Level | Pressure | Flow | Temperature | Liquid Analysis | Registration | Systems Components | Services | Solutions

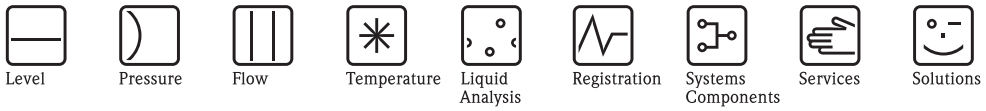
Product Overview

A snapshot of Endress+Hauser's product lines

- Level
- Flow
- Pressure
- Temperature
- Data Acquisition & Components
- Liquid Analysis

Endress+Hauser

People for Process Automation



Product Overview

A snapshot of Endress+Hauser's product lines

Be sure to visit our web site, **www.us.endress.com**, for the latest technical information on all our products.

Contact Endress+Hauser at 888-ENDRESS for complete product catalogs; Level, Flow, Pressure, Temperature, Recorders, System Components, Analytical, and Solutions or individual product Technical Information brochures.

Endress+Hauser, Inc.
2350 Endress Place
Greenwood, IN 46143

06/11

Endress+Hauser

People for Process Automation

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Introduction to Endress+Hauser

Endress+Hauser is a global supplier of process automation solutions. The company develops, manufactures and sells sensors and systems for production and logistics in the process industry. These products acquire, transmit and use process information. The products are excellent in both performance and price; the services are ground-breaking. Both aid customers' competitiveness with a maximum of quality, safety and efficiency. The power of this global company is intensified by its local support to you. This support starts with excellent manufacturing facilities located within the US. ISO 9001 certified manufacturing facilities and ISO/IEC 17025 accredited calibration systems assure Endress+Hauser delivers highly reliable measuring instruments to customers throughout North and South America.

To complement its own strengths appropriately, Endress+Hauser collaborates with universities and research institutes, as well as with other business partners and competitors. In parallel, the company continues to expand its industry know-how, and ensures the competence of Sales and Service. A tight network of production and sales companies, together with representatives, gives Endress+Hauser a very strong presence across global markets.

The company owes its good reputation to employees' competence, creativity and commitment. Endress+Hauser behaves responsibly towards the community and environment, and is commercially successful. The financially strong and independent family company stands for continuity, the broadest range in its industry, and active relationships. Endress+Hauser seeks to be its customers' preferred partner throughout the world.

History

Endress+Hauser was founded by Georg H. Endress and Ludwig Hauser in 1953. It all began as a vision – the use of electronics for the remote measurement of level in containers, tanks and silos, on a reliable and accurate basis.

Endress+Hauser products are manufactured at state of the art Product Centers, using the newest manufacturing techniques available, and continuing to update equipment as technology changes. Each Product Center is responsible for a particular measuring technology; level products are designed and built by one Product Center, while flow measuring products are designed and built by another. This unique philosophy allows research and development to focus on a particular measurement technology. At the same time, the various technologies and best practices are shared among the Product Centers, giving rise to new ideas, designs, and products that are unsurpassed by any other measurement manufacturer.

Level measurement at Endress+Hauser has grown from single-point capacitance switches to continuous level measurement. Enhancing the various needs of industry, frequency shift tuning fork level switches from Endress+Hauser have become the standard for basic level switches. For aggressive materials, ultrasonic and radar measurement systems have been developed to meet all the level measurement requirements in industries where non-contact measuring is needed.

As our growth has continued in the field of level measurement, other fields have been added to achieve world-wide leadership. In 1977, Endress+Hauser met the need for more accurate and dependable liquid flow measuring by introducing a line of electromagnetic flow meters. As with our level instrumentation, the challenge for more accurate flow meters and various types of in-line connections was met by Endress+Hauser. From the basic magnetic flow meter to the microprocessor controlled systems of today, Endress+Hauser meets and exceeds the industry standards. As a company grows, so must its product base. Conductive fluids are just one medium of liquids flow. What about steam, gas, and non-conductive fluids? Once again, Endress+Hauser met the challenge by introducing a specialized vortex flow meter. For industries that require mass flow and volumetric flow measurement, Endress+Hauser offers the Coriolis mass flow measuring system. This is the ultimate in mass flow technology, using straight through flow tubes, and a secondary containment vessel to ensure process safety.

Our commitment to further provide industry with a full line of measurement systems led our research and development engineers into the pressure field. Using our capacitance knowledge and ceramics, Endress+Hauser overcame the limitations inherent to conventional pressure sensors. We now produce ceramic, capacitive pressure measuring cells coupled with hybrid integrated circuits, capable of withstanding over-pressure loads up to 800 times rated pressure. Our sensors provide long-term stability in aggressive environments with various process connections to fit your industrial applications. Endress+Hauser offers systems to measure processes from vacuum to 6000 psig, differential pressure systems, and hydrostatic pressure systems.

Industrial requirements continue to rise, and so does the need for accurate recording instruments. Endress+Hauser not only provides traditional recorders for which there is still a need, but also recording devices that plot continuous colored traces, print data, record process events, and notify alarm status. Our commitment to perfection allows all that information to be provided simultaneously in stand-alone monitoring units or integrated into your process control system.

Endress+Hauser is committed to the industries we serve. We develop, manufacture and sell sensors, transmitters and systems, which extract information from manufacturing procedures in the processing industry and prepare it for use by process control systems. The physical variables include level, pressure, flow, analytical and temperature, as well as industrial components. Our goal is to continue our commitment to new products and services for our valued customers.

A network of skilled sales and service personnel are located worldwide, ready to provide the customer support required. Local sales and service locations assure there is someone available, in your time zone, to support you with knowledgeable technicians, spare parts inventory and calibration facilities.

Level

Level measurement and control can be found in almost all types of industries; from the food and pharmaceutical industries where hygiene is of paramount importance, to the chemical, oil, gas and petrochemical industries which require robust and reliable instrumentation to suit the hazardous conditions.

Endress+Hauser offers a complete range of sensors and transmitters for virtually all aspects of level measurement. Our experience in all areas of process measurement has lead to the development of a product offering that can withstand the most challenging process conditions. Their reliability can be counted on in corrosive and abrasive environments, sanitary applications and general process industries.

Level products

Stable level measurement, a lower total cost of ownership, reduction of inventory loss at the measuring point – areas that you the customer look for in order to lower production cost and provide the highest quality product. Endress+Hauser's dedication to reasearch and development coupled with leading edge technology ensures each instrutment manufactured meets the needs of our customers' applications.

By employing specific measurement technologies, Endress+Hauser level products provide measurement solutions in:

- Vibration
  Level limit switch for use in liquids or solids, using a tuning fork or rod. A piezoelectric drive vibrates the assembly to its resonant frequency which changes state when material is present.
- Mechanical
  Economical paddle limit switch for applications in dust hazardous areas. Ideal for high or low level indication in powders, granulates, animal feed, cement, etc. When material comes in contact with the paddle, rotation is stopped and a switch point takes place.
- Capacitance
  Point level or continuous level in liquids or solids for non-conductive materials, based on the dielectric constant of the material.
- Conductivity
  Level limit switch for multiple point detection in conductive liquids using single or multiple (up to 5) rods or cables.
- Radar
  Radar level measurement is designed for challenging applications requiring non-contact, continuous measurement. Radar level instruments are ideal for dynamic process applications with rapid level changes or agitator blades involving liquids and slurries. Endress+Hauser uses the pulse time-of-flight principle, where short pulses are emitted towards the material from an antenna. Our newest radar instrument, Levelflex, launches an electrical impulse down a cable or probe to the material surface.
- Ultrasonics
  Ultrasonic continuous level measurement involves no contact with the measured material, making it ideal for applications in hostile environments. Ultrasonic measurement is versatile and commonly used for continuous non-contact measurement of liquids, slurries and solids. A tank with an ultrasonic system can be emptied and then filled with a different material and the level reading will still be accurate.
- Radiometric
  Level measurement using gamma radiation for difficult applications, such as high temperatures, high pressures, corrosive materials, toxic chemicals, etc. where non-contact measurement is required. Radiometric measurement from Endress+Hauser provides level limit detection, continuous level, interface measurement and density or concentration.
- Hydrostatic/differential pressure (refer to Pressure)

Basic Level Measurement Technologies

Vibration (liquids)

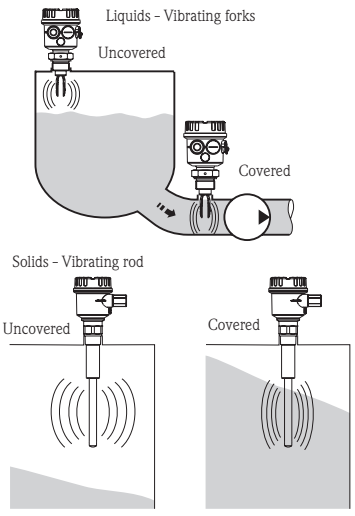
Point level detection using a vibrating fork or. When activated by a bimorph piezoelectric drive electronics, the forks vibrate at their resonant frequency. When material covers the forks, the frequency changes. This change in frequency is monitored, and at an appropriate change in frequency, the switching logic is activated. This technology is used in liquids, slurries, and oils for high level or low level limit control and pump control.

Changes in the amplitude of the tuning fork vibrations are not measured and can be ignored. This provides protection against buildup, gas bubbles and turbulence. Materials with varying density, viscosity, foam, suspended particles and composition changes do not affect the switch point of the tuning fork.

Vibration (solids)

The vibrating rod point level switch is used in bulk solids such as animal feed, rice, dye powders, cement, and is available for use in dust incendive hazardous areas.

A piezoelectric drive excites the vibrating rod, the rod's vibrating amplitude changes (the vibration is damped). The electronics compare the actual amplitude with a target value and indicate whether the rod is vibrating freely or covered with the process material.



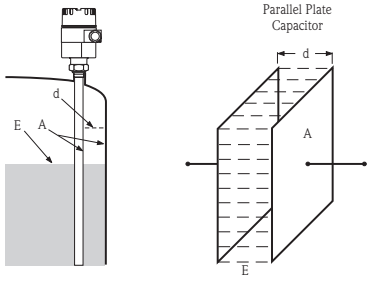
Mechanical

A reduction gear and synchronous motor drive the shaft and paddle. If the paddle is stopped by material covering it, the hinged motor moves from the rest position to the switch position. This movement operates two switch contacts – the first is for external level indication and the second switches the power off to the motor. When the material falls away from the paddle, the hinged motor returns to its rest position, the two contacts switch to normal operation, and the paddle starts to rotate. Intermittent loads that operate against or even in the same direction of rotation are evened out by using a slip clutch.

Capacitance

Capacitance level measurement systems take advantage of the dielectric constant in all materials to determine changes in level.

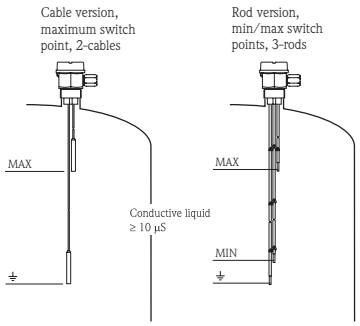
A capacitor is no more than a pair of conductive electrodes, or plates, with fixed spacing and a dielectric (process material) between them. In the most common applications, the probe element (a metal rod or cable) serves as the active plate, while the process vessel serves as a ground plate. When "empty space" or air in the vessel is replaced by the process material, the capacitance electronics register the change in capacitance. This change is converted to an electrical signal and used to provide an output from a point or continuous level. Level switches and continuous level measurements can be accomplished with the right probe configuration and electronics.



Conductivity

An alternating voltage exists between the rod probes in an empty tank. As soon as the conductive liquid in a tank creates a connection between the ground probe rod and, for example, the maximum probe rod, a measurable current flows and the instrument switches. With level limit detection, the instrument switches back as soon as the liquid clears the maximum probe. With two-point control, the Liquipoint does not switch back until the maximum and minimum probe is cleared.

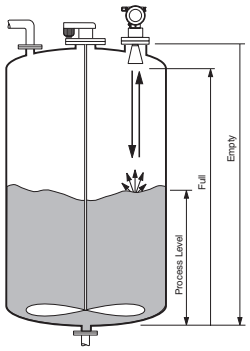
Using alternating voltage prevents corrosion of the probe rods and electrolytic destruction of the product. The material used for the tank walls is not important for measurement because the system is designed as a closed potential-free circuit between the probes and the electronics. There is absolutely no danger from electrical shock if the probes are touched during operation.



Radar, free-space for liquids and solids

Endress+Hauser uses the pulse time-of-flight (TOF) principle, where short radar pulses are emitted towards the material from an antenna. These pulses are reflected from the material surface and detected by the same antenna, now acting as the receiver. The distance to the material surface is proportional to the run time of the radar pulse, which is converted into a level signal.

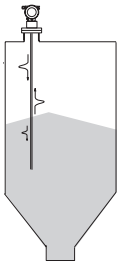
Radar systems from Endress+Hauser are suitable in areas of high temperature or pressure, in the presence of gas vapors, vacuum, turbulence, or dust.



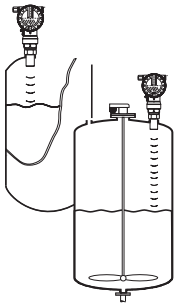
Guided Radar

The newest radar instrument from Endress+Hauser, Levelflex, is a "downward-looking" time-of-flight system, which measures the distance from the probe mounting (top of the tank) to the material level. An electrical impulse is launched and guided down the probe or cable, which acts as a surface wave transmission line. When the surface wave meets a discontinuity in the surrounding medium (a sudden change in dielectric constant), it is partially reflected. The reflected impulse travels back up the cable to the pulse sampler where it is detected and timed.

Radar systems from Endress+Hauser operate in a frequency band assigned for industrial, scientific and medical applications. Its low beam power allows safe installation in metallic and nonmetallic vessels, with no risk to humans or the environment. This technology does not require an FCC site license and can be used without restrictions.



Ultrasonic Level Measurement



In ultrasonic level measurement the operating principle is based on the measurement of the travel time of a sound signal transmitted from and received by the same sensor after reflection from the liquid or solids surface. The travel time of a sound pulse is a direct measure of the height of the material in a silo or tank. The distance in air traveled by the pulse in feet is equal to the travel time in seconds multiplied by the speed of sound in feet per second. Signal process techniques, including temperature compensation and rejection of false echoes returned by tank obstructions, are used to maintain the integrity of the level information.

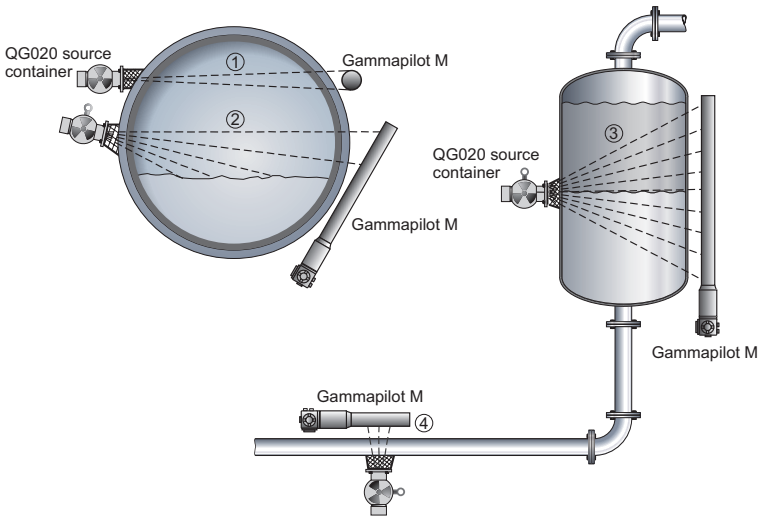
Ultrasonic systems will not work in vacuums or gasses other than air.

Radiometric Level Measurement

In radiometric level measurement, a radiation source (^{137}Cs or ^{60}Co) is emitted in one direction through the process vessel or pipe and received by the transmitter. The radiation source is enclosed in a shielded container which allows the radiation to be emitted in only one direction and shields the radiation in any other direction.

The Gammapilot M transmitter contains a scintillator, a photomultiplier and the evaluation circuit. Gamma radiation generates light flashes within the scintillator. The photomultiplier converts these flashes into electrical pulses and amplifies them. The pulse rate is a measure of the radiation intensity. Depending on the calibration, the pulse rate is converted to a level, limit, density or concentration signal by the evaluation circuit.

1 Point level measurement
2 Continuous level measurement
3 Interface measurement
4 Density or concentration measurement



Flow

Flow measurement and control can be found in almost all types of industries; from the food and pharmaceutical industries where hygiene is of paramount importance, to the chemical, oil, gas and petrochemical industries which require robust and reliable instrumentation to suit the hazardous conditions.

Endress+Hauser offers a complete range of sensors and transmitters for virtually all aspects of flow measurement. Our experience in all areas of process measurement has lead to the development of a product offering that can withstand the most challenging process conditions. Their reliability can be counted on in corrosive and abrasive environments, sanitary applications and general process industries.

Flow products

Stable flow measurement, a lower total cost of ownership, reduction of pressure loss at the measuring point – areas that you the customer look for in order to lower production cost and provide the highest quality product. Endress+Hauser's dedication to reasearch and development coupled with leading edge technology ensures each instrutment manufactured meets the needs of our customers' applications.

By employing specific measurement technologies, Endress+Hauser flow products provide measurement solutions in:

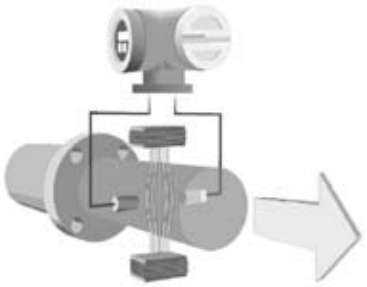
- Electromagnetic
  Proline Promag electromagnetic flowmeter versions are designed to meet the requirements of various industries, ranging from sanitary requirements meeting 3-A and EHEDG standards, as well as for use in hazardous areas. Promag sensors are available in sizes from 1/2" to 78", and are suited for water, wastewater, chemical, food, beverage, pharmaceutical and process applications.
- Coriolis
  Proline Promass Coriolis flowmeters are designed to measure mass flow, volume flow, density, and temperature. The single full-bore Promass I sensor is capable of integral viscosity measurement. Promass sensors are available in sizes from 1/24" up to 10" with dual straight tubes, dual bent tubes, and single straight tube designs plus rigid secondary containment providing a second line of defense and increased process safety. Promass systems meet the requirements of various industries, ranging from 3-A sanitary requirements and EHEDG standards, SIL 2 requirements, and use in hazardous areas. A high temperature sensor (Promass F, up to 660°F) is available for special applications.
- Ultrasonic
  Proline Prosonic ultrasonic flowmeters are designed for non-contact flow measurement in difficult applications such as glass reinforced pipe, ductile iron pipe with cement lining or steel pipes with plastic liners. Prosonic flow sensors are available for nominal pipe sizes from 1/2" up to 160". Clamp-on sensors are constructed of stainless steel and rated NEMA 6P and can be completely submerged. Insertion sensors are also available, which once installed, can be replaced without interrupting the process. Prosonic systems are designed for use in water, wastewater, chemical and process industries.
- Thermal
  Proline t-mass thermal mass flow measuring systems are designed for direct mass flow measurement of gases. Two types of sensors are available: in-line flanged for pipes sizes from 1/2" to 4", or insertion sensors for pipe sizes from 3" to 60". Insertion version can be programmed for cirucular or rectangular ducting installation. On-board software allows the selection of up to 20 pure gases and the creation of mixed gases with a maximum of 8 components (e.g. Biogas)
- Vortex
  Proline Prowirl vortex flowmeters provide accurate and reliable measurement of flow and temperature for computing mass flow and heat consumption. Ideal for gas, steam and liquids with a process temperature range of -330°F to +750°F. With constant pressure, the Prowirl can output the mass flow of superheated steam or the mass and volume flow of other gases. The Prowirl sensor is designed for wafer mounting (1/2" to 6") or ANSI flanged (1/2" to 12") and is ideal for chemical, petrochemical, power and district heating industries and other process applications.
- Differential Pressure
  Differential pressure flow measurement is based on two well-known technologies; orifice plate and pitot tubes. A primary element (orifice plate or pitot tube) creates a pressure difference inside the pipe, which is a direct measure of volume or mass flow. Differential pressure measurement is ideal for gas, steam and liquids in applications with temperatures from -328 to +1830°F in pressures up to 6300 psi. Orifice plate systems range in size from 3/8" to 40"; pitot tube systems are ideal in sizes from 1-1/2" up to 472".

NOTE:

Proline stands for a common software electronics structure, an identical operating concept, common servicing concept and even field validation. The Proline transmitter electronics are available in two versions: a basic version for most standard operations (Proline 50/80/90/91 transmitters, and a highly sophisticated version (Proline 53/55/83/93 transmitters) with extensive functionality and addtional software options like Advanced Diagnostics. Each PROline flowmeter is configured in the same manner: quickly and easily guided by simple prompts on the display. Critical data is stored on removable chips allowing for easy exchange of electronics.

Basic Flow Measurement Technologies

Electromagnetic Flow Measurement



Electromagnetic flow meters measure the volume flow rate of electrically conductive fluids. The measuring sensor consists of a lined pipe, an electromagnetic coil, and corrosion-resistant electrodes (not to all process materials). When the conductive liquid or slurry passes through the magnetic field (produced by the magmeter electronics), it generates a voltage proportional to the average velocity of the material. It is based on Faraday's law of induction: if a conductor moves within a magnetic field, a voltage will be induced therein. Liquid media can be accurately measured with conductivities of 5 μS/cm and above.

The voltage induced by the flowing fluid is proportional to the flow rate. The measuring electrodes detect the voltage signal which is sent to an amplifier where it is digitized and communicated to the transmitter. The transmitter processes the signals and outputs current and pulse signals which are used for totalizing, pump control, limit values, batch functions, etc.

Coriolis Mass Flow Measurement

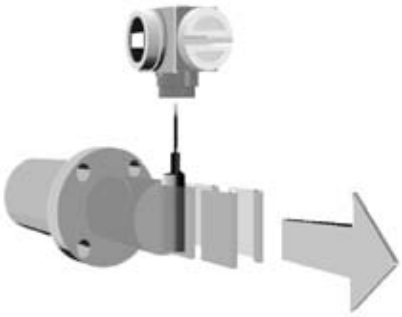
The measuring principle is based on the controlled generation of Coriolis forces. The sensing meter contains a flow tube(s), which in the absence of flow, the inlet and outlet sections vibrate in phase with each other. When liquid is flowing, inertial (Coriolis) forces cause a phase shift between inlet and outlet sections. Two sensors measure the phase difference, which is directly proportional to flow.

The amplitude of the Coriolis force depends on the moving mass (process material), its velocity in the system, and therefore its mass flow. The flowing material causes the tube(s) to oscillate, acting like a tuning fork. As the mass flow increases, the phase difference also increases. The oscillations of the measuring pipe(s) are determined using electro-dynamic sensors at the inlet and outlet of the measuring tube assembly. The measurement principle operates independent of temperature, pressure, viscosity, conductivity or flow profile.

The Promass I has a full bore, straight-through, single-tube design which operates somewhat differently than the dual-tube design. In order to maintain balance for flawless measurement, a patented Torsion Mode Balanced (TMB) system is used. By exciting an eccentrically located, counter-oscillating pendulum mass, the single tube system provides accurate measurement, even with changing process and ambient conditions.

The Promass measuring system is used wherever mass flow measurement is critical in mixing and batching of raw materials, process control, measurement of quickly changing densities and control of product quality. Coriolis meters can measure mass flow, volumetric flow, density, temperature, and/or viscosity.

Vortex Shedding Flow Measurement



The vortex sensor measures flow rate using the Karman Vortex Street principle. As fluid flows pass a bluff body, vortices are produced on alternate sides of the body. The frequency at which these vortices are produced (or shed) is directly proportional to the flow rate and is independent of fluid density, viscosity, pressure, or temperature.

The principle function of the flow meter is threefold: the bluff body disrupts the fluid stream creating vortices, the DSC sensor and front-end electronics detect the shedding vortices and process a pulse signal output signal, the electronics convert the signal to a usable scaled output signal. The DSC (Differential Switched Capacitor) sensor improves the signal-to-noise ratio and eliminates the effects of vibration on the measuring signal.

Vortex pulses acting on the tongue (DSC sensor) mistune the capacitors and this change is detected by the capacitor circuit. The elastic behavior of the carrier rod and tongue are matched by computer design which effectively cancels any pipe vibration acting on the sensor. The carrier rod and tongue move in absolute synchronism regardless of the vibration axis, including rotational vibration. By eliminating any external effects of vibration, only the vortex pulse signals are processed by the electronics.

The Prowirl vortex measuring system is ideal for liquids, gases, and steam. Applications for oxygen, nitrogen, cryogenics, and solvents are well within the measuring techniques of the vortex system.

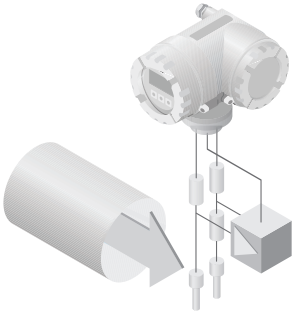
Ultrasonic Flow Measurement

The ultrasonic flow system is a non-intrusive, externally mounted measuring system which uses ultrasonic sound waves to measure the flowing fluid in a pipeline. The Prosonic flow systems operates on the principle of transit time difference. An acoustic signal (ultrasonic) is transmitted from one sensor to another. The time (transit) that the signal requires to arrive at the receiver is then measured. According to physical principles, the signal sent against the direction of flow requires longer to return than the signal in the direction of flow; therefore, the difference in the transit time is directly proportional to the velocity of flow. The transmitter converts the measured values supplied by the sensors into standardized output signals.

The Prosonic flow sensors (clamp on versions) are mounted directly onto existing piping. Isolating or opening the piping is not required. The system is ideal for bidirectional measurement of pure or slightly dirty liquids. The Prosonic flow system is especially suitable when retrofitting equipment as no interruption of the process is necessary. Endress+Hauser does offer insertion type sensors. Once installed, the sensors can be replaced without interrupting the process.

Thermal Mass Flow Measurement

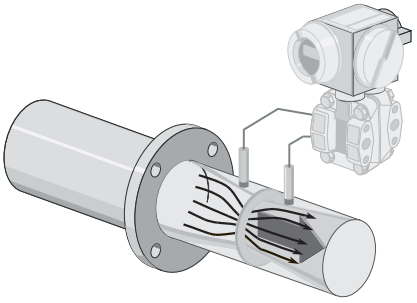
The thermal mass flow measuring system is based on a thermal dispersion principle. The thermal principle operates by monitoring the cooling effect of a gas stream as it passes over a heated transducer (PT 100). Gas flowing through the sensing section passes over two PT 100 RTD transducers, one of which is used conventionally as a temperature sensing device, while the other is used as a heater. The temperature sensor monitors the actual process values while the heater is maintained at a constant differential temperature above the actual process temperature by varying the power consumed by the sensor. The greater the mass flow, the greater the cooling effect and power required to maintain the differential temperature. the measured heater power is therefore a measure of the gas mass flowrate.



Differential Pressure Flow Measurement

Differential pressure flow measurement is based on two well-known technologies; orifice plate and pitot tubes. A primary element (orifice plate or pitot tube) creates a pressure difference inside the pipe, which is a direct measure of volume or mass flow. Two impulse lines carry the differential pressure to the transmitter, where it is converted into the corresponding output signals.

Orifice plates have a circular constriction in the pipe cross-section to create the difference in pressure. Static pressure drops in relation to the associated increase in flow velocity. The difference in pressure upstream and downstream to the orifice is a measure of the flow rate.



Pitot tubes have various pressure-tapping holes to measure total head pressure at the leading end and static pressure only at the trailing end. The corresponding pressure difference is proportional to the flow rate.

Metering in hot-water and cooling systems and metering steam and condensate at very high temperatures in secondary systems remain primary areas of application even today. Pitot tubes are a viable alternative to orifice plates where low pressure losses are required and when flow has to be measured in large diameter pipes (up to several feet). The transmitters in differential-pressure systems can be replaced at any time without the process having to be interrupted.

Pressure

Pressure measurement and control can be found in almost all types of industries; from the food and pharmaceutical industries where hygiene is of paramount importance, to the chemical, oil, gas and petrochemical industries which require robust and reliable instrumentation to suit the hazardous conditions.

Endress+Hauser offers a complete range of sensors and transmitters for virtually all aspects of pressure measurement. Our experience in all areas of process measurement has lead to the development of a product offering that can withstand the most challenging process conditions. Their reliability can be counted on in corrosive and abrasive environments, sanitary applications, and even in areas where excessive temperature occurrences threaten operations.

Pressure products

Pressure sensors guarantee safety and provide crucial information on the process. Even in level and flow measurement, pressure and differential pressure measuring technology is often used. This makes pressure one of the most important measured variables in process automation, inspiring Endress+Hauser to continuously improve and drive forward the development and production of high-quality pressure measurement. With its extensive portfolio of pressure measuring instruments, Endress+Hauser can offer a pressure transmitter that combines the latest technology with high-grade material for every application and budget.

By employing specific measurement technologies, Endress+Hauser pressure products provide measurement solutions in:

- Gauge pressure
- Absolute pressure
- Differential pressure
- Hydrostatic pressure (level)
- Flow (Differential pressure with Orifice Plate or Pitot Tube)

Pressure Basic Measurement Technologies

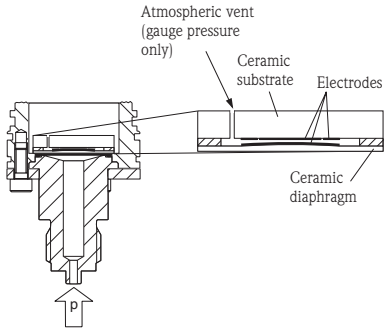
Gauge/Absolute Pressure Measurement

Pressure measurement for gauge, absolute, vacuum and compound are based on two technologies; capacitance ceramic sensors (for up to 600 psig) and silicon metallic sensors (for up to 6000 psig).

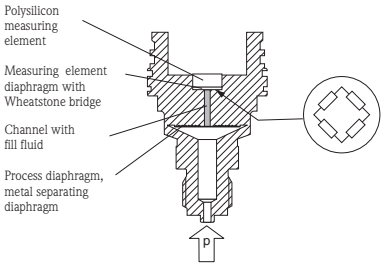
Ceramic – The operating principle of the ceramic sensor is based on capacitance technology. As pressure is applied to the ceramic diaphragm, the measuring capacitor deflects by a minimum of less than 0.001 inch. A change in capacitance proportional to pressure is measured between the substrate electrode and the measuring (diaphragm) electrode. The electronics convert this differential capacitance into a usable output signal. The actual measuring range is determined by the thickness of the ceramic diaphragm which, with overload, stops on the substrate without sustaining damage.

Silicon – The silicon sensor incorporates insulated thin film strain gauges. The line pressure deflects the separating diaphragm and the filling fluid transmits the pressure to a resistance bridge. The bridge output voltage, which is proportional to pressure, is then measured and processed.

The silicon sensor offers a wide temperature range, a small and easily compensated temperature coefficient and long-term stability. Its good elasticity properties ensure high reproducibility, low hysteresis and fourfold resistance to overload.



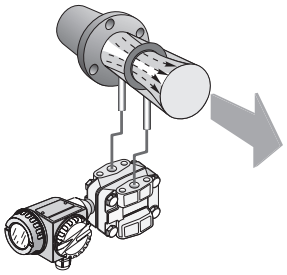
Ceramic measuring cell



Silicon measuring cell

Differential Pressure Measurement

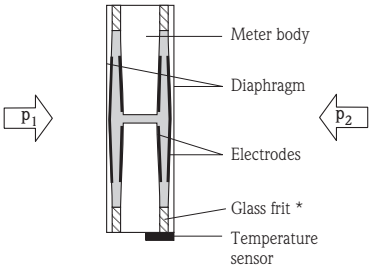
Differential pressure sensors are available in two versions; single chamber ceramic (for up to 1200 inH_2O) or silicon sensors (for up to 580 psi).



Ceramic – The ceramic sensor consists of a substrate and two diaphragms. The diaphragms and substrate constitute two measuring surfaces and are connected by a capillary. Silicone oil, mineral oil or inert oil serves as the filling fluid in the capillary. A differential pressure-proportional change in the capacitance is measured by the electrodes on the ceramic substrate and diaphragms.

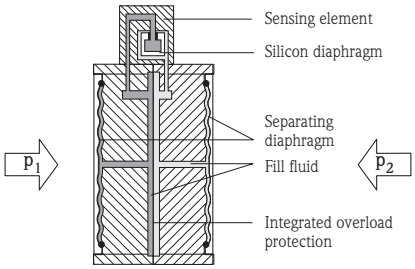
Silicon – The silicon measuring sensor is comprised of a silicon diaphragm which has pressure sensitive thin-film resistors. The differential pressure acting at the isolating diaphragms is transmitted to the measuring element by silicone oil or inert oil. The silicon diaphragm deflects accordingly causing a change in resistance which is measured and processed by the transmitter electronics.

The silicon sensor offers a wide temperature range, a small and easily compensated temperature coefficient and long-term stability. Its good elasticity properties ensure high reproducibility, low hysteresis and fourfold resistance to overload.

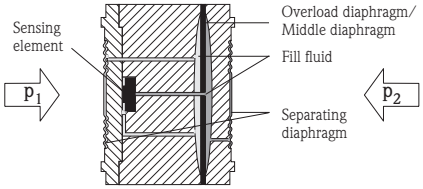


* Glass frit fixes the diaphragm onto the meter body

Ceramic measuring cell



Silicon measuring cell (4 inH_2O and 12 inH_2O)

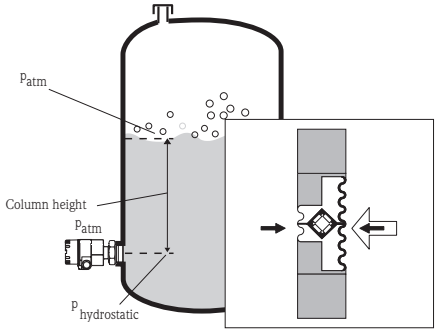


Silicon measuring cell (40 inH_2O and above)

Hydrostatic Pressure Measurement

Hydrostatic level measurement provides both continuous and limit control of liquids and pastes. Together with an appropriate transmitter, they can be used to determine level, volume, differential pressure, product weight, density and can be integrated into various automation systems.

