Product Overview A snapshot of Endress+Hauser's product lines

- Liquid Analysis
- Flow
- = Level
- Pressure
- Temperature
- System Components
- Data Acquisition
- Services
- Solutions





Product Overview

A snapshot of Endress+Hauser's product lines

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

Contact Endress+Hauser at 888-ENDRESS for individual product Technical Information brochures.

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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.

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' pre-ferred 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 flowmeters and various types of in-line connections was met by Endress+Hauser. From the basic magnetic flowmeter 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 flowmeter. 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 10,500 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 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.

Gamma In gamma measurement, a radiation source (¹³⁷Cs or ⁶⁰Co) 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 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 3A 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 3A 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 circucular 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".

Proline 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 additional 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 μ S/ 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 10,500 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 (dia-phragm) 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 $1200 \text{ inH}_2\text{O}$) 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.



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 inH₂O to 58 psig. Vacuum can be measured to 1.7 psia.





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 $\leq 0.05\%$ 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.







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.



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.

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, In 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.

- **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 deter mine the conductivity value. The conductivity serves as a measure of ion concentration.

• **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.





- 2 Receiver and signal processing
- 3 Cable
- 4 Primary winding5 Secondary winding
- 6 Bore
- 7 Sensor housing
- 8 Process medium9 Induced electric current
- 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 efficient 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 deter mined 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 Cl₂, 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.

www.us.endress.com/level

Vibration

Liquiphant [®] M					
	FTL50	FTL51	FTL50H	FTL51H	FTL51C
Application	Liquids	Liquids	Liquids, hygienic	Liquids, hygienic	Liquids, corrosive
Measurement type	Point level, liquids	Point level, liquids	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 switch- ing 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 switch- ing 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 switch- ing 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	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	-40 to +160°F	-40 to +160°F	-60 to +160°F
Process temperature	-58 to +300°F	-58 to +300°F	-58 to +300°F	-58 to +300°F	-58 to +300°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 1450 psi, threaded connectionsFlanges: pressure depends on flange selected and process temperature Maximum 230 psi, Tri-Clamp Maximum 145 psi, Varivent" Maximum 600 psi, 1" welded neck	Maximum 1450 psi, threaded connectionsFlanges: 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: ¾* NPT, 1* NPT, 316L SS or Alloy C-4 ANSI flanges: 1* to 4* (Class 150, 300), 316L SS Tri-Clamp: 1½*, 2*, 316L SS	Threaded: ¾" 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: 1½°, 2°, 316L SS 1° flush mount, 316L SS (re- quires weld neck adapter) Varivent DN 40, 316L SS	ANSI flanges: 1° to 4° (Class 150, 300), 316L SS Tri-Clamp: 1½°, 2°, 316L SS 1° flush mount, 316L SS (re- quires 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	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	10,000 cSt	10,000 cSt
Function indication	Red, yellow, green LEDs (depending on electronics)	Red, yellow, green LEDs (depending on electronics)	Red, yellow, green LEDs (depending on electronics)	Red, yellow, green LEDs (depending on electronics)	Red, yellow, green LEDs (depending on electronics)
Wetted material	316L SS or Alloy C4	316L SS or Alloy C4	316L SS or Alloy C4	316L SS or Alloy C4	316L SS or Alloy C4, coated (ECTFE, PFA, Enamel)
Approvals / certificates	FM, CSA, SIL3	FM, CSA, SIL3	FM, CSA, SIL 3, 3-A, FDA compliant materials	FM, CSA, SIL 3, 3-A, FDA compliant materials	FM, CSA, SIL 2, FDA compliant materials

Liqui	iphant S High Tem	perature		L
	FTL70 (compact)	FTL71 (extended)		FTL31
			Application	Liquid
Application	Liquids	Liquids	Measurement	Point
Measurement type	Point level, liquids	Point level, liquids	Sensor	Frequ
Sensor	Frequency shift tuning fork, compact version	Frequency shift tuning fork, extended forks to 115"	Output	AC/DO DC-PN
Output	FEL51: AC, load switch FEL 52: DC-PNP FEL54: DPDT relay FEL55: 8 to 16 mA	FEL51: AC, load switched via thyristor FEL52: DC-PNP FEL54: DPDT relay FEL55: B to 16 mA		20 to 2-wire 10 to 3-wire
	FEL56: L-H edge NAN FEL58: H-L edge NAN FEL57: PFM for separa	Ambient temperature	-40 to	
D 1	FEL50A: Profibus PA		Process temperature	-40 to
Power supply	FEL51: 19 to 253 VAC FEL52: 10 to 55 VDC (PNP) FEL54: 19 to 253 VAC, 19 to 55 VDC (relay)		Process pressure	580 p
	FEL55: 11 to 36 VDC (FEL56, 57, 58: NAMU separate power supply FEL50A: 9 to 32 VDC	FEL55: 11 to 36 VDC (current) FEL56, 57, 58: NAMUR and PFM, requires separate power supply (e.g. FTL325N/325P) FEL50A: 9 to 32 VDC from bus		
Ambient temperature	-40 to +160°F	-40 to +160°F	Maximum	1 to 1
Process temperature	-76 to +540°F	-76 to +540°F	Function	Red a
Process pressure	Maximum 1450 psi, th Flanges: Pressure deno	nreaded connections	Wetted material	316L
Process	Threaded: 34" NPT, 1"	NPT, 316L SS or Alloy	Approvals/ certificates	WHG, 3.1 M Inspec
connections	ANSI flanges: 1" to 4" 316L SS RF, optional A	(Class 150, 300, 600) Alloy C 4 plating		1
Housings	Polyester (PBT), Alum compartment aluminu	inum, Dual- m		
Maximum viscosity	10,000 cSt	10,000 cSt		
Function indication	Red, yellow, green LEE electronics))s (depending on		
Wetted material	316L SS or Alloy C4	316L SS or Alloy C4	Measuring Prin	ciple
Approvals/ certificates	FM, CSA, SIL 3	FM, CSA, SIL 3	Characteristic /	

	Liqu	uiphant T		
	FTL31		FTL33	
			Ţ	
Application	Liquids		Liquids	
Measurement type	Point leve	el, liquids	Point level, liquids	
Sensor	Frequenc tuning fo	y shift rk	Frequency shift tuning fork	
Output	AC/DC DC-PNP		AC/DC DC-PNP	
Power supply	20 to 253 2-wire, 10 to 35 3-wire	3 V AC/DC, V DC-PNP,	20 to 253 V AC/DC, 2-wire , 10 to 35V DC-PNP, 3-wire	
Ambient temperature	-40 to 158°F		-40 to 158°F	
Process temperature	-40 to 30	2°F	-40 to 302°F	
Process pressure	580 psi		580 psi	
Process connections	Threads: G¾, G1, M MNPT¾, R½, R¾, 1	G½, MNPT½, MNPT1, R1	Threads: G½, G¾, G1, MNPT½, MNPT¾, MNPT1, R½, R¾, R1	
Maximum viscosity	1 to 10,0	00 mPas	1 to 10,000 mPas	
Function indication	Red and g	jreen LEDs	Red and green LEDs	
Wetted material	316L SS		316L SS	
Approvals/ certificates	WHG, EN10204- 3.1 Material, Final Inspection Report		WHG, EN10204- 3.1 Material, Final Inspection Report	
			Liquin	ha
		FTL80		FI
		1 1100	11	¹ 1

Liquiphant Failsafe					
	FTL80	FTL81	FTL85		
	The second se		1		
Measuring Principle	Vibration Liquids	Vibration Liquids	Vibration Liquids		
Characteristic / Application	Compact point level switch for MIN and MAX safety applica- tions up to SIL3	Reliable point level switch with extension pipe for MIN and MAX safety applications up to SIL3	Coated point level switch for MIN and MAX		
Supply / Communication	2-wire 4 to 20 mA	2-wire 4 to 20 mA	2-wire, 4 to 20 mA		
Ambient temperature	-76°F to +160°F	-76°F to +160°F	-58° to +160F		
Process temperature	-76°F to +540°F	-76°F to +540°F	-76°F to +300°F		
Process pressure absolute / max. overpressure limit	Vacuum to 1450 psi (100 bar)	Vacuum to 1450 psi (100 bar)	Vacuum to 580 psi (40 bar)		
Min. density of medium	Density from 0.4 SGU (0.4 g/ cm3)	Density from 0.4 SGU (0.4 g/ cm3)	Density from 0.4 SGU (0.4 g/cm3)		
Main wetted parts	316L, Alloy C	316L, Alloy C	With high corrosion-resistant coating made of enamel, ECTFE and various PFA materials		
Process connection	Flange: ASME 1" to 4", DN25 to DN100, JIS 10K to 20K Thread: G3/4, G1, R3/4, R1, MNPT3/4, MNPT1	Flange: ASME 1" to 4", DN25 to DN100, JIS 10K to 20K Thread: G3/4, G1, R3/4, R1, MNPT3/4, MNPT1	Flange: ASME 1" to 4", DN25 to DN100, JIS 10K to 20K		
Sensor length	Compact	Extension pipe up to 9.8 ft. (3 m)	Extension pipe up to 9.8 ft. (3 m)		
Output	2-wire 4 to 20 mA	2-wire 4 to 20 mA	2-wire 4 to 20 mA		
Certificates / Approvals	ATEX, FM, IECEx Overfill prevention WHG EN10204-3.1 Material NACE	ATEX, FM, IECEx Overfill prevention WHG EN10204-3.1 Material NACE	ATEX, FM, IECEx Overfill prevention WHG EN10204-3.1 Material NACE		
Components	Nivotester FTL825, Transmitter	Nivotester FTL825, Transmitter	Nivotester FTL825, Transmitter		

Liquiphant Failsafe				
	FTL825 Nivotester			
Measuring Principle	Vibration Liquids			
Characteristic / Application	Failsafe level transmitter point level. Connection to FTL80/81/85 Permanent self-monitoring, LIVE-signal			
Supply / Communication	85 - 253 VAC/DC 20 - 30 VAC/20 - 60 VDC			
Ambient temperature	-4°F to +140°F -20°C to +60°C			
Output	2x SPST safety contact point level 1x SPST signal contact 1x SPDT fault contact			
Certificates / Approvals	ATEX, FM, IECEx Overfill prevention WHG			
Specialties	SIL 3 according to IEC61508			
Instrumentation	Separate instrumentation			

	Soliphant [®] M	Soliphant T		
	FTM50 FTM51 FTM52	FTM20 (compact) FTM21 (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 Nivotester switch unit (i.e. FTL325) 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	FTM50, 51: -14.5 to 362 psi FTM52: 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	FTM50: dependent on mounting location, 4" fork FTM51: extended tube, 6" up to 13 feet FTM52: extension cable, up to 65 feet	Dependent on mounting location FTM21: extension pipe; 20, 40 or 60 inch		
Maximum particle size	0.4"	<u>≤</u> 0.98"		
Function indication	Red and green LEDs	Green and yellow LEDs		
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		

	FML621 Density Computer
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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 push- buttons or RS232/RS485
Interface	RS232, RS485, 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	
	FTL325P (intrinsically safe signal circuit, Liquiphant/Soliphant®)	FTL325N (one and three channel amplifier for NAMUR)
	1 an	
Application	Liquids, solids	Liquids
Measurement type	Point level	Point level
Output	AC/DC, relays	AD/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

Liquipoint				Liquipoint T
	FTW23	FTW33		FTW31 FTW32
Measuring Principle	Capacitance	Conductive		
Characteristic / Application	For use in storage tanks, mixing vessels	Compact point level switch for use in	Application	Liquids
	media with dielectric constant >20	vessels with or without an agitator,	Measurement type	Multiple point level
		active buildup compensation, flush mounting	Output	AC/DC, relay
Supply / Communication	10 to 30 V DC	10 to 30 V DC		NAMUR
Ambient temperature	-40 to 158°F (-40 to 70°C)	-40 to 158°F (-40 to 70°C)	Measured detection range	FTW31 rod: 4" to 158" FTW32 cable: 10" to 590"
Process temperature	Standard: -4 to +212°F Cleaning -4 to +275°F for 1h	Standard: -4 to +212°F Cleaning: -4 to 302°F for 1h	Power supply	20 to 253 VAC/20 to 55 VDC 10.8 to 45 VDC (PNP)
Process pressure absolute / max. overpressure limit	Vacuum: 232 psi	0 to 362.5 psi abs / 0 to 25 bar abs		NAMUR requires separate power, e.g. FTW325
Min. conductivity of medium	>20 DC	1µS/cm	Ambient	-40 to +160°F
Main wetted parts	Sensor: 316L	Sensor: 316L	temperature	NAMUR, -40 to +140°F
Process connection	Thread G1_G1/2_G3/4_M24	Thread G1_G1/2_G3/4_M24	Process temperature	-40 to +212°F
Process connection hygienic	Weld-in adapters Tri-Clamp Varivent	Clamp ISO 2852.1 to 1.1/2".2"	Process pressure	-14.5 to 145 psi
· rocco connection nygicine	treta in adaptero, in clainp, rantent	DIN11851 Pipe union	Process connection	Threaded: 1-1/2" NPT
Output	DC PNP	DC PNP	Wetted material	Rod probes: 316L SS, PP insulation
Approvals/certificates	EHEDG, 3A, CSA C/US General Purpose	EHEDG, 3A		Cable probes: 316Ti SS, FEP insulation
Specialties	CIP and SIP suitable	CIP and SIP suitable	Function indication	Red, yellow, green LEDS
Application limits	Buildup	Conductive foam is recognized as a liquid	Housing	Compact: PBT Remote: housing PPS; cover PBT
Instrumentation	Compact	Compact	Approvals/certificates	CE
Electronic insert	DC/PNP	DC PNP	**	1

Capacitance

	Nivector	Minicap		Solicap [®] M	Solicap S
	FTC968	FTC260 (compact version)	FTC262 (cable version)	FTI55 / FTI56 (limit detection switch)	FTI77 (limit detection switch)
Application	Powders, granules, pellets	Bulk solids, iquids	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 1450 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 LEDs	Red and green LEDs	Red, green and yellow LEDs	Red, green and yellow LEDs
Wetted material	Blue PC, lock nuts black PA	Probe: Polyphenyl- ene sulphide (FDA listed material)	Cable: steel coated with high density PE Probe: Polyphynylene 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, valv. 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	CD, combination FM/CSA, SIL2/SIL3 (with FEI55 insert)	CD, combination FM/CSA, SIL2/SIL3 (with FEI55 insert)

	Liquicap T			
	FTI51 / FTI52 (limit detection switch)	FMI51 / FMI52 (continuous level detection)		FMI21
Application	Liquids	Liquids	Application	Liquids
Measurement type	Point level	Continuous level	Measurement type	Capacitance, continuous
Output	DC-PNP (FEI52) 3-12 VDC (FEI53) AC/DC, relay output (FEI54)	4 to 20 mA HART [®] (FEI50H) PFM (FEI57C)	Output	4 to 20 mA 0 to 100%
	8/16 mA (FEI55) PFM (FEI57S)		Measured detection range	6" to 98"
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	10 to 30 VDC
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	FEI50H: 12 to 36 VDC FEI57C: 14.8 VDC	Ambient tempera- ture	-40 to +160°F
	FEI57S: 9.5 to 12.5 VDC		Process tempera-	-40 to +212°F
Ambient temperature	-58 to +158°F	-58 to +158°F	ture D	1/5/1/5
Process temperature	-112 to +392°F	-112 to +392°F	Process pressure	-14.5 to 145 psi
Process pressure	-14.5 to 1450 psi	-14.5 to 1450 psi	Process connections	Threaded: 1-1/2" NPT, PPS
Process connections	Threaded: 1/2", 3/4", 1", 1-1/2" Flange: 1" to 6" Tri-Clamp: 1", 1-1/2", 2"	Threaded: 1/2", 3/4", 1", 1-1/2" Flange: 1" to 6" Tri-Clamp: 1", 1-1/2", 2"	Wetted material	Rod probes: 316L SS, op- tional carbon fiber (CPC) Probe insulation: PP
Maximum particle size	N/A	N/A	Eunction indication	Pod and groon LEDs
Function indication	Red, green, yellow LEDS	Red and green LED, HART, local display	Function indication	optional 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	PBT-FT Cover PBT Cover with sight glass, PA
Housing	Polyester, Aluminum, Dual-compartment aluminum, 316 SS	Polyester, Aluminum, Dual-compartment aluminum, 316 SS	Approvals/certifi-	CE
Approvals/certificates	CE, combination FM/CSA, SIL2	CE, combination FM/CSA, SIL2	cuito	

Level

Transmitter/Limit Switch

Nivotester						
	FTC625 (intrinsically safe signal circuit)	FTC325 (intrinsically safe signal circuit)	FTW325 (intrinsically safe signal circuit)			
Application	Liquids	Liquids, solids	Liquids			
Measurement type	Capacitance, point level	Capacitance, 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				
Mounting	DIN rail	DIN rail	DIN rail			
Function indication	Red, green, yellow LEDS	Red, green, yellow LEDs	Red, green, yellow LEDs			
Operation	Switches, RS485 Remote with FieldCare®/ DeviceCare 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			

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Micropilot						
	FMR50	FMR51	FMR52	FMR53		
Appication	Liquids	Liquids	Liquids	Liquids		
Measurement type	Radar, non contact, continuous	Radar, non contact, continuous	Radar, non contact, continuous	Radar, non contact, continuous		
Max measured range	98 ft	131 ft, 230 ft enhanced dymanics	131 ft, 197 ft enhanced dymanics	66 ft		
Output	4 to 20mA HART, Profibus, FOUNDATION™ Fieldbus	4 to 20mA HART, Profibus, FOUNDATION™ Fieldbus	4 to 20mA HART, Profibus, FOUNDATION Fieldbus	4 to 20mA HART, Profibus, FOUNDATION Fieldbus		
Antenna type	Encapsulated PVDF or PP clad horn antenna	Horn: 1-1/2", 2", 3", 4"	Horn: PTFE disk, 2" and 3"	PFTE Rod antenna		
Power supply	16-32 VDC	16-32 VDC	16-32 VDC 16-32 VDC			
Ambient temperature	-40 to +176°F	-40 to +176°F	-40 to +176°F	-40 to +176°F		
Process temperature	-40 to +266°F	-321 to +842°F	-40 to +392°F	-40 to +302°F		
Process connections	G1-1/2, MNPT1-1/2, Flange (3" to 6")	MNPT1-1/2", Flange (2" to 6"), Tri-Clamp	Flange 2" to 6", Tri-Clamp	MNPT1-1/2, Flange (2" to 6")		
Wetted material	PVDF, PTFE, Viton, PP, PBT	316L, Alloy C, PTFE, Ceramic	PTFE	PVDF, PTFE		
Operation	4 to 20 mA, HART Display (with three buttons)	HART, Profibus, FOUNDATION Fieldbus, Display (with three buttons)	HART, Profibus, FOUNDATION Fieldbus, Display (with three buttons)	HART, Profibus, FOUNDATION Fieldbus, Display (with three buttons)		
Housing	PTB Plastic, Dual compartment Aluminum, Dual compartment	316L, Dual compartment Aluminum, Dual compartment	316L, Dual compartment Aluminum, Dual compartment	316L, Dual compartment Aluminum, Dual compartment		
Approvals / certificates	ATEX, FM, CSA, CE, SIL	ATEX, FM, CSA, CE, SIL	ATEX, FM, CSA, CE, SIL	ATEX, FM, CSA, CE, SIL		

Micropilot					
	FMR54	FMR56	FMR57		
Appication	Liquids	Bulk solids	Bulk solids		
Measurement type	Radar, non contact, continuous	Radar, non contact, continuous	Radar, non contact, continuous		
Max measured range	66 ft	98 ft	230 ft		
Output	4 to 20mA HART, Profibus, FOUNDATION Fieldbus	4 to 20mA HART, Profibus, FOUNDATION Fieldbus	4 to 20mA HART, Profibus, FOUNDATION Fieldbus		
Antenna type	Horn: 3", 4", 6", 8", 10"	Horn: PP 3" and 4"	Parabolic 8" and 10", Horn 3" and 4"		
Power supply	16-32 VDC	16-32 VDC	16-32 VDC		
Ambient temperature	-40 to +176°F	-40 to +176°F	-40 to +176°F		
Process temperature	-321 to +752°F	-40 to +176°F	-40 to +752°F		
Process connections	Flange(3" to 12")	Flange 3" to 6", Mounting Bracket	MNPT1-1/2, Flange 3" and 4", UNI 8" and 10"		
Wetted material	316L	PP, UP	316L, PTFE, PEEK, Polyamid		
Operation	HART, Profibus, FOUNDATION Fieldbus, Display (with three buttons)	HART, Profibus, FOUNDATION Fieldbus, Display (with three buttons)	HART, Profibus, FOUNDATION Fieldbus, Display (with three buttons)		
Housing	316L, Dual compartment Aluminum, Dual compartment	PTB Plastic, Dual compartment Aluminum, Dual compartment	316L, Dual compartment Aluminum, Dual compartment		
Approvals / certificates	ATEX, FM, CSA, CE, SIL	ATEX, FM, CSA, CE, SIL	ATEX, FM, CSA, CE, SIL		

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	Micropilot				
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Appication	Continuous/ Liquids	Continuous/Liquids			
Measurement type	Radar, non-contact level and flow	Radar, non-contact level and flow			
Max measured range	16 ft	66 ft			
Output	 Current output: 4 to 20 mA Digital output (SmartBlue): 0 to 16 ft 	 Current output: 4 to 20 mA Digital output (HART, SmartBlue): 0 to 66 ft, depending on antenna version 			
Antenna type	Integral non-metallic horn	Integral non-metallic horn			
Specialties	Bluetooth® commissioning, Operation and maintenance via SmartBlue App	Optional Bluetooth® commissioning, Operation and maintenance via SmartBlue App			
Supply/Communication	2-wire (4 to 20 mA) Bluetooth® wireless technology and App	2-wire (HART, 4 to 20 mA), <i>Bluetooth®</i> wireless technology and App (optional)			
Ambient temperature	-40 to+140°F	-40 to +176°F			
Process temperature	-40 to+140°F	-40 to +176°F			
Process pressure	-14.5 to 43 psi	-14.5 to +43psi			
Process connections	Thread: G1", NPT1"; G1 1/2", NPT1 1/2"	Thread: G1", NPT1"; G1 1/2", NPT1 1/2", G2", NPT2", Flange: 3" to 6"			
Wetted material	PVDT, PBT	PVDT, PBT			
Operation	4 to 20 mA; SmartBlue (app) via <i>Bluetooth</i> wireless technology	HART; DeviceCare; Optional: SmartBlue (app) via Bluetooth wireless technology			
Housing	PVDF	PVDF			
Approvals / certificates	CSA C/US	ATEX, CSA C/US, IEC Ex			

Micropilot S High Accuracy						
	FMR530	FMR532	FMR533	FMR540	NMR81	NMR84
Application	Liquids, custody transfer	Liquids, custody transfer	Liquids, custody transfer	Liquids, custody transfer	Liquids, high accuracy	Liquids, high accuracy
Measurement type	Radar, non-contact, continuous	Radar, non-contact, continuous	Radar, non-contact, continuous	Radar, non-contact, continuous	Radar, non-contact	Radar, non-contact
Max measured range	65 ft	125 ft	131 ft	Horn: 98 ft Parabolic: 131 ft	230 ft	131 ft
Output	4 to 20 mA, HART	4 to 20 mA, HART, Modbus RS485, V1	4 to 20 mA, HART, Modbus RS485, V1			
Antenna type	Horn: 3", 4", 6", 8", 10"	Planar: 6", 8", 10" 12	Parabolic antenna: 20"	Horn: 4" Parabolic: 8", 10"	Drip off, tear drop	Drip-off, planar
Power supply	16 to 32 VDC	16 to 32 VDC	16 to 32 VDC	16 to 36 VDC	85 to 264 VAC	85 to 264 VAC
Ambient temperature	-40 to +176°F	-40 to +176°F	-40 to +176°F	-40 to +176°F	-40 to +140°F	-40 to +140°F
Process temperature	-40 to +392°F	-40 to +302°F	-40 to +392°F	-40 to +392°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	Horn: -14.5 to 232 psi Parabolic: -14.5 to 87 psi	232 psi	362 psi
Process connections	3" to 10" ANSI flange	6" to 12" ANSI flange 6" to 12" Uniflange	6" to 10" ANSI flange 6" Uniflange	4" or 6" ANSI flange 6", 8" or 10" Uniflange	2", 3", 4" flange	4" - 12" flange
Wetted material	PTFE, 316Ti SS	HNBR, 316L SS	PTFE, 316L SS	Horn: PEEK, 316L SS Parabolic: PTFE, 316L SS	316SS, PEEK	316SS PEEK
Operation	HART, VU331 display module, FieldCare software	HART, display module, FieldCare software	HART, display module, FieldCare software			
Housing	Aluminum with separate connection compartment	Aluminum or 316L SS	Aluminum or 316L SS			
Approvals / certificates	CE, FM, CSA, Nmi, PTB	CE, FM, CSA, Nmi, PTB	CE, FM, CSA, Nmi, PTB			

