

Liquid analysis

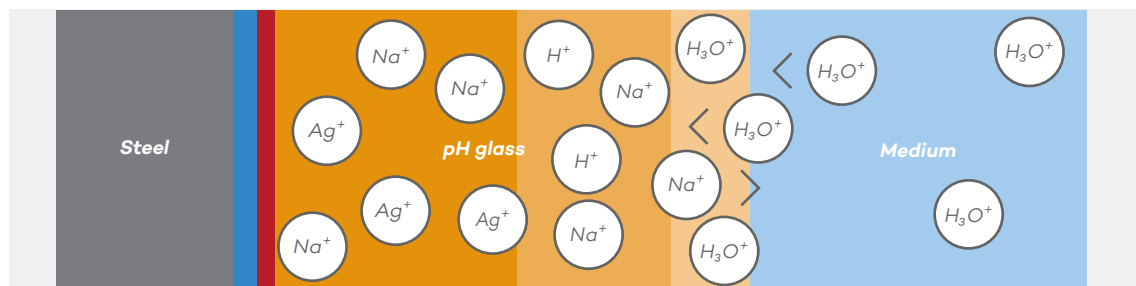
Because glass
has its limits



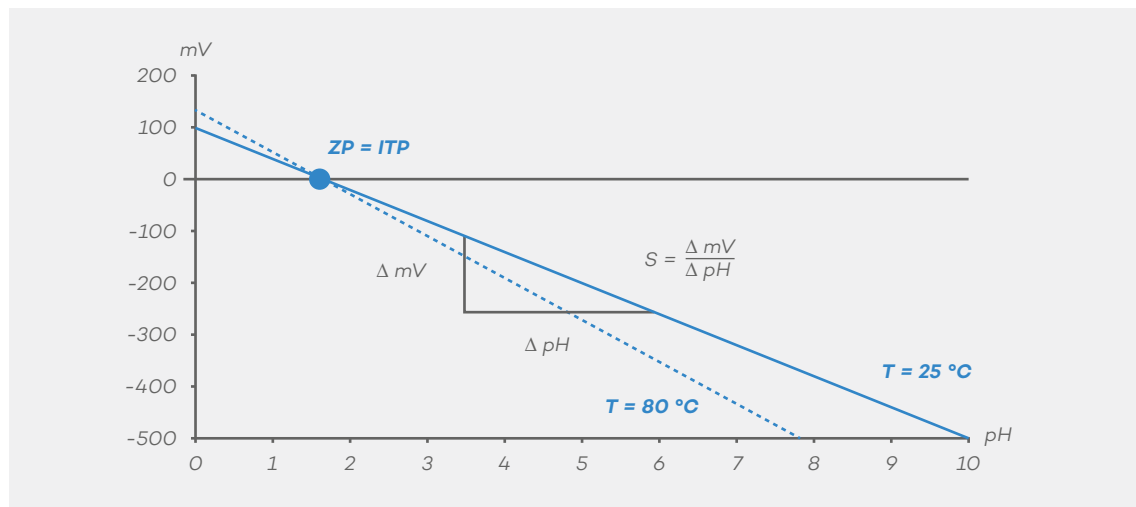
Technology

Glass lining is a unique composite material that optimally combines the advantages of steel and glass. Specially developed formulations react to H^+ ions in liquid media, which makes them suitable for **pH measurement**.

Embedding sensors of in the glass lining delivers **redox potential and conductivity measurements**.



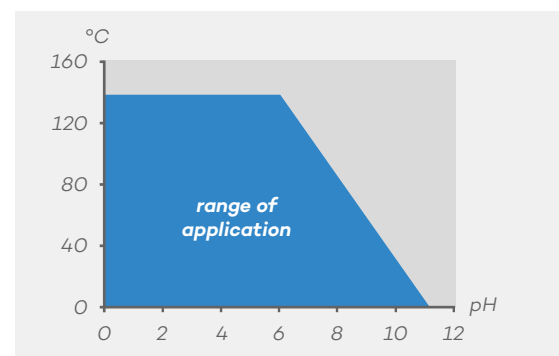
Half-cell reaction at a pH sensitive glass lining layer