The weight of a column of liquid generates a hydrostatic pressure. At constant density, the hydrostatic pressure is a function of the height of the liquid only. The atmospheric pressure acts on the measuring cell through a pressure compensation system and thus is self-compensating. An overload substrate protects the measuring cell from pressure peaks to 20 times the nominal rating (maximum 360 psig). This ensures that accuracy remains unaffected. The measuring cells cover a pressure range from 15 inH_2O to 58 psig. Vacuum can be measured to 1.7 psia.



Temperature

Temperature measurement and control can be found in almost all types of industries; from the food and pharmaceutical industries where hygiene is of paramount importance, to the chemical, oil, gas and petrochemical industries which require robust and reliable instrumentation to suit the hazardous conditions.

Endress+Hauser offers a complete range of sensors and transmitters for virtually all aspects of temperature measurement. Our experience in all areas of process measurement has lead to the development of a product offering that can withstand the most challenging process conditions. Their reliability can be counted on in corrosive and abrasive environments, sanitary applications, and even in areas where overpressure or excessive temperature occurrences threaten operations.

Temperature products

Endress+Hauser provides a wide range of temperature products, including transmitters and sensors designed to meet the requirements of all industries.

Temperature transmitter family

iTEMP® transmitters are an installation-ready solution to improve the functionality of temperature measurement by increasing accuracy and reliability when compared to direct wired sensors. Overall installation costs are lower than with direct wired sensors, since inexpensive two-conductor 4 to 20 mA signal wire can run over long distances – instead of expensive extension or compensation wires for thermocouples.

Each unit can be configured for a variety of sensor inputs: RTD, thermocouple, millivolt or ohm. All iTEMP® transmitters provide long term stability ≤ 0.05% per year. Transmitter types available from Endress+Hauser include:

- Field transmitters
- DIN rail mounted transmitters
- Head transmitters

Temperature sensors

Class A Pt100 thermometers are exclusively used in Endress+Hauser sensors. The mechanical variations of sensors, thermowells and housings ensure the highest functionality, even under harsh environmental conditions. Certified and automated welding technologies and the computer controlled calculation and sizing of thermowells to international standards safeguard the practicality of the products. Sensor technologies available include:

- Thermocouple
- RTD

Temperature Basic Measurement Technologies

Of all process variables, temperature is the one with which people have the most personal familiarity. Yet, many of the measurement issues are not clearly understood by the average person. Further, the concepts of temperature and heat are often confused.

Fundamentally, temperature is indicative of the average amount of kinetic energy in a group of molecules. That is, it is a direct indication of the average amount of molecular motion in the studied object. Even the human senses detect temperature changes, and can sense which of two objects has the higher temperature. Yet temperature is not a measure of the amount of heat (or heat energy) contained within an object. An iceberg, although colder than a lit match, contains vastly more heat than a lit match. Heat may be thought of as the sum of all the kinetic energy of all the molecules-in-question. If temperature tells us nothing about the energy contained in an object, what then does temperature tell us?

Our concepts of “colder” and “warmer” are directly related to relative temperatures, and temperature tells us which way heat will flow. When two bodies are in contact, heat (or energy), always moves from a body of higher temperature to a body of lower temperature (except in the case of a “heat pump”). Two simple bodies in contact and left alone, will eventually reach the same temperature.

The expression of a measured value may be in any one of several “temperature scales”, which are describe in units by degrees. The specific unit used is indicated by the “type” of degree stated. All temperature scales seek to create a one-to-one correspondence between the indicated temperature value and a specific level of molecular activity. The most commonly used scales are Celsius (formerly Centigrade) and Fahrenheit. These linear scales have somewhat arbitrary “starting points” for what they consider to be “zero degrees”. In contrast the Kelvin and Rankine scales set zero degrees to correspond to the theoretical “absolute zero” where all molecular motion would cease. These latter scales are a bit more convenient when the goal is to relate a temperature measurement directly to heat content or kinetic energy, since the temperature is directly proportional to both, and requires no offset to the more arbitrary zero points of Celsius and Fahrenheit scales.

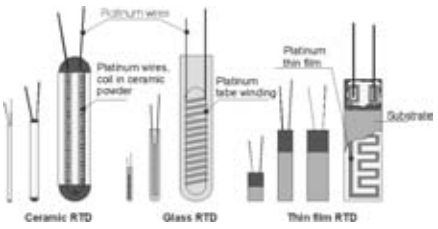
What is it, fundamentally, that causes a temperature sensing device (or even your skin) to get a reading of the temperature? At the molecular level, it is the result of the aggregate momentum transferred to the sensing device by all the collisions of moving molecules.

In industrial processes, the measurement of temperature is not only critical for numerous reasons, but it is also the single most common process variable measured.

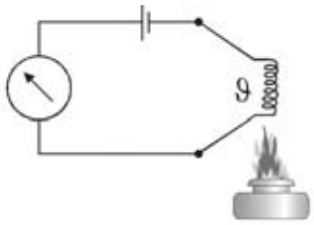
Although there are several sensor types used to transducer sensed temperature into a measurable and usable electrical signal, the vast majority used are one of two types – the "RTD" (Resistive Temperature Device) or TC (Thermocouple).

Resistive temperature devices capitalize on the fact that the electrical resistance of a material changes as it temperature changes. As their name indicates, RTDs rely on resistance changes in a metal, with the resistance rising more or less linear with temperature.

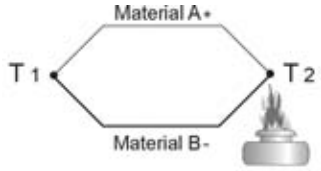
When two wires composed of dissimilar metals are joined at both ends and one of the ends is heated, there is a continuous current which flows in the thermoelectric circuit.



RTD types



Resistive temperature measurement



Thermocouple temperature measurement

Data acquisition and system components

Our recorders and components are designed for simple installation and are user friendly. We also pride ourselves on protecting both resources and environment. Easy to read graphic displays combined with power failure secure storage and manipulation monitored measured data archiving guarantees safe traceability of process sequences in all industrial areas. We develop sensors, transmitters and systems that reliably record, transmit and process critical plant information to optimize your process control.

Endress+Hauser offers recorders from simple data collection and display to multi-channel, multi-instrument monitoring and process control. System components are necessary in order ensure that measurements such as energy supply and sensor monitoring comply with international industrial standards and regulations. Our range of system components not only cover these basic requirements, but also increase plant availability via integrated diagnostic functions. They also optimize process by direct front-end control or manage energy usage with tested calculation methods.

The range of system components offered:

- Process displays for both field and panel mounting
- Active barriers and power supplies
- Process transmitters
- Energy managers
- Surge arresters

Analysis

Water, the most abundant substance on earth is used throughout the industrial world as a critical substance in the manufacturing processes. From the Chemical, Oil, and Gas Industries to the Automotive industry, within the Pulp and Paper Industry to the precise manufacturing environment of a Semiconductor plant, water is there, providing the medium in which many products are made, modified, and/or cleaned.

The purity of our drinking water has increasingly become a matter of public concern. Most drinking water supplies today require special treatment before it can be distributed and utilized. This is to eliminate possible toxic and infectious contaminants and make it safer for human consumption.

Endress+Hauser offers a full line of analytical systems important to different interests and industries. Examples of available technologies and industries include:

pH	Environmental
Oxidation/Reduction (ORP)	Corrosion
Conductivity	Scaling
Chlorine	Disinfecting
Dissolved Oxygen	Power, feed water
Turbidity	Dissolved solids
Optical	Fermentation, emulsions, effluent
Chemical Analysis	Water/Wastewater

Analytical products

By employing specific measurement technologies, Endress+Hauser analytical products provide measurement solutions in:

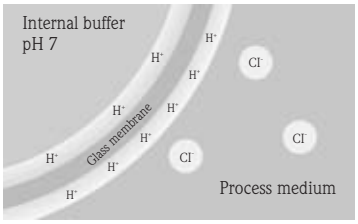
- pH
  pH is the measurement of hydrogen ion activity. It is measured on a scale of 0 to 14, where zero is extremely acid and 14 is extremely alkaline. The mid point of 7.0 pH is distilled water. It is the most widely used liquid analysis measurement, and is found in all industries. Used to determine the degree of acidity or alkalinity of a sample, pH measurement is a number that is directly related to a ratio of H^+ (hydrogen ion) and OH^- (hydroxyl ion) concentrations in a solution.
  Endress +Hauser offers two groups of pH electrodes. CPF compact electrodes (non-glass) which are inserted directly into the process, or CPS glass electrodes which are placed in a separate holder.

  pH glass electrodes:

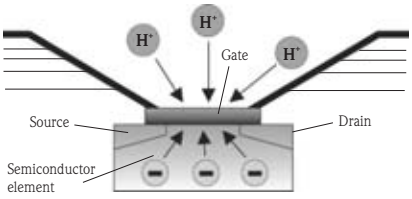
  The method of pH measurement using glass electrodes is a potentiometric measurement method. Since glass is basically an electric insulator, amplifiers for the pH measurement must have an extremely high input impedance. The measuring effect is based on a pH-sensitive glass membrane, whose surface reacts to the acid content of the solution with a specific voltage.
  This voltage is then measured relative to a reference element. Most modern pH glass electrodes display high selectivity (low cross-sensitivity to ions other than H^+) over a wide temperature range. A pH sensor achieves the outstanding performance of linear measurement of a material component over a concentration range of 14 (!) exponents.

  pH non-glass electrodes:

  Apart from using a glass membrane, the pH value can also be measured using an ion-selective field-effect transistor (ISFET). It is, en effect, a simple transistor with a source and drain that are separated from the gate by means of an isolator. As with the glass membrane, hydrogen ions from the medium can accumulate on the gate. The resulting positive charge on the outer side of the gate is "mirrored" on the inner side where a negative charge occurs.
  This makes the semiconductor channel conductive. The "field effect" results from the extent of the conductivity: the higher the pH value of the liquid, the more H^+ ions accumulate on the gate and the more current can measurably flow between the source and drain. In contrast to the glass electrode, there is no ion flow between the fluid and the sensor. "Chemistry" and electrical measurement are kept totally separate. As a result, the sensor material does not change and the need for re-calibration is by no means as frequent as with glass electrodes. Since there is no source layer, ISFETs are also suitable for pH measurement in media with a low proportion of water. Modern ISFET materials are highly selective and follow the Nernst law in closer tolerance limits than glass. The sensor's extreme robustness comes from embedding the chip in a stable and unbreakable PEEK body.



Voltage occurrence with pH measurement with glass electrodes



The current between the source and drain of the semiconductor element depends on the charge at the gate and thus directly on the pH value.

- ORP
  ORP (Oxidation-reduction Potential) measurements are used to monitor chemical reactions, quantify electron activity or determine the oxidizing or reducing properties of solutions ORP is related to pH in that it utilizes a similar measuring system, and delivers millivolts, as does pH. ORP is a specialized measurement that can follow the progress of a chemical reaction that involves the loss and gain of electrons (Oxidation or Reduction) between species in solution. ORP only measures in millivolts, whereas pH measurements are related to a scale. ORP electrodes are the same type as pH.

- Conductivity
  Conductivity is a common measuring technique. The range of conductivity is wide, from the purest water to the high conductivity of acid and alkali concentrations. Conductivity is a straightforward and reliable way to determine the purity of water, or the concentration of an acid or alkali.
  The principle of conductivity measurement for analysis is defined as the ability of a solution to conduct an electrical current between two electrodes. In a solution, the current flows by ion transport. Therefore, the higher the ion concentration, the more current flow. Chemical compounds which produce conducting solutions are called electrolytes.

  Endress+Hauser offers two basic types of sensors for conductivity measurement. The contacting (conductive) sensor and the electrode less (inductive) sensor.

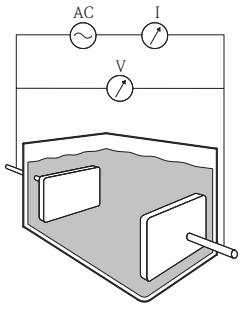
  Conductive sensor

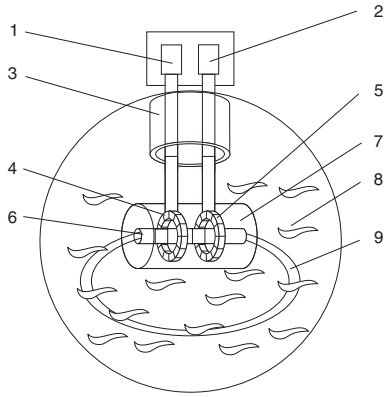
  The conductivity of liquids is measured with a measuring system that has two coaxially arranged electrodes like a capacitor.
  The electric resistance or its reciprocal value, the conductance G, is measured according to Ohm's law. The specific conductivity K is determined using the cell constant k that is dependent on the sensor geometry.

  Inductive sensor

  In inductive conductivity measurement, a transmitting coil generates a magnetic alternating field that induces an electric voltage in a liquid. The ions present in the liquid enable a current flow which increases with increasing ion concentrations.

  The current in the liquid generates a magnetic alternating field in the receiving coil. The resulting current in the receiving coil is measured and used to determine the conductivity value. The conductivity serves as a measure of ion concentration.





1 Oscillator
2 Receiver and signal processing
3 Cable
4 Primary winding
5 Secondary winding
6 Bore
7 Sensor housing
8 Process medium
9 Induced electric current

- Chlorine
  Chlorine is used not only in your home to clean and disinfect, but is widely used throughout industry, especially in water/wastewater treatment. As a common last step of water treatment, a chlorination takes place, not only to destroy remaining bacteria but also to prevent the growth in the water pipe system which delivers clean water to households and industrial locations.

- Dissolved Oxygen
  Oxygen is one of the basics of life, and is especially important in wastewater treatment. The level of dissolved oxygen determines the life span of micro-organisms in activated sludge basins which break down solids material. The measurement of dissolved oxygen is also important in lakes, streams and fish farming, to ensure healthy growth for the food industry. Pharmaceuticals and biotechnology also benefit from the use of measuring oxygen levels in controlled envirnoments for micro-organism growth.

- Turbidity
  Turbidity is the process of measuring solids content or suspended solids in wastewater, where large amounts of sludge must be handled. Sludge has to be removed in the primary clarifier, recirculated as activated sludge in the biology and separated from the treated water in the secondary clarifier. Most countries have very strict regulations regarding the maximum load of sludge particles in the effluent of the treatment plant. Getting rid of the sludge separated from the water is an important cost factor and will become more costly in the near future.

- Chemical Analysis
  Chemical analysis is especially important to ensure clean water; not only for drinking, but in our rivers, lakes, and underground water sources. Endress+Hauser offers the Stamolys chemical analyzer, a self-contained sampler system which measure the correct values needed for effiecient dosing of chemicals. The Stamolys CA 71 system is available for measurement of Nitrates, Phosphates, Chlorine, Ammonium, Aluminum, Chromate, Copper, Iron, Hardness, Hydrazine, Manganese, and Silicate.

Basic Analytical Measurement Technologies

- Chlorine

  Chlorine is used not only in your home to clean and disinfect, but is widely used throughout industry, especially in water/wastewater treatment. Chlorine is a building block for nearly all chemical processes. It plays a vital role in the health of the population and in maintaining a clean and safe environment.
  Chlorine sensors from Endress+Hauser are membrane-capped amperometric sensors. The membrane only allows hypochlorous acid molecules to diffuse through the membrane to react at the electrodes. Detected hypochlorous acid is a proportion of the active chlorine, which acts as a depolarizer at the cathode after diffusion by the membrane.

  Total chlorine

  Total chlorine is a weaker disinfectant than free chlorine, but last much longer. It is normally used in pipe lines, or in areas where it is too costly to maintain a free chlorine level. Total chlorine is the sum of total free chlorine and bound chlorine. Bound chlorine (chloramines) is not measured, its share can be determined numerically by subtracting free chlorine from total chlorine. Bound chlorine is no longer active and has no disinfectant effects. Forms of chlorine that have a disinfecting effect are: elemental chlorine Cl_2, hypochlorous acid HOCl, hypochlorite ions OCl^-, and combinations thereof.

  Free chlorine

  The free chlorine form is the type that disinfects most effectively, but does not last as long. Sunlight, temperature fluctuations, pH changes and rain weaken the effects, especially in swimming pools or areas exposed to the environment. Hypochlorous acid HOCl proportion depends on the pH value. As pH value increases (> pH 6), HOCl dissociates into hypochlorite ions OCl^- and hydrogen ions H^+. Only OCl^- is left at approximately 9.5 pH, where the disinfectant effect is extremely low. Normally, free
  chlorine is measured along with pH to maintain the most effective disinfecting properties.

- Dissolved oxygen

  Dissolved oxygen (DO) is the term commonly used in liquid analytical work for the measurement of the amount of oxygen dissolved in a unit volume of water. It is an important indicator of the degree of usefulness of a sample of water for a specific application. The process requirements of a given application determine the level of dissolved oxygen that can be tolerated.
  The primary application for parts-per-million (ppm) dissolved oxygen systems is measurement and control in aeration basins used in aerobic digesters in wastewater treatment plants. Correct levels of oxygen must be maintained to nourish the bacteria that
  are used to digest the waste. Endress+Hauser offers a single sensor style for measuring dissolved oxygen. The membrane covered sensor provides a sealed system which measures the oxygen molecules transferred through a gas permeable membrane to the electrodes.

- Turbidity

  In order to ensure efficient water treatment, the primary sludge has to be removed. The task is to control a pump or slide valve. Most essential is to make sure that the sludge concentration is at least 1.5 to 2% DS (dry solids). A lower concentration will create tremendous costs in later stages of sludge treatment (e.g. sludge conditioning and de-watering).
  Endress+Hauser incorporates optical technology which is most suitable for measuring the solids concentration in the sludge pipeline, and can be used easily to switch off the pump at too low concentrations. The 90° scattered light method with a measuring frequency in the near-infrared range of light (880 nm) guarantees a measurement of turbidity value under standardized, comparable conditions. The excitation radiation of an infrared transmitter strikes the medium at a defined beam angle. The different refractive indices of the entrance window and the measuring medium (water) are taken into account. Particles in the medium generate a scattered radiation which strikes the scattered light receiver at a defined angle. The measurement in the medium is constantly adjusted with the values of a reference receiver. For sludge level measurement in the primary clarifier, Endress+Hauser offers ultrasonic systems which provide non-contact continuous measurement.

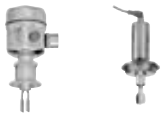
- Chemical analyzers

  The reduction and elimination of certain chemicals during the treatment process ensures that clean water is introduced into rivers and lakes from wastewater treatment facilities. Analyzers from Endress+Hauser are compact self-contained sampler and analyzer systems which are designed for specific chemicals, such as ammonium, nitrate, phosphate, etc.
  The measurement is accomplished using photometric technology. A sample is drawn into the analyzer and conditioned. The analyzer sample pump conveys a part of the filtrate to a mixing vessel where a reagent pump adds reagent at a specific ratio. As a result of the reaction, the sample turns a characteristic color. The photometer determines the sample absorption of an emitted light at a specific wavelength. The wavelength is parameter specific.
  The absorption intensity is proportional to the concentration of the specified parameter in the sample. Additionally, the absorption of a reference light is determined to receive a genuine measuring result. The reference signal is subtracted from the measuring signal to prevent any effects due to turbidity, contamination and ageing of the LEDs. The temperature in the photometer is controlled thermostatically so that the reaction is reproducible and takes place within a short period of time.

The specifications listed in the Product Overview pages are for basic comparison. Detailed specifications are available in the individual Technical Information documents. Specifications subject to change without notice.

Vibration

Liquiphant M

	FTL 50 (compact)	FTL 51 (extended)	FTL 50 H (compact, hygienic/ sanitary)	FTL 51 H (hygienic/sanitary, extended)	FTL 51 C (coated extended)
					
Application	Liquids		Liquids, hygienic		Liquids, corrosive
Measurement type	Point level, liquids		Point level, liquids		Point level, liquids
Sensor	Frequency shift tuning fork, compact version	Frequency shift tuning fork, extended forks to 115" (optional to 235")	Frequency shift tuning fork, compact version	Frequency shift tuning fork, extended forks to 115"	Frequency shift tuning fork, compact and extended forks to 115" (to 48" for enamel coating)
Output	FEL51: AC, load switched via thyristor FEL52: DC-PNP FEL54: DPDT relay FEL55: 8 to 16 mA FEL56: L-H edge NAMUR FEL58: H-L edge NAMUR with test button FEL57: PFM for separate switching unit FEL50A: Profibus PA FEL50D: Density (with FML621 density computer)		FEL51: AC, load switched via thyristor FEL52: DC-PNP FEL54: DPDT relay FEL55: 8 to 16 mA FEL56: L-H edge NAMUR FEL58: H-L edge NAMUR with test button FEL57: PFM for separate switching unit FEL50A: Profibus PA FEL50D: Density (with FML621 density computer)		FEL51: AC, load switched via thyristor FEL52: DC-PNP FEL54: DPDT relay FEL55: 8 to 16 mA FEL56: L-H edge NAMUR FEL58: H-L edge NAMUR with test button FEL57: PFM for separate switching unit FEL50A: Profibus PA FEL50D: Density (with FML621 density computer)
Power supply	FEL51: 19 to 253 VAC FEL52: 10 to 55 VDC (PNP) FEL54: 19 to 253 VAC, 19 to 55 VDC (relay) FEL55: 11 to 36 VDC (current) FEL56, 58, 57: NAMUR and PFM, requires separate power supply (e.g. FTL 325N / 325P) FEL50A: 9 to 32 VDC from bus FEL50D: powered by FML621 density computer		FEL51: 19 to 253 VAC FEL52: 10 to 55 VDC (PNP) FEL54: 19 to 253 VAC, 19 to 55 VDC (relay) FEL55: 11 to 36 VDC (current) FEL56, 58, 57: NAMUR and PFM, requires separate power supply (e.g. FTL 325N / 325P) FEL50A: 9 to 32 VDC from bus FEL50D: powered by FML621 density computer		FEL51: 19 to 253 VAC FEL52: 10 to 55 VDC (PNP) FEL54: 19 to 253 VAC, 19 to 55 VDC (relay) FEL55: 11 to 36 VDC (current) FEL56, 58, 57: NAMUR and PFM, requires separate power supply (e.g. FTL 325N / 325P) FEL50A: 9 to 32 VDC from bus FEL50D: powered by FML621 density computer
Ambient temperature	–40 to +160°F		–40 to +160°F		–60 to +160°F
Process temperature	–40 to +300°F		–40 to +300°F		–40 to +300°F (ECTFE coating, –40 to +250°F)
Process pressure	Maximum 1450 psi, threaded connections Flanges: pressure depends on flange selected and process temperature Maximum 230 psi, Tri-clamp		Maximum 1450 psi, threaded connections Flanges: pressure depends on flange selected and process temperature Maximum 230 psi, Tri-clamp Maximum 145 psi, Varivent Maximum 600 psi, 1" welded neck		ECTFE, PFA: –14 to +580 psi Enamel: –14 to +360 psi
Process connections	Threaded: 3/4" NPT, 1" NPT, 316L SS or Alloy C-4 ANSI flanges: 1" to 4" (Class 150, 300), 316L SS Tri-clamp: 1-1/2", 2", 316L SS		ANSI flanges: 1" to 4" (Class 150, 300), 316L SS Tri-clamp: 1-1/2", 2", 316L SS 1" flush mount, 316L SS (requires weld neck adapter) Varivent DN 40, 316L SS		ANSI flanges: 1" to 3", (Class 150, 300) 316L SS, coated (ECTFE, PFA) ANSI flanges: 2" (Class 150, 300) Alloy C-4, coated (Enamel)
Housings	Compact (welded 316L SS), Polyester (PBT) Aluminum, Dual-compartment Aluminum, 316L SS		Compact (welded 316L SS), Polyester (PBT) Aluminum, Dual-compartment Aluminum, 316L SS		Polyester (PTB), 316L SS, coated Aluminum, dual-compartment coated aluminum
Maximum viscosity	10,000 cSt		10,000 cSt		10,000 cSt
Function indication	Red, yellow, green LED's (depending on electronics)		Red, yellow, green LED's (depending on electronics)		Red, yellow, green LED's (depending on electronics)
Wetted material	316L SS or Alloy C4		316L SS or Alloy C4		316L SS or Alloy C4, coated (ECTFE, PFA, Enamel)
Approvals / certificates	FM, CSA, SIL 3		FM, CSA, SIL 3, 3-A, FDA compliant materials		FM, CSA, SIL 2, FDA compliant materials

	FML 621 Density Computer
	
Basic application	Density / concentration
Medium	Liquids
Housing	DIN rail or panel mount
Inputs	Pressure, temperature, FEL50D electronic insert (analog, digital, TC, RTD, mA, mV, V, pulse)
Outputs	4 to 20 mA, relays, pulse
Display / Local operation	160 x 80 dot matrix with rear illumination / 8 soft-key pushbuttons or RS 232/ RS 485
Interface	RS 232, RS 485, PROFIBUS-PA
Operating software	ReadWin 2000
Ambient temperature	–4 to 122°F
Power supply	90 to 250 VAC 20 to 36 VDC, 20 to 28 VAC
Standards / approvals	FM, CSA

NOTE: The FML621 density computer is only available for use with a Liquiphant M specified with the FEL50D electronics. The FDL50D electronics are not interchangeable with any other electronic insert.

Level limit switch / Power supply

Nivotester

	FTL 325 P (intrinsically safe signal circuit, Liquiphant/Soliphant)	FTL 325 N (one and three channel amplifier for NAMUR)
		
Application	Liquids, solids	Liquids
Measurement type	Point level	Point level
Output	AC/DC, relays	AC/DC, relays
Input	PFM signal	NAMUR L-H edge
Power supply	85 to 253 VAC 20 to 60 VDC	85 to 253 VAC 20 to 60 VDC
Ambient temperature	–4 to +140°F	–4 to +140°F
Mounting	DIN rail	DIN rail
Function indication	Red, green, yellow LEDs	Red, green, yellow LEDs
Operation	Switches	Switches
Housing	Body, Polycarbonate Front cover, polypropylene	Body, Polycarbonate Front cover, polypropylene
Approvals / certificates	CE, FM, CSA, SIL 2	CE, FM, CSA, NAMUR

Liquiphant S High Temperature		
	FTL 70 (compact) 	**FTL 71 (extended)** 
Application	Liquids	
Measurement type	Point level, liquids	
Sensor	Frequency shift tuning fork, compact version	Frequency shift tuning fork, extended forks to 115"
Output	FEL51: AC, load switched via thyristor FEL52: DC-PNP FEL54: DPDT relay FEL55: 8 to 16 mA FEL56: L-H edge NAMUR FEL58: H-L edge NAMUR with test button FEL57: PFM for separate switching unit FEL50A: Profibus PA	
Power supply	FEL51: 19 to 253 VAC FEL52: 10 to 55 VDC (PNP) FEL54: 19 to 253 VAC, 19 to 55 VDC (relay) FEL55: 11 to 36 VDC (current) FEL56, 58, 57: NAMUR and PFM, requires separate power supply (e.g. FTL 325N / 325P) FEL50A: 9 to 32 VDC from bus	
Ambient temperature	-40 to +160°F	
Process temperature	-40 to +450°F / -40 to +540°F	
Process pressure	Maximum 1450 psi, threaded connections Flanges: pressure depends on flange selected and process temperature	
Process connections	Threaded: 3/4" NPT, 1" NPT, 316L SS or Alloy C-4 ANSI flanges: 1" to 4" (Class 150, 300, 600), 316L SS RF, optional Alloy C 4 plating	
Housings	Polyester (PBT), Aluminum, Dual-compartment aluminum	
Maximum viscosity	10,000 cSt	
Function indication	Red, yellow, green LED's (depending on electronics)	
Wetted material	316L SS or Alloy C4	
Approvals / certificates	FM, CSA, SIL 3	

Liquiphant T		
	FTL 20 	**FTL 260** 
Application	Liquids	Liquids
Measurement type	Point level, liquids	Point level, liquids
Sensor	Frequency shift tuning fork	Frequency shift tuning fork
Output	AC DC-PNP AS-i	AC DC-PNP
Power supply	19 to 253 VAC 10 to 35 VDC (PNP) 24.5 to 31 VDC (AS-i)	19 to 253 VAC 10 to 55 VDC (PNP)
Ambient temperature	-40 to +158°F (AS-i-bus, -13 to +158°F)	-40 to +160°F
Process temperature	-40 to +300°F	-40 to +300°F
Process pressure	-14.5 to 580 psig	Max. 360 psi
Process connections	Threaded: 1/2", 3/4" NPT	Threaded: 1" NPT
Maximum viscosity	10,000 cSt	10,000 cSt
Function indication	Red and green LED's	Red and green LED's
Wetted material	316L SS	316 SS
Approvals / certificates	UL, CSA US, AS-i	CSA general purpose

Soliphant M				Soliphant T
	FTM 50 	**FTM 51** 	**FTM 52** 	**FTM 20 (compact)** **FTM 21 (with pipe extension)** 
Application	Solids			Solids
Measurement type	Point level, fine-grained bulk solids			Point level, fine or coarse grained bulk solids
Sensor	Frequency shift tuning fork			Frequency shift vibrating rod
Output (dependent on electronics insert selected)	AC (FEM51) DC-PNP (FEM52) AC/DC, relay output (FEM54) DC, 8/16 mA (FEM55) PFM (FEM57) output to Nivotestester switch unit (i.e. FTL 325) NAMUR, H-L edge (FEM58)			DC PNP AC/DC, relay output
Power supply	19 to 253 VAC 10 to 55 VDC (PNP) 19 to 253 VAC / 55 VDC 11 to 36 VDC			10 to 45 VDC (PNP) 19 to 253 VAC / 19 to 55 VDC
Ambient temperature	-58 to +158°F, -40 to +158°F (F16 polyester housing)			-40 to +158°F
Housing	Polyester, Aluminum, Dual-compartment aluminum, 316 SS			Polyester, Aluminum
Process temperature	-58 to +302°F			-40 to +300°F
Process pressure	FTM 50, 51: -14.5 to 362 psi FTM 52: 29 psi			-14.5 to 362 psi
Process connections	Threaded: 1-1/4", 1-1/2" NPT, 304 SS Flange: 2", 3", 4" 150 ANSI, 316 SS 2" Tri-clamp, 316L SS			Threaded: 1-1/4" or 1-1/2" NPT, 316 SS
Measured detection range	FTM 50: dependent on mounting location, 4" fork FTM 51: extended tube, 6" up to 13 feet FTM 52: extension cable, up to 65 feet			Dependent on mounting location FTM 21: extension pipe; 20, 40, or 60 inch
Maximum particle size	0.4"			≤ 0.98"
Function indication	Red, green LED's			Green, yellow LED's
Wetted material	Threaded process connection: 316L SS Extension tube: 316L SS Flanges: 316L SS Cable: braided steel, polyurethane coated Fork: 316L SS			316L SS
Approvals / certificates	CE, SIL 2, combination FM/CSA			CE, combination FM/CSA

Capacitance

	Nivector	Minicap		Solicap M	Solicap S
	FTC 968 	**FTC 260 (compact version)** 	**FTC 262 (cable version)** 	**FTI55 / FTI56 (limit detection switch)** 	**FTI77 (limit detection switch)** 
Application	Powders, granules, pellets	Bulk solids, liquids	Bulk solids	Bulk solids	Bulk solids / high temperature
Measurement type	Point level	Point level	Point level	Point level	Point level
Output	AC DC-PNP	AC/DC, relay DC-PNP	AC/DC, relay DC-PNP	AC - 2 wire (FEI51) DC- PNP (FEI52) 3-12 VDC (FEI53) AC/DC, relay output (FEI54) 8/16 mA (FEI55) PFM (FEI57S) NAMUR H-L Edge (FEI58)	AC - 2 wire (FEI51) DC- PNP (FEI52) 3-12 VDC (FEI53) AC/DC, relay output (FEI54) 8/16 mA (FEI55) PFM (FEI57S) NAMUR H-L Edge (FEI58)
Measured detection range	Dependent on mounting location	Dependent on mounting location	236"	Rod probe: up to 13 ft Cable probe: up to 72 ft	Sword probe: up to 40 inches Cable probe: up to 65 ft
Power supply	21 to 253 VAC 10 to 55 VDC (PNP)	20 to 253 VAC 20 to 55 VDC 10.8 to 45 VDC (PNP)	20 to 253 VAC 20 to 55 VDC 10.8 to 45 VDC (PNP)	FEI52, 10 to 55 VDC FEI53, 14.5 VDC FEI54, 19 to 253 VAC 50/60 Hz or 19 to 55 VDC FEI55, 11 to 36 VDC FEI57S, 9.5 to 12.5 VDC FEI58, powered by FTL325N or 375N	FEI52, 10 to 55 VDC FEI53, 14.5 VDC FEI54, 19 to 253 VAC 50/60 Hz or 19 to 55 VDC FEI55, 11 to 36 VDC FEI57S, 9.5 to 12.5 VDC FEI58, powered by FTL325N or 375N
Ambient temperature	-4 to +140°F	-40 to +160°F	-40 to +160°F	-58 to +158°F	-58 to +158°F
Process temperature	-4 to +176°F	-40 to +250°F	-40 to +160°F	-58 to +356°F	-58 to +752°F
Process pressure	-14.5 to 87 psi	-14.5 to 360 psi	-14.5 to 90 psi	-14.5 to 360 psi	-14.5 to 145 psi
Process connections	Threaded: 1" BSPP with two hex lock nuts	Threaded: 1" NPT	Threaded: 1-1/2" NPT	Threaded: 1-1/2" NPT Flange: 2", 3" or 4"	Threaded: 1-1/2" NPT Flange: 2", 3" or 4"
Maximum particle size	0.4"	1.2"	1.2"	N/A	N/A
Function indication	Red LED	Red and green LED's	Red and green LED's	Red, green and yellow LED's	Red, green and yellow LED's
Wetted material	Blue PC, lock nuts black PA	Probe: Polyphenylene sulphide (FDA listed material)	Cable: steel coated with high density PE Probe: Polyphenylene sulphide (FDA listed material)	Rod, partially insulated: PPS, 316L SS Rod, fully insulated: PE, galv. steel Cable, partially insulated: PTFE, 316L SS Cable, fully insulated: PA, galv. steel	Sword, process connection, inactive length, tensioning weight for cable probe: 316L SS or steel. Cable: zinc coated steel or 316L SS
Housing	PC	Polyester	Polyester	Polyester, Aluminum, Dual-compartment aluminum, 316 SS	Polyester, Aluminum, Dual-compartment aluminum, 316 SS
Approvals / certificates	CE	CE, FM, CSA	CE, FM, CSA	CE, combination FM/CSA, SIL2/SIL3 (with FEI55 insert)	CE, combination FM/CSA SIL2/SIL3 (with FEI55 insert)

