



INGOLD

Leading Process Analytics

Chemical

**Process Analytics Solutions
for Chemical Applications**

METTLER TOLEDO



METTLER TOLEDO – Dedicated to innovation and quality.

METTLER TOLEDO Group.

METTLER TOLEDO is specialized in the area of precision instruments and offers the most comprehensive range of services on a global level. With more than 8,000 employees, the company generates annual sales of over USD 1 billion. METTLER TOLEDO International Inc. has been listed on the New York Stock Exchange since 1997.

Our industrial solutions cover the diverse steps in a host of manufacturing processes. Solutions range from receiving raw materials through various manufacturing processes, in-line process control and end-of-line packaging control, to logistics and shipping. These solutions are integrated into the customer's IT environment, helping automate their processes.

METTLER TOLEDO instruments are used in research, scientific, drug discovery, and quality control labs, amongst many others in the pharmaceutical, chemical, food & beverage and cosmetics industries.

METTLER TOLEDO invests between USD 60 and 70 million per year in R&D, having increased the R&D spending by an average of more than 10% each year for the past five years. METTLER TOLEDO has an outstanding reputation as a global innovator. It also has highly specialized know-how in the field of automation and robotics, miniaturization, software development, as well as optical- and laser-based applications. METTLER TOLEDO is committed to total quality management and ISO standards and compliance with industry regulations.

Within the METTLER TOLEDO group, the Process Analytics division focuses on inline analytical measurement solutions for industrial production processes. The division is comprised of two long-standing business units – INGOLD and THORNTON – which are recognized as leaders in the markets they serve.



INGOLD – “Leading Process Analytics”.

Founded in 1948, INGOLD AG became part of Mettler AG in 1986, forming the cornerstone of the Mettler-Toledo Process Analytics division.



The INGOLD pH, dissolved oxygen, conductivity, turbidity and dissolved carbon dioxide product lines firmly establish METTLER TOLEDO as a worldwide leader for process analytical measuring systems in the chemical, food & beverage, biotechnology and pharmaceutical industries, meeting the challenging requirements of modern industrial liquid processes.

INGOLD has a long history of innovations, starting with Dr. Ingold’s invention of the pH combination electrode. For more than five decades, INGOLD has been leading the industry with robust and hazardous area approved pH, dissolved oxygen, CO₂ and turbidity sensors, and established industry standards with its INGOLD safety socket, retractable housings and the IP 68 (submersible) VP connector for watertight installations. INGOLD is particularly well known for its patented pH inventions such as the silver-ion barrier or Xerolyt polymer pH reference systems for chemical applications. Recently, automated cleaning and calibration systems as well as digital communication protocols PROFIBUS® PA and FOUNDATION Fieldbus have been added to complement the INGOLD product portfolio.

INGOLD products are well known for their quality, accuracy and reliability even under demanding process conditions. With INGOLD’s top-of-the-line, low-maintenance pH, ORP, conductivity, DO, and turbidity measurement solutions controlling your process, improved quality and reliability are guaranteed.

Optimal quality assurance with automated pH measurement loops.

The combination of METTLER TOLEDO’s robust and long-life pH sensors, retractable housings with the industry’s most advanced safety features, and the new EasyClean system for automated cleaning and calibration, provides long and unattended operation of a pH loop. These automated systems are particularly suitable for applications requiring frequent pH sensor calibration, thereby ensuring maximum uptime for your process.

Turbidity measurement in chemical processes.

Turbidity measurement is essential for quality assurance and process optimization in a variety of chemical processes such as separation or filtration processes for product purification. As an integral part of our strategy, INGOLD now offers forward/side scatter turbidity technology complementing our solutions portfolio for chemical applications.

METTLER TOLEDO products cover process requirements throughout the plant.

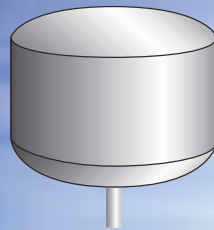
Chemical Plant Process

Synthesis process

Media preparation



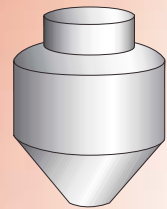
pH
DO / O₂
Conductivity
Turbidity



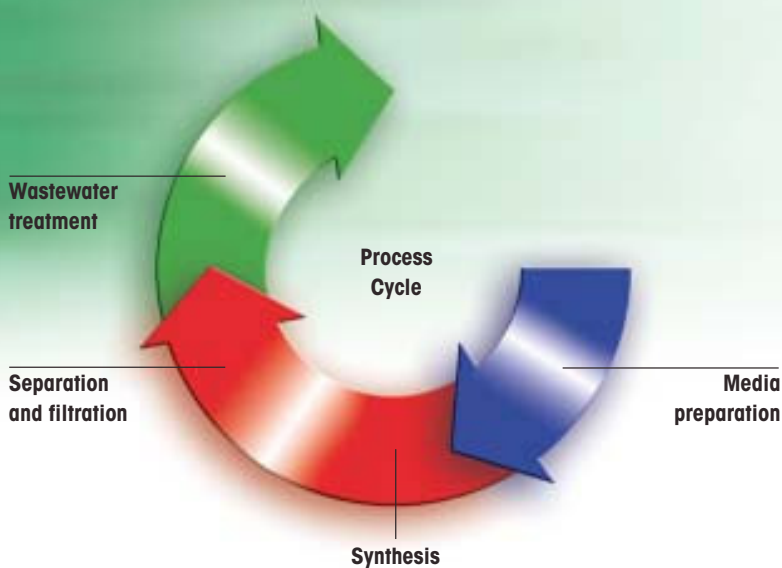
Synthesis process (pp. 6-9)



