

SensoCheck® provides maximum process reliability

The Premium and Advanced Line pH Transmitters from METTLER TOLEDO Ingold are able to monitor serviceability of the pH electrode during calibration procedures and during actual process operation. The new multi-functional pH sensor InPro®3200SG with an integrated ancillary platinum electrode is ideal for use in conjunction with the diagnostic features of the Premium and Advanced transmitter series.

Self-diagnostics during pH measurement

During calibration, SensoCheck continuously monitors the electrode relative to its zero point, slope and response. On the basis of this data, a calculation of the performance efficiency of the electrode is derived. A specialized function of SensoCheck is impedance measurements of the glass electrode (resistance at the glass membrane) and the impedance of the reference electrode (resistance at the diaphragm). This is accomplished by superimposing an AC signal between glass electrode and reference electrode as well as between reference electrode and an ancillary electrode, against which the ohmic resistance of the glass membrane and

reference system are both measured. Fig.1 illustrates the measurement system setup when using a separate, auxiliary electrode.

This innovative diagnostic tool enables the pH electrode to be monitored for possible glass breakage or contamination during operation. Instead of using a cumbersome auxiliary electrode, SensoCheck makes it possible to create the required electrical contact via the vessel or pipe wall, or even the housing – provided that the distance to the electrode is not too great and that the conductivity of the sample media is not too low.



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NEW: InPro3200SG with integrated ancillary electrode

In addition to a temperature (Pt100 or Pr1000), the new multifunctional electrode InPro3200SG is equipped with an ancillary platinum electrode (guard ring). This makes it possible for the 3200SG

- to monitor the impedance of the reference electrode
- to ground the sample medium in the event of problems arising from noise
- to carry out simultaneous ORP measurements

Fig.2 illustrates the measurement setup for the InPro3200SG. This sensor performs equally well in industrial/CPI applications or biotechnological applications. It is sterilizable, autoclavable and certified for use in hazardous areas, (Zones 2, 1 and 0). The mechanical pressure resistance has been tested and certified in accordance with the current European Pressure Equipment Directive (PED 97/23/EEC, Art.3, Para.3).

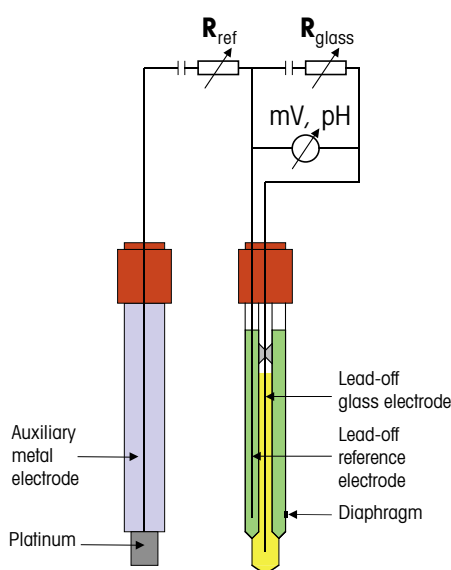


Fig.1: Monitoring of impedances of glass and reference electrodes with the aid of a separate, auxiliary electrode.

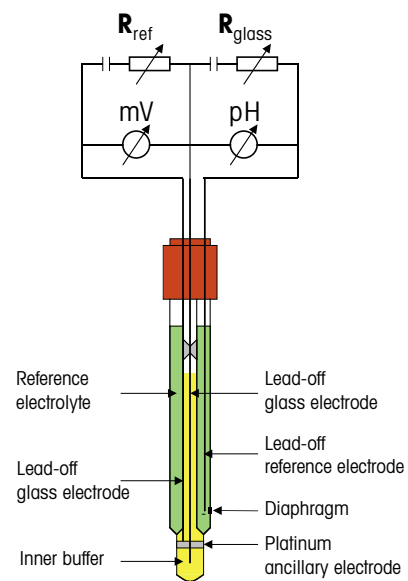


Fig.2: Monitoring of the impedances of glass and reference electrodes using the multifunctional pH sensor, InPro3200SG.

Specifications	InPro3200SG
pH range	0...14
Temperature range	0...140 °C, 32...284 °F
Pressure range	0...2.5 bar, 0...72 psi
Sterilizable	yes
Autoclavable	yes
Temperature sensor	Pt100 or Pt1000
Reference system	ARGENTHAL® with silver-ion barrier
Overall lengths	120, 225, 325, 425 mm
Connector	VarioPin VP (IP68)
Hazard rating	Ex II 1/2G EEx ia IIC T6/T5/T4
Pressure certification	PED 97/23/EEC, Art.3, Para.3

Transmitter functionalities

Built-in alarm functions of these transmitters are easily configured to respond to an over-range or under-range condition of user defined parameter limit values, which first triggers a warning signal, subsequently followed by indication of a system failure. A membrane resistance of 0 might signify glass breakage, or any excessive resistance at the reference electrode points caused by fouling of the diaphragm.

