

Product Overview

A snapshot of Endress+Hauser's product lines

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



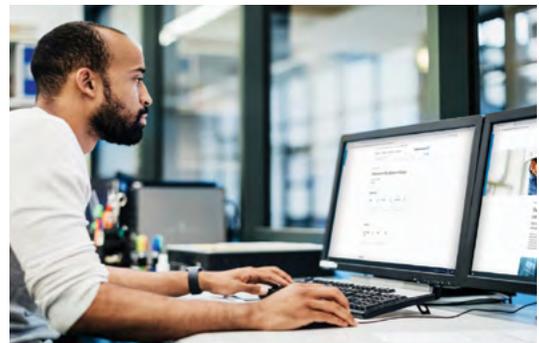


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Endress + Hauser 
People for Process Automation

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.

Endress+Hauser reserves the right to change or modify our product appearance and specifications at any time without notice. Though the information provided herein is believed to be accurate, be advised that the information contained herein is NOT a guarantee for satisfactory results.

02.25

Table of contents

Technologies overview	3	Analysis	
Endress+Hauser Product Overview		Liquid Analysis	64
Level	19	pH and ORP sensors / holders / transmitters	
Vibration		Conductivity sensors / holders / transmitters	
Conductivity		Chlorine sensors / holders / transmitters	
Capacitance		Dissolved oxygen sensors / holders / transmitters	
Radar		Turbidity sensors / holders / transmitters	
Tank Gauging		Colorimetric analyzers	
Guided radar		TOC and Phosphorus	
Microwave barrier		Nutrient	
Mechanical		Process photometers	
Ultrasonic		Optical sensors and transmitters	
Radiometric (gamma)		Software	
Flow	34	Optical Analysis	90
Electromagnetic		Raman spectroscopy	
Coriolis		Tunable diode laser absorption spectroscopy (TDLAS)	
Ultrasonic		Quench fluorescence (QF)	
Vortex		Services	96
OEM		Applicator	
Flow monitoring		Commissioning services	
Differential pressure		Technical support	
Pressure	51	Repair	
Gauge/absolute		Repair field service	
Differential		Calibration services	
Hydrostatic		Calibration management	
Temperature	54	Maintenance services	
Transmitters		Support services	
Head transmitters		Process Training University	
RTD temperature sensors		Solutions	98
Thermocouple temperature sensors		Flow Metering	
Compact thermometers		Inventory Management	
Data Acquisition and Components	60	Liquid Analysis	
Recorders		Gas Analysis	
Multi-functional components (display / power supply)		Netilion	
Multi-functional components			
DIN rail mounting			
Wireless HART			
Field gateway components			
FieldCare software			
Field Xpert communicators			

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 led 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, 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 time-of-flight principle, where electromagnetic pulses are emitted towards the material from an antenna. Levelflex launches electromagnetic 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. 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 incensive 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.

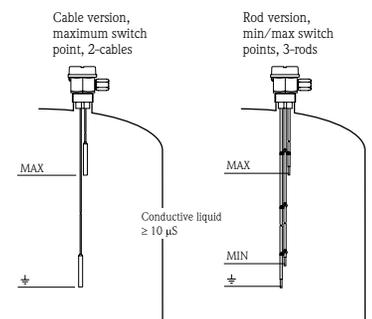
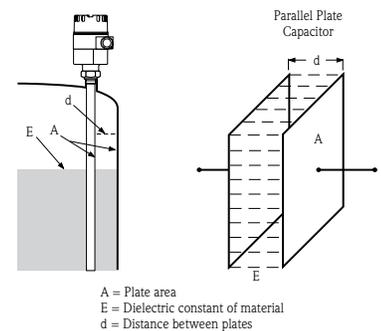
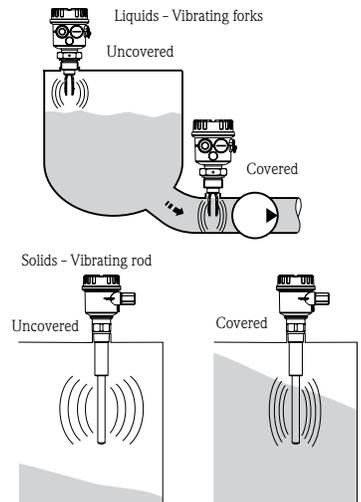
Mechanical A reduction gear and synchronous motor drive the shaft and paddle. If the paddle is stopped by material covering it, the hinged motor moves from the rest position to the switch position. This movement operates two switch contacts – the first is for external level indication and the second 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 free space radar is used for continuous, non-contact level measurement of liquids, pastes, slurries and solids. The measurement is not affected by changing media, temperature changes, gas blankets or vapors. The free space radar offers maximum reliability due to improved algorithms, small beam angles and uses Heartbeat Technology® for diagnostics. Endress+Hauser offers a wide selection of sending frequencies, 6Ghz & 26Ghz, using pulse technology and 80Ghz using FMCW technology. Communications have been updated to include Bluetooth® for configuration and diagnostic evaluation.

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

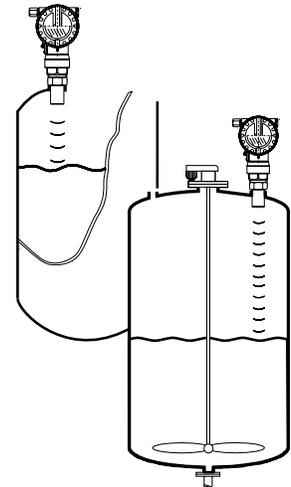
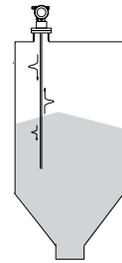
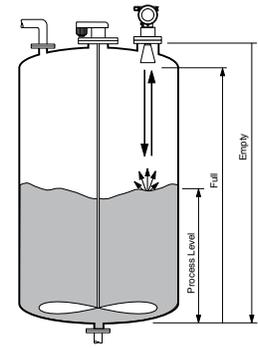
Guided radar Levelflex is a “downward-looking” time-of-flight system, which measures the distance from the probe mounting (top of the tank) to the material level. An electrical impulse is launched and guided down the probe or cable, which acts as a surface wave transmission line. When the surface wave 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.

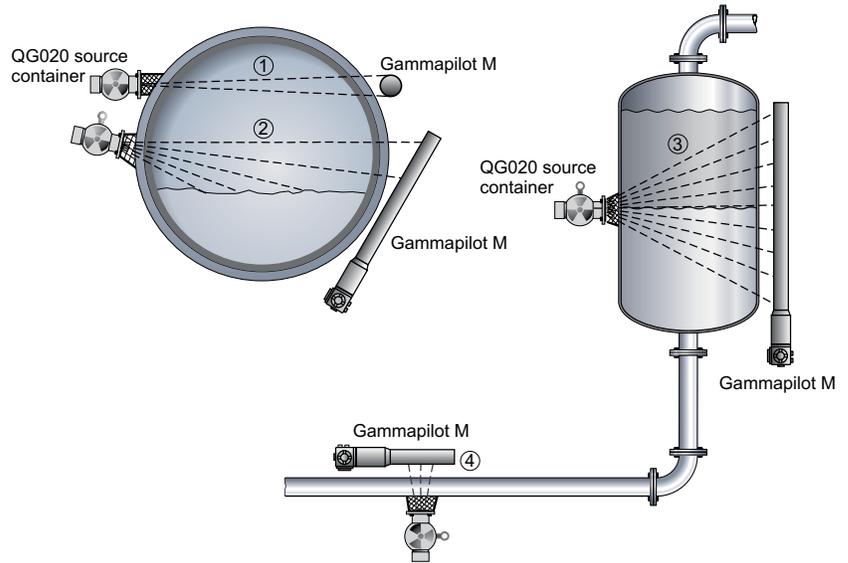
Ultrasonic level measurement In ultrasonic level measurement the operating principle is based on the measurement of the travel time of a sound signal transmitted from and received by the same sensor after reflection from the liquid or solids surface. The travel time of a sound pulse is a direct measure 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.

Gamma In gamma measurement, a radiation source (^{137}Cs or ^{60}Co) is emitted in one direction through the process vessel or pipe and received by the transmitter. The radiation source is enclosed in a shielded container which allows the radiation to be emitted in only one direction and shields the radiation in any other direction. The Gammapilot M transmitter contains a scintillator, a photomultiplier and the evaluation circuit. Gamma radiation generates light flashes within the scintillator. The photomultiplier converts these flashes into electrical pulses and amplifies them. The pulse rate is a measure of the radiation intensity. Depending on the calibration, the pulse rate is converted to a level, limit, density or concentration signal by the evaluation circuit.

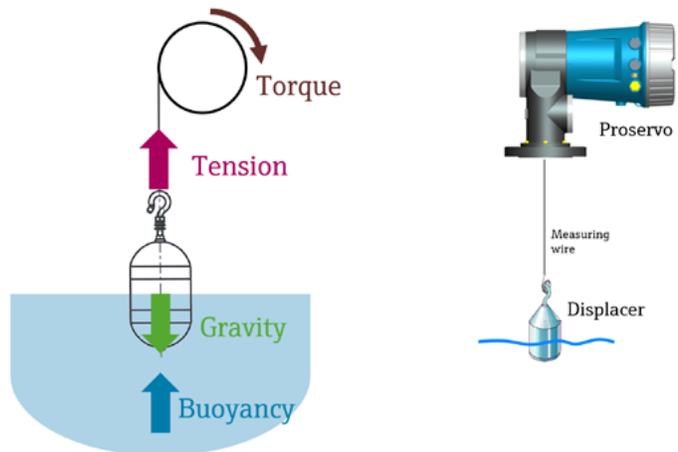


- 1 Point level measurement
- 2 Continuous level measurement
- 3 Interface measurement
- 4 Density or concentration measurement



Measuring principle – Proservo NMS8x

- Proservo operating principle is based upon the principle of Archimedes; the buoyancy acts against the gravity and directly influences the displacer apparent weight; when the displacer contacts or goes into a liquid, its weight changes due to the liquid buoyancy
- The weight results into a wire tension and effects a torque on the wire drum
- With the servo motor the Proservo will always aim to stabilize the torque to follow the level
- In addition, this principle can be used to monitor interface levels as well as the density (avg. and profile) of the liquid product



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 led 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.

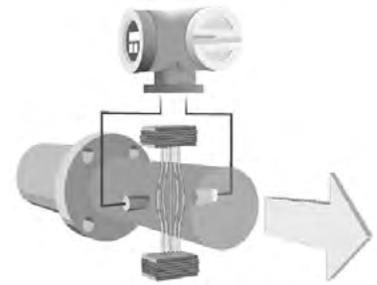
By employing specific measurement technologies, Endress+Hauser flow products provide measurement solutions in:

- **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 1/12" to 90", 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 16" with dual bent tubes, single bent tube, 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. A special ultrasonic flowmeter (Prosonic B 200) has been designed specifically for wet biogas applications. Not only can it measure flow, it can also measure temperature and methane content which can be converted directly to available energy (BTU or kJ) in the stream.
- **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 circular 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. 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 flowmeters 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 magnetron 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 $5 \mu\text{S}/\text{cm}$ 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.

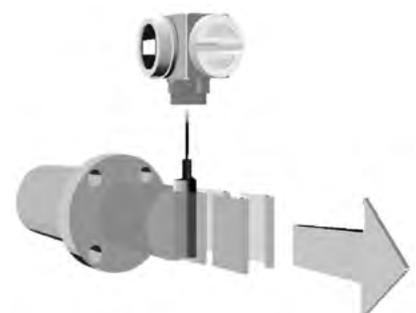
The Promass I has a full bore, straight-through, single-tube design which operates somewhat differently than the dual-tube design. In order to maintain balance for flawless measurement, a patented Torsion Mode Balanced (TMB) system is used. By exciting an eccentrically located, counter-oscillating pendulum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

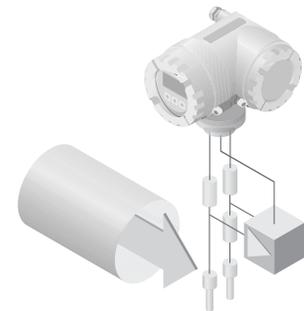


The Prowirl vortex measuring system is ideal for liquids, gases, and steam. Applications for oxygen, nitrogen, cryogenics, and solvents are well within the measuring techniques of the vortex system.

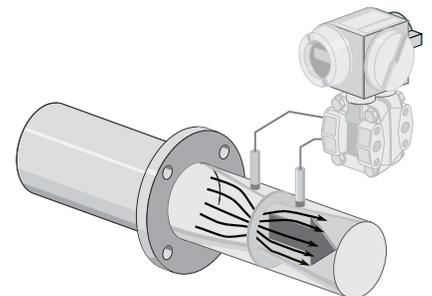
Ultrasonic flow measurement The ultrasonic flow system is a non-intrusive, externally mounted measuring system which uses ultrasonic sound waves to measure the flowing fluid in a pipeline. The Prosonic flow systems operates on the principle of transit time difference. An acoustic signal (ultrasonic) 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 led 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)

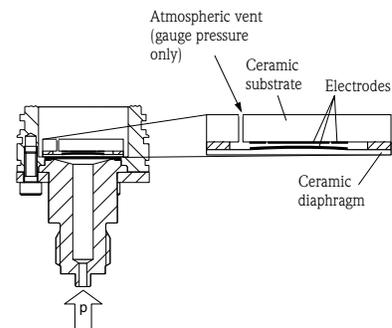
Pressure Basic Measurement Technologies

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).