pH / ORP
DO / O₂
Conductivity
Turbidity



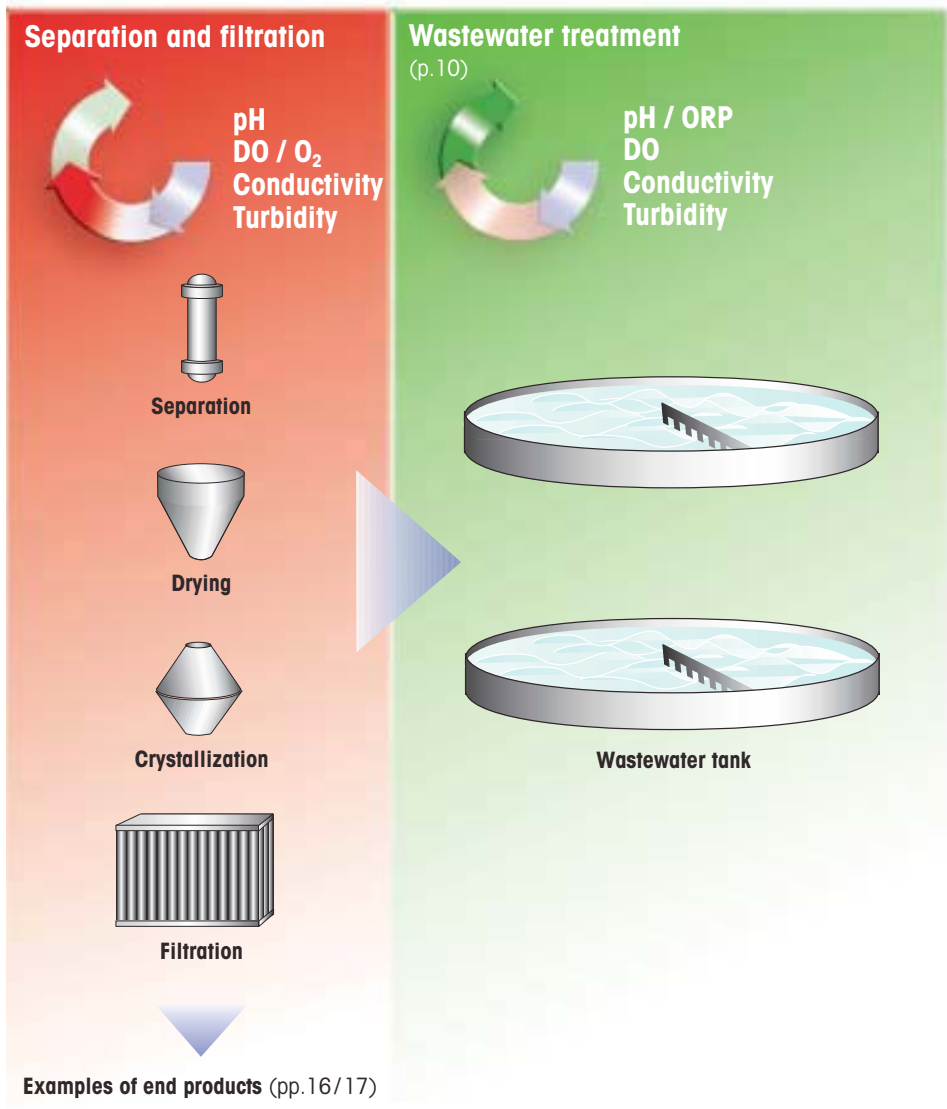
Synthesis reactor



Acids



Wet scrubbers



Fertilizers



Adhesives



Chloralkali



Pesticides



Soaps / detergents / cleaners

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INGOLD pH and ORP measurement – reliable even in harsh environments.

Accurate measurement of pH is a critical parameter for controlling chemical production processes. The demands on measurement technology stretch from safety aspects such as aggressive media and hazardous area zones to specific challenges like high temperatures or high-pressure ranges. INGOLD sensors provide long life and reliable measurement for a whole variety of processes, even in hazardous areas. Solution ground options allow advanced diagnostics and ORP measurement. Robust, retractable housings ensure reliable process connections with unique safety features.

pH electrodes – the right sensor for every application, pressure-resistant and hazardous area approved.



