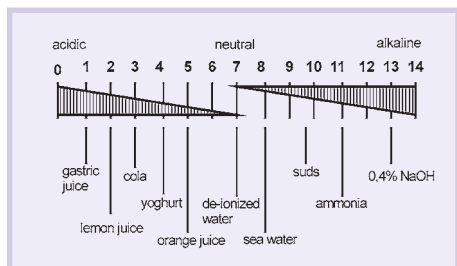


WATER ANALYSIS

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

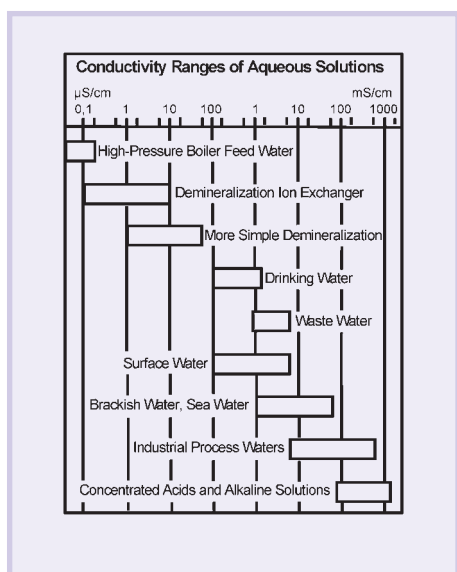
The level of the Redox potential (measured in mV) indicates the strength of an oxidising or reducing reaction of a measuring solution. A negative voltage value means that the solution has reducing properties compared to a standard hydrogen electrode. A positive value indicates that the solution has an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

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.

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.

ALMEMO® measuring system with data logger and comprehensive sensor equipment

For exploring abandoned polluted areas and their environments or for performing groundwater quality tests

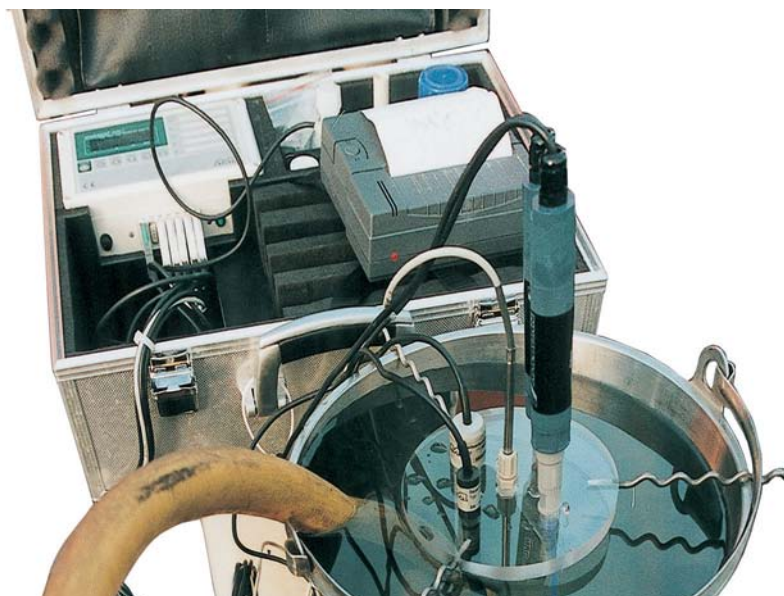
ALMEMO® data logger including sensor equipment and accessories

- ▶ ALMEMO® 2690-8 with 5 measuring inputs, including PC data cable Order no. MA26908AKSU
- ▶ Temperature sensor -70 to +400 °C Order no. FPA30L0250 + OFS0001
- ▶ pH electrode 1 to 12 pH including connecting cable and buffer solutions pH 4/7/10 Order no. FY96PHEK + ZA9610AKY4W
+ ZB98PHPL4 + ZB98PHPL7
+ ZB98PHPL10 + ZB98PHNL
- ▶ Redox electrode including connecting cable and buffer solution 220 mV and KCl solution Order no. FY96RXEK + ZA9610AKY5W
+ ZB98RXPL2
- ▶ Conductivity probe 0.01 to 20.00 mS/cm including reference solution 2.77 mS/cm Order no. FYA641LFP1 + ZB96LFRL
- ▶ Probe for measuring solute oxygen Order no. FYA640O2
- ▶ Adjustment set for the oxygen probe, saturation and zero point adjustment Order no. ZB9640AS