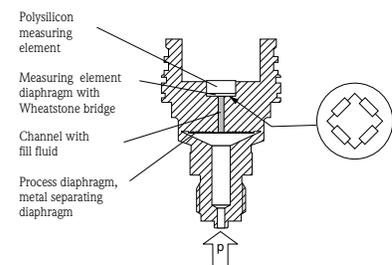
Ceramic—The operating principle of the ceramic sensor is based on capacitance technology. As pressure is applied to the ceramic diaphragm, the measuring capacitor deflects by a minimum of less than 0.001 inch. A change in capacitance proportional to pressure is measured between the substrate electrode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

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

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



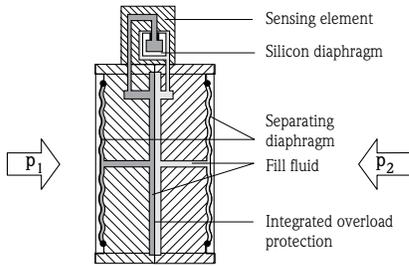
Ceramic measuring cell



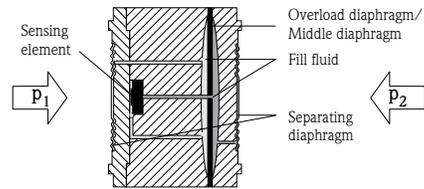
Silicon measuring cell

Differential pressure measurement Differential pressure sensors are available in silicon sensors (for up to 580 psi). 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.



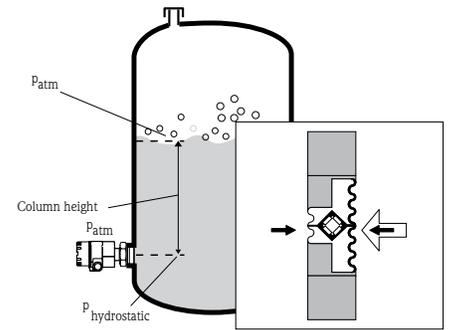
Silicon measuring cell
(4 inH₂O and 12 inH₂O)



Silicon measuring cell
(40 inH₂O and above)

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

The weight of a column of liquid generates a hydrostatic pressure. At constant density, the hydrostatic pressure is a function of the height of the liquid only. The atmospheric pressure acts on the measuring cell through a pressure compensation system and thus is self-compensating. An overload substrate protects the measuring cell from pressure peaks to 20 times the nominal rating (maximum 360 psig). This ensures that accuracy remains unaffected. The measuring cells cover a pressure range from 15 inH₂O to 58 psig. Vacuum can be measured to 1.7 psia.



Temperature

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

Endress+Hauser offers a complete range of sensors and transmitters for virtually all aspects of temperature measurement. Our experience in all areas of process measurement has led 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.

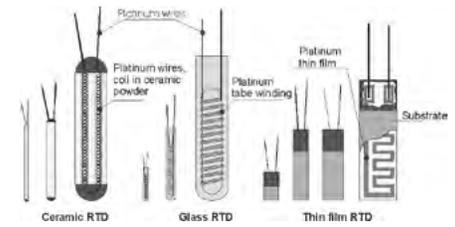
What is it, fundamentally, that causes a temperature sensing device (or even your skin) to get a reading of the temperature? At the molecular level, it is the result of the aggregate momentum transferred to the sensing device by all the collisions of moving molecules.

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.

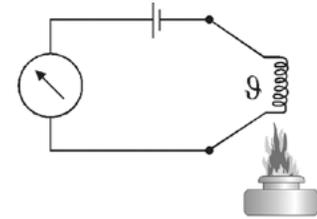
Although there are several sensor types used to transducer sensed temperature into a measurable and usable electrical signal, the vast majority used are one of two types – the “RTD” (Resistive Temperature Device) or TC (Thermocouple).

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

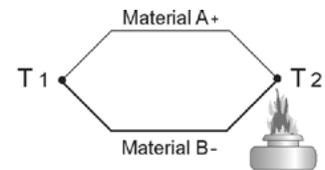
When two wires composed of dissimilar metals are joined at both ends and one of the ends is heated, there is a continuous current which flows in the thermoelectric circuit.



RTD types



Resistive temperature measurement



Thermocouple temperature measurement

Data acquisition and system components

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

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

The range of system components offered:

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

Analysis

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

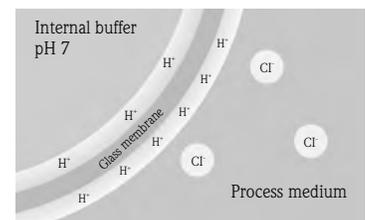
The purity of our drinking water has increasingly become a matter of public concern. Most drinking water supplies today require special treatment before it can be distributed and utilized. This is to eliminate possible toxic and infectious contaminants and make it safer for human consumption.

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

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

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

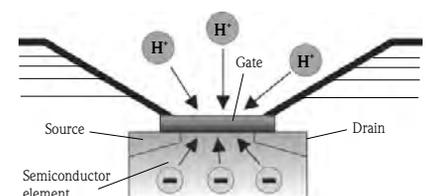
- **pH:** pH is the measurement of hydrogen ion activity. It is measured on a scale of 0 to 14, where zero is extremely acid and 14 is extremely alkaline. The mid point of 7.0 pH is distilled water. It is the most widely used liquid analysis measurement and is found in all industries. Used to determine the degree of acidity or alkalinity of a sample, pH measurement is a number that is directly related to a ratio of H^+ (hydrogen ion) and OH^- (hydroxyl ion) concentrations in a solution.



Voltage occurrence with pH measurement with glass electrodes

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.

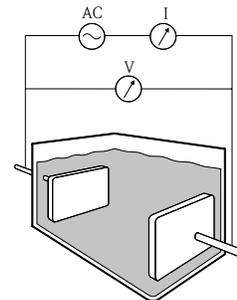
pH glass electrodes: The method of pH measurement using glass electrodes is a potentiometric measurement method. Since glass is basically an electric insulator, amplifiers for the pH measurement must have an extremely high input impedance. The measuring effect is based on a pH-sensitive glass membrane, 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.



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.

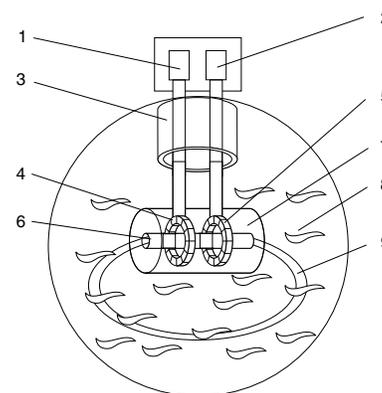
- ORP:** ORP (Oxidation-reduction Potential) measurements are used to monitor chemical reactions, quantify electron activity or determine the oxidizing or reducing properties of solutions. ORP is related to pH in that it utilizes a similar measuring system, and delivers millivolts, as does pH. ORP is 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 determine the conductivity value. The conductivity serves as a measure of ion concentration.



- Oscillator
- Receiver and signal processing
- Cable
- Primary winding
- Secondary winding
- Bore
- Sensor housing
- Process medium
- Induced electric current

- Chlorine:** Chlorine is used not only in your home to clean and disinfect, but is widely used throughout industry, especially in water/wastewater treatment. 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. As a common last step of water treatment, 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.

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

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

- Dissolved Oxygen:** 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 environments for micro-organism growth.

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:** 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.

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 Analysis:** 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. CA80 & CA71 Liquid 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.
- **Optical Analysis:** Endress+Hauser acquired SpectraSensors in 2012 and Kaiser Optical Systems in 2013 to add to their rapidly expanding gas analyzer portfolio. Endress+Hauser now offers Raman spectroscopy, TDLAS, and quenched fluorescence (QF) analyzers which provide high-performance chemical composition and concentration measurements of gases, liquids, and solids. These lab-to-process analyzer systems are trusted throughout the life science, oil & gas, chemical, and food and beverage industries.
- **Raman spectroscopy:** Endress+Hauser Raman analyzers, powered by Kaiser Raman technology, are gold standards trusted throughout the chemical, pharmaceutical, biopharmaceutical, oil & gas, and food & beverage industries. For over 30 years, our Raman analyzers have been proven and reliable. Our Raman technology represents the state-of-the art in Raman instrumentation, with a long history of success in lab to manufacturing, including cGMP.

The Endress+Hauser Raman Rxn analyzer suite features highly intuitive, fully embedded Raman RunTime control software, and works in concert with a wide range of versatile Raman optimized sampling probes. Delivering 24/7 process feedback, Raman technology provides companies with total process transparency so they can tightly monitor and control their chemistries. In doing so, they gain the power to drive product quality, improve plant safety, and optimize process efficiencies across their lab-to-process enterprise.

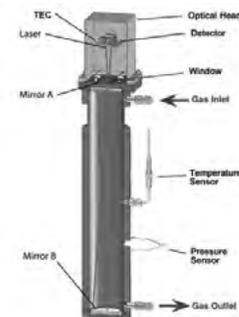
Raman spectroscopy is a measurement principle that uses visible or near-infrared light to measure chemical composition. When light is scattered from a molecule, most photons are elastically scattered. The scattered photons have the same energy (frequency) and therefore wavelength as the incident photons. However, a small fraction of light (approximately 1 in 10⁷ photons) is scattered at optical frequencies different from, and usually lower than, the frequency of the incident photons. The process leading to this inelastic scatter is termed the Raman effect. Raman scattering can occur with a change in vibrational, rotational or electronic energy of a molecule. The difference in energy between the incident photon and the Raman scattered photon is equal to the energy of a vibration of the scattering molecule. A plot of intensity of scattered light versus energy difference is a Raman spectrum. Raman spectroscopy is useful for chemical analysis for several reasons:

- Specificity: Because Raman detects fundamental vibrations, Raman bands have a good signal-to-noise ratio and are non-overlapping. This allows a Raman spectrum to be used for everything from “fingerprinting” of samples to constructing complex chemical models of reaction processes.
 - Analysis of aqueous systems: The infrared spectroscopy (IR) spectrum of water is strong and relatively complex, making IR inadequate for analysis of aqueous solutions due to heavy interference by the water bands. However, the Raman spectrum of water is weak and unobtrusive, allowing good spectra to be acquired of species in aqueous solutions.
 - Analysis of organic and inorganic chemistries: If a covalent chemical bond exists between chemical species, then a unique Raman signature may be produced.
 - Wide concentration range: The measured intensity of a Raman species is directly proportional to the concentration. This allows a Raman analysis to measure a species concentration from a fraction of 1% to 100% without sample dilution.
 - No sample preparation: Unlike most other chemical analysis techniques, Raman requires no special preparation of the sample. In fact, no contact with the sample is needed at all because Raman involves only illuminating a sample with a laser and collecting the scattered photons.
 - Non-destructive analysis: Because Raman involves only illuminating a sample with a laser (often through a window) and collecting the scattered photons, this makes Raman spectroscopy non-destructive.
 - Compatible with common windows: Can utilize standard sampling containers and windows manufactured of glass, sapphire, transparent polymers, and diamond to measure samples *in situ*.
 - Quantitative Raman: Because the intensity of a Raman band is directly proportional to the number of molecules giving rise to the band, then the Raman band can be used to provide a measure of composition and concentration of a molecule.
 - Short measurement times: A Raman spectrum can, typically, be acquired on a timescale from a fraction of a seconds to several minutes, thus Raman can be used to monitor chemical reactions in “real time.”
- **Tunable diode laser absorption spectroscopy (TDLAS):** Endress+Hauser TDLAS analyzers, powered by SpectraSensors TDLAS technology, detect and measure the concentration of analyte molecules (H₂O, H₂S, NH₃, C₂H₂, and C₂H₄) in process gas streams. Since 1999, our products have helped companies boost operational safety, optimize productivity and ensure high plant availability.

Our commitment to providing reliable gas analysis measurement is evidenced by an installed base of over 10,000 gas analyzers around the world in natural gas production, transportation, storage, distribution, gas processing, refining, petrochemical, specialty and bulk gas production. Our expertise in this field is also underscored by our extensive portfolio of patents.

The J22 TDLAS gas analyzer for moisture measurement in natural gas offers configuration flexibility with a variety of features to suit any application. It meets the highest levels of accuracy and reliability with low maintenance and low total cost of ownership.

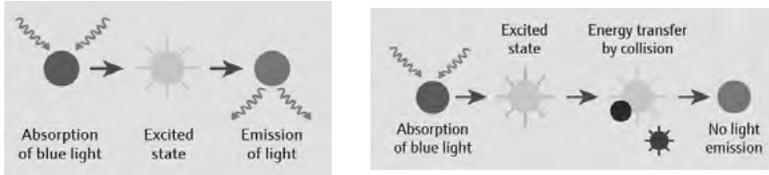
The basic design of a TDLAS analyzer is depicted in the diagram below. The principal components of the analyzer are: an optical head housing the laser with thermo-electric cooler and a solid state detector, the sample cell with a mirror positioned at the end opposite the laser, gas inlet and outlet connections, and temperature and pressure sensors. A window isolates the laser source and solid state detector components from the process gas inside the sample cell. This design allows measurements to be performed with absolutely no contact between the process gas sample (and any entrained contaminants) and critical analyzer components. In operation, process gas from a sampling probe is introduced into the sample cell of the analyzer. A tunable diode laser emits a wavelength of



near-infrared (NIR) light specific for the target analyte into the sample cell where it passes through the gas and is reflected back by a mirror at the opposite end of the cell to a solid state detector. Analyte molecules present in the gas sample absorb and reduce the intensity of laser light energy in direct proportion to their concentration according to the Lambert-Beer law. The difference in light intensity is measured by the solid state detector and this signal is processed using advanced algorithms to calculate analyte concentration in the process gas.

The path length of the sample cell can be increased to create a multi-pass Herriott cell in which laser light traverses the cell multiple times to increase analyzer sensitivity for trace (sub-ppm) level measurements.