Long lifetime in demanding processes

The InPro 4800 is designed for the toughest applications and high operational pressures, e.g. in oxidizing media. The InPro 4550 has a highly resistant polymer body for direct mounting.



The versatile proven industry leader

The InPro 4250 is a pH electrode with an enhanced solid-state Xerolyt® Plus reference system, offering high resistance to organic solvents and acids and freedom from clogging.



High accuracy measurement

The versatile InPro 3200 family guarantees high accuracy. An optional solution ground offers ORP measurement and advanced diagnostic features.

A solution provider completes the selection

The liquid-filled electrode type InPro 2000 is a versatile solution provider for the most critical applications and provides high accuracy and long life even in highly contaminated media.



“Advanced Line” pH transmitters

A broad range of four- and two-wire transmitters pH 2100 e. These offer highly reliable and accurate pH measurement, featuring advanced diagnostics as well as hazardous area approvals. Loop-powered versions are available with HART®, PROFIBUS® PA or FOUNDATION Fieldbus protocols.



M 700 – new modular top-of-the-line pH transmitters

This new transmitter family M 700 comes with an extensive range of variable outputs and SW options for maximum flexibility. The modular design offers multi-channel measurements with an outstanding cost per loop ratio.

Temperature-compensated pH measurement – the InPro® family

The integrated temperature sensor provides the following benefits:

- Elimination of calibration errors.
- More precise pH measurement.
- Measurement of process temperature directly at the point of pH measurement.

New option:

INGOLD offers the only 12 mm solution ground electrode with advanced diagnostics and ORP measurement option!

Static and retractable housings



State-of-the-art, static housings

The InFit® housing series is a family for safe, quick and simple mounting of pH electrodes, DO and conductivity sensors with PG 13.5 thread. InFit housings are fully compliant with the European Pressure Directive guidelines.

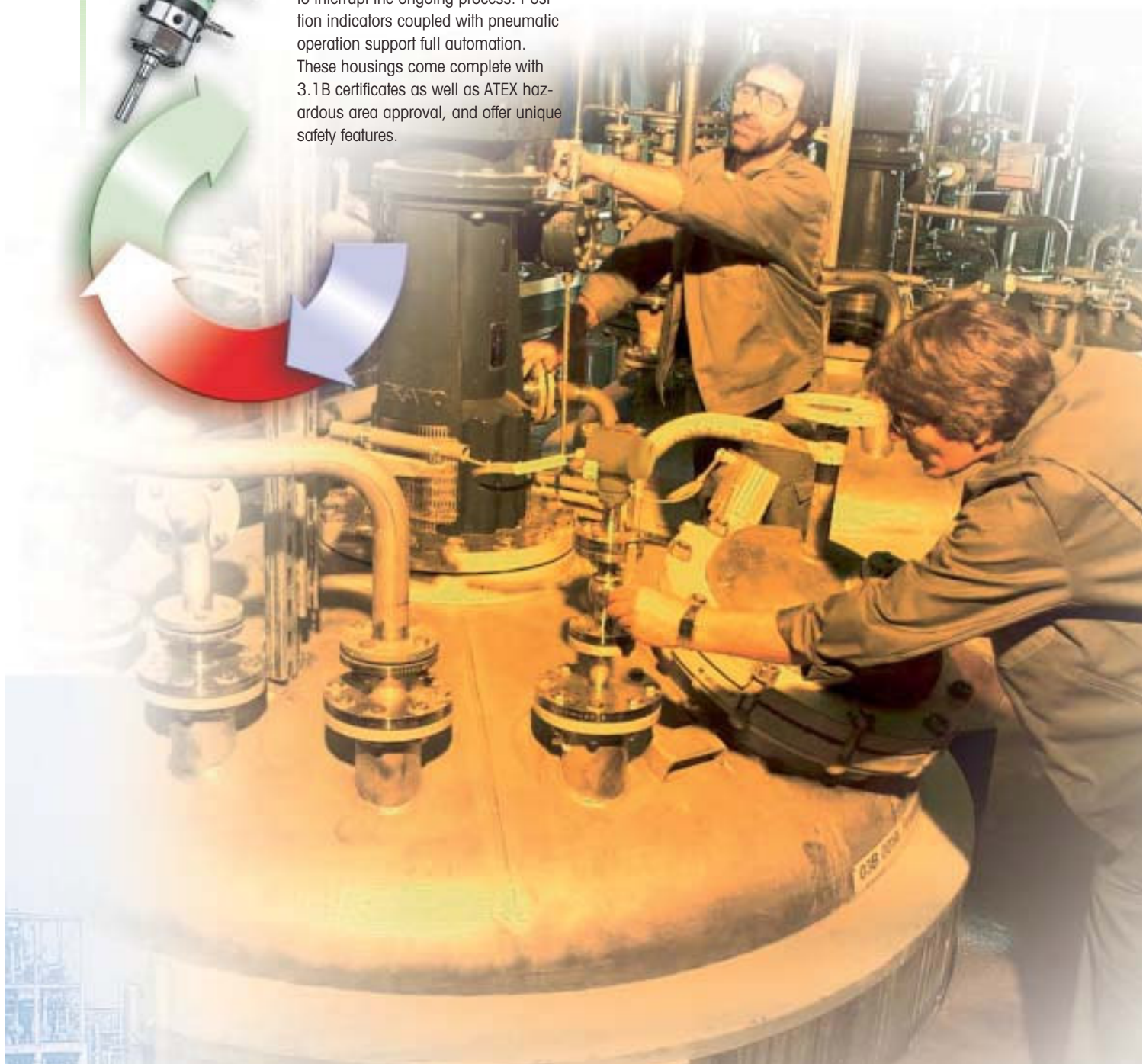
The leading, versatile retractable housing

