



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

The HD2156.2 instrument is a **datalogger**. It memorizes 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 multi-standard RS232C serial port and USB 2.0. The storing interval, printing, and baud rate can be configured using the menu.

The HD2156.1 and HD2156.2 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 **IP67** protection degree.

INSTRUMENT TECHNICAL CHARACTERISTICS

Measured quantities: pH, mV, χ , Ω , TDS, NaCl, $^{\circ}$ C, $^{\circ}$ F

Instrument

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

Operating conditions

Working temperature	-5...50 $^{\circ}$ C
Storage temperature	-25...65 $^{\circ}$ C
Working relative humidity	0...90%RH without condensation
Protection degree	IP67

Power

Batteries	4 1.5V type AA batteries
Autonomy	200 hours with 1800mAh alkaline batteries
Power absorbed with instrument off	20 μ A
Mains	Output mains adapter 9Vdc / 250mA

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 HD2156.2

Type	2000 pages containing 10 samples each
Quantity	20,000 sets of three measurements composed of pH or mV, χ or 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 baud
Data bit	8
Parity	None
Stop bit	1
Flow Control	Xon/Xoff
Serial cable length	Max 15m
Immediate print interval	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
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Connections

pH/mV input	Female BNC connector
Conductivity input	8-pole male DIN45326 connector
Serial interface and USB	8-pole MiniDin 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	$\pm 0.001pH \pm 1$ digit
Input impedance	$> 10^1 \Omega$
Calibration error @25 $^{\circ}$ C	10 Offset > 20mV Slope > 63mV/pH or Slope < 50mV/pH Sensitivity > 106.5% or Sensitivity < 85%

Measurement of mV by Instrument

Measurement range	-1999.9...+1999.9mV
Resolution	0.1mV
Accuracy	$\pm 0.1mV \pm 1$ digit
Drift after 1 year	0.5mV/year

Measurement of conductivity		Resolution	Measurement of salinity		Resolution		
Measuring range	0.00...19.99 μ S/cm	0.01 μ S/cm	Measurement range	0.000...1.999g/l	1mg/l		
Kcell=0.1				2.00...19.99g/l	10mg/l		
Measuring range	0.0...199.9 μ S/cm	0.1 μ S/cm		20.0...199.9g/l	0.1g/l		
Kcell=1	200...1999 μ S/cm	1 μ S/cm	Accuracy (salinity)	$\pm 0.5\%$ 1digit			
	2.00...19.99mS/cm	0.01mS/cm	Temperature compensation	0...100°C with α_t selectable from 0.00 to 4.00%/°C			
	20.0...199.9mS/cm	0.1mS/cm	automatic/manual	20°C or 25°C			
Measuring range	200...1999mS/cm	1mS/cm	Reference temperature	0.4...0.8			
Kcell=10			X / TDS Conversion factor	0.1, 0.7, 1.0 and 10.0			
Accuracy (conductivity)	$\pm 0.5\%$ 1digit		Cell constant K (cm ⁻¹)				
Measurement of resistivity		till 100M Ω ·cm/(*)	Standard solutions automatically detected @25°C				
Measuring range	Kcell=0.1		147 μ S/cm				
Measuring range	5.0...199.9 Ω ·cm	0.1 Ω ·cm	1413 μ S/cm				
Kcell=1	200...999 Ω ·cm	1 Ω ·cm	12880 μ S/cm				
	1.00k...19.99k Ω ·cm	0.01k Ω ·cm	111800 μ S/cm				
	20.0...99.9k Ω ·cm	0.1k Ω ·cm					
	100k...999k Ω ·cm	1k Ω ·cm					
Measuring range	1...10M Ω ·cm	1M Ω ·cm					
Kcell=10	0.5...5.0 Ω ·cm	0.1 Ω ·cm					
Accuracy (resistivity)	$\pm 0.5\%$ 1digit						
Measurement of total dissolved solids (with coefficient X/TDS=0.5)			Measurement of temperature				
Measuring range	Kcell=0.1	0.00...19.99mg/l	0.05mg/l	Pt100 measuring range	-50...+200°C		
Measuring range	200...1999mg/l	0.5mg/l		Pt1000 measuring range	-50...+200°C		
Kcell=1	200...1999mg/l	1mg/l		Resolution	0.1°C		
	2.00...19.99g/l	0.01g/l		Accuracy	± 0.25 °C		
	20.0...99.9g/l	0.1g/l		Drift after 1 year	0.1°C/anno		
Measuring range	Kcell=10	100...999g/l	1g/l	Preset cell constant values:	K=0,01 - K=0,1 - K=1, K=10		
Accuracy (conductivity)							