Tank Gauging

Proservo					
NMS80		NMS81	NMS83		
Appication	Liquids, liquified gases, high accuracy	Liquids, liquified gases, high accuracy	Hygienic liquids, high accuracy		
Measurement type	High precision servo	High precision servo	High precision servo		
Max measured range	154 ft	154 ft	154 ft		
Output	4 to 20 mA, HART, Modbus RS485, V1	4 to 20 mA, HART, Modbus RS485, V1	4 to 20 mA, HART, Modbus RS485, V1		
Power supply	85 to 264 VAC	85 to 264 VAC	85 to 264 VAC		
Ambient temperature	-40 to +140°F	-40 to +140°F	-40 to +140°F		
Process temperature	-328 to +392°F	-328 to +392°F	-328 to +392°F		
Process pressure	0 to 87 psi	0 to 362.5 psi	0 to 362.5 psi		
Process connections	3", 4", 6"	3", 4", 6"	3", 4", 6"		
Wetted material	Carbon Steel, 316L SS	316L SS	316L SS		
Operation	HART, display module, FieldCare software	HART, display module, FieldCare software	HART, display module, FieldCare software		
Housing	Aluminum or 316L SS	Aluminum or 316L SS	Aluminum or 316L SS		
Approvals / certificates	ATEX, CSA, FM	ATEX, CSA, FM	ATEX, CSA, FM		

Tank Side Monitoring					
NRF81					
Application	System integration				
Measurement type	Legacy systems				
Output	4 to 20 mA, HART, Modbus RS485, V1				
Power supply	85 to 264 VAC				
Ambient temperature	-40 to +140°F				
Operation	HART, display module, FieldCare software				
Housing	Aluminum, 316L SS				
Approvals/ certificates	CE, FM, CSA, Nmi, PTB				

Guided radar

Levelflex (for liquids)					
	FMP50 (Rod/cable probe)	FMP51 / 52 / 54			FMP53 (Rod probe)
	9	FMP51 (rod, cable, coax)	FMP52 (rod, cable)	FMP54 (rod, cable, coax)	
Application	Liquids	Liquids	Liquids, corrosive	Liquids, high temperature/ pressure	Liquids, hygienic
Measurement type	Radar, continuous level	Radar, continuous level/ interface	Radar, continuous level/ interface	Radar, continuous level/ interface	Radar, continuous
Measured range	Liquids: 39 ft Max. rod length, 13 ft Max. cable length, 40 ft	Liquids: 148 ft Max. rod length, 33 ft Max. cable length, 148 ft Max. coax length, 20 ft	Liquids: 148 ft Max. rod length, 13 ft Max. cable length, 148 ft	Liquids: 148 ft Max. rod length, 33 ft Max. cable length, 148 ft Max. coax length, 20 ft	Liquids: maximum 20 ft.
Output	4 to 20 mA, HART Profibus PA FOUNDATION Fieldbus				
Power supply	HART 2-wire: 11.5 to 35 VDC HART 4-wire: 90 to 253 VAC, 10.4 to 48 VDC Profibus 2-wire: 9 to 32 VDC	HART 2-wire: 11.5 to 35 VDC HART 4-wire: 90 to 253 VAC, 10.4 to 48 VDC Profibus 2-wire: 9 to 32 VDC	HART 2-wire: 11.5 to 35 VDC HART 4-wire: 90 to 253 VAC, 10.4 to 48 VDC Profibus 2-wire: 9 to 32 VDC	HART 2-wire: 11.5 to 35 VDC HART 4-wire: 90 to 253 VAC, 10.4 to 48 VDC Profibus 2-wire: 9 to 32 VDC	HART 2-wire: 11.5 to 35 VDC HART 4-wire: 90 to 253 VAC, 10.4 to 48 VDC Profibus 2-wire: 9 to 32 VDC
Ambient temperature	-40 to +176°F With display: -4 to +158°F				
Process temperature	-4 to +176°F	-40 to +392°F depending on O-ring material	-58 to +392°F	-321 to +842°F	-4 to +302°F, with FFKM O-ring -4 to +266°F, with EPDM O-ring
Process pressure	Vacuum to 87 psi	Vacuum to 580 psi	Vacuum to 580 psi	Vacuum to 5800 psi	Vacuum to 232 psi
Process connections	34" NPT	3⁄4". 11⁄2" NPT Flange, 11⁄2" to 8" (150 lb to 300 lb)	1½", 2" 3" Tri-Clamp Flange, 1½", 2", 3", 4" (150 lb to 300 lb)	1½"NPT Flange 2", 3", 4" (300 lb to 1500 lb)	1" to 1½", 2" or 3" Tri-Clamp SMS, DIN and NEMUO Bio process connections
Wetted material	316L, 316 SS	316L SS, PTFE	316L SS, PTFE	316L SS, PTFE	Probe, 316L SS
Operation	4-line LCD with 3 push- buttons, HART, Profibus PA	4-line LCD with 3 push- buttons, HART, Profibus PA	4-line LCD with 3 push- buttons, HART, Profibus PA	4-line LCD with 3 push- buttons, HART, Profibus PA	4-line LCD with 3 push-buttons, HART, Profibus PA
Housing	PTB plastic, dual compartment Aluminum, dual compartment	PTB plastic, dual compartment Aluminum, dual compartment 316L SS, dual compartment	PTB plastic, dual compartment Aluminum, dual compartment 316L SS, dual compartment	PTB plastic, dual compartment Aluminum, dual compartment 316L SS, dual compartment	PTB plastic, dual compartment Aluminum, dual compartment
Approvals/ certificates	CE, FM, CSA, SIL 3	CE, FM, CSA, SIL 3	CE, FM, CSA, SIL 3, 3-A, FDA	CE, FM, CSA, SIL 3	CE, FM, CSA, SIL 3, ASME BPE and USP Class VI, FDA, 3-A

	Levelflex (for solids)		Levelflex (for solids)		
	FMP50 (Rod/cable, coax)		FMP56 (cable)	FMP57 (rod, cable)	
Application	Liquids, level and interface	Application	Solida Javal	Solide Journal	
Measurement type	Radar and capacitance, continuous	Application	30103, 19991	Solids, level	
Measured range	Liquids: 33 ft	Measurement type	Radar, continuous	Radar, continuous	
	Max. rod length, 13 ft Max. cable length, 33 ft Max. coax length, 20 ft	Measured range	Solids, 40 ft Max cable length, 40 ft	Solids, 40 ft Max. rod length, 13 ft Max. cable length, 148 ft	
Output	4 to 20 mA, HART Profibus PA, FOUNDATION Fieldbus	Output	4 to 20 mA, HART, Profibus PA, FOUNDATION Fieldbus		
Power supply	HART 2-wire: 11.5 to 35 VDC HART 4-wire: 90 to 253 VAC, 10.4 to 48 VDC Profilus 2-wire: 9 to 32 VDC	Power supply	HART 2-wire: 11.5 to 35 VDC HART 4-wire: 90 to 253 VAC, 10.4 to 48 VDC Profibus 2-wire: 9 to 32 VDC	HART 2-wire: 11.5 to 35 VDC HART 4-wire: 90 to 253 VAC, 10.4 to 48 VDC Profibus 2-wire: 9 to 32 VDC	
Ambient temperature	-40 to +176°F	Ambient temperature	-40 to +176°F With display: -4 to +158°F	-40 to +176°F With display: -4 to +158°F	
Process temperature	-58 to +392°F	Process temperature	-22 to +248°F, with FFKM O-ring -40 to +248°F, with EPDM O-ring	22 to +248°F, with FFKM O-ring -40 to +248°F, with EPDM O-ring	
Process pressure	-14.5 to 580 psi	Troccob temperature			
Process connections	1½" to 6", 150 lb ANSI RF flange, PTFE coated	Process pressure	-14.5 to 232 psi	-14.5 to 232 psi	
	1" to 4" 300 lb ANSI RF flange, PTFE coated	Process connections	34" NPT	1½" NPT	
Wetted material	316L, SS			Flange, 1½" to 8" (150 lb ANSI)	
Operation	4-line LCD with 3 push-buttons, HART, Profibus PA	Wetted material	316L SS	316L SS	
	Remote operation via HART, FieldCare	Operation	4-line LCD with 3 pushbuttons, HART, Profibus PA		
Housing	PTB plastic, dual compartment; Aluminum, dual compartment; 316L SS, dual compartment	Housing	PTB plastic, dual compartment; Aluminum, dual compartment; 316L SS, dual compartm		
Approvals/ certificates	CE, FM, CSA, SIL 3	Approvals/ certificates	CE, FM, CSA, SIL 3		

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 switcl	h 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: 1½" NPT, alum	inum or 316Ti SS	
Housing	Aluminum or 316 Ti SS		
Approvals/Certificates	CE, ATEX, IECEx		

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Soliwave M FQR56 / FDR56			
	FQR56 Emitter FDR56 Receiver		
	(p)		
Application	Wood chips, wood dust or flour; plaster, cement, ash; paper or cardboard shred, gravel, sand, dried powders in general, bags and boxes		
Measurement type	Non-contact microwave		
Output	Relay SPDT, 4 to 20 mA, Solid State Relay		
Measured detection range	328 ft		
Power supply	85 to 253 VAC 20 to 60 V	/DC/20 to 30 VAC	
Ambient temperature	-40 to +158°F		
Process temperature	-40 to +158°F		
Process pressure	Non-contact installation: any within installation 7.2 psi to 99 psi		
Process connections	1½" R, 1½" NPT		
Housing	Polyester or 316 SS		
Approvals/Certificates	CSA, ATEX, IECEx		

Mechanical

Ni S	ivotester FTR325 Switch Amplifier	
	FTR325 Single channel amplifier	
Application	Single channel switch ampli-	Aŗ
	barrier system. Used for level	M ty
	counting of packaged goods	01
Input	Open collector output from Soliwave	
Output	SPDT relay and SPST alarm signal output relay	M de
Power supply	85 to 253 VAC, 50/60 Hz 20 to 60 VDC / 20 to 30 VAC,	Po
Ambiant	6 to 1160°E	Ar ter
temperature	-4 (0 + 140 F	Pr
Mounting	DIN rail	tei
Housing	Polycarbonate	Pr
Approvals/ Certificates	CE	Pr co
		. Ho
		Ar Ce

Solimotion [®] Flow Indicator		
	FTR20	
pplication	Flow indicator, bulk solids	
leasurement pe	Microwave barrier	
utput	Relay SPST Analog 4 to 20 mA Solid State relay	
leasured etection range	65 ft (20 m)	
ower supply	85 - 253 VAC or 20 - 60 VDC Solid State 30 VAC or 30 VDC	
mbient mperature	-40 to +158°F	
rocess mperature	-40 to +158°F	
rocess pressure	7.2 to 98.6 psia	
rocess onnections	Thread R 1½" (EN 10226) NPT 1½" (ANSI/ASME B1.20.1)	
ousing	Polyester or Stainless Steel	
pprovals/ ertificates	CSA, ATEX, IECEX	

	Soliswitch	Silopilot	
	FTE31	FMM50	
Application	Solids	Continuous, solids	
Measurement type	Paddle switch	Electromechanical (Yo-Yo)	
Output	Binary, SPDT relay	0/4 to 20 mA	
Measured detection range	FTE rod: 4" to 23" FTE cable: up to 78"	229 ft	
Power supply	110 VAC 230 VAC 20 to 28 VDC	180 to 253 VAC, 50/60 HZ or 90 to 127 VAC, 50/60 Hz	
Ambient temperature	-4 to +140°F	-40 to+158°F	
Process temperature	-4 to +180°F	-4 to +446°F	
Process pressure	7 to 26 psi	11.6 to 43.5 psi	
Maximum particle size	2"	N/A	
Process connections	Threaded: 1¼" NPT Valox 553 (PBT) or 316L SS	Flange, 4"	
Wetted material	Rod and paddle: 316L SS Cable extensions: 316Ti SS	SS, Alu/Steel	
Function indication	N/A	Plain text display	
Housing	PBT	Aluminum Aluminum coated	
Approvals/ Certificates	CE, FM, CSA	ATEX	

Ultrasonic

Prosonic M					
	FMU 40	FMU 41	FMU 42	FMU 43	FMU 44
	0	6		O	9
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	N
		F. at
Application	Liquids, pastes, coarse bulk solids	1
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	1
Power supply	14 to 35 VDC	1
Ambient temperature	-4 to +140°F	1
Process temperature	-4 to +140°F	1
Process pressure	10 to 43 psi	1
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	1
Housing	PBT	1
Approvals / certificates	CE, CSA general purpose	1

NOTE: FMU30 replaces the FTU230 and FTU231

		Prosonic S Sensors (for Pro	osonic 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	
Application	Liquids, solids	Solids	
Measurement type	Ultrasonic, continuous, non-contact	Ultrasonic, continuous, non-contact	
Measured range	Liquids: 82 ft, solids: 50 ft	Solids: 148 ft	
Output	Analog signal to transmitter	Analog signal to transmitter	
Power supply	FMU 90 Prosonic transmitter	FMU 90 Prosonic transmitter	
Process temperature	-40 to +203°F	-40 to +176°F (optional to 302°F)	
Process pressure	10 to 43 psi	10 to 22 psi	
Process connections	1 NPT	1 NPT	
Housing / wetted material	UP, Al/PTFE	UP/PE (optional UP/VA)	
Ingress protection	NEMA 6P	NEMA 6P	
Approvals / certificates	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		
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 6-line plain text LCD, 3 push button keys, indicator LEDs		
Approvals / certificates	CE, CSA general purpose	CE, CSA general purpose	

Radiometric (Gamma)

	Radiometric source container			
	FQG60	FQG61/ FQG62	FQG63	QG2000
Application	Soilds, Liquids, Suspensions, Sludge	Solids, liquids, suspensions, sludge	Soilds, Liquids, Suspensions, Sludge	Solids, liquids, suspensions, sludge
Measuremnet Type	Non-contact radioactive measurement for continuous level, limit or density	Non-contact radioactive measurement for continuous level, limit or density	Non-contact radioactive measurement for continuous level, limit or density	Non-contact radioactive measurement for continuous level, limit or density
Radiation angle of emission	20° or 40°	5°, 20° or 40°		20° or 40°
Width of emission channel	6°	6°		6°
Shield Material	Lead	Lead	Lead	Lead
Source Material	¹³⁷ Cs or ⁶⁰ Co	¹³⁷ Cs or ⁶⁰ Co	¹³⁷ Cs or ⁶⁰ Co	¹³⁷ Cs or ⁶⁰ Co
Container Weight	39.69 lbs	FQG61 manual: 88 lbs pneumatic: 110 lbs FQG62 manual: 192 lbs pneumatic: 215 lbs	194 lbs	695 lbs
Ambient temparture	-40°F to +248°F	-40°F to +392°F -4°F to +176°F with pneumatic actuator	-62°F to +392°F	-4°F to +392°F
Mounting	Mounting kit	Flange, 150 lb ANSI, 4" steel or stainless steel	Flange, 150 lb ANSI, 4"	Steel or stainless steel mounting plate
Housing	316L	Steel, 304 SS, optional 316Ti SS	316L	316Ti SS
ON / OFF switching	Manual, padlock for secruity	Manual, padlock for security Pneumatic, padlock for security	Manual, padlock for secruity	Manual, padlock for security
Approvals / certificates	CE, FM, CSA, SIL2/3 (for level limit)	PTB report, CNSC, NRC	CE, FM, CSA, SIL2/3 (for level limit)	PTB report, CNSC

Radiometric measurement transmitter		
	Gammapilot [®] M FMG60	
Application	Solids, liquids, suspensions, sludge	
Measure- ment type	Non-contact radioactive measurement for continuous level, limit, density, concen- tration	
Measured range	Up to 6.6 ft (single FMG60). Multiple units can be cas- caded 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)	

Radiometric measurement sensor and transmitter				
	Gammapilot M FTG20			
Application	Soilds, Liquids, Suspen- sions, Sludge			
Measurem- net type	Non-contact radioactive measurement for limit or density			
Output	Relay, 8/16 mA (passive) or 4 to 20 mA output			
Power supply	11 to 36 VDC, 11 to 30 VDC (Ex ia), 19 to 55 VDC or 19 to 253 VAC (50 to 60 Hz)			
Ambient temperature	-40 to +158°F (-40 to +70°C) Aluminum housing, -40 to +158°F (-40 to +70°C) 316L housing, 32 to +248°F (0 to +120°C) with 316L and water cooling			
Mounting	Mounting Set			
Weight	17 lbs			
Approvals / certificates	CE, FM, CSA, SIL2/3 (for level limit)			

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Gai	nma modulator		Synchronizer		
	FHG65			FHG66	
Application	Suppresses background and extraneous radiation from the FMG60 Gammapilot 18 to 36 VDC		Application	Used to synchronize two or three FHG65 modulators	
Power supply			Output	Floating changeover contact	
Ambient temperature	-4 to +140°F without water cooling. 32 to 248°F with water cooling, at the terminal		Function indication	LEDs indicate operation, faults and error assignment	
Mounting	Mounted to source container		Power supply	18 to 36 VDC	
Housing	FQG61 or FQG62 304SS		Ambient temperature	-4 to +140°F	
	Water jacket, 316L SS and 304 SS		Mounting	DIN rail	
Weight	Without water jacket, 40 lbs	1	Housing	Polycarbonate	
	With empty water jacket, 46 lbs		Weight	0.3 lbs	
	With water jacket full, 55 lbs		Approvals /	CE	
Approvals / certificates	ls / CE, FM, CSA es		certificates		



Level

Flow Products available from Endress+Hauser

Electromagnetic

Flow

Senso	rs		Diameter	Measuring range	Pressure	Temperature (process)
Proma Water/W Proma Water/W	Promag® D Water/Waste water	- Ta	1 to 4"	0 to 33 ft/s 0 to 2642 gal/min	Cl 150 PN 16 JIS 10K	0 to +140°F
	Promag L Water/Waste water	(III)	2 to 90"	0 to 33 ft/s 0 to 713,265 gal/min	Cl 150 PN 10 to 16 AS Table E, PN 16	-4 to +194°F
letic (El	Promag W Water/Waste water	(Ā)	1 to 78"	0 to 33 ft/s 0 to 484,315 gal/min	Cl 150 to 300, PN 6 to 40 JIS 10 to 20K, AWWA Class D AS Table E, PN 16	-4 to +176°F
Line Chemica applicat	Promag P Chemical/Process applications	(Ta	½ to 24"	0 to 33 ft/s 0 to 42,267 gal/min	Cl 150 to 300, PN 10 to 40 JIS 10 to 20K AS Table E, PN 16	-40 to +356°F
Elect	Promag H Hygiene	-	¥12 to 6"	0 to 33 ft/s 0 to 1242 gal/min	Cl 150, PN 16 to 40 JIS 10 to 20K	-4 to +302°F
	Promag S Inhomogeneous fluids High solid content	(III)	½ to 24"	0 to 33 ft/s 0 to 42,267 gal/min	Cl 150 to 300, PN 10 to 40 JIS 10 to 20K AS Table E, PN 16	−40 to +356°F

Transmitters	Combinable with	Housing	Display/Operation	Temperature (Ambient)	Power supply	
100 Compact design	Sensor P, H	Compact SS Compact Alu Ultra Compact SS	Optional no-button display Operation via web server, FieldCare/DeviceCare or HART	-40 to +140°F	DC 20 to 30 V	
200 Two-wire	Sensor P, H	Compact Alu	Four-line LCD/Push buttons or Touch control Operation via FieldCare/DeviceCare	-40 to +140°F	Two-wire DC 18 to 30 V	
300 Compact Universal use	Sensor P, H	Aluminum	Four-line, backlit LCD/Touch control. Operation via web server, WLAN, WirelessHART and various operating tools (FieldCare, HART handheld, etc.)	-40 to +140°F	AC 100 to 230 V, DC 24 V (Zone 1, Div. 1) AC/DC 24 to 230 V (Zone 2, Div. 2, Non-Ex)	
400 Water Waste water	Sensor D, L, W	Compact/Remote Polycarbonate	Four-line, backlit LCD/Touch control Operation via FieldCare/DeviceCare or web- browser	-4 to +122°F	AC 90 to 264 V (47 to 63 Hz) AC 18 to 30 V (44 to 66 Hz) DC 18 to 30 V	
500 Remote Universal use	Sensor P, H, W	Aluminum, poly- carbonate, SS die-cast	Four-line, backlit LCD/Touch control. Operation via web server, WLAN, WirelessHART and various operating tools (FieldCare, HART handheld, etc.)	-40 to +140°F Optional: -58 to +140°F	AC 100 to 230 V, DC 24 V (Zone 1, Div. 1) AC/DC 24 to 230 V (Zone 2, Div. 2, Non-Ex)	
10 Basic	Sensor D, L, W, P, H	Compact Alu Remote Alu	Two-line LCD/Push buttons Operation via FieldCare/DeviceCare	-4 to +140°F	AC 85 to 250 V (45 to 65 Hz) AC 20 to 28 V (45 to 65 Hz) DC 11 to 40 V	
50* Standard	Sensor D, L, W, P, H	Compact SS Compact Alu Remote Alu	Two-line, backlit LCD/Push buttons Operation via FieldCare/DeviceCare	-4 to +140°F Optional: -40 to +140°F	AC 85 to 260 V (45 to 65 Hz) AC 20 to 55 V (45 to 65 Hz) DC 16 to 62 V	
51* Custody transfer	Sensor W, P	Compact Alu Remote Alu	Two-line, backlit LCD/Push buttons Operation via FieldCare/DeviceCare	-4 to +140°F	AC 85 to 260 V (45 to 65 Hz) AC 20 to 55 V (45 to 65 Hz) DC 16 to 62 V	
53* High-end	Sensor L, W, P, H	Compact SS Compact Alu Remote Alu	Four-line, backlit LCD/Touch control Operation via FieldCare/DeviceCare	-4 to +140°F Optional: -40 to +140°F	AC 85 to 260 V (45 to 65 Hz) AC 20 to 55 V (45 to 65 Hz) DC 16 to 62 V	
55 Special applications	Sensor S, H	Compact SS Compact Alu Remote Alu	Four-line, backlit LCD/Touch control Operation via FieldCare/DeviceCare	-4 to +122°F Optional: -40 to +122°F	AC 20 to 260 V (45 to 65 Hz) DC 20 to 64 V	
800 Battery- powered	Sensor W	Compact/Remote Polycarbonate	Eight-line LCD/Push buttons Operation via Config 5800 or GSM and GPSR	-4 to +140°F	Battery operation: DC 3.6 V Mains: AC 100 to 240 V (44 to 66 Hz), DC 12 to 60 V	

*50D sensor phased out 10/1/16. 50L sensor phased out 10/1/17. *51P / 51W sensor phased out 10/1/17. 53L sensor phased out 10/1/17.

www.us.endress.com/flow

Materials (wetted parts)	Process connection	Protection	Approval/Certification	Measuring uncertainty ¹⁾ (best possible "accuracy")
Polyamid liner	Wafer: EN (DIN), ASME, JIS	NEMA 4X (IP67)	Drinking water	Liquids: ±0.5%
Polyurethane liner PTFE liner Hard rubber liner	Lap-joint flange (DN ≤ 300): EN (DIN), ASME; Welded flange (DN ≥ 350): EN (DIN), ASME, AWWA, AS	NEMA 4X/6/6P (IP67/IP68)	Drinking water; custody transfer	Liquids: ±0.2%
Hard rubber liner Polyurethane liner	Flange: EN (DIN), ASME, JIS, AWWA, AS	NEMA 4X/6P (IP67/IP68)	Drinking water; custody transfer; marine approvals; PED, CRN; certified corrosion resistance (EN ISO 12944)	Liquids: ±0.2%
PFA liner PTFE liner	Flange: EN (DIN), ASME, JIS, AS	NEMA 4X/6P (IP67/IP68)	Drinking water; custody transfer; marine approvals; PED, CRN	Liquids: ±0.2%
PFA liner	Flange: EN (DIN), ASME, JIS; external thread, internal thread, weld connection, clamp connection, couplings	NEMA 4X (IP67)	3A, EHEDG, FDA; marine approvals; PED, CRN	Liquids: ±0.2%
PTFE, PFA, Polyurethane liner Natural rubber liner Hard rubber liner	Flange: EN (DIN), ASME, JIS, AS	NEMA 4X/6P (IP67/IP68)	PED, CRN	Liquids: ±0.2%