The InTrac® e housing family meets the highest safety standards for in-line process measurement. They provide a straightforward means for insertion and withdrawal of sensors without any need to interrupt the ongoing process. Position indicators coupled with pneumatic operation support full automation. These housings come complete with 3.1B certificates as well as ATEX hazardous area approval, and offer unique safety features.



InTrac 787– the robust solution

In top- and side-entry applications with the need for withdrawal from the process under enhanced safety conditions, the manually operated InTrac 787 housing is a robust solution featuring a ball valve and a safety mechanism for the insertion tube.



A broad range of measurement solutions for optimizing processes and reducing costs.

METTLER TOLEDO strives to provide a broad range of top quality analytical measurement solutions for a wide variety of chemical processes. Beyond well-known pH solutions, **METTLER TOLEDO** offers reliable and robust conductivity, turbidity and cleaning systems for harsh and demanding applications, including hazardous area environments. As a new application, **INGOLD** introduces gas-phase O₂ measurement for head space using proven **INGOLD** dissolved oxygen technology. These systems provide an inexpensive, yet reliable and robust oxygen monitoring solution in gas-phase environments.

Conductivity measurement

Robust inductive and four-electrode sensors for a wide range of applications.



State-of-the-art, inductive conductivity
The InPro 7200 PEEK inductive sensors offer reliable conductivity measurement in high temperature and other challenging chemical processes.



Wide-range, four-electrode sensor
The InPro 7108-VP four-electrode conductivity sensor with a particularly wide measurement range comes with material certificate and ATEX hazardous area approval.



"Advanced Line" conductivity transmitters

The Cond and Cond Ind 7100e transmitters offer high-quality performance and an easy-to-use interface with diagnostic information, two current outputs and integrated PID controller. Two-wire units are available in HART®, PROFIBUS® PA or FOUNDATION Fieldbus version with ATEX, FM or CSA hazardous area approvals.

Turbidity measurement



Reliable turbidity measurement

The forward scatter turbidity sensor InPro 8400 is designed for low to medium turbidity ranges found in separation or purification applications, and is factory calibrated, pressure-tested and compliant with the European Pressure Directive. The sensors are available for a variety of process connections and pipe sizes.



The back scatter turbidity sensor InPro 8200 covers a wide range of high turbidity applications, particularly well suited for crystallization onset monitoring.



The turbidity transmitter Trb 8300 F/S offers high user-convenience through plain text menus. The ProCal® calibration routine allows an easy adaptation of turbidity values.

IP 68 VarioPin connector – the industrial standard for all METTLER TOLEDO sensors.



The rugged construction of the VarioPin connector is as watertight as a fixed cable and as convenient as a detachable one. The VarioPin connector is tested to IP 68, ensuring that the connection is dustproof and submersible.

Oxygen measurement in gas-phase headspace applications



Lower cost-of-ownership

The well-proven polarographic oxygen sensor InPro 6800 provides a reliable and accurate measurement alternative in a variety of headspace or gas applications. The sensor offers ATEX / FM and 3.1B material certificates. Service-friendly design and unique inner body guarantee optimal cost-of-ownership, particularly in comparison to conventional gas measurement technologies.



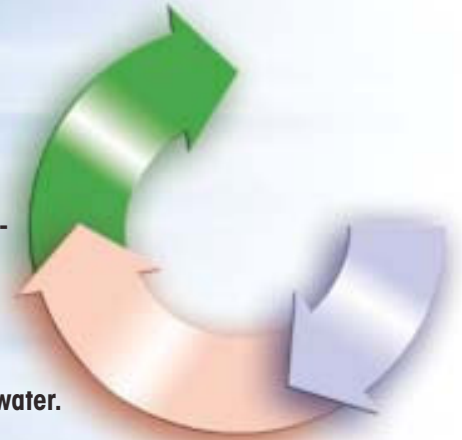
Enhanced transmitter performance

The O₂ 4100e two-wire transmitter is a high-performance transmitter with a unique gas compensation mode that secures more accurate measurement in gas applications. The two-wire transmitter offers ATEX and FM approval and has a built-in HART® digital communication protocol.



Economical quality solutions from INGOLD.

