serial ports RS232C and USB2.0 and software DeltaLog9 (Vers.2.0 and subsequent ones). The storing and printing parameters can be set from menu.
The **HD3409.2** measures the **concentration** (in mg/l) **of dissolved Oxygen in liquids**, the **saturation index** (in %) and the **temperature** using SICRAM combined probes of polarographic type with two or three electrodes or galvanic type, and integrated temperature sensor. **Temperature** is measured by Pt100-SICRAM or direct 4 wire-immersion, penetration or contact probes.
Thanks to an internal pressure sensor, the instruments automatically compensate for barometric pressure. The instrument anticipates automatic compensation of the Oxygen probe membrane permeability and of the salinity of the liquid being examined. The dissolved Oxygen probe's quick calibration function guarantees timely correctness of the performed measurements.

The display shows continually the temperature in °C or °F and one selectable parameter according to the connected probe type. Printing and storage always include the temperature in °C or °F and one selectable parameter for each probe type.
Other common function of this instrument series include: Max, Min and Avg function, the Auto-HOLD function, the automatic turning off which can also be excluded.
The instruments have IP66 protection degree.

Technical characteristics HD3409.2
mg/l O_2, %O_2, mbar, °C/°F measurement

Instrument	
Dimensions (Length x Width x Height)	220x120x55mm
Weight	460g (complete with batteries)
Materials	ABS, rubber
Display	2x4½ characters plus symbols visible area: 52x42mm
Operating conditions	
Working temperature	-5 … 50°C
Storage temperature	-25 … 65°C
Working relative humidity	0 … 90% RH without condensation
Protection degree	**IP66**
Power	
Batteries	3 batteries 1.5V type AA
Autonomy (only batteries)	100 hours with 1800mAh alkaline batteries
Mains (cod. **SWD10**)	Output mains adapter 100-240Vac/ 12Vdc-1A
Security of memorized data	Unlimited
Storage of the measured values	
Type	2000 pages of 9 samples each
Quantity	18,000 measures made up of the four parameters mg/l O_2, %O_2, mbar, [°C or °F]
Selectable storage interval	1s, 5s, 10s, 15s, 30s, 1min, 2min, 5min, 10min, 15min, 20min, 30min and 1hour
Time	
Date and hour	Schedule in real time
Accuracy	1min/month max drift
Serial interface RS232C	
Type	RS232C electrically isolated
Baud rate	Can be set from 1200 to 38400 baud
Data bit	8
Parity	None
Stop bit	1
Flow Control	Xon/Xoff
Serial cable length	Max 15m
Selectable print interval	immediate or 1s, 5s, 10s, 15s, 30s, 1min, 2min, 5min, 10min, 15min, 20min, 30min and 1hour
USB Interface	
Type	1.1 - 2.0 electrically isolated
Connections	
Serial interface and USB	8-pole MiniDin connector
Mains adapter (cod. SWD10)	2-pole connector (positive at centre) 12Vdc/1A



Power absorbed with instrument off

Without dissolved oxygen probe	20µA
With dissolved oxygen probe	40µA

Measurement connections

Input for Oxygen probes	8-pole male DIN45326 connector
Input for temperature probes with SICRAM module or TP47 module	8-pole male DIN45326 connector

Measurement of the concentration of dissolved Oxygen

Measurement range	0.00…90.00mg/l
Resolution	0.01mg/l
Accuracy	±0.03mg/l±1digit (0...90%RH, 1013mbar, 20...25°C)

Measurement of the saturation index of dissolved Oxygen

Measurement range	0.0…600.0%
Resolution	0.1%
Accuracy	±0.3% ±1digit (in the range 0.0…199.9%) ±1% ±1digit (in the range 200.0…600.0%)

Automatic/manual temperature compensation

	0…50°C

Measurement of barometric pressure

Measurement range	0.0…1100.0mbar
Resolution	0.1mbar
Accuracy	±2mbar±1digit between 18 and 25°C ±(2mbar+0.1mbar/°C) in the remaining range

Salinity setting

Setting range	0.0…70.0g/l
Resolution	0.1g/l

Temperature measurement with the sensor inside the dissolved Oxygen probe

Measurement range	0.0…+45.0°C
Resolution	0.1°C
Accuracy	±0.1°C ±1digit
Drift after 1 year	0.1°C/year

Temperature measurement by Instrument with Pt100 probe

Pt100 Measurement range	-200…+650°C
Resolution	0.1°C
Accuracy	±0.1°C ±1digit
Drift after 1 year	0.1°C/year

Ordering codes

HD3409.2: The kit is composed of: instrument HD3409.2 **datalogger**, for the measurement of dissolved oxygen concentration - saturation index - temperature, calibrator HD9709/20 (for polarographic probe) or DO9709/21 (for galvanic probe), 3 1.5V alkaline batteries, operating manual and **DeltaLog9**.

Dissolved oxygen probes, temperature probes, standard reference solutions, connection cables, cables for data download to PC or printer have to be ordered separately.

Accessories

HD2110CSNM: 8-pole connection cable Mini Din - Sub D 9-pole female for RS232C, for connection to PC without USB input.

HD2101/USB: Connection cable USB 2.0 connector type A - 8-pole Mini Din for connection to PC with USB input.

SWD10: Stabilized power supply at 100-240Vac/12Vdc/1A mains voltage.

HD40.1: Portable, serial input, 24 column thermal printer, 57mm paper width, four NiMH 1.2V rechargeable batteries, SWD10 power supply, instruction manual, 5 thermal paper rolls. Requires the cable HD2110CSNM (**optional**).

HD22.2: Laboratory electrode holder composed of basis plate with incorporated magnetic stirrer, staff and replaceable electrode holder. Height max. 380mm. Powered by bench-top meters of the series HD22… with cable HD22.2.1 (**optional**) or supplier SWD10 (**optional**).

HD22.3: Laboratory electrode holder with metal basis plate. Flexible electrode holder for free positioning. For Ø 12mm probes.

TP47: Connector for Pt100 4-wire probes without SICRAM module.

Solutions

DO9700: zero oxygen solution.

DO9701: electrolyte solution for polarographic probes DO9709 SS and DO9709 SS.5.

DO9701.1: electrolyte solution for galvanic probes DO9709 SS.1 and DO9709 SS.5.1.

Combined dissolved Oxygen/temperature probes

DO 9709 SS Polarographic combined oxygen and temperature probe with possibility of membrane replacement. Ø12mm x 120mm. 2m cable. The code includes: probe, 2 membranes, electrolyte solution and zero point solution.

DO 9709 SS.5 Polarographic combined oxygen and temperature probe with possibility of membrane replacement. Ø12mm x 120mm. 5m cable. The code includes: probe, 2 membranes, electrolyte solution and zero point solution.