Capacitance

Liquicap M		
	FTI51 / FTI52 **(limit detection switch)**	**FMI51 / FMI52** **(continuous level detection)**
		
Application	Liquids	Liquids
Measurement type	Point level	Continuous level
Output	DC- PNP (FEI52) 3-12 VDC (FEI53) AC/DC, relay output (FEI54) 8/16 mA (FEI55) PFM (FEI57S)	4 to 20 mA, HART (FEI50H) PFM (FEI57C)
Measured detection range	Rod probe: up to 13 ft Cable probe: up to 33 ft	Rod probe: up to 13 ft Cable probe: up to 72 ft
Power supply	FEI52, 10 to 55 VDC FEI53, 14.5 VDC FEI54, 19 to 253 VAC 50/60 Hz or 19 to 55 VDC FEI55, 11 to 36 VDC FEI57S, 9.5 to 12.5 VDC	FEI50H, 12 to 36 VDC FEI57C, 14.8 VDC
Ambient temperature	-58 to +158°F	-58 to +158°F
Process temperature	-112 to +392°F	-112 to +392°F
Process pressure	-14.5 to 1450 psi	-14.5 to 1450 psi
Process connections	Threaded: ½", 3/4", 1", 1-1/2" Flange: 1" to 6" Tri-clamp: 1", 1-1/2", 2"	Threaded: ½", 3/4", 1", 1-1/2" Flange: 1" to 6" Tri-clamp: 1", 1-1/2", 2"
Maximum particle size	N/A	N/A
Function indication	Red, green and yellow LED's	Red and green LED, HART, local display
Wetted material	Rod, 316L SS; insulated rod, PFA or PTFE coated 316L SS Cable, 316 SS; insulated cable, PFA or FEP coated 316 SS	Rod, 316L SS; insulated rod, PFA or PTFE coated 316L SS Cable, 316 SS; insulated cable, PFA or FEP coated 316 SS
Housing	Polyester, Aluminum, Dual-compartment aluminum, 316 SS	Polyester, Aluminum, Dual-compartment aluminum, 316 SS
Approvals / certificates	CE, combination FM/CSA, SIL2	CE, combination FM/CSA, SIL2

Liquicap T	
	FMI 21 
Application	Liquids
Measurement type	Capacitance, continuous
Output	4 to 20 mA 0 to 100%
Measured detection range	6" to 98"
Power supply	10 to 30 VDC
Ambient temperature	-40 to +160°F
Process temperature	-40 to +212°F
Process pressure	-14.5 to 145 psi
Process connections	Threaded: 1-1/2" NPT, PPS
Wetted material	Rod probes: 316L SS, optional carbon fiber (CFC) Probe insulation: PP
Function indication	Red and green LEDs, optional display
Housing	PBT-FR Cover PBT Cover with sight glass, PA
Approvals / certificates	CE

Transmitter / Limit switch

Nivotester			
	FTC 625 **(intrinsically safe signal circuit)**	**FTC 325** **(intrinsically safe signal circuit)**	**FTW 325** **(intrinsically safe signal circuit)**
			
Application	Liquids	Liquids, solids	Liquids
Measurement type	Capacitance, point level	Capcitiance, point level	Conductivity, point level
Output	Relay, switch	One SPDT, one SPST	Two relays, SPDT
Input	PFM signal	2-wire PFM, 3-wire analog	NAMUR
Power supply	85 to 253 VAC 20 to 30 VAC / 20 to 60 VDC	85 to 253 VAC 20 to 30 VAC / 20 to 60 VDC	85 to 253 VAC 20 to 30 VAC / 20 to 60 VDC
Ambient temperature	-4 to +140°F	-4 to +140°F	-4 to +140°F
Mounting	DIN rail	DIN rail	DIN rail
Function indication	Red, green, yellow LEDs	Red, green, yellow LEDs	Red, green, yellow LEDs
Operation	Switches, RS-485 Remote with FieldCare software	Switches	Switches
Housing	Body, Polycarbonate Front cover, polypropylene	Body, Polycarbonate Front cover, polypropylene	Body, Polycarbonate Front cover, polypropylene
Approvals / certificates	CE, FM, CSA	CE, FM, CSA (3-wire, non-hazardous)	CE, FM, CSA, NAMUR

Conductivity

Liquipoint T		
	FTW 31	**FTW 32**
		
Application	Liquids	
Measurement type	Multiple point level	
Output	AC/DC, relay DC-PNP NAMUR	
Measured detection range	FTW 31 rod: 4" to 158" FTW 32 cable: 10" to 590"	
Power supply	20 to 253 VAC/20 to 55 VDC 10.8 to 45 VDC (PNP) NAMUR requires separate power, e.g. FTW 325	
Ambient temperature	-40 to +160°F NAMUR, -40 to +140°F	
Process temperature	-40 to +212°F	
Process pressure	-14.5 to 145 psi	
Process connections	Threaded: 1-1/2" NPT	
Wetted material	Rod probes: 316L SS, PP insulation Cable probes: 316Ti SS, FEP insulation	
Function indication	Red, yellow, green LEDs	
Housing	Compact: PBT Remote: housing, PPS; cover PBT	
Approvals / certificates	CE	

Radar

Micropilot M

	FMR 230	FMR 231	FMR 240	FMR 244	FMR 245	FMR 250
						
Application	Liquids, pastes, slurries	Liquids, pastes, slurries	Liquids, pastes, slurries	Liquids, pastes, slurries	Liquids, pastes, slurries	Bulk solids, liquids
Measurement type	Radar, non-contact, continuous	Radar, non-contact, continuous	Radar, non-contact, continuous	Radar, non-contact, continuous	Radar, non-contact, continuous	Radar, non-contact, continuous
Maximum measured range	65 ft	65 ft	65 ft	65 ft	229 ft	230 ft
Output	4 to 20 mA, HART, Profibus, Foundation Fieldbus	4 to 20 mA, HART, Profibus, Foundation Fieldbus	4 to 20 mA, HART, Profibus, Foundation Fieldbus	4 to 20 mA, HART, Profibus, Foundation Fieldbus	4 to 20 mA, HART, Profibus, Foundation Fieldbus	4 to 20 mA, HART
Antenna type	Horn: 3", 4", 6", 8', 10"	Rod: 14" to 21"	Horn: 1-1/2", 2", 3", 4" Wave guide antenna: 12 to 150"	Horn: enclosed PTFE,1-1/2"	Horn: disk, PTFE clad, 2" and 3"	Horn: 3", 4" Parabolic: 8", 10"
Power supply	16 to 32 VDC	16 to 32 VDC	16 to 32 VDC	16 to 32 VDC	16 to 32 VDC	16 to 32 VDC
Ambient temperature	-40 to +176°F	-40 to +176°F	-40 to +176°F	-40 to +176°F	-40 to +176°F	-40 to +176°F
Process temperature	-76 to +752°F	-40 to +302°F	-40 to +302°F	-40 to +266°F	-40 to +302°F	-40 to +392°F
Process pressure	Vacuum to 2320 psi	Vacuum to 580 psi	Vacuum to 580 psi	Vacuum to 43 psi	Vacuum to 232 psi	Vacuum to 232 psi
Process connections	3" to 10" ANSI flanges 3" Tri-clamp	1-1/2" threaded 2" to 6" ANSI flanges 2", 3" Tri-clamp	1-1/2" threaded 2" to 6" ANSI flanges 3" Tri-clamp	1-1/2" threaded	2" to 6" ANSI flanges 2" or 3" Tri-clamp	1-1/2" NPT 3" or 4" ANSI flange 4", 8" or 10" universal flange
Wetted material	Enamel, PTFE, 316Ti SS, Ceramic, 316 SS with PTFE	PVDF + PTFE, 317 SS + PTFE, PTFE	PTFE, 316L SS, Alloy C 22	PTFE, PDVF	316 L SS with PTFE disk	316 L SS, PEEK
Operation	HART, Profibus-PA, Foundation Fieldbus, VU 331 display module	HART, Profibus-PA, Foundation Fieldbus, VU 331 display module	HART, Profibus-PA, Foundation Fieldbus, VU 331 display module	HART, Profibus-PA, Foundation Fieldbus, VU 331 display module	HART, Profibus-PA, Foundation Fieldbus, VU 331 display module	HART, Profibus-PA, Foundation Fieldbus, VU 331 display module
Housing	Aluminum, Aluminum with separate connection compartment, 316 SS	Aluminum, Aluminum with separate connection compartment, 316 SS	Aluminum, Aluminum with separate connection compartment, 316 SS	Aluminum, Aluminum with separate connection compartment	Aluminum, Aluminum with separate connection compartment, 316 SS	Aluminum, Aluminum with separate connection compartment, 316 SS
Approvals / certificates	CE, FM, CSA, SIL 2, FCC	CE, FM, CSA, SIL 2, FCC	CE, FM, CSA, SIL 2, FCC	CE, FM, CSA, SIL 2, FCC	CE, FM, CSA, SIL 2, FCC	CE, FM, CSA, FCC

Micropilot S

	FMR 530	FMR 532	FMR 533	FMR 540
				
Application	Liquids, custody transfer	Liquids, custody transfer	Liquids, custody transfer	Liquids, custody transfer
Measurement type	Radar, non-contact, continuous	Radar, non-contact, continuous	Radar, non-contact, continuous	Radar, non-contact, continuous
Maximum measured range	65 ft	125 ft	131 ft	Horn: 98 ft Parabolic: 131 ft
Output	4 to 20 mA, HART	4 to 20 mA, HART	4 to 20 mA, HART	4 to 20 mA, HART
Antenna type	Horn: 3", 4", 6", 8', 10"	Planar antenna: 6", 8", 10", 12"	Parabolic antenna: 20"	Horn: 4" Parabolic: 8", 10"
Power supply	16 to 32 VDC	16 to 32 VDC	16 to 32 VDC	16 to 36 VDC
Ambient temperature	-40 to +176°F	-40 to +176°F	-40 to +176°F	-40 to +176°F
Process temperature	-40 to +392°F	-40 to +302°F	-40 to +392°F	-40 to +392°F
Process pressure	14.5 to 580 psi	14.5 to 362 psi	14.5 to 232 psi	-14.5 to 232 psi, horn antenna -14.5 to 87 psi, parabolic
Process connections	3" to 10" ANSI flanges	6" to 12" ANSI flanges 6" to 12" Uniflange	6" to 10" ANSI flanges 6" Uniflange	4" or 6" ANSI flange 6", 8" or 10" Uniflange
Wetted material	PTFE, 316Ti SS	HNBR, 316L SS	PTFE, 316L SS	Horn: PEEK, 316L SS Parabolic: PTFE, 316L SS
Operation	HART, VU 331 display module, FieldCare software	HART, VU 331 display module, FieldCare software	HART, VU 331 display module, FieldCare software	HART, VU 331 display module, FieldCare software
Housing	Aluminum with separate connection compartment	Aluminum with separate connection compartment	Aluminum with separate connection compartment	Aluminum with separate connection compartment
Approvals / certificates	CE, FM, CSA, Nmi, PTB	CE, FM, CSA, Nmi, PTB	CE, FM, CSA, Nmi, PTB	CE, FM, CSA, Nmi, PTB

Guided radar

Levelflex M					
	FMP 40 (cable probe)	**FMP 40 (rod probe)**	**FMP 40 (coax probe)**	**FMP 41C (corrosive/hygienic)**	**FMP 45 (high pressure/temperature)**
					
Application	Solids, liquids	Liquids, solids	Liquids only	Liquids only	Liquids only
Measurement type	Radar, continuous	Radar, continuous	Radar, continuous	Radar, continuous	Radar, continuous
Measured range	Liquids: 115 ft Solids: 115 ft	Liquids: 6.6 ft Solids: 13 ft 0.24" rod: 6.6 ft, liquids only	Liquids: 13 ft	Rod probe: 13 ft Cable probe: 100 ft	Rod probe: 13 ft Coax probe: 13 ft Cable probe: 115 ft
Output	4 to 20 mA, HART Profibus, Foundation Fieldbus	4 to 20 mA, HART Profibus, Foundation Fieldbus	4 to 20 mA, HART Profibus, Foundation Fieldbus	4 to 20 mA, HART Profibus, Foundation Fieldbus	4 to 20 mA, HART Profibus, Foundation Fieldbus
Power supply	HART 2-wire: 16 to 36 VDC HART 4-wire: 90 to 250 VAC, 10.5 to 32 VDC	HART 2-wire: 16 to 36 VDC HART 4-wire: 90 to 250 VAC, 10.5 to 32 VDC	HART 2-wire: 16 to 36 VDC HART 4-wire: 90 to 250 VAC, 10.5 to 32 VDC	HART 2-wire: 16 to 36 VDC HART 4-wire: 90 to 250 VAC, 10.5 to 32 VDC	HART 2-wire: 16 to 36 VDC HART 4-wire: 90 to 250 VAC, 10.5 to 32 VDC
Ambient temperature	–40 to +176°F	–40 to +176°F	–40 to +176°F	–40 to +176°F	–40 to +176°F
Process temperature	–40 to +302°F	–40 to +302°F	–40 to +302°F	–40 to +392°F	–328 to +752°F
Process pressure	Vacuum to 580 psi	Vacuum to 580 psi	Vacuum to 580 psi	Vacuum to 5800 psi Tri-clamp, max. 232 psi 3" Tri-clamp max. 145 psi	Vacuum to 5800 psi
Grain size	Max. 0.87"	Max. 0.87"	N/A	N/A	N/A
Process connections	3/4", 1-1/2" NPT 1-1/2" to 8" ANSI flanges	3/4", 1-1/2" NPT 1-1/2" to 8" ANSI flanges	3/4", 1-1/2" NPT 1-1/2" to 8" ANSI flanges	1-1/2" to 3" Tri-clamp 1-1/2" to 8" ANSI flanges	1-1/2" NPT 2" to 4" ANSI flanges
Wetted material	316L SS	317L SS	317L SS	316 SS with PFA coating	Rod/Coax: 316L SS Cable: 316 SS
Operation	VU 331 LCD with bar graph and 3 keys, HART, Profibus-PA, Foundation Fieldbus	VU 331 LCD with bar graph and 3 keys, HART, Profibus-PA, Foundation Fieldbus	VU 331 LCD with bar graph and 3 keys, HART, Profibus-PA, Foundation Fieldbus	VU 331 LCD with bar graph and 3 keys, HART, Profibus-PA, Foundation Fieldbus	VU 331 LCD with bar graph and 3 keys, HART, Profibus-PA, Foundation Fieldbus
Housing	Aluminum Aluminum with separate connection compartment	Aluminum Aluminum with separate connection compartment	Aluminum Aluminum with separate connection compartment	Aluminum Aluminum with separate connection compartment 316L SS	Aluminum Aluminum with separate connection compartment 316L SS
Approvals / certificates	CE, FM, CSA, SIL 2	CE, FM, CSA, SIL 2	CE, FM, CSA, SIL 2	CE, FM, CSA, SIL 2, 3-A	CE, FM, CSA, SIL 2

Levelflex M	
	FMP 43 
Application	Liquids, hygienic
Measurement type	Radar, continuous
Measured range	Liquids: 12" to 157"
Output	4 to 20 mA, HART Profibus, Foundation Fieldbus
Power supply	HART 2-wire: 16 to 36 VDC HART 4-wire: 90 to 250 VAC, 10.5 to 32 VDC
Ambient temperature	-40 to +176°F
Process temperature	-4 to +302°F, with FFKM (Kalrez) o-ring -4 to +266°F, with EPDM o-ring
Process pressure	232 psi
Process connections	1-1/2" or 2" 150 lb ANSI RF flange 1" to 1-1/2", 2" or 3" Tri-clamp SMS, DIN and NEMUO Bio process connections available
Wetted material	Probe, 316L SS
Operation	VU 331 LCD with bar graph and 3 keys, HART, Profibus-PA, Foundation Fieldbus
Housing	Aluminum Aluminum with separate connection compartment 316L stainless steel
Approvals / certificates	CE, FM, CSA, SIL 2, 3-A, FDA

Levelflex M	
	FMP 55 
Application	Liquids, level and interface
Measurement type	Radar, continuous with capacitance
Measured range	Up to 33 feet
Output	4 to 20 mA, HART Profibus-PA
Power supply	HART 2-wire: 17.5 to 30 VDC HART 4-wire: 90 to 253 VAC, 10.4 to 48 VDC
Ambient temperature	-40 to +176°F
Process temperature	-58 to +392°F
Process pressure	-14.5 to 580 psi
Process connections	1-1/2" to 6" 150 lb ANSI RF flange, PTFE coated 1" to 4" 300 lb ANSI RF flange, PTFE coated
Wetted material	316L SS
Operation	4-line LCD 3 keys, HART, Profibus-PA Remote operation via HART, FieldCare, AMS Device Manager, SIMATIC PDM
Housing	Aluminum PBT non-metallic 316L stainless steel
Approvals / certificates	CE, FM, CSA, SIL 2

Microwave Barrier

Soliwave M FQR50 / FDR50		
	FQR50 Emitter	**FDR50 Receiver**
		
Application	Solids (wood chips, wood dust, flour, plaster, gravel, sand, dried powders, bags, boxes)	
Measurement type	Non-contact microwave	
Output	Open collector signals are evaluated by FTR325 switch amplifier. Alarm and control devices may be connected to the FTR325 relay outputs.	
Measured detection range	Up to 26 ft Up to 66 ft	
Power supply	Powered by FTR325 switch amplifier	
Ambient temperature	-4 to +158°F	
Process temperature	-4 to +158°F	
Process pressure	11 to 70 psi (only when the FQR50 or FDR50 are built into the process)	
Process connections	Threaded: 1-1/2" NPT, aluminum or 316TI SS	
Housing	Aluminum or 316Ti SS	
Approvals / certificates	CE	

Nivotester FTR325 Switch Amplifier	
	FTR325 Single channel amlifier
	
Application	Single channel switch amplifier for the Soliwave microwave barrier system. Used for level detection of solids or control and counting of packaged goods
Input	Open collector output from Soliwave
Output	SPDT relay and SPST alarm signal output relay
Power supply	85 to 253 VAC, 50/60 Hz 20 to 60 VDC / 20 to 30 VAC, 50/60 Hz
Ambient temperature	-4 to +140°F
Mounting	DIN rail
Housing	Polycarbonate
Approvals / certificates	CE

Mechanical

Soliswitch	
	FTE 31
	
Application	Solids
Measurement type	Paddle switch
Output	Binary, SPDT relay
Measured detection range	FTE rod: 4" to 23" FTE cable: up to 78"
Power supply	110 VAC 230 VAC 20 to 28 VDC
Ambient temperature	-4 to +140°F
Process temperature	-4 to +180°F
Process pressure	7 to 26 psi
Maximum particle size	2"
Process connections	Threaded: 1-1/4" NPT Valox 553 (PBT) or 316L SS
Wetted material	Rod and paddle: 316L SS Cable extension: 316Ti SS
Function indication	N/A
Housing	PBT
Approvals / certificates	CE, FM, CSA

Ultrasonic

Prosonic M					
	FMU 40 	**FMU 41** 	**FMU 42** 	**FMU 43** 	**FMU 44** 
Application	Solids, liquids	Solids, liquids	Solids, liquids	Solids, liquids	Solids, liquids
Measurement type	Ultrasonic, continuous, non-contact	Ultrasonic, continuous, non-contact	Ultrasonic, continuous, non-contact	Ultrasonic, continuous, non-contact	Ultrasonic, continuous, non-contact
Maximum measured range	Solids: 6 ft Liquids: 16 ft	Solids: 12 ft Liquids: 26 ft	Solids: 16 ft Liquids: 33 ft	Solids: 23 ft Liquids: 50 ft	Solids: 33 ft Liquids: 65 ft
Output	4 to 20 mA, HART, Profibus, Foundation Fieldbus	4 to 20 mA, HART, Profibus, Foundation Fieldbus	4 to 20 mA, HART, Profibus, Foundation Fieldbus	4 to 20 mA, HART, Profibus, Foundation Fieldbus	4 to 20 mA, HART, Profibus, Foundation Fieldbus
Power supply	HART 2-wire, 4-20 mA loop HART 4-wire, 10.5 to 32 VDC HART 4-wire, 90 to 253 VAC 2-wire Profibus 2-wire Foundation Fieldbus	HART 2-wire, 4-20 mA loop HART 4-wire, 10.5 to 32 VDC HART 4-wire, 90 to 250 VAC 2-wire Profibus 2-wire Foundation Fieldbus	HART 2-wire, 4-20 mA loop HART 4-wire, 10.5 to 32 VDC HART 4-wire, 90 to 250 VAC 2-wire Profibus 2-wire Foundation Fieldbus	HART 4-wire, 10.5 to 32 VDC HART 4-wire, 90 to 250 VAC 2-wire Profibus 2-wire Foundation Fieldbus	HART 2-wire, 4-20 mA HART 4-wire, 10.5 to 32 VDC HART 4-wire, 90 to 250 VAC 2-wire Profibus 2-wire Foundation Fieldbus
Ambient temperature	-40 to +176°F	-40 to +176°F	-40 to +176°F	-40 to +176°F	-40 to +176°F
Process temperature	-40 to +176°F	-40 to +176°F	-40 to +176°F	-40 to +176°F	-40 to +176°F
Process pressure	10 to 44 psi	10 to 44 psi	10 to 36 psi	10 to 36 psi	10 to 36 psi
Grain size	Min. 0.16”	Min. 0.16”	Min. 0.16”	Min. 0.16”	Min. 0.16”
Process connections	1-1/2” NPT	2” NPT	3” or 4” universal flange FAU 20 mounting bracket	4” universal with slip-on flange	4” or 6” universal flange, 8” ANSI FAU 20 mounting bracket
Wetted material	PVDF	PVDF	PVDF	UP and 316 Ti SS	PP, PVDF and 316L SS
Operation	HART, VU 331 display module, ToF Tool software	HART, VU 331 display module, ToF Tool software	HART, VU 331 display module, ToF Tool software	HART, VU 331 display module, ToF Tool software	HART, VU 331 display module, ToF Tool software
Housing	Aluminum, Aluminum with separate connection compartment	Aluminum, Aluminum with separate connection compartment	Aluminum, Aluminum with separate connection compartment	Aluminum	Aluminum, Aluminum with separate connection compartment
Approvals / certificates	CE, FM, CSA	CE, FM, CSA	CE, FM, CSA	CE, FM, CSA	CE, FM, CSA

Prosonic T	
	FMU30 
Application	Liquids, pastes, coarse bulk solids
Measurement type	Ultrasonic, continuous, non-contact for level, flow, or volume
Maximum measured range	1-1/2” sensor: Liquids, 16 ft; solids 6 ft 2” sensor: Liquids 26 ft; solids 11 ft
Output	4 to 20 mA
Power supply	14 to 35 VDC
Ambient temperature	-4 to +140°F
Process temperature	-4 to +140°F
Process pressure	10 to 43 psi
Process connections	1-1/2” NPT or 2” NPT UNI flange: 2”, 3”, 4”
Wetted material	Sensor, PP; matching layer, EPDM
Operation	LCD display, 3 pushbuttons
Housing	PBT
Approvals / certificates	CE, CSA general purpose

NOTE:
FMU30 replaces the FTU230 and FTU231

Prosonic S Sensors (for Prosonic S Transmitter)				
	FDU 90 	**FDU 91** 	**FDU 91 F** 	**FDU 92** 
Application	Liquids, solids	Liquids, solids	Liquids, solids, hygienic	Liquids, solids
Measurement type	Ultrasonic, continuous, non-contact	Ultrasonic, continuous, non-contact	Ultrasonic, continuous, non-contact	Ultrasonic, continuous, non-contact
Measured range	Liquids: 10 ft Solids: 4 ft	Liquids: 33 ft Solids: 16 ft	Liquids: 33 ft Solids: 16 ft	Liquids: 65 ft Solids: 33 ft
Output	Analog signal to transmitter	Analog signal to transmitter	Analog signal to transmitter	Analog signal to transmitter
Power supply	FMU 90 Prosonic transmitter	FMU 90 Prosonic transmitter	FMU 90 Prosonic transmitter	FMU 90 Prosonic transmitter
Process temperature	–40 to +176°F	–40 to +176°F	–40 to +221°F (up to 275°F for 30 min)	–40 to +203°F
Process pressure	10 to 58 psi	10 to 58 psi	10 to 58 psi	10 to 58 psi
Process connections	1" NPT	1" NPT	1" NPT, slip-on flange, Tri-clamp	1" NPT
Housing / wetted material	PVDF	PVDF	316L SS	PVDF
Ingress protection	NEMA 6P	NEMA 6P	NEMA 6P	NEMA 6P
Approvals / certificates	CE, FM, CSA	CE, FM, CSA	CE, FM, CSA, 3-A	CE, FM, CSA

Prosonic S Sensors (for Prosonic S Transmitter), continued			
	FDU 93 	**FDU 95** 	**FDU 96** 
Application	Liquids, solids	Solids	Solids
Measurement type	Ultrasonic, continuous, non-contact	Ultrasonic, continuous, non-contact	Ultrasonic, continuous, non-contact
Measured range	Liquids: 82 ft, solids: 50 ft	Solids: 148 ft	Solids: 230 ft
Output	Analog signal to transmitter	Analog signal to transmitter	Analog signal to transmitter
Power supply	FMU 90 Prosonic transmitter	FMU 90 Prosonic transmitter	FMU 90 Prosonic transmitter
Process temperature	-40 to +203°F	–40 to +176°F (optional to 302°F)	-40 to +302°F
Process pressure	10 to 43 psi	10 to 22 psi	10 to43 psi
Process connections	1" NPT	1" NPT	1" NPT
Housing / wetted material	UP, Al/PTFE	UP/PE (optional UP/VA)	UP / Aluminum (PTFE coated)
Ingress protection	NEMA 6P	NEMA 6P	NEMA 6P
Approvals / certificates	CE, FM, CSA	CE, FM, CSA	CE, FM, CSA

Prosonic S Transmitter		
	FMU 90 	**FMU 95** 
Application	Level, flow, pump control, liquids or solids	Level control for silo or tank farms
Measurement type	Ultrasonic, continuous, non-contact	Ultrasonic, continuous, non-contact
Measured range	Dependent on FDU sensor (see sensors above)	Dependent on FDU sensor (see sensors above)
Input	From 1 or 2 FDU 90 series sensors	Up to 5 or 10 FDU 90 series sensors
Output	0/4 to 20 mA, HART, Profibus DP, up to 3 totalizers and up to 3 resettable counters. Up to 6 SPDT relays	Profibus DP
Power supply	90 to 253 VAC, 50/60 Hz 10.5 to 32 VDC	90 to 253 VAC, 50/60 Hz 10.5 to 32 VDC
Ambient temperature	-40 to +140°F	-40 to +140°F
Mounting	Wall mount field enclosure, panel mount, 19" rack mount	Wall mount field enclosure, panel mount, 19" rack mount
Housing	Field housing, PC; DIN rail housing, PBT	Field housing, PC; DIN rail housing, PBT
Operation	HART, Profibus-DP 6-line plain text LCD, 3 push button keys, indicator LEDs	Profibus-DP, or FieldCare programming 6-line plain text LCD, 3 push button keys, indicator LEDs
Approvals / certificates	CE, CSA general purpose	CE, CSA general purpose

Radiometric

Radiometric source container

	FQG61 / FQG62	QG2000
		
Application	Solids, liquids, suspensions, sludge	Solids, liquids, suspensions, sludge
Measurement type	Non-contact radioactive measurement for continuous level, limit or density	Non-contact radioactive measurement for continuous level, limit or density
Radiation angle of emission	5°, 20°, or 40°	20° or 40°
Width of emission channel	6°	6°
Shield material	Lead	Lead
Source material	^{60}Co or ^{137}Cs	^{60}Co or ^{137}Cs
Container weight	FQG61 manual: 88 lbs pneumatic: 110 lbs FQG62 manual: 192 lbs pneumatic: 215 lbs	QG2000: 695 lbs
Ambient temperature	-40 to +392°F -4 to +176°F with pneumatic actuator	-4 to +392°F
Mounting	Flange, 150 lb ANSI, 4" steel or stainless steel	Steel or stainless steel mounting plate
Housing	Steel, 304 SS, optional 316Ti SS	316Ti SS
ON/OFF switching	Manual, padlock for security Pneumatic, padlock for security	Manual, padlock for security
Approvals / certificates	PTB report, CNSC, NRC	PTB report, CNSC

Radiometric measurement transmitter

	Gammapilot M FMG60
	
Application	Solids, liquids, suspensions, sludge
Measurement type	Non-contact radioactive measurement for continuous level, limit, density, concentration
Measured range	Up to 6.6 ft (single FMG60). Multiple units can be cascaded for longer ranges.
Output	4 to 20 mA with HART, Profibus-Pa, Foundation Fieldbus, and pulses for cascading mode
Power supply	90 to 253 VAC, 50/60 Hz; 18 to 36 VDC
Ambient temperature	-40 to +140°F (up to 248°F with water cooling)
Mounting	FHG60 mounting kit
Housing	Terminal head, aluminum or 316L SS; detector pipe, 316L SS
Weight	24 up to 68 lbs; with water jacket, 44 up to 159 lbs
Approvals / certificates	CE, FM, CSA, SIL 2/3 (for level limit)

Gamma Modulator

	FHG65
	
Application	Suppresses background and extraneous radiation from the FMG60 Gammapilot
Power supply	18 to 36 VDC
Ambient temperature	-40 to +140°F without water cooling 32 to 248°F with water cooling, at the terminal housing, maximum 167°F
Mounting	Mounted to source container FQG61 or FQG62
Weight	Without water jacket, 40 lbs With empty water jacket, 46 lbs With water jacket full, 55 lbs
Housing	304 SS Water jacket, 316LSS and 304 SS
Approvals / certificates	CE, FM, CSA

Synchronizer

	FHG66
	
Application	Used to synchronize two or three FHG65 modulators
Output	Floating changeover contact
Function indication	LEDs indicate operation, faults and error assignment
Power supply	18 to 36 VDC
Ambient temperature	-4 to +140°F
Mounting	DIN rail
Housing	Polycarbonate
Weight	0.3 lbs
Approvals / certificates	CE

Flow Products available from Endress+Hauser

Proline Promag electromagnetic flowmeters

Promag 50/53 Transmitters		
	50 	**53** 
Power supply	85 to 260 VAC 20 to 55 VAC/16 to 62 VDC	85 to 260 VAC 20 to 55 VAC/16 to 62 VDC
Housing	Compact, aluminum (A) Remote wall-mount, aluminum (B) Compact, 304 SS (C, H sensor only) Remote field housing, aluminum (D)	Compact, aluminum (A) Remote wall-mount, aluminum (B) Compact, 304 SS (C, H sensor only) Remote field housing, aluminum (D)
Output	4 to 20 mA HART, Pulse, Frequency	4 to 20 mA HART, Pulse, Frequency
Display / Local operation	2-line LCD / 3 pushbuttons	4-line LCD / Touch control
Remote operation	HART, Profibus-PA	HART, Profibus-PA / DP, Foundation Fieldbus
Ambient temperature	-5 to +140°F, optional -40 to +140°F	-5 to +140°F, optional -40 to +140°F

Refer to the following page for the 50D and 50L Promag

Promag 50/53 Sensors			
	W 	**P** 	**H** 
Basic application	Water, wastewater	Chemical, process	Food, beverage, pharmaceutical
Nominal size	1" to 78"	1/2" to 24"	1/12" to 4"
Measuring range	2.5 gpm to 700 Mgal/day	1.0 to 44,000 gpm	0.015 to 1250 gpm
Sensor liner (process temperature)	Hard rubber (+32 to +175°F), 3" up to 78" Polyurethane (-5 to +125°F), 1" up to 78"	PTFE (-40 to +265°F)	PFA (-40 to +300°F)
Electrodes	316L SS, Alloy C-22, Tantalum	316L SS, Alloy C-22	316L SS, Alloy C-22
Process connections	ANSI Class 150 (1" to 24"), Class 300 (up to 8") Class D AWWA (28" to 78")	ANSI Class 150 flanges	ANSI Class 150 flanges, Tri-clamp, Weld pipe nipple
Ambient temperature	-5 to +140°F	-5 to +140°F	-5 to +140°F
Approvals / certificates	FM, CSA	FM, CSA	FM, CSA, 3-A
Transmitter housing types	Compact aluminum, wall-mounted aluminum remote aluminum	Compact aluminum, wall-mounted aluminum remote aluminum	Compact aluminum, wall-mounted aluminum, remote aluminum, compact stainless steel