In effluent treatment, control of DO transfer in aeration basins is required to enable the process of aerobic decomposition by microorganisms. Accurate pH measurement is also important for monitoring the quality of the final discharge of the treated effluent. Our rugged measuring and cleaning systems provide a reliable solution for these demands even in the harsh environments of chemical wastewater.



Wastewater Treatment

pH measurement



Low-maintenance electrodes

The InPro 4250 is a solid-state pH electrode, offering high resistance to solvents and acids. The InPro 3200SG features ORP measurement.



Cost-effective polymer body pH-electrode

The InPro 4010 with PSU body ensures reliable measurements in contaminated effluents. The PVDF InPro 4501, with 1" NPT thread, a flat membrane and solution ground is a robust and easy-to-handle alternative.

DO measurement



Unique price/performance ratio

Designed for simultaneous measurement of DO and temperature values in wastewater treatment applications, the InPro 6050 is a reliable partner.

Turbidity measurement



The new low-cost polymer body sensor

The InPro 8050 for high turbidity together with the transmitter Trb 8300 form an ideal system for highly contaminated wastewater applications, offering easy and reliable measurement at reasonable costs.

"Value Line" Transmitters



Cost effective solutions for standard applications

These transmitters for pH, DO and conductivity are characterized by their straightforward installation, set-up and operation. They offer two current outputs and are available in panel- and wall-mount versions.

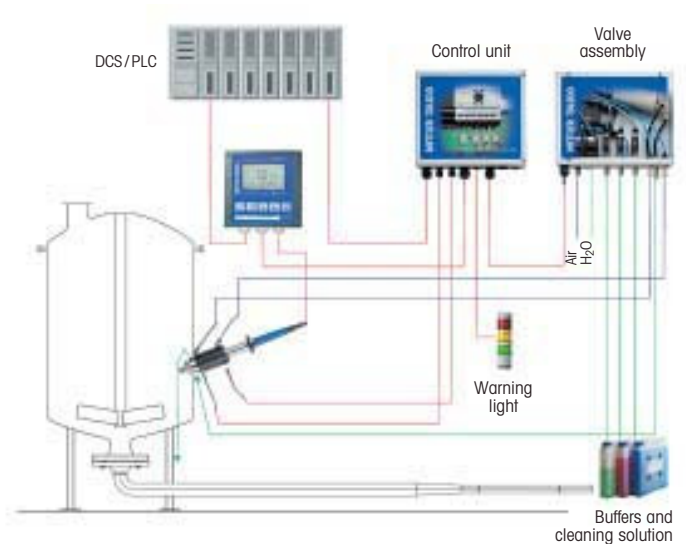


Sensor maintenance made easy – fully automated cleaning and calibration systems.

METTLER TOLEDO is focused on delivering more value, greater safety, and maximum uptime for chemical processes. The EasyClean family with its fully automated EasyClean 350 system performs unattended system optimization, either stand-alone or integrated into process control systems. EasyClean integrates our industrial retractable housings and long-life pH electrodes into a reliable in-line measurement system, ensuring productivity gains by freeing up maintenance personal from frequent calibration and maintenance of pH loops in the field.

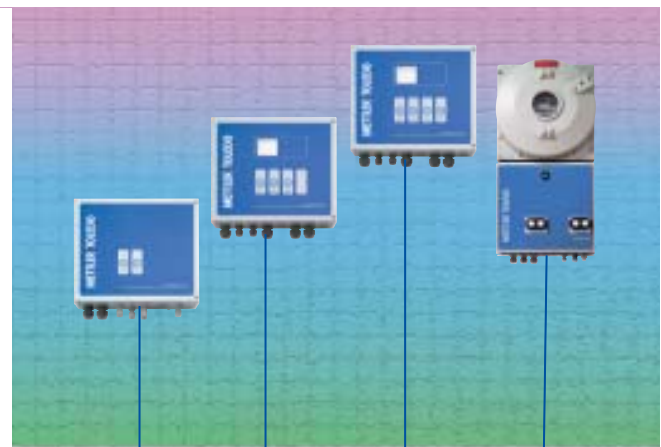
EasyClean system integration

In a variety of chemical processes, particularly in sticky and high-viscosity media, e. g. in soaps and detergents, cleaning agents, adhesives and gelatines production, frequent cleaning and calibration of the pH sensor is mandatory for accurate measurement and long sensor life. In these processes, EasyClean is an ideal way to increase productivity and ensure reliable and accurate measurements. A specific advantage of the EasyClean is its simple installation and operation, which also allows direct, yet simple control of cleaning and calibration from a PLC.



Adaptable, open solutions

The EasyClean family offers adaptable solutions for every application, from simple rinsing to fully automated cleaning and calibration. The units are open to connect to any transmitter with a wash contact, and thus serve to protect existing investments.



Function	Rinse	Rinse/clean	Rinse/clean calibrate	Rinse/clean calibrate
	Water	Water, cleaning solution	Water, cleaning solution, 2 buffers	Water, cleaning solution, 2 buffers hazardous area

Digital communication instruments – easy and fast integration into process control systems.