Monitoring of the pH electrode relative to the impedances of the glass and reference electrodes allows for maintenance to be conducted in real time, before the unexpected failure of the loop. During set up, the electrode configuration (type of glass membrane, type of reference system) as well as the process conditions must be taken into consideration since the ambient temperature has a direct effect upon the electrical resistance of the glass membrane (which increases relative to a decline in temperature).

Cost savings through automation

Contamination at the diaphragm is the most common cause of erroneous pH readings. By monitoring the impedance of the reference electrode, it is possible to predict the level of fouling. Once a user defined limit has been reached, the sensor can be automatically cleaned and calibrated without human intervention by the METTLER TOLEDO EasyClean 350 automated cleaning system. The EasyClean systems use safe and effective pneumatic technology to control multi-functional retractable housings to withdraw the sensor from the process and position the sensor for automated flushing, cleaning, calibration, and reinsertion into the process afterwards.

Monitoring and automation of a pH measuring point provides substantial operational benefits and cost savings:

- longer serviceable life of the electrodes due to regular cleaning, and therefore lower electrode consumption
- reduced labor costs through automation of routine maintenance tasks
- more accurate pH measurements due to regular cleaning and recalibration of the electrode

Self-monitoring and automation of a pH measuring point is therefore an important factor for achieving greater process reliability.



InPro3200SG – the new multifunctional pH sensor with integrated platinum electrode.



Premium Line Transmitter with 4-wire design is used for highly exacting measurement and control tasks.

Impedance of reference electrode

Electrode model	Warning		Failure	
	min.	max.	min.	max.
465, InPro2000	2 k	15 k	1 k	20 k
XEROLYT	5 k	20 k	1 k	30 k
InPro3100	12 k	50 k	5 k	60 k
InPro4200				
InPro4800				
PA, DPA, DPAS, InPro3200(SG)	2 k	10 k	1 k	20 k

Impedance of glass membrane

Membrane type	Warning		Failure	
	min.	max.	min.	max.
HA	200 M	800 M	0 M	1000 M
A41, LR3	100 M	600 M	0 M	800 M
LoT, HF	50 M	200 M	0 M	400 M



Automated cleaning and calibration with EasyClean.

A clear view – with our new turbidity measuring systems!

Turbidity is a phenomenon associated with the backscattering of light by undissolved particles in a medium, causing that medium to appear visually cloudy or hazy. The intensity of scattered light is measured at a defined angle relative to the incident of light.

In actual practice, configurations based on 25° forward scattering, 90° vertical scattering and 180° backward scattering have proven to be the most appropriate for measurement purposes.



In reality, the 180° backward scattering method is the only one which allows general widespread implementation due to the complex requirements for defined pipe systems, or bypass systems of other methods.

Turbidity measuring systems

Due to this universal adaptability, yet simple concept, METTLER TOLEDO currently offers the only measurement system based on 180° backward scattered light. The measuring sensors are available in either single or duplex optical fiber versions. The single-fiber sensors -InPro 8050 and InPro 8100- are suitable for measurements in media with high turbidity levels and have only one optical fiber at the sensor tip. For low to medium turbidity applications, the dual fiber sensors InPro 8200 are used. In these sensors, both optical fibers are exposed at the sensor tip.

Even at high solids content, linearity between signal and solids concentration continues to be a prominent feature of both sensor types.

Process connection

All common methods of connection, whether insert, flow-through, immersion or retractable type housings, are readily available for integration of the measuring system in the process. An important advantage of retractable housings is that sensors can be automatically cleaned and calibrated in-situ without interrupting the ongoing process.

Latest instrument technology

The new compact Transmitter Trb 8300 has a high-resolution graphic display. In conjunction with the plain text menu, configuration can be carried out quickly and easily. Three independently configurable data sets enable rapid instrument set up specific to the (process) medium. The three data sets link to analog outputs and can be accessed at any time, GMP-compliant, via the RS232 interface. A selection of calibration modes allows online and offline multipoint calibration.