- **Quenched fluorescence (QF) technology:** QF analyzers perform on-line, real-time measurements of oxygen (O_2) in gas streams from ppm levels to percentage levels. This technology involves transmitting a blue LED light to the sensor tip causing it to emit "fluorescence." When the sensor tip comes into contact with oxygen, the O_2 molecules absorb energy, preventing the emission. The amount of oxygen is inversely proportional to the intensity and duration of the luminescence.



Endress+Hauser's OXY5500 optical oxygen analyzer is a compact, stand-alone, single channel analyzer that uses quenched fluorescence (QF) technology to reliably measure oxygen in natural gas and gas processing applications. A sensor probe is inserted into the process stream and is connected to the controller by an optical fiber. Featuring an LCD display and built-in data logger, the OXY5500 also has full sample conditioning systems available as well as software for a PC interface.

The OXY5500 is unaffected by the presence of H_2S and other compounds which cause interferences and measurement biases in electrochemical sensors. As such, OXY5500 analyzers are demonstrably faster, more accurate, more stable, and require less maintenance than alternative oxygen measurement systems for natural gas.

Vibration

Liquiphant® M					
	FTL41 	FTL51B 	FTL50H (compact, hygienic/sanitary) 	FTL51H (hygienic/sanitary, extended) 	FTL62 
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	Frequency shift tuning fork	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	FEL42, 3-wire PNP FEL44, relay DPDT FEL48, 2-wire NAMUR	FEL61: AC, load switched via thyristor FEL62: DC-PNP FEL64: DPDT relay FEL68: H-L edge NAMUR with test button FEL67: PFM for separate switching unit FEL60D: Density (with FML621 density computer)	FEL51: AC, load switched via thyristor FEL52: DC-PNP FEL54: DPDT relay FEL55: 8 to 16 mA FEL56: L-H edge NAMUR FEL58: H-L edge NAMUR with test button FEL57: PFM for separate switching unit FEL50A: Profibus PA FEL50D: Density (with FML621 density computer)	FEL51: AC, load switched via thyristor FEL52: DC-PNP FEL54: DPDT relay FEL55: 8 to 16 mA FEL56: L-H edge NAMUR FEL58: H-L edge NAMUR with test button FEL57: PFM for separate switching unit FEL50A: Profibus PA FEL50D: Density (with FML621 density computer)	FEL61: 2-wire, test button FEL62: 3-wire PNP, test button FEL640C: Low voltage supply, relay DPDT, test button FEL64: Relay DPDT, test button FEL67: 2-wire PFM, test button FEL68: 2-wire, NAMUR, test button FEL60H: 2-wire 8/16mA HART, test button FEL60D: density/concentration
Power supply	FEL42, 10-55 VDC FEL44, relay 19-253 VAC/ 19-55 VDC FEL48, 2-wire NAMUR	FEL61: 19 to 253 VAC FEL62: 10 to 55 VDC (PNP) FEL64: 19 to 253 VAC, 19 to 55 VDC (relay) or 9-20VDC FEL67,68: NAMUR and PFM, requires separate power supply (e.g. FTL 325N / 325P) FEL60D: 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	FEL61: 19 to 253 VAC FEL62: 10 to 55 VDC FEL64DC: 19 to 253 VAC, 19 to 55 VDC contract, 253 V/6A FEL67: 2-wire, PFM, test button, requires separate power supply (e.g. FTL325N / 325P) FEL68: 2-wire NAMUR, test button, requires separate power supply (e.g. FTL325N / 325P) FEL60H: 2-wire 8/16mA HART, test button, 10.5 to 35 VDC FEK600: density/concentration, powered by FML621
Ambient temperature	-58 to +158 °F	-58 to +158 °F	-58 to +158 °F	-58 to +158 °F	-60 to +158 °F
Process temperature	-50 to +150 °C (-58 to +302 °F)	-50 to +150 °C (-58 to +302 °F)	-58 to +302 °F	-58 to +302 °F	-58 to +302 °F
Process pressure	-1 to +40bar (-14.5 to +580psi)	-1 to +100bar (-14.5 to +1450psi)	Maximum 928 psi, threaded connections Flanges: pressure depends on flange selected and process temperature Maximum 230 psi, Tri-Clamp Maximum 145 psi, Varivent® Maximum 600 psi, 1" welded neck	Maximum 928 psi, threaded connections Flanges: pressure depends on flange selected and process temperature Maximum 230 psi, Tri-Clamp Maximum 145 psi, Varivent Maximum 600 psi, 1" welded neck	ECTFE, PFA: -14 to +580 psi Enamel: -14 to +360 psi
Process connections	Threaded: 3/4" NPT, 1" NPT (316L) ASME Flange: 1-4" (316L or C22) Tri-clamp: 1-2" (316L)	Threaded: 3/4" NPT, 1" NPT (316L or C22) ASME Flange: 1-4" (316L or C22) Tri-clamp: 1-2" (316L)	ANSI flanges: 1" to 4" (Class 150, 300), 316L SS Tri-Clamp: 1½", 2", 316L SS 1" flush mount, 316L SS (requires 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 (requires weld neck adapter) Varivent DN 40, 316L SS	ANSI flanges: 1" to 3", (Class 150, 300) 316L SS, coated (ECTFE, PFA) ANSI flanges: 2" (Class 150, 300) Alloy C-4, coated (Enamel)
Housings	Polyester (PBT) Aluminum	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), single compartment aluminum (coated) and 316L, dual compartment aluminum (coated) and 316L
Maximum viscosity	10,000 CST	10,000 CST	10,000 cSt	10,000 cSt	10,000 mPa·s
Function indication	LED lights: Green, Yellow, Red (on electronics only)	LED lights: Green, Yellow, Red (on electronics and option Bright Status LED)	Red, yellow, green LEDs (depending on electronics)	Red, yellow, green LEDs (depending on electronics)	Red, yellow, green LEDs (depending on electronics)
Wetted material	316L	316L or C22	316L SS or Alloy C4	316L SS or Alloy C4	316L SS or Alloy C4, coated (ECTFE, PFA, Enamel)
Approvals / certificates	CSA, ATEX	CSA, ATEX, IEC, SIL, HEARTBEAT	FM, CSA, SIL 3, 3-A, FDA compliant materials	FM, CSA, SIL 3, 3-A, FDA compliant materials	CSA C/US, SIL 2, FDA compliant materials

*Phasing out

Liquiphant High Temperature	
	FTL64 
Application	Liquids
Measurement type	Point level, liquids
Sensor	Frequency shift tuning fork
Output	FEL61: AC, load switched via thyristor FEL62: DC-PNP FEL64: DPDT relay FEL64DC: Low voltage, supply, relay DPDT FEL60H: 8 to 16 mA FEL68: NAMUR with test button FEL67: PFM for separate switching unit
Power supply	FEL61: 19 to 253 VAC FEL62: 10 to 55 VDC (PNP) FEL64: 19 to 253 VAC, 19 to 55 VDC (relay) FEL60H: 11 to 36 VDC (current) FEL68, 67: NAMUR and PFM, requires separate power supply (e.g. FTL325N/325P)
Ambient temperature	-76 to +158 °F
Process temperature	-76 to +536 °F
Process pressure	Maximum 1450 psi, threaded connections Flanges: Pressure depends on flange selected and process temperature
Process connections	Threaded: 3/4" NPT, 1" NPT, 316L SS or Alloy C22 ANSI flanges: 1" to 4" (Class 150, 300, 600)
Housings	Polyester (PBT), Aluminum, Dual-compartment aluminum, 316L and Dual-compartment 316L
Maximum viscosity	10,000 mPa·s
Function indication	Red, yellow, green LEDs (depending on electronics)
Wetted material	316L SS or Alloy C22
Approvals/certificates	CSA C/US, SIL 3

Liquiphant Vibronics		
	FTL43 	FTL63 
Application	Liquids	Liquids
Measurement type	hygienic point level, compact	hygienic point level
Measuring principle	Vibration Liquids	Vibration Liquids
Characteristic / Application	Advanced device for point level detection in hygienic/aseptic applications. Focus Food & Beverage and Life Sciences. Compact sensor version with an optional pipe extension up to 1,5 m (5 ft). Compact hygiene housing.	Premium device for point level detection in hygienic/aseptic applications Focus Food & Beverage and Life Sciences. Compact sensor version with an optional pipe extension up to 3 m (9,85 ft). Modular housing concept.
Specialities	Plug and play functionalities One-button operation Heartbeat Technology Surface finish: mechanical or electro-polished	Plug and play functionalities, Heartbeat Technology, LED Module, Bluetooth® Operation and maintenance, Surface finish: mechanical or electro-polished, Density/Concentration measurement, SIL 2/3 according to IEC 61508.
Supply / Communication	12...30V DC-PNP IO-Link 8/16mA HART	19...253V AC, 10...55V DC-PNP, 9...20V DC with relay DPDT, 19...253V AC or 19...55V DC with relay DPDT, 8/16mA HART, NAMUR, PFM
Ambient temperature	-40 °C...+85 °C (-40 °F...+185 °F)	-50 °C...+70 °C (-58 °F...+158 °F)
Process temperature	-40 °C...+150 °C (-40 °F...+302 °F)	-50 °C...+150 °C (-58 °F...+302 °F)
Process pressure / max. overpressure limit	Vacuum...64 bar (Vacuum...928 psi)	Vacuum...64 bar (Vacuum...928 psi)
Min. density of medium	0.5 g/cm³ (25.0 lb/ft³) (0.4 g/cm³ (31.2 lb/ft³) optional)	0.5 g/cm³ (0.4 g/cm³ optional)
Main wetted parts	316L	316L
Process connection	Threads (for weld-in adapter): G3/4A, G1A Flanges: DN25...DN50 (EN1092-1) NPS 2" CL150 (ASME B16.5, RF)	Threads (for weld-in adapter): G3/4A, G1A
Process connection hygienic	Tri-Clamp, DIN 11851, DIN11864-1, Ingold, Flush mount, DRD, SMS1145, Varivent (Varinline)	Tri-Clamp, DIN 11851, DIN11864-1 Ingold, Flush mount, DRD, SMS1145, Varivent (Varinline)
Sensor length	Compact sensor Short tube/Preferential length 148mm...1500mm (6,00...59")	Compact sensor Short tube (Liquiphant II) 148mm...3000mm (6,00...118")
Communication	IO-Link, HART, Bluetooth® wireless technology	HART Bluetooth® wireless technology
Certificates / Approvals	ATEX, IEC Ex, CSA C/US, JPN Ex, KC Ex, INMETRO Ex, NEPSI Ex/CCC, UK Ex	ATEX, IEC Ex, CSA C/US, JPN Ex, KC Ex, INMETRO Ex, NEPSI Ex/CCC, UK Ex
Safety approvals	Overfill protection WHG	Overfill protection WHG; SIL 2/ SIL 3
Design approvals	Inspection certificate 3.1, EN10204 Conformity to cGMP Declaration of Conformity ASME B31.3 AD2000 CRN approval	Inspection certificate 3.1, EN10204, CoC ASME BPE, Conformity to cGMP, EU Food Contact Material (EC) 1935/2004, US Food Contact Material FDA CFR 21, CN Food Contact Material GB 4806, Declaration of Conformity ASME B31.3, AD2000, CRN approval
Hygienic approvals	3-A EHEDG CoC-ASME BPE EU Food Contact Material (EC) 1935/2004 US Food Contact Material FDA CFR 21 CN Food Contact Material GB 4806	3-A, EHEDG, CoC-ASME BPE
Options	Customized settings Weld-in adapter	LED module, Bluetooth module, Graphic touch display, Customized settings, Weld-in adapter
Components	RN22 RN42 SFP20	FTL325P Interface PFM FTL325N Interface NAMUR FML621 Density controller

Liquiphant T		
	FTL31	FTL33
		
Application	Liquids	Liquids
Measurement type	Point level, liquids	Point level, liquids
Sensor	Frequency shift tuning fork	Frequency shift tuning fork
Output	AC/DC DC-PNP	AC/DC DC-PNP
Power supply	20 to 253 V AC/ DC, 2-wire, 10 to 35 V DC- PNP, 3-wire	20 to 253 V AC/ DC, 2-wire, 10 to 35 V DC- PNP, 3-wire
Ambient temperature	-40 to 158 °F	-40 to 158 °F
Process temperature	-40 to 302 °F	-40 to 302 °F
Process pressure	580 psi	580 psi
Process connections	Threads: G½, G¾, G1, MNPT½, MNPT¾, MNPT1, R¾, R1	Threads: Tri- Clamp 1"-2", Flush mount, G½, G¾, G1, MNPT½, MNPT¾, MNPT1, R½, R¾, R1
Housing		
Maximum viscosity	1 to 10,000 mPas	1 to 10,000 mPas
Function indication	Red and green 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

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

Liquiphant FailSafe			
	FTL80	FTL81	FTL85
			
Measuring Principle	Vibration Liquids	Vibration Liquids	Vibration Liquids
Characteristic / Application	Compact point level switch for MIN and MAX safety applications 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	-58 °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

	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 +302 °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"	≤ 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

Level Limit Switch/Power supply

	Nivotester	
	FTL325P (intrinsically safe signal circuit, Liquiphant/Soliphant®) 	FTL325N (one and three channel amplifier for NAMUR) 
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

