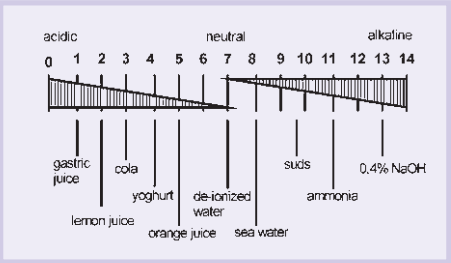
WATER ANALYSIS

The pH Value



The pH value is a logarithmic measure for the concentration of the H ions in a hydrous solution and indicates, by a numerical value, whether the solution has an acid, neutral or alkaline reaction.

The pH scale ranges from pH0 to pH14, pH7 is neutral.
The further the pH value deviates from 7, the more aggressive the sample is. The acidic or alkaline effect will increase by the factor 10 per pH unit.

The illustration on the left shows some examples for pH values of typical substances.

The Redox Potential

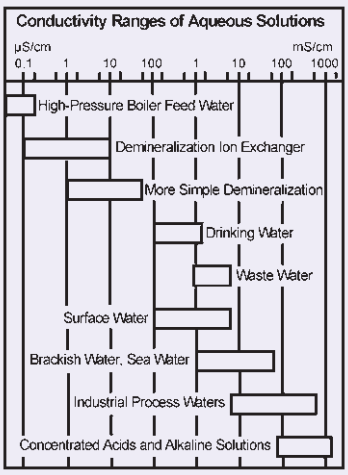
The level of the Redox potential (measured in mV) indicates the strength of an oxidising or reducing reaction of a measuring solution. A negative voltage value means that the solution has reducing properties compared to a standard hydrogen electrode. A positive value indicates that the solution has an oxidising effect.

As the extermination of microorganisms (disinfection) is directly related to the strength of the oxidation (e.g. of chlorine) the Redox potential is successfully being used for monitoring disinfection processes, e.g. in swimming baths. However, redox measurements are also performed for controlling the denitrification of waste waters (redox break point determination) at the detoxification in galvanic plants and for monitoring multiple chemical processes (e.g. cyanide oxidation or chromate reduction).

ALMEMO® pH and Redox Measurement

By using reference solutions the calibration of pH and redox probes can be started with the push of a button. As the adjustment is stored in the ALMEMO® connector, the probe can also be used with other devices. If ALMEMO® devices with several input sockets are used, it is even possible to connect more probes with individual adjustments. The calculation of the pH value is based on the electrode steepness at 25°C. If the temperature of the measuring medium largely deviates from the reference temperature, it is possible for all ALMEMO® devices to perform a temperature compensation.

The Electrical Conductivity



The conductivity (unit S/m = Siemens/meter) is a measure for the ion concentration in a measuring solution.

It is proportional to the salt, acid or base content in the measuring solution. High-purity waters have a conductivity of approx. 0.05µS/cm (at 25°C), natural waters approx. 100 to 1000mS/m, some bases (e.g. potassium hydroxide solutions) up to slightly more than 1000mS/cm.

The diagram shows further examples of hydrous solutions relevant for measurements.

In practice, the conductivity measurement is used for monitoring plants, for producing of high-purity waters or for determining the salinity of sea water.

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Solute Oxygen

Oxygen is not only a component of the air but it is also contained dissolved in water and, practically, in every liquid. For example, water contains approximately 9mg/l oxygen in saturated compound at a temperature of 20°C and an atmospheric pressure of 1019mbar.

Every liquid accepts as much oxygen until the oxygen partial vapour pressure in the liquid is in a balance with the ´contacting´ air or gas phase. The saturation state (air-saturated water) is reached when the partial pressure of the physically dissolved oxygen in the liquid equals the partial pressure of the oxygen in the air.

The current oxygen concentration increases with atmospheric pressures and with decreasing temperatures. Relevant for metrology are processes, such as the oxygen consumption involved with microbiological decomposition processes or an oxygen production, e.g. due to the growth of algae.

The oxygen concentration is very important for animals and organisms living in water and for the biological treatment of municipal and industrial waste water. Additionally, corrosion processes in lines and keeping the quality of beverages depend on the solute oxygen in the liquid.

Portable Case with Data Logger and Complete Sensor Equipment for Exploring Abandoned Polluted Areas and Their Environment or for Performing Ground Water Quality Tests

ALMEMO® Data Logger with Sensor Equipment and Accessories

- Temperature sensor: –70 to +400°C, resolution 0.01K
- pH electrode: 1–12pH,
  incl. connecting cable and buffer solutions pH 4/7/10
- Redox electrode incl. connecting cable
  and buffer solution 220mV and KCl solution
- Conductivity probe: 0.01 to 20.00mS/cm
  incl. reference solution 2.77mS/cm
- Probe for solute oxygen:
  0 to 40mg/l or 0 to 260% saturation incl. filling solution
- Adjustment set for saturation and zero point adjustment of the oxygen probe
- Acrylic lid for accepting 5 sensors
- PC fiber optic data cable for PC and laptop
- High quality instrumentation case including compartments

Additional Printer Package

- Thermo printer incl. mains adapter
- Data cable
- 2 rolls of temperature sensitive paper

Offers available on request

WATER ANALYSIS

pH One-Bar Measuring Chain Type FY96PHEK

Applications:
manual measurements e.g. swimming pools, drinking water ...