Promag 10 Sensor/transmitter					
	10 W 	**10 D** 	**10 L** 	**10 P** 	**10 H** 
Basic application	Water, wastewater	Water, wastewater	Water, wastewater	Chemical, process	Food, beverage, pharmaceutical
Nominal size	1" to 78"	1" to 4"	2" to 48"	1" to 24"	1/12" to 4"
Measuring range	2.5 gpm to 700 Mgal/day	2.5 gpm to 1250 gpm	10 gpm to 175,000 gpm	2.5 to 44,000 gpm	0.015 to 1250 gpm
Sensor liner (process temperature)	Hard rubber (32 to +175°F) 3" to 78" HR, 1" to 40" PU Polyurethane (-5 to +125°F)	Polyamide (32 to 140°F)	PU (-4 to +122°F) PTFE (-4 to +194°F) Hard rubber (32 to 176°F)	PTFE (-40 to +265°F)	PFA (-40 to +300°F)
Electrodes	316L SS Alloy C-22	316L SS	316L SS	316L SS Alloy C-22	316L SS Alloy C-22
Housing	Compact, aluminum Remote, aluminum	Compact, aluminum Remote, aluminum	Compact, aluminum Remote, aluminum	Compact, aluminum Remote, aluminum	Compact, aluminum Remote, aluminum
Process connections	ANSI Class 150 flanges (1" to 24") Class D AWWA (28" to 78")	Wafer style, for 1 to 4" ANSI flanges, Class 150	Lap-joint, 2" to 12"; ANSI flanges, Class 150, 2" to 24"; AWWA Class D, 28" to 48"	ANSI Class 150 flanges ANSI Class 300 flanges (1" to 6" only)	ANSI Class 150 flanges, Tri-clamp, Weld pipe nipple
Output	4 to 20 mA HART, Pulse	4 to 20 mA HART, Pulse	4 to 20 mA HART, Pulse	4 to 20 mA HART, Pulse	4 to 20 mA HART, Pulse
Ambient temperature	-5 to +140°F	-4 to +140°F	-4 to +140°F	-5 to +140°F	-5 to +140°F
Power supply	85 to 250 VAC 20 to 28 VAC/11 to 40 VDC	85 to 250 VAC 20 to 28 VAC/11 to 40 VDC	85 to 250 VAC 20 to 28 VAC/11 to 40 VDC	85 to 250 VAC 20 to 28 VAC/11 to 40 VDC	85 to 250 VAC 20 to 28 VAC/11 to 40 VDC
Display / User interface	2-line LCD / 3 pushbuttons	2-line LCD / 3 pushbuttons	2-line LCD /3 pushbuttons	2-line LCD / 3 pushbuttons	2-line LCD / 3 pushbuttons
Remote operation	HART, FieldCare	HART, FieldCare	HART, FieldCare	HART, FieldCare	HART, FieldCare
Approvals / certificates	FM, CSA, NSF 61	NSF 61, FM, CSA	NSF 61, FM, CSA	FM, CSA	FM, CSA, 3-A

Promag 50 Sensor/transmitter		
	50 D 	**50 L** 
Basic application	Water, wastewater	Water, wastewater
Nominal size	1” to 4”	2” to 48”
Measuring range	2.5 gpm to 1250 gpm	10 gpm to 175,000 gpm
Sensor liner	Polyamide	PU, PTFE, Hard rubber
Electrodes	316L SS	316L SS
Housing	Compact, aluminum Remote, aluminum	Compact, aluminum Remote, aluminum
Process connections	Wafer style, for 1 to 4” ANSI flanges, Class 150	Lap-joint, 2” to 12” ANSI flanges, Class 150, 2” to 24”; AWWA Class D, 28” to 48”
Output	4 to 20 mA HART, pulse, frequency, status	4 to 20 mA HART, pulse, frequency, status
Ambient temperature	–4 to +140°F	–4 to +140°F
Process temperature	32 to +140°F	–4 to +122°F, PU liner –4 to +194°F, PTFE 32 to 176°F, Hard rubber
Power supply	85 to 250 VAC 20 to 28 VAC/11 to 40 VDC	85 to 250 VAC 20 to 28 VAC/11 to 40 VDC
Display / User interface	2-line LCD / 3 pushbuttons	2-line LCD / 3 pushbuttons
Remote operation	HART, FieldCare, Profibus DP/PA	HART, FieldCare, Profibus DP/PA
Approvals / certificates	CE, NSF 61, FM, CSA	CE, NSF 61, FM, CSA

Promag 55 sensor/transmitter		
	55S 	**55H** 
Basic application	Fluids with high solids content	Fluids with high solids content, food and beverage
Nominal size	1/2” to 24”	1/12” to 4”
Measuring range	1 to 44,000 gpm	0.015 to 1250 gpm
Sensor liner (process temperature)	PTFE (1/2” to 24”), –40 to +266°F PFA (1” to 8”), –4 to +356°F Polyurethane (1” to 24”), –4 to +122°F Natural rubber (2-1/2” to 24”), 32 to +140°F	Sensor, –4 to +302°F Seals: EPDM, –4 to +266°F; Silicon, Viton, Kalrez seals, –4 to +302°F
Electrodes	316L SS, Alloy C-22, Tantalum, Tungsten carbide, Platinum Rhodium 80/20, 302 SS brush type	316L SS, Alloy C-22, Tantalum, Platinum Rhodium 80/20 (up to 1” only)
Housing	Sensor: 1/2 to 12”, alum.; 14 to 24”, painted steel Transmitter: aluminum, die-cast powder coated	Sensor: 316L SS Transmitter: aluminum, die-cast powder coated or 316L SS
Process connections	ANSI Class 150, 300 316L SS ANSI Class 150, 300 A105 CS	ANSI Class 150, 316L SS up to 1”; Class 150 PVDF up to 1” Weld nipple, 316L SS; threaded and tri-clamp, 316L SS
Output	4 to 20 mA HART, pulse, frequency, relay	4 to 20 mA HART, pulse, frequency, relay
Ambient temperature	–4 to +122°F, remote –4 to +140°F	–4 to +122°F, remote –4 to +140°F
Power supply	85 to 260 VAC 20 to 55 VAC, 20 to 64 VDC	85 to 260 VAC 20 to 55 VAC, 20 to 64 VDC
Display / User interface	4-line LCD / Touch control	4-line LCD / Touch control
Remote operation	HART, Profibus-PA, FOUNDATION Fieldbus	HART, Profibus-PA, FOUNDATION Fieldbus
Approvals / certificates	FM, CSA	FM, CSA, 3-A, FDA compliant materials

Promag 23 Sensor/transmitter (2-wire)		
	23 P 	**23 H** 
Basic application	Chemical, process	Food, beverage, pharmaceutical
Nominal size	1" to 8"	1/12" to 4"
Measuring range	2.5 to 4850 gpm	0.015 to 1250 gpm
Sensor liner (process temperature)	PTFE (-40 to +265°F) PFA (-5 to +355°F)	PFA (-5 to +300°F)
Electrodes	316L SS, Alloy C-22, Tantalum, Platinum/rhodium	316L SS, Alloy C-22, Tantalum, Platinum/rhodium
Housing	Compact, aluminum	Compact, aluminum
Process connections	ANSI Class 150/300 flanges	ANSI Class 150 flanges, Tri-clamp, hose, weld pipe nipple, PVC adhesive coupling
Output	4 to 20 mA HART, Pulse	4 to 20 mA HART, Pulse
Ambient temperature	-5 to +140°F	-5 to +120°F
Power supply	12 to 30 VDC	12 to 30 VDC
Display / User interface	4-line LCD / Touch control	4-line LCD / Touch control
Remote operation	HART	HART
Approvals / certificates	FM, CSA	FM, CSA, 3-A

Dosimag (filling applications)	
	5BH 
Basic application	Food, beverage, pharmaceutical, chemical
Nominal sizes	5/32", 5/16", 1/2"
Measuring range	0.13 to 13.2 gal/min
Power supply	20 to 30 VDC
Housing	Compact, 304 SS
Sensor liner	PFA
Electrodes	316L SS, Alloy C-22
Seals	EPDM (-4 to +266°F) Silicone (-4 to +302°F) Viton® (32 to +302°F)
Process connections	Tri-clamp, 316L SS
Output	Pulse (max 10 kHz)
Operation	Remote, via FieldTool™ operating software
Ambient temperature	-4 to +140°F
Process temperature	-4 to +266°F
Approvals / certificates	3-A, FM, CSA (general purpose)

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FieldTool™ is a registered trademark of Endress+Hauser Flowtec AG, Reinach, CH

Magphant flow limit switch	
	DTI 200 
Basic application	All industries, conductive liquids
Pipe sizes	1" to 80", insertion
Measuring range	3.3 to 16.4 ft/s
Power supply	20 to 30 VDC
Housing	Compact, aluminum
Process connection	Weld stub, external (1" pipe) Weld stub, internal (1-1/2" and larger pipe) Plastic weld stub (for plastic pipe)
Process temperature	-4 to +250°F
Electrodes	316L SS
Output	4 to 20 mA
Local operation	Mini-switches, potentiometers, LEDs
Ambient temperature	-4 to +140°F
Approvals / certificates	FM, CSA

PROline Promass Coriolis flowmeters

Promass 80/83 Transmitters		
	80 	**83** 
Power supply	85 to 260 VAC 20 to 55 VAC/16 to 62 VDC	85 to 260 VAC 20 to 55 VAC/16 to 62 VDC
Housing	Compact, aluminum (A) Remote wall-mount, aluminum (B) Compact, 304 SS (C), not available for E sensor Remote field housing, aluminum (D)	Compact, aluminum (A) Remote wall-mount, aluminum (B) Compact, 304 SS (C), not available for E sensor Remote field housing, aluminum (D)
Output	4 to 20 mA HART, Pulse, Frequency	4 to 20 mA HART, Pulse, Frequency
Display / Local operation	2-line LCD / 3 pushbuttons	4-line LCD / Touch control
Remote operation	HART, Profibus-PA	HART, Profibus-PA / DP, Foundation Fieldbus, MODBUS® RS 485, Ethernet/IP
Ambient temperature	-5 to +140°F, optional -40 to +140°F	-5 to +140°F, optional -40 to +140°F

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Promass Sensors for 80/83 transmitters	
	S 
Basic application	Food, beverage, process
Nominal sizes	3/8" to 2"
Measuring range	0 to 2570 lb/min
Measured variable	Mass flow, density, volume flow, temperature
Sensor housing	304 SS
Sensor tubes	Single, 904L SS
Secondary containment	Yes
Seals	No internal seals
Process connections	ANSI Class 150, 300 Tri-clamp
Ambient temperature	-4 to +140°F
Process temperature	-60 to +300°F
Transmitter housing type	Compact alu., wall-mounted alu., remote alu., compact SS
Approvals / certificates	FM, CSA, 3-A, SIL 2

Promass Sensors for 80/83 transmitters						
	P 	**F** 	**H** 	**I** 	**A** 	**E** 
Basic application	Life science, pharmaceutical	Process industries	Food, beverage, process	Food, beverage, process	Process industries	Process industries
Nominal sizes	3/8" to 2"	3/8" to 10"	3/8" to 2"	3/8" to 3"	1/24", 1/12", 1/8"	3/8" to 2"
Measuring range	0 to 2570 lb/min	0 to 80,860 lb/min	0 to 2570 lb/min	0 to 6600 lb/min	0 to 16.5 lb/min	0 to 2570 lb/min
Measured variable	Mass flow, density, volume flow, temperature	Mass flow, density, volume flow, temperature	Mass flow, density, volume flow, temperature	Mass flow, density, volume flow, temperature	Mass flow, density, volume flow, temperature	Mass flow, density, volume flow, temperature
Sensor housing	304 SS	304 SS	304 SS	304 SS	304 SS	304 SS
Sensor tubes	Single bent tube, 316L SS	Dual, 904L SS, 3/8" to 4" Alloy C-22, 3/8" to 3" 316L, 6" and 10"	Single, Zirconium	Single, Titanium	Single, 904 SS or Alloy C-22	Dual, 904L SS
Secondary containment	Yes	Yes	Yes	Yes	Yes	No
Seals	No internal seals	No internal seals	No internal seals	No internal seals	No internal seals (optional mounting sets, threaded connections, EPDM, Silicon, Viton, Kalrez)	No internal seals
Process connections	ANSI Class 150, 300 Tri-clamp, Neumo Bioconnect	ANSI Class 150, 300, 600 Tri-clamp	ANSI Class 150, 300 (304 SS) Wetted parts Zirconium 702	ANSI Class 150, 300 (304 SS), VCO, Tri-clamp Wetted parts Titanium	VCO, 904L SS or Alloy C-22 Tri-clamp, 904 SS	ANSI Class 150, 300, 600 VCO Tri-clamp
Ambient temperature	-4 to +140°F	-4 to +140°F	-4 to +140°F	-4 to +140°F	-4 to +140°F	-4 to +140°F
Process temperature	-60 to +400°F	-60 to +400°F Optional -60 to +660°F	-60 to +400°F	-60 to +300°F	-60 to +400°F	-4 to +284°F
Transmitter housing type	Compact aluminum, wall-mounted aluminum, remote aluminum, compact SS	Compact aluminum, wall-mounted aluminum, remote aluminum, compact SS	Compact aluminum, wall-mounted aluminum, remote aluminum, compact SS	Compact aluminum, wall-mounted aluminum, remote aluminum, compact SS	Compact aluminum, wall-mounted aluminum, remote aluminum, compact SS	Compact aluminum, wall-mounted aluminum, remote aluminum
Approvals / certificates	FM, CSA, ASME BPE, FDA, 3-A, SIL 2	FM, CSA, 3-A, SIL 2	FM, CSA, SIL 2	FM, CSA, SIL 2, 3-A	FM, CSA, SIL 2, 3-A	FM, CSA, 3-A, SIL 2

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Promass 40 E

	40 E
	
Basic application	Process industries
Nominal sizes	3/8", 1/2", 1", 1-1/2", 2"
Measuring range	0 to 2570 lb/min
Measured variable	Mass flow, volume flow
Power supply	85 to 260 VAC 20 to 55 VAC 16 to 32 VDC
Housing	Transmitter, coated aluminum Sensor, 304 SS
Sensor tubes	Dual, 904L SS
Secondary containment	No
Seals	No internal seals
Process connections	ANSI Class 150, 300, 600 VCO Tri-clamp
Output	4 to 20 mA HART, frequency, status
Display / Local operation	2-line LCD / None
Remote operation	HART, FieldTool software operation
Ambient temperature	-4 to +140°F
Process temperature	-4 to +255°F
Approvals / certificates	3-A, FM, CSA

Promass E 200

	TB2 loop-powered 2-wire
	
Basic application	Process industries
Nominal sizes	3/8", 1/2", 1", 1-1/2", 2"
Measuring range	0 to 2570 lb/min
Measured variable	Mass flow, volume flow
Power supply	18 to 30 VDC
Housing	Transmitter, coated aluminum Sensor, 304 SS
Sensor tubes	Dual, 904L SS
Secondary containment	No
Seals	No internal seals
Process connections	ANSI Class 150, 300, 600 VCO Tri-clamp
Output	2-wire, 4 to 20 mA HART
Display / Local operation	4-line LCD /3 pushbuttons
Remote operation	HART, FieldCare, Field Xpert, VIATOR Bluetooth
Ambient temperature	-4 to +140°F
Process temperature	-4 to +284°F
Approvals / certificates	3-A, FM, CSA

Cubemass DCI

	8CN
	
Basic application	Process industries
Nominal sizes	1/24", 1/12", 1/8", 1/4"
Measuring range	0 to 37 lb/min
Measured variable	Mass flow, volume flow
Power supply	85 to 260 VAC 20 to 55 VAC 16 to 32 VDC
Housing	Transmitter, coated aluminum Sensor, 304 SS
Sensor tube	Single, 904L SS
Secondary containment	Yes
Seals	Viton, EPDM, Silicone, Kalrez
Process connections	VCO, VCO mounting kit ½"flange, VCO mounting kit NPT-F
Output	4 to 20 mA HART, frequency, status, relay
Display / Local operation	4-line LCD / Touch control
Remote operation	HART, Modbus RS485
Ambient temperature	-4 to +140°F
Process temperature	-58 to +392°F
Approvals / certificates	SIL 2, NEC/CEC, NEPSI

Dosimass (filling applications)

	8BE
	
Basic application	Food, beverage, pharmaceutical, chemical
Nominal sizes	5/16", 1/2", 1"
Measuring range	0 to 660 lb/min
Measured variable	Mass flow, volume flow, density
Power supply	20 to 30 VDC
Housing	Compact, 304 SS
Sensor tubes	904L SS
Secondary containment	No
Seals	None, welded process connections
Process connections	Tri-clamp, 316L SS
Output	Pulse (max 10 kHz)
Operation	Remote, via "Field Tool" operating software
Ambient temperature	-4 to +140°F
Process temperature	-4 to +257°F
Approvals / certificates	3-A, FM, CSA (general purpose)

CNGmass DCI	
	8DF 
Basic application	Compressed natural gas fueling
Nominal sizes	3/8", ½", 1"
Measuring range	0 to 330 lb/min
Measured variable	Mass flow, volume flow
Power supply	85 to 260 VAC 16 to 62 VDC / 20 to 55 VAC
Housing	Transmitter, coated aluminum
Sensor body	304 SS
Sensor tubes	Dual, 316L SS
Process connections	Female thread, 316 SS
Output	Current / HART / frequency /relay / pulse / Modbus RS485
Local operation	4-line LCD, touch control
Remote operation	HART, FieldCare, MODBUS RS485
Ambient temperature	-40 to +140°F
Process temperature	-58 to +302°F
Process pressure	Maximum 5080 psi
Approvals / certificates	NEPSI, NTEP, MC

CNGmass	
	8FF 
Basic application	Compressed natural gas fueling
Nominal sizes	3/8", ½", 1"
Measuring range	0 to 330 lb/min
Measured variable	Mass flow, volume flow
Power supply	10 to 30 VDC / 20 to 28 VAC
Housing	Transmitter, coated aluminum
Sensor body	304 SS
Sensor tubes	Dual, 316L SS
Process connections	Female thread, 316 SS
Output	Pulse / frequency / status
Local operation	DIP switches, LEDs
Remote operation	FXA291 and FieldCare, MODBUS RS485
Ambient temperature	-40 to +140°F
Process temperature	-58 to +257°F
Process pressure	Maximum 5080 psi
Approvals / certificates	FM, CSA, NEPSI, NTEP, MC

LPGmass	
	8FE 
Basic application	Liquified petroleum gas fueling
Nominal sizes	3/8", ½", 1", 1-1/2"
Measuring range	0 to 1650 lb/min
Measured variable	Mass flow, volume flow
Power supply	10 to 30 VDC / 20 to 28 VAC
Housing	Transmitter, coated aluminum
Sensor body	304 SS
Sensor tubes	Dual, 316L SS
Process connections	316 SS flanges, VCO, Tri-clamp
Output	Pulse / frequency / status
Local operation	DIP switches, LEDs
Remote operation	FXA291 and FieldCare, MODBUS RS485
Ambient temperature	-40 to +140°F
Process temperature	-40 to +257°F
Process pressure	Maximum 1450 psi (process connection dependent)
Approvals / certificates	FM, CSA

PROline Thermal mass flowmeters

t-mass 65F/65I		
	65F 	**65I** 
Basic application	Mass flowrate of gas	Mass flowrate of gas
Nominal sizes	1/2" to 4", flanged	3" to 60" pipe diameter, insertion
Measuring range	1.1 to 8250 lb/h	44 to 1,584,000 lb/h
Measured variable	Mass flow, gas temperature	Mass flow, gas temperature
Power supply	85 to 260 VAC 20 to 55 VAC 16 to 62 VDC	85 to 260 VAC 20 to 55 VAC 16 to 62 VDC
Housing	Transmitter, coated aluminum	Transmitter, coated aluminum
Sensor type	Flanged, in-line	Insertion; 9", 13", 17", 24"
Sensor body	316L SS	316/316L SS
Transducer	316L SS, Alloy C22	316L SS, Alloy C22
Process connections	ANSI Class 150, 300	1" MNPT
Process seal	Viton, -4 to+ 212°F Kalrez, -4 to +212°F EPDM, -40 to +212°F	Not required with MNPT connection
Output	4 to 20 mA HART, frequency, relay	4 to 20 mA HART, frequency, relay
Display / Local operation	2-line LCD / 3 pushbuttons	2-line LCD / 3 pushbuttons
Remote operation	HART, Profibus-DP, MODBUS RS 485	HART, Profibus-DP, MODBUS RS 485
Ambient temperature	-4 to +140°F	-4 to +140°F
Process temperature	-40 to +212°F	-40 to +266°F
Process pressure	-7.25 to +580 psig	-7.25 to +290 psig
Approvals / certificates	FM, CSA	FM, CSA

Flowphant T flow switch	
	DDT31 
Application	Mass flow
Measuring range	Flow, 0.1 to 9.8 ft/s (flow as a relative value between 0 and 100%) Temperature, -4 to +185°F
Measuring principle	Calorimetric method
Output	One PNP switch output, flow Two PNP switch outputs, flow or temperature PNP switch output with 4 to 20 mA (active), flow or temperature
Ambient temperature	-40 to +185°F
Process temperature	-4 to +185°F
Power supply	18 to 30 VDC
Process connections	1/4" and ½"NPT
Approvals / certificates	UL

Proline Prosonic ultrasonic flowmeters

	Prosonic 91 W	Prosonic 93 W	Prosonic 93 C
	91W 	**93W** 	**93C (in-line)** 
Basic application	Drinking water, process water	Drinking water, process water, wastewater	Drinking water, process water, wastewater
Nominal pipe sizes	2" to 160"	Clamp-on, 2" to 160" Insertion, 8" to 160"	12" to 78"
Measuring range	0 to 50 ft/s	0 to 50 ft/s	0 to 33 ft/s
Measured variable	Flow velocity (converted to volume flow)	Flow velocity (converted to volume flow)	Flow velocity (converted to volume flow)
Sensor type	W sensor, clamp-on	W sensor, clamp-on W sensor, insertion	W sensor, insertion, integrated in measuring pipe
Sensor housing	304 SS	304 SS	316L SS
Sensor contact surface	Chemical resistant plastic	Chemical resistant plastic	Weld in holder, 316L SS Measuring tube, ST 37.2 CS
Process mounting	Clamp on: 304 SS tension bands	Clamp on: 304 SS tension bands Insertion: threaded, mounts to weld-in adapter, 304 SS	Threaded, mounts to weld-in adapter. Measuring tube, ANSI flanges, Class 150 (12" to 24"); Class D AWWA (28" to 78")
Process temperature	-5 to +175°F (optional, 32 to 265°F)	-5 to +175°F clamp on -40 to +176°F insertion	Measuring tube, 14 to +140°F W insertion, -40 to +175°F
Transmitter type	Prosonic 91	Prosonic 93	Prosonic 93
Power supply	85 to 260 VAC 20 to 55 VAC/16 to 62 VDC	85 to 260 VAC 20 to 55 VAC/16 to 62 VDC 9 to 32 VDC for Profibus and FF	85 to 260 VAC 20 to 55 VAC/16 to 62 VDC 9 to 32 VDC for Profibus and FF
Transmitter housing	Aluminum, remote wall-mount/pipe-mount	Remote field housing, aluminum	Remote field housing, aluminum
Ambient temperature	-5 to 140°F	-5 to 140°F	-5 to 140°F
Output	4 to 20 mA HART, Pulse	4 to 20 mA HART, Pulse, Frequency	4 to 20 mA HART, Pulse, Frequency
Display / Local operation	2-line LCD / 3 pushbuttons	4-line LCD / Touch control	4-line LCD / Touch control
Remote operation	HART, FieldCare	HART, Profibus-PA, Foundation Fieldbus, FieldCare	HART, Profibus-PA, Foundation Fieldbus, FieldCare
Approvals / certificates	FM, CSA	FM, CSA	FM, CSA

	Prosonic 93 P	
		
	93P (clamp on, ½"to 2-1/2")	**93P (clamp on 2" to 160")**
Basic application	Chemical, process	Chemical, process
Nominal pipe sizes	1/2" to 2-1/2"	2" to 160"
Measuring range	0 to 23 ft/s	0 to 50 ft/s
Measured variable	Flow velocity (converted to volume flow)	Flow velocity (converted to volume flow)
Sensor housing	304 SS	304 SS
Sensor contact surface	Chemical resistant plastic	Chemical resistant plastic
Process mounting	Clamp on, 304 SS tension bands	Clamp on, 304 SS tension bands
Process temperature	-40 to +212°F (optional -40 to +302°F)	-40 to +176°F (optional 32 to +340°F)
Transmitter type	Prosonic 93	
Transmitter housing	Aluminum, remote wall-mount/pipe-mount, remote field housing	
Power supply	85 to 260 VAC 20 to 55 VAC/16 to 62 VDC 9 to 32 VDC for Profibus and FF	
Ambient temperature	-5 to 140°F	
Output	4 to 20 mA HART, Pulse, Frequency	
Display / Local operation	4-line LCD / Touch control	
Remote operation	HART, Profibus-PA, Foundation Fieldbus, FieldCare	
Approvals / certificates	FM, CSA	

Proline Prosonic ultrasonic flowmeters

Prosonic 93T Portable		
		
	93T (clamp-on, ½"to 2-1/2")	**93P (clamp-on 2" to 160")**
Basic application	Water, process, liquids	Water, process, liquids
Nominal pipe sizes	1/2" to 2-1/2"	2" to 160"
Measuring range	0 to 50 ft/s	0 to 50 ft/s
Measured variable	Flow velocity (converted to volume flow)	Flow velocity (converted to volume flow)
Sensor housing	304 SS	304 SS
Sensor contact surface	Chemical resistant plastic	Chemical resistant plastic
Process mounting	Corrosion protected aluminum and 304 SS clamp-on	Clamp-on, 304 SS tension bands or textile strapping
Process temperature	-40 to +212°F (optional -40 to +302°F)	-40 to +176°F (optional 32 to +340°F)
Transmitter type	Hand-held remote	
Transmitter housing	Plastic	
Power supply	100 to 240 VAC to 12 VDC power adapter Re-chargable built-in battery (8-hour operating time, 3.6 hours charging)	
Ambient temperature	+32 to +140°F	
Output	0/4 to 20 mA, data logger function in CSV format on USB storage device	
Display / Local operation	4-line LCD / Touch control	
Remote operation	FieldCare	
Approvals / certificates	CE	

The Prosonic 93T replaces the Prosonic 92T portable system.

Prosonic 92F transmitter / sensor	
	92F 
Basic application	Chemical, petrochemical, energy
Nominal pipe sizes	1" to 12"
Measuring range	0 to 10,570 gpm
Measured variable	Flow velocity (converted to volume flow)
Housing	Compact, aluminum Remote, aluminum
Sensor contact surface	Stainless steel
Process mounting	In-line, ANSI flanges, Class 150 and 300
Process temperature	-40 to +302°F
Power supply	Loop-powered, 12 to 36 VDC
Output	4 to 20 mA, optional pulse or frequency
Ambient temperature	-40 to +140°F
Display / Local operation	2-line LCD / 3 pushbuttons
Remote operation	HART, Profibus-PA
Approvals / certificates	FM, CSA

PROline Prowirl Vortex flowmeters

Prowirl 72/73 Transmitters		
	72 	**73** 
Basic application	Gas, steam, liquids	Gas, steam, liquids, saturated steam mass
Nominal size	1/2" to 12" (flanged) 1/2" to 6" (wafer)	1/2" to 12" (flanged) 1/2" to 6" (wafer)
Measuring range	Liquid 0.70 to 10,391 gpm (flanged) 0.84 to 2752 gpm (wafer) Gas 1.77 to 11,595 SCFM (flanged) 2.35 to 3066 SCFM (wafer)	Liquid 0.70 to 10,391 gpm (flanged) 0.84 to 2752 gpm (wafer) Gas 1.77 to 11,595 SCFM (flanged) 2.35 to 3066 SCFM (wafer)
Process connection	Flange version: ANSI Class 150, 300, 600 flanges Wafer version: ANSI Class 150, 300 flanges	Flange version: ANSI Class 150, 300, 600 flanges Wafer version: ANSI Class 150, 300 flanges
Housing	Compact, aluminum Remote field housing, aluminum	Compact, aluminum Remote field housing, aluminum
Output	4 to 20 mA HART, pulse, status	4 to 20 mA HART, pulse, status, frequency
Display / Local operation	2-line LCD / 3 pushbuttons	2-line LCD / 3 pushbuttons
Remote operation	HART, PFM, Profibus-PA, Foundation Fieldbus	HART, PFM, Profibus-PA, Foundation Fieldbus
Ambient temperature	-40 to +158°F, compact -40 to +185°F, remote	-40 to +158°F, compact -40 to +185°F, remote
Process temperature	-330 to +750°F	-330 to +750°F
DSC sensor	Flanged version: 316L SS, Inconel, Alloy C-22 Wafer version: 316L SS, Alloy C-22	Flanged version: 316L SS Wafer version: 316L SS
Sensor seal	Grafoil (graphite), -330 to +750°F Viton, +5 to +345°F Kalrez, -5 to +527°F Grafoil (oil/fat/water-free), -330 to +750°F Viton (oil/fat/water-free), +5 to +345°F Gylon® (PTFE), -330 to +500°F Gylon (oil/fat/water-free), -330 to +500°F (not for 8" to 12" sensors)	Grafoil (graphite), -330 to +750°F Viton, +5 to +345°F Kalrez, -5 to +527°F Grafoil (oil/fat/water-free), -330 to +750°F Viton (oil/fat/water-free), +5 to +345°F Gylon (PTFE), -330 to +500°F Gylon (oil/fat/water-free), -330 to +500°F (not for 8" to 12" sensors)
Power supply	Non-hazardous, 12 to 36 VDC (HART 18 to 36 VDC) Intrinsically safe, 12 to 30 VDC (HART 18 to 30 VDC) Explosion proof, 15 to 36 VDC (HART 21 to 36 VDC)	Non-hazardous, 12 to 36 VDC (HART 18 to 36 VDC) Intrinsically safe, 12 to 30 VDC (HART 18 to 30 VDC) Explosion proof, 15 to 36 VDC (HART 21 to 36 VDC)
Approvals / certificates	FM, CSA, CE	FM, CSA, CE

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Flow computers

Energy manager		
	RMS 621 	**RMC 621** 
Basic application	Steam and water	Gas, liquids, steam and water
Measuring range	Liquids: +32 to +572°F (water only) Steam: 0 to 14,500 psig, +32 to +1472°F	Liquids: -460 to +572°F Steam: 0 to 14,500 psig, +32 to +1472°F Technical gas: 0 to 7250 psig, -215 to +1472°F Natural gas: 0 to 1740 psig, -76 to +392°F
Calculation standards	Steam/water: IAPWS-IF 97	Steam/water: IAPWS-IF 97 Technical gas: Real gas calculation, improved ideal gas cal., gas tables Natural gas: NX 19, SGERG(88), AGA8 Liquids: OIML R63, Ap12540, ASTM D1250, Linear calculations, internal stored tables
Housing	DIN rail or panel mount	DIN rail or panel mount
Inputs	Current, PFM, pulse, temperature (Pt100/500/1000)	Current, PFM, pulse, temperature (Pt100/500/1000)
Outputs	0/4 to 20 mA, pulse, relays, digital	0/4 to 20 mA, pulse, relays, digital
Display / Local operation	142 x 36 dot matrix with rear illumination / 8 soft-key pushbuttons or RS 232/ RS 485	142 x 36 dot matrix with rear illumination / 8 soft-key pushbuttons or RS 232/ RS 485
Interface	RS 232, RS 48585, PROFIBUS-DP	RS 232, RS 485, PROFIBUS-DP
Operating software	ReadWin 2000	ReadWin 2000
Ambient temperature	-4 to 140°F	-4 to +140°F
Power supply	90 to 250 VAC 18 to 36 VDC 20 to 28 VAC	90 to 253 VAC 20 to 36 VDC 20 to 28 VAC
Standards / approvals	OILM R75, CE / UL	OILM R75, CE / UL, FM, CSA

Differential Pressure Flow Measurement

Flow Measurement, Differential Pressure		
	Deltatop, Orifice plate (DO71W, DO74P, DO75F) 	**Deltatop, Pitot tube (DP71B, DP72B, DP73B)** 
Basic application	Gas, steam and liquids	Gas, steam and liquids
Nominal pipe size	3/8" to 40" depending on version	2" to 21 ft
Measuring range	Fluid dependent	Fluid dependent
Sensor type	Sharp edge orifice Bidirectional orifice Quarter circle nozzle orifice Conical inlet orifice Segmental orifice	Pitot tube
Process temperature	-328 to +1830°F	-328 to +1830°F
Process pressure	Up to 6300 psi	Up to 6300 psi
Process connections	ANSI Class 150, 300, 600, 900, 1500, 2500; 316L SS, C22.8 or A105 CS	1" ANSI Class 150, 300, 600, 1500; 316Ti SS Weld nipple, cutting ring, threaded; 316Ti SS
Transmitter	Deltabar S PMD75	Deltabar S PMD75
Output	4 to 20 mA HART	4 to 20 mA HART
Ambient temperature	-40 to +185°F, transmitter	-40 to +185°F, transmitter
Power supply	11.5 to 45 VDC; Profibus and FF, 9 to 32 VDC	11.5 to 45 VDC; Profibus and FF, 9 to 32 VDC
Display / User interface	4-line LCD / Push buttons	4-line LCD / Push buttons
Remote operation	HART, Profibus-PA, FOUNDATION Fieldbus	HART, Profibus-PA, FOUNDATION Fieldbus
Approvals / certificates	FM, CSA, NACE, SIL	FM, CSA, NACE, SIL

Pressure Products available from Endress+Hauser

Gauge / Absolute

	Cerabar T		
	PMC 131 	**PMP 131** 	**PMP 135** 
Application	Process pressure	Process pressure	Hygienic process
Span	-15 to 600 psi	15 to 6000 psi	0 to 600 psi
Pressure sensor	Ceramic	Metallic	Metallic
Output	4 to 20 mA	4 to 20 mA PNP switch output	4 to 20 mA PNP switch output
Process temperature	-40 to +275°F	-13 to +158°F	-13 to +212°F (up to +275°F for 1 hour)
Power supply	11 to 30 VDC	12 to 30 VDC	12 to 32 VDC
Process connections	Threaded	Threaded	Mini-clamp Tri-clamp Threaded
Approvals / certificates	SIL 2	SIL 2	SIL 2, 3-A

	Ceraphant T	
	PTC31 	**PTP31** 
Application	Process pressure	Process pressure
Span	1.5 to 600 psi	15 to 6000 psi
Pressure sensor	Ceramic	Metallic
Output	One PNP switch output Two PNP switch outputs PNP switch output with 4 to 20 mA (active)	One PNP switch output Two PNP switch outputs PNP switch output with 4 to 20 mA (active)
Process temperature	-40 to +212°F	-40 to +212°F
Power supply	12 to 30 VDC	12 to 30 VDC
Process connections	Threaded	Threaded
Approvals / certificates	UL	UL