Characteristic curve of pH measurement



Isocorrosion curve of pH enamel



Range of application with a measurement precision of ± 0.1 pH at 0.1 nNa+

pH measurement

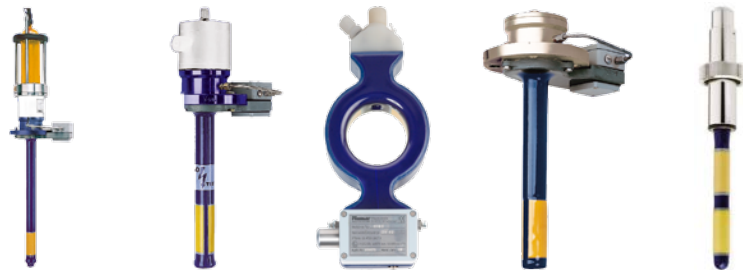
Whenever robustness and chemical resistance are key, Pfaudler's **low-maintenance and durable pH measurement systems** are your first choice.

Sensors for general process engineering (Type pH 03)

Probes with **process-independent reference electrode** are needed to meet the requirements of a wide range of process applications.

Sensors for specific batch processes (Type pH 40 / pH 18)

Most processes in the chemical, pharmaceutical and food industries are recurring production processes that run according to the same schedule. They are regulated or controlled to a particular pH to ensure uniform quality. In batch processes with **reproducible sodium ion concentration**, probes with **sodium-sensitive reference** electrode can be used.



Type	pH 03	pH 03 Dual	pH 03 Ring	pH 40	pH 18
Measured value	Absolute pH	Absolute pH (2x)	Absolute pH	Relative pH	Relative pH
Reference system	Diaphragm + reference electrode	Diaphragm + reference electrode	Diaphragm + reference electrode	Reference enamel	Reference enamel
Measuring range (pH)	0 to 10	0 to 10	0 to 10	3 to 12	3 to 12
Slope (mV/pH)	> 55	> 55	> 55	50 to 57.5	50 to 57.5
Operating temperature (°C)	0 to +140	0 to +140	0 to +140	0 to +140	0 to +140
Temperature compensation	Pt 100	Pt 100	Pt 100	Pt 100	Pt 100 (optional) Pt 1000
Operating pressure (bar)	-1 to +9	-1 to +9	-1 to +9	-1 to +40*	-1 to +15
Explosion protection	II 1/2 G EEx ia IIB T6 or II 2G EEx ia IIC T6	II 1/2 G EEx ia IIB T6 or II 2G EEx ia IIC T6	II 1/2 G EEx ia IIB T6 or II 2G EEx ia IIC T6	II 1/2 G EEx ia IIB T6 or II 2G EEx ia IIC T6	–
Dimensions (mm)	L = 300 – 3200 D = 38 – 180 DN = 50 – 200	L = 300 – 3200 D = 38 – 180 DN = 50 – 200	DN 50 / DN 80	L = 300 – 3200 D = 38 – 180 DN = 50 – 200	L = 144 D = 31

* operating pressure of up to 100 bar possible

Sensors for hygienic processes

Hygienic processes in the pharmaceutical and food sectors place special demands on the design of probes. The use of suitable materials and an easy to clean design are crucial in these environments. Pfaudler's specially developed **hygienic probes** are **EHEDG certified** for these uses.



Type	pH Reiner
Measured value	Absolute pH
Reference system	Ground-joint diaphragm (ceramics), reference electrode AgAgCl
Measuring range (pH)	Linear range 0 to +10* pH / application range -2 to +14** pH
Slope (mV/pH)	57,5
Operating temperature (°C)	0 to +140
Temperature compensation	Pt 1000
Operating pressure (bar)	-1 bis +6
Explosion protection	-
Dimensions (mm)	L = 120 / D = 12,5
Process fitting	Pfaudler Aseptic-Adapter for welded-on nozzle DN 30, adapter for welded-on nozzle DN 25, adapter for Varivent system; others on request
Electrical connection	6-pin gold-plated, Interconnex Variopin
Degree of protection	IP 68
Electrolyte	Sterile KCl solution; others (such as NaCl) on request

* temperature-dependent

** depending on the alkali error (Na+)

Redox potential measurement

The redox potential generated in oxidation and reduction processes can be determined by means of **robust glass-lined probes with precious metal electrode**. For this purpose, a rhodium electrode is embedded in the glass lining. Measurement takes place against a reference electrode. An external electrolyte reservoir or pH-sensitive glass lining can serve for this purpose.