Conductivity

Liquipoint		
	FTW23 	FTW33 
Measuring Principle	Capacitance	Conductive
Characteristic / Application	For use in storage tanks, mixing vessels and pipes. For water based liquids or media with dielectric constant >20	Compact point level switch for use in pipes and in storage, mixing and process vessels with or without an agitator, active buildup compensation, flush mounting
Supply / Communication	10 to 30 V DC	10 to 30 V DC
Ambient temperature	-40 to 158 °F (-40 to 70 °C)	-40 to 158 °F (-40 to 70 °C)
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
Process pressure absolute / max. overpressure limit	Vacuum: 232 psi	0 to 362.5 psi abs / 0 to 25 bar abs
Min. conductivity of medium	>20 DC	1µS/cm
Main wetted parts	Sensor: 316L Sensor isolation: PEEK	Sensor: 316L Sensor isolation: PEEK
Process connection	Thread G1, G1/2, G3/4, M24	Thread G1, G1/2, G3/4, M24
Process connection hygienic	Weld-in adapters, Tri-Clamp, Varivent	Clamp ISO 2852 1 to 1 1/2", 2", DIN11851 Pipe union
Output	DC PNP, IO-Link	DC PNP, IO-Link
Approvals/certificates	EHEDG, 3A, CSA C/US General Purpose	EHEDG, 3A
Specialties	CIP and SIP suitable	CIP and SIP suitable
Application limits	Buildup	Conductive foam is recognized as a liquid
Instrumentation	Compact	Compact
Electronic insert	DC/PNP	DC PNP

Liquipoint T	
	FTW31  FTW32 
Application	Liquids
Measurement type	Multiple point level
Output	AC/DC, relay DC-PNP NAMUR
Measured detection range	FTW31 rod: 4" to 158" FTW32 cable: 10" to 590"
Power supply	20 to 253 VAC/20 to 55 VDC 10.8 to 45 VDC (PNP) NAMUR requires separate power, e.g. FTW325
Ambient temperature	-40 to +160 °F NAMUR, -40 to +140 °F
Process temperature	-40 to +212 °F
Process pressure	-14.5 to 145 psi
Process connection	Threaded: 1-1/2" NPT
Wetted material	Rod probes: 316L SS, PP insulation Cable probes: 316Ti SS, FEP insulation
Function indication	Red, yellow, green LEDs
Housing	Compact: PBT Remote: housing PPS; cover PBT
Approvals/certificates	CE

Capacitance

	Minicap		Solicap® M	Solicap S
	FTC260 (compact version) 	FTC262 (cable version) 	FTI55 / FTI56 (limit detection switch) 	FTI77 (limit detection switch) 
Application	Bulk solids, liquids	Bulk solids	Bulk solids	Bulk solids / high temperature
Measurement type	Point level	Point level	Point level	Point level
Output	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	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	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	-40 to +176 °F	-40 to +176 °F	-58 to +158 °F	-58 to +158 °F
Process temperature	-40 to +266 °F	-40 to +176 °F	-58 to +356 °F	-58 to +752 °F
Process pressure	-14.5 to 360 psi	-14.5 to 90 psi	-14.5 to 360 psi	-14.5 to 145 psi
Process connections	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	1.2"	1.2"	N/A	N/A
Function indication	Red and green LEDs	Red and green LEDs	Red, green and yellow LEDs	Red, green and yellow LEDs
Wetted material	Probe: Polyphenylene sulphide (FDA listed material)	Cable: steel coated with high density PE Probe: Polyphenylene sulphide (FDA listed material)	Rod, partially insulated: PPS, 316L SS Rod: fully insulated: PE, galv. steel Cable, partially insulated: PTFE, 316L SS Cable, fully insulated: PA, valv. steel	Sword, process connection, inactive length, tensioning weight for cable probe: 316L SS or steel Cable: zinc coated steel or 316L SS
Housing	Polyester	Polyester	Polyester, Aluminum Dual-compartment aluminum, 316 SS	Polyester, Aluminum Dual-compartment aluminum, 316 SS
Approvals/certificates	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® M		
	FTI51 / FTI52 (limit detection switch)	FMI51 / FMI52 (continuous level detection)
		
Application	Liquids	Liquids
Measurement type	Point level	Continuous level
Output	AC 2-wire (FEI51) DC-PNP (FEI52) 3-12 VDC (FEI53) AC/DC, relay output (FEI54) 8/16 mA (FEI55) PFM (FEI57S)	4 to 20 mA HART™ (FEI50H) PFM (FEI57C)
Measured detection range	Rod probe: up to 13 ft / Cable probe: up to 33 ft	Rod probe: up to 13 ft / Cable probe: up to 72 ft
Power supply	FEI51: 19 to 253 VAC FEI52: 10 to 55 VDC FEI53: 14.5 VDC FEI54: 19 to 253 VAC, 50/60 Hz or 19 to 55 VDC FEI55: 11 to 36 VDC FEI57S: 9.5 to 12.5 VDC	FEI50H: 12 to 36 VDC FEI57C: 14.8 VDC
Ambient temperature	-58 to +158 °F	-58 to +158 °F
Process temperature	-112 to +392 °F	-112 to +392 °F
Process pressure	-14.5 to 1450 psi	-14.5 to 1450 psi
Process connections	Threaded: 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"
Maximum particle size	N/A	N/A
Function indication	Red, green, yellow LEDs	Red and green LED, HART, local display
Wetted material	Rod: 316L SS; insulated rod, PFA or PTFE coated 316L SS Cable: 316 SS; insulated cable, PFA or FEP coated 316 SS	Rod: 316L SS; insulated rod, PFA or PTFE coated 316L SS Cable: 316 SS; insulated cable, PFA or FEP coated 316 SS
Housing	Polyester, Aluminum, Dual-compartment aluminum, 316 SS	Polyester, Aluminum, Dual-compartment aluminum, 316 SS
Approvals/certificates	CE, combination FM/CSA, SIL2	CE, combination FM/CSA, SIL2

Liquicap T	
	FMI21
	
Application	Liquids
Measurement type	Capacitance, continuous
Output	4 to 20 mA 0 to 100%
Measured detection range	6" to 98"
Power supply	10 to 30 VDC
Ambient temperature	-40 to +160 °F
Process temperature	-40 to +212 °F
Process pressure	-14.5 to 145 psi
Process connections	Threaded: 1-1/2" NPT, PPS
Wetted material	Rod probes: 316L SS, optional carbon fiber (CPC) Probe insulation: PP
Function indication	Red and green LEDs, optional display
Housing	PBT-FT Cover PBT Cover with sight glass, PA
Approvals/certificates	CE

Transmitter/Limit Switch

Nivotester		
	FTC325 (intrinsically safe signal circuit)	FTW325 (intrinsically safe signal circuit)
		
Application	Liquids, solids	Liquids
Measurement type	Capacitance, point level	Conductivity, point level
Output	One SPDT, one SPST	Two relays, SPDT
Input	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
Ambient temperature	-4 to +120 °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 (3-wire, non-hazardous)	CE, FM, CSA, NAMUR

Radar

Micropilot®				
	FMR50	FMR51	FMR52	FMR53
				
Application	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, 130 ft enhanced dynamics	131 ft, 230 ft enhanced dynamics	131 ft, 197 ft enhanced dynamics	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"	PTFE 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) SmartBlue (app) via Bluetooth wireless technology	HART, Profibus, FOUNDATION Fieldbus, Display (with three buttons) SmartBlue (app) via Bluetooth wireless technology	HART, Profibus, FOUNDATION Fieldbus, Display (with three buttons) SmartBlue (app) via Bluetooth wireless technology	HART, Profibus, FOUNDATION Fieldbus, Display (with three buttons) SmartBlue (app) via Bluetooth wireless technology
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	FWR30
				
Application	Liquids	Bulk solids	Bulk solids	Liquids
Measurement type	Radar, non contact, continuous	Radar, non contact, continuous	Radar, non contact, continuous	Level radar
Max measured range	66 ft	98 ft	230 ft	49 ft
Output	4 to 20mA HART, Profibus, FOUNDATION Fieldbus	4 to 20mA HART, Profibus, FOUNDATION Fieldbus	4 to 20mA HART, Profibus, FOUNDATION Fieldbus	SIM Card (5G connectivity)
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	Wireless with battery, Mobile connectivity with NB-IoT, LTE-M or 2G (fallback)
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	-20 °C...+60 °C (-4 °F...+140 °F)
Process connections	Flange(3" to 12")	Flange 3" to 6", Mounting Bracket	MNPT1-1/2, Flange 3" and 4", UNI 8" and 10"	Thread ASME MNPT 1-1/2, 316L, EPDM pressure max 4 bar
Wetted material	316L	PP, UP	316L, PTFE, PEEK, Polyamid	Housing: plastic PBT/ PC
Operation	HART, Profibus, FOUNDATION Fieldbus, Display (with three buttons) SmartBlue (app) via Bluetooth wireless technology	HART, Profibus, FOUNDATION Fieldbus, Display (with three buttons) SmartBlue (app) via Bluetooth wireless technology	HART, Profibus, FOUNDATION Fieldbus, Display (with three buttons) SmartBlue (app) via Bluetooth wireless technology	Commissioning and operation via digital services like "Netilion Value" or "SupplyCare Hosting"
Housing	316L, Dual compartment Aluminum, Dual compartment	PTB Plastic, Dual compartment Aluminum, Dual compartment	316L, Dual compartment Aluminum, Dual compartment	PTB Plastic
Approvals / certificates	ATEX, FM, CSA, CE, SIL	ATEX, FM, CSA, CE, SIL	ATEX, FM, CSA, CE, SIL	

Micropilot					
	FMR60B 	FMR62B 	FMR63B 	FMR66B 	FMR67B 
Application	Liquids	Liquids	Liquids	Bulk Solids	Bulk Solids
Measurement type	Radar, non-contact, continuous				
Max measured range	164 ft.	262 ft.	410 ft.	164 ft.	410 ft.
Output	4 to 20mA, HART, PROFINET - APL				
Antenna type	PVDF, PTFE and PEEK	PTFE drip off, PTFE flush and 316L horn	PEEK, PTFE	PVDF, PTFE	PTFE
Power supply	10.5-35 VDC				
Ambient temperature	-40 to +185 °F				
Process temperature	-40 to +392 °F	-321 to +842 °F	-40 to +392 °F	-40 to +266 °F	-40 to +842 °F
Process connections	Thread MNPT 3/4", UNI flange: 3", 4" and 6"	ASME B16.5 flanges: 2" thru 8" class 150, 300, 316L and PTFE coated 316L, Tri-Clamp	Tri-clamp, M24 with process adapter, DIN 11851	Tri-clamp, M24 with process adapter, DIN 11851	Tri-clamp, M24 with process adapter, DIN 11851
Wetted material	316L SS, PVDF, PTFE or PEEK	316L SS, PTFE	PEEK, PTFE	PVDF, PTFE	316L, A1203 (ceramic) or graphite, PTFE
Operation	HART, Display (with three buttons), PROFINET - APL SmartBlue (app) via Bluetooth wireless technology	HART, Display (with three buttons), PROFINET - APL SmartBlue (app) via Bluetooth wireless technology	HART, Display (with three buttons), PROFINET - APL SmartBlue (app) via Bluetooth wireless technology	HART, Display (with three buttons), PROFINET - APL SmartBlue (app) via Bluetooth wireless technology	HART, Display (with three buttons), PROFINET - APL SmartBlue (app) via Bluetooth wireless technology
Housing	Plastic, Aluminum (coated), Single or Dual Compartment	Plastic and Aluminum	Plastic, Aluminum, 316L Hygienic	Plastic, Aluminum, 316L	Plastic, Aluminum, 316L
Approvals /certificates	ATEX, IEC, FM, CSA, CE, SIL	ATEX, CSA, CE, SIL	ATEX, CSA, CE, SIL	ATEX, CSA, CE, SIL	ATEX, CSA, CE, SIL

Micropilot				
	FMR43 	FMR30B 	FMR20B 	FMR10B 
Application	Hygienic processes	Basic applications, liquids and solids	Basic applications, liquids and solids	Basic applications, liquids and solids
Measuring principle	Level radar	Level radar	Level radar	Level radar
Characteristic / Application	Compact device for continuous non-contact level measurement with hygienic requirements (3A, EHEDG, ASME BPE, USP Class VI)	Water & Wastewater and Utility applications in all industries Storage tanks	Water & Wastewater and Utility applications in all industries Storage tanks	Water & Wastewater and Utility applications in all industries Storage tanks
Specialities	Heartbeat Technology, SmartBlue app, 180 GHz for very small process connections and narrow beam angles	Bluetooth® commissioning Operation and maintenance SmartBlue App, Heartbeat Verification	Bluetooth® commissioning Operation and maintenance SmartBlue App, Heartbeat Verification	Bluetooth® commissioning Operation and maintenance SmartBlue App, Heartbeat Verification
Supply / Communication	2-wire, HART, IO-Link, Bluetooth®	2-wire (HART, 4...20 mA), Bluetooth® and App (optional)	2-wire (HART, 4...20 mA), Bluetooth® and App (optional)	2-wire (HART, 4...20 mA), Bluetooth® and App (optional)
Frequency	80 GHz 180 GHz	W-Band (~80 Ghz)	W-Band (~80 Ghz)	W-Band (~80 Ghz)
Accuracy	+/- 1 mm (0.04 in)	+/- 2mm (0.08")	+/- 2mm (0.08")	+/- 5mm (0.2")
Ambient temperature	-40 °C ... +80 °C (-40 °F ... +176 °F)	-40...+80 °C (-40...+176 °F)	-40...+80 °C (-40...+176 °F)	-40...+60 °C (-40...+140 °F)
Process temperature	-40 to +150 °C (-40 to +302 °F)	-40...+80 °C (-40...+176 °F)	-40...+80 °C (-40...+176 °F)	-40...+60 °C (-40...+140 °F)
Process pressure / max. overpressure limit	-1 to +20 bar (-14.5 to +290 psi)	-1...3 bar (-14,5...43 psi)	-1...3 bar (-14,5...43 psi)	-1...3 bar (-14,5...43 psi)
Main wetted parts	PEEK, PTFE316L (for threaded connections)	PVDF, PBT/PC	PVDF, PBT/PC	PVDF, PBT/PC
Process connection	Thread ASME B1.20.1, NPT Thread ISO228, G	Thread: G1-1/2", NPT1-1/2" Flange: UNI flange 2", 3", 4", UNI slip on flange 3", 4", 6"	Thread: G1", NPT1", G1-1/2", NPT1-1/2" Flange: UNI flange 2", 3", 4", UNI slip on flange 3", 4", 6"	Thread: G1", NPT1", G1-1/2", NPT1-1/2"
Process connection hygienic	NEUMO BioControl Clamp/Tri-Clamp Thread metric (DIN13)			
Max. measurement distance	15 m (49 ft)	30m (98.4 ft)	30m (98.4 ft)	10 m (32.8 ft)
Communication	HART, IO-Link, Bluetooth® wireless technology and app (optional)	4...20 mA HART Bluetooth® wireless technology	4...20 mA HART Bluetooth® wireless technology	4...20 mA HART Bluetooth® wireless technology
Certificates / Approvals	ATEX, CSA C/US, EAC Ex, JPN Ex, KC Ex, INMETRO Ex, NEPSI Ex, UK Ex	ATEX, C/US, EAC Ex, JPN Ex, KC Ex, INMETRO Ex, NEPSI Ex, UK Ex	ATEX, C/US, EAC Ex, JPN Ex, KC Ex, INMETRO Ex, NEPSI Ex, UK Ex	

