The instrument series HD3405.2 is made up of 4 bench top instruments for electrochemical measures: pH, conductivity, 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 HD3405.2 measures pH, redox potential (ORP) in mV. It measures temperature with Pt100 or Pt1000 immersion, penetration or contact probes. The pH 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 HD3406.2 measures conductivity, liquid 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 probe calibration can be performed automatically in one or more of the 147µS, 1413µS, 12880µS or 111800µS/cm conductivity calibration solutions.

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 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 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 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 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 common function of this instrument series 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 of the instrument series HD34...

### Common technical data

**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
- Stocking 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 departure

**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
- Common connections to all models: 8-pole MiniDin connector
- Mains adapter (cod. SWD10): 2-pole connector (positive at centre) 12Vdc/1A

**EMC Standard regulations**
- Security: EN61000-4-2, EN61010-1 level 3
- Electrostatic discharge: EN61000-4-2 level 3
- Electric fast transients: EN61000-4-4 level 3, EN61000-4-5 level 3
- Voltage variations: EN61000-4-11
- Electromagnetic interference susceptibility: IEC1000-4-3
- Electromagnetic interference emission: EN55020 class B

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Technical characteristics HD3406.2 χ, Ω, TDS, NaCl, °C/°F measurement

- **Measured values**: χ, Ω, TDS, NaCl, °C, °F

- **Storage of measured values**: 2000 pages of 18 samples each

- **Type**: 36,000 sets of measures made up of [χ - Ω or TDS or NaCl] and [°C - °F]

- **Measurement connections**
  - Input conductivity: 8-pole male DIN45326 connector
  - Input for temperature probes: 8-pole male DIN45326 connector complete with TP47 modules

- **Measurement of conductivity by instrument**
  - Measurement range (Kcell=0.01) / Res.
  - Measurement range (Kcell=0.1) / Res.
  - Measurement range (Kcell=1) / Res.
  - Measurement range (Kcell=10) / Res.
  - Accuracy (conductivity)

<table>
<thead>
<tr>
<th>Measurement range (Kcell)</th>
<th>Res.</th>
<th>Accuracy (conductivity)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00…1.999µS/cm</td>
<td>0.001µS/cm</td>
<td>±0.5% ±1digit</td>
</tr>
<tr>
<td>0.00…19.99µS/cm</td>
<td>0.01µS/cm</td>
<td></td>
</tr>
<tr>
<td>0.0…199.9µS/cm</td>
<td>0.1µS/cm</td>
<td></td>
</tr>
<tr>
<td>200…1999µS/cm</td>
<td>1µS/cm</td>
<td></td>
</tr>
<tr>
<td>2.00…19.99mS/cm</td>
<td>0.01mS/cm</td>
<td></td>
</tr>
<tr>
<td>20.0…199.9mS/cm</td>
<td>0.1mS/cm</td>
<td></td>
</tr>
<tr>
<td>200…1999mS/cm</td>
<td>1mS/cm</td>
<td></td>
</tr>
</tbody>
</table>
Measurement of resistivity by instrument
Measurement range (Kcell=0.01) / Res. Up to 1GΩ cm / (*)
Measurement range (Kcell=0.1) / Res. Up to 100MΩ cm / (*)
Measurement range (Kcell=1) / Res. 5.0…199.9Ω cm / 0.1Ω cm
200…999Ω cm / 1Ω cm
1.0K…19.9kΩ cm / 0.01Ω cm
20.0K…99.9kΩ cm / 0.1kΩ cm
100k…999kΩ cm / 1kΩ cm
1…10MΩ cm / 1MΩ cm
Measurement range (Kcell=10) / Res. 0.5…5.0Ω cm / 0.1Ω cm
Accuracy (resistivity) ±0.5% ±1digit

Measurement of total dissolved solids (with coefficient $\chi$/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…199.9mg/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
Measurement range (Kcell=10) / Res. 100…999g/l / 1g/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

Temperature measurement by instrument
Measurement range Pt100 -50…+200°C
Measurement range Pt1000 -50…+200°C
Resolution 0.1°C
Accuracy ±0.25°C
Drift after 1 year 0.1°C/year

Automatic/manual temperature compensation
Reference temperature 0…100°C with $\alpha_T = 0.00…-0.004%/°C$
Conversion factor $\chi$/TDS 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)
147uS/cm
1413uS/cm
12880uS/cm
111800uS/cm

(*) 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:

<table>
<thead>
<tr>
<th>conductivity (µS/cm)</th>
<th>resistivity (MΩ/cm)</th>
<th>conductivity (µS/cm)</th>
<th>resistivity (MΩ/cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.001 µS/cm</td>
<td>1000 MΩ cm</td>
<td>0.01 µS/cm</td>
<td>100 MΩ cm</td>
</tr>
<tr>
<td>0.002 µS/cm</td>
<td>500 MΩ cm</td>
<td>0.02 µS/cm</td>
<td>50 MΩ cm</td>
</tr>
<tr>
<td>0.003 µS/cm</td>
<td>333 MΩ cm</td>
<td>0.03 µS/cm</td>
<td>33 MΩ cm</td>
</tr>
<tr>
<td>0.004 µS/cm</td>
<td>250 MΩ cm</td>
<td>0.04 µS/cm</td>
<td>25 MΩ cm</td>
</tr>
</tbody>
</table>

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### 2 and 4 electrode conductivity probes for HD3406.2 and HD3456.2