Accurate and fast calibration

Offline calibration depends upon the type of grab sample container, and the immersion depth and immersion angle of the sensor. Calibration errors due to these variables can be avoided by using the CaliCap calibration tool, since this accessory orients the turbidity sensor in a defined position.

Typical applications

Single-fiber sensors of the type InPro 8100 have proved highly suitable for monitoring and controlling crystallization and similar processes. The polymer single-fiber sensor type InPro 8050 has been designed for use in industrial effluent treatment. Typical pharmaceutical applications such as fermentation and separation can be very well controlled by means of the dual-fiber InPro 8200 model. ■

	InPro®8050	InPro®8100	InPro®8200
Turbidity	10 – 4000 FTU 0 – 250 g/L	10 – 4000 FTU 0 – 250 g/L	5 – 4000 FTU 0 – 30 g/L
Temperature	0...60 °C 32...140 °F	-30...130 °C -22...266 °F	-10/-30...130 °C 14/-22...266 °F
Pressure	0...2 bar, 0...29 psi	0...6 bar, 0...87 psi	0...6 (16) bar, 0...87(232) psi
Material	PSU	DIN 1.4435	DIN 1.4435, HA-C276
Application	Effluent/wastewater	Crystallization	Fermentation/Separation

Conductivity measurement for general application and infrastructure processes – from raw water to effluent

Conductivity measurements are a vital measurement for industrial applications. And, not only for primary processes- but also for important auxiliary infrastructure applications, such as pre-treatment of process additives, cooling water treatment, and downstream operations involving effluents and wastewater.

The compact and functional Value-Line transmitter unit

Whether your measuring point is in a simple water loop or at a critical junction in your process, conductivity provides key information regarding:

- conditioning of raw water
- feed-in of conditioned water
- cooling water re-circulation
- discharge of process water
- discharge of process effluent
- effluent treatment

Electrolytic conductivity is regarded as a particularly reliable means to monitor and control such loops. Conductivity measurement systems from METTLER TOLEDO are specially designed to meet the requirements of such applications.

Particularly well suited to treatment and monitoring of industrial water

InPro7010 Series sensors represent an extremely good value, are very robust, as well as easy to install. Specially treated surfaces of the electrodes guarantee long-term

measurement stability, and reduce errors caused by polarization. The integrated temperature sensor responds rapidly to fluctuations in temperature, so that overall measurement accuracy is almost instantaneous. Sensors with different cell constants are available to optimize the measurement range of the sensor to the actual application. These sensors have a very broad application range and are easy to install in pipe systems.

Strong data acquisition and processing

Microprocessor-controlled transmitters from METTLER TOLEDO Ingold are equipped with a range of powerful features which are easily configured via a user-friendly set-up program. These transmitters support both manual and automatic temperature compensation in conjunction with Pt100 or Pt1000 sensors in either two-wire or 3-wire configurations.

Performance overview

- choice of 7 different conductivity measuring ranges
- two current outputs 0/4...20 mA, galvanically isolated
- two limit switches with time delay relays
- one alarm and one wash contact
- selectable temperature coefficient between 0.00 and 10 %/°C, as well as stored ultrapure water compensation graph
- PI controller ■

	InPro®7010	InPro®7011	InPro®7012
Cell constant	0.01 cm ⁻¹	0.1 cm ⁻¹	1.0 cm ⁻¹
Most suitable fields of application	filtration plants ion exchange units reverse osmosis	monitoring of condensate boiler feed water cooling water loops	wastewater cleaning solutions



Rugged and precise: Value Line conductivity sensors.

pH electrodes for explosive areas

The InPro family of pH electrodes from METTLER TOLEDO is certified for use in hazardous zones according to the latest ATEX standard. The associated designation for these intrinsically safe sensors is EX II 1/2G EEx ia IIC T6/T5/T4.

The complete line of InPro pH electrodes is comprised of four basic design types, each engineered to meet the general requirements for industrial processes. An integrated sensor (Pt100 or Pt1000) for automatic temperature compensation, and a rugged industrial-strength VarioPin (IP68) connector are standard features which make the InPro sensors extremely well suited to demanding industrial applications. Ingold's exclusive patented silver-ion barrier ensures a clean diaphragm, free of contamination. These key technical advantages make InPro sensors the most highest-performing, longest-lasting sensors available for your industrial requirements.

