

**HD3405.2**

pH mV °C °F

**HD3406.2**

χ Ω TDS NaCl °C °F

**HD3409.2**

mg/l %sat

**HD3456.2**

pH mV χ Ω TDS NaCl °C °F

## Introduction

The instrument series HD34... 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 147 $\mu$ S, 1413 $\mu$ S, 12880 $\mu$ S or 111800 $\mu$ S/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.

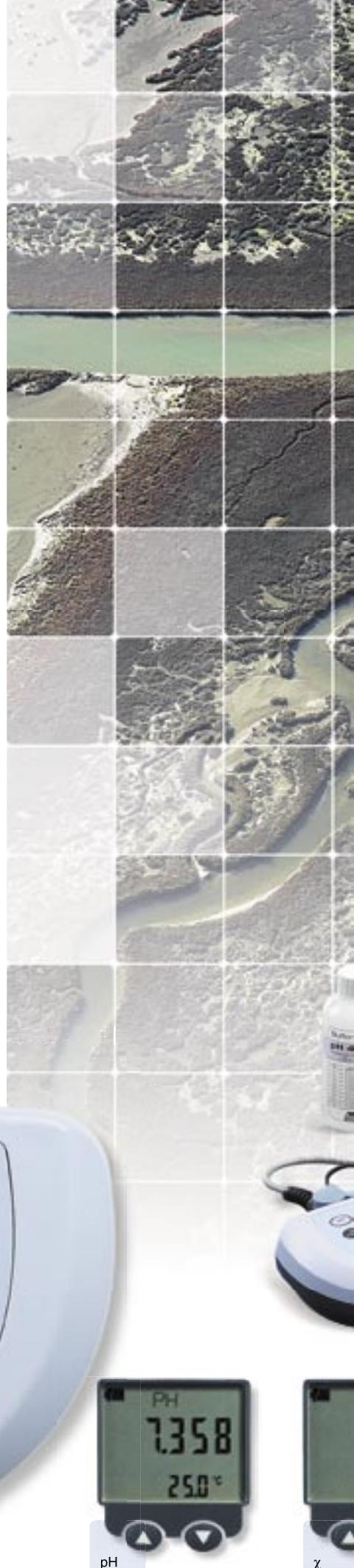
The pH electrode calibration, as well as manual, can be carried out on one, two or three points and the calibration sequence can be chosen from a list of 13 buffers.

The probe calibration can be performed automatically in one or more of the 147 $\mu$ S, 1413 $\mu$ S, 12880 $\mu$ S or 111800 $\mu$ S/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 1ora

#### USB Interface

Type 1.1 - 2.0 electrically isolated

#### Common connections to all models

Serial interface and USB 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

# HD3456.2

## Technical characteristics HD3456.2 pH, mV, $\chi$ , $\Omega$ , TDS, Sal, °C/F measurement

### Measured values

pH, mV,  $\chi$ ,  $\Omega$ , TDS, salinity, °C, °F

### Storage of measured values

Tipo  
Quantity

2000 pages of 10 samples each  
20,000 terns of measures made up of [pH or mV], [ $\chi$  or  $\Omega$  or TDS or salinity] and temperature.

### Connections

pH/mV input  
Conductivity input  
Input for temperature probes with TP47 module

Female BNC connector  
8-pole male DIN45326 connector  
8-pole male DIN45326 connector

### Measurement of pH by Instrument

Measurement range  
Resolution  
Accuracy  
Input impedance  
Calibration error @25°C

-2.000...+19.999pH  
0.01 o 0.001pH selectable from menu  
 $\pm 0.001\text{pH} \pm 1\text{digit}$   
 $>10^{12}\Omega$   
 $|\text{Offset}| > 20\text{mV}$   
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  
Resolution  
Accuracy  
Drift after 1 year

-1999.9...+1999.9mV  
0.1mV  
 $\pm 0.1\text{mV} \pm 1\text{digit}$   
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





Vdc      female BNC      8-pole MiniDin  
 GRD      8-pole male DIN 45326



#### Measurement of conductivity by Instrument

Measurement range (Kcell=0.01) / Res.	0.000...1.999µS/cm / 0.001µS/cm
Measurement range (Kcell=0.1) / Res.	0.0...19.99µS/cm / 0.01µS/cm
Measurement range (Kcell=1) / Res.	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) / Res.	200...1999mS/cm / 1mS/cm
Accuracy (conductivity)	±0.5% ±1digit

#### 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
	1.00k...19.99kΩ·cm / 0.01kΩ·cm
	20.0k...99.9kΩ·cm / 0.1kΩ·cm
	100k...999kΩ·cm / 1kΩ·cm
	1...10MΩ·cm / 1MΩ·cm
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...199.9 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
Accuracy (salinity)	20.0...199.9g/l / 0.1g/l