Additional printer package

- ▶ Thermo printer including mains adapter
- ▶ Data cable
- ▶ 2 rolls of thermal paper

Order no. DK2081



WATER ANALYSIS

pH One-Bar Measuring Chain FY 96 PHEK



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 μ S / cm |
| Diaphragm type: | glass fiber |
| Reference: | Ag / AgCl (3mol KCl / gel) |
| Shaft length: | 125 \pm 3mm |
| Shaft diameter: | 12mm (polycarbon) |
| Electrode head: | plug head SN6 |

pH One-Bar Measuring Chain FY 96 PHER



Applications:

Waste water, drinking water, industrial water
chemical industry, paper industry, food industry ...
(not media contained for chlorine and fluoride,
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 μ S / 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 \pm 3mm |
| Electrode head: | plug head SN6 |

pH One-Bar Measuring Chain FY 96 PHEN



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 μ S / cm, |
| Diaphragm type: | ceramik diaphragm |
| Reference: | Ag / AgCl stock (3mol KCl / liquid) KCl-elektrolyt refillable |
| Shaft length: | 160 \pm 3mm |
| Shaft diameter: | 12mm (material: glass) |
| Electrode head: | plug head SN6 |

pH Insertion Electrode FY 96 PHEE



Applications:

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

Type

pH-insertion electrode pH 1 ... 12, 0 ... 60°C

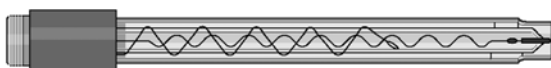
for unpressurised operating

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 FY 96 RXEK



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. ZA9610AKY4W

5m Order no. ZA9610AKY4WL05

ALMEMO® transducer cable* for pH and redox probes,

1.2m Order no. ZA9610AKY6W

5m Order no. ZA9610AKY6WL05

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. ZA9610AKY5W

5m Order no. ZA9610AKY5WL05

ALMEMO® transducer cable* for pH and redox probes,

1.2m Order no. ZA9610AKY6W

5m Order no. ZA9610AKY6WL05

Redox buffer solution, 220mV Order no. ZB98RXPL2

KCl solution, 3-molar
for refilling and storage, 50ml Order no. ZB98PHNL

* Cable with spray-coated ALMEMO® connector

01/2011 We reserve the right to make technical changes.

WATER ANALYSIS

ALMEMO® connecting cable for pH and redox probes

Applications

Transducer cables are available for all popular electrodes with a coaxial connector. To avoid the measuring signal being corrupted by the measuring instrument itself an extremely high-impedance amplifier is integrated in the ALMEMO® connector on the connecting cable. It is also possible, by means of impedance conversion and differential measurement, to measure several electrodes with different potentials, -free from interference and using only one ALMEMO® device.



Transducer cable with various electrodes



Technical data

| | |
|--------------------|---|
| Transducer | High-impedance measuring amplifier (>500 Gohm), integrated in the ALMEMO® connector |
| Electrode terminal | For plug-on head S7/SN6 or SMEK (see variants) |

Variants

ALMEMO® connecting cable with transducer (ALMEMO® connector, spray-coated)

For probes with plug-on head S7/SN6 (coaxial connector, screw-fit):

Programming for pH probe

Cable length 1.2 meters **Order no. ZA9610AKY4W**
Cable length 5 meters **Order no. ZA9610AKY4WL05**

Programming for redox probes

Cable length 1.2 meters **Order no. ZA9610AKY5W**
Cable length 5 meters **Order no. ZA9610AKY5WL05**

Programming for pH or redox probe (1 probe connectable at a time)

Cable length 1.2 meters **Order no. ZA9610AKY6W**
Cable length 5 meters **Order no. ZA9610AKY6WL05**

ALMEMO® connecting cable with transducer For probes with SMEK plug-on head

Cable length 2 meters

Programming for pH probe with integrated temperature sensor NTC (30 kohm at 25 °C), linearization saved in ALMEMO® connector (only for current V6 ALMEMO® devices)

Order no. ZA9640AKY8

Programming

for pH probe

Order no. ZA9610AKY8

Programming

for redox probe

Order no. ZA9610AKY9

new!