HART® is the most common and established field communication worldwide. It allows digital communication to be superimposed on the analog signal between the field device and control system. This opens up the advantages of digital communication, e. g. for configuration and maintenance of instruments, while still protecting analog control system investment. METTLER TOLEDO offers a variety of appropriate HART® transmitters for integration into process control systems.

Integrated device descriptions

METTLER TOLEDO's intelligent analytical instruments offer Device Descriptions (DD) for the hand-held HART® Communicator 275/375 as well as full integration into various control systems, e. g. AMS.

Foundation Fieldbus Protocol (coming soon)

"Advanced Line" instruments will also be available with FOUNDATION Fieldbus H1 protocol versions for pH, DO, conductivity thus offering the industry's most comprehensive line of transmitters for digital communication.

"Advanced Line" HART® and FOUNDATION Fieldbus:



pH 2100 e
O₂ 4100 e
Cond 7100 e
Cond Ind 7100 e

- Easy configuration
- Advanced access code protection
- ATEX, FM hazardous area approvals

HART® and FOUNDATION Fieldbus System Integration



"Premium Line" HART®:



pH 2220
O₂ 4220
Cond 7220

- Advanced access code protection
- Plain text menu operation
- Optional relay with second current output
- ATEX approval

Only fieldbus technology permits the full use of the functional advantages of digital communication. PROFIBUS® PA is a vendor-independent, open field bus standard for a wide range of applications in manufacturing and process automation. With its leading range of analytical transmitters for pH, DO and conductivity, METTLER TOLEDO supports digital integration into process control systems.

PROFIBUS® allows vendor-independent communication between devices. PROFIBUS® can be used for automation, engineering or visualization systems with their distributed peripherals on one bus. Only PROFIBUS® PA has offered consistent automation solutions for all areas of a company for many years, with more than three million nodes proven in practical applications.

PROFIBUS® PA (Process Automation) serves as the field instrumentation bus for process automation, offering cost savings through flexibility, advanced diagnostics and reduced maintenance costs.

Benefits of METTLER TOLEDO PROFIBUS® PA transmitters:

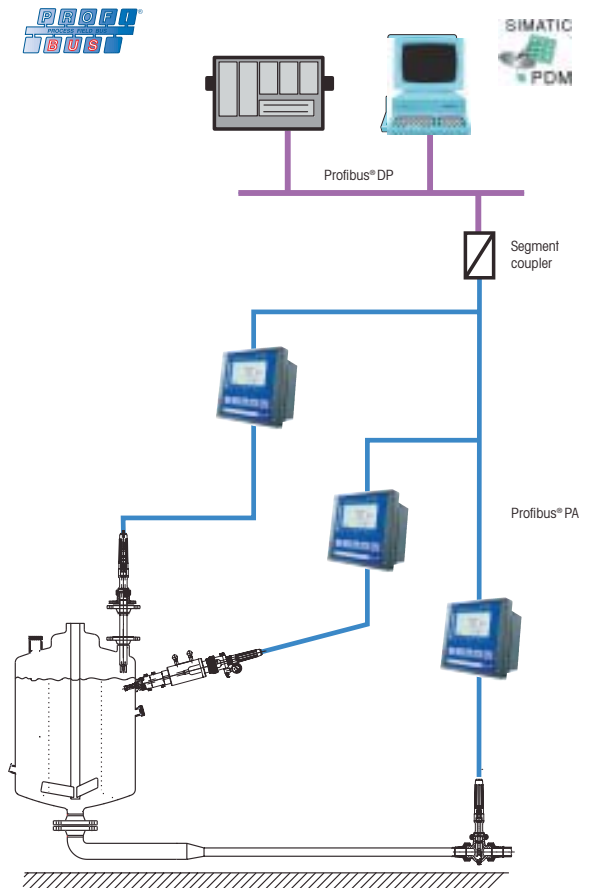
- Integrated device configuration files (GSD files) provide a full integration of best-in-class pH, DO and conductivity solutions into PLCs.
- METTLER TOLEDO PROFIBUS® PA devices receive their power supply from the bus network and comply with FISCO model for hazardous areas.
- METTLER TOLEDO's PROFIBUS® devices are fully integrated into various process device management tools for easy configuration, commissioning and diagnostics of intelligent field instruments.

Full Profibus® integration of METTLER TOLEDO instruments.



pH 2100 PA
O₂ 4100 PA
Cond 7100 PA
Cond Ind 7100 PA

- Profibus® PA profiles 3.0
- Basic pass code protection
- ATEX approval



Advanced safety features and hazardous area environments.

METTLER TOLEDO has a long history of providing robust and safe analytical measurement solutions for the chemical industry. We recently completed our range of ATEX and FM approved sensors and transmitters, as well as ATEX approved housings. With these new products, our portfolio of quality solutions now provides the industry's broadest range of analytical equipment for chemical applications in hazardous areas.