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Galvanic isolation	Inputs	Outputs	Communication	Ex approvals	Protection
Inputs/Outputs/ Power supply	_	4–20 mA, pulse/frequency/ switch output	HART, integrated web server and service interface via RJ45 Ethernet PROFIBUS DP, PROFINET [®] Modbus RS485, EtherNet/IP™	ATEX, IECEx, cCSAus	NEMA 4X (IP66 and IP67) Optional: IP69K (exceeds NEMA 4X PW12)
Inputs/Outputs	-	4–20 mA, pulse/frequency/ switch output	HART, FOUNDATION Fieldbus PROFIBUS PA	ATEX, IECEx, cCSAus	NEMA 4X (IP66 and IP67)
Inputs/Outputs/ Power supply	Status input, current input (4–20 mA); Optional: freely configurable I/Os	4–20 mA, pulse/frequency/switch output, relays; Optional: freely configurable I/Os	HART, WirelessHART, PROFIBUS PA/ DP, Modbus RS485, FOUNDATION Fieldbus, EtherNet/IP, PROFINET	cCSAus, ATEX, NEPSI, INMETRO, EAC, etc.	Type 4X (IP66/67) Optional: IP69K (stainless steel)
Inputs/Outputs/ Power supply	Status input	0/4–20 mA, pulse/frequency/ switch output	HART, integrated web server and service interface via RJ45 Ethernet EtherNet/IP, Modbus RS485 PROFIBUS DP	cCSAus (Cl. I Div. 2)	NEMA 4X (IP66 and IP67)
Inputs/Outputs/ Power supply	Status input, current input (4–20 mA); Optional: freely configurable I/Os	Max. 4 outputs ("digital" version): 4–20 mA, pulse/frequency/switch output, relays; Optional: freely configurable I/Os	HART, WirelessHART, PROFIBUS PA/ DP, Modbus RS485, FOUNDATION Fieldbus, EtherNet/IP, PROFINET	cCSAus, ATEX, NEPSI, INMETRO, EAC, etc.	Type 4X (IP66/67) Optional: IP69K (stainless steel)
Inputs/Outputs/ Power supply	-	4–20 mA, pulse/switch output	HART	FM, CSA Div. 2	NEMA 4X (IP67)
Inputs/Outputs/ Power supply	Status input	0/4–20 mA, pulse/frequency (1 kHz passive), switch output	HART, PROFIBUS DP, PROFIBUS PA	ATEX, IECEx, FM, CSA, TIIS, NEPSI	NEMA 4X (IP67)
Inputs/Outputs/ Power supply	Status input	0/4–20 mA, pulse/frequency (1 kHz passive), switch output	HART	ATEX, IECEx	NEMA 4X (IP67)
Inputs/Outputs/ Power supply	Status input, current input 4–20 mA	0/4–20 mA, status (10 kHz, active/passive), relays, switch output	HART, PROFIBUS DP/PA, FOUNDATION Fieldbus, Modbus RS485, EtherNet/IP™	ATEX, IECEx, FM, CSA, TIIS, NEPSI	NEMA 4X (IP67)
Inputs/Outputs/ Power supply	Status input, current input 4–20 mA	0/4-20 mA, pulse/frequency (10 kHz, active/passive), relays, switch output	HART, PROFIBUS DP, PROFIBUS PA FOUNDATION Fieldbus	FM, CSA Div. 2, IECEx Zone 2	NEMA 4X (IP67)
Inputs/Outputs/ Power supply	Status input	Pulse/switch output	4-band GSM/GPRS modem for data transmission via e-mail or SMS	_	NEMA 4X (IP67)

Coriolis

Sensors			Diameter	Measuring range	Pressure	Temperature (process)
	Promass [®] F Universal flowmeter		¾ to 10" HT: 1", 2", 3"	0 to 80,840 lb/min	Cl 150 to 600 PN 16 to 100 JIS 10 to 63K	−58 to +392°F HT: −58 to +662°F
	Promass A Low flow rates	0	1⁄24 to 1/8"	0 to 16.5 lb/min	Cl 150 to 600 PN 16 to 400 JIS 10 to 63K	−58 to +392°F
	Promass I Hygiene, viscosity		¾ 8 to 3"	0 to 6600 lb/min	Cl 150 to 600 PN 40 to 100 JIS 10 to 63K	−58 to +302°F
	Promass H Chemically aggressive fluids		¾ 8 to 2"	0 to 2570 lb/min	Cl 150 to 300 PN 40 JIS 10 to 20K	−58 to +392°F (Zr) −58 to +302°F (Ta)
	Promass E Basic applications		3∕8 to 3"	0 to 6600 lb/min	Cl 150 to 600 PN 40 to 100 JIS 10 to 63K	−40 to +284°F
lis le	Promass S Food & Beverages		3∕8 to 2"	0 to 2570 lb/min	Cl 150 to 300 PN 40 to 63 JIS 10 to 40K	−58 to +302°F
Coriol Prolin	Promass P Life Sciences Industries (Pharma, biotechnology)		³∕8 to 2"	0 to 2570 lb/min	Cl 150 to 300 PN 40 to 63 JIS 20 to 40K	−58 to +392°F
	Promass Q Challenging applications Fiscal metering	÷	1 to 4"	0 to 20,210 lb/min	Cl 150 to 600 PN 16 to 100 JIS 10 to 63K	-58 to +401°F Opt: -320.8 to +302°F (low-temperature version)
	Promass G High pressures	4	3%8 to 1"	0 to 661 lb/min	5,080 psi	-58 to +302°F
	Promass O High pressures Oil and gas industry		3 to 6"	0 to 29,395 lb/min	Cl 900, Cl 1500 PN 160, PN 250	−40 to +392°F
	Promass X High flow rates Oil and gas industry		12 to 16"	0 to 150,649 lb/min	Cl 150 to 600 PN 10 to 100	−58 to +356°F
	Cubemass C Low flow rates Compact design		½₄ to ¼"	0 to 37 lb/min	2320/5800 psig	-58 to +392°F

Transmitters	Combinable with	Housing	Display/Operation	Temperature (Ambient)	Power supply	
100 Compact design	Sensor F, I, E, S, P, C, O, X	Compact SS Compact Alu Ultra compact SS	Optional no-button display Operation via web server, FieldCare/DeviceCare or HART	-40 to +140°F	DC 20 to 30 V	
200 Two-wire	Sensor E, F	Compact Alu Compact SS	Four-line LCD/Push buttons or Touch control Operation via FieldCare/DeviceCare	-4 to +140°F	Two-wire DC 18 to 30 V	
300 Compact Universal use	Sensor F, E, A, I, Q, S, P, H, O, X Cubemass C	Aluminum SS die-cast	Four-line, backlit LCD/Touch control. Operation via web server, WLAN, WirelessHART and various operating tools (FieldCare, HART handheld, etc.)	–40 to +140°F Optional: –58 to +140°F	AC 100 to 230 V, DC 24 V (Zone 1, Div. 1) AC/DC 24 to 230 V (Zone 2, Div. 2, Non-Ex)	
500 Remote Universal use	Sensor F, E, A, I, Q, S, P, H, O, X Cubemass C	Aluminum, polycarbonate, SS die-cast	Four-line, backlit LCD/Touch control. Operation via web server, WLAN, WirelessHART and various operating tools (FieldCare, HART handheld, etc.)	-40 to +140°F Optional: -76 to +140°F	AC 100 to 230 V, DC 24 V (Zone 1, Div. 1) AC/DC 24 to 230 V (Zone 2, Div. 2, Non-Ex)	
40 Basic	Sensor E	Compact Alu	Two-line, backlit LCD Operation via HART or FieldCare/DeviceCare	-4 to +140°F Optional: -40 to +140°F	AC 85 to 260 V (45 to 65 Hz) AC 20 to 55 V (45 to 65 Hz) DC 16 to 62 V	
80 Standard	Sensor F, A, I, H, E, S, P	Compact SS Compact Alu Remote Alu	Two-line, backlit LCD/Push buttons Operation via FieldCare/DeviceCare	-4 to +140°F Optional: -40 to +140°F	AC 85 to 260 V (45 to 65 Hz) AC 20 to 55 V (45 to 65 Hz) DC 16 to 62 V	
83 High-end	Sensor F, A, I, H, E, S, P, O, X	Compact SS Compact Alu Remote Alu	Four-line, backlit LCD/ Touch Control Operation via FieldCare/DeviceCare	-4 to +140°F Optional: -40 to +140°F	AC 85 to 260 V (45 to 65 Hz) AC 20 to 55 V (45 to 65 Hz) DC 16 to 62 V	
84 Custody transfer	Sensor F, A, O, X, Cubemass DCI	Compact SS Compact Alu Remote Alu	Four-line, backlit LCD/ Touch Control Operation via FieldCare/DeviceCare	-4 to +140°F Optional: -40 to +140°F	AC 85 to 260 V (45 to 65 Hz) AC 20 to 55 V (45 to 65 Hz) DC 16 to 62 V	

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Materials (wetted parts)		Process connection	Protection App		proval/Certification	Measurin (best poss	1g uncertainty ¹⁾ sible "accuracy")
Measuring tube: 904L (1.4 (1.4404), Alloy C-22 (2.4 tion: 316/316L (1 Alloy C-22 (2.4	539), 316/316L 4602); Connec- 4404), 602)	Flange: EN (DIN), ASME, JIS Tri-Clamp, couplings, lap joint flange VCO	es, NEMA 4X (IP67)	SIL 2 CRN, AL	2/3; 3A, EHEDG; PED,) 2000; marine approvals	Liqui (±0.05% Gase	ids: ±0.10% % PremiumCal) es: ±0.35%
Measuring tube: 904L (1.4539), Alloy C-22 (2.4602); Connection: 904L (1.4539), Alloy C-22 (2.4602), 316/316L (1.4404)		Tri-Clamp, VCO	NEMA 4X (IP67)	SIL 2;	3A, EHEDG; PED, CRN	Liqui Gase	ids: ±0.10% es: ±0.50%
Measuring tube: Titan Connection: Titaniu	ium grade 9 m grade 2	Flange: EN (DIN), ASME, JIS Tri-Clamp, couplings	NEMA 4X (IP67)	SIL 2;	3A, EHEDG; PED, CRN	Liqui Gase	ids: ±0.10% es: ±0.50%
Measuring tube: Zirconiun Tantalum 2.5W; Connect Zirconium 702/R	n 702/R 60702, ion: Tantalum, 60702	Flange: EN (DIN), ASME, JIS	NEMA 4X (IP67)		SIL 2; PED, CRN	Liqui Gase	ids: ±0.10% es: ±0.50%
Measuring tube: 904 Connection: 316/316	L (1.4539) JL (1.4404)	Flange: EN (DIN), ASME, JIS Tri-Clamp, couplings, VCO	NEMA 4X (IP67)	SIL 2; 3A; 1	PED, CRN; marine approvals	Liqui (Optio Gasi	ids: ±0.15% onal: ±0.10%) es: ±0.75%
Measuring tube: 904 Connection: 316L (316/316L (1.4	L (1.4539) 1.4435), 404)	Flange: EN (DIN), ASME, JIS Tri-Clamp, couplings	NEMA 4X (IP67)	SIL 2; 34	A, EHEDG, FDA; PED, CRN	Liqui Gase	ids: ±0.10% es: ±0.50%
Measuring tube: 316 Connection: 316L (316/316L (1.4	L (1.4435) 1.4435), 404)	Flange: EN (DIN), ASME, JIS Hygienic clamps, couplings and flang	Jes (IP67)	3A, EHEI	DG, FDA; ASME BPE, ISPE; SIL 2; PED, CRN	Liqui Gase	ids: ±0.10% es: ±0.50%
Measuring tube: 316/3 Connection: 316/316	16L (1.4404) SL (1.4404)	Flange: ASME, JIS, EN (DIN)	Type 4X (IP66/67)	Custody ti NAC	ransfer; SIL 2/3; PED, CRN; E MR0175/MR0103	Liqu (±0.05% Gas	lid: ±0.10% % PremiumCal) s: ±0.35%
Measuring tube: 316L (1.4435) Connection: 316/316L (1.4404)		Cylindrical internal thread BSPP (G)	Type 4X (IP66/67)	CRN		Liquid: ±0.15% Gas: ±0.75%	
Measuring tube: 25Cr duplex (1.4410) Connection: 25Cr duplex (1.4410)		Flange: EN (DIN), ASME	NEMA 4X (IP67)	Custody transfer; SIL 2; PED, CRN, AD 2000; Materials conforms to NORSOK M-630, NACE MR175/MR103		Liquids: ±0.10% (±0.05% PremiumCal) Gases: ±0.35%	
Measuring tube: 316/316L (1.4404) Connection: 316/316L (1.4404)		Flange: EN (DIN), ASME	NEMA 4X (IP67)	Custody trai CRN; Material NA	nsfer; marine approvals; PED, s conforms to NORSOK M-630, LCE MR175/MR103	Liquids: ±0.10% (±0.05% PremiumCal) Gases: ±0.35%	
Measuring tube: 904 Connection: 904L (316/316L (1.4	L (1.4539) 1.4539), 404)	VCO	NEMA 4X (IP67)	SIL 2/3; CRN		Liqu Ga:	uid: ±0.10% s: ±0.50%
Galvanic isolation	Inputs	Outputs	Communication		Ex approvals		Protection
Inputs/Outputs/ Power supply	_	4-20 mA, pulse/frequency/ switch output	HART, PROFIBUS DP, I EtherNet/I	Modbus RS485, p™	ATEX, IECEx, cCSAus (Modbus only)	NEMA O (exceed	. 4X (IP66 and IP67) Optional: IP69K ds NEMA 4X PW12)
Inputs/Outputs	_	4–20 mA, pulse/frequency/ switch output	HART, PROFIE FOUNDATION	US PA, Fieldbus	ATEX, IECEx, cCSAus	[]	NEMA 4X IP66 and IP67)
Inputs/Outputs/ Power supply	Status input, current input (4–20 mA); Optional: freely configurable I/O	4–20 mA, pulse/frequency/switch output, relays; Optional: freely configurable I/Os s	HART, WirelessHART, DP, Modbus RS485, I Fieldbus, EtherNet/I	PROFIBUS PA/ FOUNDATION P, PROFINET	cCSAus, ATEX, NEPSI, INMETI EAC, etc.	RO, IP6 O (s	56/67 (Type 4X))ptional: IP69K stainless steel)
Inputs/Outputs/ Power supply	Inputs/Outputs/ Power supply Option: freely		HART, WirelessHART, DP, Modbus RS485, I Fieldbus, EtherNet/I	PROFIBUS PA/ FOUNDATION P, PROFINET	cCSAus, ATEX, NEPSI, INMETI EAC, etc.	RO, IP6 O (s	56/67 (Type 4X) Optional: IP69K stainless steel)
Inputs/Outputs/ Power supply		0/4-20 mA, frequency/switch output	HART		ATEX, IECEx, FM, CSA, TIIS, NI	IPSI	NEMA 4X (IP67)
Inputs/Outputs/ Power supply	Status input	0/4–20 mA, pulse/frequency (1 kHz passive), switch output	HART, PROFIE	BUS PA	ATEX, IECEx, FM, CSA, TIIS, NE	IPSI	NEMA 4X (IP67)
Inputs/Outputs/ Power supply	Status input, current input 4–20 mA	0/4-20 mA, pulse/frequency (10 kHz, active/passive), relays, switch output	HART, PROFIBU FOUNDATION I Modbus RS485, Et	S DP/PA, 7ieldbus, herNet/IP™	ATEX, IECEx, FM, CSA, TIIS, NE	IPSI	NEMA 4X (IP67)
Inputs/Outputs/ Power supply	Status input	0/4-20 mA, pulse/frequency (10 kHz, active/passive), 2 × pulse (90°/180°), relays,	HART Modbus RS	485	ATEX, IECEx, FM, CSA, TIIS, NE	IPSI	NEMA 4X (IP67)

¹⁾ Depending on the transmitter

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Ultrasonic

Sensors			Diameter	Measuring range	Pressure	Temperature (process)	
	Prosonic Flow W Clamp-on sensor Standard applications	c Flow W sensor pplications		0 to 50 ft/s 0 to 2,987,656 gal/min	No limit Non-invasive	−4 to +176°F Optional: 32 to 266°F	
	Prosonic Flow W Insertion sensor Standard applications		8 to 160"	0 to 50 ft/s 0 to 2,987,656 gal/min	232 psig	-4 to +176°F	
sonic line	Prosonic Flow P Clamp-on sensor Process applications		½ to 160"	0 to 50 ft/s 0 to 2,987,656 gal/min	No limit Non-invasive	−40 to +176°F Optional: 32 to 338°F	
Ultra	Prosonic Flow F Inline sensor Chemical industry		1 to 12"	0 to 33 ft/s 0 to 10,567 gal/min	CI 300 PN 40	-40 to +302°F Optional: -40 to +392°F	
	Prosonic Flow B Methane/Biogas measurement	<u>í</u>	2 to 8"	0 to 98 ft/s	145 psia	32 to 176°F	
	Prosonic Flow C Inline sensor Water/Waste water		12 to 78"	0 to 33 ft/sec 0 to 484,315 gal/min	CI 150 PN 16	-4 to +140°F	

Transmitters	Combinable with	Housing	Display/Operation	Temperature (Ambient)	Power supply	
91 Basic	Sensor W	Remote Alu	Two-line LCD/Push buttons Operation via FieldCare/DeviceCare	-4 to +140°F	AC 85 to 250 V (45 to 65 Hz) AC 20 to 28 V (45 to 65 Hz) DC 11 to 40 V	
93 High-end	Sensor W, P, C	Remote Alu	Four-line, backlit LCD/Touch control Operation via FieldCare/DeviceCare	-4 to +140°F Optional: -40 to +140°F	AC 85 to 260 V (45 to 65 Hz) AC 20 to 55 V (45 to 65 Hz) DC 16 to 62 V	
93 T Portable	Sensor P	Portable Plastic	Four-line, backlit LCD/Touch control Operation via FieldCare/DeviceCare	0 to +140°F	Rechargeable battery + charger: AC 100 to 240 V (47 to 63 Hz)	
92 Inline	Sensor F	Compact Alu Remote Alu	Two-line LCD/Push buttons Operation via FieldCare/DeviceCare	Compact: -40 to +140°F Remote: -40 to +176°F	Two-wire DC 12 to 35 V	
200 Two-wire	Sensor B	Compact Alu Compact SS	Four-line LCD/Push buttons or Touch control Operation via FieldCare/DeviceCare	-40 to +140°F	Two-wire DC18 to 30 V	

Materials (wetted parts)	Process connection	Protection	Approval/Certification	Measuring uncertainty ¹⁾ (best possible "accuracy")
Not wetted (Clamp-on sensor)	Clamp-on sensor	NEMA 4X/6P (IP67/IP68)	Marine approvals	Liquids: <2.0% (onsite) ±0.5% (under reference condi- tions)
316L (1.4404)	Welding connector	NEMA 6P (IP68)	-	Liquids: <2.0% (onsite) ±0.5% (under reference condi- tions)
Not wetted (Clamp-on sensor)	Clamp-on sensor	NEMA 4X/6P (IP67/IP68)	Marine approvals	Liquids: <2.0% (onsite) ±0.5% (under reference condi- tions)
CF3M/316/316L A105/A106/316/316L	Flange: EN (DIN), ASME, JIS	NEMA 4X/6P (IP67/IP68)	Marine approvals; PED, CRN, AD 2000; NACE MR175/MR103	Liquids: ±0.5% (2 or 3 beams) ±0.3% (4 beams)
316L (1.4404)	Flange: EN (DIN), ASME	NEMA 4X (IP66/67)	PED	Gases: ±1.5% Methane content: ±2.0% o.f.s
Carbon steel, epoxy coated	Flange: EN (DIN), ASME, AWWA	NEMA 6P (IP68)	Drinking water	Liquids: ±0.5%

Galvanic isolation		Inputs Outputs		Communication	Ex approvals	Protection	
	Inputs/Outputs/ Power supply	es/Outputs/ _ 0/4-20 mA, ver supply _ pulse/switch output		HART	FM, CSA Div. 2	NEMA 4X (IP67)	
	Inputs/Outputs/ Power supply	Status input, current input 4–20 mA	0/4–20 mA, pulse/frequency (10 kHz, active/passive), relays, switch output	HART, PROFIBUS DP, PROFIBUS PA, FOUNDATION Fieldbus	ATEX, IECEx, FM, CSA, TIIS, NEPSI	NEMA 4X (IP67)	
	Inputs/Outputs/ Power supply	Current input 4–20 mA	Data logger	-	-	-	
	Inputs/Outputs	-	4–20 mA, pulse/switch output	HART, PFM, PROFIBUS PA, FOUNDATION Fieldbus	ATEX, IECEx, FM, CSA, TIIS, NEPSI	NEMA 4X (IP67)	
	Inputs/Outputs	-	40–20 mA pulse frequency/ switch output	HART	ATEX, IECEx, cCSAus	NEMA 4X (IP66/67)	

Vortex

Flow

Sensors			Diameter	Measuring range	Pressure	Temperature (process)
	Prowirl® F Flanged version		½ to 12"	Liquid: 0.16 to 2412 m³/h Steam, gas: 2 to 32166 m³/h	Cl 150 to 1500 PN 10 to 250 JIS 10 to 40K	-328 to +752°F Optional: -328 to +842°F
	Prowirl D Wafer version	1	½ to 6"	Liquid: 0.16 to 625 m³/h Steam, gas: 2 to 8342 m³/h	Cl 150 to 300 PN 10 to 40 JIS 10 to 20K	−328 to +752°F Optional: −328 to +842°F
Vortex Proline	Prowirl R For low flows		1 to 10"	Liquid: 0.16 to 545 m³/h Steam, gas: 3.6 to 7262 m³/h	Cl 150 to 300 PN 10 to 40 JIS 10 to 20K	−328 to +752°F Optional: −328 to +842°F
	Prowirl O High pressures	L	½ to 6"	Liquid: 0.16 to 545 m³/h Steam, gas: 2 to 7262 m³/h	Cl 600 to 1500 PN 63 to 250 JIS 40K	-328 to +752°F Optional: -328 to +842°F
	Prowirl C Carbon steel		2 to 6"	Liquid: 30 ft/s Gas: 394 ft/s	CL600 to 900	-40 to 752°F

Transmitters

	Combinable with	Housing	Display/Operation	Temperature (Ambient)	Power supply	
200 Standard	Sensor D, F, R, O, C	Compact Alu Compact SS	Four-line LCD/Push buttons or Touch Control Operation via FieldCare/DeviceCare Four-line/Illuminated	Compact: -40 to +176°F Remote: -40 to +185°F Optional: from -58°	Two-wire DC12 to 35V	

Thermal

Sensors			Diameter	Measuring range	Pressure	Temperature (process)	
	t-mass A Flanges/External threads Basic applications		½ to 2"	Gas and process condition dependent	-7.25 to 580 psig	-40 to +212°F	
le	t-mass B for the sensor Basic applications		3 to 60"	Gas and process condition dependent	-7.25 to 290 psig	-40 to +212°F	
Therma	t-mass F Flanged version High-End		½ to 4"	Gas and process condition dependent	Cl 150 to 300 PN 16 to 40	-40 to +212°F	
	t-mass I Insertion sensor High-End		3 to 60"	Gas and process condition dependent	290 psi g	-40 to +266°F	
	t-mass T Insertion sensor Liquid monitoring		1½ to 40"	226 to 14,100,000 l/h	580 psig	-4 to +212°F SIP: 266°F	

Transmitters		Combinable with	Housing	Display/Operation	Temperature (Ambient)	Power supply	
	150 Basic	Sensor A, B, T	Compact Alu	Four-line LCD/Push buttons Operation via FieldCare/DeviceCare, HART or service interface (CDI)	-40 to +140°F	DC 18 to 30 V	
65 High-end		Sensor I, F	Compact Alu Remote Alu Option: Compact SS	Two-line, backlit LCD/Push buttons Operation via FieldCare/DeviceCare	-4 to +140°F Optional: -40 to +140°F	AC 85 to 260 V (45 to 65 Hz) AC 20 to 55 V (45 to 65 Hz) DC 16 to 62 V	

Materials (wetted parts)	Process connection	Protection	Approval/Certification	Measuring uncertainty ¹⁾ (best possible "accuracy")
Meter body: CF3M (1.4404), Alloy C-22 (2.4602) DSC sensor: 316L (1.4435), Inconel 718, Alloy C-22 (2.4602), Titanium Gr. 5	Flange: EN (DIN), ASME, JIS Optional: with integrated line size reduction	NEMA 4X (IP67)	Marine approvals; PED, CRN; SIL 1 (Prowirl 73), SIL 2 (Prowirl 72); degreased acc. to BS-IEC-60877:1999	Liquids: ±0.75% Vol. Gases/steam: ±1.0% Vol.
Meter body: CF3M (1.4404) DSC sensor: 316L (1.4435), Alloy C-22 (2.4602)	Wafer: EN (DIN), ASME, JIS	NEMA 4X (IP67)	Marine approvals; PED, CRN, AD 2000; SIL 1 (Prowirl 73), SIL 2 (Prowirl 72); degreased acc. to BS-IEC-60877:1999	Liquids: ±0.75% vol; ±1.0% mass Steam/Gas: ±1.0% vol; ±1.7% mass
Meter body: CF3M (1.4408) DSC sensor: 316/316L (1.4435) Connection: F316/F316L (1.4404)	Flange: EN (DIN), ASME, JIS	NEMA 4X (IP66/67)	3.1 material; NAMUR; SIL 2/3; PED, CRN, AD2000; degreased acc. to BSIEC- 60877:1999; NACE MR0175/MR0103; welding test acc. to ISO 15614-1	Liquids: ±0.75% vol; ±0.85% mass Steam/Gas: ±1.0% vol; ±1.7% mass
Meter body: CF3M (1.4408), 1.4571 DSC sensor: UNS N07718, Alloy 718, Titanium Grade 5; Connection: 1.4408 CF3M, (1.4571), F316/F316L	Flange: EN (DIN), ASME, JIS	NEMA 4X (IP66/67)	3.1 material; NAMUR; SIL 2/3; PED, CRN, AD2000; degreased acc. to BSIEC- 60877:1999; NACE MR0175/MR0103; welding test acc. to ISO 15614-1	Liquids: ±0.75% vol; ±0.85% mass Steam/Gas: ±1.0% vol; ±1.7% mass
Meter body: Carbon Steel DSC sensor: Alloy 718	Flange: ASME	NEMA 4X (IP67)	IS, XP, NI, SIL, CRN, NACE MR0175, 3.1 Material, EN10204-2.1, EN10204-2.2	Liquids: ±0.75% vol; ±0.85% mass Steam/Gas: ±1.0% vol; ±1.7% mass