NTC temperature sensor for automatic temperature compensation when measuring pH

Connector programming designation *T for ALMEMO® 2490 and 2590-2/-3S/-4S and (with effect from 07/2006) for ALMEMO® 2690/ 2890/ 5690/ 8590/ 8690



Variants

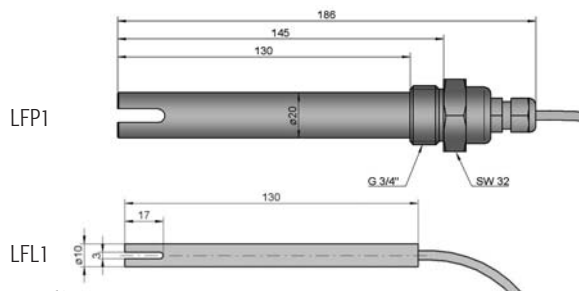
Stainless-steel sheathed sensor (see page 08.07) Diameter 3.0 mm, length 250 mm, Hexagonal cable sleeve with 1.5 meters PVC cable and ALMEMO® connector

Order no. FNA30L0250T

Safety hose made from PTFE (for aggressive media) Hermetically sealed on one side, inside diameter 3.0 mm, outside diameter 4.0 mm, length 700 mm

Order no. ZT9000TS7

Conductivity Probe FYA 641 LFP1



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

Types (including manufacturer's test certificate)

Active conductivity probe with automatic temperature compensation, Built-in probe, G 3/4" thread, suitable for use under pressure up to 20mS/cm

Order no. FYA641LFP1

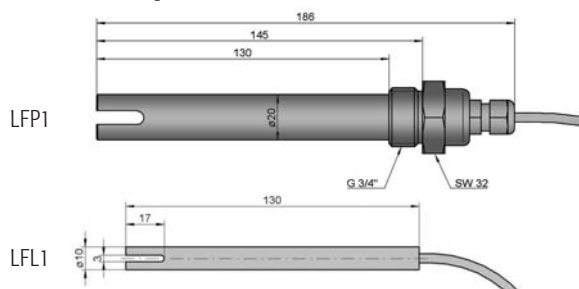
Laboratory probe, not suitable for use under pressure up to 10mS/cm

Order no. FYA641LFL1

Technical Data:

| | |
|------------------------------|--|
| Measuring range: | 0.01 to 20mS/cm LFL1 up to 10mS/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: | LFP1: 130mm/20mm LFL1: 130mm/10mm |
| Fitting length / thread | only LFP1 145 mm / G3/4" |
| Maximum pressure | LFP1: 16 bar at 25 °C LFL1: not suitable for use under pressure |
| Cable length: | 1.5m |
| Power supply: | 8 to 12V through meas. instr. |
| Current consumption: | approx. 3mA |

Conductivity Probe FYA 641 LFP2



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, Built-in probe, G 3/4" thread, suitable for use under pressure

Order no. FYA641LFP2

Laboratory probe, not suitable for use under pressure

Order no. FYA641LFL2

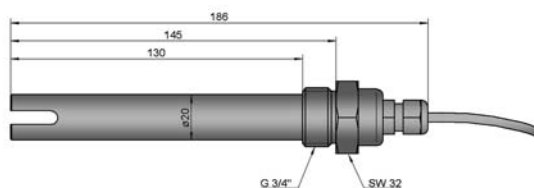
Technical Data:

| | |
|------------------------------|--|
| 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: | LFP2: 130mm/20mm LFL2: 130mm/10mm |
| Fitting length / thread | only LFP2 145 mm / G3/4" |
| Maximum pressure | LFP2: 16 bar at 25 °C LFL2: not suitable for use under pressure |
| Cable length: | 1.5m |
| Power supply: | 8 to 12V through meas. instr. |
| Current consumption: | approx. 3mA |

01/2011 We reserve the right to make technical changes.

WATER ANALYSIS

Conductivity Probe FYA 641 LFP3



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 / G3/4" |
| Maximum pressure | 16 bar at 25 °C |
| Cable length: | 1.5m |
| Power supply: | 8 to 12V through meas. instr. |
| Current consumption: | approx. 15mA |

Oxygen Sensor FYA 640 O2



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 O₂ measurements in liquids incl. connecting cable 1.5m long with spray-coated ALMEMO® connector **Ord. No. FYA640O2**

Technical Data:

| | |
|--|---|
| Measuring ranges: | |
| Temperature range: | -5.0 ... 50°C |
| O ₂ saturation: | 0 ... 260% saturation |
| O ₂ 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 spray-coated ALMEMO® connector |
| Polarisation voltage: | 650mV |
| Service life (with one electrolyte filling): | several months |
| Total service life (durability): | several years |

01/2011 We reserve the right to make technical changes.