Member of GHM GROUP

HD2156.1; HD2156.2

HD2156.1, HD2156.2
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	-2.00…+19.99pH
Resolution	0.01pH
Accuracy	± 0.01pH ±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	±0.6mV or ±1‰ of reading (the greater)
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

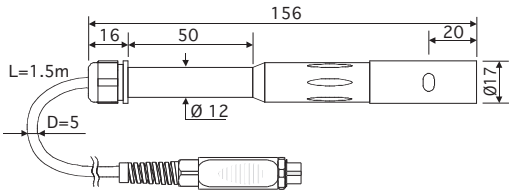
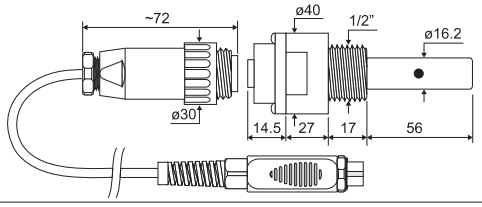
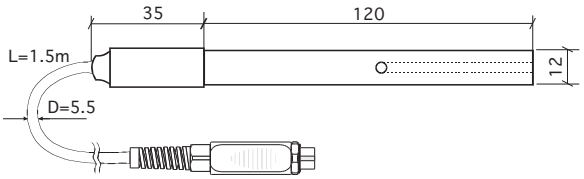
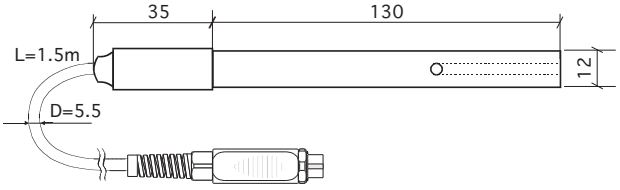
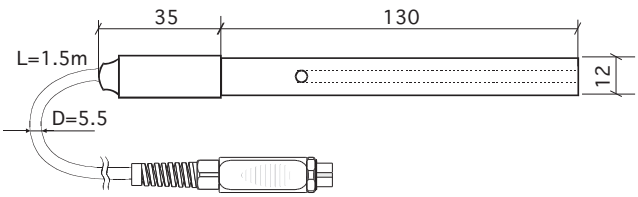
Measurement of total dissolved solids (with coefficient χ/TDS=0.5)		*Resolution*
Measuring range Kcell=0.01	0.000…19.999mg/l	0.005mg/l
Measuring range Kcell=0.1	0.00…19.99mg/l	0.05mg/l
Measuring range Kcell=1	0.0…199.9mg/l	0.5mg/l
	200…1999mg/l	1mg/l
	2.00…19.99g/l	0.01g/l
	20.0…99.9g/l	0.1g/l
Measuring 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, cable CP23, 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

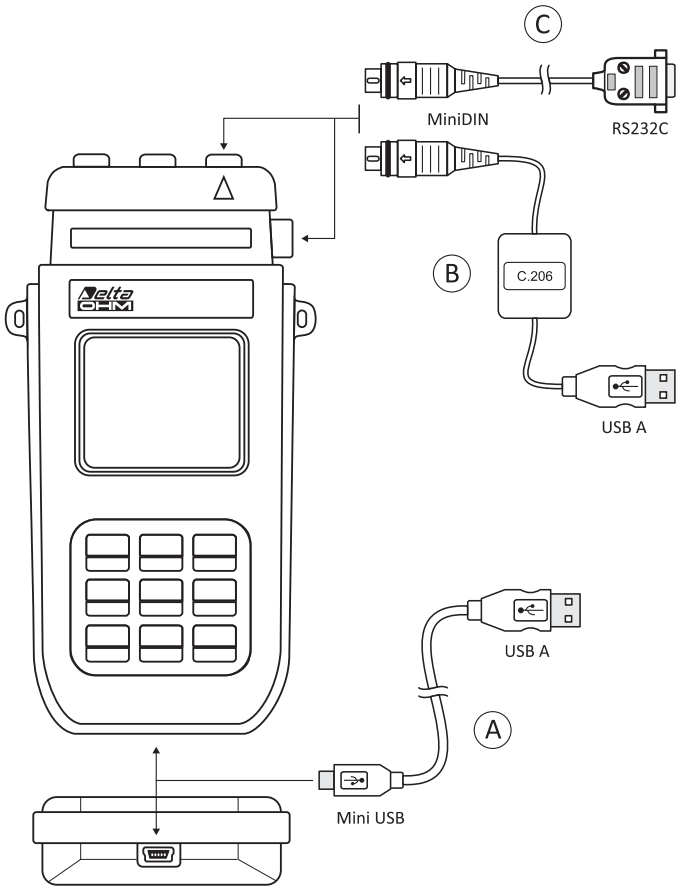
HD40.1: 24-column portable thermal printer, serial interface, 57mm paper width, four NiMH 1.2V rechargeable batteries, SWD10 power supply, instruction manual, 5 thermal paper rolls. It uses the cable HD2110CSNM (optional).

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.