DO 9709 SS.1 Galvanic combined oxygen and temperature probe with possibility of membrane replacement. Ø12mm x 120mm. Ø16mm tip with membrane. 2m cable. The code includes: probe, 2 membranes in total, electrolyte solution and zero point solution.

DO 9709 SS.5.1 Galvanic combined oxygen and temperature probe with possibility of membrane replacement. Ø12mm x 120mm. Ø16mm tip with membrane. 5m cable. The code includes: probe, 2 membranes in total, electrolyte solution and zero point solution.

Probes' specifications at page WA-79.

Accessories

DO 9709/20: Calibrator for polarographic probes DO 9709SS and DO 9709SS.5

DO 9709/21: Calibrator for galvanic probes DO 9709SS.1 and DO 9709SS.5.1

DO 9709 SSK: Kit of accessories for probes DO 9709SS and DO 9709SS.5: 3 membranes, zero point solution and electrolyte.

DO 9709/21K: Kit of accessories for probes DO 9709SS.1 and DO 9709SS.5.1: 3 membranes, zero point solution and electrolyte.

Temperature probes equipped with SICRAM module

TP472I: Wire wound Pt100 sensor, immersion probe. Stem Ø 3 mm, length 300 mm. Cable length 2 m.

TP472I.0: Thin film Pt100 sensor, immersion probe. Stem Ø 3 mm, length 230 mm. Cable length 2 m.

TP473P.I: Wire wound Pt100 sensor, penetration probe. Stem Ø 4mm, length 150 mm. Cable length 2 m.

TP473P.0: Thin film Pt100 sensor, penetration probe. Stem Ø 4mm, length 150 mm. Cable length 2 m.

TP474C.I: Wire wound Pt100 sensor, contact probe. Stem Ø 4mm, length 230mm, contact surface Ø 5mm. Cable length 2 m.

TP474C.0: Thin film Pt100 sensor, contact probe. Stem Ø 4mm, length 230mm, contact surface Ø 5mm. Cable length 2 m.

TP475A.0:, Thin film Pt100 sensor, air probe. Stem Ø 4mm, length 230mm. Cable length 2 m.

TP472I.5: Thin film Pt100 sensor, penetration probe. Stem Ø 6mm, length 500 mm. Cable length 2 m.

TP472I.10: Thin film Pt100 sensor, penetration probe. Stem Ø 6mm, length 1000mm. Cable length 2 m.

TP49A.0: Thin film Pt100 sensor, immersion probe. Stem Ø 2,7mm, length 150mm. Cable length 2 m. Aluminium handle

TP49AC.0: Thin film Pt100 sensor, contact probe. Stem Ø 4mm, length 150mm. Cable length 2 m. Aluminium handle

TP49AP.0: Thin film Pt100 sensor, penetration probe. Stem Ø 2,7mm, length 150mm. Cable length 2 m. Aluminium handle

TP875.I: Wire wound Pt100 sensor, 150mm diameter globe-thermometer equipped with handle. Cable length 2 m.

TP876.I: Wire wound Pt100 sensor, 50mm diameter globe-thermometer equipped with handle. Cable length 2 m.

TP87.0: Thin film Pt100 sensor, immersion probe. Stem Ø 3 mm, length 70 mm. Cable length 2 m.

TP878.0: Thin film Pt100 sensor, contact probe for solar panels. Cable length 2 m.

TP878.1.0: Thin film Pt100 sensor, contact probe for solar panels. Cable length 5 m.

TP879.0: Thin film Pt100 sensor, penetration probe for compost. Stem Ø 8 mm, length 1000 mm. Cable length 2 m.

Temperature probes without SICRAM module

TP47.100.0: Thin film Pt100 sensor, immersion probe. Stem Ø 3mm, length 230mm. Connection cable 4 wires with connector, length 2 m.

TP47: Connector for Pt100 4-wire probes without SICRAM module.

TP87.100.0: Thin film Pt100 sensor, immersion probe. Stem Ø 3mm, length 70mm. 4-wires connection cable with connector, length 1 m.

mg/l **%sat** **mbar** **°C**

DO 9403T-R1
pH/mV TRANSMITTER

The **DO 9403T-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.

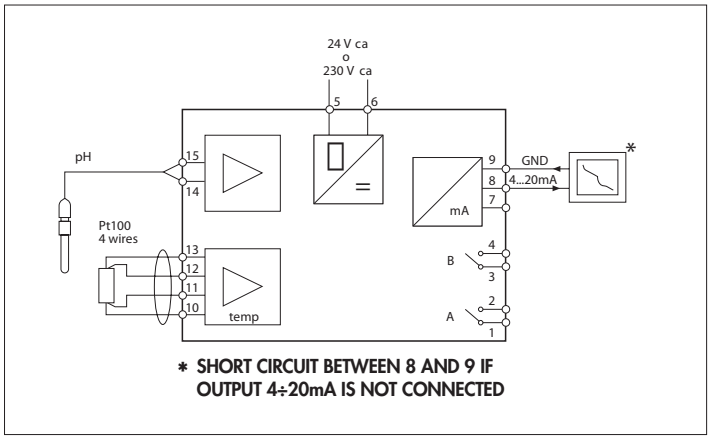


Fig.1 Active transmitter.

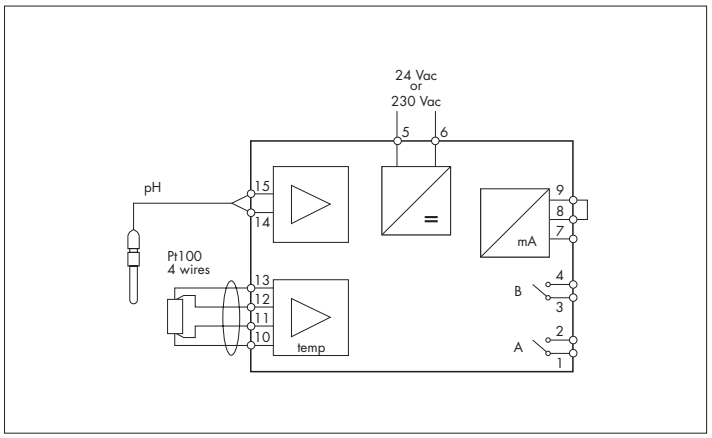


Fig.2 Active indicator.