Tank Gauging

Micropilot S High Accuracy				
	FMR532	FMR540	NMR81	NMR84
				
Application	Liquids, custody transfer	Liquids, custody transfer	Liquids, custody transfer	Liquids, custody transfer
Measurement type	Radar, non-contact, continuous	Radar, non-contact, continuous	Radar, non-contact	Radar, non-contact
Max measured range	125 ft	Horn: 98 ft Parabolic: 131 ft	230 ft	131 ft
Output	4 to 20 mA, HART	4 to 20 mA, HART	4 to 20 mA, HART, Modbus RS485, V1	4 to 20 mA, HART, Modbus RS485, V1
Antenna type	Planar: 6", 8", 10" 12"	Horn: 4" Parabolic: 8", 10"	Drip off, tear drop	Drip-off, planar
Power supply	16 to 32 VDC	16 to 36 VDC	85 to 264VAC, 52- 75VAC or 19-64VDC	85 to 264VAC, 52- 75VAC or 19-64VDC
Ambient temperature	-40 to +176 °F	-40 to +176 °F	-40 to +140 °F	-40 to +140 °F
Process temperature	-40 to +302 °F	-40 to +392 °F	-40 to +392 °F	-40 to +392 °F
Process pressure	14.5 to 362 psi	Horn: -14.5 to 232 psi Parabolic: -14.5 to 87 psi	232 psi	362 psi
Process connections	6" to 12" ANSI flange 6" to 12" Uniflange	4" or 6" ANSI flange 6", 8" or 10" Uniflange	2", 3", 4" flange	4" - 12" flange
Wetted material	HNBR, 316L SS	Horn: PEEK, 316L SS Parabolic: PTFE, 316L SS	316SS, PEEK	316SS PEEK
Operation	HART, VU331 display module, FieldCare software	HART, VU331 display module, FieldCare software	HART, display module, FieldCare software	HART, display module, FieldCare software
Housing	Aluminum with separate connection compartment	Aluminum with separate connection compartment	Aluminum or 316L SS	Aluminum or 316L SS
Approvals / certificates	CE, FM, CSA, Nmi, PTB			

Proservo			
	NMS80	NMS81	NMS83
			
Application	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 264VAC, 52-75VAC or 19-64VDC	85 to 264VAC, 52-75VAC or 19-64VDC	85 to 264VAC, 52-75VAC or 19-64VDC
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 264VAC, 52-75VAC or 19-64VDC
Ambient temperature	-40 to +140 °F
Operation	HART, display module, FieldCare software
Housing	Aluminum, 316L SS
Approvals / certificates	CE, FM, CSA, Nmi, PTB

See our tank gauging temperature offering in the temperature section

Guided radar

Levelflex (for liquids)					
	FMP50 (Rod/cable probe)	FMP51 / 52 / 54			FMP53 (Rod probe)
					
		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	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
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	-40 to +176 °F With display: -4 to +158 °F	-40 to +176 °F With display: -4 to +158 °F	-40 to +176 °F With display: -4 to +158 °F	-40 to +176 °F With display: -4 to +158 °F
Process temperature	-4 to +176 °F	-50 to +392 °F depending on O-ring material	-50 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	¾" NPT	¾", 1½" NPT Flange, 1½" 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 SmartBlue (app) via <i>Bluetooth</i> wireless technology	4-line LCD with 3 push- buttons, HART, Profibus PA SmartBlue (app) via <i>Bluetooth</i> wireless technology	4-line LCD with 3 push- buttons, HART, Profibus PA SmartBlue (app) via <i>Bluetooth</i> wireless technology	4-line LCD with 3 push- buttons, HART, Profibus PA SmartBlue (app) via <i>Bluetooth</i> wireless technology	4-line LCD with 3 push-buttons, HART, Profibus PA SmartBlue (app) via <i>Bluetooth</i> wireless technology
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	
	FMP55 (Rod/cable, coax)
	
Application	Liquids, level and interface
Measurement type	Radar and capacitance, continuous
Measured range	Liquids: 33 ft Max. rod length, 13 ft Max. cable length, 33 ft Max. coax length, 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
Ambient temperature	-40 to +176 °F
Process temperature	-58 to +392 °F
Process pressure	-14.5 to 580 psi
Process connections	1½" to 6", 150 lb ANSI RF flange, PTFE coated 1" to 4" 300 lb ANSI RF flange, PTFE coated
Wetted material	316L, SS
Operation	4-line LCD with 3 push-buttons, HART, Profibus PA Remote operation via HART, FieldCare SmartBlue (app) via <i>Bluetooth</i> wireless technology
Housing	PTB plastic, dual compartment; Aluminum, dual compartment; 316L SS, dual compartment
Approvals/ certificates	CE, FM, CSA, SIL 3

Levelflex (for solids)		
	FMP56 (cable)	FMP57 (rod, cable)
		
Application	Solids, level	Solids, level
Measurement type	Radar, continuous	
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	
Power supply	HART 2-wire: 11.5 to 35 VDC; Profibus 2-wire: 9 to 32 VDC HART 4-wire: 90 to 253 VAC, 10.4 to 48 VDC	
Ambient temperature	-40 to +176 °F; With display: -4 to +158 °F	
Process temperature	-22 to +248 °F, with FKM O-ring -40 to +248 °F, with EPDM O-ring	-22 to +302 °F, with FKM O-ring -40 to +248 °F, with EPDM O-ring 23 to 365 °F, with FFKM O-ring
Process pressure	-14.5 to 232 psi	
Process connections	¾" NPT	1½" NPT Flange, 1½" to 8" (150 lb ANSI)
Wetted material	316L SS	
Operation	4-line LCD with 3 pushbuttons, HART, Profibus PA SmartBlue (app) via <i>Bluetooth</i> wireless technology	
Housing	PTB plastic, dual compartment; Aluminum, dual compartment; 316L SS, dual compartment	
Approvals/ certificates	CE, FM, CSA, SIL 3	

Microwave barrier

Soliwave M FQR56 / FDR56		
	FQR56 Emitter	FDR56 Receiver
		
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 VDC/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

Solimotion® Flow Indicator	
	FTR20
	
Application	Flow indicator, bulk solids
Measurement type	Microwave barrier
Output	Relay SPST Analog 4 to 20 mA Solid State relay
Measured detection range	65 ft (20 m)
Power supply	85 - 253 VAC or 20 - 60 VDC Solid State 30 VAC or 30 VDC
Ambient temperature	-40 to +158 °F
Process temperature	-40 to +158 °F
Process pressure	7.2 to 98.6 psia
Process connections	Thread R 1½" (EN 10226) NPT 1½" (ANSI/ASME B1.20.1)
Housing	Polyester or Stainless Steel
Approvals/Certificates	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 44
				
Application	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
Maximum measured range	Solids: 6 ft Liquids: 16 ft	Solids: 12 ft Liquids: 26 ft	Solids: 16 ft Liquids: 33 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
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 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
Process temperature	-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
Grain size	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" or 6" universal flange, 8" ANSI FAU 20 mounting bracket
Wetted material	PVDF	PVDF	PVDF	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
Housing	Aluminum, Aluminum with separate connection compartment	Aluminum, Aluminum with separate connection compartment	Aluminum, Aluminum with separate connection compartment	Aluminum, Aluminum with separate connection compartment
Approvals / certificates	CE, FM, CSA	CE, FM, CSA	CE, FM, CSA	CE, FM, CSA

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

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

Prosonic S Sensors (for Prosonic S Transmitter), continued		
	FDU 93	FDU 95
		
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 10.5 to 32 VDC
Ambient temperature	-40 to +140°F	-40 to +140°F
Mounting	Wall mount field enclosure, panel mount, 19" rack mount	Wall mount field enclosure, panel mount, 19" rack mount
Housing	Field housing, PC; DIN rail housing, PBT	Field housing, PC; DIN rail housing, PBT
Operation	HART, Profibus-DP 6-line plain text LCD, 3 push button keys, indicator LEDs	Profibus-DP, or FieldCare programming 6-line plain text LCD, 3 push button keys, indicator LEDs
Approvals / certificates	CE, CSA general purpose	CE, CSA general purpose

Radiometric (Gamma)

Radiometric source container			
	FQG61/ FQG62 	FQG63 	FQG66 
Application	Solids, liquids, suspensions, sludge	Solids, Liquids, Suspensions, Sludge	Solids, liquids, suspensions, sludge
Measurement Type	Non-contact radioactive measurement for continuous level, limit or density	Non-contact radioactive measurement for continuous level, limit or density	Non-contact radioactive measurement for continuous level, limit or density
Radiation angle of emission	5°, 20° or 40°		20° or 40°
Width of emission channel	6°		6°
Shield Material	Lead	Lead	Lead
Source Material	¹³⁷ Cs or ⁶⁰ Co	¹³⁷ Cs or ⁶⁰ Co	¹³⁷ Cs or ⁶⁰ Co
Container Weight	FQG61 manual: 88 lbs pneumatic: 110 lbs FQG62 manual: 192 lbs pneumatic: 215 lbs	194 lbs	959 lbs
Ambient temperature	-40 °F to +392 °F -4 °F to +176 °F with pneumatic actuator	-62 °F to +392 °F	-67 °F to +212 °F
Mounting	Flange, 150 lb ANSI, 4" steel or stainless steel	Flange, 150 lb ANSI, 4"	Steel or stainless steel mounting plate
Housing	Steel, 304 SS, optional 316Ti SS	316L	316 SS
ON / OFF switching	Manual, padlock for security Pneumatic, padlock for security	Manual, padlock for security	Manual, padlock for security
Approvals / certificates	PTB report, CNSC, NRC	CE, FM, CSA, SIL2/3 (for level limit)	PTB report

Radiometric measurement transmitter	
	Gammapiot® FMG50 
Application	Solids, liquids, suspensions, sludge
Measurement type	Non-contact radioactive measurement for continuous level, limit, density, concentration
Measured range	Up to 9.8 ft with a single FMG50
Output	4 to 20 mA with HART
Power supply	14 to 35 VDC
Ambient temperature	-40 to +170 °F
Mounting	FHG51 mounting kit
Housing	Terminal head, aluminum or 316L SS; detector pipe, 316L SS
Weight	26 up to 62 lbs
Approvals / certificates	CE, CSA C/US, SIL 2/3

Radiometric measurement sensor and transmitter	
	Gammapiot M FTG20 
Application	Solids, Liquids, Suspensions, Sludge
Measurement 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)

Gamma modulator	
	FHG65 
Application	Suppresses background and extraneous radiation from the FMG60 Gammapiot
Power supply	18 to 36 VDC
Ambient temperature	-4 to +140 °F without water cooling, 32 to 248 °F with water cooling, at the terminal housing, maximum 167 °F
Mounting	Mounted to source container FQG61 or FQG62
Housing	304SS Water jacket, 316L SS and 304 SS
Weight	Without water jacket, 40 lbs With empty water jacket, 46 lbs With water jacket full, 55 lbs
Approvals / certificates	CE, FM, CSA

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

Flow Products available from Endress+Hauser

Electromagnetic

FLOW

Sensors		Diameter	Measuring range	Pressure	Temperature (process)	
Electromagnetic (EMF) Proline	Promag® D Water/Waste water		1 to 4"	0 to 33 ft/s 0 to 1,250 gal/min	Cl 150 PN 16 JIS 10K	0 to +140 °F
	Promag W Water/Waste water		1 to 120"	0 to 33 ft/s 0 to 900,690 gal/min	Cl 150 to 300, PN 6 to 40 JIS 10 to 20K, AWWA Class D AS Table E, PN 16	-4 to +194 °F
	Promag P Chemical/Process applications		½ to 24"	0 to 33 ft/s 0 to 42,267 gal/min	Cl 150 to 900, PN 10 to 160 JIS 10 to 20K AS Table E, PN 16	-40 to +356 °F
	Promag H Hygiene		½ to 6"	0 to 33 ft/s 0 to 2,650 gal/min	Cl 150, PN 16 to 40 JIS 10 to 20K	-4 to +302 °F
	Promag S Inhomogeneous fluids High solid content		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, W	Aluminum Hygienic SS	Four-line, backlit LCD/Touch control. Operation via web server, WLAN, 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 W	Compact/Remote Polycarbonate	Four-line, backlit LCD/Touch control Operation via FieldCare/DeviceCare or web-server	-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, polycarbonate, SS die-cast	Four-line, backlit LCD/Touch control. Operation via web server, WLAN, 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, H, P, W	Compact/Remote Aluminum, Compact/Remote Polycarbonate	2.4" LCD display with touch & auto rotate; Configuration and operation via SmartBlue App (Bluetooth) possible	-40 to +140 °F	DC 24 V AC 100 to 230 V AC 100 to 230 V/DC 24 V (non-hazardous area)
55 Special applications	Sensor S	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	Polycarbonate	4-line backlit display with touch control (operation from outside)	-40 to +140 °F	Internal: Batteries per DC 3.6 V External: AC 85 to 265 V (47 to 63 Hz) / DC 19 to 30 V