	Cerabar M		
	PMC51 	**PMP51** 	**PMP55** 
Application	Process pressure, level (gauge and absolute)	Process pressure, level (gauge and absolute)	Process pressure, level (gauge and absolute)
Span (adjustable)	-15 to 600 psi	-15 to 6000 psi	-15 to 6000 psi
Pressure sensor	Ceramic	Metallic	Metallic with diaphragm seal
Output	4 to 20 mA / HART® Profibus-PA FOUNDATION™ Fieldbus	4 to 20 mA / HART® Profibus-PA FOUNDATION™ Fieldbus	4 to 20 mA / HART® Profibus-PA FOUNDATION™ Fieldbus
Ambient temperature	-40 to +185°F without display -4 to +158°F with display	-40 to +185°F without display -4 to +158°F with display	-40 to +185°F without display -4 to +158°F with display
Power supply	11.5 to 45 VDC 11.5 to 30 VDC for intrinsically safe unit	11.5 to 45 VDC 11.5 to 30 VDC for intrinsically safe unit	11.5 to 45 VDC 11.5 to 30 VDC for intrinsically safe unit
Process temperature	-4 to +212°F	-40 to +257°F	-94 to +752°F depending on seal and fill oil
Process connections	Threaded, ANSI flange	Threaded, ANSI flange	Threaded, Tri-clamp, ANSI flange, extended daiphragm, Varivent, separator
Approvals / certificates	FM, CSA, NSF 61	FM, CSA, NSF 61	FM, CSA, 3-A

NOTE:
The PMC51 replaces the PMC41/45
The PMP51 replaces the PMP41/45
The PMP55 replaces the PMP46/48

	Cerabar S		
	PMC71 	**PMP71** 	**PMP75** 
Application	Process pressure, level	Process pressure, level	Process pressure, level
Span (adjustable)	1.5 to 600 psi	1.5 to 10,150 psi	5.8 to 6000 psi
Pressure sensor	Ceramic	Metallic	Metallic
Output	4 to 20 mA / HART® Profibus-PA FOUNDATION™ Fieldbus	4 to 20 mA / HART Profibus-PA FOUNDATION Fieldbus	4 to 20 mA / HART Profibus-PA FOUNDATION Fieldbus
Process temperature	-40 to +257°F (optional high temp, -40 to +302°F)	-40 to +257°F	up to +662°F (with diaphragm seal)
Power supply	10.5 to 45 VDC 9 to 32 VDC (PROFIBUS, FF)	10.5 to 45 VDC 9 to 32 VDC (PROFIBUS, FF)	10.5 to 45 VDC 9 to 32 VDC (PROFIBUS, FF)
Process connections	Threaded ANSI flange	Threaded ANSI flange	Threaded ANSI flange Tri-clamp Varivent
Approvals / certificates	SIL 2, combination FM/CSA, NSF 61	SIL 2, combination FM/CSA, NSF 61	SIL 2, combination FM/CSA

Tri-clamp®
is a registered trademark of Ladish & Co., Inc., Kenosha, WI, USA
HART®
is a registered trademark of HART Communication Foundation, Austin, TX, USA
Varivent®
is a registered trademark of Tuchenhagen
PROFIBUS®
is a registered trademark of PROFIBUS Nutzerorganisation e.V., Karlsruhe, D
FOUNDATION™ Fieldbus
is a registered trademark of Fieldbus FOUNDATION, Austin, USA

Differential

Deltabar M	
	PMD55 
Application	Differential pressure, level, flow
Span (adjustable)	1.5 to 600 psi
Pressure sensor	Metallic
Output	4 to 20 mA HART Profibus-PA FOUNDATION Fieldbus
Ambient temperature	–40 to +185°F
Process temperature	–40 to +185°F
Process temperature range, seals	FKM Viton, –4 to +185°F PTFE, –40 to +185°F NBR, –4 to +185°F EPDM, –40 to +185°F
Power supply	11.5 to 45 VDC
Process connections	Oval flange, 1/4-18 NPT, 316L SS or C22.8
Approvals / certificates	FM/CSA

Deltabar S					
	PMD75 	**PMD70** 	**FMD76** 	**FMD77** 	**FMD78** 
Application	Differential pressure, level, flow	Differential pressure, level, flow	Level	Level	Differential pressure, level
Span (adjustable)	4 inH_2O to 600 psi	10 inH_2O to 45 psi	40 inH_2O to 45 psi	40 inH_2O to 240 psi	40 inH_2O to 600 psi
Pressure sensor	Metallic	Ceramic	Ceramic	Metallic	Metallic
Output	4 to 20 mA HART Profibus-PA FOUNDATION Fieldbus	4 to 20 mA HART Profibus-PA FOUNDATION Fieldbus	4 to 20 mA HART Profibus-PA FOUNDATION Fieldbus	4 to 20 mA HART Profibus-PA FOUNDATION Fieldbus	4 to 20 mA HART Profibus-PA FOUNDATION Fieldbus
Process temperature	–40 to +248°F	–40 to +185°F	–40 to +185°F	–40 to +660°F	–40 to +660°F
Power supply	10.5 to 45 VDC 9 to 32 VDC (Profibus, FF)	10.5 to 45 VDC 9 to 32 VDC (Profibus, FF)	10.5 to 45 VDC 9 to 32 VDC (Profibus, FF)	10.5 to 45 VDC 9 to 32 VDC (Profibus, FF)	10.5 to 45 VDC 9 to 32 VDC (Profibus, FF)
Process connections	Threaded	Threaded	Threaded ANSI flange Sanitary tank spud	Threaded ANSI flange	Threaded ANSI flange Tri-clamp Varivent
Approvals / certificates	SIL 2, combination FM/CSA	SIL 2, combination FM/CSA	SIL 2, combination FM/CSA	SIL 2, combination FM/CSA	SIL 2, combination FM/CSA

Hydrostatic

Deltapilot M				
	FMB50 	**FMB51** 	**FMB52** 	**FMB53** 
Application	Hydrostatic level/pressure Food, pharma, chemical	Hydrostatic level/pressure Food, pharma, chemical	Hydrostatic level/pressure Food, pharma, chemical	Hydrostatic level/pressure water, wastewater
Span	-14.5 to 145 psi	-14.5 to 145 psi	-14.5 to 145 psi	-14.5 to 145 psi
Pressure sensor	Contite	Contite	Contite	Contite
Output	4 to 20 mA / HART Profibus-PA Foundation Fieldbus	4 to 20 mA / HART Profibus-PA Foundation Fieldbus	4 to 20 mA / HART Profibus-PA Foundation Fieldbus	4 to 20 mA / HART Profibus-PA Foundation Fieldbus
Process temperature	+14 to +212°F	+14 to +185°F	+14 to +158°F with PE Cable +14 to +176°F with FEP cable	+14 to +158°F with PE Cable +14 to +176°F with FEP cable
Power supply	11.5 to 45 VDC IS versions, 11.5 to 30 VDC	11.5 to 45 VDC IS versions, 11.5 to 30 VDC	11.5 to 45 VDC IS versions, 11.5 to 30 VDC	11.5 to 45 VDC IS versions, 11.5 to 30 VDC
Process connections	Threaded ANSI flange Flush-mounted hygienic	Threaded ANSI flange	Threaded ANSI flange	Remote electronics, suspension clamp for sensor
Approvals / certificates	FM, CSA, 3-A, NSF 61	FM, CSA, NSF 61	FM, CSA, NSF 61	FM, CSA NSF 61

Deltapilot S				Waterpilot
	FMB70 	**DB51A/DB52A** 	**DB53A** 	**FMX21**  A B C
Application	Hydrostatic level, hygienic	Hydrostatic level	Hydrostatic level	Hydrostatic level
Span	40 to 4000 inH_2O (1.5 to 150 psi)	1.5 to 60 psi (adjustable)	1.5 to 60 psi (adjustable)	1.5 to 300 psi (3 to 600 ftH_2O)
Pressure sensor	Contite®	Contite	Contite	Ceramic
Output	4 to 20 mA / HART Profibus-PA FOUNDATION Fieldbus	4 to 20 mA / HART Profibus-PA FOUNDATION Fieldbus	4 to 20 mA / HART Profibus-PA FOUNDATION Fieldbus	4 to 20 mA / HART
Process temperature	+14 to +212°F (up to 275°F for 30 minutes)	+14 to +176°F	+14 to +176°F	+14 to +158°F (salt water version, 32 to 122°)
Power supply	10.5 to 45 VDC (10.5 to 30 VDC for intrinsically safe units) 9 to 32 VDC (Profibus, FF)	11.5 to 30 VDC 9 to 32 VDC (Profibus, FF)	11.5 to 30 VDC 9 to 32 VDC (Profibus, FF)	10.5 to 35 VDC Intrinsically safe, 10.5 to 30 VDC
Process connections	Universal mounting adapters, NPT, Tri-clamp, ANSI flange, Varivent	Threaded ANSI flange	Mounting clamp	Mounting clamp Threaded mount
Approvals / certificates	combination FM/CSA, 3-A, SIL2, NSF 61	FM, CSA	FM, CSA	FM, CSA, NSF 61

NOTE: The FMX21 waterpilot replaces the FMX167 waterpilot

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A-Standard 0.87" version
B-Heavy duty 1.66" version
C-Saltwater 1.15" version

FMB70 pressure transmitter
replaces DB50S transmitter

Temperature Products available from Endress+Hauser

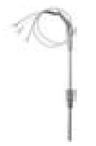
iTEMP® Temperature Transmitters

	Field mounted		DIN rail mounted			
	TMT 142 **(Single input)**	**TMT 162** **(Dual input, dual-compartment housing)**	**TMT 121**	**TMT 122**	**TMT 127**	**TMT 128**
						
RTD input	Pt100, Pt 200, Pt500, Pt1000 Ni100, Ni500, Ni1000	Pt100, Pt500, Pt1000 Ni100, Ni500, Ni1000	Pt100, Pt500, Pt1000 Ni100, Ni500, Ni1000	Pt100, Pt500, Pt1000 Ni100, Ni500, Ni1000	Pt100	No
TC input	B, C, D, R, S, E, J, K, L, N, T, U	B, C, D, R, S, E, J, K, L, N, T, U	B, C, D, R, S, E, J, K, L, N, T, U	B, C, D, R, S, E, J, K, L, N, T, U	No	J, K, N, R, S, T
Ohms input	10 to 2000 Ω	10 to 2000 Ω	10 to 2000 Ω	10 to 2000 Ω	No	No
mV input	-20 to 100 mV	-20 to 100 mV	-10 to 100 mV	-10 to 75 mV	No	No
Output	HART, 4 to 20 mA 20 to 4 mA	HART, 4 to 20 / 20 to 4 mA, Foundation Fieldbus	4 to 20 mA 20 to 4 mA	HART, 4 to 20 mA 20 to 4 mA	4 to 20 mA	4 to 20 mA
Ambient temperature	-40 to +185°F	-40 to +185°F	-40 to +185°F	-40 to +185°F	-40 to +185°F	-40 to +185°F
Power supply	11 to 40 VDC (8 to 40 VDC without display)	11 to 40 VDC (8 to 40 VDC without display)	12 to 35 VDC	12 to 35 VDC	12 to 35 VDC	12 to 35 VDC
Approvals / certificates	FM, CSA, NAMUR	FM, CSA, SIL 2, UL (HART)	FM, CSA, UL	FM, CSA, UL	FM, CSA, UL	FM, CSA, UL

	Head transmitters					
	TMT 180	**TMT 181**	**TMT 187**	**TMT 188**	**TMT 182**	**TMT 80**
						
RTD input	Pt100	Pt100, Pt500, Pt1000, Ni100, Ni500, Ni1000	Pt100	No	Pt100, Pt500, Pt1000, Ni100, Ni500, Ni1000	Pt100, Pt1000
TC input	No	B, C, D, R, S, E, J, K, L, N, T, U	No	J, K, N, R, S, T	B, C, D, R, S, E, J, K, L, N, T, U	B, K, N, R, S
Ohms input	No	10 to 2000 Ω	No	No	10 to 2000 Ω	No
mV input	No	-10 to 100 mV	No	No	-10 to 75 mV	No
Output	4 to 20 mA 20 to 4 mA	4 to 20 mA 20 to 4 mA	4 to 20 mA	4 to 20 mA	HART, 4 to 20 mA 20 to 4 mA	4 to 20 mA
Ambient temperature	-40 to +185°F	-40 to +185°F	-40 to +185°F	-40 to +185°F	-40 to +185°F	-40 to +185°F
Power supply	10 to 35 VDC	8 to 35 VDC	8 to 35 VDC	8 to 35 VDC	10 to 35 VDC	8 to 35 VDC
Approvals / certificates	UL	FM, CSA, UL	FM, CSA, UL	FM, CSA, UL	FM, CSA, UL	CE

	Head transmitters (con't)		
	TMT 84 **(dual input)**	**TMT 85** **(dual input)**	**TMT 82** **(dual input)**
			
RTD input	Pt 50, 100, 200, 500, 1000; Ni100, 120, 1000; Cu 10, 50, 100	Pt 50, 100, 200, 500, 1000; Ni100, 120, 1000; Cu 10, 50, 100	Pt 50, 100, 200, 500, 1000; Ni100, 120; Cu 50
TC input	B, C, D, R, S, E, J, K, L, N, T, U	B, C, D, R, S, E, J, K, L, N, T, U	B, C, D, R, S, E, J, K, L, N, T, U
Ohms input	10 to 400Ω, or 10 to 2000 Ω	10 to 400Ω, or 10 to 2000 Ω	10 to 400Ω, or 10 to 2000 Ω
mV input	-20 to 100 mV -5 to30 mV	-20 to 100 mV	-20 to 100 mV
Output	Profibus-PA	FOUNDATION Fieldbus	HART, 4 to 20 mA or 20 to 4 mA
Ambient temperature	-40 to +185°F	-40 to +185°F	-40 to +185°F
Power supply	9 to 32 VDC	9 to 32 VDC	11 to 42 VDC
Approvals / certificates	FM, CSA, UL	FM, CSA, UL	FM, CSA, UL

RTD temperature sensors

	TH 11	TH 12	TH 17	TH 18
				
Application	Process industry	Process industry	Hygienic, dairy, pharmaceutical	Hygienic, dairy, pharmaceutical
Measurement probe	Pt100	Pt100	Pt100	Pt100
Measuring range	-58 to +392°F / -328 to +1112°F	-58 to +392°F / -328 to +1112°F	-58 to +392°F	-58 to +392°F
Process connection	1/2" NPT, 316 SS 1/8" NPT compression, 316 SS 1/4" NPT compression, 316 SS	1/8" NPT compression, 316 SS 1/4" NPT compression, 316 SS	1" to 3" Tri-clamp, 316L SS	1/2" or 3/4" Tri-clamp, 316L SS
Output	Dependent on electronics, all iTEMP transmitters compatible	Dependent on electronics, all iTEMP transmitters compatible	Dependent on electronics, all iTEMP transmitters compatible	Dependent on electronics, all iTEMP transmitters compatible
Connection head	Aluminum, NEMA 4X Polypropylene, FDA compliant, NEMA 4X	Aluminum, NEMA 4X Polypropylene, FDA compliant, NEMA 4X	Aluminum, NEMA 4X Polypropylene, FDA compliant, NEMA 4X	Aluminum, NEMA 4X Polypropylene, FDA compliant, NEMA 4X
Ambient temperature	With head-mounted transmitter: -40 to +185°F Without head-mounted transmitter: Aluminum, -40 to +302° Polypropylene, -40 to +185°F	With head-mounted transmitter: -40 to +185°F Without head-mounted transmitter: Aluminum, -40 to +302° Polypropylene, -40 to +185°F	With head-mounted transmitter: -40 to +185°F Without head-mounted transmitter: Aluminum, -40 to +302° Polypropylene, -40 to +185°F	With head-mounted transmitter: -40 to +185°F Without head-mounted transmitter: Aluminum, -40 to +302° Polypropylene, -40 to +185°F
Minimum immersion	1", high temperature sensor 3/4", low temperature sensor	1-14", high temperature sensor 3/4", low temperature sensor	2"	3/4"
Immersion length	4", 6", 9", 12" 2" to 96", specified in 1/2" increments	6", 12", 18", 24" 2" to 96" specified in 1/2" increments	2", 4", 6" 2" to 30", specified in 1/2" increments	3/4", 1-1/4", 2-3/4" 1" to 15" specified in 1/2" increments
Approvals / certificates	Based on transmitter type used	Based on transmitter type used	Based on transmitter type used	Based on transmitter type used

RTD temperature sensors in Thermowells

	TH 13	TH 14	TH 15	TH 27
				
Application	Process industry	Process industry	Process industry	Hygienic, dairy, pharmaceutical, biotech
Measurement probe	Pt100	Pt100	Pt100	Pt100
Measuring range	-58 to +392°F / -328 to +1112°F	-58 to +392°F / -328 to +1112°F	-58 to +392°F / -328 to +1112°F	-58 to +392°F / -328 to +1112°F
Process connection	1/2" NPT, 316 SS 3/4" NPT, 316 SS 1" NPT, 316 SS Weld socket, 3/4", 316 SS Weld socket, 1", 316 SS	1" ANSI flange, 316 SS 1-1/2" ANSI flange, 316 SS 2" ANSI flange, 316 SS	1/2" NPT, 316 SS + Hex nipple, 316 SS 1/2 " NPT 316 SS + Nipple union nipple, 316 SS	1", 2", 2-1/2", 3" Tri-clamp, 316L SS 1" Hex nipple, 316 SS 1" NPT nipple union nipple, 316 SS
Output	Dependent on electronics, all iTEMP transmitters compatible	Dependent on electronics, all iTEMP transmitters compatible	Dependent on electronics, all iTEMP transmitters compatible	Dependent on electronics, all iTEMP transmitters compatible
Connection head	Aluminum, NEMA 4X Polypropylene, FDA compliant, NEMA 4X	Aluminum, NEMA 4X Polypropylene, FDA compliant, NEMA 4X	Aluminum, NEMA 4X Polypropylene, FDA compliant, NEMA 4X	Aluminum, NEMA 4X Polypropylene, FDA compliant, NEMA 4X 316L SS, NEMA 4X
Ambient temperature	With head-mounted transmitter: -40 to +185°F Without head-mounted transmitter: Aluminum, -40 to +300° Polypropylene, -40 to +185°F SS, -40 to +300°F without display	With head-mounted transmitter: -40 to +185°F Without head-mounted transmitter: Aluminum, -40 to +300° Polypropylene, -40 to +185°F SS, -40 to +300°F without display	With head-mounted transmitter: -40 to +185°F Without head-mounted transmitter: Aluminum, -40 to +300° Polypropylene, -40 to +185°F SS, -40 to +300°F without display	With head-mounted transmitter: -40 to +185°F Without head-mounted transmitter: Aluminum, -40 to +300° Polypropylene, -40 to +185°F SS, -40 to +300°F without display
Minimum immersion	Tapered thermowell: 4-1/2" Stepped thermowell: 2-1/2" Straight thermowell: 4" Weld-in thermowell: 4-1/2"	Tapered thermowell: 4-1/2" Stepped thermowell: 2-1/2" Straight thermowell: 4" Weld-in thermowell: 4-1/2"	Without thermowell: High temperature, 1-1/4" Low temperature, 3/4"	Without thermowell: High temperature, 1-1/4" Low temperature, 3/4" ½"straight thermowell, 4" ½"reduced thermowell, 2-1/2"
Immersion length	2-1/2", 4-1/2", 7-1/2", 10-1/2", 13-1/2", 16-1/2", 22-1/2" 2" to 24", specified in 1/2" increments	2", 4", 7", 10", 13", 16", 22" 2" to 24" specified in 1/2" increments	4", 6", 9", 12", 14" 4" to 30", specified in 1/2" increments	2-1/2", 3", 4", 4-1/2", 5", 6" 2" to 18", specified in 1/2" increments
Approvals / certificates	Based on transmitter type used	Based on transmitter type used	Based on transmitter type used	Based on transmitter type used

RTD temperature sensors in Thermowells, explosion proof

	T 13	T 14	T 15
			
Application	Petrochemical, refineries	Petrochemical, refineries	Petrochemical, refineries
Measurement probe	Pt100	Pt100	Pt100
Measuring range	-58 to +392°F / -328 to +1112°F	-58 to +392°F / -328 to +1112°F	-58 to +392°F / -328 to +1112°F
Process connection	1/2" NPT, 316 SS 3/4" NPT, 316 SS 1" NPT, 316 SS Weld socket, 3/4", 316 SS Weld socket, 1", 316 SS	1" ANSI flange, 316 SS 1-1/2" ANSI flange, 316 SS 2" ANSI flange, 316 SS	1/2" NPT, 316 SS + Hex nipple, 316 SS 1/2 " NPT 316 SS + Nipple union nipple, 316 SS
Output	Dependent on electronics, all iTEMP transmitters compatible	Dependent on electronics, all iTEMP transmitters compatible	Dependent on electronics, all iTEMP transmitters compatible
Connection head	Aluminum, NEMA 4X 316L SS, NEMA 4X	Aluminum, NEMA 4X 316L SS, NEMA 4X	Aluminum, NEMA 4X 316L SS, NEMA 4X
Ambient temperature	With head-mounted transmitter: -40 to +185°F Without head-mounted transmitter: Alum. or SS, -50 to +212°F Field transmitter: With display, -40 to +158°F Without, -40 to +185°F	With head-mounted transmitter: -40 to +185°F Without head-mounted transmitter: Alum. or SS, -50 to +212°F Field transmitter: With display, -40 to +158°F Without, -40 to +185°F	With head-mounted transmitter: -40 to +185°F Without head-mounted transmitter: Alum. or SS, -50 to +212°F Field transmitter: With display, -40 to +158°F Without, -40 to +185°F
Minimum immersion	Tapered thermowell: 4-1/2" Stepped thermowell: 2-1/2" Straight thermowell: 4" Weld-in thermowell: 4-1/2"	Tapered thermowell: 4-1/2" Stepped thermowell: 2-1/2" Straight thermowell: 4" Weld-in thermowell: 4-1/2"	Without thermowell: High temperature, 1-1/4" Low temperature, 3/4"
Immersion length	2-1/2", 4-1/2", 7-1/2", 10-1/2", 13-1/2", 16-1/2", 22-1/2" 2" to 18", specified in 1/2" increments	2", 4", 7", 10", 13", 16", 22" 2" to 18" specified in 1/2" increments	4", 6", 9", 12" 4" to 100", specified in 1/2" increments
Approvals / certificates	FM, CSA	FM, CSA	FM, CSA

Omnigrad M RTD temperature sensors

	TR 10	TR 11
		
Application	Process industry	Process industry
Measurement probe	Pt100	Pt100
Measuring range	-328 to +1112°F	-58 to +392°F / -328 to +1112°F
Process connection	1/2" NPT: 316L SS, Alloy C276 3/4" NPT: 316L SS	½" NPT: 316L SS, Alloy C276 3/4" NPT: 316L SS
Neck tube	3" to 6"	Without
Process pressure range	Up to 1088 psi	Up to 1088 psi
Output	Dependent on electronics, all iTEMP transmitters compatible: 4 to 20 mA, HART, Profibus PA, Foundation Fieldbus	Dependent on electronics, all iTEMP transmitters compatible: 4 to 20 mA, HART, Profibus PA, Foundation Fieldbus
Terminal head	Aluminum, Polyamide, 316L SS	Aluminum, Polyamide, 316L SS
Ambient temperature	With head-mounted transmitter: -40 to +185°F Without head-mounted transmitter: Aluminum, -40 to +300° Polyamide, -40 to +248°F 316L SS, -40 to+212°F With head mounted transmitter and display: -4 to +158°F	With head-mounted transmitter: -40 to +185°F Without head-mounted transmitter: Aluminum, -40 to +300° Polyamide, -40 to +248°F 316L SS, -40 to+212°F With head mounted transmitter and display: -4 to +158°F
Maximum length	394"	394"
Protection tube, welded	Outer diameter: 0.35", 0.43 or 0.47"	Outer diameter: 0.35", 0.43" or 0.47"
Tip shape	Reduced, straight, tapered	Reduced, straight, tapered
Approvals / certificates	Based on transmitter type used	Based on transmitter type used

Thermocouple (TC) temperature sensors

Thermocouple (TC) temperature sensors

	TH 51	TH 52	TH 56
			
Application	Process industry	Process industry	Process industry
Measurement probe	TC type: J, K, E, N, or T	TC type: J, K, E, N, or T	TC type: J, K, E, N, or T
Measuring range	-454 to +2500°F	-454 to +2500°F	-454 to +2500°F
Process connection	1/2" NPT, 316 SS 1/8" NPT compression, 316 SS 1/4" NPT compression, 316 SS	1/8" NPT compression, 316 SS 1/4" NPT compression, 316 SS	1/8" NPT compression, 316 SS 1/4" NPT compression, 316 SS
Output	Dependent on electronics, all iTEMP transmitters compatible	Dependent on electronics, all iTEMP transmitters compatible	Dependent on electronics, all iTEMP transmitters compatible
Connection head	Aluminum and Polypropylene, NEMA 4X	Cable with connector	Cable with connector
Ambient temperature	With head-mounted transmitter: -40 to +185°F Without head-mounted transmitter: Aluminum, -40 to +302° Polypropylene, -40 to +185°F	Dependent on connector type, Standard, up to +350°F High temperature, up to+800°F	Dependent on connector type, Standard, up to +350°F High temperature, up to +800°F
Minimum immersion	10 x OD of sensor sheath, nominal	10 x OD of sensor sheath, nominal	10 x OD of sensor sheath, nominal
Immersion length	4", 6", 9", 12" 2" to 96", specified in 1/2" increments	6", 12", 18", 24" 2" to 96" specified in 1/2" increments	12", 18", 24", 48", 72", 96" 2" to 96", specified in 1/2" increments
Approvals / certificates	Based on transmitter type used	Based on transmitter type used	Based on transmitter type used

Thermocouple (TC) temperature sensors in Thermowells

	TH 53	TH 54	TH 55
			
Application	Process industry	Process industry	Process industry
Measurement probe	TC type: J, K, E, N, or T	TC type: J, K, E, N, or T	TC type: J, K, E, N, or T
Measuring range	-454 to +2500°F	-454 to +2500°F	-454 to +2500°F
Process connection	1/2" NPT, 316 SS 3/4" NPT, 316 SS 1" NPT, 316 SS Weld socket, 3/4", 316 SS Weld socket, 1", 316 SS	1" ANSI flange, 316 SS 1-1/2" ANSI flange, 316 SS 2" ANSI flange, 316 SS	1/2" NPT, 316 SS + Hex nipple, 316 SS 1/2 " NPT 316 SS + Nipple union nipple, 316 SS
Output	Dependent on electronics, all iTEMP transmitters compatible	Dependent on electronics, all iTEMP transmitters compatible	Dependent on electronics, all iTEMP transmitters compatible
Connection head	Aluminum and Polypropylene, NEMA 4X	Aluminum and Polypropylene, NEMA 4X	Aluminum and Polypropylene, NEMA 4X
Ambient temperature	With head-mounted transmitter: -40 to +185°F Without head-mounted transmitter: Aluminum, -40 to +302° Polypropylene, -40 to +185°F	With head-mounted transmitter: -40 to +185°F Without head-mounted transmitter: Aluminum, -40 to +302° Polypropylene, -40 to +185°F	With head-mounted transmitter: -40 to +185°F Without head-mounted transmitter: Aluminum, -40 to +302° Polypropylene, -40 to +185°F
Minimum immersion	Tapered thermowell, 4-1/2" Stepped thermowell, 2-1/2"	Tapered thermowell, 4-1/2" Stepped thermowell, 2-1/2"	4"
Immersion length	2-1/2", 4-1/2", 7-1/2", 10-1/2", 13-1/2", 16-1/2", 22-1/2" 2" to 24", specified in ½" increments	2", 4", 7", 10" 2" to 24" specified in 1/2" increments	4", 6", 9", 12", 14" 4" to 30", specified in 1/2" increments
Approvals / certificates	Based on transmitter type used	Based on transmitter type used	Based on transmitter type used

Thermocouple (TC) temperature sensors in Thermowells, explosion proof			
	T 53 	**T 54** 	**T 55** 
Application	Chemical, petrochemicals	Chemical, petrochemicals	Chemical, petrochemicals
Measurement probe	TC type: J, K, E, N, or T	TC type: J, K, E, N, or T	TC type: J, K, E, N, or T
Measuring range	-454 to +2500°F	-454 to +2500°F	-454 to +2500°F
Process connection	1/2" NPT, 316 SS 3/4" NPT, 316 SS 1" NPT, 316 SS Weld socket, 3/4", 316 SS Weld socket, 1", 316 SS	1" ANSI flange, 316 SS 1-1/2" ANSI flange, 316 SS 2" ANSI flange, 316 SS	1/2" NPT, 316 SS + Hex nipple, 316 SS 1/2 " NPT 316 SS + Nipple union nipple, 316 SS
Output	Dependent on electronics, all iTEMP transmitters compatible	Dependent on electronics, all iTEMP transmitters compatible	Dependent on electronics, all iTEMP transmitters compatible
Connection head	Aluminum and 316L SS, NEMA 4X	Aluminum and 316L SS, NEMA 4X	Aluminum and 316L SS, NEMA 4X
Ambient temperature	With head-mounted transmitter: -40 to +185°F Without head-mounted transmitter: Aluminum, SS -58 to +212° Field transmitter: -40 to +185°F w/o display -40 to +158°F w display	With head-mounted transmitter: -40 to +185°F Without head-mounted transmitter: Aluminum, SS -58 to +212° Field transmitter: -40 to +185°F w/o display -40 to +158°F w display	With head-mounted transmitter: -40 to +185°F Without head-mounted transmitter: Aluminum, SS -58 to +212° Field transmitter: -40 to +185°F w/o display -40 to +158°F w display
Minimum immersion	With thermowell: Tapered, 4-1/2" Stepped , 2-1/2" 3/4" straight, 4" Weld in, 4-1/2"	With thermowell: Tapered, 4-1/2" Stepped , 2-1/2" 3/4" straight, 4" Weld in, 4-1/2"	Without thermowell 2-1/2"
Immersion length	2-1/2", 4-1/2", 7-1/2", 10-1/2", 13-1/2", 16-1/2", 22-1/2" 2" to 18", specified in 1/2" increments	2", 4", 7", 10", 13", 16", 22" 2" to 18" specified in ½" increments	4", 6", 9", 12" 4" to 100", specified in 1/2" increments
Approvals/certificates	FM, CSA	FM, CSA	FM, CSA

easytemp™ compact thermometer

Compact RTD transmitter			
	TSM 470 G 	**TSM 470 F** 	**TSM 470 P** 
Application	General industries	Food industry	Pharmaceutical
Measuring range	-60 to +320°F	-60 to +320°F	-60 to +320°F
Output signal	4 to 20 mA 20 to 4 mA	4 to 20 mA 20 to 4 mA	4 to 20 mA 20 to 4 mA
Power supply	10 to 35 VDC	10 to 35 VDC	10 to 35 VDC
Minimum immersion	1-1/2"	3/4"	3/4"
Process connection	1/2" NPT	1", 1-1/2", 2" Tri-clamp	1/2" and 3/4" Tri-clamp
Sensor diameter	1/4" sheath	1/4", 3/8" reduced to 3/16"	5/32"
Insertion length	3-1/4" to 8-1/4"	2" to 6"	3/4" to 2-3/4"
Approvals / certificates	UL, ABS	UL, 3-A	UL, 3-A

easytemp™ is a registered trademark of Endress+Hauser Wetzer

Thermophant T temperature switch	
	TTR31 
Application	Process control
Measurement probe	Pt100
Measuring range	-58 to +302°F
Process connections	1/4" and ½" NPT
Output	One PNP switch output Two PNP switch outputs PNP switch output with 4 to 20 mA (active)
Power supply	12 to 30 VDC
Ambient temperature	-40 to +185°F
Approvals / certificates	UL

Data Acquisition and Components available from Endress+Hauser

Recorders			
	Minilog B **RDL 10**	**Memograph M** **RSG 40**	**Ecograph T** **RSG 30**
			
Recorder type	Data recorder	Graphic data manager, paperless, record, visualize, analyze and communicate	Visual data manager, paperless
Application	Process monitoring	Process monitoring / control	Process monitoring / control
Input	1 Analog, 1 discrete, universal	Up to 20 analog, 6 to 14 digital, 8 mathematics channels, Profibus	3 or 6 Analog, 1 digital
Input types	V, mA, RTD, TC	V, mV, mA, RTD, TC, frequency, pulse, Profibus-DP	V, mV, mA, RTD, TC
Setpoint control relays	2 per channel	1 alarm relay, 5 NO relays for limit values, optional digital card with 6 NO relays	4 relays Up to 14 alarm setpoints
Plot or memory storage	Internal memory, 128 K	Internal memory 256 MB, SD card or USB stick	Internal, 2 MB Flash, 2 MB SRAM External CF cards from 32 MB to 512 MB
Interface	RS 232	Integrated WEB server, Profibus, Modbus, USB, TCP/IP, OPC, Ethernet, RS232/485	USB port, RS 232 / RS 485, Ethernet, 7 integrated pushbuttons
Display type	7-digit LCD	7" TFT display, multicolor	5" color LCD
Ambient temperature	-10 to +130°F	+14 to +122°F	+32 to +122°F
Power supply	3.6 V battery or external power supply, 7 to 30 VDC	100 to 230 VAC 24 V AC/DC	115 to 230 VAC
Approvals / certificates	CE	CE, UL, FDA 21 CFR 11	CE, UL