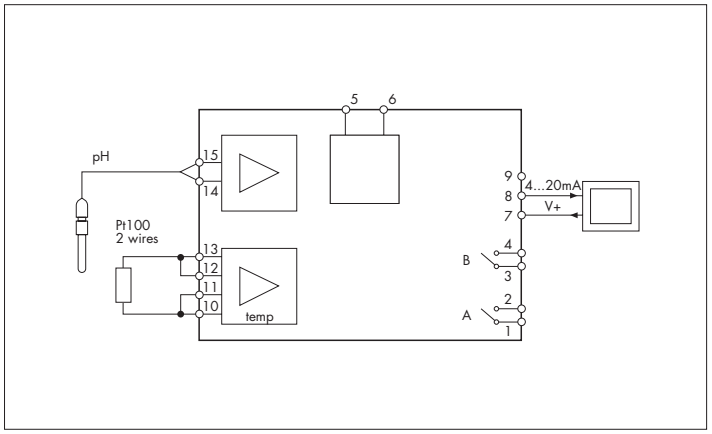


Fig.3 Passive transmitter.

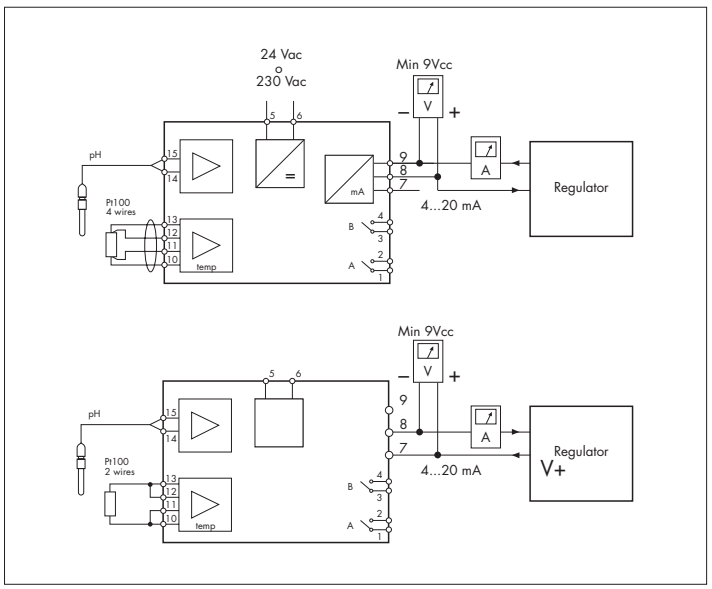


Fig.4

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.

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.

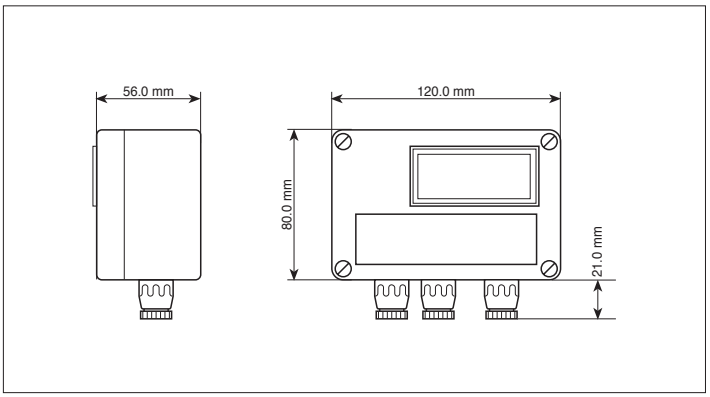
NOTE: During the SET point setting phase (REL symbol lit or flashing) the instrument returns to normal function if no key is pressed for 2 minutes.

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.



Dimensions

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.**

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% 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	According to Nernst
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
R Load	Load resistance	$R_{Lmax} = \frac{Vdc-10}{0,022}$ R_{Lmax} = 636 Ω @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
Temp.	Operation	0...50°C
	Storage	-20...70°C, no condensation
Case	External dimensions	120x80x56 mm
	Protection class	IP64

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 the SET key, the REL symbol lights up on the display indicating that the instrument is measuring the voltage present at the input using the second measurement scale.
- Using the ▲ and ▼ keys, adjust the voltage value so as to have the correct voltage value on the display.
- Press the SET key, the REL symbol on the display switches off.
- Simulate a voltage of 450 mV at the input, corresponding to the full scale 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 scale 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. 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.

Order code
DO 9403T-R1: pH transmitter 4÷20 mA passive or active, power supply 24 Vac, 120x80x56 mm for use in the field.
HD 882 M100/300: Temperature probe with Pt100 sensor, miniature head, shaft Ø6x300 mm.
HD 882 M100/600: Temperature probe with Pt100 sensor, DIN B head, shaft Ø6x600 mm.
HD 8642: Buffer solution 4.01 pH.
HD 8672: Buffer solution 6.86 pH.
HD 8692: Buffer solution 9.18 pH.
HD R220: Buffer solution redox 220 mV
HD R468: Buffer solution redox 468 mV
HD62PT: Diaphragm cleaning (tiourea in HCl) - 500ml.
HD62PP: Protein cleaning (pepsin in HCl) - 500ml.
HD62RF: Regeneration (fluorhydric acid) - 100ml.
HD62SC: Solution for electrode preservation - 200ml
CP5T: Extension cable. Connector S7/wire - TERMINAL BOARD.
CP5/10T: Extension cable L=10m.Connector S7/wire.
KPI 10: Combined industrial electrode, S7 PG13,5 connector, glass body, Ag/AgCl sat KCl, Ø 12x120, temperature 0÷130°C, porous Teflon fitting.
KPI 11: Combined industrial electrode, S7 PG13,5 connector, Rytron body, Ag/AgCl sat KCl, temperature 0÷100°C, porous Teflon fitting.
KPI 12: Platinum electrode for Redox measurement,S7 PG13,5 connector, Ag/AgCl sat KCl, temperature 0÷130°C, pressure 6 bar.
KPI 13: Platinum electrode for Redox measurement, Rytron body, S7 PG13,5 connector, temperature 0÷100°C Ag/AgCl sat KCl.
Electrode dimensions at page WA-18

DO 9785T - DO 9765T

pH TRANSMITTERS

DO 9785T/DO 9765T 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).

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 temperature	Automatic	According to Nernst
	Manual	-50÷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
R Load	Load resistance	$R_{Lmax} = \frac{Vdc-10}{0,022}$ R_{Lmax} = 636 Ω @Vdc = 24 Vdc
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 case	External dimensions	120x122x56 mm
	Protection class	IP64
DO 9785T case	External dimensions	96x96x126 mm
	Protection class	IP54

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

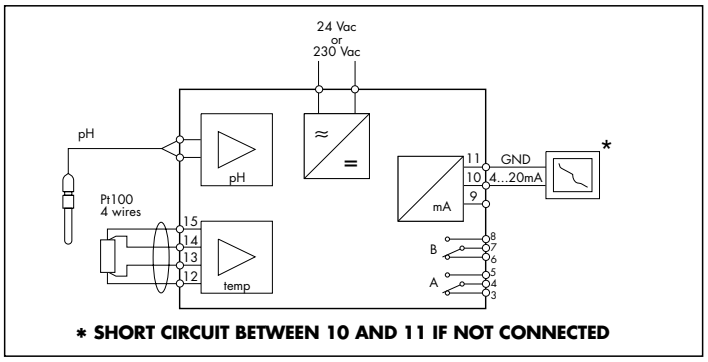


Fig.1 Active transmitter.