<table>
<thead>
<tr>
<th>ORDERING CODE</th>
<th>MEASUREMENT RANGE AND USE</th>
<th>DIMENSIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP06T</td>
<td>K=0.7</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5µS/cm … 200µS/cm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0…90°C</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4-electrode cell in Pocan/Platinum</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Probe material Pocan</td>
<td></td>
</tr>
<tr>
<td></td>
<td>General use</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No heavy tasks</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.04µS/cm … 20µS/cm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0…120°C</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2-electrode cell in AISI 316</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ultrapure water</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Measurement in closed-cell</td>
<td></td>
</tr>
<tr>
<td>SPT01G</td>
<td>K=0.1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.1µS/cm … 500µS/cm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0…80°C</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2-electrode cell in Platinum wire</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Probe material glass</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pure water</td>
<td></td>
</tr>
<tr>
<td>SPT1G</td>
<td>K=1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10µS/cm … 10mS/cm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0…80°C</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2-electrode cell in Platinum wire</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Probe material glass</td>
<td></td>
</tr>
<tr>
<td></td>
<td>General heavy use, average conductivity</td>
<td></td>
</tr>
<tr>
<td>SPT10G</td>
<td>K=10</td>
<td></td>
</tr>
<tr>
<td></td>
<td>500µS/cm … 200mS/cm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0…80°C</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2-electrode cell in Platinum wire</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Probe material glass</td>
<td></td>
</tr>
<tr>
<td></td>
<td>General heavy use, high conductivity</td>
<td></td>
</tr>
</tbody>
</table>
**Temperature probes**

**Temperature probes with Pt100 sensor complete with SICRAM module**

<table>
<thead>
<tr>
<th>Modell</th>
<th>Type</th>
<th>Application range</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>TP87</td>
<td>Immersion</td>
<td>-50°C…+200°C</td>
<td>±0.25°C (-50°C…+200°C)</td>
</tr>
<tr>
<td>TP472I.0</td>
<td>Immersion</td>
<td>-50°C…+400°C</td>
<td>±0.25°C (-50°C…+350°C)</td>
</tr>
<tr>
<td>TP473P.0</td>
<td>Penetration</td>
<td>-50°C…+400°C</td>
<td>±0.25°C (-50°C…+350°C)</td>
</tr>
<tr>
<td>TP474C.0</td>
<td>Contact</td>
<td>-50°C…+400°C</td>
<td>±0.3°C (-50°C…+350°C)</td>
</tr>
<tr>
<td>TP475A.0</td>
<td>Air</td>
<td>-50°C…+250°C</td>
<td>±0.3°C (-50°C…+250°C)</td>
</tr>
<tr>
<td>TP472I.5</td>
<td>Immersion</td>
<td>-50°C…+400°C</td>
<td>±0.3°C (-50°C…+350°C)</td>
</tr>
<tr>
<td>TP472I.10</td>
<td>Immersion</td>
<td>-50°C…+400°C</td>
<td>±0.4°C (+350°C…+400°C)</td>
</tr>
</tbody>
</table>

Temperature drift @20°C 0.003%/°C

**Pt100 4-wire probes and Pt1000 2-wire probes complete with TP47 module**

<table>
<thead>
<tr>
<th>Modell</th>
<th>Type</th>
<th>Application range</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>TP47.100</td>
<td>Pt100 4-wire</td>
<td>-50…+200°C</td>
<td>Class A</td>
</tr>
<tr>
<td>TP47.1000</td>
<td>Pt1000 2-wire</td>
<td>-50…+200°C</td>
<td>Class A</td>
</tr>
<tr>
<td>TP87.100</td>
<td>Pt100 4-wire</td>
<td>-50…+200°C</td>
<td>Class A</td>
</tr>
<tr>
<td>TP87.1000</td>
<td>Pt1000 2-wire</td>
<td>-50…+200°C</td>
<td>Class A</td>
</tr>
</tbody>
</table>

Temperature drift @20°C 0.005%/°C

**TP47**: Module for the connection of Pt100 4-wire and Pt1000 2-wire probes to instrument series HD34…, without amplifying electronics and linearization.
Ordering codes for instrument series HD34...
HD3406.2K: The kit is composed of: instrument HD3406.2 datalogger, for measurement of 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.

Common Accessories for instruments series HD34...
HD2110CSNM: 9-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.
S'print-BT: Portable, serial input, 24 column thermal printer, 58mm 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.
HD22.3: Laboratory electrode holder with metal basis plate. Flexible electrode holder for free positioning. For Ø 12mm probes.
TP47: Module for the connection of Pt100 4-wire and Pt1000 2-wire probes to instrument series HD34..., without amplifying electronics and linearization.

Accessories for instruments HD3406.2 and HD3456.2 with input for conductivity measurement
Combined conductivity and temperature probes
SP06T: Combined conductivity and temperature 4-electrode cell in Platinum, body in Pocan. Cell constant K = 0.7. Measurement range 5µS/cm …200mS/cm, 0…90°C.
SPT401.001: Combined conductivity and temperature 2- electrode cell in stainless steel AISI 316. Cell constant K = 0.01. Measurement range 0.04µS/cm …2µS/cm, 0…120°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 0.1µS/cm …50µS/cm, 0…80°C.
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.

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 for HD3406.2 and HD3456.2 complete with TP47 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 metres.
TP47.1000: Pt1000 sensor immersion probe. Probe's stem Ø 3mm, length 230mm. Connection cable 2 wires with connector, length 2 metres.
TP87.100: Pt100 sensor immersion probe. Probe's stem Ø 3mm, length 70mm. 4 wire connection cable with connector, length 1 metre.
TP87.1000: Pt1000 sensor immersion probe. Probe's stem Ø 3mm, length 70mm. 2 wire connection cable with connector, length 1 metre.

Common Accessories for instruments of the series HD34...
TP47: Module for the connection of Pt100 4-wire and Pt1000 2-wire probes to instrument series HD34..., without amplifying electronics and linearization.

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