Multi-functional components				
	RIA 452	**RIA 45**	**RIA 46**	**RIA 251**
				
Component function	Digital display, Pump control	Digital display, process display and control unit	Digital display, process display and control unit, field mounted	Digital display Process display / monitoring
Input	Analog, digital	Analog, 1 or 2	Analog, 1 or 2	Analog, 1
Input types	V, mA, RTD, TC, digital	V, mA, resistance, RTD, TC	V, mA, resistance, RTD, TC	4 to 20 mA
Relay outputs / number	8 SPDT	2 SPDT (optional)	2 SPDT (optional)	N/A
Type of outputs	Relay, 0 to 20 mA, 0 to 10 VDC	Relay, 1 or 2 analog, digital status	Relay, 1 or 2 analog, digital status	4 to 20 mA only
Loop power to transmitter	24 V, 250 mA	24 to 230 VAC / VDC	24 to230 VAC / VDC	N/A
Interface	RS 232, ReadWin software, USB-box	FieldCare software, 3 pushbuttons, USB	FieldCare software, 3 pushbuttons, USB	3 pushbuttons
Display type	7-digit LCD, bar graph, status and digital input LEDs, limit value flags (1 to 8), 9 x 77 dot matrix	5-digit backlit LCD, Dot matrix for text/bar graph, limit value indicators, channel display, status LEDs	5-digit backlit LCD, Dot matrix for text/bar graph, limit value indicators, channel display, status LEDs	5-digit backlit LCD
Ambient temperature	-4 to +140°F	-4 to +140°F	-4 to +140°F	+14 to +140°F
Power supply	90 to 250 VAC, 20 to 36 VDC, 20 to 28 VAC	24 to 230 V AC/DC	24 to 230 V AC/DC	Loop powered, 40 to 20 mA
Approvals / certificates	CE, FM, CSA	CE, FM, CSA, UL	CE, FM, CSA, UL	CE, FM, CSA

Profibus Field Indicator	
	RID 261
	
Component function	Digital display
Input types	Profibus-PA
Interface	2 dip switches
Display type	7-digit LCD, 1/4" height
Ambient temperature	-15 to +140°F
Power supply	9 to 32 VDC
Approvals / certificates	CE

Loop powered field indicator

	RIA 14	RIA 16
		
Component function	Loop powered field indicator with explosion proof enclosure	Loop powered field indicator in field mounted housing
Input	4 to 20 mA	4 to 20 mA
Type of outputs	Digital limit switch	Digital limit switch
Display measuring range	-19999 to +99999	-19999 to +99999
Loop power to transmitter	4 to 20 mA	4 to 20 mA
Interface	3 push buttons, remote via FieldCare PC operating software	3 push buttons, remote via FieldCare PC operating software
Display type	5-digit LCD, 3/4" height, trend bargraph in 10% increments	5-digit LCD, 1" height, trend bargraph in 10% increments
Ambient temperature	-40 to +176°F	-40 to +176°F
Power supply	Loop-powered, 4 to 20 mA	Loop-powered, 4 to 20 mA
Approvals / certificates	CE, FM, CSA, UL	CE, FM, CSA, UL

NOTE:
RIA14 and RIA16 replace the RIA261 and RIA141

Field indicator, Foundation Fieldbus

	RID 14	RID 16
		
Component function	Digital indicator	Digital indicator
Input	8-channel	8-channel
Display measuring range	-9999 to +99999	-9999 to +99999
Communication	Foundation Fieldbus	Foundation Fieldbus
Display type	5-digit LCD, 0.8" height, trend bargraph in 10% increments, over/under range, units	5-digit LCD, 1.06" height, trend bargraph in 10% increments, over/under range, units
Housing	Field mounted wall or pipe, aluminum (optional SS)	Field or panel mounted, plastic (aluminum optional)
Ambient temperature	-40 to +176°F	-40 to +176°F
Power supply	9 to 32 VDC, via fieldbus	9 to 32 VDC, via fieldbus
Approvals / certificates	CE, FM, CSA, UL	CE, FM, CSA, UL

Multi-functional components (DIN rail mounting)

	RNS 221	RN 221N	RMA 42
			
Component function	Power supply for 2-wire systems	Power supply, active barrier for 2-wire systems	Digital process transmitter and control unit for monitoring analog measured values
Input	N/A	1 analog	1 or 2 universal
Input types	N/A	4 to 20 mA	V, mA, RTD, TC, resistance
Relay outputs / number	N/A	N/A	2 SPDT
Type of outputs	N/A	4 to 20	1 or 2: 0/4 to 20 mA, voltage 1 linearization table, 32 points Mathematics functions
Loop power to transmitter	2 channels 24 V, 30 mA	18V, 20 mA	24 VDC, 22 mA
Interface	HART	HART	3 push buttons, USB, HART, FieldCare
Display type	3 LEDs	1 LED	5-digit LCD, alarm markers, bar graph, LED relay indicators
Ambient temperature	0 to +140°F	0 to +120°F	-4 to +140°F
Power supply	20 to 253 VAC/VDC	20 to 253 VAC/VDC	24 to 230 VAC/VDC
Approvals / certificates	CE	CE, FM, CSA	CE

NOTE:
RMA42 replaces the RTA421, RMA421 and RMA422

Safety barrier, DIN rail mount

	RB223
	
Component function	Loop-powered barrier for separation of 4 to 20 mA signal circuits, one or two channel
Input	0/4 to 22 mA for specified accuracy 0 to 40 mA operating range
Output	0/4 to 22 mA for specified accuracy 0 to 40 mA operating range (max. current depends on load)
Power supply	Loop-powered, 0/4 to 20 mA
Ambient temperature	-4 to +140°F
Interface	HART communication, bi-directional
Mounting	Standard top-hat DIN rail
Housing	Plastic PC, UL 940
Approvals / certificates	CE, FM, CSA, UL, SIL 3

Power supply Easy Analog

	RNB130
	
Component function	Primary switched-mode power supply
Input	100 to 240 VAC
Output	24 VDC
Power supply	85 to 264 VAC
Ambient temperature	-13 to +158°F
Display element	DC OK LED, green
Mounting	Standard top-hat DIN rail
Housing	Polyamide PA
Approvals / certificates	CE, UL

DIN rail protective housing

	
Component function	Field mounted protective housing for DIN rail instruments
Housing	Polycarbonate (PC)
Ambient temperature	-40 to +180°F (ambient temp. limits of DIN device mounted must be considered)
Cable entries	1 x PG 13.5, 4 PG 11
Protection	NEMA 4X

BTU / Steam manager

	EngyCal RH33 BTU meter	EngyCal RS33 Steam calculator
		
Basic application	Custody transfer BTU meter heat/cold given off by liquids	Steam calculator for recording and billing steam mass and energy
Measuring range	Water: 32 to 662°F Water/glycol (0 to 60% glycol): -40 to +662°F Liquids: -328 to +1112°F	Steam: 32 to 1112°F Pressure: 0 to 14,500 psi
Calculation standards	IAPWS-IF 97, NAMUR NE21, NE43	IAPWS-IF 97, NAMUR NE21, NE43
Measurement/calculation	500 ms interval	500 ms interval
Housing	Wall/pipe mounting, panel or top-hat rail	Wall/pipe mounting, panel or top-hat rail
Inputs	2 Current/pulse, 2 Current/RTD 2 digital (activate tariff counter)	2 Current/pulse, 2 Current/RTD, 2 digital (activate tariff counter)
Outputs	0/4 to 20 mA, pulse, 2 relays, 2 digital (open collector), 24 VDC	0/4 to 20 mA, pulse, 2 relays, 2 digital (open collector), 24 VDC
Display / Local operation	160 x 80 dot matrix with rear illumination, 3 soft-key pushbuttons, USB for configuration, 2 LED indicators	160 x 80 dot matrix with rear illumination, 3 soft-key pushbuttons, USB for configuration, 2 LED indicators
Interface	USB, Ethernet TCP/IP, RS485, Modbus TCP, Modbus RTU, M-Bus Internal data logging and logbook	USB, Ethernet TCP/IP, RS485, Modbus TCP Modbus RTU, M-Bus Internal data logging and logbook
Operating software	Field Data Manager, FieldCare Device Setup	Field Data Manager
Ambient temperature	-4 to 140°F	-4 to +140°F
Power supply	100 to 230 VAC 24 V AC/DC	100 to 230 VAC 24 V AC/DC
Standards / approvals	OILM R75, MID (EN1434 water/liquids), UL, CE	OILM R75, CE, UL

Batch Controller

	RA33
	
Basic application	Batching and dosing of liquids, mass and volume flow
Function	Filling and dosing
Housing	Wall/pipe mounting, panel or top-hat rail
Inputs	0/4 to 20 mA / pulse for flow, 1 RTD 0/4 to 20 mA, pulse/frequency, 0/4 to 20 mA density
Outputs	0/4 to 20 mA or voltage pulse, 2 relay outputs, 2 digital (open collector, optional), 24 VDC transmitter power supply
Power supply	100 to 230 VAC 24 VAC / DC
Display / Local operation	160 x 80 dot matrix with rear illumination, three operation push buttons, 14 function buttons for batch operation or via FieldCare
Interface	USB (with CDI protocol, Ethernet TCP/IP, RS485, RS232 printer interface (optional), Modbus TCP, Modbus RTU
Operating software	Field Data Manager software Ms20
Ambient temperature	-4 to +140°F
Standards / approvals	CE, UL, CSA GP

WirelessHART

	SWA70 Adapter	SWG70 Fieldgate
		
Application	Battery powered interface module connecting HART and 4 to 20 mA devices to a WirelessHART network	Gateway device for WirelessHART networks. Converts and stores wireless device data in a format compatible with other systems, host applications such as HMI / SCADA tools.
Input	One point to point HART device, one point to point 4 to 20 mA device or up to 4 externally powered HART devices operating in multidrop mode	WirelessHART communication interface
Output	WirelessHART communication interface	Ethernet (10 BASE-T/10 BASE TX), RS-485 serial
Transmission range	Outdoor, 250 m (820 ft) Indoor, 50 m (164 ft)	Outdoor, 250 m (820 ft) Indoor, 50 m (164 ft)
Power supply	Long life lithium thionylchloride battery pack, 5 to 7.2 VDC	20 to 30 VDC
Battery life	5 to 7 years dependent on update rate, instrument type and environmental conditions	N/A
Ambient temperature	-40 to +176°F (temperatures below -22°F, battery pack capacity decreases rapidly)	-4 to +140°F
Antenna	Omnidirectional dipole, adjustable in vertical plane	Omnidirectional dipole, adjustable in vertical plane, optional remote antenna
Approvals / certificates	CE, FM, CSA, FCC Part 15.247	CE, FCC CFR 47 Part 15

Analysis Products available from Endress+Hauser

Analysis pH

pH and pH Memosens Sensors

	Orbisint CPS 11 11D with Memosens	**Ceraliquid CPS 41 41D with Memosense**	**Ceragel CPS 71 CPS71D with Memosens**	**Orbipore CPS 91 91D with Memosens**	**Tophit CPS 441 441D with Memosens**	**Tophit CPS 471 471D with Memosens**	**Tophit CPS 491 491D with Memosens**
							
Application	Process/environment	Food/biotechnology	Process/hygienic	Process/chemical	Process/environment	Process/environment	Process/environment
Parameter	pH	pH	pH	pH	pH	pH	pH
Material	Glass	Glass	Glass	Glass	PEEK, EPDM	PEEK, EPDM	PEEK, perfluoroelastomer
Measuring range	0 to 14 pH	0 to 14 pH	0 to 14 pH	0 to 14 pH	0 to 14 pH	0 to 14 pH	0 to 14 pH
Temperature	+32 to +275°F	+5 to +275°F	+32 to +275°F	+32 to +230°F	+5 to +275°F	+5 to +275°F	+5 to +230°F
Temperature sensor	Pt100/Pt1000, NTC (11D)	Pt 100/Pt 1000, NTC (41D)	Pt100/Pt1000	Pt100/Pt1000, NTC (91D)	Pt1000	Pt1000	Pt1000
Process pressure	87 or 232 psi	145 psi	190 psi	190 psi	145 psi	145 psi	145 psi
Diaphragm	PTFE	Ceramic	Ceramic	Open	Ceramic	Ceramic	Open
Reference	Gel	Liquid	Gel	Solid gel	Liquid	Gel	Solid gel
Lengths (mm)	120/225/360/425	120/225/360/425	120/225/360/425	120/225/360/425	120/225/360/425	120/225/360/425	120/225/360/425
Sensor cable	CPK 9, CYK 10 (11D)	CPK 9	CPK 9, CYK 10 (71D)	CPK 9, CYK 10 (91D)	CPK 12, CYK 10 (441D)	CPK 12, CYK 10(471D)	CPK 12, CYK 10 (491D)
Approvals / certificates	FM	FM	FM, 3-A, biocompatible	FM	FM, CSA, 3-A, FDA	FM, CSA, 3-A, FDA	FM, CSA

ORP and ORP Memosens Sensors / pH Sensors

	Orbisint CPS12/13 CPS 12D with Memosens	**Ceraliquid CPS42/43 CPS 42D with Memosens**	**Ceragel CPS 72 CPS 72D with Memosens**	**Orbitex CPS 21**	**Ceratex CPS 31**	**CPS 64**
						
Application	Process/environment	Food/biotechnology	Process/hygienic	Water/wastewater	Municipal water	Process/environment
Parameter	ORP	ORP	ORP	pH	pH	pH
Material	Glass	Glass	Glass	Glass	Glass	Glass
Measuring range	-1500 to 1500 mV	-1500 to 1500 mV	-1500 to +1500 mV	2 to 12 pH	2 to 12 pH	0 to 14 pH
Temperature	+5 to +275°F	+5 to +275°F	+5 to +275°F	+32 to +140°F	+32 to +140°F	+5 to+265°F
Temperature sensor	NTC (12D)	NTC (42D)	N/A	Pt 100	Pt 100	N/A
Process pressure	232 psi	145 psi	232 psi	87 psi	9 psi	217 psi
Diaphragm	PTFE	Ceramic	Ceramic	Open ring junction	Ceramic	N/A
Reference	Gel	KCl liquid	Gel	Gel	Gel	CPS 13 / CPS 43 Ref sensor
Lengths (mm)	120/225/360	120/225/425	120/225/360	120/150	120/150	120/425
Sensor cable	CPK 9, CYK 10 (12D)	CPK 9, CYK 10 (42D)	CPK 9, CYK 10 (72D)	CPK 9	CPK 9	CPK 9
Approvals / certificates	CSA, FM (12D)	CSA, FM (42D)	FM, CSA (Not 72D)	General purpose	General purpose	General purpose

pH / ORP Sensors

	Orbipac W CPF 81/82 81/82D with Memosens	**Purisys CPF 201**
		
Application	Water/wastewater	Pure and ultrapure water
Parameter	pH / ORP	pH
Material	PPS / Glass	316L SS / glass
Measuring range	0 to 14 pH / -1500 to +1500 mV	0 to 14 pH
Temperature	+32 to +230°F	+32 to +165°F
Temperature sensor	Pt100	Pt100/Pt1000
Process pressure	50 psi	50 psi
Diaphragm	PTFE	PTFE
Reference	Gel	Gel
Lengths (mm)	12.5/23/58.5	N/A
Sensor cable	Fixed cable, CPK 9, CYK 10 (81/82D)	CPK 9
Approvals / certificates	General purpose	General purpose

pH Enamel coated sensor

	Ceramax CPS 341D Memosens for hygienic use
	
Application	Water, active ingredient prep, fermentation, biotechnology, food/beverage
Parameter	pH, temperature
Material	Porcelain enamel metal substrate (PEMS)
Measuring range	-2 to 14 pH (0 to 10 pH linear range); 32 to 280°F measuring range
Temperature	+32 to +280°F
Temperature sensor	NTC 30KΩ
Process pressure	0 to 87 psi
Process connection	3/4", 1" threaded; 2" Tri-clamp
Reference	Ag/AgCl with 3 M KCl and inhibitor
Length	120 mm
Sensor cable	CYK 10
Approvals / certificates	General purpose

pH / ORP holder assemblies

	Dipfit W CPA 510	**Dipsys CPA 530**	**Dipfit W CPA 111**	**Dipfit P CPA 140**	**Flowfit P CPA 240**	**Flowfit W CPA 250**
						
Application	Water, wastewater, process	Water, wastewater, process	Water, wastewater, process	Process	Process	Water
Description	Single installation point for 120 mm, bayonet style holder	Single installation point, 120 mm electrode, PVC suspended holder, bayonet	3 installation points for 120 mm electrodes, bayonet style holder	3 installation points for 120 mm electrodes, bayonet style holder	3 installation points for 120 mm electrodes	3 installation points for 120 mm electrodes
Area of use	Open tank, channel, closed tank	Open tank, ducts, tall tanks	Open tank, channel, closed tank	Closed tank	Piping or bypass	Piping or bypass
Process connection	DN 50 (2") oval flange, 316 SS hanging bracket, DN 50 (2") flange	DN 50 (2") oval flange, 316 SS hanging bracket, DN 50 (2") flange	Suspended, lap joint flange or adjustable flange	3" Class 150 ANSI flange	1" Class 150 ANSI flange	1" Class 150 ANSI flange or G1 thread
Material	PVC, PVDF	PVC	Polypropylene	PVDF or 316L SS	PVDF or 316L SS	Polypropylene
Maximum pressure	87 psi	43 psi	60 psi	90 or 145 psi	120 or 145 psi	90 psi
Maximum temperature	+122°F	+68°F (+122°F non-pressurized)	+180°F	+250 or +300°F	+250 or +300°F	+180°F
Immersion depth	20 to 118 inches	Up to 33 feet	20 to 118 inches	20 to 100 inches	N/A	N/A
Sensor connection thread	Pg 13.5	Pg 13.5	3 x Pg 13.5	3 x Pg 13.5	3 x Pg 13.5	3 x Pg 13.5
Certificates	N/A	N/A	N/A	3.1.B EN 10204	3.1.B EN 10204	N/A
Associated cleaning systems	Cleaning can be accomplished without electrode removal	N/A	Integrated spray cleaning CPR 31 or external spray CPR 30	Integrated spray cleaning CPR 31	Spray cleaning connection G 1/2	Spray cleaning connection with CPR 3

pH / ORP holder assemblies

	Unifit H CPA 442	**Cleanfit W CPA 450**	**Probfit CPA 463S**	**Cleanfit P CPA 471**	**Cleanfit P CPA 472**
					
Application	Food, pharmaceuticals	Water, wastewater, process	Chemical, water, process	Water, wastewater, process	Water, wastewater, process
Description	Single 120 mm electrode with or without protection guard	Manual operation, 120 mm electrode	Pneumatic operation with flushing chamber, 120 mm electrode	Manual or pneumatic, can be fully automated with CPC30/310	Manual or pneumatic, can be fully automated with CPC30/310
Area of use	Open and closed tanks, piping	Open tank or closed tank and piping	Tank or piping	Tank or piping (min. 3" diameter)	Tank or piping (min. 3" diameter)
Process connection	1-1/2", 2" Tri-clamp, Weld socket	1-1/4" NPT or 1-1/4" Class 150 ANSI flange	2" Class 150 ANSI flange	2" Class 150 ANSI flange, 2" Tri-clamp, Varivent, 1-1/4" NPT	2" Class 150 ANSI flange, 1" NPT
Material	316L SS	316L SS, Alloy C4, titanium	PVDF, 316L SS, Alloy C4, PEEK	316L SS	Polypropylene, PVDF, PEEK
Maximum pressure	145 psi	60 psi	87 psi	60, 90, or 145 psi	60 or 90 psi
Maximum temperature	+285°F	+265°F	+68°F or +212°F (SS, Alloy C4)	+180 or +285°F	+140 or +180°F
Immersion depth	0.4 to 3.4 inches	Up to 28 inches	6.5" or 10.4"	2.6 to 8.2 inches	2.6 to 8.5 inches
Sensor connection thread	Pg 13.5	Pg 13.5	Pg 13.5	Pg 13.5	Pg 13.5
Certificates	3-A, 3.1.B EN 10204	3.1.B EN 10204	3.1.B EN 10204	3.1.B EN 10204	N/A
Associated cleaning systems	N/A	Rinse chamber connection G 1/4	Integrated rinse chamber, can be combined with automatic Airtrol calibration system	Integrated rinse chamber with connection, 1/4" NPT	Integrated rinse chamber with connection, 1/4" NPT

pH / ORP holder assemblies

	Cleanfit P CPA 472D	**Cleanfit P CPA 473**	**Cleanfit P CPA 474**	**Cleanfit H CPA 475**	**Cleanfit P CPA 477**	**Echofit CPA 640**
						
Application	Chemical, power, process	Water, wastewater, process	Water, wastewater, process	Food, pharmaceuticals	Chemical, wastewater	Replacement kit
Description	Manual or pneumatic, can be fully automated with CPC30/310	Manual or pneumatic, can be fully automated with CPC30/310	Manual or pneumatic, can be fully automated with CPC30/310	Manual or pneumatic, can be fully automated with CPC30/310	Pneumatic with pneumatic or electric limit switches	Single installation point, 12 mm dia. glass electrodes, 120 mm
Area of use	Tank or piping (min.4" diameter)	Tank or piping (min. 3" diameter)	Tank or piping (min. 3" diameter)	Tank or piping (min. 3" diameter)	Tank or piping (min. 3" diameter)	Process connection adapter for various electrodes
Process connection	2" Class 150 ANSI flange	2" Class 150 ANSI	2" Class 150 ANSI	2" Tri-clamp 2" Class 150 ANSI flange	Slotted nut Rd 65 x1/6	1/2" NPT, 3/4" NPT, 1" NPT
Material	PVDF, PEEK, 316L SS, Hastelloy C4, Titanium	316L SS	Polypropylene, PVDF, PEEK	316L SS	316L SS	PVDF, 316 Ti SS
Maximum pressure	60 or 145 psi	60, 90, or 145 psi	60, 90, or 145 psi	60, 90, or 145 psi	87 psi	150 psi
Maximum temperature	+32 to +284°F	+180 or +285°F	+180 or +265°F	+180 or +285°F	+40 to +194°F	+70°F (+285°F, SS version)
Immersion depth	5.8 to 11.2 inches	2.4 to 9.3 inches	2.8 to 8.1 inches	1.9 to 4 inches	4.7 inches	1", 2", 3.4"
Sensor connection thread	Pg 13.5	Pg 13.5	3/4" NPT (CPF 81/82)	Pg 13.5	Pg 13.5	Pg 13.5
Certificates	3.1.B EN 10204	3.1.B EN 10204	N/A	3-A, 3.1.B EN 10204	N/A	N/A
Associated cleaning systems	Integrated rinse chamber with connection, 1/4" NPT	Integrated rinse chamber with connection, 1/4" NPT	Integrated rinse chamber with connection, 1/4" NPT	Integrated rinse chamber with connection, 1/4" NPT	Integrated rinse chamber with connection, 1/4" NPT, ½" NPT	N/A

Modular holder assemblies

	Flexdip CYH 112	**Flexdip CYA 112**
		
Application	Water and wastewater	Water and wastewater
Description	Single installation point, flexible holder system: for floor, wall or rail mounting	Standard immersion pipe, chain immersion pipe or floater immersion pipe
Area of use	Basins, open channels, open tanks, process vats	Basins, open channels, open tanks, process vats
Sensor installation	Cantilever arm with chain, fixed immersion pipe, free swinging or float-lever version for varying levels	Various sensor connection threads or chain mount adapter. Straight or 45° angle mounting
Compatible sensor holder assemblies	Flexdip CYA112, Dipfit W CLA111, Dipfit W CPA111	Flexdip CYH112
Material	Stainless steel and plastic	Stainless steel and PVC
Ambient temperature	-4 to +140°F	-4 to +140°F
Main pipe height	20", 40", 71"	Lengths vary depending on application
Cantilever arm length	20", 40", 59"	N/A

pH / ORP Transmitters

	Mycom S CPM 153	**Liquisys M CPM 223/253**	**Liquiline M CM 42**	**Liquiline CM 330** **Dual channel**
				
Application	Chemical, pharmaceutical, food, water	Chemical, pharmaceutical, food, water	Chemical, pharmaceutical, food, water	Water, wastewater
Measurement type	pH, ORP 4-wire transmitter 1 or 2 measuring circuits, up to 5 relays	pH, ORP 4-wire transmitter 1 or 2 measuring circuits, 2 or 4 relays	2-wire transmitter for pH, ORP, conductivity, dissolved oxygen, concentration	2-wire transmitter for pH and ORP or Chlorine and pH
Measurement range	pH: -2 to +16 pH ORP: -1500 to +1500 mV Temperature: Pt 100, Pt 1000, NTC, or PTC -58 to +392°F	pH: -2 to +16 pH ORP: -1500 to +1500 mV Temperature: Pt 100, Pt 1000, -58 to +302°F NTC 30K, -4 to +212°F	pH: -2 to +16 pH ORP: -1500 to +1500 mV Temperature: Pt 100, Pt 1000, NTC 30K -10 to +300°F	pH: -2 to +16 pH ORP: -1500 to +1500 mV Chlorine: 0.001 to 50.0 mg/l Temperature: -10 to +300°F
Output	0/4 to 20 mA, 15 VDC (digital) Automatic clean and calibration functions	0/4 to 20 mA, 15 VDC (digital) Automatic clean and calibration functions	1 x 4 to 20 mA + HART, 2 x 4 to 20 mA + HART Automatic clean and calibration functions	2 x 4 to 20 mA
Input	4 to 20 mA, 6 to 30 V, 0 to 10 kOhm, 10 to 50V digital (memosens)	4 to 20 mA, 6 to 30 V, 0 to 10 kOhm, 10 to 50V digital (memosens)	Glass, iSFET, digital (memosens) sensors	Digital (memosens) sensors
Power supply	100 to 230 VAC 24 VAC/VDC	100/115/230 VAC 24 VAC/VDC	12.5 to 30 VDC; Profibus or fieldbus 9 to 32 VDC (non-hazardous) or 9 to 17.5 VDC (hazardous)	12.5 to 30 VDC
Ambient temperature	+14 to +131°F (FM, +14 to +122°F)	+14 to +131°F	-20 to +175°F	-20 to +160°F
Mounting	Wall, pipe	Wall, pipe, panel mount (CPM 223)	Wall, pipe, panel mount	Wall, pipe, panel mount
Operation	Via push buttons and dot matrix LCD display, HART or Profibus-PA, RS 232 (DAT module)	Via push buttons and dot matrix LCD display, HART or Profibus-PA	Via soft keys, LCD display, and navigator; HART, Profibus-PA, and FOUNDATION fieldbus	Via soft keys, LCD display, and navigator
Housing	Aluminum, plastic coated	Field housing: ABS PC Fr, polyester front Panel mount: Polycarbonate, polyester front	Polycarbonate plastic housing or 304 SS housing	Polycarbonate plastic housing
Approvals / certificates	CE, FM, CSA	CE, FM, CSA	CE, FM, CSA, SIL 2	CE

pH / ORP Transmitters

	Liquiline CM 442 **Digital Memosens Transmitter**
	
Application	Water/wastewater, power, chemical, process industries
Measurement type	Memosens transmitter for pH, ORP, conductivity, dissolved oxygen, turbidity, nitrate
Measurement range	Dependent on sensor type
Output	2 or 4 4 to 20 mA, 1 or 2 SPDT relays Automatic clean and calibration functions
Input	1 or 2 digital Memosens sensors (Memosens sensors only)
Power supply	100 to 230 VAC 24 VAC 24 VDC
Ambient temperature	-4 to +140°F
Mounting	Wall, pipe, panel mount
Operation	Via soft keys, LCD display, and navigator; Integration into FieldCare and W@M asset management
Housing	Polycarbonate plastic housing
Approvals / certificates	CE

Automatic cleaning / calibration

	Autoclean/chemoclean CYR 10 / CYR 20	**Topclean S CPC 30**	**Topcal S CPC 310**
			
Application	Chemical, water, wastewater	Pharmaceutical, food, water	Pharmaceutical, food, wastewater, process
Measurement type	pH/ORP	pH/ORP/temperature	pH/ORP/temperature
System capabilities	Cleaning, rinsing	Sterilization, cleaning, rinsing	Calibration, sterilization, cleaning, rinsing
System components *	pH/ORP electrode, electrode holder assembly, program controller, CYR 10 injector, spray nozzle	pH/ORP electrode, pneumatic electrode holder assembly (with pneumatic or electric limit switches), CPG 30 control unit, CYR 10 injector assembly, transmitter CPM 153	pH/ORP electrode, pneumatic electrode holder assembly (with pneumatic limit switches), CPG 310 control unit, buffer/cleaner solutions containers, membrane pumps for buffer and cleaning solutions, rinsing block, transmitter CPM 153
Basic functions	Cleaning time, rinse time, cleaning cycle, weekly program via relays	Cleaning time, rinse time, cleaning cycle, weekly program, daily program, DAT module, electrode holder control, six relay contacts, two current outputs	Cleaning cycle, weekly program, in-process cleaning/calibration, DAT module, electrode holder control, calibration to buffer tables, limit values and alarm functions, digital inputs and outputs, six relay contacts, two current outputs
Power supply	110, 230 VAC 24 VDC	100 to 115 VAC, 230 VAC 24 VC/DC	100 to 230 VAC 24 VC/DC
Ambient temperature	CYR 20: +32 to +122°F CYR 10: +23 to +104°F	CPG 30: +14 to +131°F CYR 10: +23 to +104°F	CPG 310: +14 to +131°F
Mounting	CYR 20: DIN rail mount, panel mount CYR 10: wall mount	CPG 30: wall mount CYR 10: wall mount CPM 153: wall or panel mount	CPG 310: wall mount CPM 153: wall or panel mount
Programming	Push button and 4-digit LCD	Mycom S CPM 153 transmitter, HART, Profibus-PA	Mycom S CPM 153 transmitter, HART, Profibus-PA
Housing	CYR 20: PC/ ABS CYR 10: PVC	CPG 30: Polyester GF CYR 10: PVC CPM 153: aluminum, plastic coated	CPG 310: Polyester GF CPM 153: aluminum, plastic coated
Approvals / certificates	General purpose	FM, CSA	CE, FM, CSA

* Electrode, electrode holder, spray nozzles are purchased separately

Memosens

	
Application	Food and beverage, chemical, water, wastewater, process industries
Description	Digital transmission of pH signals via cable using contact-less inductive connection. Current calibration data is stored in sensor head.
Area of use	Used with CPS 11D, 71D, 91D, CPS 441D, 471D, and 491D memosens pH electrodes and connects to CPM 153, Liquiline CM 42 CPM 223/253 transmitters via CYK 10 cable
Electrode connection	Twist-lock plug-in connector, water tight
Material	Sensor plug-in: PPS-40GF Cable coupling: PEEK
Process temperature	Depending on sensor, max. +275°F
Process pressure	Depending on sensor, operated up to a safety pressure of 725 psi at +275°F
Certificates	Data cable CYK 10: FM, CSA

Memocheck *

	Memocheck Plus CYP01D Memocheck CYP02D Memocheck Sim CYP03D
	
Application	Test tools for measuring points with Memosens to simulate digital signal transmission
Area of use	Checking all parameters of pH, ORP, conductivity, dissolved oxygen, chlorine, turbidity, nitrate Connects to any transmitter with Memosens technology
Transmitter connection	CYK10 data cable, twist-lock memosens coupling
Material	CYP01D/CYP02D: PET (white plastic), PPS GF 40 (blue plastic) CYP03D: ABS (UL 94 HB)
Power supply	CYP03D only: 3 AA 1.5 V batteries
Ambient temperature	CYP01D/CYP02D: 5 to 158°F CYP03D: 0 to 122°F
Certificates	FM, CSA (CYP03D, non-hazardous only)

* Depending on order code selection, the Memocheck system can be used for ORP, conductivity, chlorine, dissolved oxygen, turbidity, and nitrate. Contact Endress+Hauser for details.