Galvanic isolation		Inputs	Outputs	Communication	Ex approvals	Protection
	Inputs/Outputs	Current input 4-20 mA	4–20 mA, pulse/frequency/switch output	HART, PROFIBUS PA, FOUNDATION Fieldbus	ATEX, IECEx, cCSAus, NEPSI, IMMETRO, TIIS (in prep)	NEMA 4X (IP66/67)

Materials (wetted parts)	Process connection	Protection	Approval/Certification	Measuring uncertainty ¹⁾ (best possible "accuracy")
316L (1.4404)	Lap-joint flange, flange: EN (DIN), ASME R external thread (EN) NPT external thread (ASME)	NEMA 4X (IP66 and IP67)	PED	Gases: ±3% o.r. (15 to 100% o.f.s.) ±0.45% o.f.s. (1 to 15% o.f.s.)
316L (1.4404)	Thread: G1A, G¾A 1" NPT, ¾" NPT	NEMA 4X (IP66 and IP67)	PED	Gases: ±3% o.r. (15 to 100% o.f.s.) ±0.45% o.f.s. (1 to 15% o.f.s.)
316L (1.4404) Alloy C-22	Flange: EN (DIN), ASME, JIS	NEMA 4X (IP67)	PED, CRN; degreased acc. to 0000-N-S-430-00-01 (BOC) and BS-IEC-60877:1999	Gases: ±1.5% o.r. (10 to 100% o.f.s.) ±0.15% o.f.s. (1 to 10% o.f.s.)
316L (1.4404) Alloy C-22	Thread: 1" NPT, G1A	NEMA 4X (IP67)	PED, CRN; degreased acc. to 0000-N-S-430-00-01 (BOC) and BS-IEC-60877:1999	Gases: ±1.5% o.r. (10 to 100% o.f.s.) ±0.15% o.f.s. (1 to 10% o.f.s.)
316/316L (1.4404) Alloy C22	Standard: G¾" A, ¾" NPT Hygienic: Tri-Clamp, DIN 11851, DIN 11864-1 Form A	NEMA 4X (IP66/67)	3.1 material; CRN; 3A, EHEDG	Liquid: ±5% o.f.s.

isolation		Outputs	Communication	Ex approvals	Protection
Outputs/ Power supply	_	0/4–20 mA, pulse/frequency/ switch output	HART	cCSAus (Cl. I Div. 2)	NEMA 4X (IP66 and IP67)
Inputs/Outputs/ Power supply	Status input, current input 4–20 mA	0/4–20 mA, pulse/frequency, (1 kHz, active/passive), relays, switch output	HART, PROFIBUS DP/PA, Modbus RS485, FOUNDATION Fieldbus	ATEX, IECEx, FM, CSA, TIIS, NEPSI	NEMA 4X (IP67)

Flow

Sensors			Diameter	Measuring range	Pressure	Temperature (process)	
	EMF	Dosimag® Filling/bottling Conductive liquids		DN 4 (5⁄32"), 8 (5⁄16"), 15 (1⁄2"), 25 (1")	0.033 to 33 ft/s 0 to 26.4 gpm	232 psi	-4 to +266°F
		Dosimass Filling/bottling Liquids		3⁄8", ½", 1"	0 to 660 lbs/min	580 psi	-40 to +257°F
	S	CNGmass Compressed Natural Gas Fueling		³⁄8", ¹⁄2", 1"	0 to 330 lb/min	max. 5080 psi	−58 to +257°F
	Corioli	CNGmass DCI Compressed Natural Gas Fueling	*	³⁄8", ¹⁄2", 1"	0 to 330 lb/min	max. 5080 psi	−58 to +302°F
		LPGmass Liquified Petroleum Gas Fueling		³⁄8", ¹⁄2", 1", 1¹⁄2"	0 to 1650 lb/min	Cl 150 to 300 PN 40 JIS 10 to 63K	-40 to +257°F
		LNGmass Liquified Natural Gas Fueling	i de la	³⁄8", ¹⁄2", 1"	0 to 660 lb/min	Cl 300 PN 40	−320 to +257°F

Transmitters	Housing	Display/Operation	Temperature (Ambient)	Power supply
Dosimag Compact version	Compact SS	Operation via FieldCare/DeviceCare	-4 to +140°F	DC 20 to 30 V
Dosimass Compact version	Compact SS	Operation via FieldCare/DeviceCare	-4 to +140°F	DC 20 to 30 V
CNGmass Compact version Custody transfer	Compact Alu	Operation via FieldCare/DeviceCare	-40 to +140°F	AC 20 to 28 V DC 10 to 30 V
CNGmass DCI Compact/remote version Custody transfer	Compact SS Compact Alu Remote Alu	Four-line, backlit LCD/Touch control Operation via FieldCare/DeviceCare	-40 to +140°F	AC 85 to 260 V (45 to 65 Hz) AC 20 to 55 V (45 to 65 Hz) DC 16 to 62 V
LPGmass Compact version Custody transfer	Compact Alu	Operation via FieldCare/DeviceCare	-40 to +140°F	AC 20 to 28 V DC 10 to 30 V
LNGmass Compact version	Compact Alu	Operation via FieldCare/DeviceCare	-40 to +140°F	DC 20 to 30 V

Materials (wetted parts)	Process connection	Protection	Approval/Certification	Measuring uncertainty ¹⁾ (best possible "accuracy")
PFA liner	Tri-Clamp, weld connection	NEMA 4X (IP67)	3A, EHEDG, FDA; PED, CRN, METAS	±0.5% Optional: ±0.25%
904L (1.4539) 316L (1.4404)	Tri-Clamp, couplings	NEMA 4X (IP67)	3A; PED, CRN	±0.15%
316L (1.4404) 316L (1.4435)	Internal thread: G½" (DN 8), G¾" (DN 15) G1" (DN 25)	NEMA 4X (IP67)	Custody transfer; PED, CRN, NTEP, PTB, METAS	±0.5% (per fill cycle)
316L (1.4404) 316L (1.4435)	Internal thread: G½" (DN 8), G¾" (DN 15) G1" (DN 25)	NEMA 4X (IP67)	Custody transfer; PED, CRN, NTEP, PTB, METAS	±0.5% (per fill cycle)
904L (1.4539) 316L (1.4404)	Flange: EN (DIN), ASME, JIS; VCO	NEMA 4X (IP67)	Suitable for system approval acc. to OIML R117-1 (2004/22/EG [MID], Appendix MI-005); PED, NTEP, MC, NMI	±0.2%
904L (1.4539) 316/316L (1.4404)	Flange: EN (DIN), ASME	NEMA 4X (IP66/67)	3.1 material, CRN, NTEP, NMI	±0.15% o.r. under reference conditions (for mass and volume flow)

Galvanic isolation	inputs	Outputs	Communication	Ex approvals	Protection
Inputs/Outputs/Power supply	-	Pulse, switch output	Modbus RS485	-	NEMA 4X (IP67)
Inputs/Outputs/Power supply	-	Pulse, switch output	Modbus RS485	ATEX II 3G	NEMA 4X (IP67)
Inputs/Outputs/Power supply	-	Pulse/frequency, switch output	Modbus RS485	ATEX, IECEx, FM, CSA, NEPSI	NEMA 4X (IP67)
Inputs/Outputs/Power supply	Status input	0/4-20 mA, pulse/frequency (10 kHz, active/passive), 2 × pulse (90°/180°), relays, switch output	HART, Modbus RS485	ATEX, CEC, NEC, TIIS, NEPSI	NEMA 4X (IP67)
Inputs/Outputs/Power supply	-	Pulse/frequency, switch output	Modbus RS485	ATEX, IECEx, FM, CSA, NEPSI	NEMA 4X (IP67)
Outputs/Power supply	-	Modbus RS485	Modbus RS485	ATEX, IECEx, cCSAus, NEPSI, INMETRO (Ex ia)	NEMA 4X (IP66/67)

Sensors			Diameter	Measuring range	Pressure	Temperature (process)	
EMF	Magphant® Limit switch/Trend display Conductive liquids	Ť	½ to 78"	0 to 248,982 gal/min	232 psia	-4 to +248°F	
mal	Flowphant [®] DTT31 Standard applications Liquids	1. T.	ANSI NPT $\frac{1}{2}$ and $\frac{1}{2}$ "	0.1 to 9.84 ft/sec Relative value between 0 to 100%	Up to 1450 psi	-4 to +185°F	
The	Flowphant DTT35 Hygienic applications Liquids	Ĩ.	Tri-Clamp 1" - 1½", 2" Varivent F, N DIN 11851 APV-Inline	0.1 to 9.84 ft/sec Relative value between 0 to 100%	Max. 1450 psig all except conical metal (232 psig)	-4 to +185°F	

Transmitters	Housing Display/Operation		Temperature (Ambient)	Power supply
Magphant Compact version	Compact Alu	LED	-4 to +140°F	DC 20 to 30 V
Flowphant DTT31 Compact version	Compact SS	One-line, backlit LCD Color change on faults, LED for status indication/Push buttons	-40 to +185°F	DC 18 to 30 V (reverse polarity protection)
Flowphant DTT35 Compact hygienic version	Compact SS	One-line, backlit LCD Color change on faults, LED for status indication/Push buttons	-40 to +185°F	DC 18 to 30 V (reverse polarity protection)

	Materials (wetted parts)	Process connection	Protection	Approval/Certification	Measuring uncertainty ¹⁾ (best possible "accuracy")
	PVDF	Weld nipple	NEMA 4X (IP66)	Marine approvals	±2.0%
	AISI 316L	Weld nipple, compression fitting, threaded connection: ASME, ISO	IP65	Marine approvals	±2.0 to 10% (depending on measuring range)
	AISI 316L	Clamp ISO 2852, APV inline, Varivent, Conical metal-metal G½", dairy thread (DIN 11851)	IP65	3A; marine approvals	±2.0 to 10% (depending on measuring range)

Galvanic isolation	Inputs	Outputs	Communication	Ex approvals	Protection
No galvanic isolation	-	4-20 mA, relays	-	FM, CSA Div. 2	NEMA 4X (IP66)
No galvanic isolation	-	$1 \times \text{or } 2 \times \text{PNP}$ switch outputs Optional $1 \times \text{PNP}$ switch outputs and $1 \times 4-20$ mA output (active)	Programmable via PC (ReadWin 2000 and FieldCare/ DeviceCare)	-	IP65
No galvanic isolation	-	$1 \times \text{or } 2 \times \text{PNP}$ switch outputs Optional $1 \times \text{PNP}$ switch outputs and $1 \times 4-20$ mA output (active)	Programmable via PC (ReadWin 2000 and FieldCare/ DeviceCare)	-	IP65

Differential Pressure Flow Measurement

	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	ANSI Class 150, 300, 600, 1500; 316Ti SS Weld nipple, cutting ring, threaded; 316Ti SS						
Transmitter	Deltabar S PMD75	Detabar S PMD75						
Output	4 to 20 mA HART, Profibus and FOUNDATION Fieldbus	4 to 20 mA HART, Profibus and FOUNDATION Fieldbus						
Ambient temperature	-40 to +185°F, transmitter	-40 to +185°F, transmitter						
Power supply	11.5 to 45 VDC; Profibus and FOUNDATION Field- bus, 9 to 32 VDC	11.5 to 45 VDC; Profibus and FOUNDATION Field- bus, 9 to 32 VDC						
Display / User interface	4-line LCD / Push buttons	4-line LCD / Push buttons						
Approvals / certificates	FM, CSA, NACE, SIL	FM, CSA, NACE, SIL						

Pressure Products available from Endress+Hauser

					Gauge	Absolute			www.us.	endress.com/pressure
		Cerab	ar® T					Cerap	hant T	
	PMC131	PMP11	PMP21		PMP23		PTC31		PTP31B	РТР33В
	ŢĄ		a set					ALL A		
						Application	Process j	oressure	Process pressure	Process pressure
Application	Process pressure	Process Pressure	Process Pre	ssure	Hygienic Pressure	Measuring	1.5 to 60	00 psi	6 to 6000 psi (gauge/	6 to 600 psi (gauge/
Measuring range	-15 to 600 psi	-15 to 600 psig	-15 to 6000) psig, Isia	-15 to 600 psig, 0 to 600 psia	Pressure sensor	Ceramic		Metallic	Metallic
Pressure sensor	Ceramic	Metallic	Metallic		Metallic	Output	One PNF	switch output	PNP switch + 4-20 mA,	PNP switch + 4-20 mA,
Output	4 to 20 mA	4-20 mA, 0-10 VDC	4-20 mA		4-20 mA		Two PNF PNP swit	switch outputs ch output with	PNP switch, 2xPNP switch	PNP switch, 2xPNP switch
Process	-4 to +212°F	-13 to 185°F	-40 to 212°	F	14 to 212°F,		4 to 20 r	nA (active)		
temperature		(-25 to 85 C)	(-40 to 100	(C)	-10 to 100 C, (275°F/135°C for	Process tem- perature	-40 to +2	212°F	-40 to +212°F	14 to 212°F, 225°F for 1 hour max
Power supply	11 to 30 VDC	11-30 VDC	12-30 VDC		1 100r)	Power supply	12 to 30	VDC	12 to 30 VDC	12 to 30 VDC
Process connections	Threaded	Threaded	Threaded		Mini-clamp, Tri- clamp, threaded	Process connec- tions	Threade	1	Threaded	Threaded, Clamp, Tri-clamp, Varivent, universal adapter
Approvals / certificates	SIL	CSA/FM/ATEX Ex	CSA/FM/A Ex	TEX	CSA/FM/ATEX/ IEC Ex	Approvals / certificates	UL		CSA/CUS, DNVGL, ABS	CSA/CUS, EHEDG, 3A
						Cerabar M				
	PMC51			PMP51			PMP55			
							P			
Application	Process press	ure, level (gauge and at	osolute)	Process pressure, level (gauge and absolute)			Process pressure, level (gauge and absolute)			
Measuring range	-15 to 600 p	31		-15 to	o 6000 psi			-15 to 6000 psi		
Pressure sensor	Ceramic			Metal	llic			Metallic with diaphragm seal		
Output 4 to 20 mA / HART Profibus-PA FOUNDATION Fieldbus			4 to 2 Profib FOUN	0 mA / HART ous-PA IDATION 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	o +185°F without displ +158°F with display	ay		-40 to +185°F v -4 to +158°F wi	vithout display th display			
Power supply	11.5 to 45 VI 11.5 to 30 VI	DC DC for intrinsically safe	unit	11.5 t 11.5 t	to 45 VDC to 30 VDC for intrinsic	ally safe unit		11.5 to 45 VDC 11.5 to 30 VDC	for intrinsically safe unit	
Process temperatu	re -40 to +212° -40 to +266°F +302°F for m	F for hygienic process con ax. of 60 min (for hygie	nections nic)	-40 to -40 to -40 to	o +257°F (internal diap o +218°F (flush-mount o +266°F (hygienic conn	ohragms) ed diaphragms) ections max 302°F fo	r 30 min.)	-94 to +752°F d	lepending on seal and fill oil	
Process connection	s Threaded, Al	ISI flange, Tri-Clamp, V	arivent	Threa	ded, ANSI flange, Tri-(Clamp, Varivent		Threaded, Tri-C separator	lamp, ANSI flange, extended	l diaphragm, Varivent,
Approvals / certifica	ites FM, CSA, NS	F 61, 3A, SIL		FM, C	SA, NSF 61, 3A, SIL			FM, CSA, 3A, S	IL	

	Cerabar S							
	PMC71	PMP71	PMP75					
Application	Process pressure, level	Process pressure, level	Process pressure, level					
Measuring range	-15 to 600 psi	-15 to 10,500 psi	-15 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	-13 to +257°F -4 to +302°F	-40 to +257°F (internal) -40 to +212°F (flush mount)	-94°F to +752°F depending upon diaphragm seal/fill fluid					
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, combination FM/CSA, NSF 61	SIL, combination FM/CSA, NSF 61	SIL, combination FM/CSA					

Differential

	Deltabar M
	PMD55
Application	Differential pressure, level, flow
Span (adjustable)	0.15 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, SIL, 3A

		Deltabar S						
	PMD75	FMD71	FMD72	FMD77	FMD78			
Application	Differential pressure, level, flow	Differential pressure, level	Differential pressure, level	Level	Differential pressure, level			
Span (adjust- able)	4 in $\mathrm{H_2O}$ to 600 psi		12 inH_2O to 150 psi	40 inH_20 to 240 psi	40 in $\rm H_2O$ to 600 psi			
Pressure sensor	Metallic	Metallic	Metallic	Metallic	Metallic			
Output	4 to 20 mA HART Profibus PA FOUNDATION Fieldbus	4 to 20 mA HART	4 to 20 mA HART	4 to 20 mA HART Profibus PA FOUNDATION Fieldbus	4 to 20 mA HART Profibus PA FOUNDATION Fieldbus			
Process temperature	-40 to +248°F	-13 to 302°F	-40 to +257°F (Consult factory for temperatures above 257°F)	-40 to +660°F	-40 to +660°F			
Power supply	10.5 to 45 VDC 9 to 32 VDC (Profibus, FF)	12 to 45 VDC	12 to 45 VDC	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 ANSI flange	Threaded ANSI flange	Threaded ANSI flange	Threaded ANSI flange Tri-Clamp Varivent			
Approvals/ certificates	SIL, FM/CSA	FM/CSA	FM/CSA	SIL, FM/CSA	SIL, FM/CSA, 3A			

Hydrostatic

	Deltapilot® M			
	FMB50	FMB51	FMB52	FMB53
		11		10
Application	Hydrostatic level/pressure Food, pharmaceutical, chemical	Hydrostatic level/pressure Food, pharmaceutical, chemical	Hydrostatic level/pressure Food, pharmaceutical, chemical	Hydrostatic level/pressure water, wastewater
Measuring range	-15 to 150 psi	-15 to 150 psi	-15 to 150 psi	-15 to 150 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, SIL	FM, CSA, NSF 61, SIL	FM, CSA, NSF 61, SIL	FM, CSA, NSF 61, SIL

	Deltapilot S	Waterpilot		
	FMB70	FMX21		
Application	Hydrostatic level, hygienic	Hydrostatic level		
Measurement range	40 to 4,000 inH ₂ O (1.5 to 150 psi)	1.5 to 300 psi (3 to 600 ftH ₂ 0)		
Pressure sensor	CONTITE	Ceramic		
Output	4 to 20 mA / HART Profibus PA FOUNDATION Fieldbus	4 to 20 mA analog only		
Process temperature	14 to 212°F (up to 275°F for 30 minutes)	14 to 158°F (salt water version, 32 to 122°F)		
Power supply	10.5 to 45 VDC (10.5 to 30 VDC for intrinsically safe units) 9 to 32 VDC (Profibus, FOUNDATION Fieldbus)	10.5 to 35 VDC Intrinsically safe, 10.5 to 30 VDC		
Process connections	Universal mounting adapters, NPT, Tri-clamp, ANSI flange, Varivent	Mounting clamp, Threaded mount		
Approvals / certificates	FM, CSA, 3-A, SIL, NSF 61	FM, CSA, NSF61		

NOTE: FMX21 Waterpilot replaces FMX167 Waterpilot

FMB70 pressure transmitter replaces DB50S transmitter

A - Standard 0.87 version B - Heavy duty 1.66 version C - Salt water 1.15 version

www.us.endress.com/temperature

Field mounted			DIN rail mounted			
	TMT142 (Single input)	TMT162 (Dual input, dual- compartment housing)	TMT121	TMT122	TMT127	тмт128
RTD input	Pt100, Pt200, 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 mA/ 20 to 4 mA Profibus PA 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 tempera- ture	-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/certifi- cates	FM, CSA, CE, UL, ATEX	FM, CSA, SIL 2, UL, CE, ATEX	FM, CSA, UL, CE, ATEX	FM, CSA, UL, CE, ATEX	FM, CSA, UL, CE, ATEX	FM, CSA, UL, CE, ATEX

	Head transmitters								
	TMT180	TMT181	TMT187	TMT188	TMT182	TMT80	TMT84 (dual input)	TMT85 (dual input)	TMT82 (dual input)
	3		5	S		:)	N.A	1	
RTD input	Pt100	Pt100, Pt500, Pt1000 Ni100, Ni500, Ni1000	Pt100	No	Pt100, Pt500, Pt1000 Ni100, Ni500, Ni1000	Pt100, Pt1000	Pt50, Pt100, Pt200, Pt500, Pt1000, Ni100, Ni120, Ni1000, Cu10, Cu50, Cu100	Pt50, Pt100, Pt200, Pt500, Pt1000, Ni100, Ni120, Ni1000, Cu10, Cu50, Cu100	Pt50, Pt100, Pt200, Pt500, Pt1000, Ni100, Ni120, Cu50
TC input	No	B, C, D, R, S, E, J, K, L, N, T, U	No	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, K, N, R, S	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	No	10 to 2000 Ω	No	No	10 to 2000 Ω	No	10 to 400 Ω, or 10 to 2000 Ω	10 to 400 Ω, or 10 to 2000 Ω	10 to 400 Ω, or 10 to 2000 Ω
mV input	No	-10 to 100 mV	No	No	-10 to 75 mV	No	-20 to 100 mV -5 to 30 mV	-20 to 100 mV	-20 to 100 mV
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	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	-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	11.5 to 35 VDC	8 to 35 VDC	9 to 32 VDC	9 to 32 VDC	11 to 42 VDC
Approvals/ certificates	UL, CSA, CE	FM, CSA, UL, CE, ATEX	FM, CSA, UL, CE, ATEX	FM, CSA, UL, CE, ATEX	FM, CSA, UL, CE, ATEX	CE	FM, CSA, UL, CE, ATEX	FM, CSA, UL, CE, ATEX	FM, CSA, UL, CE, ATEX, SIL 2/SIL 3 (according to IEC 61508:2010)

RTD temperature sensors							
	TH11	TH12	TH17	TH18			
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						
Connection head	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'F Polypropylene, -40 to +185'F	With head-mounted transmitter: -40 to +185'F Without head-mounted transmitter: Aluminum, -40 to +302°F Polypropylene, -40 to +185'F	With head-mounted transmitter: -40 to +185'F Without head-mounted transmitter: Aluminum, -40 to +302'F Polypropylene, -40 to +185'F	With head-mounted transmitter: -40 to +185'F Without head-mounted transmitter: Aluminum, -40 to +302'F 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	1-1/4"	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", 2-1/2", 3", 4", 5", 6" 2" to 30", specified in 1/2" increments	3/4", 1-1/4", 2-1/4", 2-3/4" 1" to 15", specified in 1/4" increments			
Approvals / certificates	Based on transmitter type used						

RTD temperature sensors in Thermowells							
	TH13	TH14	TH15	TH27			
	T	Ŧ					
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						
Process connection	1/2" NPT, 316 SS 3/4" NPT, 316 SS 1" NPT, 316 SS Socket weld, 3/4", 1", 316L SS Weld-in, 3/4", 1", 316L 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 or Nipple-Union-Nipple (NUN)	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						
Connection head	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 +300'F 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'F 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°F 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'F 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 32", specified in 1/2" increments			
Approvals / certifi- cates	Based on transmitter type used						