The right sensor for your application

The InPro2000 sensor is designed to operate with different types of liquid electrolytes, making it possible for the sensor to cover a wide range of process applications. Outfitted with a positive pressure housing, the InPro2000 sensors are extremely resistant to contamination, yet are highly accurate, and have very fast response times. The InPro3100 is a gel-type electrode designed for biotechnology applications that require sterilization or autoclave protocols. The InPro3200 is a high-performance sensor for use in pharmaceutical and industrial processes; however, when more

extreme conditions are encountered, the InPro4250 with its solid polymer electrolyte and annular open junction is particularly resistant to sensor fouling that can shut down your process. InPro4250 is also a cost-effective sensor for wastewater treatment.



Our measurement system is down!

“The new electrode is not working!” Occasionally our inside technical staff is confronted by calls of this nature. However, more often than not, the fix is usually something quite simple.

One of the first diagnostic procedures is to check for the “watering cap” and make sure it has been removed. All newly manufactured electrodes are equipped with a small plastic watering cap placed over the sensor end to prevent the gel layer of the membrane glass from drying out. If the cap remains on the electrode, no measurements can be taken. When scrambling to

keep production running, it is easy to overlook the watering cap- but this one is a fast and easy fix !



Save costs through automated cleaning and calibration

Systems for measurement of pH and ORP values perform best when the sensors are cleaned, checked, and calibrated at regular intervals. Through automation of these tasks, measurement accuracy and serviceable life of the sensors are both greatly improved, while workload for maintenance personnel is substantially reduced. Consequently, the use of automated sensor cleaning systems leads to a distinct decline in process measurement costs within a very short time.

The new range of EasyClean Systems 300 offers semi-automated sensor cleaning using a wash solution, followed by intensive flushing with clear water and air. Once the sensor is clean, the automated calibration sequence is performed quite easily using the instrument key pad without having to remove the sensor. The cleansing and flushing cycles are initiated either manually by push button or automatically through a programmable timer. Completely process-independent system operation guarantees optimal service life of the electrodes.



EasyClean 300.

Reduction in costs

The overall costs for a measuring point are split up into labor costs and material costs. By using an EasyClean System, employee productivity is maximized and personnel expenditures drop dramatically because, most daily maintenance activities are handled automatically, allowing the maintenance team to perform multiple tasks simultaneously. As an added benefit, the electrode service life increases substantially, leading to further cost saving. In most cases a break-even analysis will demonstrate a very short payback period when routine maintenance is automated with an EasyClean system. ■

Inductive conductivity systems: rugged, reliable, explosion-proof

Regardless of your requirements—hazardous area applications, system integration with HART® Communications, or continuous diagnostics using Sensocheck®— this instrument does it all. A PROFIBUS® version is also available for integrating with PROFIBUS systems. For extreme operating conditions, like those found in the presence of strong acids/alkalis and high temperature, the CondInd 7100 e and matched inductive InPro7200/7201 conductivity sensors comprise an ideal solution. Made from PEEK and having a measuring

range of 0 to 2000 mS/cm, these sensors deliver reliable performance even under the most hazardous conditions. A fully encapsulated design and state-of-the-art measurement technology combine to form a sensor which is virtually immune to fouling. The InPro7200/7201 sensors, also, exhibit no polarization effects and are able to withstand temperatures of up to 200 °C/392 °F without any effect upon performance. Finally, METTLER TOLEDO Ingold offers the widest selection of process connection styles, which guarantees that this sensor will fit your process. ■

InPro 7201.



Transmitter CondInd 7100 e.

New features for conductivity measurement

METTLER TOLEDO Ingold's InPro®7108 conductivity sensor is made of PEEK material (grade 45, level 6) and fully complies with the most current requirements for cleaning-in-place (CIP) and sterilization-in-place (SIP) procedures. The sensor is available with electrodes made from stainless steel or Hastelloy, and can be used in applications with temperatures of up to 140 °C/284 °F (or greater depending upon length of exposure).

NEW: MaxCert™

No more calls, emails, or need to contact METTLER TOLEDO Ingold for documentation. Our new MaxCert program supplies all necessary certificates with the sensor:

- Declaration of Conformity 2.1
- 3.1B Certificate
- Certification of the cell constant

The cell constant is determined by a method using ultrapure water as the reference basis.

NEW: WideRange™

The new WideRange™ technology provides a unique measurement range up to 800 µS/cm.

Reliable signal transmission

A new connecting cable guarantees substantially greater reliability in signal processing. Sensors and cables are equipped with the rugged and water-tight VarioPin connector (IP68). Wet or corroded plug connections are now a thing of the past.

To be able to measure in the lowest µS range, METTLER TOLEDO also offers professional solutions for the most diverse applications and process connections. ■



Conductivity sensor
InPro7108 for CIP/SIP processes.

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