Analysis conductivity

Conductivity sensors

	Condumax W CLS 12	Condumax W CLS 13	Condumax W CLS 15, CLS15D with Memosens	Condumax H CLS 16, CLS16D with Memosens	Condumax W CLS 19 Compact	Condumax W CLS 21, CLS21D with Memosens	Condumax W CLS 30
							
Application	Industrial, water	Industrial high temperature	Pure, ultrapure water	Pure, ultrapure water	Pure, ultrapure water	Water, wastewater	Industrial, water
Parameter	Conductivity	Conductivity	Conductivity	Conductivity	Conductivity	Conductivity	Conductivity
Material	316L SS	316 Ti SS	316L SS	316L SS	316Ti SS	Graphite	Graphite / titanium
Measuring range	0.04 to 20 µS/cm 0.1 to 200 µS/cm	0.04 to 20 µS/cm 0.1 to 200 µS/cm	0.04 to 20 µS/cm 0.1 to 200 µS/cm	0.04 to 500 µS/cm	0.04 to 20 µS/cm 0.1 to 200 µS/cm	10 µS/cm to 20 mS/cm	0.1 mS/cm to 200 mS/cm
Temperature	-22 to +320°F	-4 to +482°F	Threaded: -4 to +212°F Tri-clamp: -4 to +266°F -4 to +248°F CLS15D	23 to 248°F 23 to 266°F, CLS16D	+14 to 140°F	-4 to +275°F	-4 to +257°F, PTFE -4 to +194°F, PP
Temperature sensor	Integrated Pt 100	Integrated Pt 100	Pt 100, NTC (CLS15D)	Pt 100/1000, NTC (CLS16D)	Integrated Pt 100	Pt 100, NTC (CLS21D)	Integrated Pt 100/PTC
	580 psi (up to +212°F) 174 psi (up to +302°F)	580 psi	174 psi at 68°F	174 psi at 68°F	87 psi	232 psi at 68°F	87 psi (PTFE) 232 psi (PP)
Insertion depth	Minimum 2"	Minimum 2"	Minimum 1.26"	Minimum 0.79"	Minimum 1.38"	Minimum 0.63"	Minimum 2.5"
Process connection	1" NPT (316 Ti SS)	1" NPT (316 Ti SS)	Fixed cable: 1/2" NPT (PES), 1-1/2" Tri-clamp (316L SS) Connector: 3/4" NPT (PES), 1-1/2" Tri-clamp (316L SS)	1", 1-1/2", 2" Tri-clamp (316L SS), 2 to 5" Varivent	1/2" NPT (PES)	3/4" NPT (PES) 1" NPT (PES) 2" Tri-clamp (PES or SS)	1" NPT (316 Ti SS, PES) 3/4" NPT (PES)
Sensor cable	CYK 71	CYK 71	CYK 71, CYK10 (CPS15D)	CPK 9, CYK10 (CLS16D)	CYK 71	CYK 71, CYK10 (CPS21D)	CYK 71
Approvals / certificates	FM (when used with CLM 431 and CLM 153 transmitters)	FM (when used with CLM 431 and CLM 153 transmitters)	FM (when used with CLM 431 and CLM 153 transmitters)	FM (when used with CLM 431 and CLM 153 transmitters), 3-A	General purpose	FM (when used with CLM 431 and CLM 153 transmitters)	FM (when used with CLM 431 and CLM 153 transmitters)

Conductivity sensors

	Indumax P CLS 50 CLS 50D with Memosens	Indumax H CLS 52	Indumax H CLS 54
			
Application	Chemical, process	Food, beverage, pharmaceutical	Food, beverage, pharmaceutical
Parameter	Conductivity	Conductivity	Conductivity
Material	PFA/PEEK	PEEK	Virgin PEEK
Measuring range	2 µS/cm to 2000 mS/cm	10 µS/cm to 2000 mS/cm	100 µS/cm to 2000 mS/cm
Temperature	-4 to +356°F	+23 to +257°F	+14 to +257°F
Temperature sensor	Integrated Pt 100	Integrated Pt 100	Integrated Pt 1000
Process pressure	290 psi (without flange) 232 psi (with flange)	232 psi	232 psi
Insertion depth	Sensor head must be completely submerged	Minimum 1.3"	Sensor head must be completely submerged
Process connection	1" NPT (PEEK) 2" Class 150 ANSI (PVDF) 2" Class 150 ANSI (316L SS)	2" Tri-clamp 2" Perlick Varivent	2" Tri-clamp Varivent NEUMO BioControl D50
Sensor cable	Fixed cable	CLK 5 fixed cable	CLK 5 fixed cable
Approvals / certificates	FM (when used with CLM 431 and CLM 153 transmitters)	General purpose	General purpose, 3-A, EHEDG, FDA, USP class VI, FM (when used with CM 42 Liquiline M)

Conductivity holder assemblies

	Dipfit W CLA 111	Dipfit P CLA 140
		
Application	Water, wastewater, process	Chemical, wastewater, process
Description	Single installation point, CLS 21 or CLS 50 electrode, immersion holder	Single installation point for CLS 50 electrode, immersion holder, bayonet style
Area of use	Open channels, basins, tanks	Open tank, channel, closed tank
Process connection	Adjustable flange, suspension bracket, mounting bracket	3" Class 150 ANSI flange
Material	Polypropylene	316L SS, PVDF
Maximum pressure	Non-pressurized systems	145 psi
Maximum temperature	+176°F	+302°F
Immersion depth	3 ft to 10 ft	1.5 to 7.5 ft
Sensor connection thread	G 1, G 3/4	G 3/4
Certificates	N/A	N/A
Associated cleaning systems	External spray cleaning (CLR 30 spray head)	N/A

Conductivity Transmitters

	Smartec S CLD 132	Smartec S CLD 134	Liquiline M CM 42	Mycom S CLM 153	Liquisys M CLM 223/253
					
Application	Chemical, beverage, water	Food, beverage, pharmaceutical and biotech	Chemical, pharmaceutical, food, water	Chemical, pharmaceutical, food, water	Ultrapure water, water treatment, cooling water
Measurement type	Conductivity 4-wire transmitter	Conductivity 4-wire transmitter	2-wire transmitter for pH, ORP, conductivity, dissolved oxygen, concentration	Conductivity 4-wire transmitter 1 or 2 measuring circuits, up to 5 relays	Conductivity 4-wire transmitter 1 or 2 measuring circuits, 2 or 4 relays
Measurement range	Conductivity: 0 µS/cm to 2000 mS/cm Temperature: +14 to +302°F	Conductivity: 100 µS/cm to 2000 mS/cm Concentration: 0 to 30% Temperature: -31 to +482°F	Conductivity: 0.1 µS·k to 20 mS·k Resistivity: 10 MΩ/k to 50 Ω/k Concentration: 0 to 30% Temperature: Pt 100, Pt 1000	Conductivity: 0.04 µS/cm to 2000 mS/cm Temperature: Pt 100/Pt 1000, -31 to +482°F, NTC, -31 to +482°F	Conductivity: 0.01 µS/cm to 1000 mS/cm Temperature: Pt 100, -31 to +482°F
Output	0/4 to 20 mA, HART, Profibus	0/4 to 20 mA, HART, Profibus, temperature	1 x 4 to 20 mA + HART, 2 x 4 to 20 mA + HART Automatic clean and calibration functions	0/4 to 20 mA, 15 VDC (digital) Automatic clean and calibration functions	0/4 to 20 mA, 15 VDC (digital) Automatic clean and calibration functions
Input	0/4 to 20 mA 10 to 50 V digital (inputs 1 and 2)	0/4 to 20 mA 10 to 50 V digital (inputs 1 and 2), Pt1000 switchable to Pt100	Analog sensors, two and four electrode, conductivity (inductive and resistive), concentration	4 to 20 mA, 6 to 30 V, 0 to 10 kOhm, 10 to 50V digital	0 to 2000 mS/cm, 10 to 50 VDC (digital)
Power supply	100/115/ 230 VAC 24 VAC/VDC	100/115/ 230 VAC 24 VAC/VDC	12.5 to 30 VDC; Profibus or fieldbus 9 to 32 VDC, (non-hazardous) or 9 to 17.5 VDC (hazardous)	100 to 230 VAC 24 VAC/VDC	100/115/230 VAC 24 VAC/VDC
Ambient temperature	-13 to +158°F	32 to +131°F	-20 to +175°F	+14 to +131°F (FM, +14 to +122°F)	+14 to +131°F
Mounting	Compact: direct via CLS 52 sensor Remote: Wall, pipe	Compact: direct via CLS 54 sensor Remote: Wall, pipe	Wall, pipe, panel mount	Wall, pipe, panel mount	Wall, pipe, panel mount (CPM 223)
Operation	Via push buttons and LCD display, HART or Profibus PA/DP	Via push buttons and LCD display, HART or Profibus PA/DP	Via soft keys, LCD display, and navigator HART, Profibus-PA, and FOUNDATION fieldbus	Via push buttons and dot matrix LCD display, HART or Profibus-PA, RS 232 (DAT module)	Via push buttons and dot matrix LCD display, HART or Profibus-PA
Housing	304 SS	304 SS	Polycarbonate plastic housing or 304 SS housing	Aluminum, plastic coated	Field housing: ABS PC Fr, polyester front Panel mount: Polycarbonate, polyester front
Approvals /certificates	General purpose	General purpose, 3-A, EHEDG, FDA, USP class VI	CE, FM, CSA, SIL 2	CE, FM, CSA	CE, FM, CSA

Conductivity transmitter

	Liquisys S CLM 223 F
	
Application	Food, beverage
Measurement type	Conductivity and resistance 4-wire transmitter, 3 relays, 2nd current output for temperature
Measurement range	Conductivity: 0 to 200 mS/cm Resistance: 0 to 200 MΩ Temperature: Pt 100, Pt 1000, NTC -31 to +482°F
Output	0/4 to 20 mA, 15 VDC (digital)
Input	0/4 to 20 mA, 0 to 2000 mS/cm, 10 to 50 VDC (digital)
Power supply	100/115/230 VAC 24 VAC/VDC
Ambient temperature	+14 to +131°F
Mounting	Panel mount
Operation	Via push buttons and dot matrix LCD display
Housing	Panel mount: Polycarbonate, polyester front
Approvals / certificates	General purpose

Conductivity transmitter, Memosens

	Liquiline CM 442 Digital Memosens Transmitter
	
Application	Water/wastewater, power, chemical, process industries
Measurement type	Memosens transmitter for pH, ORP, conductivity, dissolved oxygen, turbidity, nitrate
Measurement range	Dependent on sensor type
Output	2 or 4 4 to 20 mA, 1 or 2 SPDT relays Automatic clean and calibration functions
Input	1 or 2 digital Memosens sensors (Memosens sensors only)
Power supply	100 to 230 VAC 24 VAC 24 VDC
Ambient temperature	-4 to +140°F
Mounting	Wall, pipe, panel mount
Operation	Via soft keys, LCD display, and navigator; Integration into FieldCare and W@M asset management
Housing	Polycarbonate plastic housing
Approvals / certificates	CE

Conductivity calibration	
	Conductivity calibration Concal 
Application	Pharmaceutical, food, ultrapure water
Measurement type	Conductivity calibration
Measurement range	Up to 20 µS/cm or MΩ, adjustable
Reference electrode	CLS 15
Reference transitter	CLM 153
Power supply	115 VAC
Fluid temperature range	+32 to +212°F
Pressure maximum	87 psi (flow assembly)
Minimum flow	0.13 GPM (flow assembly)
Approvals / certificates	ASTM 5391-93

Conductivity calibration solutions	
	Precision calibration solution CLY 11 
Application	Field calibration for conductivity electrodes
Measurement type	Conductivity
Calibration solution (at +76°F)	CLY 11-A: 74.0 µS/cm CLY 11-B: 149.6.0 µS/cm CLY 11-D: 11.64 mS/cm CLY 11-E: 107.00 mS/cm
Storage temperature	+14 to +122°F
Approvals / certificates	Traceable to: ASTM 5391-93

Analysis chlorine

Chlorine sensors

	Total chlorine CCS 120	**Free chlorine CCS 140/141**	**Chlorine dioxide CCS 240/241**	**Free chlorine Chloromax CCS142D**
				
Application	Drinking, industrial water	Drinking, industrial water	Drinking, industrial water	Drinking, process, industrial water
Parameter	Total chlorine	Free chlorine	Chlorine dioxide	Free chlorine
Material	PVC, PPE membrane	PVC, PTFE membrane (membrane cap replaceable)	PVC, PTFE membrane (membrane cap replaceable)	PVDF, PTFE membrane (membrane cap replaceable)
Measuring range	0.1 to 10 ppm	CCS 140: 0.05 to 20 mg Cl_2/l CCS 141: 0.01 to 5 mg Cl_2/l (CCS 140/141, at +76°F, pH 7.2)	CCS 240: 0.05 to 20 ppm ClO_2 CCS 241: 0.01 to 5 ppm ClO_2	142D-A: 0.05 to 20 mg/l Cl_2 142D-G: 0.01 to 5 mg/l Cl_2 (A and G, at 77°F, pH 7.2)
Temperature	+41 to +113°F	CCS 140: +50 to +113°F CCS 141: +35 to +113°F	CCS 240/241: +35 to +113°F	+41 to +122°F
pH value range	6.5 to 9.5 pH	CCS 140: 4 to 8 pH CCS 141: 4 to 8.2 pH	CCS 240/241: in stability range of ClO_2	0 to 14 pH
Temperature sensor	Integrated NTC	Integrated NTC	Integrated NTC	
Maximum back pressure	14.5 psig	14 psig	15 psig	14.5 psig
Installation	CCA 250 flow holder	CCA 250 flow holder	CCA 250 flow holder	CCA 250 flow holder, CYH 112
Sensor cable	4-wire, 15 ft, double-shielded	4-wire, 15 ft, double-shielded	4-wire, 15 ft, double-shielded	CYK10 Memosens cable
Transmitter	Liquisys M CCM 223/253	Liquisys M CCM 223/253	Liquisys M CCM 223/253	Liquiline CM44, CM330

Chlorine flow holder assembly

	Flowfit W CCA 250
	
Application	Drinking, industrial water
Description	Flow assembly designed to hold chlorine or chlorine dioxide sensors for measurement of free chlorine and chlorine dioxide
Material	Plexiglass (PMMA), PVC, 316Ti SS
Maximum pressure	14 psig with sensors at +104°F
Maximum temperature	+113°F
Measured water flow	7 to 30 gal/hr, adjustable needle valve
Sensor connection	Two Pg 13.5 for pH and/or ORP electrodes (120 mm only) One internal threaded connection for CCS series electrode

Modular holder assemblies

	Flexdip CYH 112	**Flexdip CYA 112**
		
Application	Water and wastewater	Water and wastewater
Description	Single installation point, flexible holder system: for floor, wall or rail mounting	Standard immersion pipe, chain immersion pipe or floater immersion pipe
Area of use	Basins, open channels, open tanks, process vats	Basins, open channels, open tanks, process vats
Sensor installation	Cantilever arm with chain, fixed immersion pipe, free swinging or float-lever version for varying levels	Various sensor connection threads or chain mount adapter. Straight or 45° angle mounting
Compatible sensor holder assemblies	Flexdip CYA112, Dipfit W CLA111, Dipfit W CPA111	Flexdip CYH112
Material	Stainless steel and plastic	Stainless steel and PVC
Ambient temperature	-4 to +140°F	-4 to +140°F
Main pipe height	20", 40", 71"	Lengths vary depending on application
Cantilever arm length	20", 40", 59"	N/A

Analysis chlorine

Chlorine Transmitters		
	Liquisys M CCM 223/253 	**Liquiline CM 330 Dual channel** 
Application	Drinking water, cooling water, food processing	Water, wastewater
Measurement type	Chlorine/chlorine dioxide 4-wire transmitter 1 or 2 measuring circuits, 2 or 4 relays Measures pH and temperature	2-wire transmitter for pH and ORP or Chlorine and pH
Measurement range	CCS 140/240: 0.05 to 20 ppm CCS 141/241: 0.01 to 5 ppm Temperature: +35 to +110°F	pH: -2 to +16 pH ORP: -1500 to +1500 mV Chlorine: 0.001 to 50.0 mg/l Temperature: -10 to +300°F
Output	0/4 to 20 mA, 15 VDC (digital)	2 x 4 to 20 mA + HART
Input	4 to 20 mA, 10 to 50 V (digital)	Digital (memosens) sensors
Power supply	100/115/230 VAC 24 VAC/VDC	12.5 to 30 VDC
Ambient temperature	+14 to +131°F	-20 to +160°F
Mounting	Wall, pipe, panel mount (CPM 223)	Wall, pipe, panel mount
Operation	Via push buttons and dot matrix LCD display, HART or Profibus	Via soft keys, LCD display, and navigator
Housing	Field housing: ABS PC Fr, polyester front Panel mount: Polycarbonate, polyester front	Polycarbonate plastic housing
Approvals / certificates	CSA general purpose	CE

Compact Chlorine Measuring Station		
	CCE10 	**CCE11** 
Application	Drinking water, industrial water, swimming pool water - chlorine dosing in water treatment	Drinking water, industrial water, swimming pool water – quality control and monitoring in distribution networks
Description	Factory assembled panel for measurement of free chlorine, chlorine dioxide or total chlorine as well as pH and temperature	Factory assembled panel for measurement of free chlorine, pH and temperature
Sensors	Analog sensors for free chlorine and pH	Digital sensors with Memosens for free chlorine and pH
Sensor holder	Flowfit CCA250 assembly	Flowfit CCA250 assembly
Transmitter	Liquisys M CCM253	Liquiline CM330 Memosens
Measurement range	Dependent on sensor specified	Dependent on sensor specified
Output	0/4 to 20 mA, active	0/4 to 20 mA, passive
Power supply	110/115/230 VAC 24 V AC/DC	12.5 to 30 VDC
Ambient temperature	32 to 120°F	32 to 120°F
Process pressure	Maximum 58 psi at 104°F	Maximum 58 psi at 104°F
Flow rate	7.9 to 31.7 gal/h, adjustable Optimum: 7.9 gal/h	7.9 to 31.7 gal/h, adjustable Optimum: 7.9 gal/h
Operation	Via push button and dot matrix LCD display, HART, Profibus PA/DP	Via 4 soft keys, LCD display and navitgator
Approvals / certificates	CSA general purpose	CE

Compact Chlorine System	
	CCE1 / CCE3 
Application	Drinking water, industrial water, swimming pool water
Description	Factory assembled panel for simple measurement of free chlorine, pH, ORP value and temperature. Assembled and wired panel includes installed tubing, dirt-trap, sampling cock for DPD calibration sample. Check valve and various connectors plus CCA250 flow assembly. Transmitter, sensors and cable ordered separately depending on application requirements.

Dissolved oxygen sensors			
	Oxymax W COS 31 	**Oxymax W COS 41** 	**Oxymax W COS 71** 
Application	Water, wastewater, fish farming	Water, wastewater, fish farming	Water, boiler feed water
Parameter	Dissolved oxygen	Dissolved oxygen	Dissolved oxygen
Material	316 Ti SS, POM membrane cap	POM	316 Ti SS, POM membrane cap
Measuring range	0.05 to 60 ppm	0.05 to 20 ppm	0.001 to 20 ppm
Temperature sensor	Integrated NTC	Integrated NTC	Integrated NTC
Ambient temperature	+23 to +122°F	+23 to +122°F	+23 to +122°F
Process temperature	+32 to +266°F	+23 to +122°F	+23 to +122°F
Process pressure	0 to 145 psi	0 to 145 psi	0 to 145 psi
Process connection	G 1 thread	3/4" or G 1 thread	G 1 thread
Immersion depth	Submersible	Submersible	Submersible
Sensor cable	Fixed or TOP 68 connector	Fixed or TOP 68 connector	Fixed or TOP 68 connector
Transmitter	Liquisys M COM 223/253	Liquisys M COM 223/253	Liquisys M COM 223/253

Dissolved oxygen sensors			
	Oxymax COS 22 **COS 22D Digital sensor** 	**Oxymax W COS 51D** **Digital sensor** 	**Oxymax W COS 61,** **COS 61D Digital sensor** **(Optical sensor)** 
Application	Food, pharmaceutical, biotech	Water, wastewater, fish farming	Water, wastewater, fish farming
Parameter	Dissolved oxygen	Dissolved oxygen	Dissolved oxygen
Material	316L SS, Silicone membrane cap (FDA), PTFE, steel mesh	POM	316 Ti SS, POM, Silicon (fluorescence layer)
Measuring range	0.01 to 60 mg/l 0 to 600% saturation 0 to 1200 hPa 0 to 25 Vol%	0.01 to 100 ppm 0.00 to 100% saturation 0 to 2000 hPa	0 to 20 ppm 0 to 200% saturation 0 to 400 hPa
Temperature sensor	Integrated NTC	Integrated NTC	Integrated NTC
Ambient temperature	23 to 175°F	20 to 120°F	-4 to +140°F
Process temperature	23 to 175°F	20 to 120°F	20 to +140°F
Process pressure	0 to 174 psi	0 to 145 psi	0 to 145 psi
Shaft length	120, 225, 360, 420 mm	N/A	N/A
Process connection	PG 13.5 thread	3/4" NPT or G1 thread	G 1 thread
Sensor cable	COK21 (COS22), CYK10 (22D)	CYK10	Fixed, TOP 68 connector
Transmitter	Liquisys M COM 223/253 Liquiline CM42 Liquisys COM 223/253F	Liquiline CM42, Liquisys M COM 223/253 Liquisys M COM 223F/253F	Liquisys M COM 223/253 Liquiline CM42

Analysis dissolved oxygen

Dissolved oxygen holder assembly

	Flowfit W COA 250	Flowfit W COA 260	Cleanfit COA 451
			
Application	Water, wastewater	Water, boiler feed water	Water, wastewater
Description	Flow assembly designed for bypass system, for dissolved oxygen sensor COS 31 or COS 41 and 1 CUR 3 cleaner spray head	Flow assembly designed to hold dissolved oxygen sensor COS 71, plate or wall mount	Manually operated SS holder assembly with ball valve and rinse connections, designed to hold COS 31 or COS 41
Material	PVC	Flow vessel, 316L SS	316L SS
Maximum pressure	87 psi at +68°F	145 psi at +122°F	145 psi (29 psi for manual operation)
Maximum temperature	+122°F	+122°F	+32 to +122°F
Flow rate	26 to 260 gal/hr	0.05 to 0.16 gpm	N/A, must be constant flow
Sensor connection	Threaded mounting sleeve with union nut	Internal, with pressing screw assembly	Internal, with sensor external threads
Holder installation	Bypass line	Wall mount or mounting plate	Weld neck, 2" Class 150 ANSI flange

Modular holder assemblies

	Flexdip CYH 112	Flexdip CYA 112
		
Application	Water and wastewater	Water and wastewater
Description	Single installation point, flexible holder system: for floor, wall or rail mounting	Standard immersion pipe, chain immersion pipe or floater immersion pipe
Area of use	Basins, open channels, open tanks, process vats	Basins, open channels, open tanks, process vats
Sensor installation	Cantilever arm with chain, fixed immersion pipe, free swinging or float-lever version for varying levels	Various sensor connection threads or chain mount adapter. Straight or 45° angle mounting
Compatible sensor holder assemblies	Flexdip CYA112, Dipfit W CLA111, Dipfit W CPA111	Flexdip CYH112
Material	Stainless steel and plastic	Stainless steel and PVC
Ambient temperature	-4 to +140°F	-4 to +140°F
Main pipe height	20", 40", 71"	Lengths vary depending on application
Cantilever arm length	20", 40", 59"	N/A

NOTE: Other holder assemblies are available, refer to pH holder information for:
CPA240, CPA450, CPA475, CPA442

Dissolved oxygen transmitters

	Liquisys M COM 223/253	Liquisys M COM 223F/253F	Liquiline CM 42	Liquiline CM 442 Digital Memosens Transmitter
				
Application	Water, Wastewater	Food and pharmaceutical	Chemical, pharmaceutical, food, water	Water/wastewater, power, chemical, process industries
Measurement type	Dissolved oxygen 4-wire transmitter 1 or 2 measuring circuits, 2 or 4 relays Measures O_2 and temperature	Dissolved oxygen 4-wire transmitter 1 or 2 measuring circuits, 2 or 4 relays Measures O_2 and temperature	2-wire transmitter for pH, ORP, conductivity, dissolved oxygen, concentration	Memosens transmitter for pH, ORP, conductivity, dissolved oxygen, turbidity, nitrate
Measurement range	O_2 measurement: 0.05 to 60 ppm or 0 to 200% saturation Temperature: +14 to +140°F	O_2 measurement: 0.1 to 20 ppm or 0 to 200% saturation Temperature: +14 to +140°F	0.0 to 100.0 ppm, 0 to 1000 % saturation, 0 to 2000 hPa Temperature: -10 to +300°F	Dependent on sensor type
Output	0/4 to 20 mA, 15 VDC (digital)	0/4 to 20 mA, 15 VDC (digital)	1 x 4 to 20 mA + HART, 2 x 4 to 20 mA + HART Automatic clean and calibration functions	2 or 4 4 to 20 mA, 1 or 2 SPDT relays Automatic clean and calibration functions
Input	4 to 20 mA, 10 to 50 V (digital)	4 to 20 mA, 10 to 50 V (digital)	Digital (memosens) sensors	1 or 2 digital Memosens sensors (Memosens sensors only)
Power supply	100/115/230 VAC 24 VAC/VDC	100/115/230 VAC 24 VAC/VDC	12.5 to 30 VDC; Profibus or fieldbus 9 to 32 VDC (non-hazardous) or 9 to 17.5 VDC (hazardous)	100 to 230 VAC 24 VAC 24 VDC
Ambient temperature	+14 to +131°F	+14 to +131°F	-20 to +175°F	-4 to +140°F
Mounting	Wall, pipe, panel mount (CPM 223)	Wall, pipe, panel mount (CPM 223F)	Wall, pipe, panel mount	Wall, pipe, panel mount
Operation	Via push buttons and dot matrix LCD display, HART or Profibus	Via push buttons and dot matrix LCD display, HART or Profibus	Via soft keys, LCD display, and navigator HART, Profibus-PA, and FOUNDATION fieldbus	Via soft keys, LCD display, and navigator; Integration into FieldCare and W@M asset management
Housing	Field housing: ABS PC Fr, polyester front Panel mount: Polycarbonate, polyester front	Field housing: ABS PC Fr, polyester front Panel mount: Polycarbonate, polyester front	Polycarbonate plastic housing or 304 SS housing	Polycarbonate plastic housing
Approvals / certificates	CSA general purpose	CSA general purpose	CE, FM, CSA, SIL 2	CE

Analysis turbidity

Turbidity sensors				
	Turbimax W CUS 31 	**Turbimax W CUS 41** 	**Turbimax W CUS 65** 	**Turbimax CUS 51D with Memosens** 
Application	Drinking water, industrial water	Water, wastewater	Water, boiler feeder water	Water, wastewater
Parameter	Turbidity	Turbidity	Turbidity	Turbidity
Measurement method	90° scattered light, 880 nm	90° scattered light, 880 nm	4-beam pulsed light, 880 nm	90°, 135°, 4-beam pulsed light 860 nm
Material	PVC, sapphire optical window	PVC, sapphire optical window	316L SS, POM optical window	316L SS, sapphire optical window
Measuring range	0.000 to 9999 FNU 0.00 to 2000 ppm 0 to 200.0%	0.000 to 9999 FNU 0.00 to 2000 ppm 0 to 200.0%	1 to 1000 FNU 0 to 150 ppm	1 to 9999 FNU 0 to 150 g/l 0 to 15%
Temperature sensor	Integrated NTC	Integrated NTC	N/A	N/A
Ambient temperature	+23 to +122°F	+23 to +122°F	-4 to +140°F	-4 to +140°F
Process temperature	+23 to +122°F	+23 to +122°F	+32 to +122°F	+23 to +120°F
Process pressure	14.5 psi at +122°F, 87 psi at +77°F	14.5 psi at +122°F, 87 psi at +77°F	Maximum 87 psi	7 to 145 psia
Process connection	3/4" NPT	3/4" NPT	3/4" NPT	3/4" NPT
Immersion depth	Submersible	Submersible	Submersible	Submersible
Sensor cable	Fixed	Fixed	Fixed	Fixed, for Memosens transmitters only
Transmitter	Liquisys M CUM 223/253	Liquisys M CUM 223/253	CUM 740	Liquiline CM 442

Turbidity holder assembly		
	Flowfit W CUA 120/250 	**Cleanfit CUA 451** 
Application	Water, wastewater	Water, wastewater
Description	Flow assembly designed for bypass system, for turbidity sensor CUS 31 or CUS 41 and one CUR 3 cleaner spray head	Manually operated SS holder assembly with ball valve and rinse connections, designed to hold CUS 31, CUS 41, or CUS 65
Material	PVC	316L SS
Maximum pressure	90 psi at +77°F, 15 psi at +122°F	145 psi (29 psi for manual operation)
Maximum temperature	+122°F	+32 to +122°F
Flow rate	Constant	Constant flow
Sensor connection	Threaded mounting sleeve with union nut	Internal, with sensor external threads
Holder installation	Bypass line	Weld neck, 2" Class 150 ANSI flange

Modular holder assemblies		
	Flexdip CYH 112 	**Flexdip CYA 112** 
Application	Water and wastewater	Water and wastewater
Description	Single installation point, flexible holder system: for floor, wall or rail mounting	Standard immersion pipe, chain immersion pipe or floater immersion pipe
Area of use	Basins, open channels, open tanks, process vats	Basins, open channels, open tanks, process vats
Sensor installation	Cantilever arm with chain, fixed immersion pipe, free swinging or float-lever version for varying levels	Various sensor connection threads or chain mount adapter. Straight or 45° angle mounting
Compatible sensor holder assemblies	Flexdip CYA112, Dipfit W CLA111, Dipfit W CPA111	Flexdip CYH112
Material	Stainless steel and plastic	Stainless steel and PVC
Ambient temperature	-4 to +140°F	-4 to +140°F
Main pipe height	20", 40", 71"	Lengths vary depending on application
Cantilever arm length	20", 40", 59"	N/A

Turbidity transmitters

	Liquisys M CUM 223/253	Turbidity/solids content CUM 740
		
Application	Water, Wastewater	Water, Wastewater
Measurement type	Turbidity/suspended solids 4-wire transmitter, 1 or 2 measuring circuits, 2 or 4 relays, measures turbidity and temperature	Turbidity/solids content transmitter, 1 or 2 channel, 5 relays, measures turbidity and temperature
Measurement range	Turbidity measurement: 0.00 to 9999 FNU, 0.00 to 3000 ppm, 0 to 200% saturation Temperature: +23 to +158°F	Turbidity measurement: 0.00 to 9999 FNU, 0.00 to 3000 ppm, 0 to 200% saturation Temperature: +23 to +158°F
Output	0/4 to 20 mA, 15 VDC (digital), relays	0/4 to 20 mA, relays, max. two
Input	4 to 20 mA, 10 to 50 V (digital) CUS 31, CUS 41 sensors	Pulsed light signal from CUS 65 sensors
Power supply	100/115/230 VAC 24 VAC/VDC	115/230 VAC 24 VAC/VDC
Ambient temperature	+14 to +131°F	-4 to +140°F
Mounting	Wall, pipe, panel mount (CPM 223)	Wall, mounting post
Operation	Via push buttons and dot matrix LCD display, HART or Profibus	Via push buttons, LED display, 2-line LCD display, RS 232
Housing	Field housing: ABS PC Fr, polyester front Panel mount: Polycarbonate, polyester front	Polycarbonate, plexiglass cover
Approvals / certificates	CSA general purpose	General purpose

Turbidity transmitter, Memosens

	Liquiline CM 442 Digital Memosens Transmitter
	
Application	Water/wastewater, power, chemical, process industries
Measurement type	Memosens transmitter for pH, ORP, conductivity, dissolved oxygen, turbidity, nitrate
Measurement range	Dependent on sensor type
Output	2 or 4 4 to 20 mA, 1 or 2 SPDT relays Automatic clean and calibration functions
Input	1 or 2 digital Memosens sensors (Memosens sensors only)
Power supply	100 to 230 VAC 24 VAC 24 VDC
Ambient temperature	-4 to +140°F
Mounting	Wall, pipe, panel mount
Operation	Via soft keys, LCD display, and navigator; Integration into FieldCare and W@M asset management
Housing	Polycarbonate plastic housing
Approvals / certificates	CE

Sludge level measurement systems

	Optical measurement CUC 101	Ultrasonic measurement CUM 750 / CUS 70
		
Application	Water, Wastewater, Chemical	Water, Wastewater, Chemical
Measurement type	Optical sensor for sludge level and interface detection, 1 or 2 channel self-contained system, 5 relays	Ultrasonic sensor for sludge level and interface detection, 4 channel self-contained system, 4 relays
Measured variable	Suspended solids concentration, level/depth measurement	Level/depth measurement, 1 to 328 ft
Input	Input 1: 0 to 12 g/l and 0 to 36 ft height Input 2: synchronization of stepper motor (24 VDC)	Height measurement via ultrasonic sound waves
Output	Output 1: 0/4 to 20 mA for level Output 2: 0/4 to 20 mA for solids concentration	0/4 to 20 mA per channel
Power supply	115/230 VAC	110/220 VAC
Ambient temperature	-4 to +140°F	-40 to +140°F
Mounting	Sensor: attached to cable (42 ft) which is auto wound on cable drum. Drum driven by stepper motor. Drum and transmitter mounted in polyester housing with polycarbonate sight window. System mounted with rail bracket.	Sensor mounted via cable (20 ft), transmitter wall or stand mounted
Sensor	316 Ti SS and POM; sensor cable, polyurethane jacket	Epoxy resin; sensor cable, polyurethane jacket
Transmitter housing	Polycarbonate, plexiglass cover	Polycarbonate, plexiglass cover
Operation	Via push buttons, LED display, 2-line LCD display	Via push buttons, LCD display, RS 232/RS 485
Approvals / certificates	General purpose	General purpose

Turbidity meters

	Turbimax CUE 21 / 22	Turbimax CUE 23 / 24	Turbimax CUE 25 / 26
			
Application	Water, treated process water (in-line continuous measurement)	Water, process water, wastewater (laboratory measurement)	Water, process water, wastewater (handheld field measurement)
Parameter	Turbidity	Turbidity	Turbidity
Measurement method	90° scattered light CUE 21, infrared light, 860 nm CUE 22, white light (Tungsten), 600 nm	90° scattered light CUE 23, infrared light, 860 nm CUE 24, white light (Tungsten), 600 nm	90° scattered light CUE 25, infrared light, 860 nm CUE 26, white light (Tungsten), 600 nm
Measuring range	0 to 1000 NTU	0 to 1000 NTU	0.01 to 1100 NTU
Output	4 to 20 mA Two relays	RS 232, uni-directional	N/A
Power supply	100 to 240 VAC	12 VDC (adaptable to 100 to 240 VAC)	4 AAA alkaline batteries
Ambient temperature	+34 to +122°F	+50 to +104°F	+32 to +122°F
Process temperature	+34 to +122°F	+32 to +122°F	+32 to +122°F
Process pressure	Max. 200 psi	N/A	N/A
Sample holder	Glass cuvette, flow-through	Glass cuvette	Glass cuvette
Operation	Four keys, LCD (backlit)	Four keys, LCD (backlit)	Four keys, LCD
Communication	RS 485, optional Modbus	RS 232	N/A
Approvals	CE, ETL (UL3111-1), U.S. EPA 180.1	CE, ETL (UL3101-1), U.S. EPA 180.1	CE, U.S. EPA 180.1

Compact turbidity measuring station

	CUE 31
	
Application	Drinking water, filter backwash, spring water, pool water
Description	Factory assembled panel for simple measurement of water with turbidity levels <1 FNU. Assembled and wired panel includes installed tubing, inlet and outlet with stop cocks for flow regulation, and drain. Complete with flow through holder with CUS31 turbidity sensor, Liquisys CUM 253 transmitter with one current output and two relays.