Type:
pH-one-bar measuring chain pH 1 … 12, 0 … 60°C
for unpressurised operating **Order No. FY96PHEK**

Technical Data:

pH range::	1 … 12
Operating range	0 ... 13pH / 0 … 60°C
Operating pressure:	unpressurised
Conductivity:	> 150 µS / cm
Diaphragm type:	glass fiber
Reference:	Ag / AgCl (3mol KCl / gel)
Shaft length:	125 ±3mm
Shaft diameter:	12mm (polycarbon)
Electrode head:	plug head SN6

pH One-Bar Measuring Chain Type FY96PHER

Applications:
Waste water, drinking water, industrial water
chemical industry, paper industry, food industry ...
(not media contained for chlorine and fluride,
for not frequent temperature fluctuations)

Type:
pH-one-bar measuring chain
pH 1 ... 12; 0 … 80°C **Order No. FY96PHER**

Technical Data:

pH range:	1 … 12
Operating range	0 ... 13pH / 0 … 80°C
max. pressure:	6 bar
Conductivity:	> 50 µS / cm
Diaphragm type:	PTFE ring diaphragm
Reference:	Ag mit AgCl stock (3mol KCl / polymer)
Shaft diameter:	12mm (glass)
screw connection	thread PG13.5
Shaft length:	120 ±3mm
Electrode head:	plug head SN6

pH One-Bar Measuring Chain Type FY96PHEN

Applications:
manual measurements in the laboratory

Type:
pH-one-bar measuring chain pH 0 … 12, 0 … 80°C
for unpressurised operating **Order No. FY96PHEN**

Technical Data:

pH range:	0 … 12
Operating range	0 ... 13pH / 0 … 80°C
Operating pressure:	unpressurised
Conductivity:	> 150 µS / cm,
Diaphragm type:	ceramik diaphragm
Reference:	Ag / AgCl stock (3mol KCl / liquid) KCl-elektrolyt refillable
Shaft length:	160 ±3mm
Shaft diameter:	12mm (material: glass)
Electrode head:	plug head SN6

WATER ANALYSIS

pH Insertion Electrode Type FY96PHEE

Applications:

pH-measurings in semi-solid or pasty media,
e.g. foods like meat, cheese ...

Type

pH-insertion electrode pH 1 … 12, 0 … 60°C
for unpressurised operating **Order No. FY96PHEE**

Technical Data:

pH range:	1 … 12
Operating range	0 ... 13pH / 0 … 60°C
Operating pressure:	unpressurised
Diaphragm type:	3 ceramik diaphragms
Reference:	Ag / AgCl (3mol KCl / liquid) KCl-elektrolyt refillable
Shaft length:	120 ±3mm (glass)
Penetrating tip	approx. 45 mm, Ø 6 to 8 mm
Electrode head:	plug head SN6

Redox One-Bar Meas. Chain Type FY96RXEK

Applications:

manual measurements e.g. swimming pools, drinking water ...

Type:

Redox-one-bar measuring chain 0 … 60°C
for unpressurised operating **Order No. FY96RXEK**

Technical Data:

Operating temperature	0 … 60°C
Operating pressure:	unpressurised
Conductivity:	> 150 µS / cm
Diaphragm type:	glass fiber
Metal electrode :	platinum
Shaft length:	125 ±3mm
Shaft diameter:	12 mm (material: plastic)
Electrode head:	plug head SN6

Accessories for pH-One-Bar Measuring Chains and Redox-One-Bar Measuring Chain

pH-One-Bar Measuring Chains:

ALMEMO® transducer cable for pH probes, 1.2m	Order No. ZA9610AKY4
ALMEMO® transducer cable for pH and redox probes, 1.2m	Order No. ZA9610AKY6
Buffer solution pH 4.0 50ml	Order No. ZB98PHPL4
Buffer solution pH 7.0 50ml	Order No. ZB98PHPL7
Buffer solution pH 10.0 50ml	Order No. ZB98PHPL10
KCl solution, 3-molar, 50ml for refilling and storage	Order No. ZB98PHNL

Redox-One-Bar Measuring Chain:

ALMEMO® transducer cable for redox probes, 1.2m	Order No. ZA9610AKY5
ALMEMO® transducer cable for pH and redox probes, 1.2m	Order No. ZA9610AKY6
Redox buffer solution, 220mV	Order No. ZB98RXPL2
KCl solution, 3-molar for refilling and storage, 50ml	Order No. ZB98PHNL

WATER ANALYSIS

Transducer Cables for pH and Redox Electrodes

Applications:

The transducer cables are available for all popular electrodes with a coaxial connector. An extreme high-impedance measuring amplifier is integrated into the ALMEMO® connector of the connecting cable to avoid any corruptions of measuring signals caused by the measuring instrument. Through impedance conversion and differential measurement it is also possible to measure several electrodes with different potentials, free from interferences, using only one ALMEMO® instrument. The illustration shows the transducer cable with electrodes from various manufacturers.