#### Automatic/manual temperature compensation

Reference temperature	0...100°C with $\alpha_T$ that can be selected from 0.00 to 4.00%/°C
$\chi/TDS$ conversion factor	20°C o 25°C selectable from menu
Cell constant K (cm⁻¹)	0.4...0.8

#### 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:

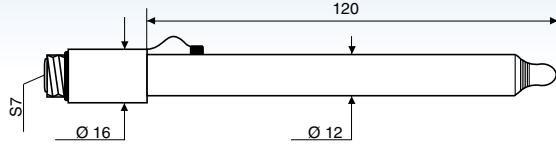
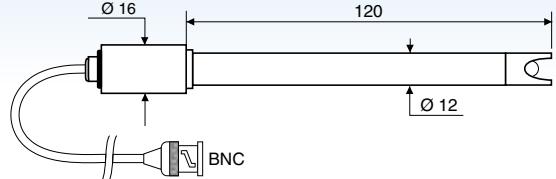
K cell = 0.01 cm⁻¹		K cell = 0.1 cm⁻¹	
Conductivity (µS/cm)	Resistivity (MΩ·cm)	Conductivity (µS/cm)	Resistivity(MΩ·cm)
0.001 µS/cm	1000 MΩ·cm	0.01 µS/cm	100 MΩ·cm
0.002 µS/cm	500 MΩ·cm	0.02 µS/cm	50 MΩ·cm
0.003 µS/cm	333 MΩ·cm	0.03 µS/cm	33 MΩ·cm
0.004 µS/cm	250 MΩ·cm	0.04 µS/cm	25 MΩ·cm
...	...	...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

## Technical data of probes and modules equipped with instruments of the series HD34...

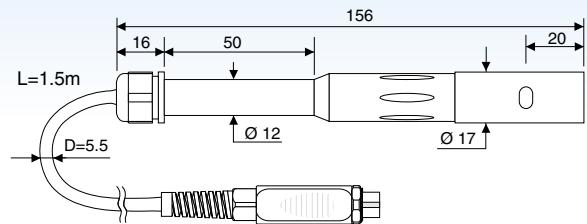
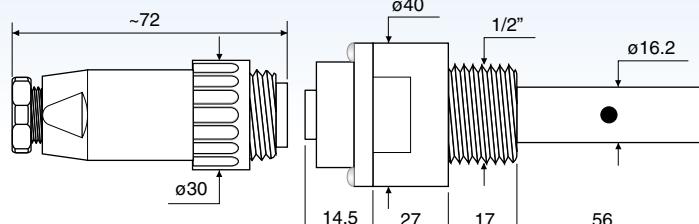
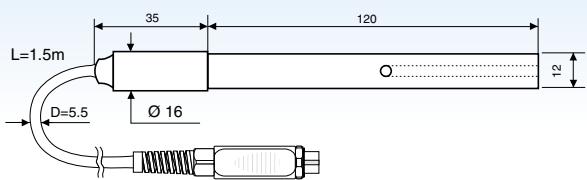
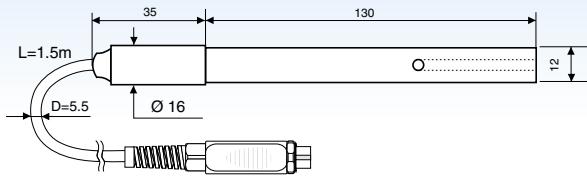
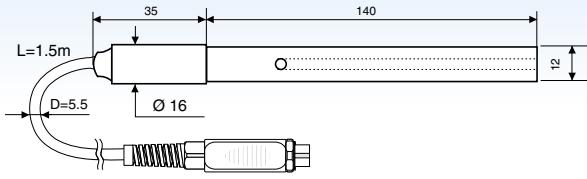
### pH Electrodes for HD3405.2 and HD3456.2