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%
PTFE liner Hard rubber liner Polyurethane liner	Lap-joint flange (DN ≤ 300): EN (DIN), ASME; Welded flange (DN ≥ 350): EN (DIN), ASME, 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 ETFE liner	Cl 150 to 900, PN 10 to 160 JIS 10 to 20K AS Table E, PN 16	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%

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: IP69 (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, PROFIBUS PA, Modbus RS485, FOUNDATION Fieldbus, EtherNet/IP, PROFINET, Profinet w/ Ethernet-APL/SPE	cCSAus, ATEX, NEPSI, INMETRO, EAC, etc.	Type 4X (IP66/67) Optional: IP69 (stainless steel)
Inputs/Outputs/ Power supply	Status input	0/4-20 mA, pulse/frequency/ switch output	HART, PROFIBUS PA, Modbus RS485, FOUNDATION Fieldbus, EtherNet/IP, PROFINET, Profinet w/ Ethernet-APL/SPE	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, PROFIBUS PA, Modbus RS485, FOUNDATION Fieldbus, EtherNet/IP, PROFINET, Profinet w/ Ethernet-APL/SPE	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, MODBUS RS485, Bluetooth	ATEX, IECEx, cCSAus, EAC, NEPSI, INMETRO, KC, JPN, UK Ex	IP66/67, Nema Type 4X
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/ Optional power supply	Status input	3x Pulse/switch output (passive)	Modbus RS485; LTE Cat M1; LTE Cat NB1; LTE Cat NB2; GPRS; EGPRS	CSA, GP	Compact version: IP66/67, type 4X enclosure and IP68, type 6P enclosure Sensor remote version (standard): IP66/67, type 4X enclosure

Coriolis

Sensors

			Diameter	Measuring range	Pressure	Temperature (process)
Coriolis Proline	Promass® F Universal flowmeter		3/8 to 10" HT: 1" to 10"	0 to 80,840 lb/min	CI 150 to 900 PN 16 to 100 JIS 10 to 63K	-58 to +302 °F Optional: -58 to +464 °F HT: -58 to +662 °F
	Promass A Low flow rates		1/4 to 1/8"	0 to 16.5 lb/min	CI 150 to 2500 PN 16 to 400 JIS 10 to 63K	-58 to +401 °F
	Promass I Hygiene, viscosity		3/8 to 3"	0 to 6,600 lb/min	CI 150 to 600 PN 40 to 100 JIS 10 to 63K	-58 to +302 °F
	Promass H Chemically aggressive fluids		3/8 to 2"	0 to 2,570 lb/min	CI 150 to 300 PN 40 JIS 10 to 20K	-58 to +401 °F (Zr) -58 to +302 °F (Ta)
	Promass E Basic applications		3/8 to 3"	0 to 6,600 lb/min	CI 150 to 600 PN 40 to 100 JIS 10 to 63K	-40 to +302 °F
	Promass S Food & Beverages		3/8 to 2"	0 to 2,570 lb/min	CI 150 to 300 PN 40 to 63 JIS 10 to 40K	-58 to +302 °F
	Promass K Basic Applications		3/8" to 3"	0 to 6615 lb/min	CI 150 to 300 PN 40 to 63 JIS 20 to 40K	-40 to +302 °F
	Promass P Life Sciences Industries (Pharma, biotechnology)		3/8 to 2"	0 to 2,570 lb/min	CI 150 to 300 PN 40 to 63 JIS 20 to 40K	-58 to +302 °F Optional: -58 to +401 °F
	Promass Q Challenging applications Fiscal metering		1 to 10"	0 to 88,183 lb/min	CI 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		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 10"	0 to 80,840 lb/min	CI 900, CI 1500 PN 160, PN 250	-40 to +401 °F
	Promass X High flow rates Oil and gas industry		12 to 16"	0 to 150,649 lb/min	CI 150 to 600 PN 10 to 100	-58 to +356 °F
	Cubemass C Low flow rates Compact design		1/4 to 1/4"	0 to 37 lb/min	2,320/5,800 psig	-58 to +401 °F
	Promass U 500		1/8"; 1/4"; 1/2"; 1"	0.01 to 78 l/min	87 psi (6 bar)	32 to 176 °F (0 to 80 °C)

Transmitters

	Combinable with	Housing	Display/Operation	Temperature (Ambient)	Power supply
100 Compact design	Sensor A, F, G, H, 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 A, 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 Hygienic SS	Four-line, backlit LCD/Touch control. Operation via web server, WLAN, 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, 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)
10 Basic	Sensor K	Compact Aluminum or Polycarbonate	2.4" LCD display with touch & auto rotate; Configuration and operation via SmartBlue App (Bluetooth) possible	-40 to +140 °F	DC 24 V AC 100 to 230 V AC 100 to 230 V / DC 24 V (non-hazardous area)

Materials (wetted parts)	Process connection	Protection	Approval/Certification	Measuring uncertainty ¹⁾ (best possible „accuracy“)
Mass Flow: Liquids: $\pm 0.10\%$ ($\pm 0.05\%$ PremiumCal) Gases: $\pm 0.25\%$	Flange: EN (DIN), ASME, JIS Tri-Clamp, couplings, lap joint flanges, VCO	NEMA 4X (IP67)	SIL 2/3; 3A, EHEDG; PED, CRN, AD 2000; marine approvals	Liquids: $\pm 0.10\%$ ($\pm 0.05\%$ PremiumCal) Gases: $\pm 0.25\%$
Measuring tube: 904L (1.4539), Alloy C-22 (2.4602); Connection: 904L (1.4539), Alloy C-22 (2.4602), 316/316L (1.4404)	Flange: EN (DIN), ASME, JIS Tri-Clamp, couplings, lap joint flanges, VCO	NEMA 4X (IP67)	SIL 2; 3A, EHEDG; PED, CRN	Mass Flow: Liquids: $\pm 0.10\%$ Gases: $\pm 0.35\%$
Measuring tube: Titanium grade 9 Connection: Titanium grade 2	Flange: EN (DIN), ASME, JIS Tri-Clamp, couplings	NEMA 4X (IP67)	SIL 2; 3A, EHEDG; PED, CRN	Liquids: $\pm 0.10\%$ Gases: $\pm 0.50\%$
Measuring tube: Zirconium 702/R 60702, Tantalum 2.5W; Connection: Tantalum, Zirconium 702/R 60702	Flange: EN (DIN), ASME, JIS	NEMA 4X (IP67)	SIL 2; PED, CRN	Liquids: $\pm 0.10\%$ Gases: $\pm 0.50\%$
Measuring tube: 904L (1.4539) Connection: 316/316L (1.4404)	Flange: EN (DIN), ASME, JIS Tri-Clamp, couplings, VCO	NEMA 4X (IP67)	SIL 2; 3A; PED, CRN; marine approvals	Liquids: $\pm 0.15\%$ (Optional: $\pm 0.10\%$) Gases: $\pm 0.5\%$
Measuring tube: 316L (1.4539) Connection: 316L (1.4435), 316/316L (1.4404)	Flange: EN (DIN), ASME, JIS Tri-Clamp, couplings	NEMA 4X (IP67)	SIL 2; 3A, EHEDG, FDA; PED, CRN	Liquids: $\pm 0.10\%$ Gases: $\pm 0.50\%$
Measuring tube: 1.4539 (904L) Connection: 1.4404 (316/316L)	Flange: EN (DIN), ASME, JIS Tri-Clamp, couplings, VCO	IP66/67, NEMA Type 4X	ATEX, IECEx, cCSAus, EAC, NEPSI, INMETRO, JPN, UK Ex, KC	Mass flow (liquid): $\pm 0.5\%$ (standard), $\pm 0.15\%$ (option) Mass flow (gas): $\pm 0.75\%$
Measuring tube: 316L (1.4435) Connection: 316L (1.4435), 316/316L (1.4404)	Flange: EN (DIN), ASME, JIS Hygienic clamps, couplings and flanges	NEMA 4X (IP67)	3A, EHEDG, FDA; ASME BPE, ISPE; SIL 2; PED, CRN	Liquids: $\pm 0.10\%$ Gases: $\pm 0.50\%$
Measuring tube: 316/316L (1.4404) Connection: 316/316L (1.4404)	Flange: ASME, JIS, EN (DIN)	Type 4X (IP66/67)	Custody transfer; SIL 2/3; PED, CRN; NACE MR0175/MR0103	Liquids: $\pm 0.1\%$ (Optional: $\pm 0.05\%$) Gases: $\pm 0.25\%$
Measuring tube: 316L (1.4435) Connection: 316/316L (1.4404)	Cylindrical internal thread BSPP (G)	Type 4X (IP66/67)	CRN	Liquid: $\pm 0.15\%$ Gas: $\pm 0.75\%$
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: $\pm 0.10\%$ ($\pm 0.05\%$ PremiumCal) Gases: $\pm 0.35\%$
Measuring tube: 316/316L (1.4404) Connection: 316/316L (1.4404)	Flange: EN (DIN), ASME	NEMA 4X (IP67)	Custody transfer; marine approvals; PED, CRN; Materials conforms to NORSOK M-630, NACE MR175/MR103	Liquids: $\pm 0.10\%$ ($\pm 0.05\%$ PremiumCal) Gases: $\pm 0.35\%$
Measuring tube: 904L (1.4539) Connection: 904L (1.4539), 316/316L (1.4404)	VCO	NEMA 4X (IP67)	SIL 2/3; CRN	Liquid: $\pm 0.10\%$ Gas: $\pm 0.50\%$
316L SS, Polycarbonate Makrolon	Barb fitting Panel mount or table top versions	IP 66/67 NEMA 4X	Cl. 1 Div. 2	0.5% of reading

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 (Modbus only)	NEMA 4X (IP66 and IP67) Optional: IP69 (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, PROFIBUS PA, Modbus RS485, FOUNDATION Fieldbus, EtherNet/IP, PROFINET, Profinet w/ Ethernet-APL/SPE	cCSAus, ATEX, NEPSI, INMETRO, EAC, etc.	IP66/67 (Type 4X) Optional: IP69 (stainless steel)
Inputs/Outputs/ Power supply	Status input, current input (4-20 mA); Option: freely configurable I/Os	Max. 4 outputs ("digital" version): 4-20 mA, pulse/frequency/switch output, relays; Optional: freely configurable I/Os	HART, PROFIBUS PA, Modbus RS485, FOUNDATION Fieldbus, EtherNet/IP, PROFINET, Profinet w/ Ethernet-APL/SPE	cCSAus, ATEX, NEPSI, INMETRO, EAC, etc.	IP66/67 (Type 4X) Optional: IP69 (stainless steel)
Inputs/Outputs/ Power supply	-	4-20 mA, pulse/switch output	HART, MODBUS RS485, Bluetooth	ATEX, IECEx, cCSAus, EAC, NEPSI, INMETRO, KC, JPN, UK Ex	IP66/67, Nema Type 4X

Ultrasonic

FLOW

Sensors			Diameter	Measuring range	Pressure	Temperature (process)
Ultrasonic Proline	Prosonic Flow W Clamp-on sensor Standard applications		½ to 160"	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 I Insertion sensor Standard applications		8 to 160"	0 to 50 ft/s	232 psi	-4 to +176 °F
	Prosonic Flow E Bidirectional measuring Utilities applications		2" to 6"	0.02 to 16.4 ft/s 0 to 1680 gal/min	CI 150 PN 40	17.8 to 302 °F
	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 Optional: 338 °F to 1022 °F
	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		2 to 8"	0 to 98 ft/s	159 psia	32 to 176 °F
	Prosonic Flow G Natural/process gas measurement		1 to 12"	1 to 130 ft/sec	CI 600	-60 to +320 °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 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
100 Bidirectional	Sensor E	Compact SS	Four-line backlit LCD available (no local operation) Operation via web browser and operating tools possible	-4 to +140 °F	DC 19.2 to 28.8 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
300 Compact universal use	Sensor G	Aluminum, SS die-cast	Four-line, backlit LCD/Touch control. Operation via web server, WLAN, and various operating tools (FieldCare, HART handheld, etc.)	-40 to +140 °F Optional: -58 to +140 °F	AC 100 to 230 V, DC 24V (Zone 1, Div. 1) AC/DC 24 to 230 V (Zone 2, Div. 2, Non-Ex)
400 Water and Wastewater	Sensor I, W	Aluminum, Polycarbonate	Four-line, backlit LCD/Touch control. Operation via web server, WLAN, and various operating tools (FieldCare, HART handheld, etc.)	-40 to +140 °F	AC 100 to 240 V / AC/DC 24 V
500 Compact universal use	Sensor G, P	Aluminum, polycarbonate	Four-line, backlit LCD/Touch control. Operation via web server, WLAN, and various operating tools (FieldCare, HART handheld, etc.)	-40 to +140 °F Optional: -58 to +140 °F	AC 100 to 230 V, DC 24V (Zone 1, Div. 1) AC/DC 24 to 230 V (Zone 2, Div. 2, Non-Ex)