Type	rH	ORP	pH / ORP
Measured value	Redox potential	Redox potential	Absolute pH and Redox potential
Reference system	Reference enamel	Diaphragm + reference electrode	Diaphragm + reference electrode
Measuring range (mV) Measuring range (pH)	-1200 to +1500 –	-1200 to +1500 –	-1200 to +1500 0 to 10
Slope (mV/pH)	–	–	> 55
Operating temperature (°C)	0 to +140	-5 to +160	0 to +140
Temperature compensation	Pt 100 (optional)	–	Pt 100
Operating pressure (bar)	-1 to +40*	-1 to +9	-1 to +9
Explosion protection	II 1/2 G EEx ia IIB T6 or II 2G EEx ia IIC T6	II 1/2 G EEx ia IIB T6 or II 2G EEx ia IIC T6	II 1/2 G EEx ia IIB T6 or II 2G EEx ia IIC T6
Dimensions (mm)	L = 300 – 3200 D = 38 – 180 DN = 50 – 200	L = 300 – 3200 D = 38 – 180 DN = 50 – 200	L = 300 – 3200 D = 38 – 180 DN = 50 – 200

* operating pressure of up to 100 bar possible

Conductivity measurement

The conductivity of a medium can be determined by durable **glass-lined probes in a 4-conductor circuit**. To achieve this, four rhodium electrodes are arranged behind each other and fused into the probe's glass lining.



Type	LF	LF Ring
Measured value	Conductivity	Conductivity
Reference system	–	–
Measuring range (mS/cm)	0.01 to 2000	0.01 to 2000
Slope (mV/pH)	–	–
Operating temperature (°C)	-25 to +200	-25 to +200
Temperature compensation	Pt 100	Pt 100
Operating pressure (bar)	-1 to +40*	-1 to +100
Explosion protection	II 1/2 G EEx ia IIB T6 or II 2G EEx ia IIC T6	II 1/2 G EEx ia IIB T6 or II 2G EEx ia IIC T6
Dimensions (mm)	L = 300 – 3200 D = 38 – 180 DN = 50 – 200	DN 50 / DN 80

* operating pressure up to 100 bar possible

Features and benefits

Features	pH 03, pH 03 Dual, pH Ring	pH 40, pH 18	pH Reiner	rH, ORP, pH / ORP	LF, LF Ring
Mechanical robust, abrasion-resistant, chemically resistant	•	•	•	•	•
Extremely high pressure ranges possible		•		•	•
Suitable for high temperatures	•	•	•	•	•
Self-cleaning	•	•	•	•	•
CIP- / SIP-compliant	•	•	•	•	•
Slope is maintained throughout service life	•	•	•		
Positive pressure effectively prevents diaphragm clogging and contamination	•		•	•	
No reference electrode poisoning possible	•		•	•	
Glass-lined sodium ion sensitive reference electrode without diaphragm and electrolyte line		•			
Ground-joint diaphragm in aseptic construction			•		
Stainless steel pressure vessel			•		
Electrolyte in sterile bottle with septum			•		
Electrolyte level monitoring (optional)			•		
Adapter for fitting in all common nozzles and flow chambers			•		
EHEDG certification			•		
High chemical resistance through the use of Rhodium electrodes				•	•
Wide measurement range 0.01 mS to 2 S					•
Suitable as ring probe for phase separation and 'empty' signal					•
Certified for explosion zone 0	•	•		•	•

Benefits					
Permanent inline monitoring in applications with high mechanical and chemical stress	•	•	•	•	•
No retractable holder / bypass installation required	•	•		•	•
Low life-cycle costs due to minimal maintenance expense	•	•	•	•	•
Service life limited only by glass corrosion and / or abrasion	•	•	•	•	•
No electrolyte contamination of the product		•			•
No need for consumables		•			•
Permanent inline monitoring in hygienic applications			•		
Combined pH / ORP measurement possible				•	
No catalytic or biological effects	•	•	•	•	•
Can be stored dry	•	•	•	•	•

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