☞ For temperature compensation of the pH measurement any separate temperature sensor (NTC or Pt100, 0.01 K) can be used; an alternative is to use the combined pH / temperature cable.

Types:

ALMEMO® transducer cable for pH value probes	**Order No. ZA9610AKY4**
ALMEMO® transducer cable for redox probes	**Order No. ZA9610AKY5**
ALMEMO® transducer cable for pH value and redox probes	**Order No. ZA9610AKY6**
Option: cable length 5m	**Order No. OA9610K5**

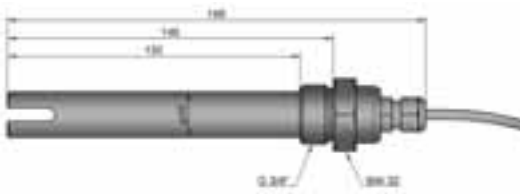
ALMEMO® transducer cable for pH probes including NTC temperature sensor FNA446PH with 1-meter cable (1 shared ALMEMO® connector)
Order No. ZA9640AKY4

Technical Data:

Device:	ALMEMO® connector with with integrated measuring amplifier >500 GΩ
Electrodes:	coaxial connector with screw for probes with plug head e.g. S7, SN6
Cable length:	1.2m (optional 5m)

new!

Conductivity Probe Type FYA641LFP1



Applications:

Concentrated waste water, aggressive waters, general aqueous and partly aqueous solutions, beer, emulsions, electroplating, waters, concentrated acidic and alkaline solutions, corrosive acids and alkaline solutions, lacquers and paints, substances containing protein, soaps, detergents, suspensions, titrations in organic substances, environmental analysis.

Accessories:

Reference solution 2.77mS/cm at 25°C
0.02mol KCl, 250ml Order No. ZB96LFRL

Type (including manufacturer's test certificate)
Active conductivity probe
0 … 20mS/cm with automatic temperature compensation **Order No. FYA641LFP1**

Technical Data:

Measuring range:	0.01 to 20mS/cm
Temperature sensor:	NTC, type N (10k at 25°C)
Temperature compensation:	0 to +70°C, automatic
Compensation coefficient:	1.9 linear
Cell constant:	approx. 1cm^{-1}
Electrode material:	special coal
Accuracy:	
0.01 to 5mS/cm:	± 1% of meas. val. + 0.05mS
5 to 20mS/cm:	± 2% of meas. val. + 0.05mS
Nominal temperature:	25°C ± 3°C
Operating temperature:	–5 to 70°C
Minimum insertion depth:	30mm
Shaft material:	PVC - C
Shaft length/shaft diameter:	130mm/20mm
Fitting length / thread	145 mm / G¾"
Maximum pressure	16 bar at 25 °C
Cable length:	1.5m
Power supply:	8 to 12V through meas. instr.
Current consumption:	approx. 3mA

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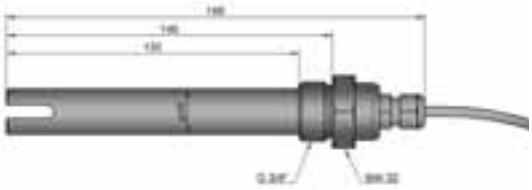
Conductivity Probe Type FYA641LFP2



new!

Applications:

Low-salt waste water, general aqueous and partly aqueous solutions, fish tanks, emulsions, desalting/ion exchanger, beverages, waters, cold/boiler feed water, lacquers and paints, milk, samples with low ionic strength, substances containing protein, purest water, soaps, detergents, suspensions, drinking water, environmental analysis.