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 conditions)
1.4301 (304), 1.4404 (316L)	Welding connector	IP66/67, NEMA Type 4X IP68, NEMA Type 6P (optional)	cCSAus	Liquids: <2.0% (onsite) ±0.5% (under reference conditions)
<ul style="list-style-type: none"> ■ Measuring tube: 1.4301 (F304) ■ Process Connection: 1.4571; 1.4404 (F316L); 1.0038 (S235JR); 1.4306 (F304L); 1.4307 (F304L); A105 	Flange: EN, ASME	NEMA 4X (IP66/67)	PED	±0.5% (under reference conditions)
1.4301 (304), 1.4404 (316L)	Welding connector	IP66/67, NEMA Type 4X IP68, NEMA Type 6P (optional)	cCSAus	Liquids: <2.0% (onsite) ±0.5% (under reference conditions)
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
Measuring tube: 1.4408/1.4409 (CF3M) Transducer: 1.4404 (316, 316L, Titan Grade 2	Flange: PN, ASME	NEMA IP66/67, type 4X enclosure	ATEX, IECEx, cCSAus, JPN, EAC, UK Ex	Volume flow: ±0.5 % o.r. for 3 to 40 m/s (9.84 to 131.23 ft/s) ±1.0 % o.r. for 0.3 to 3 m/s (0.98 to 9.84 ft/s)

Galvanic isolation	Inputs	Outputs	Communication	Ex approvals	Protection
Inputs/Outputs/ Power supply	-	0/4-20 mA, pulse/switch output	HART	FM, CSA Div. 2	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/ Power supply	-	4-20 mA HART, pulse/frequency/switch output (passive)	HART	-	NEMA 4X (IP66/67)
Inputs/Outputs	-	4-20 mA pulse frequency/ switch output	HART	ATEX, IECEx, cCSAus	NEMA 4X (IP66/67)
Inputs/Outputs/ Power supply	Status input, current input (4-20 mA); Option: freely configurable I/O's	4-20 mA, pulse/frequency/switch output, relays; Optional: freely configurable I/O's	HART, Modbus RS485	cCSAus, ATEX, NEPSI, INMETRO, EAC, etc.	IP66/67 (Type 4X)
Inputs/Outputs/ Power supply	Status input	4-20 mA (active) Pulse/frequency/switch output (passive)	HART	cCSAus Cl.I Div.2	IP66/67, NEMA Type 4X
Inputs/Outputs/ Power supply	Status input, current input (4-20 mA); Option: freely configurable I/O's	4-20 mA, pulse/frequency/switch output, relays; Optional: freely configurable I/O's	HART, Modbus RS485	cCSAus, ATEX, NEPSI, INMETRO, EAC, etc.	IP66/67 (Type 4X)

Sensors

			Diameter	Measuring range	Pressure	Temperature (process)
Vortex Proline	Prowirl® F Flanged version		½ to 12"	Liquid: 0.09 to 1,420 ft³/min Steam, gas: 1.18 to 18,932 ft³/min	Cl 150 to 600 PN 10 to 250 JIS 10 to 40K	-328 to +752 °F Optional: -328 to +842 °F
	Prowirl D Wafer version		½ to 6"	Liquid: 0.09 to 368 ft³/min Steam, gas: 1.18 to 4,910 ft³/min	Cl 150 to 300 PN 10 to 40 JIS 10 to 20K	-328 to +752 °F Optional: -328 to +842 °F
	Prowirl R For low flows		1 to 10"	Liquid: 0.15 to 321 ft³/min Steam, gas: 2.12 to 4,274 ft³/min	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		½ to 12"	Liquid: 0.09 to 321 ft³/min Steam, gas: 1.18 to 4,274 ft³/min	Cl 900 to 1500 PN 63 to 250 JIS 40K	-328 to +752 °F Optional: -328 to +842 °F

Transmitters

	Combinable with	Housing	Display/Operation	Temperature (Ambient)	Power supply
200 Two-wire	Sensor D, F, R, O	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

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

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, Profinet Ethernet-APL/SPE	ATEX, IECEx, cCSAus, NEPSI, IMMETRO, TIIS (in prep)	NEMA 4X (IP66/67)

Sensors

		Diameter	Measuring range	Pressure	Temperature (process)	
Thermal Proline	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
	t-mass B Insertion sensor Basic applications		3 to 60"	Gas and process condition dependent	-7.25 to 290 psig	-40 to +212 °F
	t-mass T Insertion sensor Liquid monitoring		1½ to 40"	1 to 62,200 gal/min	580 psig	-4 to +212 °F SIP: 266 °F
	t-mass F Flanged version High-End		1/2 to 4"	Gas and process condition dependent	CL 150 to 300 PN 16 to 40	-40 to +356 °F
	t-mass I Insertion sensor High-End		3 to 60"	Gas and process condition dependent	290 psig	-40 to +356 °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
300 Compact universal use	Sensor F, I	Aluminum	Four-line, backlit LCD/Touch control. Operation via web server, WLAN, and various operating tools (FieldCare, HART handheld, etc.)	-40 to +140 °F Optional: -58 to +140 °F	AC 100 to 230 V, DC 24V (Zone 1, Div. 1) AC/DC 24 to 230 V (Zone 2, Div. 2, Non-Ex)
500 Compact universal use	Sensor F, I	Aluminum, polycarbonate	Four-line, backlit LCD/Touch control. Operation via web server, WLAN, and various operating tools (FieldCare, HART handheld, etc.)	-40 to +140 °F Optional: -58 to +140 °F	AC 100 to 230 V, DC 24V (Zone 1, Div. 1) AC/DC 24 to 230 V (Zone 2, Div. 2, Non-Ex)

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.)
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.
316L (1.4404) Alloy C-22	Flange: EN (DIN), ASME, JIS	NEMA 4X/6P (IP67/IP68)	PED, NACE, degreased acc. To IEC/TR 60877 and BOC 50000810-4	Gases: ±1.0% o.r. (10 to 100% o.f.s.) ±0.10% o.f.s. (1 to 10% o.f.s.)
316L (1.4404) Alloy C-22	Thread: ¾" NPT, 1" NPT, G¾" G1"	NEMA 4X/6P (IP67/IP68)	PED, NACE, degreased acc. To IEC/TR 60877 and BOC 50000810-4	Gases: ±1.0% o.r. (10 to 100% o.f.s.) ±0.10% o.f.s. (1 to 10% o.f.s.)

Galvanic isolation	Inputs	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); Option: freely configurable I/O's	4-20 mA, pulse/frequency/switch output, relays; Optional: freely configurable I/O's	HART, Modbus RS485	cCSAus, ATEX, NEPSI, INMETRO, EAC, etc.	IP66/67 (Type 4X)
Inputs/Outputs/ Power supply	Status input, current input (4-20 mA); Option: freely configurable I/O's	4-20 mA, pulse/frequency/switch output, relays; Optional: freely configurable I/O's	HART, Modbus RS485	cCSAus, ATEX, NEPSI, INMETRO, EAC, etc.	IP66/67 (Type 4X)

Flow measurement OEM

FLOW

Sensors			Diameter	Measuring range	Pressure	Temperature (process)
EMF	Dosimag® Filling/bottling Conductive liquids		DN 4 (3/32"), 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", 1/2", 1"	0 to 660 lbs/min	580 psi	-40 to +257 °F
Coriolis	CNGmass Compressed Natural Gas Fueling		3/8", 1/2", 1"	0 to 330 lb/min	max. 5,080 psi	-58 to +257 °F
	CNGmass DCI Compressed Natural Gas Fueling		3/8", 1/2", 1"	0 to 330 lb/min	max. 5,080 psi	-58 to +302 °F
	LPGmass Liquified Petroleum Gas Fueling		3/8", 1/2", 1", 1 1/2"	0 to 1,650 lb/min	Cl 150 to 300 PN 40 JIS 10 to 63K	-40 to +257 °F
	LNGmass Liquified Natural Gas Fueling		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, IO Link	Modbus RS485, IO Link	-	NEMA 4X (IP67)
Inputs/Outputs/Power supply	-	Pulse, switch output	Modbus RS485, IO Link	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)

Flow monitoring

Sensors			Diameter	Measuring range	Pressure	Temperature (process)
EMF	Picomag Smart Conductive liquids		½ to 2"	up to 198 gal/min	232 psi	14 to 158 °F
	Magphant® Limit switch/Trend display Conductive liquids		½ to 78"	0 to 248,982 gal/min	232 psia	-4 to +248 °F
Thermal	Flowphant® DTT31 Standard applications Liquids		ANSI NPT ¼ and ½"	0.1 to 9.84 ft/sec Relative value between 0 to 100%	Up to 1,450 psi	-4 to +185 °F
	Flowphant DTT35 Hygienic applications Liquids		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. 1,450 psig all except conical metal (232 psig)	-4 to +185 °F

Transmitters	Housing	Display/Operation	Temperature (Ambient)	Power supply
Picomag Compact version	Compact SS	Integrated display, operation via SmartBlue app	14 to 140 °F	18 to 30V DC
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")
PEEK, AISI 316L, FKM	Standard: external NPT thread (G½", G¾", G1", G2") Optional: adapter sets for internal (G) and external (R, NPT) threads, Tri-Clamp, Victaulic	IP65/67	UL-listed (cUL _{US}) Drinking water approvals (in preparation)	±0.8%
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)

Inputs	Outputs	Communication	Ex approvals	Protection
Status	Current (4 to 20mA) Pulse Switch Voltage (2 to 10V)	IO-Link	-	IP 65/67
-	4-20 mA, relays	-	FM, CSA Div. 2	NEMA 4X (IP66)
-	1 × or 2 × PNP switch outputs Optional 1 × PNP switch outputs and 1 × 4-20 mA output (active)	Programmable via PC (ReadWin 2000 and FieldCare/ DeviceCare)	-	IP65
-	1 × or 2 × PNP switch outputs Optional 1 × PNP switch outputs and 1 × 4-20 mA output (active)	Programmable via PC (ReadWin 2000 and FieldCare/ DeviceCare)	-	IP65

Surface Acoustic Wave

Sensors			Diameter	Measuring range	Pressure	Temperature (process)
Teqwave	Teqwave H		3/8" to 1"	Concentration, density, sound velocity, temperature	Max 232 psi	32 to 212 °F
	Teqwave I		7" or 20"	Concentration, density, sound velocity, temperature	Max 232 psi	32 to 212 °F
	Teqwave F		1/4" to 1"	Concentration, density, sound velocity, temperature	Max 232 psi	32 to 212 °F
	Teqwave T		7"	Concentration, density, sound velocity, temperature	NA	32 to 212 °F

Sensor		Diameter	Measuring range	Pressure	Temperature (process)	Materials (wetted parts)
Teqwave MW 300/500		2" to 12"	0-50% total solids	232 psi (16 bar)	32 to 176 °F (0 to 80 °C)	CF3M SS; Ceramic; 316L

Transmitters

		Combinable with	Housing	Display/Operation	Temperature (Ambient)
Teqwave H Transmitter		Teqwave H	Anodized aluminum, Stainless steel 1.4301 (304)	3.5" TFT color touch screen or LED indication	32 to 122 °F
Teqwave Transmitter		Teqwave F/I	Anodized aluminum	3.5" TFT color touch screen or LED indication	32 to 122 °F
Teqwave Portable Transmitter		Teqwave T	ABS plastic	3.5" TFT display with 4 operating keys	32 to 122 °F

Materials (wetted parts)	Process connection	Protection	Approval/Certification	Measuring uncertainty ¹⁾ (best possible "accuracy")
1.4404 (F316L)	Tri-clamp	Sensor: IP68	3A, EHEDG	Density: $\pm 0.01\text{g/cm}^3$ Temperature: $\pm 0.5\text{K}$ Sound velocity: 2m/s
1.4404 (F316L)	Flange, threaded	IP68	-	Density: $\pm 0.01\text{g/cm}^3$ Temperature: $\pm 0.5\text{K}$ Sound velocity: 2m/s
1.4404 (F316L)	Flanged, threaded	IP68	-	Density: $\pm 0.01\text{g/cm}^3$ Temperature: $\pm 0.5\text{K}$ Sound velocity: 2m/s
Stainless steel, 1.4571 (V4A)	None	IP68	-	Density: $\pm 0.01\text{g/cm}^3$ Temperature: $\pm 0.5\text{K}$ Sound velocity: 2m/s

Process connection	Protection	Approval/Certification	Measuring uncertainty ¹⁾ (best possible "accuracy")	Operation	Housing
Wafer design	IP 66/67 NEMA 4X	Cl. 1 Div. 2	2"-3": 0.02% 4"-12": 0.01%	4-line backlit display with touch control web browser; WLAN	Aluminum, coated

Power supply	Outputs	Communication	Ex approvals	Protection
DC 24 V (18 to 35 V)	4 - 20 mA	Modbus TCP	Non-hazardous area	IP40
DC 24 V (18 to 35 V)	4 - 20 mA	Modbus TCP	Non-hazardous area	IP40
Lithium-ion battery (2300 mAh capacity)	none	USB	Non-hazardous area	IP65

Differential Pressure Flow Measurement

Flow measurement, Differential Pressure		
	Primary Element, Orifice plate	Primary Element, Pitot tube
		
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, Deltabar M PMO55	Deltabar S PMD75, Deltabar M PMO55
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 Fieldbus, 9 to 32 VDC	11.5 to 45 VDC; Profibus and FOUNDATION Fieldbus, 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

	Cerabar® T			
	PMC11/PMC21	PMP11	PMP21	PMP23
				
Application	Process pressure	Process Pressure	Process Pressure	Hygienic Pressure
Measuring range	PMC11: 6 to 600 psi (gauge/absolute) PMC21: 1.5 to 600 psi (gauge/absolute)	-15 to 600 psig	-15 to 6000 psig, 0 to 6000 psia	-15 to 600 psig, 0 to 600 psia
Pressure sensor	Ceramic	Metallic	Metallic	Metallic
Output	4 to 20 mA	4-20 mA, 0-10 VDC	4-20 mA	4-20 mA
Process temperature	-13 to 185 °F (PMC11) -13 to 212 °F (PMC21)	-13 to 185 °F (-25 to 85 °C)	-40 to 212 °F (-40 to 100 °C)	14 to 212 °F, -10 to 100 °C, (275 °F/135 °C for 1 hour)
Power supply	11 to 30 VDC	11-30 VDC	12-30 VDC	12-30 VDC
Process connections	Threaded	Threaded	Threaded	Mini-clamp, Tri-clamp, threaded
Approvals / certificates		CSA C/US/FM/ATEX Ex	CSA C/US/FM/ATEX Ex	CSA C/US/FM/ATEX/IEC Ex