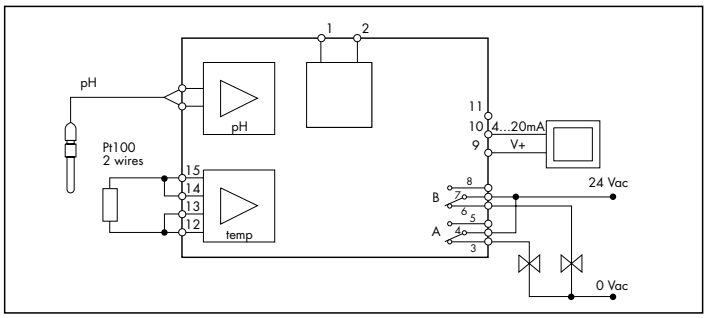


Fig.2 Passive transmitter.

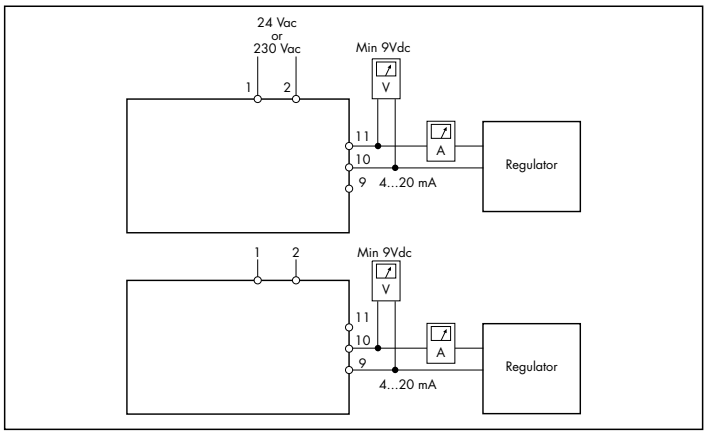
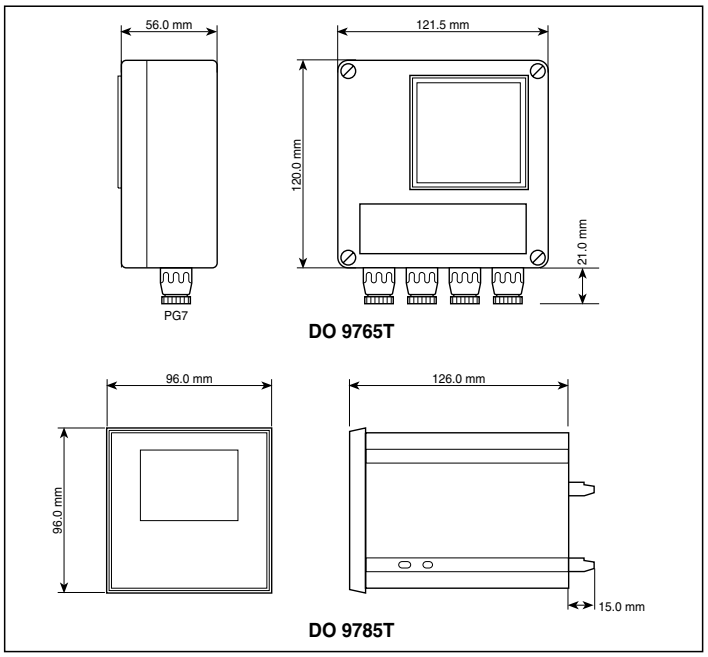


Fig.3



Dimensions

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 DO 9785T/DO 9765T 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. **(Calibration procedure to be carried out at a laboratory by skilled workers).**
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 s and t keys, bring the parameter displayed to the desired value. Press OK to confirm. Parameter P7 cannot be altered.

Calibrating the voltage input (calibration procedure to be carried out at a laboratory by skilled workers)
- 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.

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 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 (calibration procedure to be carried out at a laboratory by skilled workers)
- 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.

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 Ø6x300 mm.

HD 8642: Buffer solution 4.01 pH.

HD 8672: Buffer solution 6.86 pH.

HD 8692: Buffer solution 9.18 pH.

HDR 220: Buffer solution Redox 220 mV 0,5l.

HDR 468: Buffer solution Redox 468 mV 0,5l.

CP5/10: Extension cable for connecting the electrode to the DO9403T or to the DO9765T (S7-wire-TERMINAL BOARD) L=10m.

CP5: Extension for connecting the electrode to the DO 9403T-R1 or to the DO 9765T (S7-wire-TERMINAL BOARD) L=5m.

CP5S: Extension for connecting the electrode to the DO 9785T (BNC-S7) L=5m.

CP5S/10: Extension cable L=10m. Connector BNC/S7.

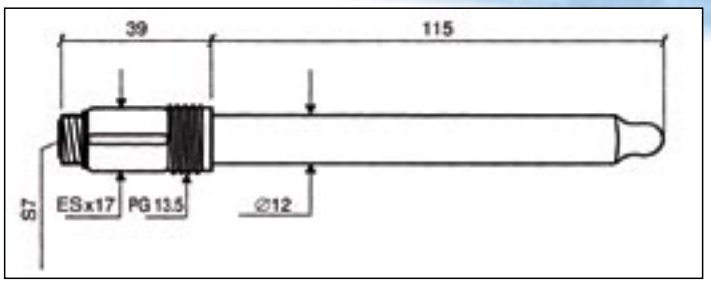
KPI 10: Combined industrial electrode, S7 PG13.5 connector, refillable, glass body, Ag/AgCl sat KCl Ø12x120 mm, temperature 0÷130°C, porous Teflon fitting.

KPI 11: Combined industrial electrode, S7 brass 1" connector, refillable, Rytron body, Ag/AgCl sat KCl, temperature 0÷100°C, porous Teflon fitting.

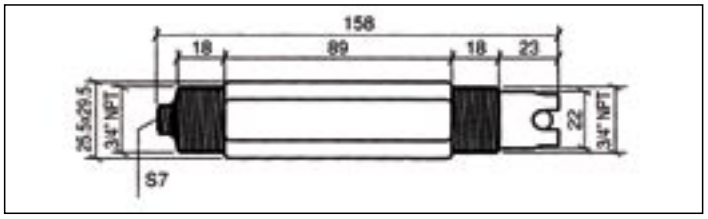
KPI 12: Platinum electrode for Redox measurement,S PG13,5 connector, pressure 6 bar.

KPI 13: Platinum electrode for Redox measurement, Rytron body, S PG13,5 connector, Ag/AgCl sat KCl.