(*) 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 (μ S/cm)	Resistivity (M Ω ·cm)	Conductivity (μ S/cm)	Resistivity(M Ω ·cm)
0.001 μ S/cm	1000 M Ω ·cm	0.01 μ S/cm	100 M Ω ·cm
0.002 μ S/cm	500 M Ω ·cm	0.02 μ S/cm	50 M Ω ·cm
0.003 μ S/cm	333 M Ω ·cm	0.03 μ S/cm	33 M Ω ·cm
0.004 μ S/cm	250 M Ω ·cm	0.04 μ S/cm	25 M Ω ·cm
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TECHNICAL DATA OF PROBES AND MODULES EQUIPPED WITH INSTRUMENT					
2 and 4 electrode conductivity probes					
ORDER CODE	MEASUREMENT RANGE	DIMENSIONS			
SP06T	K=0.7 5 μ S...200mS/cm 0...90°C 4-electrode cell in Pocan/Platinum		156	50	20
SPT 400.001 not suitable for HD 2306.0	K=0.01 0.05...19.9 μ S/cm 2-electrode cell AISI 316 - Teflon		72	30	40
SPT01G	K=0.1 0.1 μ S...500 μ S/cm 0...80°C 2-electrode cell in Glass/Platinum		35	120	12
SPT1G	K=1 10 μ S...10mS/cm 0...80°C 2-electrode cell in Glass/Platinum		35	130	12
SPT10G	K=10 500 μ S...200mS/cm 0...80°C 2-electrode cell in Glass/Platinum		35	130	12

Temperature probes with connector 4 wire Pt100 and 2 wire Pt1000 sensor

Model	Type	Working range	Accuracy
TP47.100	Pt100 4 wires	-50...+200°C	Class A
TP47.1000	Pt1000 2 wires	-50...+200°C	Class A
TP87.100	Pt100 4 wires	-50...+200°C	Class A
TP87.1000	Pt1000 2 wires	-50...+200°C	Class A

Temperature drift @20°C 0.005%/°C

ORDER CODES

HD2156.1: The kit is composed of: instrument HD2156.1, 4 1.5V alkaline batteries, operating manual, case and DeltaLog9 software. **Other pH electrodes, conductivity and temperature probes must be ordered separately.**

HD2156.2K: The kit is composed of: instrument HD2156.2 **datalogger**, 4 1.5V alkaline batteries, operating software DeltaLog9. **Other pH electrodes, conductivity and temperature probes must be ordered separately.**

pH/mV probes, conductivity probes, temperature probes, standard calibration solutions for various types of measurements, 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.

HD2101/USB: Connection cable USB 2.0 connector type A - 8-pole MiniDin (not suitable for HD2156.1K).

DeltaLog9: Software for download and management of the data on PC using Windows 98 to Vista 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.

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, 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 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.

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 401

CP: 1.5m extension cable with BNC/S7 connector for electrode without cable, thread S7.

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

Characteristics and dimensions of the probes at page 402

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 (fl uorhydric acid) - 100ml.

HD62SC: Solution for electrode preservation - 200ml.

Temperature probes complete with SICRAM module

TP87: PT100 sensor immersion probe. Stem Ø 3 mm, length 70 mm. Cable length 1 m.

TP4721.0: Pt100 sensor immersion probe. Stem Ø 3 mm, length 230 mm. Cable length 2 m.

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

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

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

TP4721.5: Immersion probe, sensor Pt100. Stem Ø 6mm, length 500 mm. Cable length 2 m.

TP4721.10: Immersion probe, sensor Pt100. Stem Ø 6mm, length 1,000mm. Cable length 2 m.

Temperature probes without SICRAM module

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

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

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

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

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