Sensors for all applications

INGOLD's most comprehensive sensor families for pH, dissolved and gas-phase oxygen, conductivity and turbidity for virtually all applications, complete with ATEX or FM approvals.



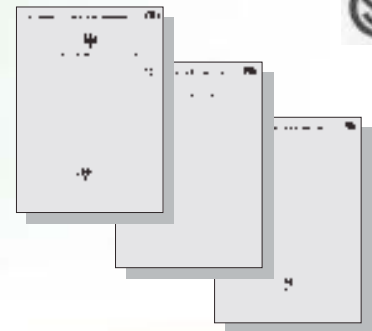
Complete "Advanced Line" transmitter family

The two-wire transmitters for pH, DO and conductivity provide ATEX and FM cl. 1 div. 1 approvals and thus a complete line for hazardous area applications including gas-phase oxygen measurement. METTLER TOLEDO's "Advanced Line" four-wire transmitters offer FM and CSA Cl. 1 Div. 2 approvals.



ATEX approved retractable housings

Although housings are usually not regarded as critical in hazardous areas, METTLER TOLEDO delivers ATEX approvals as standard, for retractable housings in stainless steel versions.



EasyClean for hazardous areas

The EasyClean 300X semi-automated cleaning and calibration system offers a solution for hazardous area applications with frequent maintenance requirements.

Advantages at a glance

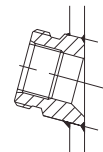
- Complete range of hazardous area approved sensors for ATEX and FM
- Retractable housings are ATEX approved
- Complete hazardous area approvals for "Advanced Line" transmitters (ATEX, FM, CSA)



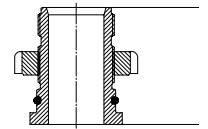
It all started with the INGOLD socket and the 465 pH electrodes decades ago. Today, METTLER TOLEDO has unrivalled in-depth experience in housing and sensor equipment design and a proven track record in meeting the chemical industry's most stringent safety and process requirements. Robust static and retractable housings and sensors with unique safety and diagnostic features are core products within our chemical industry applications program.

INGOLD process adaptors

The INGOLD weld-in socket is an optimized process adaptor and offers the highest level of safety.



Safety weld-in socket



Threaded socket

Compliance with regulations

The static and retractable housings follow stringent design principles, are industry-proven, fulfill the requirements of the European Pressure Equipment Directive (PED), and come with 3.1B material certificates as standard.



3.1B material certificate

Smooth surfaces, application-specific materials and leading safety features

The smooth surfaces of our retractable housings prevent adherence of sticky media. The materials 1.4404 and 1.4435 fulfill the requirements of AISI 316L. In addition, METTLER TOLEDO housings are available in polymer versions and offer a variety of O-ring options to meet application needs. Our retractable housings offer advanced safety features such as sensor detection, a patented insertion tube and cleaning chamber sealing.



Smooth surface of an O-ring

Pressure-tested electrodes and sensors with advanced diagnostics options

INGOLD pH, DO, conductivity and turbidity sensor design is pressure tested and compliant with the European Pressure Equipment Directive. Sensor options such as solution ground for pH electrodes offer additional diagnostic features to enhance reliability of measurement.



Advantages at a glance

- Material certificates standard at no additional cost
- Retractable housings with unrivalled safety features
- Compliance with European Pressure Directive for electrodes, sensors and housings
- Built-in diagnostics help ensure measurement reliability

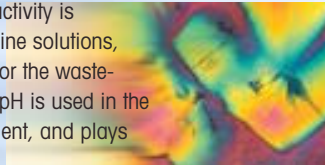
Application competence – INGOLD expertise ensuring reliable measurement solutions.

For critical applications in a harsh environment, METTLER TOLEDO is the right partner. Using our know-how, experience and professional sales and service network, we have the right solutions for your demanding applications in virtually all industry segments.

Acids

During the acid production process, conductivity is measured to control acid concentration, brine solutions, and phase separation, as well as to monitor the wastewater, boiler feed, and condensate return. pH is used in the cooling water cycle and wastewater treatment, and plays a major role in citric acid production.

METTLER TOLEDO provides robust, reliable and long-life measurement solutions for all these critical steps.



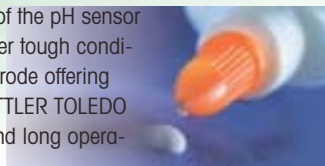
Fertilizers

During the production of granulated ammonia phosphate, it is critical that the pH is reliably controlled in order to ensure the addition of the proper amount of liquid ammonia to the phosphate solution. Due to the harsh conditions in the reaction vessel, the pH is measured indirectly in the scrubber. For these applications METTLER TOLEDO offers automated cleaning and measuring solutions to optimize sensor lifetime and reduce maintenance costs



Adhesives

Especially in glue production, the surface of the pH sensor has to guarantee a stable signal even under tough conditions. The InPro 4250 is a solid-state electrode offering high resistance to solvents and acids. METTLER TOLEDO solutions ensure reliable measurements and long operational life of the sensor.