ORDERING CODE	MEASUREMENT RANGE AND USE	DIMENSIONS
KP20	0...14pH / 0...80°C / 3bar Body in Epoxy - GEL filled 1 ceramic diaphragm Waste water, drinking water, paints, water emulsions, galvanic baths, fruit juices, water suspensions, titration, varnishes.	
KP30	0...14pH / 0...80°C / 3bar Body in Epoxy - GEL filled 1 ceramic diaphragm Cable L=1m with BNC Waste water, drinking water, water emulsions, galvanic baths, paints, varnishes, water suspensions, fruit juices, titration.	
KP50	0...14pH / 0...80°C / 3bar Body in glass - GEL filled 1 Teflon ring diaphragm Varnishes, cosmetics, water emulsions, galvanic baths, creams, deionised water, TRIS solutions, drinking water, fruit juices, low-ion-content solutions, mayonnaise, preserved food, paints, titration, titration in non-water solutions, water suspensions, detergents, waste water, viscous samples.	
KP61	2...14pH / 0...80°C / 3bar Body in glass Liquid reference filling Triple ceramic diaphragm Waste water, paste, bread, fruit juices, varnishes, cosmetics, creams, deionised water, drinking water, water emulsions, galvanic baths, detergents, yoghurt, milk, titration, preserved food, titration in non-water solutions, water suspensions, mayonnaise, wine, low ion-content solution, butter, proteic substances, paints, viscous samples	
KP62	0...14pH / 0...80°C / 3bar Body in glass - GEL filled 1 ceramic diaphragm Paints, varnishes, drinking water, water emulsions, fruit juices, galvanic baths, water suspensions, titration, waste water.	
KP63	0...14pH / 0...80°C / 1bar Body in glass Reference filling solution KCl 3M 1 ceramic diaphragm Cable L=1m with BNC Paints, varnishes, drinking water, water solutions, fruit juices, galvanic baths, water suspensions, titrations, waste water.	
KP64	0...14pH / 0...80°C / 0.1bar Body in glass Liquid reference KCl 3M Teflon collar diaphragm Paints, varnishes, cosmetics, creams, deionised water, drinking water, water emulsions, fruit juices, detergents, low ion-content solutions, preserved food, water suspensions, titration, titration in non-water solutions, TRIS solutions, waste water, viscous samples, wine.	
KP70	2...14pH / 0...50°C / 0.1bar Body in Epoxy - GEL filled 1 open junction Paste, bread, paints, varnishes, cosmetics, creams, drinking water, water emulsions, fruit juices, galvanic baths, detergents, mayonnaise, preserved foods, cheese, milk, water suspensions, viscous samples, waste water, butter, yoghurt.	
KP80	2...14pH / 0...60°C / 1bar Body in glass - GEL filled 1 open junction Paste, bread, paints, varnishes, cosmetics, creams, drinking water, water emulsions, fruit juices, galvanic baths, detergents, mayonnaise, preserved food, water suspensions, titration, titration in non-water solutions, viscous samples, waste water, yoghurt, milk, butter.	

## ▷ Redox Electrodes for HD3405.2 and HD3456.2

ORDERING CODE	MEASUREMENT RANGE AND USE	DIMENSIONS
KP90	±2000mV 0...80°C 5bar Body in glass Reference filling solution KCl 3M General use	
KP91	±1000mV 0...60°C 1bar Body in Epoxy - GEL Cable L=1m with BNC General use No heavy tasks	

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

ORDERING CODE	MEASUREMENT RANGE AND USE	DIMENSIONS
SP06T	K=0.7 5µS/cm ...200mS/cm 0...90°C 4-electrode cell in Pocan/Platinum Probe material Pocan General use No heavy tasks	
SPT401.001	K=0.01 0.04µS/cm ...20µS/cm 0...120°C 2-electrode cell in AISI 316 Ultrapure water Measurement in closed-cell	
SPT01G	K=0.1 0.1µS/cm ...500µS/cm 0...80°C 2-electrode cell in Platinum-wire Probe material glass Pure water	
SPT1G	K=1 10µS/cm ...10mS/cm 0...80°C 2-electrode cell in Platinum wire Probe material glass General heavy use, average conductivity	
SPT10G	K=10 500µS/cm ...200mS/cm 0...80°C 2-electrode cell in Platinum wire Probe material glass General heavy use, high conductivity	

## Temperature probes

### Temperature probes with Pt100 sensor complete with SiCRAM module

Modell	Type	Application range	Accuracy
TP87	Immersion	-50°C...+200°C	±0.25°C (-50°C...+200°C)
TP472I.0	Immersion	-50°C...+400°C	±0.25°C (-50°C...+350°C) ±0.4°C (+350°C...+400°C)
TP473P.0	Penetration	-50°C...+400°C	±0.25°C (-50°C...+350°C) ±0.4°C (+350°C...+400°C)
TP474C.0	Contact	-50°C...+400°C	±0.3°C (-50°C...+350°C) ±0.4°C (+350°C...+400°C)
TP475A.0	Air	-50°C...+250°C	±0.3°C (-50°C...+250°C)
TP472I.5	Immersion	-50°C...+400°C	±0.3°C (-50°C...+350°C) ±0.4°C (+350°C...+400°C)
TP472I.10	Immersion	-50°C...+400°C	±0.3°C (-50°C...+350°C) ±0.4°C (+350°C...+400°C)

Temperature drift @20°C 0.003%/°C

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

Modell	Type	Application range	Accuracy
TP47.100	Pt100 4-wire	-50...+200°C	Class A
TP47.1000	Pt1000 2-wire	-50...+200°C	Class A
TP87.100	Pt100 4-wire	-50...+200°C	Class A
TP87.1000	Pt1000 2-wire	-50...+200°C	Class A

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...

**HD3456.2K:** 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.**

## ► Common Accessories for instruments series HD34...

**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.

**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 instrument series HD3405.2 and HD3456.2 with input for pH measurement

### ► 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.

**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.

**CE:** 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.

### ► Elettrolyte solutions

**KCL 3M:** 50cc 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.

## ► 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 ...20µS/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 ...500µS/cm, 0...80°C.

**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.

**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.

### ► 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.