RTD temperature sensors in Thermowells, Explosion Proof				Omnigrad M RTD temperature sensors			
	T13	T14	T15		TR10	TRII	
Application	Petrochemical, refineries	Petrochemical, refineries	Petrochemical, refineries	Application	Process industry	Process industry	
Measurement probe	Pt100	Pt100	Pt100	Measurement probe	Pt100	Pt100	
Measuring range	-58 to +392°F /	-58 to +392°F /	-58 to +392°F /	Measuring range	-328 to +1112°F	-58 to +392°F / -328 to +1112°F	
Process connec- tion	¹ / ₂ " NPT, 316 SS 34" NPT, 316 SS	1" ANSI flange, 316 SS 1½" ANSI flange, 316 SS	⁴ / ₂ " NPT, 316 SS+ Hex nipple, 316 SS	Process connection	½" NPT: 316L SS, Alloy C276 ¾" NPT: 316L SS	½" NPT: 316L SS, Alloy C276 ¾" NPT: 316L SS	
	1" NPT, 316 SS Socket weld, 34", 1",	2" ANSI flange, 316 SS	½" NPT 316SS+ Nipple-Union-Nipple,	Neck tube	3" to 6"	Without	
	316LSS Weld-in, ¾", 1", 316LSS		316 SS	Process pressure range	Up to 1088 psi	Up to 1088 psi	
Output	Dependent on electron- ics, iTEMP transmitters compatible	Dependent on electron- ics, iTEMP transmitters compatible	Dependent on electron- ics, iTEMP transmitters compatible	Output	Dependent on electronics, all iTEMP transmitters compatible:	Dependent on electronics, all iTEMP transmitters compatible:	
Connection head	Aluminum, NEMA 4X 316LSS_NEMA 4X	Aluminum, NEMA 4X 316LSS_NEMA 4X	Aluminum, NEMA 4X 316LSS_NEMA 4X		FOUNDATION Fieldbus	FOUNDATION Fieldbus	
Ambient	With head-mounted	With head-mounted	With head-mounted	Terminal head	Aluminum, Polyamide, 316L SS	Aluminum, Polyamide, 316L SS	
temperature	Vith near monitor 185'F Without head-mounted transmitter: Aluminum or SS, -50 to +212'F Field transmitter: With display, -40 to +158'F Without, -40 to +185'F	Vitimical indext transmitter: -40 to +185'F Without head-mounted transmitter: Aluminum or SS, -50 to +212'F Field transmitter: With display, -40 to +185'F	With field mineted transmitter: -40 to +185'F Without head-mounted transmitter: Aluminum or SS, -50 to +212'F Field transmitter: With display, -40 to +158'F Without 40 to +195'F	Ambient temperature	With head-mounted transmitter: -40 to +185'F Without head-mounted trans- mitter: Aluminum, -40 to +300'F Polyamide, -40 to +248'F 316LSS, -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 trans- mitter: Aluminum, -40 to +300'F Polyamide, -40 to +248'F 316LSS, -40 to +212'F With head mounted transmitter and display: -4 to +158'F	
Minimum	Tapered thermowell: 4½"	Tapered thermowell: 4½"	Without thermowell:	Maximum length	394"	394"	
mmersion	Stepped thermowell: 242" Straight thermowell: 4" Weld-in thermowell: 44/2"	Stepped thermowell: 2½" Straight thermowell: 4" Weld-in thermowell: 4½"	Low temperature, 34"	Protection tube, welded	Outer diameter: 0.35", 0.43" or 0.47"	Outer diameter: 0.35", 0.43" or 0.47"	
Immersion length	2½", 4½", 7½", 10½",	2", 4", 7", 10" 13",	4", 6", 9", 12"	Tip shape	Reduced, straight, tapered	Reduced, straight, tapered	
	13½", 164", 22½" 16", 22" ½" to 22½", specified in ½" increments increments	4 to 100°, specified in ½" increments	4" to 100", specified in 1/2" increments Approvals / certificates		Based on transmitter type used		
Approvals / certificates	FM, CSA	FM, CSA	FM, CSA	_			

Thermocouple (TC) temperature sensors

Thermocouple (TC) temperature sensors				Thermocouple (TC) temperature sensors in Thermowells		
	TH51	TH52	TH56	TH53	TH54	TH55
Application	Process industry	Process industry	Process industry	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	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	-454 to +2500°F	-454 to +2500°F	-454 to +2500°F
Process connec- tion	¹ ⁄ ₂ " NPT, 316 SS 1/8" NPT compression 316 SS ¹ ⁄ ₄ " NPT compression 316 SS	1/8" NPT compression 316 SS ¼" NPT compression 316 SS	1/8" NPT compression 316 SS ¼" NPT compression 316 SS	¹ ⁄ ₂ " NPT, 316 SS ³ ⁄ ₄ " NPT, 316 SS ¹ " NPT, 316 SS Socket weld, ³ ⁄ ₄ ", 316 SS Weld-in, 1", 316SS	1" ANSI flange, 316 SS 1½" ANSI flange, 316 SS 2" ANSI flange, 316 SS	½" NPT, 316 SS + Hex nipple, 316 SS ½" NPT 316 SS + Nipple-Union-Nipple, 316 SS
Output	Dependent on electron- ics, iTEMP transmitter compatible	Dependent on electron- ics, iTEMP transmitter compatible	Dependent on electron- ics, iTEMP transmitter compatible	Dependent on electron- ics, iTEMP transmitter compatible	Dependent on electron- ics, iTEMP transmitter compatible	Dependent on electron- ics, iTEMP transmitter compatible
Connection head	Aluminum and Polypropyl- ene, NEMA 4X	Cable with connector	Cable with connector	Aluminum and Polypropyl- ene, NEMA 4X	Aluminum and Polypropyl- ene, NEMA 4X	Aluminum and Polypropyl- ene, NEMA 4X
Ambient temperature	With head-mounted transmitter: -40 to +185'F Without head-mounted transmitter: Aluminum -40 to +302'F 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	With head-mounted transmitter: -40 to +185°F Without head-mounted transmitter: Aluminum -40 to +302°F Polypropylene, -40 to +185°F	With head-mounted transmitter: -40 to +185'F Without head-mounted transmitter: Aluminum -40 to +302'F Polypropylene, -40 to +185'F	With head-mounted transmitter: -40 to +185'F Without head-mounted transmitter: Aluminum -40 to +302'F Polypropylene, -40 to +185'F
Minimum immersion	10 x OD of sensor sheath, nominal	10 x OD of sensor sheath, nominal	10 x OD of sensor sheath, nominal	Tapered thermowell, 4½" Stepped thermowell, 2½"	Tapered thermowell, 4½" Stepped thermowell, 2½"	4"
Immersion length	6", 12", 18", 24" 2" to 96", specified in ½" increments	12", 18", 24", 48", 72", 96" 2" to 96", specified in ½" increments	4", 6", 9", 12" 4" to 100", specified in ½" increments	2½", 4½", 7½", 10½", 13½", 16½", 22½" 2 to 24", specified in ½" increments	2", 4", 7", 10" 2" to 24" specified in ½" increments	4", 6", 9", 12", 14" 4" to 30" specified in ½" increments
Approvals / certificates	Based on transmitter type used	Based on transmitter type used	Based on transmitter type used	Based on transmitter type used	Based on transmitter type used	Based on transmitter type used

Thermocouple (TC) temperature sensors in Thermowells, Explosion Proof					iTHERM [®] modular RTD thermometer		
	T53	T54	T55			TM401	TM411
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Application	Chemical, petrochemicals	Chemical, petrochemicals	Chemical, petrochemicals	App	plication	Hygienic and aseptic	Hygienic and aseptic
Measurement	TC type: J, K, E, N, or T	TC type: J, K, E, N, or T	TC type: J, K, E, N, or T	Inse	ert	Not replaceable	Replaceable
Measuring range	-454 to +2500°F	-454 to +2500°F	-454 to +2500°F	Sen	sor	Standard thin film 1x Pt100	Standard thin film 1x Pt100 1x Pt100 iTHERM QuickSens 1 x Pt100 iTHERM StrongSens 1x or 2x Pt100 wirewound
Process connection	¹ ⁄ ₄ " NPT, 316 SS ³ ⁄ ₄ " NPT, 316 SS 1" NPT, 316 SS Socket weld, ³ ⁄ ₄ ", 316 SS Weld-in, 1", 316 SS	1" ANSI flange, 316 SS 1½" ANSI flange, 316 SS 2" ANSI flange, 316 SS	4/2" NPT, 316 SS + Hex nipple, 316 SS 4/2" NPT 316 SS + Nipple-Union-Nipple, 316 SS	Mea rang	asuring ge	-58 to +392°F	PT100: -328 to +1,112°F StrongSens: -58 to +932°F QuickSens: -58 to +392°F
Output	Dependent on electronics, iTEMP transmitter compatible	Dependent on electronics, iTEMP transmitter compatible	Dependent on electronics, iTEMP transmitter compatible	Proc	cess nection	Compression fitting, Tri-Clamp, Microclamp, Clamp connec- tions acc. to ISO2852, Ingold, G3/4*Liquiphant, G1*Liquiph- ant, Varivent, SMS1147, Screwed pipe joint acc. to DIN 11851	Compression fitting, Weld-in adapter, Clamp connections acc. to
Connection head	Aluminum and 316L SS, NEMA 4X	Aluminum and 316L SS, NEMA 4X	Aluminum and 316L SS, NEMA 4X				ISO2852, Screwed pipe joint acc. to DIN 11851,
Ambient temperature	With head-mounted trans- mitter: -40 to +185°F Without head-mounted transmitter: Aluminum, SS -58 to +212°F Field transmitter: -40 to +185°F w/o display	With head-mounted trans- mitter: -40 to +185'F Without head-mounted transmitter: Aluminum, SS -58 to +212"F Field transmitter: -40 to +185'F w/o display	With head-mounted trans- mitter: -40 to +185°F Without head-mounted transmitter: Aluminum, SS -58 to +212°F Field transmitter: -40 to +185°F w/o display				Aseptic screwed pipe joint acc. to DIN 11864-1, Metallic sealing system, Thread acc. to ISO228 for Liquiphant adapter, APV Inline, Varivent, Ingold, SMS1147, Neumo Biocontrol T- and corner pieces
	-40 to +158°F w display	-40 to +158°F w display	-40 to +158°F w display	Outj	put	4 to 20 mA, HART	4 to 20 mA, HART, PROFIBUS PA, FOUNDATION Fieldbus
Minimum immersion	With thermowell: Tapered, 4/2" Stepped, 2/2" 34" straight, 4" Weld-in, 4/2"	With thermowell: Tapered, 4½" Stepped, 2½" ¾" straight, 4" Weld-in, 4½"	Without thermowell: 2½"	Am tem	bient iperature	-40 to +185°F	With head xmitter: -40 to +185°F With xmitter and display: -4 to +158°F OuickNeck: -58 to +284°F
Immersion length	2½", 4½", 7½", 10½", 13½", 16½", 22½" 2 to 18", specified in ½" increments	2", 4", 7", 10", 13", 16", 22" 2" to 18" specified in ½" increments	4", 6", 9", 12" 4" to 100" specified in ½" increments	App cert	provals / ificates	3-A, EHEDG, ASME BPE, FDA, TSE Certificate of Suitability	3-A, EHEDG, ASME BPE, FDA, TSE Certificate of Suitability, ATEX/IECEx
Approvals / certificates	FM, CSA	FM, CSA	FM, CSA				

easytemp[™] compact thermometer

Compact RTD transmitter		
	TMR31	TMR35
Application	General industry	Hygienic
Measurement probe	Pt100 (Class A)	Pt100 (Class A)
Measuring range	-58 to +302°F (w/o neck) -58 to +392°F (w/neck)	-58 to +302°F (w/o neck) -58 to +392°F (w/neck)
Process connection	¼" and ½" NPT; 316L Compression fitting, 316L (Metric sizes also available)	1", 1½", 2" Tri-Clamp (Metric sizes also available)
Output	Std: Pt100, Class A 4-wire Optional: 4 to 20 mA or 20 to 4 mA	Std: Pt100, Class A 4-wire Optional: 4 to 20 mA or 20 to 4 mA
Power supply	10 to 35 VDC	10 to 35 VDC
Ambient temperature	-40 to +185°F	-40 to +185°F
Immersion length	1.6 to 23.6"	1.6 to 23.6"
Approvals / certificates	UL, CE	UL, CE, 3A

Thermophant [®] T temperature switch		
	TTR31	
Application	Process control	
Measurement probe	Pt100	
Measuring range	-58 to +302°F	
Process connection	¼" 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 RDL10	Memograph® M RSG45	Ecograph® T RSG35
Recorder type	Data recorder	Graphic data manager, paperless, record, visualize, analyze and communicate	Universal data manager, record, visual- ize, monitor and communicate
Application	Process monitoring	Process monitoring / control	Process monitoring / control
Input	1 analog, 1 discrete, universal	Up to 20 universal or HART, 6 to 14 digi- tal, 8 mathematics channels, Profibus	Up to 12 analog, 6 digital
Input types	V, mA, RTD, TC	V, mV, mA, RTD, TC, frequency, pulse, Profibus DP	V, mV, mA, RTD, TC, frequency, pulse
Setpoint control	2 per unit (display only; no output)	1 alarm relay, 5 NO relays for limit values, optional digital card with 6 NO relays	1 alarm relay, 5 NO relays for limit values
Plot or memory storage	Internal memory, 32K or 128K	Internal memory 256 MB, SD card or USB stick	Internal, 128 MB Flash External, SD card and USB stick
Interface	RS232	Integrated WEB server, Profibus, Modbus, USB, TCP/IP, OPC, Ethernet, RS232/485	USB port, Ethernet, RS232/RS485, Integrated web server, Modbus
Display type	7-digit LCD	7" TFT display, multicolor	5.7" TFT multicolor
Ambient temperature	-13 to +131°F	14 to 122°F	14 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	100 to 230 VAC 24 V AC/DC
Approvals / certificates	CE	CE, UL, FDA 21, CFR 11, ATEX Ex p	CSA, GP, CE, UL

Multi-functional components				
	RIA452	RIA45	RIA46	RIA15
	488	125 I	240.15	
Component function	Digital display, Pump control	Digital display, process display and control unit	Digital display, process display and control unit, field mounted	Loop powered digital display/Process display
Input	Analog, digital	Analog, 1 or 2	Analog, 1 or 2	Analog, Digital
Input types	V, mA, RTD, TC, digital	V, mA, resistance, RTD, TC	V, mA, resistance, RTD, TC	4 to 20 mA + HART
Relay outputs/number	4 or 8 SPDT	2 SPDT (optional)	2 SPDT (optional)	N/A
Type of outputs	Relay, analog (U, I), pulse	Relay, 1 or 2 analog, digital status	Relay, 1 or 2 analog, digital status	N/A
Loop power to trans- mitter	24 V, 250 mA	24 to 230 VAC / VDC	24 to 230 VAC / VDC	N/A
Interface	RS232, ReadWin software, USB-box	FieldCare/DeviceCare software, 3 pushbuttons, USB	FieldCare/DeviceCare 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, bargraph and limit value indicators
Ambient temperature	-4 to +140°F	-4 to +140°F	-40 to +122°F	-40 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, 4 to 20 mA
Approvals / certificates	CE, FM, CSA, ATEX, TIIS	CE, FM, CSA, UL, ATEX	CE, FM, CSA, UL, ATEX	FM, CSA, ATEX, IEC Ex, GL

Profibus field indicator		
	RID261	
Component function	Digital display	
Input types	Profibus PA	
Interface	2 dip switches	
Display type	7-digit LCD, 0.30" character height	
Ambient temperature	-15 to +140°F	
Power supply	9 to 32 VDC (non-EEX), 9 to 15 VDC (EEX)	
Approvals / certificates	CE, ATEX	

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Loop powered field indicator		
	RIA14	RIA16
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
Types of outputs	Open collector	Open collector
Display measuring range	-19999 to +99999	-19999 to +99999
Loop power to trans- mitter	4 to 20 mA	4 to 20 mA
Interface	3 push buttons, remote via FieldCare/ DeviceCare PC operating software	3 push buttons, remote via FieldCare/ DeviceCare PC operating software
Display type	5-digit backlit LCD, 0.8" height, trend bargraph in 10% increments	5-digit backlit LCD, 1.02" 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, ATEX	CE, FM, CSA, UL, ATEX

Field indicator, FOUNDATION Fieldbus			
	RID14	RID16	
Component function	Digital indicator	Digital indicator	
Input	8-channel	8-channel	
Display measuring range	-9999 to +99999	-9999 to +99999	
Communication	FOUNDATION Fieldbus, Profibus PA	FOUNDATION Fieldbus, Profibus PA	
Display type	5-digit backlit LCD, 0.8" height, trend bargraph in 10% increments, over/ under range, units	5-digit backlit LCD, 1.02" 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, ATEX	CE, FM, CSA, UL, ATEX	

Note: RIA14 and RIA16 replace the RIA261 and RIA141 $\,$

Multi-functional components (DIN rail mounting)				
	RNS221	RN221N	RMA42	RTA421
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	Limit alarm switch with power supply for monitoring current or voltage signals
Input	N/A	1 analog	1 or 2 universal	1 analog
Input types	N/A	4 to 20 mA	V, mA, RTD, TC, resistance	V, mA
Relay outputs/number	N/A	N/A	2 SPDT	2 SPDT
Types of outputs	N/A	4 to 20	1 or 2: 0/4 to 20 mA, voltage 1 linearization table, 32 points Mathematics functions Open collector output	N/A
Loop power to trans- mitter	2 channels, 24 V, 30 mA	24 VDC, 22 mA	24 VDC, 22 mA	24 VDC, 30 mA
Interface	HART	HART	3 push buttons, USB, , HART, FieldCare/De- viceCare	3 push buttons
Display type	3 LEDs	1 LED	5-digit backlit LCD, alarm markers, bar graph, LED relay indicators	LCD, 4-digit
Ambient temperature	-4 to +140°F	-4 to +122°F	-4 to +140°F	-4 to +158°F
Power supply	20 to 250 VAC/VDC	20 to 250 VAC/VDC	24 to 230 VAC/VDC	196 to 250 VAC, 50/60 Hz
				98 to 126 VAC, 50/60 Hz
				20 to 250 VDC/AC, 50/60 Hz
Approvals / certificates	CE	CE, FM, CSA, ATEX	CE, FM, CSA, ATEX, NEPSI, UL	CE

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 or specified accuracy 0 to 40 mA operating range	
Output	0/4 to 22 mA for specified accuracy 0 to 40 mA operating range (max. cur- rent 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, ATEX	

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

Note: RMA42 replaces the RMA421 and RMA422

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/calcu- lation	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 configura- tion, 2 LED indicators	160 x 80 dot matrix with rear illumination, 3 soft-key pushbuttons, USB for configura- tion, 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, FieldCare Device Setup	
Ambient temperature	-4 to +140°F	-4 to +140°F	
Power supply	100 to 230 VAC, 24V AC/DC	100 to 230 VAC, 24 V AC/DC	
Standards/approvals	OILM R75, MID (EN1434 water/liquids), UL, CE, CSA GP	OILM R75, CE, UL, CSA GP	

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 opera- tion	160 x 80 dot matrix with rear illumination, three operation push buttons, 14 function buttons for batch operation or via Field- Care/DeviceCare	
Interface	USB (with CDI protocol, Ethernet TCP/IP, RS485, RS232 printer interface (optional), Modbus TCP, Modbus RTU	
Operating software	Field Data Manager software Ms20, Field- Care/DeviceCare Device Setup	
Ambient temperature	-4 to +140°F	
Standards / approvals	CE, UL, CSA GP	

	WirelessHART	
	SWA70	SWG70 Fieldgate
Application 1	Battery powered interface module connect- ing 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 exter- nally powered HART devices operating in multidrop mode	WirelessHART communication interface
Output	WirelessHART communication interface	Ethernet (10 BASE-T/10 BASE TX), RS485 serial
Transmission range	Outdoor, 820 ft (250 m) Indoor, 165 ft (50 m)	Outdoor, 820 ft (250 m) Indoor, 165 ft (50 m)
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 (temperature below -22°F, battery pack capacity decreases rapidly)	-4 to +140°F
Antenna	Omnidirectional dipole, adjustable in vertical plane	Omnidirectional dipole, adjustable in verti- cal plane, optional remote antenna
Approvals / certificates	CE, FM, CSA, FCC Part 15.247	CE, FCC CFR 47 Part 15, ATEX

Analysis: pH and ORP

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				pH and pH M	emosens Sens	ors			
	Memosens® CPS11D or Orbisint® CPS11	Memosens CPS31D or Ceratex CPS31	Memosens CPS41D or Ceraliquid CPS41	Memosens CPS71D or Ceragel CPS71	Memosens CPS171D	Memosens CPS91D or Orbipore CPS91	Memosens CPS441D or Tophit CPS441	Memosens CPS471D or Tophit CPS471	Memosens CPS491D or Tophit CPS491
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Application	Process/ environment	Municipal water	Food/ biotechnology	Process/hygienic	Pharmaceutical, biotechnology, hygienic/sterile	Process/chemical	Process/ environment	Process/ environment	Process/ environment
Parameter	pН	pН	pН	pH	pН	pН	pН	pН	pН
Material	Glass	Glass	Glass	Glass	Jlass Glass Glass		PEEK, EPDM	PEEK, EPDM	PEEK, perfluoro- elastomer
Measuring range	0 to 14 pH	2 to 12 pH	0 to 14 pH	0 to 14 pH	1 to 12 pH	0 to 14 pH	0 to 14 pH	0 to 14 pH	0 to 14 pH
Temperature	32 to 275°F	32 to 140°F	5 to 275°F	32 to 275°F	32 to 275°F 32 to 284°F 3		5 to 275°F	5 to 275°F	5 to 230°F
Temperature sensor	Pt100/Pt1000, NTC (11D)	Pt100	Pt100/Pt1000, NTC (41D)	Pt100/Pt1000	NTC (negative temperature coefficent) 30K thermistor	Pt100/Pt1000, NTC (91D)	Pt1000	Pt1000	Pt1000
Process pressure	87 or 232 psi	9 psi	145 psi	190 psi	14.5 to 101.5 psi	190 psi	145 psi	145 psi	145 psi
Diaphragm	PTFE	Ceramic	Ceramic	Ceramic	Ceramic	Open	Ceramic	Ceramic	Open
Reference	Gel	Gel	Liquid	Gel	Gel	Solid gel	Liquid	Gel	Solid gel
Lengths (mm)	120/225/ 360/425	120/150	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	CPK9, CYK10 (11D)	CPK9, CYK10 (31D)	CPK9, CYK10 (41D)	CPK9, CYK10 (71D)	СҮК10	CPK9, CYK10 (91D)	CPK12, CYK10 (441D)	CPK12, CYK10 (471D)	CPK12, CYK10 (491D)
Approvals / certificates	FM		FM	FM, 3A, biocompatible	"CE Mark. Ex approvals; IECEx, ATEX Biocompatibility: ISO 10993- 5:2009, USP <87>, USP <88> Class VT	FM	FM, CSA, 3A, FDA	FM, CSA, 3A, FDA	FM, CSA

ORP and ORP Memosens Sensors				pH Sensors	
	Memosens CPS12D or Orbisint CPS12/13Memosens CPS42D or Ceraliquid CPS42/43Memosens CPS42D or Ceraliquid CPS42/43		Memosens CPS72D or Ceragel CPS72	Orbitex CPS21	CPS64
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Application	Process/environment	Food/biotechnology	Process/hygienic	Water/wastewater	Process/environment
Parameter	ORP	ORP	ORP	pН	pН
Material	Glass	Glass	Glass	Glass	Glass
Measuring range	-1500 to 1500 mV	-1500 to 1500 mV	-1500 to 1500 mV	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	5 to 265°F
Temperature sensor	NTC (12D)	NTC (42D)	N/A	Pt100	N/A
Process pressure	232 psi	145 psi	232 psi	87 psi	217 psi
Diaphragm	PTFE	Ceramic	Ceramic	Open ring junction	N/A
Reference	Gel	KCl liquid	Gel	Gel	CPS13/CPS43 Ref sensor
Lengths (mm)	120/225/360	120/225/425	120/225/360	120/150	120/425
Sensor cable	CPK9, CYK10 (12D)	CPK9, CYK10 (42D)	CPK9, CYK10 (72D)	СРК9	СРК9
Approvals / certificates	CSA, FM (12D)	CSA, FM (42D)	FM, CSA (Not 72D)	General purpose	General purpose