Pesticides



During the synthesis and formulation process, pH is monitored in order to achieve higher product conversion yield and to avoid the release of harmful substances. Conductivity is used for controlling separation processes and for monitoring of O₂ to prevent oxidation. Pressures and temperatures are high, and acid solutions can reduce the life of the electrodes. METTLER TOLEDO offers powerful system solutions and cleaning systems to provide long operational life of the electrode and to optimize the cost of ownership.

Chlor alkali process



The chlor alkali process is fundamental to a variety of end-products. Conductivity is used for monitoring the caustic soda concentration, wastewater, boiler feed water and brine cycles. pH is mainly measured during neutralization of the brine before electrolysis, to control elimination of chlorine. Aggressive chlorine usually leads to short lifetime of sensors. METTLER TOLEDO offers true "problem-solver" solutions consisting of cleaning systems and longlife electrodes, especially for these particularly harsh conditions.

Wet scrubbers



pH is controlled inline in order to achieve efficient use of wash concentration and chemical reagents, to avoid scaling or soft plugging. This application is very challenging due to the abrasive and corrosive environment, favoring the use of premium-quality pH electrodes. Industry-leading, well-proven METTLER TOLEDO solutions are shown in the figure to the left.

Soaps, detergents and cleaners



For the neutralization of fatty acids, automatic control of pH is paramount. During glycerine recovery and saponification steps of fats and oils, pH and conductivity are measured during reduction of alkalinity in order to control the flow of neutralizing agent and to control the electrolyte concentration of the washing lye. METTLER TOLEDO offers a variety of solutions to meet these application needs.

Service XXL – the METTLER TOLEDO service concept.

METTLER TOLEDO offers comprehensive and competent service worldwide, from product and application consulting through to installation and maintenance contracts. Competent service technicians ensure fast support in every situation and help improve uptime of equipment and reliability of measurement.

Service offering



Competence ensures quality and fast support

METTLER TOLEDO field service technicians ensure fast on-site support to maximize process uptime and to provide service and repair assistance. Competent and well trained service technicians repair instruments and sensors at our local service organizations, and ensure fast turnaround time.

Offered service modules are:

Instrument Service

- NIST traceable buffer solutions
- Equipment qualification consulting and support
- Maintenance service for oxygen sensors
- Maintenance contracts

Seminars

- Workshops, seminars and in-house seminars for customers

Calibration Service

- NIST traceable calibration service for conductivity sensors
- Calibration service for electrodes, sensors and transmitters

"Solution Consulting"

- Measurement "solution consulting"
- Measurement automation and system integration

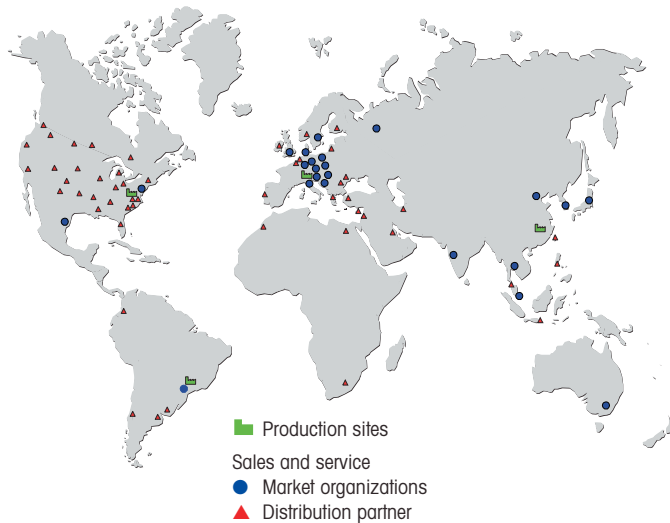


Information Centre

- Internet Webpage
 - Service information
 - Extensive product documentation download area

A worldwide network of service experts.

METTLER TOLEDO provides full sales and service coverage worldwide. Wherever our customers are, we are the competent partner. Many global manufacturers rely on our longstanding experience.



Mettler-Toledo Process Analytics' four producing organizations ensure faster logistics and response time to market demands in all global regions.

Distribution network

Based at several global production sites, with more than twenty market organizations, and numerous sales representatives, METTLER TOLEDO maintains a distribution network all around the world. Satisfaction of our customers is based on three pillars:

- **Consulting:** Our highly skilled experts are at your disposal to support you in finding the best solution for your measurement application, including planning, product selection, and installation.
- **Products:** A complete range of products and systems to meet your specific measurement requirements.
- **After-sales service:** With our customized, lifelong service management, we are able to assist in managing measurement loops throughout their entire life cycle.

Worldwide Network



Switzerland / Urdorf
Headquarters of Process Analytics



China / Shanghai



Brazil / Sao Paulo



USA / Bedford

Engineering-SpecBook with CD-ROM



Engineering of a new measurement loop is often a time-consuming task. This comprehensive book will make life easier and help to find the best solution.

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