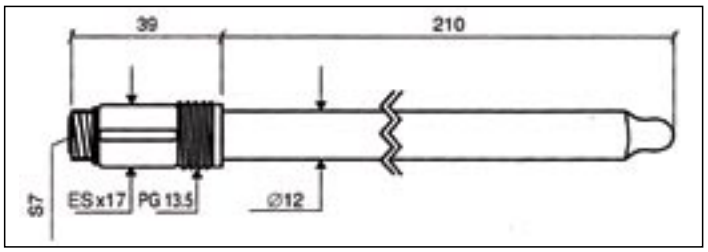
KPI GB 210: Electrode for biotechnology, S7 PG13.5 connector, glass body, gel, Ø12x210 mm, temperature 0÷135°C, max 10 bar.



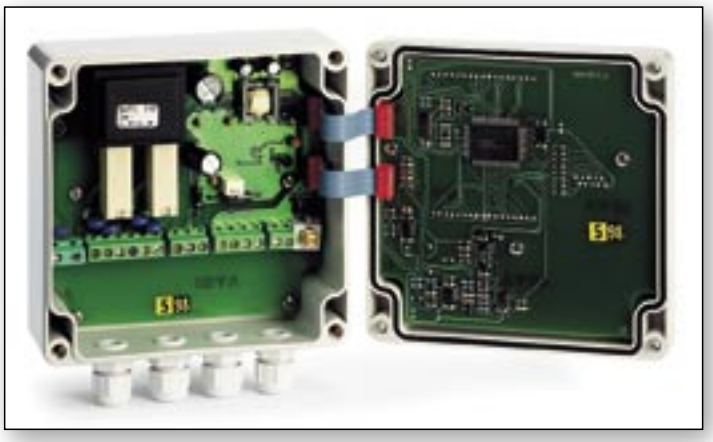
KPI 10 / KPI 12 Redox 0…14 pH 0…130°C



KPI 11 / KPI 13 Redox 0…14 pH 0…100°C



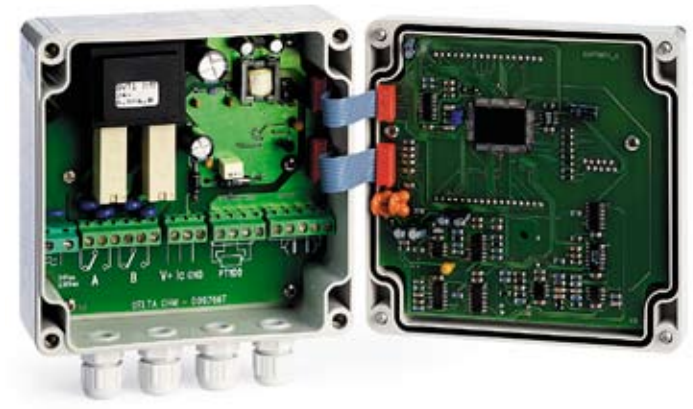
KPI GB 210 0…14 pH 0…135°C



DO 9786T - R1
DO 9766T - R1

DO 9786T - R1 • DO 9766T - R1
CONDUCTIVITY TRANSMITTERS

DO 9786T/DO 9766T transmitters convert the output of a conductivity electrode with temperature compensation into a 4÷20 mA signal.
The 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 conductivity electrode and a temperature probe (Pt100 sensor, 100 Ω at 0°C).



Technical characteristics

Input conductivity	Measuring range	0.0...199.9 mS
	2/4 electrodes	Configurable cell constant 0.01...199.9 cm-1
	Transducer energizing	Square wave 10...1000 mV, depending on conductivity, 200...1600 Hz, depending on conductivity
	Input impedance	>100 Mohm
	Cable length	<10 metres unscreened <50 metres screened (about 2 nF)
	Accuracy	0.5% of reading ±2 digits ±0.01% per °C of drift in temperature
Input temperature	Pt100 2/4 wires	-50...199.9°C
	Transducer energizing	0.5 mA dc
	Cable length	<10 metres unscreened <50 metres screened (about 5 nF)
	Accuracy	0.2°C ±0.1% of reading ±0.01°C/°C of drift in temperature
Compensation temperature	None	
	manual	Linear 0.00...4.00%/°C -50...+200C
	automatic	Linear 0.00...4.00%/°C -50...+200C
	Reference temperature	20 or 25°C Configurable
Current output	4.00...20.00 mA	Programmable and proportional to conductivity
	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	24/230 Vac - 15/+10% 1 VA, 48...62 Hz, see fig. 1
Case DO 9766T	External dimensions	120x122x56 mm
	Protection class	IP64
Case DO 9786T	External dimensions	96x96x126 mm
	Protection class	IP44

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, P8 and the corresponding parameters are displayed in sequence. After P8 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.

χ When pressed together with the CAL key it activates the conductivity 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 χ key it activates the conductivity calibration function.
- Key used to confirm conductivity 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.

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 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 conductivity.
- Press CAL to confirm this value. The message CAL disappears.

Calibration of the DO 9786T-R1 / DO 9766T-R1 with conductivity probes
Calibration of the DO 9786T-R1 / DO 9766T-R1 transmitters with conductivity probes:
- Immerse the probe in the buffer solution used for calibration.
- Press the CAL key and the ⁒ key together; the message CAL appears at the top of the display.
- The instrument can automatically recognize two standard calibration solutions: a 0.1 molar solution of KCl and a 0.01 molar solution of KCl. The instrument proposes the conductivity value as a function of the measured temperature if the temperature probe is connected, or the manually set temperature.
- Using the ▲ and ▼ keys, adjust the conductivity 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.: Before calibrating the probe set a cell constant close to the cell constant of the probe that you wish to calibrate with key PRG, function P2. If the message E1 appears during calibration, the instrument is indicating that the probe gain is too high; quit programming (°C/°F button) and increase the value of the cell constant. Likewise, if E2 appears, the instrument is indicating that the probe gain is too low; quit calibration and decrease the cell constant. Repeat the calibration operation.

Programming the parameters
P1 Temperature coefficient. May be set between 0 and 4.0%/°C (0 and 2.2%/°C).
P2 Cell constant. May be set between 0.01 and 199.9.
P3 Conductivity value corresponding to 4 mA at output. May be set between 0 and 199.9 mS.
P4 Conductivity value corresponding to 20 mA at output. May be set between 0 and 199.9 mS.
P5 Delay time in the intervention of relay A. May be set between 0 and 250 seconds.
P6 Delay time in the intervention of relay B. May be set between 0 and 250 seconds.
P7 Reference temperature of the conductivity measurement. May be set between the values 20.0 or 25.0°C.
P8 Calibration of Pt100 probe and calibration of analog output in current (see Pt100 probe calibration and analog output calibration).

To change one of these parameters (except P8) 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.