Accessories:

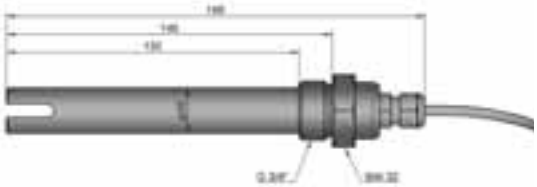
Reference solution 147µS/cm at 25°C
0.001mol KCl, 250ml Order No. ZB96LFRL2

Type (including manufacturer's test certificate)
Active conductivity probe
0 … 200µS/cm with automatic
temperature compensation **Order No. FYA641LFP2**

Technical Data:

Measuring range:	1 to 200µS/cm
Temperature sensor:	NTC, type N (10k at 25°C)
Temperature compensation:	0 to +70°C, automatic
Compensation coefficient:	1.9 linear
Cell constant:	approx. 1cm^{-1}
Electrode material:	special coal
Accuracy:	± 2% of meas. val. + 0.5µS
Nominal temperature:	25°C ± 3°C
Operating temperature:	–5 to 70°C
Minimum insertion depth:	30mm
Shaft material:	PVC - C
Shaft length/Shaft diameter:	130mm/20mm
Fitting length / thread	145 mm / G¾"
Maximum pressure	16 bar at 25 °C
Cable length:	1.5m
Power supply:	8 to 12V through meas. instr.
Current consumption:	approx. 3mA

Conductivity Probe Type FYA641LFP3



new!

Applications:

Concentrated waste water, aggressive waters, general aqueous and partly aqueous solutions, beer, emulsions, electroplating, waters, concentrated acid and alkaline solutions, corrosive acids and alkaline solutions, lacquers and paints, substances containing protein, soaps, detergents, suspensions, titrations in organic substances, environmental analysis

Accessories:

Reference solution 111.8mS/cm at 25°C
1mol KCl, 250ml Order No. ZB96LFRL3

Type (including manufacturer's test certificate)
Conductivity probe 0 … 200mS/cm
without temp. compensation **Order No. FYA641LFP3**

Technical Data:

Measuring range:	0 to 200 mS/cm
Temperature sensor:	NTC, type N (10k at 25°C)
Cell constant:	approx. 1cm^{-1}
Electrode:	4 electrodes, special coal
Accuracy:	1 mS/cm ± 1.5% of meas. val.
Nominal temperature:	25°C ± 3°C
Operating temperature:	0 to 70°C
Minimum insertion depth:	30mm
Shaft material:	PVC - C
Shaft length:	145mm
Shaft diameter:	20mm
Fitting length / thread	130 mm / G¾"
Maximum pressure	16 bar at 25 °C
Cable length:	1.5m
Power supply:	8 to 12V through meas. instr.
Current consumption:	approx. 15mA

WATER ANALYSIS

Oxygen Sensor Type FYA640O2

Applications:

Determination of the conditions of life for fish and microorganisms in waters and fish tanks, biological treatment of municipal and industrial waste water, storage of organic liquids, examinations of drinking water, control of corrosion processes in heating system lines, examination of quality-keeping of beverages.

Accessories:

Adjustment set consisting of: 25g sodium sulphite in 20ml PE bottle for preparation of the null solution, vessel for adjustment of the saturation level	Order No. ZB 9640 AS
25g sodium sulphite in 20ml PE bottle	Order No. ZB 9640 NS
20ml filling solution in PE bottle for O2 probe	Order No. ZB 9640 NL
Spare membrane cap with protection (2 pieces)	Order No. ZB 9640 EM

Type:

Oxygen sensor for O_2 measurements in liquids incl. connecting cable 1.5m long with ALMEMO® connector **Ord. No. FYA640O2**

Technical Data:

Measuring ranges:	
Temperature range:	–5.0 … 50°C
O2 saturation:	0 … 260% saturation
O2 concentration:	0.0 … 40mg/l (5 … 40°C)
Measuring principle:	Clark
Working electrode:	Pt cathode
Reference electrode:	Ag/AgCl counter electrode
Membrane:	Teflon
Response time (t_{90}%):	approx. 10–15s
Zero current at 0% saturation:	< 5nA
Meas. current at 100% saturation:	approx. 700nA
Accuracy, oxygen measurement:	< ± 1% of measured value
Velocity in blower stream:	approx. 10cm/s
Storage temperature:	–10 … 50°C
Insertion depth:	40mm
Filling volume (electrolyte):	0.6ml
Temperature sensor:	NTC type N (10k at 25°C)
Accuracy of temp. measurement (at nominal conditions):	–20 … 0°C: ±0.4°C, 0 … 70°C: ±0.1°C
Nominal conditions:	25°C ±3°C/1013mbar
Shaft material:	PVC, black
Membrane cap:	replaceable (spare)
Shaft length/shaft diameter:	145mm/12mm
Connecting cable:	1.5m long with ALMEMO® connector
Polarisation voltage:	650mV
Service life (with one electrolyte filling):	several months
Total service life (durability):	several years

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This is only possible with ALMEMO® Devices:

Through the complete electrical isolation of the measuring inputs it is possible to use only **one single** ALMEMO® device to **simultaneously** measure various chemical variables, and use several probes in **one** sampling vessel **without** having any mutual influences of the probes! Through pre-programmed ALMEMO® connectors it is possible to connect **any** environmental sensor technology.