



HD 3456.2 BENCH-TOP pH AND CONDUCTIVITY METER

The HD3456.2 is a bench top instrument for electrochemical measures: **pH, conductivity and temperature**.

The displayed data can be stored (**datalogger**) and can be transferred to PC or serial printer thanks to the multi-standard serial port RS232C and USB2.0 and software DeltaLog9 (Vers.2.0 and subsequent ones). The storing and printing parameters can be set from menu.

The **HD3456.2** measures **pH, mV, redox potential (ORP), conductivity, resistivity in liquids, total dissolved solids (TDS), and salinity** using combined 4-ring and 2-ring conductivity/temperature probes. **Temperature** is measured by Pt100 or Pt1000 immersion, penetration or contact probes.

The pH electrode calibration, as well as manual, can be carried out automatically on one, two or three points and the calibration sequence can be chosen from a list of 13 buffers.

The conductivity probe calibration can be performed automatically in one or more of the 147µS, 1413µS, 12880µS or 111800µS/cm conductivity calibration solutions.



The display shows continually the temperature in °C or °F and one selectable parameter according to the connected probe type, i.e. in case of conductivity probe it is possible to select between χ or Ω or TDS or g/l.

Other functions of this instrument include: Max, Min and Avg function, the Auto-HOLD function, the automatic turning off which can also be disabled.

The instruments have IP66 protection degree.

Technical characteristics HD3456.2

pH, mV, χ , Ω , TDS, Sal, °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

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

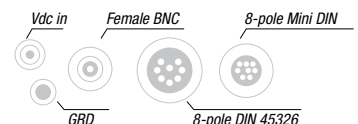
Type	RS232C electrically isolated
Baud rate	Can be set from 1200 to 38400 baud
Data bit	8
Parity	None
Stop bit	1
Flow Control	Xon/Xoff
Serial cable length	Max 15m
Selectable print interval	immediate or 1s, 5s, 10s, 15s, 30s, 1min, 2min, 5min, 10min, 15min, 20min, 30min and 1ora

USB Interface

Type	1.1 - 2.0 electrically isolated
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Connections

Serial interface and USB	8-pole MiniDin connector
Mains adapter (cod. SWD10)	2-pole connector (positive at centre) 12Vdc/1A



Storage of measured values

Tipo 2000 pages of 10 samples each
 Quantity 20,000 terns of measures made up of [pH or mV], [χ or Ω or TDS or salinity] and temperature.

Connections

pH/mV input Female BNC connector
 Conductivity input 8-pole male DIN45326 connector
 Input for temperature probes with TP47 module 8-pole male DIN45326 connector

Measurement of pH by Instrument

Measurement range -2.000...+19.999pH
 Resolution 0.01 o 0.001pH selectable from menu
 Accuracy ±0.001pH ±1digit
 Input impedance >10¹²Ω
 Calibration error @25°C |Offset| > 20mV
 Slope > 63mV/pH or Slope < 50mV/pH
 Sensitivity > 106.5% or Sensitivity < 85%
 Automatic / manual temperature compensation -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

Standard solutions automatically detected (@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

Measurement of conductivity by Instrument

		Resolution
Measurement range (Kcell=0.01)	0.000...1.999μS/cm	0.001μS/cm
Measurement range (Kcell=0.1)	0.00...19.99μS/cm	0.01μS/cm
Measurement 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
Measurement range (Kcell=10)	200...1999mS/cm	1mS/cm
Accuracy (conductivity)	±0.5% ±1digit	

Measurement of resistivity by Instrument

		Resolution
Measurement range (Kcell=0.01)	Up to 1GΩ·cm	(*)
Measurement range (Kcell=0.1)	Up to 100MΩ·cm	(*)
Measurement range (Kcell=1)	5.0...199.9Ω·cm	0.1Ω·cm
	200...999Ω·cm	1Ω·cm

Resolution

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
 0.5...5.0Ω·cm 0.1Ω·cm
 Accuracy (resistivity) ±0.5% ±1digit

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

Measurement range (Kcell=0.01) / Res.	0.00...1.999mg/l	0.005mg/l
Measurement range (Kcell=0.1) / Res.	0.00...19.99mg/l	0.05mg/l
Measurement range (Kcell=1) / Res.	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...99.9 g/l	0.1 g/l
Measurement range (Kcell=10) / Res.	100...999 g/l	1 g/l
Accuracy (total dissolved solids)	±0.5% ±1digit	

Measurement of salinity

Measurement range / Resolution	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	

Automatic/manual temperature compensation

0...100°C with α_t that can be selected from 0.00 to 4.00%/°C

Reference temperature

20°C o 25°C selectable from menu

χ/TDS conversion factor

0.4...0.8

Cell constant K (cm⁻¹)

0.01 - 0.1 - 0.7 - 1.0 - 10.0

Standard solutions automatically detected (@25°C)

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

Measurement of temperature by Instrument

Pt100 measurement range -50...+200°C
 Pt1000 measurement range -50...+200°C
 Resolution 0.1°C
 Accuracy ±0.25°C
 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
...



pH



χ



Ω



TDS

ORDERING CODES

HD3456.2: The kit is composed of: instrument HD3456.2 **datalogger**, for the measurement of pH - redox - conductivity - resistivity - TDS - salinity - temperature, 3 1.5V alkaline batteries, operating manual and **DeltaLog9 version 2.0**.