Pt100 probe calibration
- Connect the Pt100 probe to the instrument. Press the PRG key until the message P8 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 P8 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 4,000 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 20,000 mA on the precision milliammeter.
- Press OK to confirm.

Display

Symbol	Description
°C	indicates that the value shown is in °C.
°F	indicates that the value shown is in °F.
µS	indicates that the unit of the value shown is micro Siemens.
mS	indicates that the unit of the value shown is milli Siemens.
A	indicates that the relay A is in closed status.
B	indicates that the relay B is in closed status.

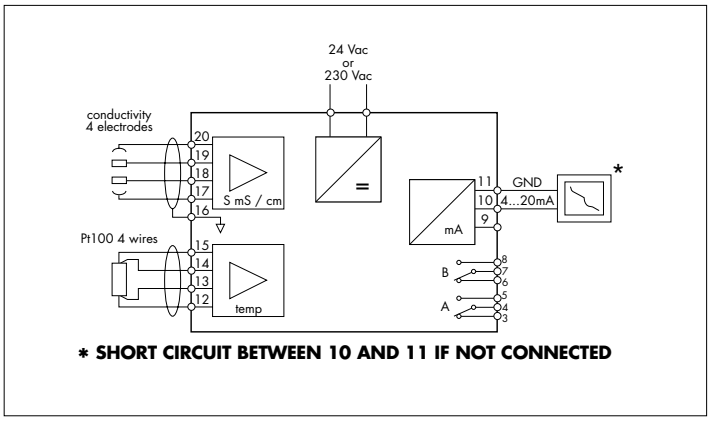


Fig.1 Active transmitter.

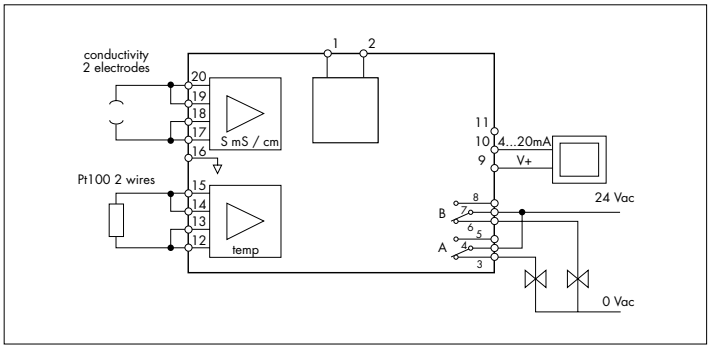


Fig.2 Passive transmitter.

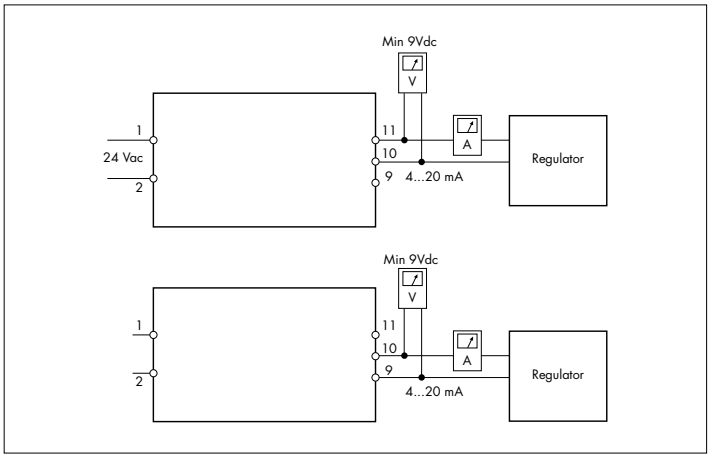
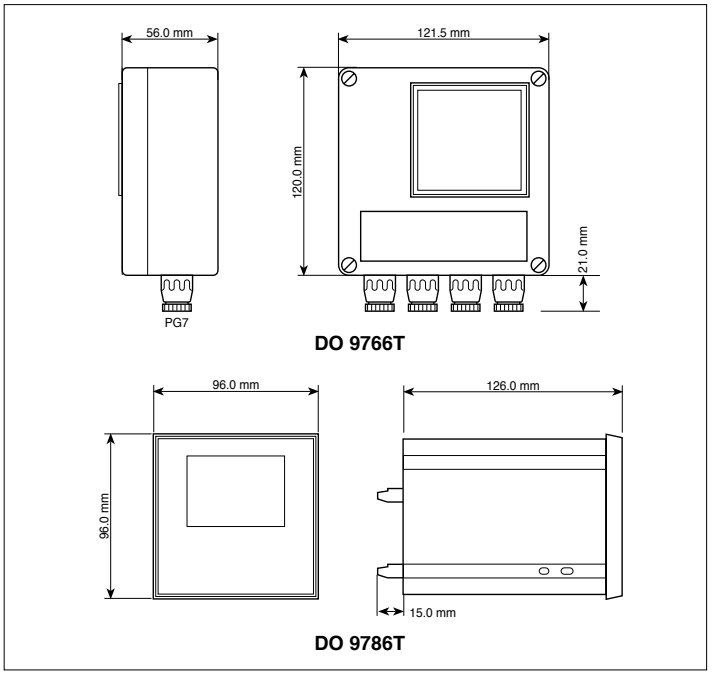


Fig.3 Calibration analog output.



Dimensions

ON indicates that the value shown corresponds to the closing thresholds of the contacts of relay A or B.
OFF indicates that the value shown corresponds to the opening thresholds of the contacts of relay A or B.

Error signals
OFL - Warning which appears during measurement when the value to be displayed is out of scale.
E1 - Error warning which appears during conductivity calibration to indicate that the probe gain is too high. Press P2 to increase the cell constant value.
E2 - Error warning which appears during conductivity calibration to indicate that the probe gain is too low. Press P2 to decrease the cell constant value.
E3 - Error warning which appears to indicate that the instrument is unable to recognize the buffer solution used for automatic calibration. Press the ▲ or ▼ key to make this indication disappear.
E4 - Reading error on the EEPROM.

APPENDIX

Table of compatibility between range and sensor

Conductivity Range	Nominal cell constant			
	0.01÷0.2	0.2÷2	2÷20	20÷199.9
0÷19.99 µS	√			
0÷199.9 µS	√	√		
0÷ 1999 µS	√	√	√	
0÷199.9 µS	√	√	√	√
0÷19.99 mS		√	√	√
0÷199.9 mS			√	√
0÷ 1999 mS				√

Temperature sensor

Temperature	Pt100	Temperature	Pt100
-50°C	80.25 Ω	100°C	138.50 Ω
-25°C	90.15 Ω	125°C	147.94 Ω
0°C	100.00 Ω	150°C	157.32 Ω
25°C	109.73 Ω	175°C	166.62 Ω
50°C	119.40 Ω	199°C	175.47 Ω
75°C	128.98 Ω		

Calculating the temperature coefficient of a solution
If the temperature coefficient of the solution is not known, it may be determined using the DO 9786T/DO 9766T.
- Set the temperature coefficient at 0.0%/°C (parameter P1).