Combined pH/ORP Memosens Sensors						
	Memosens CPS16D	Memosens CPS76D	Memosens CPS96D			
Application	Process/environmental	Process/hygienic	Process/chemical			
Parameter	pH/ORP	pH/ORP	pH/ORP			
Material	Glass	Glass	Glass			
Measuring range	0-14pH, -1500 to +1500mV (ORP)	0-14pH, -1500 to +1500mV (ORP)	0-14pH, -1500 to +1500mV (ORP)			
Temperature	32 to 275°F	32 to 280°F	32 to 230°F			
Temperature sensor	ΝΤC 30KΩ	ΝΤC 30KΩ	ΝΤC 30ΚΩ			
Process pressure	230 psi	190 psi	190 psi			
Diaphragm	PTFE	Ceramic	Open			
Reference	Gel	Gel	Gel			
Lengths (mm)	120/225/360/425	120/225/360/425	120/225/360/425			
Sensor cable	СУК10	СУК10	СУК10			
Approvals / certificates	CSA, FM	CSA, FM	CSA, FM			

pH / ORP Sensors					
	Memosens CPF81D/82D or Orbipac W CPF81/82	Purisys CPF201			
Application	Water/wastewater	Pure and ultrapure water			
Parameter	pH / ORP	рН			
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, CPK9, CYK10 (81D/82D)	СРК9			
Approvals / certificates	General purpose	General purpose			

pH / Enamel Coated Sensor				
	Ceramax CPS341D Memosens			
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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	ΝΤC 30ΚΩ			
Process pres- sure	0 to 87 psi			
Diaphragm	¾", 1" threaded; 2" Tri-Clamp			
Reference	Ag/AgCl with 3 M KCl and inhibitor			
Lengths (mm)	120 mm			
Sensor cable	СҮК10			
Approvals / certificates	General purpose			

pH / ORP Holder Assemblies							
	Dipfit W CPA510	Dipfit W CPA111	Dipfit P CPA140	Flowfit P CPA240	Flowfit W CPA250		
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Application	Water, wastewater, process	Water, wastewater, process	Process	Process	Water		
Description	Single installation point for 120 mm, bayonet style holder	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, 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	Suspended, lap joint flange or adjustable flange	3" Class 150 ANSI flange	1" Class 150 ANSI flange	G1 or 1" NPT		
Material	PVC, PVDF	Polypropylene	PVDF or 316L SS	PVDF or 316L SS	Polypropylene		
Maximum pressure	87 psi	60 psi	90 or 145 psi	120 or 145 psi	87 psi		
Maximum temperature	+122°F	+180°F	+250 or +300°F	+250 or +300°F	+180°F		
Immersion depth	20 to 118 inches	20 to 118 inches	20 to 100 inches	N/A	N/A		
Sensor connection thread	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	3.1.B EN 10204	3.1.B EN 10204	N/A		
Associated cleaning systems	Cleaning can be accom- plished without electrode removal	Integrated spray cleaning CPR31 or external spray CPR30	Integrated spray cleaning CPR31	Spray cleaning connection G 1/2	Spray cleaning connection with CPR3		

pH / ORP Holder Assemblies						
	Unifit H CPA442	Ecofit CPA640	Cleanfit [®] W CPA450	it [°] W Cleanfit CPA871 Cleanfit CPA875		
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Application	Food, pharmaceuticals	Chemical, process	Water, wastewater, process	Water, wastewater, chemical	Life sciences, food & beverage	
Description	Single 120 mm electrode with or without protection guard	Single installation point, 12 mm dia. glass electrodes, 120 mm	Manual operation, 120 mm electrode	Manual or pneumatic, can be fully automated with Cleanfit® Control CYC25	Manual or pneumatic, can be fully automated with Cleanfit Control CYC25	
Area of use	Open and closed tanks, piping	Process connection adapter for various electrodes	Open tank or closed tank and piping	Tank or piping	Tank or piping	
Process connection	1½", 2" Tri-Clamp, Weld socket	½" NPT, ¾" NPT, 1" NPT	1¼" NPT or 1-1/4" Class 150 ANSI flange	Tri-Clamp 2", 2.5" ANSI 2" 150 lbs ANSI 3" 150 lbs NPT 1.5" male G 1 1/4 Thread, Internal	Tri-Clamp 1½", 2", 2½" Aseptic clampable 1", screw- in 2", grooved flange 2" Neumo Bioconnect Dairy coupling 2", 2½" Thread G 1¼ Varivent flange	
Material	316L SS	PVDF, 316 Ti SS	316L SS, Alloy C4, titanium	316L SS, Alloy C22, titanium, PEEK, PVDF, conductive PVDF	316L SS, Alloy C22, titanium, PEEK	
Maximum pressure	145 psi	150 psi	60 psi	116 or 232 psi	116 or 232 psi	
Maximum temperature	+285°F	+70°F (+285°F, SS version)	+265°F	+14 to +284°F (158° PVDF)	+14 to +284°F	
Immersion depth	0.4 to 3.4 inches	1", 2", 3.4"	Up to 28 inches	1.35 inch - 5.30 inch	1.07" to 3.15"	
Sensor connection thread	Pg 13.5	Pg 13.5	Pg 13.5	PG 13.5	PG 13.5	
Certificates	3A, 3.1.B EN 10204	N/A	3.1.B EN 10204	Directive 94/9/EC (ATEX), CE/PED	FDA, EHEDG, Directive 94/9/EC (ATEX), CE/ PED, EC VO 1935/2004, Pharmaceutics Coc, USP Class VI,	
Associated cleaning systems	N/A	N/A	Rinse chamber connection G 1/4	Rinse chamber connection. Cleanfit Control CYC25 for GP areas	Rinse chamber connection. Cleanfit Control CYC25 for GP areas	

pH / ORP Holder Assemblies						
	Cleanfit P CPA472D	Cleanfit P CPA473	Cleanfit P CPA474	Cleanfit P CPA477		
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Application	Chemical, power, process	Water, wastewater, process	Water, wastewater, process	Chemical, wastewater		
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	Pneumatic with pneumatic or electric limit switches		
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)		
Process connection	2" Class 150 ANSI flange	2" Class 150 ANSI	2" Class 150 ANSI	Slotted nut Rd 65 x1/6		
Material	PVDF, PEEK, 316L SS, Hastelloy C4, Titanium	316L SS	Polypropylene, PVDF, PEEK	316L SS		
Maximum pressure	60 or 145 psi	60, 90, or 145 psi	60, 90, or 145 psi	87 psi		
Maximum temperature	+32 to +284°F	+180 or +285°F	+180 or +265°F	+40 to +194°F		
Immersion depth	5.8 to 11.2 inches	2.4 to 9.3 inches	2.8 to 8.1 inches	4.7 inches		
Sensor connection thread	Pg 13.5	Pg 13.5	3⁄4" NPT (CPF 81/82)	Pg 13.5		
Certificates	3.1.B EN 10204	3.1.B EN 10204	N/A	N/A		
Associated cleaning systems	Integrated rinse chamber with connection, ¼" NPT	Integrated rinse chamber with connection, ¼" NPT	Integrated rinse chamber with connection, ¼" NPT	Integrated rinse chamber with connection, ¼" NPT, ½" NPT		

Modular Holder Assemblies					
	Flexdip CYH112	Flexdip CYA112			
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 or plastic	Stainless steel or 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						
	Liquiline [®] CM442/CM444/CM448 Digital Memosens Field Transmitter	Liquiline CM442R/CM444R/CM448R Digital Memosens DIN Rail-mount Transmitter	Liquiline CM42				
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Application	Water/wastewater, power, chemical, process industries	Water/wastewater, power, chemical, process industries	Chemical, pharmaceutical, food, water				
Measurement type	Universal , multi-parameter transmitter for all Memosens and Memosens protocol sensors, including pH, ORP, conductivity, dissolved oxygen, turbidity/TSS, ammonium, nitrate, SAC/UV254, free chlorine	Universal, multi-parameter transmitter for all Memosens and Memosens protocol sensors, including pH, ORP, conductivity, dissolved oxygen, turbidity/TSS, ammonium, nitrate, SAC/UV254, free chlorine	2-wire transmitter for pH, ORP, conductivity, dissolved oxygen, concentration				
Measurement range	Dependent on connected sensor type	Dependent on connected sensor type	pH: -2 to +16 pH ORP: -1500 to +1500 mV Temperature: Pt100, Pt1000, NTC 30K -10 to +300'F				
Outputs	Up to eight 0/4 to 20 mA outputs, up to four relays (SPDT), Digital fieldbuses (HART, Profibus, Modbus (TCP/485) or EtherNet/IP) and discrete outputs.	Up to eight 0/4 to 20 mA outputs, up to four relays (SPDT), Digital fieldbuses (HART, Profibus, Modbus (TCP/485) or EtherNet/IP) and discrete outputs.	$1\ x\ 4$ to $20\ mA$ + HART, $2\ x\ 4$ to $20\ mA$ + HART Automatic clean and calibration functions				
Inputs	From one up to eight digital Memosens sensors, optional analog inputs and discrete inputs.	From one up to eight digital Memosens sensors, optional analog inputs and discrete inputs.	Glass iSFET, digital (Memosens®) sensors				
Power supply	24 VAC (CM442 only), 50/60 Hz 24 VDC 100-240 VAC, 50/60 Hz	24 VAC (CM442R only), 50/60 Hz 24 VDC (CM444R and CM448R with external DIN-rail power supply) 100-240 VAC, 50/60 Hz (CM444R and CM448R with external DIN-rail power supply)	12.5 to 30 VDC; Profibus or fieldbus 9 to 32 VDC (non-hazardous) or 9 to 17.5 VDC (hazardous)				
Ambient temperature	CM442: 0 to 140°F CM444 and CM448: 0 to 120°F	CM442: 32 to 140° F CM444 and CM448: 32 to 120°F External display: 0 to 140°F	-20 to +175°F				
Mounting	Wall or pipe	DIN-rail electronics, panel-mount remote display	Wall, pipe, panel mount				
Operation	Local interface via LCD display,menu-driven soft keys, and navigator knob. Optional IP addressable webserver. Optional HART, Profibus, EtherNet/IP ^{IM} , Modbus digi- tal. Integrates with FieldCare/DeviceCare, Field Data Manager and W@M asset management.	Optional panel-mount remote interface via LCD display, menu-driven soft keys, and navigator knob. Optional IP addressable webserver. Optional HART, Profibus, EtherNet/IP, Modbus digital. Integrates with FieldCare/DeviceCare, Field Data Manager and W@M asset management.	Via soft keys, LCD display, and navigator; HART, Profibus PA and FOUNDATION Fieldbus				
Housing	Polycarbonate housing. IP66/67, NEMA 4X	Remote display: IP66, NEMA 4x when properly mounted.	Polycarbonate plastic housing or 304 SS housing				
Approvals / certificates	CE mark CM442 only: FM and CSA; Class 1, Div 2 CM444 and CM448; General pupose	CE mark CM442R, CM444R and CM448R: General pupose	CE, FM, CSA, SIL 2				

pH / ORP Transmitters		pH / ORP Transmitters				
Liquiline To Go CYM290/291			Mycom [®] S CPM153	Liquisys M CPM223/253		
7734						
Application Chemical, Food, Pharmaceutical, Water, Wastewater		Application	Chemical, pharmaceutical, food, water	Chemical, pharmaceutical, food, water		
Measurement type pH, ORP, conductivity, oxygen		Measurement type	pH, ORP 4-wire transmitter	pH, ORP 4-wire transmitter		
Measurement range Sensor dependent			1 or 2 measuring circuits, up to 5 relays	1 or 2 measuring circuits, 2 or 4 relays		
Output Display		measurement range	ORP: -1500 to +1500 mV	ORP: -1500 to +1500 mV		
Sensor input One Memosens sensor			Temperature: Pt100, Pt1000, NTC, or PTC -58 to +392°F	Temperature: Pt100, Pt1000, -58 to +302°F		
Additional inputs Micro USB; 2 temp sensors; CYM290: DIN 19 262 fo pH_CYM291: M12 Memosens cable	r analog			NTC 30K, -4 to +212°F		
Power Batteries, 4 AA Alkaline, NiMH rechargeable or 1 Li-	-ion		Automatic clean and calibration functions	Automatic clean and calibration functions		
rechargeable Ambient temperature CYM290: +14 to +130°F (-10 to +55°C)		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®)		
CYM291: +14 to +104'F (-10 to +40'C) T3 Duracell +14 to +122'F (-10 to +50'C) T4 Energizer E91, Pov (106 and Panagonic Pro Power 16*	MN1500 vser one	Power supply	100 to 230 VAC 24 VAC/VDC	100/115/230 VAC 24 VAC/VDC		
Operation Local interface via display, keynad, 2 context-depend	ent soft	Ambient temperature	14 to 131°F (FM, 14 to 122°F)	14 to 131°F		
keys	cint bort	Mounting	Wall, pipe	Wall, pipe, panel mount (CPM223)		
Housing PA12 GF30 + TPE		Operation	Via push buttons and dot matrix LCD	Via push buttons and dot matrix LCD		
Protection IP66/67			(DAT module)	display, HART or Profibus PA		
Approvals / certificates CE Mark. CYM290: General Purpose CYM291: Ex approvals; IECEx, ATEX"		Housing	Aluminum, plastic coated	Field housing: ABS PC Fr, polyester front Panel mount: Polycarbonate, polyester front		
		Approvals / certificates	CE, FM, CSA	CE, FM, CSA		

Automatic Cleaning			
	Cleaning solution injector CYR10		
Application	Chemical, water, wastewater		
Measurement type	Various		
System capabilities	Cleaning, rinsing		
System components *	Sensor, electrode holder assembly, program controller, CYR10 injector, spray nozzle		
Basic functions	Delivery of rinse water and cleaning solution, externally controlled using Cleanfit Control CYC25		
Power supply	110, 230 VAC 24 VDC		
Ambient temperature	+23 to +104°F		
Mounting	Wall mount		
Programming	Liquiline CM44x transmitter with Cleanfit Control CYC25		
Housing	CYR10: PVC		
Approvals / certificates	General purpose		

Automatic Cleaning				
	Cleanfit Control CYC25			
Application	Chemical, Food, Pharmaceutical, Water, Wastewater, Power			
Measurement Type	pH, ORP, conductivity, oxygen			
System Capabilities	Pneumatic retractor control, sensor cleaning and rinsing			
System Components*	Liquiline CM44x transmitter, Cleanfit Control CYC25, pneumatic retractable assembly (with electric position switches), CYR10 injector (optional)			
Basic Functions	Sensor insertion and retraction, cleaning and rinsing control programmed for daily or weekly operation.			
Power Supply	24 VDC ±10%			
Ambient Temperature	+10 to +113°F (-10 to +45°C)			
Mounting	Wall mount or pole mount			
Programming	Liquiline CM44x transmitter with relay outputs			
Housing	Polycarbonate, IP66/67, NEMA 4X			
Protection	IP64			
Approvals/ Certicates	CE Mark.			

 * Electrode, electrode holder, spray nozzles are purchased separately

Memosens			
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Application	Food and beverage, chemical, water, wastewater, process industries		
Description	Digital transmission of pH signals via cable using contactless inductive connection. Current calibration data is stored in sensor head.		
Area of use	Used with CPS11D, 71D, 91D, CPS441D, 471D, and 491D Memosens pH electrodes and connects to CPM153, Liquiline CM42, CPM223/253 transmitters via CYK10 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 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	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	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 CLS12	Condumax W CLS13	Memosens CLS15D or Condumax W CLS15	Memosens CLS16D or Condumax H CLS16	Condumax W CLS19 Compact	Memosens CLS21D or Condumax W CLS21	Condumax W CLS30	Memosens CLS82D
Application	Industrial, water	Industrial high temperature	Pure, ultrapure water	Pure, ultrapure water	Pure, ultrapure water	Water, wastewater	Industrial water	Life Sciences, Biopharma- ceutial, Food/beverage, Industrial
Parameter	Conductivity	Conductivity	Conductivity	Conductivity	Conductivity	Conductivity	Conductivity	4-pole conductivity
Material	316L SS	316 Ti SS	316L SS	316L SS	316Ti SS	Graphite	Graphite / titanium	Ceramic, platinum, stain- less steel
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	1 µS/cm to 500 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	23 to 248°F
Temperature sensor	Integrated Pt100	Integrated Pt100	Integrated Pt100, NTC (CLS15D)	Integrated Pt100/1000, NTC (CLS16D)	Integrated Pt100	Integrated Pt100, NTC (CLS21D)	Integrated Pt100/PTC	Integrated Pt1000
Process pres- sure	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)	247 psi at 68°F 131 psi at 248°F
Insertion depth	Minimum 2"	Minimum 2"	Minimum 1.26"	Minimum 0.79"	Minimum 1.38"	Minimum 0.63"	Minimum 2.5"	4.72", minimum 0.59" to wall
Process connection	1" NPT (316 Ti SS)	1" NPT (316 Ti SS)	Fixed cable: ½* NPT (PES), 1½* Tri-Clamp (316L SS) Connector: ¾* NPT (PES), 1½* Tri-Clamp (316L SS)	1", 1½", 2" Tri-Clamp (316L SS), 2 to 5" Varivent	₩ NPT (PES)	34" NPT (PES) 1" NPT (PES) 2" Tri-clamp" (PES or SS)	1" NPT (316 Ti SS, PES) ¾" NPT (PES)	Tri-clamp: 1½", 2" NEUMO Biocontrol D25 Thread: G1 or NPT1 DN25 standard PG 13.5 Varivent N DN40-DN125 Varivent F DN25
Sensor cable	СҮК71	CYK71	CYK71, CYK10 (CLS15D)	CPK9, CYK10 (CLS16D)	CYK71	CYK71, CYK10 (CLS21D)	СҮК71	СҮК10
Approvals / certificates	FM (when used with CLM431, CLM153 and Liquiline [®] M CM42 transmitters)	FM (when used with CLM431, CLM153 and Liquiline® M CM42 transmitters)	FM (when used with CLM431, CLM153 and Liquiline [®] M CM42 transmitters)	FM (when used with CLM431, CLM153 and Liquiline [®] M CM42 transmitters), 3A	General purpose	FM (when used with CLM431, CLM153 and Liquiline [®] M CM42 transmitters)	FM (when used with CLM431 and CLM153 transmitters)	Non-hazardous, FM/CSA (Pending)

Conductivity Sensors					
	CLS50D with Memosens communications or Indumax P CLS50	Indumax H CLS52	CLS54D with Memosens communications or Indumax H CLS54		
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 Pt100	Integrated Pt100	Integrated Pt1000		
Process pressure	290 psi (without flange) 232 psi (with flange)	232 psi	232 psi 174 psi (CLS54D)		
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, CYK10 (CLS50D)	CLK5 fixed cable	CLK5 fixed cable, CYK10 (CLS54D)		
Approvals / certificates	FM (when used with CLM431, CLM153 and Liquiline M CM42 trans- mitters)	General purpose	General purpose, 3A, EHEDG, FDA, USP class VI, FM (when used with Liquiline M CM42)		



Conductivity Transmitters					
	Smartec CLD18	Smartec S CLD132	Smartec S CLD134		
Application	Food, beverage, pharmaceutical and biotech	Chemical, beverage, water	Food, beverage, pharmaceutical and biotech		
Measurement type	Inductive conductivity, 4-wire electronics	Inductive conductivity 4-wire transmitter	Inductive conductivity 4-wire transmitter		
Measurement range	Conductivity: 200 µS/cm to 1000 ms/cm Temperature: 14 to 266°F	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		
Output	Two: 0/4-20 mA One: Alarm; Open collector	0/4 to 20 mA, HART, Profibus	0/4 to 20 mA, HART, Profibus, temperature		
Input	Binary for measurement range switching	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		
Power supply	24 VDC, 3 W	100/115/230 VAC 24 VAC/VDC	100/115/230 VAC 24 VAC/VDC		
Ambient temperature	-4 to +140°F	-13 to +158°F	32 to +131°F		
Mounting	Compact: direct via conductivity probe	Compact: direct via CLS52 sensor Remote: Wall, pipe	Compact: direct via CLS54 sensor Remote: Wall, pipe		
Operation	Via interface buttons and LCD display	Via push buttons and LCD display, HART or Profibus PA/DP	Via push buttons and LCD display, HART or Profibus PA/DP		
Housing	Stainless steel or plastic	304 SS	304 SS		
Approvals / certificates	General purpose; CE, 3A, FDA	General purpose	General purpose, 3A, EHEDG, FDA, USP class VI		

Conductivity Transmitters					
	Liquiline CM442/CM444/CM448 Digital Memosens Field Transmitter	Liquiline CM442R/CM444R/CM448R Digital Memosens DIN Rail-mount Transmitter	Liquiline M CM42		
Application	Water/wastewater, power, chemical, process industries	Water/wastewater, power, chemical, process industries	Chemical, pharmaceutical, food, water		
Measurement type	Universal, multi-parameter transmitter for all Memosens® and Memosens protocol sensors, including pH, ORP, conductivity, dissolved oxygen, turbidity/TSS, ammonium, nitrate, SAC/UC254, free chlorine	Universal , multi-parameter transmitter for all Memosens [®] and Memosens protocol sensors, including pH, ORP, conductivity, dissolved oxygen, turbidity/TSS, ammonium, nitrate, SAC/UC254, free chlorine	2-wire transmitter for pH, ORP, conductivity, dissolved oxygen, concentration		
Measurement range	Dependent on connected sensor type	Dependent on connected sensor type	Conductivity: 0.1 μS·k to 20 mS·k Resistivity: 10 MΩ/k to 50 Ω/k Concentration: 0 to 30% Temperature: Pt100, Pt1000		
Outputs	Up to eight 0/4 to 20 mA outputs, up to four relays (SPDT), Digital fieldbuses (HART, Profibus, Modbus (TCP/485) or EtherNet/IP), and discrete outputs.	Up to eight 0/4 to 20 mA outputs, up to four relays (SPDT), Digital fieldbuses (HART, Profibus, Modbus (TCP/485) or EtherNet/IP), and discrete outputs.	$1\ x\ 4$ to $20\ mA$ + HART, $2\ x\ 4$ to $20\ mA$ + HART Automatic clean and calibration functions		
Inputs	From one up to eight digital Memosens sensors, optional analog input and discrete inputs.	From one up to eight digital Memosens sensors, optional analog input and discrete inputs.	Analog sensors, two and four electrode, conductivity (inductive and resistive), concentration		
Power supply	24 VAC (CM442 only), 50/60 Hz 24 VDC 100-240 VAC, 50/60 Hz	24 VAC (CM442R only), 50/60 Hz 24 VDC (CM444R and CM448R with external DIN-rail power supply) 100-240 VAC, 50/60 Hz (CM444R and CM448R with external DIN-rail power supply)	12.5 to 30 VDC; Profibus or fieldbus 9 to 32 VDC, (non-hazardous) or 9 to 17.5 VDC (hazardous)		
Ambient temperature	CM442: 0 to 140°F CM444 and CM448: 0 to 120°F	CM442: 32 to 140° F CM444 and CM448: 32 to 120°F External display: 0 to 140°F	-20 to +175°F		
Mounting	Wall or pipe	DIN-rail electronics, panel-mount remote display	Wall, pipe, panel mount		
Operation	Local interface via LCD display,menu-driven soft keys, and navigator knob. Optional IP addressable webserver. Optional HART, Profibus, EtherNet/IP, Modbus digital. Integrates with FieldCare/DeviceCare, Field Data Manager and W@M asset management.	Optional panel-mount remote interface via LCD display, menu-driven soft keys, and navigator knob. Optional IP addressable webserver. Optional HART, Profibus, EtherNet/IP, Modbus digital. Integrates with FieldCare/DeviceCare, Field Data Manager and W@M asset management.	Via soft keys, LCD display, and navigator; HART, Profibus PA and FOUNDATION Fieldbus		
Housing	Polycarbonate housing. IP66/67, NEMA 4X	Remote display: IP66, NEMA 4x when properly mounted.	Polycarbonate plastic housing or 304 SS housing		
Approvals / certificates	CE mark CM442 only: FM and CSA; Class 1, Div 2 CM444 and CM448: General pupose	CE mark CM442R, CM444R and CM448R: General pupose	CE, FM, CSA, SIL2		

Conductivity Transmitters			
	Liquisys M CLM223/253		
Application	Ultrapure water, water treatment, cooling water		
Measurement type	Conductivity 4-wire transmitter 1 or 2 measuring circuits, 2 or 4 relays		
Measurement range	Conductivity: 0.01 µS/cm to 1000 mS/cm Temperature: Pt100, -31 to +482"F		
Output	0/4 to 20 mA, 15 VDC (digital) Automatic clean and calibration functions		
Input	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	Wall, pipe., panel mount (CPM223)		
Operation	Via push buttons and dot matrix LCD display, HART or Profibus PA		
Housing	Field housing: ABS PC Fr, polyester front Panel mount: Polycarbonate, polyester front		
Approvals / certificates	CE, FM, CSA		

Conductivity Calibration			
	Conductivity calibration Conducal CLY421		
Application	Pharmaceutical, food, ultrapure water		
Measurement type	Conductivity calibration		
Measurement range	Up to 20 $\mu S/cm$ or $M\Omega$, adjustable		
Reference electrode	CLS15D		
Reference transmitter	CM42		
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 CLY11		
Application	Field cellibration for conductivity electroder		
Measurement type	Conductivity		
Calibration solution (at 76°F)	CLY11-A (50081902): 74.0 µS/cm CLY11-B (50081903): 149.6.0 µS/cm CLY11-C (50081904): 1.406 mS/cm CLY11-D (50081905): 12.64 mS/cm CLY11-E (50081906): 107.00 mS/cm		
Storage temperature	14 to 122°F		
Approvals / certificates	Traceable to : ASTM 5391-93		

Analysis: Chlorine

Chlorine Sensors					
	Total chlorine CCS120	Free chlorine CCS140/141	Chlorine dioxide CCS240/241	Free chlorine Memosens Chloromax CCS142D	
	ł				
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	CCS140: 0.05 to 20 mg Cl ₂ /1 CCS141: 0.01 to 5 mg Cl ₂ /1 (CCS140/141, at 76°F, pH 7.2)	$\begin{array}{c} \text{CCS240: } 0.05 \text{ to } 20 \text{ ppm ClO}_2 \\ \text{CCS241: } 0.01 \text{ to } 5 \text{ ppm ClO}_2 \end{array}$	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	CCS140: 50 to 113°F CCS141: 36 to 113°F	CCS240/241: 36 to 113°F	32 to 113°F	
pH value range	5.5 to 9.5 pH	CCS140: 4 to 8 pH CCS141: 4 to 8.2 pH	CCS240/241: in stability range of ClO ₂	CCS142D-A: 4 to 8 pH CCS142D-G: 4 to 8.2 pH	
Temperature sensor	Integrated NTC	Integrated NTC	Integrated NTC		
Maximum back pressure	14.5 psig	14.5 psig	14.5 psig	14.5 psig	
Installation	CCA250 flow holder, CYH112	CCA250 flow holder	CCA250 flow holder	CCA250 flow holder	
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 CCM223/253	Liquisys M CCM223/253	Liquisys M CCM223/253	Liquiline® CM44, CM44R, CM330	