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

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 230Vac/9Vdc-300mA mains voltage.

HD40.1: Portable, serial input, 24 column thermal printer, 57mm paper width.

HD2110CSP: Connection cable for instruments series HD34... to printer **S'print-BT**

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 \varnothing 12mm probes.

TP47: Module for the connection of Pt100 4-wire and Pt1000 2-wire probes.

pH Electrodes

KP20: Combined pH electrode for common use, gel filled with screw connector S7 body in Epoxy.

KP30: Combined pH electrode for common use, cable 1 m, gel filled, body in Epoxy.

KP50: Combined pH electrode with Teflon collar diaphragm, for emulsions, deionised water, S7 screw connector, gel filled, body in glass.

KP 61: Combined pH electrode, 3 diaphragms for milk, cream, etc. electrolyte, with screw connector S7, body in glass.

KP 62: Combined pH electrode, 1 diaphragm for pure water, paints, etc. gel-filled, with screw connector S7, body in glass.

KP 63: Combined pH electrode for common use, varnish, cable 1 m, electrolyte KCl 3M body in glass.

KP 64: Combined pH electrode for water, varnish, emulsions, etc., electrolyte KCl 3M with screw connector S7, body in glass.

KP 70: Combined pH micro electrode diam. 4.5 x L=25 mm. Gel filled with screw connector, body in glass.

KP 80: Combined pointed pH electrode, gel filled with screw connector S7, body in glass.

KP100: Flat membrane gel combined pH electrode with S7 screw connector, glass body, for skin, leather, paper.

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.

GE: S7 screw connector for pH electrode.

BNC: Female BNC for electrode extension.

ORP Electrodes

KP90: Redox Platinum electrode, with screw connector S7, electrolyte KCl 3M, body in glass.

KP91: Redox Platinum electrode with 1m cable, GEL filled, body in glass.

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: 50cc ready for use solution for refilling of the electrodes.

Cleaning and maintenance

HD62PT: Diaphragm cleaning (thiourea in HCl) - 500ml.

HD62PP: Protein cleaning (pepsin in HCl) - 500ml.

HD62RF: Regeneration (fluorhydric acid) - 100ml.

HD62SC: Solution for electrode preservation - 500ml.

Combined conductivity and temperature probes

SPO6T: Combined conductivity and temperature 4-electrode cell in Platinum, body in POCAN. Cell constant $K = 0.7$. Measurement range $5\mu\text{S}/\text{cm} \dots 200\text{mS}/\text{cm}$, $0 \dots 90^\circ\text{C}$.

SPT401.001: Combined conductivity and temperature 2-electrode cell in stainless steel AISI 316. Cell constant $K = 0.01$. Measurement range $0.04\mu\text{S}/\text{cm} \dots 20\mu\text{S}/\text{cm}$, $0 \dots 120^\circ\text{C}$. Measurement in closed-cell..

SPT01G: Combined conductivity and temperature 2-electrode Platinum-wire cell, body in glass. Cell constant $K = 0.1$. Measurement range $0.1\mu\text{S}/\text{cm} \dots 500\mu\text{S}/\text{cm}$, $0 \dots 80^\circ\text{C}$.

SPT1G: Combined conductivity and temperature 2-electrode Platinum-wire cell, body in glass. Cell constant $K = 1$. Measurement range $10\mu\text{S}/\text{cm} \dots 10\text{mS}/\text{cm}$, $0 \dots 80^\circ\text{C}$.

SPT10G: Combined conductivity and temperature 2-electrode Platinum-wire cell, body in glass. Cell constant $K = 10$. Measurement range $500\mu\text{S}/\text{cm} \dots 200\text{mS}/\text{cm}$, $0 \dots 80^\circ\text{C}$.

Electrode dimensions and characteristics at page 402

Standard conductivity calibration solutions

HD8747: Standard calibration solution 0.001mol/l equal to $147\mu\text{S}/\text{cm}$ @25°C - 200cc.

HD8714: Standard calibration solution 0.01mol/l equal to $1413\mu\text{S}/\text{cm}$ @25°C - 200cc.

HD8712: Standard calibration solution 0.1mol/l equal to $12880\mu\text{S}/\text{cm}$ @25°C - 200cc.

HD87111: Standard calibration solution 1mol/l equal to $111800\mu\text{S}/\text{cm}$ @25°C - 200cc.

Temperature probes complete with TP47 module

TP47.100: Direct 4 wires Pt100 sensor immersion probe. Probe's stem \varnothing 3mm, length 230mm. Connection cable 4 wires with connector, length 2 m.

TP47.1000: Pt1000 sensor immersion probe. Probe's stem \varnothing 3mm, length 230mm. Connection cable 2 wires with connector, length 2 m.

TP87.100: Pt100 sensor immersion probe. Probe's stem \varnothing 3mm, length 70mm. 4 wire connection cable with connector, length 1 m.

TP87.1000: Pt1000 sensor immersion probe. Probe's stem \varnothing 3mm, length 70mm. 2 wire connection cable with connector, length 1 m.

Accessories

TP47: Module for the connection of Pt100 4-wire and Pt1000 2-wire probes.