The following measurements should be taken as close as possible to the work point, between 5°C and 70°C, for greater accuracy.
- Immerse the probe in the testing liquid. Wait for the measurement to become stable.
- Take note of the temperature and of the conductivity.
- Increase the solution temperature by at least 10°C.
- Take note of the temperature and of the conductivity.
- Calculate the temperature coefficient using the following formula:

$$\alpha = \frac{(Gx-Gy) \times 100\%}{Gy(Tx-20) - Gx(Ty-20)}$$ (reference temperature 20°C)

Where:
Gx conductivity at temperature Tx
Gy conductivity at temperature Ty

N.B.: if the reference temperature is 25°C, replace 20 with 25.

- Set the temperature coefficient with the value calculated as above (parameter P1).

Calibration of the instrument for measuring conductivity
The conductivity measurement depends strongly on the temperature of the liquid that is to be measured; this relationship must be considered during calibration.

Calibration of the instrument alone by means of a precision resistance
This is a sure and accurate method for calibrating the instrument alone, but it does not allow for the variations of the cell constant that may occur, nor of the state of efficiency and cleanness of the cell.
The precision resistance used for calibration will be chosen according to the scale that you want to calibrate. Typical values are the following:

Conductivity	Resistance
100,0 µS	10.000 Ω
500,0 µS	2.000 Ω
1000 µS	1.000 Ω
5000 µS	200 Ω
10,00 mS	100 Ω
50,00 mS	20 Ω
100,0 mS	10 Ω
500,0 mS	2 Ω
1000 mS	1 Ω

The precision resistance will be connected to the end of the cable that connects the probe to the instrument. This ensures greater accuracy of calibration. Disable the temperature compensation α_T during the calibration of the instrument with the precision resistences.

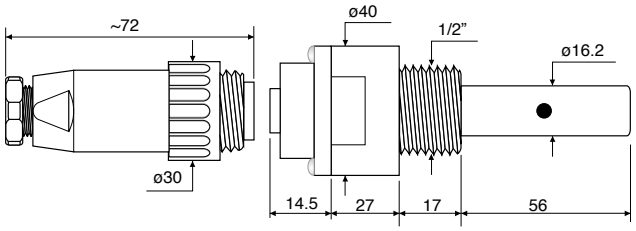
Calibration with standard solutions
In this case too, for the calibration of the instrument, cable and measuring probes in a standard solution, the greatest attention must be paid to the temperature of the solutions and the cleanness of the measuring cell. It is advised not to carry out calibration below 500 µS/cm. Solutions with low conductivity must be kept closed in their containers. Contact with the air increases their value due to the absorption of CO_2.
The regulations for the preparation of standard solutions with a base of KCl dissolved in water with a high degree of purity supply the method and percentages of KCl and water to be mixed.
DELTA OHM supplies four solutions for calibration:
HD8747: Standard calibration solution 0.001mol/l equal to 147µS/cm @25°C, 200cc.
HD8714: Standard calibration solution 0.01mol/l equal to 1413µS/cm @25°C, 200cc.
HD8712: Standard calibration solution 0.1mol/l equal to 12880µS/cm @25°C, 200cc.
HD87111: Standard calibration solution 1mol/l equal to 111800µS/cm @25°C, 200cc.

Care and maintenance of the conductivity cell
In conductivity measurement systems in industrial plants, if the installation is correctly made, readings are generally reliable for a long time. The important thing is to carry out correct, programmed maintenance of the measuring cell.
Abrasion of the cable due to continued swinging movements must be avoided, as must the formation of deposits and scale on the cell which can change its geometrical structure.
The cell must always be immersed in the liquid that is to be measured. In the industrial field, measurements may range from highly pure water to sewage or water contaminated by corrosive substances.
It is good practice to check the compatibility of the materials of which the cell and the connecting cable are made with the liquid in which the measurement is to be taken. Check that there are no floating bodies, suspended granules that may be more or less conductive, or which could get stuck inside the cell, thus leading to incorrect measurements.
To clean the cell use detergents or substances suitable for the material of which the cell is made.

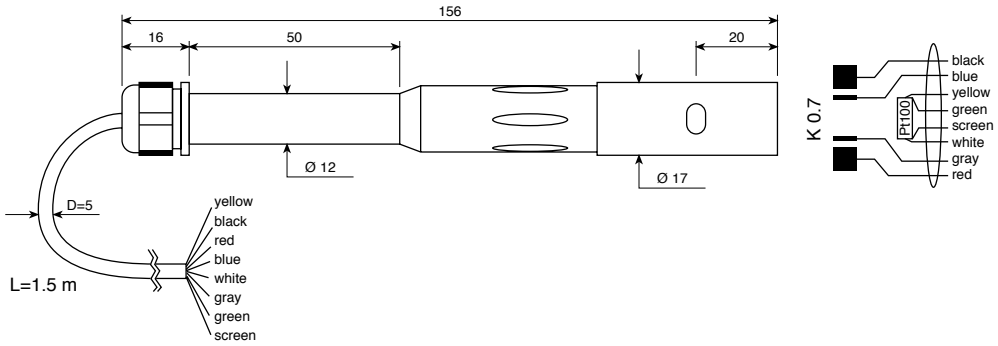
Selecting the cell constant and installation
The measurement range of the liquid to be examined determines the choice of the cell constant to be used.
Installation of the cell will vary according to the application. On the whole, the following points must be considered:
- Choose the correct cell and cell constant, suitable for the application.
- Use suitable materials, cable, cell, supports, so as to resist corrosion and the influence of atmospheric agents.
- The sensor/cell must be firmly fixed, in a place where they are easily accessible for maintenance.
- The liquid in which the sensor is immersed must be a representative part of the whole that is to be measured.
- There must be a moderate flow of liquid so that an updated sample of liquid arrives at the electrodes. Excessive movement or flow causes turbulence and air bubbles between the electrodes. As an air bubble is not conductive, it modifies the volume of the cell and changes the constant.
- Install the sensor in such a way that sludge or particles of material cannot be deposited inside it.
- If installed in containers where high currents are circulating, the conductivity cell may present measuring problems.
- The maintenance and cleaning interval depends on the quality of the liquid in which the cell is installed.