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Chlorine Flow Holder Assemblies		
	Flowfit W CCA250	
	-	
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 CYH112	Flexdip CYA112	
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 immer- sion 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 or PVC	Stainless steel or 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	

Chlorine Transmitters			
	Liquiline CM442/CM444/CM448 Digital Memosens Transmitter	Liquiline CM442R/CM444R/CM448R Digital Memosens DIN Rail-mount Transmitter	Liquisys M CCM223/253
Application	Water/wastewater, power, chemical, process industries	Water/wastewater, power, chemical, process industries	Drinking water, cooling water, food processing
Measurement type	Memosens® transmitter for pH, ORP, conductivity, dis- solved oxygen, turbidity, nitrate, chlorine	Universal, multi-parameter transmitter for all Memosens [®] and Memosens protocol sensors, including pH, ORP, conductivity, dissolved oxygen, turbidity/TSS, ammonium, nitrate, SAC/UC254, free chlorine	Chlorine/chlorine dioxide 4-wire transmitter 1 or 2 measuring circuits, 2 or 4 relays Measures pH and temperature
Measurement range	Dependent on sensor type	Dependent on connected sensor type	CCS140/240: 0.05 to 20 ppm CCS141/241: 0.01 to 5 ppm Temperature: 35 to 110°F
Outputs	Up to eight 0/4 to 20 mA outputs, up to four relays (SPDT), Digital fieldbuses (HART, Profibus, Modbus (TCP/485) or EtherNet/IP), and discrete outputs.	Up to eight 0/4 to 20 mA outputs, up to four relays (SPDT), Digital fieldbuses (HART, Profibus, Modbus (TCP/485) or EtherNet/IP), and discrete outputs.	0/4 to 20 mA, 15 VDC (digital)
Inputs	From one up to eight digital Memosens sensors, optional analog input and discrete inputs.	From one up to eight digital Memosens sensors, optional analog input and discrete inputs.	4 to 20 mA, 10 to 50 V (digital)
Power supply	24 VAC (CM442 only), 50/60 Hz 24 VDC 100-240 VAC, 50/60 Hz	24 VAC (CM442R only), 50/60 Hz 24 VDC (CM444R and CM448R with external DIN-rail power supply) 100-240 VAC, 50/60 Hz (CM444R and CM448R with external DIN-rail power supply)	100/115/230 VAC 24 VAC/VDC
Ambient temperature	-4 to +140°F	CM442: 32 to 140° F CM444 and CM448: 32 to 120°F External display: 0 to 140°F	14 to 131°F
Mounting	Wall, pipe, panel mount	DIN-rail electronics, panel-mount remote display	Wall, pipe, panel mount (CPM223)
Operation	Optional panel-mount remote interface via LCD display, menu-driven soft keys, and navigator knob. Optional IP addressable webserver. Optional HART, Profibus, EtherNet/IP, Modbus digital. Integrates with FieldCare/DeviceCare, Field Data Manager and W@M asset management.	Optional panel-mount remote interface via LCD display, menu-driven soft keys, and navigator knob. Optional IP addressable webserver. Optional HART, Profibus, EtherNet/IP, Modbus digital. Integrates with FieldCare/DeviceCare, Field Data Manager and W@M asset management.	Via push buttons and dot matrix LCD display, HART or Profibus
Housing	Polycarbonate plastic housing	Remote display: IP66, NEMA 4x when properly mounted.	Field housing: ABS PC Fr, polyester front Panel mount: Polycarbonate, polyester front
Approvals / certificates	FM/CSA = CM442 only (Cl I, Div. 2) CE, cCSAus	CE mark CM442R, CM444R and CM448R: General pupose	CSA general purpose

Analysis: Dissolved Oxygen

Dissolved Oxygen Sensors			
	Memosens COS22D or Oxymax [®] COS22	Oxymax W COS51D Digital sensor with Memosens communications	Memosens COS61D digital sensor with Memosens communications or Oxymax W COS61 (Optical sensor)
Application	Food and beverage, life sciences, power	Water, wastewater, fish farming	Water, wastewater, fish farming
Parameter	Sterilizable amperometric dissolved oxygen	Amperometric dissolved oxygen	Optical (luminescence/fluorescence) dissolved oxygen
Material	316L SS, Silicone membrane cap (FDA), PTFE, steel mesh	POM	316 Ti SS, POM, Silicon (fluorescence layer)
Measuring range	0 to 100 ppb (trace version only) 0.01 to 60 mg/L 0 to 600% saturation 0 to 1200 hPa 0 to 25 Vol% (gaseous oxygen)	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	−5 to +135°C (23 to 175°F)	-5 to +50°C (20 to 120°F)	-20 to +60°C (0 to 140°F)
Process temperature	−5 to +135°C (23 to 175°F)	-5 to +50°C (20 to 120°F)	-5 to +60°C (20 to 140°F)
Process pressure	12 bar (174 psi)	0 to 10 bar (145 psi)	0 to 10 bar (145 psi)
Shaft length	120, 225, 360, 420 mm	N/A	N/A
Process connection	PG 13.5 thread	Combination ¾" MNPT and G1" thread	COS61: G1" thread COS61D: Combination ¾" MNPT and G1" thread
Sensor cable	COK21 (COS22), CYK10 (22D)	СҮК10	COS61: Fixed cable or TOP68 with CYK71 cable COS61D: Fixed cable
Transmitter	COS22: Liquisys M COM223F/COM253F COS22D: Liquiline® CM42, CM442/444/448 and CM442R/444R/448R	Liquiline CM42, CM442/444/448 and CM442R/444R/448R	COS61: Liquisys M COM223/253 COS61D: Liquiline CM442/444/448 and CM442R/444R/448R

Dissolved Oxygen and Multi Parameter Transmitters			
	Liquiline CM442/CM444/CM448 Digital Liquiline CM442R/CM444R/CM448R Digital Memosens Field Transmitter Memosens DIN Rail-mount Transmitter		Liquiline CM42
	8.36 er		
Application	Water/wastewater, power, chemical, process industries	Water/wastewater, power, chemical, process industries	Chemical, pharmaceutical, food, water
Measurement type	Universal, multi-parameter transmitter for all Memosens and Memosens protocol sensors, including pH, ORP, conductivity, dissolved oxygen, turbidity/TSS, ammonium, nitrate, SAC/UC254, free chlorine	Universal, multi-parameter transmitter for all Memosens [®] and Memosens protocol sensors, including pH, ORP, conductivity, dissolved oxygen, turbidity/TSS, ammonium, nitrate, SAC/UC254, free chlorine	2-wire transmitter for pH, ORP, conductivity, dissolved oxygen, concentration
Measurement range	Dependent on connected sensor type	Dependent on connected sensor type	0.0 to 100.0 ppm, 0 to 1000% saturation, 0 to 2000 hPa Temperature: -10 to +300°F
Outputs	Up to eight 0/4 to 20 mA outputs, up to four relays (SPDT), Digital fieldbuses (HART, Profibus, Modbus (TCP/485), or EtherNet/IP) and discrete outputs.	Up to eight 0/4 to 20 mA outputs, up to four relays (SPDT), Digital fieldbuses (HART, Profibus, Modbus (TCP/485), EtherNet/IP) and discrete outputs.	1 x 4 to 20 mA + HART, 2 x 4 to 20 mA + HART, Profibus PA, FOUNDATION Fieldbus
Inputs	From one up to eight digital Memosens sensors, optional analog input and discrete inputs.	From one up to eight digital Memosens sensors, optional analog input and discrete inputs.	Digital sensor: All Memosens sensors and Memsens technology inductive conductivity sensors Analog sensors: pH, differential pH, IsFET pH, ORP, two and four electrode conductivity/resistivity, and inductive
Power supply	24 VAC (CM442 only), 50/60 Hz 24 VDC 100-240 VAC, 50/60 Hz	24 VAC (CM442R only), 50/60 Hz 24 VDC (CM444R and CM448R with external DIN-rail power supply) 100-240 VAC, 50/60 Hz (CM444R and CM448R with external DIN-rail power supply)	12.5 to 30 VDC; Profibus or fieldbus 9 to 32 VDC (non- hazardous) or 9 to 17.5 VDC (hazardous)
Ambient temperature	CM442: 0 to 140°F CM444 and CM448: 0 to 120°F	CM442: 32 to 140°F CM444 and CM448: 32 to 120°F External display: 0 to 140°F	-20 to +175°F
Mounting	Wall or pipe	DIN-rail electronics, panel-mount remote display	Wall, pipe, panel mount
Operation	Local interface via LCD display.menu-driven soft keys, and navigator knob. Optional IP addressable webserver. Optional HART, Profibus, EtherNet/IP, Modbus digital. Integrates with FieldCare/DeviceCare, Field Data Manager and W@M asset management.	Optional panel-mount remote interface via LCD display, menu-driven soft keys, and navigator knob. Optional IP addressable webserver. Optional HART, Profibus, EtherNet/IP, Modbus digital. Integrates with FieldCare/DeviceCare, Field Data Manager and W@M asset management.	Via soft keys, LCD display, and navigator HART, Profibus PA, and FOUNDATION Fieldbus
Housing	Polycarbonate housing. IP66/67, NEMA 4X	Remote display: IP66, NEMA 4x when properly mounted.	Polycarbonate plastic housing or 304 SS housing
Approvals / certificates	CE mark CM442 only: FM and CSA; Class 1, Div 2 CM444 and CM448: General pupose	CE mark CM442R, CM444R and CM448R: General pupose	CE, FM, CSA, SIL 2

Dissolved Oxygen Holder Assemblies				
	Flowfit W COA250	Flowfit CYA251	Cleanfit COA451	
Application	Water, wastewater	Process, wastewater	Water, wastewater	
Description	Flow assembly designed for bypass system, for dissolved oxygen sensor COS51D or COS61D	Flow assembly for nitrate/SAC (CAS51D), turbidity (CUS51D), dissolved oxygen (COS51D, COS61D)	Manually operated SS holder assembly with ball valve and rinse connections, designed to hold COS31 or COS41	
Material	PVC	PVC, EPDM (seals)	316L SS	
Maximum pressure	87 psi at 68°F	87 psi at 68°F	145 psi (29 psi for manual operation)	
Maximum temperature	122°F	32 to 120°F	32 to 122°F	
Flow rate	26 to 260 gal/hr	53 gal/hr for oxygen, 26.5 for turbidity and UV nitrate	N/A, must be constant flow	
Sensor connection	Threaded mounting sleeve with union nut	Compression fitting	Internal, with sensor external threads	
Holder installation	Bypass line	Inline or bypass line: G1¼ external thread, PVC ANSI Flange, PVC DN20, PVC DN25 hose barb, PVC Rp 3/4* female thread, PVC NPT 3/4* female thread, PVC	Weld neck, 2" Class 150 ANSI flange	

Modular Holder Assemblies			
	Flexdip CYH112	Flexdip CYA112	
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 im- mersion 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 or PVC	Stainless steel or 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, CPA442.

Analysis: Turbidity

	Turbidity Sensors			
	Turbimax CUS51D with Memosens communications	Turbimax CUS52D with Memosens communications		
Application	Water, wastewater	Water, wastewater		
Parameter	Turbidity and Total Suspended Solids (TSS)	Turbidity, temperature		
Measurement method	90° and 135° back-scatter, 4-beam pulsed light, 860 nm LED	90°F scattered light, 860 nm		
Material	316L SS, sapphire optical window	316L SS, sapphire optical window		
Measuring range	C1 version: Turbidity: 0 to 4000 FNU Solids content: 0 to 4 g/l D1 version: Turbidity: 0 to 4000 FNU Solids: 0 to 300 g/L, 0 to 30%	0.000 to 4000 FNU		
Temperature sensor	N/A	Integrated NTC		
Ambient temperature	-4 to +140°F	-4 to 185°F		
Process temperature	23 to 120°F	-4 to 185°F		
Process pressure	0.5 to 10 bar (7 to 145 psia)	0.5 to 10 bar (7 to 145 psia)		
Process connection	Combination ¾" MNPT and G1" thread	Combination ¾" MNPT and G1" thread 2" clamp (depends on sensor version)		
Installation type	Submersible, optional accessories available for flow through and insertion installations	Submersible, optional accessories available for flow through and insertion installations		
Sensor cable	Fixed	Fixed		
Transmitter	Liquiline [®] CM442/444/448 or CM442R/444R/448R	Liquiline [®] CM442/444/448 or CM442R/444R/448R		

Turbidity Sensor		
	Turbimax CUS71D with Memosens communications	
Application	Water, wastewater	
Parameter	Submersed Ultrasonic Interface Level Sensor	
Measurement method	Ultrasonic	
Material	ABS and epoxy plastic, rubber wiper	
Measuring range	1.0 to 32 ft 0 to 50 NTU	
Process temperature	34 to 122°F	
Process pressure	0 to 87 psi	
Process connection	Combination ¾" MNPT and G1" thread	
Immersion depth	Submersible	
Sensor cable	Fixed	
Transmitter	Liquiline CM442/444/448 or CM442R/444R/448R	

Turbidity Holder Assemblies					
	Flowfit W CUA120/250	Flowfit CUA252	Flowfit CUA262	Flowfit CYA251	Cleanfit CUA451
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Application	Water, wastewater	Drinking water, process	Drinking water, process	Process, wastewater	Water, wastewater
Description	Flow assembly designed for bypass system, for turbidity sensor CUS31 or CUS41 and one CUR3 cleaner spray head	Flow assembly for CUS52D turbidity sensor	Flow assembly for CUS52D turbidity sensor	Flow assembly for nitrate/SAC (CAS51D), turbidity (CUS51D), dissolved oxygen (COS51D, COS61D)	Manually operated SS holder assembly with ball valve and rinse connections, designed to hold CUS31, CUS41, or CUS65
Material	PVC	Polyethylene, stainless steel	Stainless steel	PVC, EPDM (seals)	316L SS
Maximum pressure	90 psi at 77°F, 15 psi at 122°F	87 psi	87 psi	87 psi at 68°F	145 psi (29 psi for manual operation)
Temperature	122°F	32 to 140°F	32 to 185°F	32 to 120°F	32 to 122°F
Flow rate	Constant	2.6 to 26.4 gal/hr (recommended: 15.8 gal/hr)	None specified	53 gal/hr for oxygen, 26.5 for turbidity and UV nitrate	Constant flow
Sensor connection	Threaded mounting sleeve with union nut	2" Tri-clamp fitting	2" Tri-clamp fitting	Compression fitting	Internal, with sensor external threads
Holder installation	Bypass line	Inline or bypass line: G1¼ external thread Rp 3/4 [*] female thread NPT 3/4 [*] female thread D25, PVC D25 hose barb, PVC D12 (3/8 [*] ID tube) hose barb, PVC 2 [*] ANSI flange (Plastic)	Welded, 4" stainless steel pipe	Inline or bypass line: G1¼ external thread, PVC 1 [*] ANSI Flange, PVC DN20, PVC DN25 hose barb, PVC Rp 3/4 [*] female thread, PVC NPT 3/4 [*] female thread, PVC	Weld neck, 2* Class 150 ANSI flange

Multi-Parameter Memosens Technology				
	Liquiline CM442/CM444/CM448 Digital Memosens Field Transmitter	Liquiline CM442R/CM444R/CM448R Digital Memosens DIN Rail-mount Transmitter		
Application	Water/wastewater, power, chemical, process industries	Water/wastewater, power, chemical, process industries		
Measurement type	Universal , multi-parameter transmitter for all Memosens and Memosens protocol sensors, including pH, ORP, conductivity, dissolved oxygen, turbidity/TSS, ammo- nium, nitrate, SAC/UC254, free chlorine	Universal , multi-parameter transmitter for all Memosens and Memosens protocol sensors, including pH, ORP, conductivity, dissolved oxygen, turbidity/TSS, ammo- nium, nitrate, SAC/UC254, free chlorine		
Measurement range	Dependent on connected sensor type	Dependent on connected sensor type		
Outputs	Up to eight 0/4 to 20 mA outputs, up to four relays (SPDT), Digital fieldbuses (HART, Profibus, Modbus (TCP/485) or EtherNet/IP), and discrete outputs.	Up to eight 0/4 to 20 mA outputs, up to four relays (SPDT), Digital fieldbuses (HART, Profibus, Modbus (TCP/485) or EtherNet/IP), and discrete outputs.		
Inputs	From one up to eight digital Memosens sensors, optional analog input and discrete inputs.	From one up to eight digital Memosens sensors, optional analog input and discrete inputs.		
Power supply	24 VAC (CM442 only), 50/60 Hz 24 VDC 100-240 VAC, 50/60 Hz	24 VAC (CM442R only), 50/60 Hz 24 VDC (CM444R and CM448R with external DIN-rail power supply) 100-240 VAC, 50/60 Hz (CM444R and CM448R with external DIN-rail power supply)		
Ambient temperature	CM442: 0 to 140°F CM444 and CM448: 0 to 120°F	CM442: 32 to 140°F CM444 and CM448: 32 to 120°F External display: 0 to 140°F		
Mounting	Wall or pipe	DIN-rail electronics, panel-mount remote display		
Operation	Local interface via LCD display.menu-driven soft keys, and navigator knob. Optional IP addressable webserver. Optional HART, Profibus, EtherNet/IP, Modbus digital. Integrates with FieldCare/DeviceCare, Field Data Manager and W@M asset management.	Optional panel-mount remote interface via LCD display, menu-driven soft keys, and navigator knob. Optional IP addressable webserver. Optional HART, Profibus, EtherNet/IP, Modbus digital. Integrates with FieldCare/DeviceCare, Field Data Manager and W@M asset management.		
Housing	Polycarbonate housing. IP66/67, NEMA 4X	Remote display: IP66, NEMA 4x when properly mounted.		
Approvals / certificates	CE mark CM442 only: FM and CSA; Class 1, Div 2 CM444 and CM448: General pupose	CE mark CM442R, CM444R and CM448R: General pupose		
Turbidity Meters				
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	Turbimax CUE21/22	Turbimax CUE23/24	Turbimax CUE25/26	
Application	Water, treated process water (in-line continuous measure- ment)	Water, process water, wastewater (laboratory measurement)	Water, process water, wastewater (handheld field measurement	
Parameter	Turbidity	Turbidity	Turbidity	
Measurement method	90° scattered light CUE21, IR light, 860 nm CUE22, white light per US EPA 180.1	90° scattered light CUE23, IR light, 860 nm CUE24, white light per US EPA 180.1	90° scattered light CUE25, IR light, 860 nm CUE26, white light per US EPA 180.1	
Measuring range	0 to 1000 NTU	0 to 1000 NTU	0.01 to 1100 NTU	
Output	4 to 20 mA Two relays	RS232, unidirectional	N/A	
Power supply	100 to 240 VAC	12 VDC (adaptable to 100 to 240 VAC)	4 AAA alkaline batteries	
Ambient tempera- ture	34 to 122°F	50 to 104°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	RS485, optional Modbus	RS232	N/A	
Approvals	CE, ETL (UL3111-1)	CE, ETL (UL3101-1)	CE	

Modular Holder Assemblies			
	Flexdip CYH112	Flexdip CYA112	
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 immer- sion 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 or PVC	Stainless steel or 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: Colorimetric Analyzers

	Analyzer systems					
	Liquiline System CA80 AM Ammonium	Liquiline System CA80 CR Chromate	Liquiline System CA80 FE Iron	Liquiline System CA80 NO Nitrite	Liquiline System CA80 PH Orthophosphate	Liquiline System CA80 TP Total Phosphorous
	-	-	-	-	-	-
Applications	Wastewater treatment	Industrial water	Drinking water	Water, wastewater treat- ment	Wastewater treatment	Municipal and industrial wastewater
Measurement type	Colorimetric: Indophenol blue method	Colorimetric: Diphenlycar- bazide method.	Colorimetric: Ferrozine method	Colorimetric: Naphthyl- amine method	Colorimetric: Molybdenum blue or Molybdate vanadate yellow method	Digestion and colorimetric: Molybdenum Blue
Parameter	NH4 - N (ppm)	Cr (VI), CrO ₄ (mg/L, µg/L, ppm, ppb)	Fe (ppm, mg/L, ppb, µg/L)	NO2, NO2 - N (µg/L, ppm)	PO4 - P (ppm)	Total Phosphorus (ppm, mg/L)
Measuring ranges	0.05 to 20 ppm (mg/L) 0.5 to 50 ppm (mg/L) 1 to 100 ppm (mg/L)	0.03 to 2.5 ppm (mg/L) 0.2 to 5.0 ppm (mg/L)*	0.05 to 2.5 ppm (mg/L) 0.1 to 5 ppm (mg/L)	10 to 500 μg/L 0.1 to 1.0 ppm (mg/L) 0.2 to 3.0 ppm (mg/L)	0.05 to 2.5 ppm (mg/L) (blue method) 0.05 to 10 ppm (mg/L) (blue method) 0.5 to 220 ppm (mg/L) (yellow method) 0.5 to 50 ppm (mg/L) (yel- low method)	0.05 to 10 ppm (mg/L) 0.5 to 50 ppm (mg/L)
Outputs	 Up to six 0/4- 40 mA or, HART, Profibus DP, Modbus 485, Modbus TCP, Webserver Up to 4 relays (optional) 	 Up to six 0/4- 40 mA or, HART, Profibus DP, Modbus 485, Modbus TCP, Webserver Up to 4 relays 	 Up to six 0/4- 40 mA (two standard) or, Profibus DP, Modbus 485, Modbus TCP, or EtherNet/IP (optional) Webserver (optional) Up to 4 relays (optional) 	 Up to six 0/4- 40 mA or, HART, Profibus DP, Modbus 485, Modbus TCP, Webserver Up to 4 relays (optional) 	 Up to six 0/4- 40 mA or, HART, Profibus DP, Modbus 485, Modbus TCP, Webserver Up to 4 relays 	 Up to six 0/4- 40 mA (two standard) or, Profibus DP, Modbus 485, Modbus TCP, or EtherNet/IP (optional) Webserver (optional) Up to 4 relays (optional)
Inputs	 Up to four Memosens sensors (optional) Two analog inputs (optional) 	 Up to four Memosens sensors (optional) Two analog inputs (optional) 	 Up to four Memosens sensors (optional) Two analog inputs (optional) 	 Up to four Memosens sensors (optional) Two analog inputs (optional) 	 Up to four Memosens sensors (optional) Two analog inputs (optional) 	 Up to four Memosens sensors (optional) Two analog inputs (optional)
Power supply	24 VDC or 100 to 240 VAC	24 VDC or 100 to 240 VAC	24 VDC or 100 to 240 VAC	24 VDC or 100 to 240 VAC	24 VDC or 100 to 240 VAC	100 to 240 VAC
Ambient temperature	41 to 104°F (5 to 40°C)	41 to 104°F (5 to 40°C)	41 to 104°F (5 to 40°C)	41 to 104°F (5 to 40°C)	41 to 104°F (5 to 40°C)	41 to 104°F (5 to 40°C)
Operation	Liquiline Transmitter. Back light transflective display. Push button with navigator knob.	Liquiline Transmitter. Back light transflective display. Push button with navigator knob.	Liquiline Transmitter. Back light transflective display. Push button with navigator knob.	Liquiline Transmitter. Back light transflective display. Push button with navigator knob.	Liquiline Transmitter. Back light transflective display. Push button with navigator knob.	Liquiline Transmitter, Back light transflective display. Push button with navigator knob.
Housing	Amorphous thermoplastic alloy (ASA-Polycarbonate) or stainless steel	Amorphous thermoplastic alloy (ASA-Polycarbonate) or stainless steel	Amorphous thermoplastic alloy (ASA-Polycarbonate) or stainless steel	Amorphous thermoplastic alloy (ASA-Polycarbonate) or stainless steel	Amorphous thermoplastic alloy (ASA-Polycarbonate) or stainless steel	Amorphous thermoplastic alloy (ASA-Polycarbonate) or stainless steel
Approvals/certificates	Non-hazardous, CE Marked	Non-hazardous, CE Marked	Non-hazardous, CE Marked, CSA C/US General Purpose	Non-hazardous, CE Marked	Non-hazardous, CE Marked	

Analyzer systems			
	Stamolys CA71 CL Chlorine		
Application	Water, wastewater		
Measurement type	Photometric		
Input	Cl ₂ (ppm) free or total		
Measuring range	0.01 to 1.00 ppm 0.10 to 10.00 ppm		
Output	0/4 to 20 mA		
Power supply	115/230 VAC		
Ambient temperature	41 to 104°F		
Operation	Via push buttons, LED display, LCD display, RS232		
Housing	304 SS with plexiglass window or GFK plastic		
Approvals/certificates	CE		