Analysis wastewater

Analyzer systems						
	Stamolys CA 71 AM Ammonium	**Stamolys CA 71 CL Chlorine**	**Stamolys CA 71 NO Nitrite**	**Stamolys CA 71 PH Phosphate**	**Stamolys CA 71 AL Aluminum**	**Stamolys CA 71 CR Chromate**
						
Application	Sewage treatment	Water, wastewater	Water, wastewater	Sewage treatment	Water, wastewater	Industrial water
Measurement type	Photometric	Photometric	Photometric	Photometric	Photometric	Photometric
Input	NH_4-N (ppm)	Cl_2 (ppm) free or total	NO_2-1N (ppm)	PO_4-P (ppm)	Al (ppm)	Cr (ppm)
Measurement range	0.02 to 5 ppm 0.2 to 15 ppm 0.2 to 100 ppm	0.01 to 1.00 ppm 0.10 to 10.00 ppm	10 to 500 µppm 0.10 to 1.00 ppm 0.20 to 3.00 ppm	0.05 to 2.5 ppm 0.5 to 20 ppm 0.1 to 25 ppm 1.0 to 50 ppm	10 to 300 µppm 50 to 1000 µppm	0.10 to 2.50 ppm 0.20 to 5.00 ppm
Output	0/4 to 20 mA	0/4 to 20 mA	0/4 to 20 mA	0/4 to 20 mA	0/4 to 20 mA	0/4 to 20 mA
Power supply	115/230 VAC	115/230 VAC	115/230 VAC	115/230 VAC	115/230 VAC	115/230 VAC
Ambient temperature	+41 to +104°F	+41 to +104°F	+41 to +104°F	+41 to +104°F	+41 to +104°F	+41 to +104°F
Operation	Via push buttons, LED display, LCD display, RS 232	Via push buttons, LED display, LCD display, RS 232	Via push buttons, LED display, LCD display, RS 232	Via push buttons, LED display, LCD display, RS 232	Via push buttons, LED display, LCD display, RS 232	Via push buttons, LED display, LCD display, RS 232
Housing	304 SS with plexiglass window or GFK plastic	304 SS with plexiglass window or GFK plastic	304 SS with plexiglass window or GFK plastic	304 SS with plexiglass window or GFK plastic	304 SS with plexiglass window or GFK plastic	304 SS with plexiglass window or GFK plastic
Approvals / certificates	CE	CE	CE	CE	CE	CE

Analyzer systems						
	Stamolys CA 71 CU Copper	**Stamolys CA 71 FE Iron**	**Stamolys CA 71 HA Hardness**	**Stamolys CA 71 HY Hydrazine**	**Stamolys CA 71 MN Manganese**	**Stamolys CA 71 SI Silicate**
						
Application	Industrial sewage, process	Water, wastewater	Drinking water	Cooling, boiler feed water	Water, wastewater	Industrial water
Measurement type	Photometric	Photometric	Photometric	Photometric	Photometric	Photometric
Input	Cu (II) (ppm)	Fe (ppm)	$CaCO_3$ (ppm)	N_2H_4 (ppm)	Mn (ppm)	SiO_2 (ppm)
Measurement range	0.10 to 2.00 ppm 0.20 to 5.00 ppm	10 to 500 µppm 0.05 to 2.00 ppm 0.10 to 5.00 ppm	0.01 to 10 ppm 0.8 to 80 ppm	1 to 500 µppm	1 to 150 µppm 10 to 2000 µppm	1 to 200 µppm 0.01 to 5.00 ppm
Output	0/4 to 20 mA	0/4 to 20 mA	0/4 to 20 mA	0/4 to 20 mA	0/4 to 20 mA	0/4 to 20 mA
Power supply	115/230 VAC	115/230 VAC	115/230 VAC	115/230 VAC	115/230 VAC	115/230 VAC
Ambient temperature	+41 to +104°F	+41 to +104°F	+41 to +104°F	+41 to +104°F	+41 to +104°F	+41 to +104°F
Operation	Via push buttons, LED display, LCD display, RS 232	Via push buttons, LED display, LCD display, RS 232	Via push buttons, LED display, LCD display, RS 232	Via push buttons, LED display, LCD display, RS 232	Via push buttons, LED display, LCD display, RS 232	Via push buttons, LED display, LCD display, RS 232
Housing	304 SS with plexiglass window or GFK plastic	304 SS with plexiglass window or GFK plastic	304 SS with plexiglass window or GFK plastic	304 SS with plexiglass window or GFK plastic	304 SS with plexiglass window or GFK plastic	304 SS with plexiglass window or GFK plastic
Approvals / certificates	CE	CE	CE	CE	CE	CE

Wastewater nitrate, ammonium, etc.

	ISEmax CAS40D sensor
	
Application	Wastewater
Measurement type	Ion-selective electrode system
Input	Ammonium, nitrate, potassium, chloride, pH
Measurement range	0.1 to 1000 mg/l NH_4-N 0.1 to 1000 mg/l NO_3-N 1 to 1000 mg/l potassium 1 to 1000 mg/l chloride
Ambient temperature	-4 to +120°F
Process temperature	+36 to +100°F, max. 6 psi
Sensor	PVC, glass, polyethylene (wetted parts dependent on electrodes used), O-rings EPDM
Sensor cable	328 feet maximum
Sensor power supply	Liquiline CM 442 transmitter
Sensor mounting	Upright post with boom (CYH112 / CYA112)
Approvals / certificates	CE

Water/Wastewater transmitter

	Liquiline CM 442 Digital Memosens Transmitter
	
Application	Water/wastewater, power, chemical, process industries
Measurement type	Memosens transmitter for pH, ORP, conductivity, dissolved oxygen, turbidity, nitrate (CAS51D and ISEmax CAS40D)
Measurement range	Dependent on sensor type
Output	2 or 4 4 to 20 mA, 1 or 2 SPDT relays Automatic clean and calibration functions
Input	1 or 2 digital Memosens sensors (Memosens sensors only)
Power supply	100 to 230 VAC 24 VAC 24 VDC
Ambient temperature	-4 to +140°F
Mounting	Wall, pipe, panel mount
Operation	Via soft keys, LCD display, and navigator; Integration into FieldCare and W@M asset management
Housing	Polycarbonate plastic housing
Approvals / certificates	CE

Photometric nitrate sensor

	Viomax CAS 51D with Memosens
	
Application	Water and wastewater
Parameter	Nitrate
Material	316L SS, quartz glass, EPDM O-rings
Measuring range	2 mm gap, 0.1 to 50 mg/l NO_3-N Clear water + activated sludge 8 mm gap, 0.01 to 10 mg/l NO_3-N Clear water
Ambient temperature	-4 to +140°F
Process temperature	+41 to +120°F
Process pressure	7 to 145 psia
Insertion depth	Cuvette gap, must be submerged
Process connection	3/4" NPT, G1
Sensor cable	Fixed, Memosens, maximum 328 ft
Power	Provided by Liquiline CM 442
Approvals	Non-hazardous

Modular holder assemblies

	Flexdip CYH 112	Flexdip CYA 112
		
Application	Water and wastewater	Water and wastewater
Description	Single installation point, flexible holder system: for floor, wall or rail mounting	Standard immersion pipe, chain immersion pipe or floater immersion pipe
Area of use	Basins, open channels, open tanks, process vats	Basins, open channels, open tanks, process vats
Sensor installation	Cantilever arm with chain, fixed immersion pipe, free swinging or float-lever version for varying levels	Various sensor connection threads or chain mount adapter. Straight or 45° angle mounting
Compatible sensor holder assemblies	Flexdip CYA112, Dipfit W CLA111, Dipfit W CPA111	Flexdip CYH112
Material	Stainless steel and plastic	Stainless steel and PVC
Ambient temperature	-4 to +140°F	-4 to +140°F
Main pipe height	20", 40", 71"	Lengths vary depending on application
Cantilever arm length	20", 40", 59"	N/A

Water/Wastewater Sampler Systems		
	Liquistation CSF 48 **Stationary sampler** 	**Liquiport CSP 44** **Portable sampler** 
Application	Water / Wastewater	Water / Wastewater
Online measurement available with sampler	Nitrate, Conductivity, Oxygen, pH/ORP, Turbidity	Nitrate, Conductivity, Oxygen, pH/ORP, Turbidity
Input	2 analog input, 0/4 to 20 mA 2 binary inputs (passive), 12 to 30 V 1 or 2 digital inputs (Memosens protocol)	2 analog input, 0/4 to 20 mA 2 binary inputs (passive), 12 to 30 V 1 or 2 digital inputs (Memosens protocol)
Temperature input	Pt1000, -20 to +160°F measuring range	Pt1000, -20 to +160°F measuring range
Measurement range	Dependent on connected sensor	Dependent on connected sensor
Output	2 binary, open collector, 30 V, 200 mA 2 x 0/4 to 20 mA (optional) Relay (optional), 2 SPDT connected to binary output Relay, alarm	2 binary, open collector, 30 V, 200 mA 2 x 0/4 to 20 mA (optional)
Power supply	100 to 240 VAC 24 VDC	24 VDC, 7.2 Ah lead-acid battery Charger, 90 to 265 VAC
Ambient temperature	-4 to +100°F with temperature control unit 32 to 100°F without temperature control unit	+32 to +100°F
Process temperature	+36 to +122°F	+36 to +122°F
Process pressure	Un-pressurized, open channel (un-pressurized sampling) Maximum 11.6 psi piping (pressurized sampling)	Un-pressurized
Sampling method	Vacuum pump Peristaltic pump	Peristaltic pump
Suction line	Plastic PVC or EPDM, maximum 26 foot suction height	Plastic PVC or EPDM, maximum 26 foot suction height
Sample containers	Various sizes and combinations available from 1 liter (24 containers) to 60 liter (1 container), containers made of PE or glass depending on application	Various sizes and combinations available from 1 liter (24 containers) to 20 liter (1 container), containers made of PE or glass depending on application
Transmitter	Liquiline CM442	Liquiline CM442
Operation	Via 4 soft keys, LCD display and navigator	Via 4 soft keys, LCD display and navigator
Software	Field Data Manager, Fieldcare	Field Data Manager, Fieldcare
Approvals / certificates	CE	CE

	Backwash and filter systems		Micro filter
	Stamoclean CAT 430 	**Stamoclean CAT 221** 	**Stamoclean CAT 411** **Micro filter** 
Application	Wastewater, activated sludge basins	Wastewater (inlet or outlet)	Wastewater, industrial water
System type	Micro /ultra filtration system	Self-cleaning backwash filter	Self-cleaning cross flow filter
Filtration volume	With hose pump: 0.06 gal/hr per filter With diaphragm pump: 0.12 gal/hr per filter	2.6 gal/hr	3.5 to 8 gpm, 8 to 18 ft/s flow rate, 3 to 14.5 psi
Sample distance range	With hose pump: 65 ft With diaphragm pump: 328 ft	N/A	N/A
Power supply	115 / 230 VAC	115 / 230 VAC 24 VDC	N/A
Ambient temperature	+14 to +122°F	+32 to +122°F	N/A
Sample temperature	+41 to +122°F	+41 to +104°F, 2.9 to 58 psi	+41 to +122°F
Analyzer type	Any CA 71 Stamolys analyzer (purchased separately)	Any CA 71 Stamolys analyzer (purchased separately)	Any CA 71 Stamolys analyzer (purchased separately)
Mounting	Filter element holders: 304 SS Mounting square pipe: 304 SS	Field mounting plate, PVC Housing, GFK (fiber-glass reinforced)	Field mounting plate, PVC Housing, GFK (fiber-glass reinforced)
Operation	Via push buttons, LED indicators, cycle timer	LCD display, two control push buttons	N/A
Approvals / certificates	CE	General purpose	General purpose

Analyzer, BOD	
	BIOX 1010 BOD 
Application	Industrial and municipal wastewater treatment
Analyzer function	Continuous BOD measurement
Analyzer type	Turbulent-bed bio-reactor
Measurement range	20 to 1000 mg/l BOD (20 to 100,000 mg/l optional)
Detection limit	5 mg/l
Response time	3 to 15 minutes
Output	0/4 to 20 mA selectable Dry contact relay for high, low limit and slope Dry contact relay fault signal
Power supply	230 VAC
Display / local operation	16 line, 40 characters, backlit LCD graphics display 21 key operation, RS232C for data output
Data presentation	6-hour graphic (14 day scrollable); current value with 5-digit resolution
Monitoring	Warning logs, malfunctions, limit value alarms and calibration for previous 4 weeks; leakage alerts, deficient dilution water and wastewater, reactor temperature, incorrect oxygen reading, broken oxygen sensor membrane
Data storage	14 days in RAM; 90 days with diskette drive
Ambient temperature	40 to 104°F
Sample handling	Bypass sampler with prep and self-cleaning coarse filter
Sample flow rate	0.1 to 35 GPM depending on sample bypass system

Analyzer, Toxicity	
	STIP TOX Toxicity 
Application	Industrial and municipal wastewater treatment
Analyzer function	Continuous toxic measurement
Analyzer type	Turbulent-bed bio-reactor
Measurement range	0 to 100% toxicity
Response time	3 to 15 minutes
Output	0/4 to 20 mA selectable Dry contact relay for high, low limit and slope Dry contact relay fault signal
Power supply	230 VAC
Display / local operation	16 line, 40 characters, backlit LCD graphics display 21 key operation, RS232C for data output
Data presentation	6-hour graphic (14 day scrollable); current value with 5-digit resolution
Monitoring	Warning logs, malfunctions, limit value alarms and calibration for previous 4 weeks; leakage alerts, oven failure, Peltier cooling failure, deficient oxygen, out of acid
Data storage	14 days in RAM; 90 days with diskette drive
Ambient temperature	40 to 104°F
Sample handling	Bypass sampler with prep and self-cleaning coarse filter
Sample flow rate	0.1 to 35 GPM depending on sample bypass system

Analyzer, COD	
	PHOENIX-thermcat COD 
Application	Industrial and municipal wastewater treatment
Analyzer function	Continuous COD measurement
Analyzer type	High temperature catalytic oxidation
Measurement range with built-in infrared detector (in ppm)	500 ppm; 4 to 1000 mg/l COD (optional) 2000 ppm; 40 to 4000 mg/l COD (standard) 5000 ppm; 100 to 10,000 mg/l COD (optional) 10,000 ppm; 200 to 20,000 mg/l COD (optional)
Detection limit	5 mg/l COD (with 500 ppm detectro)
Response time	3 to 15 minutes including sample prep
Output	0/4 to 20 mA selectable Dry contact relay for high, low limit and slope Dry contact relay fault signal
Power supply	230 VAC
Display / local operation	16 line, 40 characters, backlit LCD graphics display 21 key operation, RS232C for data output
Data presentation	6-hour graphic (14 day scrollable); current value with 5-digit resolution
Monitoring	Warning logs, malfunctions, limit value alarms and calibration for previous 4 weeks; leakage alerts, defective probe, general errors for measuring cell, dilution water failure
Data storage	14 days in RAM; 90 days with diskette drive
Ambient temperature	40 to 104°F
Sample handling	Bypass sampler with prep and self-cleaning coarse filter
Sample flow rate	0.1 to 35 GPM depending on sample bypass system

Analyzer, TOC/TC	
	EZ TOC II 
Application	Industrial and municipal water / wastewater treatment
Analyzer function	Continuous TOC/TC measurement
Analyzer type	UV promoted low-temperature chemical oxidation, single lamp
Measurement range	10 to 10,000 mg/l carbon
Response time	8 minutes at 100 mg/l configuration TOC
Output	0/4 to 20 mA selectable plus one 4 to 20 mA
Alarms	4 programmable alarm levels driving up to 8 Type C relays (4 standard, 4 optional)
Programmable outputs	Up to 8 Type C relays (4 standard). Can be programmed for up to 29 system parameters (includes 4 alarms).
Power supply	115 VAC or 230 VAC
Display / local operation	4 line, 20 characters, backlit display 19 key operation plus LED indicators for data input
Monitoring	Via RS232 interface
Calibration	Two-point liquid, three-point gas, manual or automatic
Ambient temperature	32 to 104°F
Sample handling	Bypass sampler with prep and self-cleaning coarse filter
Sample flow rate	0.01 GPM (50 ml/min) max. at 60 Hz

Analyzer, TOC	
	CA72 TOC 
Application	Industrial and municipal wastewater treatment
Analyzer function	Continuous TOC measurement
Analyzer type	Catalytic, high temperature oxidation
Measurement range	2 to 50,000 mg/l TOC
Detection limit	2 mg/l TOC with IR detector 500 ppm
Response time	3 to 15 minutes including sample prep
Output	0/4 to 20 mA selectable Dry contact relay for high, low limit and slope Dry contact relay fault signal
Power supply	230 VAC
Display / local operation	16 line, 40 characters, backlit LCD graphics display 21 key operation, RS232C for data output
Data presentation	6-hour graphic (14 day scrollable); current value with 5-digit resolution
Monitoring	Warning logs, malfunctions, limit value alarms and calibration for previous 4 weeks; leakage alerts, defective probe, general errors for measuring cell, dilution water failure
Data storage	14 days in RAM; 90 days with diskette drive
Ambient temperature	40 to 104°F
Sample handling	Bypass sampler with prep and self-cleaning coarse filter
Sample flow rate	0.1 to 35 GPM depending on sample bypass system

Analyzer, P_{Total}	
	CA72P analyzer 
Application	Industrial and municipal wastewater treatment
Analyzer function	Continuous measurement of total phosphorus
Analyzer type	Thermal digestion with colorimetric detection
Measurement range	0.1 to 50 mg/l (with 20 mm path length) 0.2 to 100 mg/l (with 10 mm path length
Detection limit	0.1 mg/l P_{total} (with 20 mm path length)
Response time	12 minutes excluding sample prep
Measurement cycle	Minimum 6 minutes
Output	0/4 to 20 mA selectable Dry contact relay for high, low limit and slope Dry contact relay fault signal
Power supply	230 VAC
Display / local operation	16 line, 40 characters, backlit LCD graphics display 21 key operation, RS232C for data output
Data presentation	6-hour graphic (14 day scrollable); current value with 5-digit resolution
Monitoring	Warning logs, malfunctions, limit value alarms and calibration for previous 4 weeks; leakage alerts, defective probe, general errors for measuring cell, dilution water failure
Data storage	14 days in RAM; 90 days with diskette drive
Ambient temperature	40 to 104°F
Sample handling	Bypass sampler with prep and self-cleaning coarse filter
Sample flow rate	0.1 to 35 GPM depending on sample bypass system

Analyzer, direct immersion sensor	
	Spectroscopic multi-parameter analyzer **CAS74 Sensor / CAM74 Transmitter**  Sensor  Transmitter
Application	Wastewater treatment
Sensor function	Multi-parameter, scanning light absorption spectrometry
Sensor type	Self-contained, immersible
Parameter combinations	Scan N NO_3, TS, SV, SI Scan C COD/TOC/SAC, TS, SV, SI Scan NC NO_x (NO_3 + NO_2), COD/TOC/SAC, TS, SV, SI Scan NC plus Same as Scan NC but with complete spectrum
Measuring ranges	Nitrate, 0.03 to 23 mg/l; detection limit 0.1 mg/l COD, 10 to 2000 mg/l (related to KHP); detection limit 2 mg/l TOC, 1 to 800 mg/l (related to KHP); detection limit 0.8 mg/l SAC_{254}, 1 to 250 l/m; detection limit 0.1l/m Turbidity (ATU), 1 to 250 l/m; detection limit 0.1 l/m Total solids (TS), 0.3 to 5 g/l Sludge volume (SV), 100 to 900 ml/l (sample not diluted) Sludge index (SI), 250 ml/g
Measurement cycle	1 to 10 minutes, depending on measured parameter
UV/visible light range	190 to 720 nm
Power supply	Sensor, 24 VDC, powered by transmitter. Transmitter 115 or 230 VAC, selectable
Ambient temperature	Sensor, 32 to 104°F. Transmitter, 14 to 104°F
Process temperature	Sensor, 32 to 86°F
Display / local operation	PC panel, 12" color TFT display, 800 x 600 pixel Touch screen with virtual keyboard; 4 front keys - 3 function keys (F1 - F3) and display brightness. Status LED, green (power), red (failure)
Data presentation	Current 3-hour graph and day graph (24/3h)
Data storage	Tabular and day values stored on fixed disk storage; 128 MB main memory, 6 GB hard disk.
Interface	2 USB, 2 COM, 1 LAN network 10/100MBit RJ45, PS2-mouse and PS-2 keyboard connectors, CF-slot, PC 104 internal slot, RS 232/485

Analysis, optical

Sensors

	Model OUSAF21 Flow through optical	Model OUSAF22 Flow through optical
		
Transmitter type	Model 980, 682 or CVM 40 *	Model 980, 682 or CVM 40 *
Application	Potable water	Potable water
Sensor type	Low level color	Dual beam color
Measurement wavelength	390 to 1100 nm	390 to 1100 nm
Path length	100 to 250 mm	0.5 to 100 mm
Lamp	4 watt incandescent, rated for FM Class I, Div. 1, Grps. B, C, D	4 watt incandescent, rated for FM Class I, Div. 1, Grps. B, C, D
Output	Low level current	Low level current
Window material	Pyrex, fire polished quartz, or sapphire	Pyrex, fire polished quartz, or sapphire
Maximum temperature	194°F; with PEEK isolators, 266°F	194°F; with PEEK isolators, 266°F
Maximum pressure	500 psig dependent on material, line size and process connection	3000 psig dependent on material, line size and process connection
Process connection	3/4" FNPT	Tri-clamp, flange, FNPT **
Sensor material	316 SS	316 SS

Transmitters

	Model OUM980	Model OUM682
		
Analyzer type	Dual beam photometer	Dual beam photometer
Sensor type	OUSAF21 or OUSAF22	OUSAF21 or OUSAF22
Input	Dual current from sensor	Dual current from sensor
Range	Up to 5 AU/OD	Up to 20 D
Output	1 alarm relay, 2 process relay contacts 2 fully isolated 4 to 20 mA outputs	Lamp fail relay contact 4 to 20 mA output 0 to 2 VDC tracking max. range
Power supply	100 to 250 VAC Optional 18 to 36 VDC	115, 230 VAC Optional 20 to 28 VDC
Ambient temperature	32 to 131°F	32 to 131°F
Display	4 x 20 character alphanumeric	3-1/2 digit LCD
Operation	Via 6 push buttons and display	Via rotary switch, toggle switches
Housing	Panel mount, 3.6" x 3.6"	Type 4 DIN plug-in unit

* The Memograph M CVM40 graphic transmitter and data manager is available to measure, analyze, record, and communicate for most inline photometers. Refer to the last page of this section for information.

** A flow assembly, OUA 260, is required for this sensor. Refer to the last page of this section for information.

Sensor

	OUSBT 66 Optical insertion
	
Transmitter type	Memograph M CVM40
Application	Bacterial fermentation, mammalian cell culture
Sensor type	Optical insertion probe
Measurement wavelength	Broadband NIR absorption, 880 nm
Measurement range	0 to 4 AU, 0 to 8 OD (depending on optical path length)
Path length	5, 10 or 20 mm
Lamp	4 watt incandescent
Output	Low level current
Window material	Sapphire
Detector type	Solid state silicon photodetector
Process temperature	32 to 158°F, up to 275°F when lamp is switched off
Maximum pressure	150 psig
Process connection	Threaded, PG13.5
Sensor material	316L SS
Sensor length	120 mm, 225 mm, 360 mm

Optical Transmitter

	Memograph M CVM 40
	
Recorder type	Graphic data manager, paperless Record, visualize, analyze and communicate, mathematics package
Application	Process monitoring / control
Input	Optical channels: Absorbance (UV, color, NIR, cell growth), turbidity Voltage, current, RTD, TC, pulse input, frequency input
Input types	Up to 4 optical channels for max. 2 photometric sensors, 2 universal analog channels
Outputs	1 alarm relay, 5 NO relays for limit values 0/4 to 20 mA
Plot or memory storage	Internal memory 256 MB, SD card or USB stick
Interface	Integrated WEB server, fieldbus (Profibus, Modbus), USB, TCP/IP, OPC, Ethernet, RS232/485
Local operation	4 soft keys, 2 LEDs, navigator (jog/shuttle dial)
Display type	7" TFT display, multicolor
Ambient temperature	+14 to +122°F
Power supply	100 to 230 VAC 24 V AC/DC
Approvals / certificates	CE, UL, FDA 21 CFR 11

Analysis, optical

Sensors			
	OUSAF44 **Flow through UV**	**OUSAF45** **Flow through UV**	**OUSAF46** **Flow through UV, dual channel**
			
Transmitter type	OUM960, OUM662 or CVM40 *	OUM960, OUM662 or CVM40 *	OUM960, OUM662 or CVM40 *
Application	Phase separation, Chromatography	Phase separation, Chromatography	Phase separation, Chromatography
Sensor type	Spectral absorbance in UV range	Spectral absorbance in UV range	Spectral absorbance in UV range
Measurement wavelength	254 to 365 nm	204, 214 or 226 nm	254 to 365 nm
Path length	0.5 to 100 mm	0.5 to 45 nm, up to 500 nm	0.5 to 100 mm
Lamp	Low pressure mercury vapor, 4 watt FM Class I, Div. 1, Grps. B, C, D	Low voltage 4 watt incandescent FM Class I, Div. 1, Grps. B, C, D	Low pressure mercury vapor, 4 watt FM Class I, Div. 1, Grps. B, C, D
Detector type	UV enhanced silicone detector	Silicone detector	UV enhanced silicone detector
Output	Low level current	Low level current	Low level current
Window material	Fire polished quartz or sapphire	Pyrex, Lexan, fire polished quartz, or sapphire	Fire polished quartz or sapphire
Maximum temperature	194°F continuous; with PEEK isolators, 266°F	194°F continuous; 266°F for two hours	194°F continuous; with PEEK isolators, 266°F
Maximum pressure	3000 psig dependent on material, line size and process connection	3000 psig dependent on material, line size and process connection	3000 psig dependent on material, line size and process connection
Process connection	FNPT, Tri-clamp, 150/300 lb flange **	Tri-clamp, 150/300 lb flange, FNPT **	Tri-clamp, 150/300 lb flange, FNPT **
Sensor material	316L SS	316L SS	316L SS

* The Memograph M CVM40 graphic transmitter and data manager is available to measure, analyze, record, and communicate for most inline photometers. Refer to the last page of this section for information.

** A flow assembly, OUA 260, is required for this sensor. Refer to the last page of this section for information.

Transmitters		
	OUM960	**OUM662**
		
Analyzer type	UV absorbance	UV absorbance
Sensor type	OUSAF44, OUSAF45 and OUSAF46 dual channel	OUSAF44, OUSAF45 and OUSAF46 dual channel
Input	Dual current from sensor	Dual current from sensor
Range	Up to 50 AU/OD	Up to 50 AU/OD
Output	1 alarm relay, 2 process relay contacts 2 fully isolated 4 to 20 mA outputs	Lamp fail relay contact 4 to 20 mA output 0 to 2 VDC tracking max. range
Power supply	100 to 250 VAC Optional 18 to 36 VDC	115, 230 VAC Optional 20 to 28 VDC
Ambient temperature	32 to 131°F	32 to 131°F
Display	4 x 20 character alphanumeric	3-1/2 digit LCD
Operation	Via 6 push buttons and display	Via rotary switch, toggle switches
Housing	Panel mount, 3.6" x 3.6"	Type 4 DIN plug-in unit

Analysis, optical

	Sensors			Sensor
	OUSAF12 **Flow through optical**	**OUSAF11** **Submersible optical**	**OUSCW11** **Submersible optical**	**OUSAF13** **Flow through bubble detector**
				
Transmitter type	OUM910, OUM 612 or CVM 40 *	OUM910, OUM 612 or CVM 40 *	OUM910 or OUM 612	OUM611
Application	Solids concentration	Plant effluent, mines, quarries, cow water	Clarifier, plant effluent	Biopharmaceuticals
Sensor type	Flow through color optical	Submersible color optical	Submersible color optical	Flow through visible light/NIR light
Mmeasuremen ranget	200 to 10,000 ppm	0 to 30% TSS	From 500 ppm to 5% TSS	0 to 100%
Path length	0.5 to 40 nm, up to 500 nm	5 or 10 mm	25 mm	10, 30, 40 and 60 mm
Lamp	Low voltage 4 watt incandescent FM Class I, Div. 1, Grps. B, C, D	Long life incandescent, 5 VDC	Long life incandescent, 5 VDC	Pre-focused incandescent, low wattage
Detector type	Silicone detector	Solid state silicone detector	Solid state silicone detector	Hermetically sealed silicone detectors
Output	Low level current	Low level current	Low level current	Low level current
Window material	Pyrex, Lexan, fire polished quartz, or sapphire	Teflon optical head	Teflon optical head	Pyrex or fire polished quartz
Maximum temperature	194°F continuous; 266°F for two hours	32 to 194°F	32 to 104°F	32 to 194°F; 266°F for 2 hours (SS flow cell)
Maximum pressure	1500 psig dependent on material, line size and process connection	N/A	N/A	1500 psig dependent on material, line size and process connection
Process connection	Tri-clamp, 150/300 lb flange, FNPT **	3/4" FNPT	3/4" FNPT	Tri-clamp, ANSI flange, FNPT
Sensor material	316L SS	316L SS, Teflon head	CPVC, Teflon head	316L SS, 316 SS, Kynar and others

***** The Memograph M CVM40 graphic transmitter and data manager is available to measure, analyze, record, and communicate for most inline photometers. Refer to the last page of this section for information.

****** A flow assembly, OUA 260, is required for this sensor. Refer to the last page of this section for information.

	Transmitters		Transmitter
	OUM910	**OUM612**	**OUM611** **Bubble monitor**
			
Analyzer type	Spectral absorbance	Spectral absorbance	Optical absorbance
Sensor type	OUSAF12, OUSAF11, OUSCW11	OUSAF12, OUSAF11, OUSCW11	OUSAF13
Input	Single current from sensor	Single current from sensor	Single current from sensor
Range	Up to 5 AU/OD	Up to 5 AU/OD	0 to 100% light transmittance
Output	1 alarm relay, 2 process relay contacts 2 fully isolated 4 to 20 mA outputs	Lamp fail relay contact 4 to 20 mA output 0 to 2 VDC tracking max. range	Lamp fail relay contact, 4 to 20 mA Air bubble alarm, empty pipe alarm Liquid phase absorbance set-point alarm
Power supply	100 to 250 VAC Optional 18 to 36 VDC	115, 230 VAC Optional 20 to 28 VDC	115, 230 VAC Optional 24 VDC
Ambient temperature	32 to 131°F	32 to 131°F	32 to 131°F
Display	4 x 20 character alphanumeric	3-1/2 digit LCD	3-1/2 digit LCD
Operation	Via 6 push buttons and display	Via rotary switch, toggle switches	Toggle switch, adjustment screws
Housing	Panel mount, 3.6" x 3.6"	Type 4 DIN plug-in unit	Type 4 DIN plug-in unit

Analysis, optical

Sensor	
	Model OUSTF10 **Flow through scattered light** 
Transmitter type	Model 670 or CVM 40 *
Application	Emulsions and immiscible fluids
Sensor type	Low turbidity scattered light
Measurement wavelength	Broadband VIS/NIR or NIR only; up to 200 ppm
Path length	40 mm
Lamp	4 watt incandescent, rated for FM Class I, Div. 1, Grps. B, C, D
Output	Low level current
Window material	Pyrex, fire polished quartz, or sapphire
Maximum temperature	194°F continuous
Maximum pressure	400 psig dependent on material, line size and process connection
Process connection	FNPT, Tri-clamp, 150/300 lb flange **
Sensor material	316 SS

Transmitter	
	Model 670 
Analyzer type	Turbidity monitor
Sensor type	OUSTF10
Input	Low level current from sensor
Range	0.2, 2, 20, 200 ppm or FTU
Output	Lamp fail relay contact 4 to 20 mA output 0 to 10 VDC tracking max. range
Power supply	115, 230 VAC Optional 20 to 28 VDC
Ambient temperature	32 to 131°F
Display	3-1/2 digit LCD
Operation	Via rotary switch, toggle switches
Housing	Type 4 DIN plug-in unit

***** The Memograph M CVM40 graphic transmitter and data manager is available to measure, analyze, record, and communicate for most inline photometers. Refer to the last page of this section for information.

****** A flow assembly, OUA 260, is required for this sensor. Refer to the last page of this section for information.

Sensor	
	HSP solids probe 
Transmitter type	HSM Slurry monitor
Application	Aggregate, quarries, sewage treatment
Sensor type	Dual back scatter detector
Measurement range	0.1 to 60% TSS
Probe length	12" or 18"
Output	Dual detector, 64 kHz transmission
Window material	Quartz optical
Detector type	Solid state silicon photodetector
Maximum temperature	32 to 176°F
Maximum pressure	75 psig
Process connection	1-1/2" NPT or 1-1/2" ball valve assembly
Sensor material	316 SS
Sensor insertion length	Dependent on pipe size

Transmitter	
	HSM Slurry monitor 
Analyzer type	Light Absorbance
Sensor type	HSP solids probe
Input	Dual current from sensor
Range	0 to 60% TSS
Output	2 solid state relay alarms 1 fully isolated 4 to 20 mA output
Power supply	115 or 230 VAC
Ambient temperature	32 to 120°F
Display	Multi-line graphical LCD
Operation	Via 5 push buttons and display
Housing	NEMA 4X field mount enclosure

Analysis, optical

Optical Transmitter	
	Memograph M CVM 40 
Recorder type	Graphic data manager, paperless Record, visualize, analyze and communicate, mathematics package
Application	Process monitoring / control
Input	Optical channels: Absorbance (UV, color, NIR, cell growth), turbidity Voltage, current, RTD, TC, pulse input, frequency input
Input types	Up to 4 optical channels for max. 2 photometric sensors, 2 universal analog channels
Outputs	1 alarm relay, 5 NO relays for limit values 0/4 to 20 mA
Plot or memory storage	Internal memory 256 MB, SD card or USB stick
Interface	Integrated WEB server, fieldbus (Profibus, Modbus), USB, TCP/IP, OPC, Ethernet, RS232/485
Local operation	4 soft keys, 2 LEDs, navigator (jog/shuttle dial)
Display type	7" TFT display, multicolor
Ambient temperature	+14 to +122°F
Power supply	100 to 230 VAC 24 V AC/DC
Approvals / certificates	CE, UL, FDA 21 CFR 11

Flow Assemblies	
	OUA 260 
Application	Flow assembly for certain OUSAF sensors for the measurement of UV and NIR absorption, color and turbidity
Sensor types	OUSAF44/45/46/10/12/22 and OUSTF10
Optical path lengths	0.5 mm to 90 mm
Line sizes	1/4" to 4"
Optical window materials	Pyrex, quartz, sapphire
Materials	316L SS, titanium, Hastelloy, PEEK, Kynar
O-rings	Viton, silicone, EPDM, Kalrez
Process connections	Tri-clamp, 150 lb/300 lb ANSI RF flanges, NPT female, Swagelock BVCO, Swagelock tube, tube stub
Process temperature	32 to 266°F (insure compatible with process temperature of selected sensor)
Process pressure	Up to 1450 psi depending on material, line size and process connection

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