Order code
DO 9786T: Conductivity transmitter 4÷20 mA passive or active, power supply 24 Vac with double display 96x96 mm, for panel mounting.
DO 9766T: Conductivity transmitter 4÷20 mA passive or active, power supply 24 Vac with double display 122x120 mm, for use on the field.
SPT 86: Combined industrial conductivity and temperature probe in POCAN with 4 platinum electrodes, cell constant K = 0.7, 1.5 meters cable, Pt100 with 2 wires. Temperature 0÷90°C.
SPTKI 10: Combined industrial conductivity probe in Glass with 2 black oxidized platinum electrodes, cell constant K = 1, **S7/PG13** screw-joint, 2 wires output: eurostandard S7. Temperature 0÷100°C.
SPTKI 11: Combined industrial conductivity and temperature probe in Rytron with 2 graphite electrodes, cell constant K = 1, 5 meters cable, Pt100 with four wires. Temperature 0÷50°C.
SPTKI 12: Combined industrial conductivity and temperature probe in Rytron with 2 platinum electrodes, cell constant K = 01, 5 meters cable, Pt100 with four wires. Temperature 0÷50°C.
SPTKI 13: Combined industrial conductivity and temperature probe in Rytron with 2 platinum electrodes, cell constant K = 10, 5 meters cable, Pt100 with four wires. Temperature 0÷50°C.
HD 882 M100/300: Temperature probe with Pt100 sensor, miniature head, shaft Ø6x300 mm.
HD 882 M100/600: Temperature probe with Pt100 sensor, miniature head, shaft Ø6x600 mm.
HD 8747: Calibration solution 0.001 mol/l corresponding to 147 µS/cm at 25°C, 200cc.
HD 8712: Calibration solution 0.1 mol/l corresponding to 12,880 µS/cm at 25°C, 200cc.
HD 8714: Calibration solution 0.01 mol/l corresponding to 1413 µS/cm at 25°C, 200cc.
HD 87111: Calibration solution 1 mol/l corresponding to 111800 µS/cm at 25°c, 200cc.

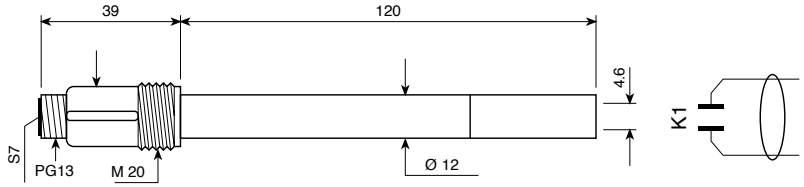
SPT 400.001
cell constant K=0.01



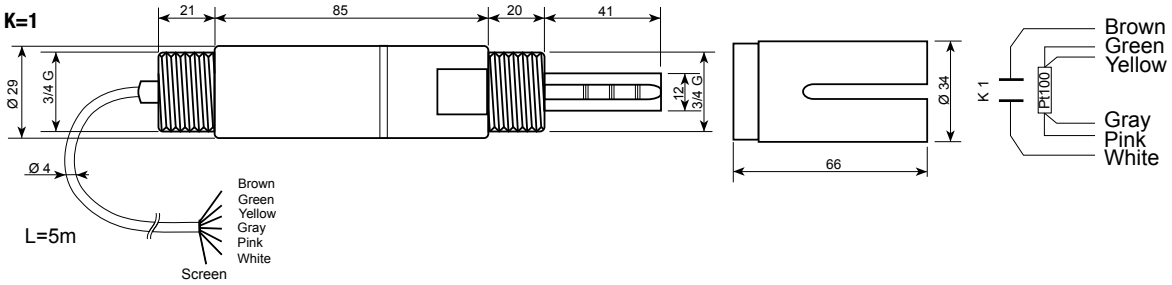
SPT 86
cell constant K=0.7



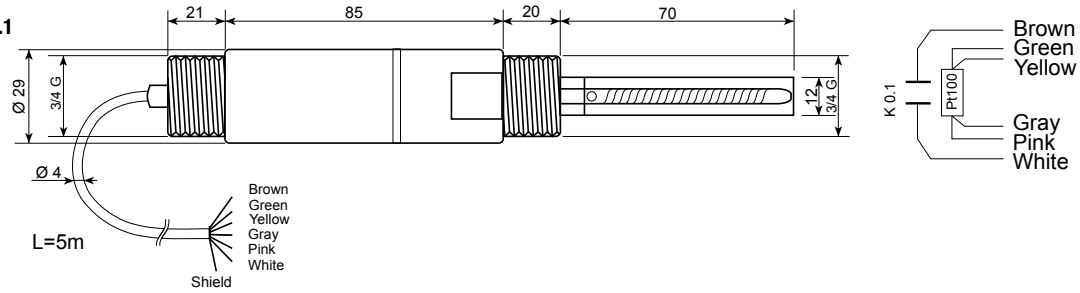
SPTKI 10
cell constant K=1



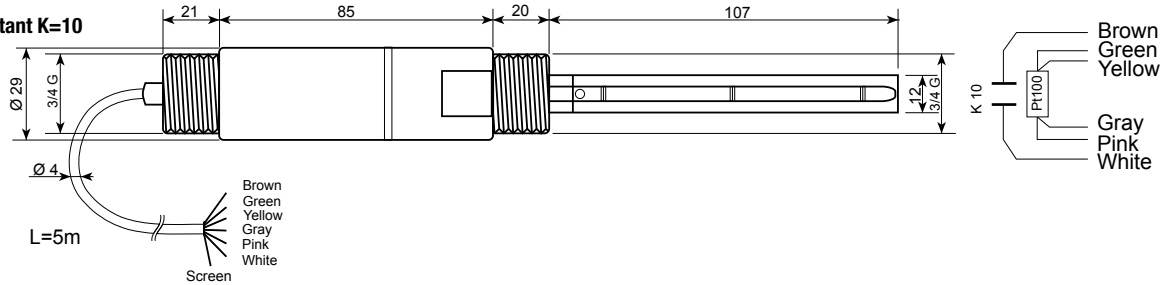
SPTKI 11
cell constant K=1



SPTKI 12
cell constant K=0.1



SPTKI 13
cell constant K=10



	Cell constant	Measuring range	Temperature range	Material	Electrodes	Temperature sensor	Max. pressure	Connection
SPT 400.001	K=0.01	0.05÷19.9µS	0÷120°C	AISI 316 - PTFE	2 AISI 316	-	12bar	4-pole connector
SPT 86	K=0.7	5µS÷20mS	0÷90°C	Pocan	4 platinum	Pt100 2 wire	6bar	1.5 m cable
SPTKI 10	K=1	100µS÷200mS	0÷100°C	Glass	2 platinum	–	6bar	S7
SPTKI 11	K=1	100µS÷10mS	0÷50°C	Rytron	2 platinum	Pt100 4 wire	6bar	5 m cable
SPTKI 12	K=01	1µS÷1mS	0÷50°C	Rytron	2 platinum	Pt100 4 wire	6bar	5 m cable
SPTKI 13	K=10	10µS÷200mS	0÷50°C	Rytron	2 platinum	Pt100 4 wire	6bar	5 m cable