	Analyzer sample preparation systems				
	Liquiline System CAT810 Sample preparation system	Liquiline System CAT820 Sample preparation system	Liquiline System CAT860 Sample preparation system		
Applications	Wastewater Treatment; outlet low solids.	Wastewater Treatment; sludge.	Wastewater Treatment; inlet with fat or oils present.		
Filter type	50 µm stainless sieve filter.	0.1 µm ceramic filter	0.1 µm ceramic filter		
Back flush	Compressed air or water	Compressed air.	Cleaning solution and compressed air.		
Filtrate delivery method	Back pressure in filter system to deliver adequate flow to analyzer.	Pump delivery controlled by CA80 analyzer or internal control timer.	Pump delivery controlled by CA80 analyzer or internal control timer.		
Filtrate quantity	Back pressure dependent.	5.5 to 16.5 ml/min (CA80 analyzer control) 4.7 to 11 ml/min (timer control)	5.5 to 16.5 ml/min (CA80 analyzer control) 4.7 to 11 ml/min (timer control)		
Process Pressure	22 to 58 psi (1.5 to 4.0 bar)	Atmospheric	Atmospheric		
Ambient Temperature	39 to 104°F (4 to 40°C)	Unheated: 41 to 122 °F (5 to 50 °C) Heated: -4 to 122 °F (-20 to 50 °C)	Unheated: 41 to 122°F (5 to 50°C) Heated: -4 to 122°F (-20 to 50°C)		
Degree of protection	IP 65	IP66/67	IP55		
Power Supply	115/230 VAC for timer version	115/230 VAC with hose heater	115/230 VAC with hose heater		
Sample distance	N/A	Filter to pump: • 9.8 ft (3 m), 6.4 ft (5 M) Pump to analyzer: • 6.6 ft (2 m), 16.4 ft (5 m), 32.8 ft (10 m), 49.2 ft (15 m), 65.6 ft (20 m), 98.4 ft (30 m)	'Filter to pump: 9.8 ft (3 m), 6.4 ft (5 M) Pump to analyzer: 6.6 ft (2 m), 16.4 ft (5 m), 32.8 ft (10 m), 49.2 ft (15 m), 65.6 ft (20 m), 98.4 ft (30 m)		
Mounting	Wall, mounting plate, or analyzer stand	Pole or wall	Wall or analyzer stand		

Analysis: TOC

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	7 minutes		
Output	0/4 to 20 mA selectable Dry contact relay for high, low limit and slope Dry contact relay fault signal		
Power supply	0 to 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, dillution 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		

Analysis: Nutrient

Wastewater nitrate, ammonium, etc			
	ISEmax CAS40D with Memosens		
Application	Wastewater		
Measurement type	Ion-selective electrode system		
Input	Ammonium, nitrate, potassium, chloride, pH		
Measurement range	0.1 to 1000 mg/1 NH ₄ -N 0.1 to 1000 mg/1 NO ₂ -N 1 to 1000 mg/1 potassium 1 to 1000 mg/1 chloride		
Ambient tempera- ture	-4 to +120°F		
Process temperature	36 to 100°F, max 6 psi		
Sensor	PVC, glass, polyethylene (wetted parts dependent on elec- trodes used), O-rings EPDM		
Sensor cable	328 feet maximum		
Sensor power supply	Liquiline® CM442 transmitter		
Sensor mounting	Upright post with boom (CYH112 / CYA112)		
Approvals /certifi- cates	CE		

Viomax® CAS51D with MemosensApplicationWastewaterParameterNitrate or SACMaterial316L SS, quartz glass, EPDM O-ringsMaterial16L SS, quartz glass, EPDM O-ringsMeasuring rangeNO3-N: 0.1 to 50 mg/l: Clear water and activated sludge NO3-N: 0.1 to 50 mg/l: Clear waterSAC: 0.1 to 50 J/m (COD 0.15 to 75 mg/l, TOC: 0.06 to 30 mg/l); Clear waterSAC: 0.5 to 250 l/m (COD 0.15 to 75 mg/l, TOC: 0.9 to 410 mg/l) Organic load at inlet, industrialAmbient tempera- ture44 to +140FProcess pressure7 to 145 psiaInsertion depthCuvette gap, must be submergedProcess connection¾'NPT, G1Sensor cableFixed, Memosens, maximum 328 ftPowerProvided by Liquiline CM442ApprovalsNon-hazardous		Photometric nitrate sensor			
ApplicationWastewaterParameterNitrate or SACMaterial316L SS, quartz glass, EPDM O-ringsMaterial316L SS, quartz glass, EPDM O-ringsMeasuring rangeNO ₃ -N: 0.1 to 50 mg/l: Clear water and activated sludge NO ₃ -N: 0.01 to 20 mg/l: Clear waterSAC: 0.1 to 50 l/m (COD 0.15 to 75 mg/l, TOC: 0.06 to 30 mg/l); Clear waterSAC: 0.5 to 250 l/m (COD: 0.75 to 370 mg/l, TOC: 0.9 to 150 mg/l) Clear water, treated waterSAC: 1.5 to 700 l/m (COD 2.5 to 1000 mg/l; TOC: 0.9 to 410 mg/l) Organic load at inlet, industrialAmbient tempera- ture-4 to +140FProcess pressure7 to 145 psiaInsertion depthCuvette gap, must be submergedProcess connection% NPT, G1Sensor cableFixed, Memosens, maximum 328 ftPowerProvided by Liquiline CM442ApprovalsNon-hazardous		Viomax® CAS51D with Memosens			
ApplicationWastewaterParameterNitrate or SACMaterial316L SS, quartz glass, EPDM O-ringsMeasuring rangeNO3-N: 0.1 to 50 mg/l: Clear water and activated sludge NO3-N: 0.01 to 20 mg/l: Clear waterSAC: 0.1 to 50 J/m (COD 0.15 to 75 mg/l, TOC: 0.06 to 30 mg/l); Clear waterSAC: 0.5 to 250 J/m (COD 0.75 to 370 mg/l, TOC: 0.3 to 150 mg/l) Clear water, treated waterSAC: 0.5 to 250 J/m (COD 2.5 to 1000 mg/l; TOC: 0.9 to 		888			
ParameterNitrate or SACMaterial316L SS, quartz glass, EPDM O-ringsMeasuring rangeNO3-N: 0.1 to 50 mg/l: Clear water and activated sludge NO3-N: 0.01 to 20 mg/l: Clear water SAC: 0.1 to 50 l/m (COD 0.15 to 75 mg/l, TOC: 0.06 to 30 mg/l); Clear waterSAC: 0.5 to 250 l/m (COD: 0.75 to 370 mg/l, TOC: 0.3 to 150 mg/l) Clear water, treated water SAC: 1.5 to 700 l/m (COD 2.5 to 1000 mg/l; TOC: 0.9 to 410 mg/l) Organic load at inlet, industrialAmbient tempera- ture4 to +140FProcess pressure7 to 145 psiaInsertion depthCuvette gap, must be submergedProcess connection% NPT, G1Sensor cableFixed, Memosens, maximum 328 ftPowerProvided by Liquiline CM442ApprovalsNon-hazardous	Application	Wastewater			
Material316L SS, quartz glass, EPDM O-ringsMeasuring rangeNO3-N: 0.1 to 50 mg/l: Clear water and activated sludge NO3-N: 0.01 to 20 mg/l: Clear water SAC: 0.1 to 50 l/m (COD 0.15 to 75 mg/l, TOC: 0.06 to 30 mg/l); Clear waterSAC: 0.1 to 50 l/m (COD 0.15 to 75 mg/l, TOC: 0.06 to 30 ng/l); Clear waterSAC: 0.5 to 250 l/m (COD: 0.75 to 370 mg/l, TOC: 0.9 to 150 mg/l) Clear water, treated waterSAC: 1.5 to 700 l/m (COD 2.5 to 1000 mg/l; TOC: 0.9 to 410 mg/l) Organic load at inlet, industrialAmbient tempera- ture-4 to +140'FProcess pressure7 to 145 psiaInsertion depthCuvette gap, must be submergedProcess connection% NPT, G1Sensor cableFixed, Memosens, maximum 328 ftPowerProvided by Liquiline CM442ApprovalsNon-hazardous	Parameter	Nitrate or SAC			
Measuring range No3-N: 0.1 to 50 mg/l: Clear water and activated sludge NO3-N: 0.01 to 20 mg/l: Clear water SAC: 0.1 to 50 l/m (COD 0.15 to 75 mg/l, TOC: 0.06 to 30 mg/l): Clear waterSAC: 0.1 to 50 l/m (COD 0.15 to 75 mg/l, TOC: 0.06 to 30 ng/l): Clear waterSAC: 0.5 to 250 l/m (COD 2.5 to 1000 mg/l; TOC: 0.9 to 10 mg/l) Organic load at inlet, industrialAmbient tempera- ture4 to 140°FProcess temperature7 to 145 psiaProcess connection% NPT, G1Sensor cableProverProverApprovalsNo-hazardous	Material	316L SS, quartz glass, EPDM O-rings			
NO3-N: 0.01 to 20 mg/l: Clear waterSAC: 0.1 to 50 l/m (COD 0.15 to 75 mg/l, TOC: 0.06 to 30 mg/l); Clear waterSAC: 0.5 to 250 l/m (COD 0.75 to 370 mg/l, TOC: 0.3 to 150 mg/l) Clear water, treated waterSAC: 1.5 to 700 l/m (COD 2.5 to 1000 mg/l; TOC: 0.9 to 410 mg/l) Organic load at inlet, industrialAmbient temperature-4 to +140°FProcess temperature1 to 120°FProcess pressure7 to 145 psiaInsertion depthCuvette gap, must be submergedProcess connection¾*NPT, G1Sensor cableFixed, Memosens, maximum 328 ftPowerProvided by Liquiline CM442ApprovalsNon-hazardous	Measuring range NO_3 -N: 0.1 to 50 mg/l: Clear water and activated slu				
SAC: 0.1 to 50 I/m (COD 0.15 to 75 mg/l, TOC: 0.06 to 30 mg/l); Clear waterSAC: 0.5 to 250 I/m (COD: 0.75 to 370 mg/l, TOC: 0.3 to 150 mg/l) Clear water, treated waterSAC: 1.5 to 700 I/m (COD 2.5 to 1000 mg/l; TOC: 0.9 to 410 mg/l) Organic load at inlet, industrialAmbient temperature-4 to +140°FProcess temperature4 to 120°FProcess pressure7 to 145 psiaInsertion depthCuvette gap, must be submergedProcess connection¾*NPT, G1Sensor cableFixed, Memosens, maximum 328 ftPowerProvided by Liquiline CM442ApprovalsNon-hazardous		NO ₃ -N: 0.01 to 20 mg/l: Clear water			
SAC: 0.5 to 250 l/m (COD: 0.75 to 370 mg/l, TOC: 0.3 to 150 mg/l) Clear water, treated water SAC: 1.5 to 700 l/m (COD 2.5 to 1000 mg/l; TOC: 0.9 to 40 0 mg/l) Organic load at inlet, industrialAmbient tempera- ture-4 to +140'FProcess temperature41 to 120'FProcess pressure7 to 145 psiaInsertion depthCuvette gap, must be submergedProcess connection%' NPT, G1Sensor cableFixed, Memosens, maximum 328 ftPowerProvided by Liquiline CM442ApprovalsNon-hazardous		SAC: 0.1 to 50 l/m (COD 0.15 to 75 mg/l, TOC: 0.06 to 30 mg/l); Clear water			
SAC: 1.5 to 700 l/m (COD 2.5 to 1000 mg/l; TOC: 0.9 to 410 mg/l) Organic load at inlet, industrialAmbient tempera- ture-4 to +140'FProcess temperature4 to 120'FProcess pressure7 to 145 psiaInsertion depthCuvette gap, must be submergedProcess connection¾* NPT, G1Sensor cableFixed, Memosens, maximum 328 ftPowerProvided by Liquiline CM442ApprovalsNon-hazardous		SAC: 0.5 to 250 l/m (COD: 0.75 to 370 mg/l, TOC: 0.3 to 150 mg/l) Clear water, treated water			
Ambient tempera- ture-4 to +140°FProcess temperature4 to 120°FProcess pressure7 to 145 psiaInsertion depthCuvette gap, must be submergedProcess connection¾* NPT, G1Sensor cableFixed, Memosens, maximum 328 ftPowerProvided by Liquiline CM442ApprovalsNon-hazardous		SAC: 1.5 to 700 l/m (COD 2.5 to 1000 mg/l; TOC: 0.9 to 410 mg/l) Organic load at inlet, industrial			
Process temperature 41 to 120°F Process pressure 7 to 145 psia Insertion depth Cuvette gap, must be submerged Process connection %* NPT, G1 Sensor cable Fixed, Memosens, maximum 328 ft Power Provided by Liquiline CM442 Approvals Non-hazardous	Ambient tempera- ture	-4 to +140°F			
Process pressure 7 to 145 psia Insertion depth Cuvette gap, must be submerged Process connection ¾* NPT, G1 Sensor cable Fixed, Memosens, maximum 328 ft Power Provided by Liquiline CM442 Approvals Non-hazardous	Process temperature	41 to 120°F			
Insertion depth Cuvette gap, must be submerged Process connection %*NPT, G1 Sensor cable Fixed, Memosens, maximum 328 ft Power Provided by Liquiline CM442 Approvals Non-hazardous	Process pressure	7 to 145 psia			
Process connection ¾* NPT, G1 Sensor cable Fixed, Memosens, maximum 328 ft Power Provided by Liquiline CM442 Approvals Non-hazardous	Insertion depth	Cuvette gap, must be submerged			
Sensor cable Fixed, Memosens, maximum 328 ft Power Provided by Liquiline CM442 Approvals Non-hazardous	Process connection	³ 4" NPT, G1			
Power Provided by Liquiline CM442 Approvals Non-hazardous	Sensor cable	Fixed, Memosens, maximum 328 ft			
Approvals Non-hazardous	Power	Provided by Liquiline CM442			
	Approvals	Non-hazardous			

Water/Wastewater Transmitters			
	Liquiline CM442/CM444/CM448 Digital Memosens Field Transmitter	Liquiline CM442R/CM448R/CM448R Digital Memosens DIN Rail-mount Transmitter	
Application	Water/wastewater, power, chemical, process industries	Water/wastewater, power, chemical, process industries	
Measurement type	Universal , multi-parameter transmitter for all Memosens and Memosens protocol sensors, including pH, ORP, conductivity, dissolved oxygen, turbidity/TSS, ammonium, nitrate, SAC/UC254, free chlorine	Universal , multi-parameter transmitter for all Memosens and Memosens protocol sensors, including pH, ORP, conductivity, dissolved oxygen, turbidity/TSS, ammonium, nitrate, SAC/UC254, free chlorine	
Measurement range	Dependent on connected sensor type	Dependent on connected sensor type	
Outputs	Up to eight 0/4 to 20 mA outputs, up to four relays (SPDT), Digital fieldbuses (HART, Profibus, Modbus (TCP/485) or EtherNet/IP), and discrete outputs.	Up to eight 0/4 to 20 mA outputs, up to four relays (SPDT), Digital fieldbuses (HART, Profibus, Modbus (TCP/485) or EtherNet/IP), and discrete outputs.	
Inputs	From one up to eight digital Memosens sensors, optional analog input and discrete inputs.	From one up to eight digital Memosens sensors, optional analog input and discrete inputs.	
Power supply	24 VAC (CM442 only), 50/60 Hz 24 VDC 100-240 VAC, 50/60 Hz	24 VAC (CM442R only), 50/60 Hz 24 VDC (CM444R and CM448R with external DIN-rail power supply) 100-240 VAC, 50/60 Hz (CM444R and CM448R with external DIN-rail power supply)	
Ambient temperature	CM442: 0 to 140°F CM444 and CM448: 0 to 120°F	CM442: 32 to 140° F CM444 and CM448: 32 to 120°F External display: 0 to 140°F	
Mounting	Wall or pipe	DIN-rail electronics, panel-mount remote display	
Operation	Local interface via LCD display,menu-driven soft keys, and navigator knob. Optional IP addressable webserver. Optional HART, Profibus, EtherNet/IP, Modbus digital. Integrates with FieldCare/DeviceCare, Field Data Manager and W@M asset management.	Optional panel-mount remote interface via LCD display, menu-driven soft keys, and navigator knob. Optional IP addressable webserver. Optional HART, Profibus, EtherNet/IP, Modbus digital. Integrates with FieldCare/DeviceCare, Field Data Manager and W@M asset management.	
Housing	Polycarbonate housing. IP66/67, NEMA 4X	Remote display: IP66, NEMA 4x when properly mounted.	
Approvals / certificates	CE mark CM442 only: FM and CSA; Class 1, Div 2 CM444 and CM448: General pupose	CE mark CM442R, CM444R and CM448R: General pupose	

Modular Holder Assemblies				Holder Assemblie	es	
	Flexdip CYH112	Flexdip CYA112		Flowfit CYA251	71110000	
				-		
			Application	Process, wastewater	Clean water	
Application	Water and wastewater	Water and wastewater	Description	Flow assembly for nitrate/SAC (CAS51D), turbidity (CUS51D),	Flow assembly for UV Nitrate (CAS51D)	
Description	Description Single installation point, flexible	Standard immersion pipe, chain		dissolved oxygen (COS51D, COS61D)		
	mounting	sion pipe	Material	PVC, EPDM (seals)	PVC	
Area of use	Basins, open channels, open tanks, process vats	Basins, open channels, open tanks, process vats	Maximum pressure	87 psi at 68°F		
Sensor installation	Cantilever arm with chain, fixed	Various sensor connection threads	Temperature	32 to 120°F		
	immersion pipe, free swinging or float-lever version for varying 45° angle mounting		Flow rate	53 gal/hr for oxygen, 26.5 for turbidity and UV nitrate		
Commetible commented day	Elevels	Elemáia CVIIII 10	Sensor connection	Compression fitting	Compression, o-rings	
assemblies	Dipfit W CPA111, ISEmax CAS40D	Flexalp CYH112	Holder installation	Inline or bypass line:	Wall mount with 6 mm OD hose	
Material	Stainless steel and plastic	Stainless steel and PVC		1" ANSI Flange, PVC	connection	
Ambient temperature	-4 to +140°F	-4 to +140°F		DN20, PVC DN25 hose barb PVC		
Main pipe height	20", 40", 71"	Lengths vary depending on application		Rp 3/4" female thread, PVC NPT 3/4" female thread, PVC		
Cantilever arm length	20", 40", 59"	N/A			·	

Water/Wastewater Sampler Systems			
	Liquistation CSF34 Stationary sampler	Liquiport CSP44 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	-20 to +160°F	Dependent on connected sensor	
Output	2 Binary Outputs Standars, 2 Binary Outputs optional Open Collector, max 30 V, 200 mA Depending on the version selected: 1 x 0/4-20 mA, active, selectable with HART 2 x 0/4-20 mA active 4 x 0/4-20 mA active 6 x 0/4-20 mA active Profibus DP MODBUS 485 Ethernet and Modbus TCP	2 binary, open collector, 30V, 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	Unpressurized, open channel (unpressurized sampling) Maximum 11.6 psi piping (pressurized sampling) Maximum 87 psi with Sampling Assembly Model CSA240	Unpressurized	
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 from1 liter (24 containers) to 60 liter (1 container), containers made of PE or glass depending on application	Various sizes and combinations available from1 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/DeviceCare	Field Data Manager, FieldCare/DeviceCare	
Approvals / certificates	CE	CE	

Analysis: Process Photometers

	Concentration and Color Sensors			
	Model OUSAF21 Flow through optical	Model OUSAF22 Flow through optical		
Transmitter type	Memograph M CVM40 or Model 980	Memograph M CVM40 or Model 980		
Application	Potable water	Potable water		
Sensor type	Low level color	Dual beam color		
Measurement wave- length	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 sapphir		
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	¾" FNPT	Tri-Clamp, flange, FNPT		
Sensor material	316 SS	316 SS		

Cell Density Sensor		
	OUSBT66 Optical insertion	
Transmitter type	Memograph M CVM40	
Application	Bacterial fermentation, mammalian cell culture	
Sensor type	Optical insertion probe	
Measurement wave- length	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	

Phase Separation, Chromatography Sensors				
	OUSAF44 Flow through UV	OUSAF45 Flow through UV	OUSAF46 Flow through UV, dual channel	
Transmitter type	Memograph M CVM40 or OUM960	Memograph M CVM40 or OUM960	Memograph M CVM40 or OUM960	
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	316LSS	

	Turbidity Sensor
	Model OUSTF10 Flow through scattered light
Transmitter type	Memograph M CVM40
Application	Emulsions and immiscible fluids
Sensor type	Low turbidity scattered light
Measurement wave- length	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

	Dairy Milk and Mining Solids Sensor	
	OUSAF11 Submersible optical	
Transmitter type	Memograph M CVM40 or OUM910	
Application	Dairy milk, mining solids	
Sensor type	Submersible color optical	
Measurement range	0 to 30% TSS	
Path length	5 or 10 mm	
Lamp	Long life incandescent, 5 VDC	
Detector type	Solid state detector	
Output	Low level current	
Window material	Teflon® optical head	
Maximum temperature	32 to 194°F	
Process connection	34" FNPT	
Sensor material	316L SS Teflon® head	

	Suspended Solids and Interface Sensor	
	OUSAF12 Flow through optical	
Transmitter type	Memograph M CVM40 or OUM910	
Application	Solids concentration (absorbance)	
Sensor type	Flow through color optical	
Measurement range	200 to 10,000 ppm	
Path length	0.5 to 50 mm, up to 500 mm	
Lamp	Low voltage 4 watt incandescent FM Class I, Div. 1, Grps. B, C, D	
Detector type	Silicone detector	
Output	Low level current	
Window material	Pyrex®, Lexan®, fire polished quartz, or sapphire	
Maximum temperature	194°F continuous, 266°F for two hours	
Maximum pressure	1500 psig dependent on material, line size and process connection	
Process connection	Tri-Clamp, 150/300 lb flange, FNPT	
Sensor material	316L SS	

Process Photometer Transmitter		
	Liquiline CM44P Digital Field Transmitter for Process Photometers and Memosens sensors	Liquiline CM44P Digital DIN Rail-mount Transmitter for Process Photometers and Memosens sensors
	8.36	
Application	Chemical, Food, Pharmaceutical	Chemical, Food, Pharmaceutical
Measurement type	Multi-parameter transmitter for process photometers and Memosens protocol sensors including pH, ORP, conductivity, dissolved oxygen, turbidity/TSS, ammonium, nitrate, SAC and free chlorine	Multi-parameter transmitter for process photometers and Memosens protocol sensors including pH, ORP, conductivity, dissolved oxygen, turbidity/TSS, ammonium, nitrate, SAC and free chlorine
Measuring range	Dependent on connected sensor type	Dependent on connected sensor type
Outputs	Up to eight 0/4-20 mA outputs, up to four relays (SPDT), discrete outputs, digital fieldbuses (HART, Profibus, Modbus (TCP/485) or EtherNet/IP	Up to eight 0/4-20 mA outputs, up to four relays (SPDT), discrete outputs, digital fieldbuses (HART, Profibus, Modbus (TCP/485) or EtherNet/IP
Input	Up to two process photometers and four Memosens sensors, analog inputs, and discrete inputs	Up to two process photometers and four Memosens sensors, analog inputs, and discrete inputs
Power supply	24 VDC 100-240 VAC, 50/60 Hz	24 VDC 100-240 VAC, 50/60 Hz
Ambient temperature	0 to 120°F	Electronics: 32 to 120'F External Display: 0 to 140'F
Mounting	Wall mount or pole mount	DIN-rail electronics, panel-mount remote display
Operation	Local interface via LCD display, menu-driven soft keys, and navigator knob. Optional IP addressable webserver. Optional HART, Profibus, EtherNet/IP, Modbus digital.	Optional panel-mount remote interface via LCD display, menu-driven soft keys, and navigator knob. Optional IP addressable webserver. Optional HART, Profibus, EtherNet/IP, Modbus digital.
Housing	Polycarbonate, IP66/67, NEMA 4X	Remote display: IP66, NEMA 4X when sealed to panel with gasket
Approvals/Certificates	CE Mark, General Purpose	CE Mark, General Purpose

Flow Assembly		
	OUA260	
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	¼" 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	

Analysis: Software

	Multichannel, multiparameter PC software for Memosens sensors	
	Memobase® Plus	
With Memobase Plus you can:	 Measure Calibrate Document 	
Multiparameter and multichannel	 Up to 4 parallel measurements of pH, DO, Chlorine, Conductivity Enable use of same sensors as in process Store single measurement or data-logging over time Export to PDF or Excel 	
Calibration	Controlled conditions (higher measuring accuracy, precise calibration results, better sensor evaluation) Sensors are calibrated with user defined templates (increased control of sensors that re-enter the process) Better process safety (calibration procedures can be defined down to TAG and sensor identity)	
Complete documentation	Lifetime history for all sensors used Measurement and calibration reports (sensor and reference solution management, FDA conformant user management, sensor performance values) Calibration history (traceability of sensors, evaluation of sensor performance) Local or central database (high data safety and security, using central database enables multiuser access)	

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