	Ceraphant T		
	PTC31B	PTP31B	PTP33B
			
Application	Process pressure	Process pressure	Process pressure
Measuring range	1.5 to 600 psi (gauge/absolute)	6 to 6000 psi (gauge/absolute)	6 to 600 psi (gauge/absolute)
Pressure sensor	Ceramic	Metallic	Metallic
Output	One PNP switch output Two PNP switch outputs PNP switch output with 4 to 20 mA (active)	PNP switch + 4-20 mA, PNP switch, 2xPNP switch	PNP switch + 4-20 mA, PNP switch, 2xPNP switch
Process temperature	-13 to +212 °F	-40 to +212 °F	14 to 212 °F, 225 °F for 1 hour max
Power supply	12 to 30 VDC	12 to 30 VDC	12 to 30 VDC
Process connections	Threaded	Threaded	Threaded, Clamp, Tri-clamp, Varivent, universal adapter
Approvals / certificates		CSA C/US/CUS, DNVGL, ABS	CSA C/US/CUS, EHEDG, 3A

	Cerabar M	
	PMCS1 B	PMP51 B
		
Application	Process pressure, level (gauge and absolute)	Process pressure, level (gauge and absolute)
Measuring range	-15 to 600 psi	-15 to 6000 psi
Pressure sensor	Ceramic	Metallic with diaphragm seal
Output	4 to 20 mA / HART	4 to 20 mA / HART
Communication	Bluetooth	Bluetooth
Ambient temperature	-40 to +185 °F without display, -4 to +158 °F with display	-40 to +185 °F without display, -4 to +158 °F with display
Power supply	11.5 to 45 VDC, 11.5 to 30 VDC for intrinsically safe unit	11.5 to 45 VDC, 11.5 to 30 VDC for intrinsically safe unit
Process temperature	-40 to +212 °F -40 to +266 °F for hygienic process connections +302 °F for max. of 60 min (for hygienic)	-40 to +257 °F (internal diaphragms) -40 to +218 °F (flush-mounted diaphragms) -40 to +266 °F (hygienic connections max 302 °F for 30 min.) -94 to +752 °F depending on seal and fill oil
Process connections	Threaded, ANSI flange	Threaded, ANSI flange
Approvals / certificates	CSA C/US, NSF 61, 3A, SIL	CSA C/US, NSF 61, 3A, SIL

	Cerabar S	
	PMC71 B	PMP71 B
		
Application	Process pressure, level	Process pressure, level
Measuring range	-15 to 600 psi	-15 to 10,500 psi
Pressure sensor	Ceramic	Metallic with diaphragm seal
Output	4 to 20 mA / HART	4 to 20 mA / HART
Communication	Bluetooth, Heartbeat	Bluetooth, Heartbeat
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	10.5 to 45 VDC
Process connections	Threaded, ANSI flange	Threaded, ANSI flange
Approvals / certificates	SIL, CSA C/US, NSF 61	SIL, /CSA C/US, NSF 61

Cerabar		
	PMP43 	PMP50 
Application	Hygienic pressure transmitter	Pressure transmitter with metal membrane for measurement of liquids and gases
Range (adjustable)	400 mbar...100 bar (6 psi...1450 psi)	1 bar...400 bar (14.5 psi...5800 psi)
Pressure sensor	Absolute and gauge pressure	Absolute and gauge pressure
Output	04...20 mA 4...20 mA HART 4...20 mA IO-Link	4...20 mA HART
Ambient temperature	-40 °C...+85 °C (-40 °F...+185 °F)	-40 °C...+85 °C (-40 °F...+185 °F)
Process temperature	-40 °C...+130 °C (-40 °F...+266 °F) -20 °C...+200 °C (-4 °F...+392 °F)	Standard: -40 °C...+125 °C (-40 °F...+257 °F) Diaphragm seal: 70 °C...+400 °C (-94 °F...+752 °F)
Power supply	4...20mA HART 11,5...45V DC (Non Ex): Ex ia: 11,5...30V DC	Ex d, Ex e, non-Ex: 10,5...35V DC Ex i: 10,5...30V DC
Process connections	Thread: G1/2...G2, R1/2, MNPT3/4...MNPT2, FNPT1/2 Flange: DN25...DN80, NPS 1"...3"	Thread: G1/2, NPT1/2 Flange: DN25...DN80, NPS 1"...3"
Approvals/certificates	ATEX, FM, CSA, CSA C/US, IECEx, INMETRO, NEPSI, UK Ex	ATEX, FM, IECEx, JPN Ex, INMETRO, NEPSI

Differential

Deltabar							
	PMD55B 	PMD75B 	PMD78B 	FMD71 	FMD72 	FMD77 	FMD78 
Application	Differential pressure, level	Level	Differential pressure, level				
Range (adjustable)	30 mbar...40 bar (0.45 psi...600 psi)	10 mbar...250 bar (0.15 psi...3750 psi)	100 mbar...40 bar (1.5psi...600 psi)		12 inH ₂ O to 150 psi	40 inH ₂ O to 240 psi	40 inH ₂ O to 600 psi
Pressure sensor	Metallic			Ceramic	Metallic		Metallic
Output	4...20 mA HART PROFINET with Ethernet-APL Bluetooth® wireless technology and app (optional)	4...20 mA HART PROFINET with Ethernet-APL Bluetooth® wireless technology and app (optional)	4...20 mA HART PROFINET with Ethernet-APL Bluetooth® wireless technology and app (optional)	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 °C...+110 °C (-40 °F...+230 °F)	-40 °C...+110 °C (-40 °F...+230 °F)	-70 °C...+400 °C (-x °F...+752 °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	Ex d, Ex e, non-Ex: 10.5...35V DC Ex i: 10.5...30V DC	Ex d, Ex e, non-Ex: 10.5...35V DC Ex i: 10.5...30V DC	Ex d, Ex e, non-Ex: 10.5...35V DC Ex i: 10.5...30V DC	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	NPT1/4-18, RC1/4"	NPT1/4-18 RC1/4"	NPT1/4-18 RC1/4"	Threaded ANSI flange	Threaded ANSI flange	Threaded ANSI flange	Threaded ANSI flange Tri-Clamp Varivent
Approvals/certificates	ATEX, IEC Ex, CSA C/US, NEPSI	ATEX, CSA, IECEx, JPN Ex, INMETRO, NEPSI, UK Ex	ATEX, CSA, IECEx, JPN Ex, INMETRO, NEPSI, UK Ex	FM/CSA C/US	FM/CSA C/US	SIL, FM/CSA C/US	SIL, FM/CSA C/US, 3A

Hydrostatic

	Deltapilot® M			
	FMB50 	FMB51 	FMB52 	FMB53 
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 C/US, 3-A, NSF 61, SIL	FM, CSA C/US, NSF 61, SIL	FM, CSA C/US, NSF 61, SIL	FM, CSA C/US, NSF 61, SIL

	Deltapilot S	Waterpilot
	FMB70 	FMX21  A B C
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 O)
Pressure sensor	CONTITE	Ceramic
Output	4 to 20 mA / HART Profibus PA FOUNDATION Fieldbus	4 to 20 mA / HART
Process temperature	14 to 212 °F (up to 275 °F for 30 minutes)	14 to 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 C/US, 3-A, SIL, NSF 61	FM, CSA C/US, NSF61

FMB70 pressure transmitter
replaces DB50S transmitter

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

Temperature Products available from Endress+Hauser

iTEMP® Temperature Transmitters

www.us.endress.com/temperature

	Field mounted				Field housing	DIN rail	Head mounted
	TMT142B (Single input) 	TMT162 (Dual input, dual-compartment housing) 	TMT127* 	TMT128* 	TMT71 	TMT72 	TMT82 (dual input) 
RTD input	Pt100, Pt200, Pt500, Pt1000 Ni100, Ni500, Ni1000	Pt100, Pt500, Pt1000 Ni100, Ni500, Ni1000	Pt100	No	Pt50, Pt100, Pt200, Pt500, Pt1000, Ni100, Ni120, Cu50, Cu100	Pt50, Pt100, Pt200, Pt500, Pt1000, Ni100, Ni120, Cu50, Cu100	Pt50, Pt100, Pt200, Pt500, Pt1000, Ni100, Ni120, Cu50
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	No	J, K, N, R, S, T	A, B, C, D, E, K, L, N, R, S, T, U	A, B, C, D, E, K, L, N, R, S, T, U	B, C, D, R, S, E, J, K, L, N, T, U
Ohms input	10 to 2000 W	10 to 2000 Ω	No	No	10 to 2000 Ω	10 to 2000 Ω	10 to 400 Ω, or 10 to 2000 Ω
mV input	-20 to 100 mV	-20 to 100 mV	No	No	-20 to 100 mV	-20 to 100 mV	-20 to 100 mV
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	4 to 20 mA	4 to 20 mA 20 to 4 mA	HART, 4 to 20 mA 20 to 4 mA	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
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	Head 10 to 36 VDC DIN 11 to 36 VDC	Head 10 to 36 VDC DIN 11 to 36 VDC	11 to 42 VDC
Optional display	Yes	Yes	No	No	Yes	Yes	No
Approvals/ certificates	FM, CSA, CE, UL, ATEX	FM, CSA, SIL 2, UL, CE, ATEX	FM, CSA, UL, CE, ATEX	FM, CSA, UL, CE, ATEX	CSA, CE, ATEX, IEC, NEPSI	CSA, CE, ATEX, IEC, NEPSI	FM, CSA, UL, CE, ATEX, SIL 2/SIL 3 (according to IEC 61508:2010)

* Replaced by the TMT71/72/82 which have the DIN Rail option included

Head transmitters					
	TMT31 	TMT36 	TMT84 (dual input) 	TMT85 (dual input) 	TMT86 (dual input) 
RTD input	Pt100, Pt1000	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, Cu50, Cu100
TC input	No	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	A, B, E, J, K, N, R, S, T, C, D, L, U
Ohms input	No	No	10 to 400 Ω, or 10 to 2000 Ω	10 to 400 Ω, or 10 to 2000 Ω	10 to 400 ohms, 10 to 2850 ohms
mV input	No	No	-20 to 100 mV -5 to 30 mV	-20 to 100 mV	-20 to 100 mV
Output	4-20 mA/20-4 mA	IO-Link	Profibus PA	FOUNDATION™ Fieldbus	Ethernet-APL/ PROFINET
Ambient temperature	-40 to +85C (-40 to +185F)	-40 to +85 °C (-40 to +185 °F)	-40 to +185 °F	-40 to +185 °F	-40 to +85C (-40 to +185F)
Power supply	10 to 35 VDC	18 to 35 VDC	9 to 32 VDC	9 to 32 VDC	<15 VDC for APL, <30 VDC for SPE switch connection
Optional display	No	Yes	No	No	Yes
Approvals/certificates	ATEX, CSA	CSA General Purpose	FM, CSA, UL, CE, ATEX	FM, CSA, UL, CE, ATEX	ATEX, CSA, CE, NEPSI, 2-WISE

RTD temperature sensors		
	TH11	TH12
		
Application	Process industry	Process industry
Measurement probe	Pt100	Pt100
Measuring range	-58 to +392 °F / -328 to +1112 °F	-58 to +392 °F / -328 to +1112 °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
Output	Dependent on electronics, all iTEMP transmitters compatible	Dependent on electronics, all iTEMP transmitters compatible
Connection head	Aluminum, NEMA 4X Polypropylene, FDA, compliant, NEMA 4X	Aluminum, NEMA 4X Polypropylene, FDA, compliant, NEMA 4X
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
Minimum immersion	1", high temperature sensor 3/4", low temperature sensor	1-14", high temperature sensor 3/4", low temperature sensor
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
Approvals/certificates	Based on transmitter type used	Based on transmitter type used

	Ambient Temperature RTD Assembly	Surface Measurement RTD Assembly
		
Application	All Industries	Process Industry
Measurement Probe	Pt100	Pt100
Measuring range	-22 to 212 °F (-30 to 100 °C)	-4 to 356 °F (-20 to 180 °C)
Process Connection	N/A	Surface mount
Output	Dependent on electronics, iTEMP transmitter compatible	Pt100 (iTEMP transmitter compatible)
Connection Head	Aluminum, PCB	Optionally ordered separately for remote mount applications
Ambient Temperature	-22 to 212 °F (-30 to 100 °C) without transmitter, -4 to 176 °F (-20 to 80 °C) with transmitter	-4 to 392 °F (-20 to 200 °C) depending on configuration
Minimum immersion	N/A	N/A
Immersion length	N/A	up to 137 1/2" (3500 mm)
Approvals/certificates	SIL (transmitter only)	N/A

RTD temperature sensors in Thermowells			
	TH13	TH14	TH15
			
Application	Process industry	Process industry	Process industry
Measurement probe	Pt100	Pt100	Pt100
Measuring range	-58 to +392 °F / -328 to +1112 °F	-58 to +392 °F / -328 to +1112 °F	-58 to +392 °F / -328 to +1112 °F
Process connection	1/2" NPT, 316 SS 3/4" NPT, 316 SS 1" NPT, 316 SS 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)
Output	Dependent on electronics, all iTEMP transmitters compatible	Dependent on electronics, all iTEMP transmitters compatible	Dependent on electronics, all iTEMP transmitters compatible
Connection head	Aluminum, NEMA 4X Polypropylene, FDA, compliant, NEMA 4X	Aluminum, NEMA 4X Polypropylene, FDA, compliant, NEMA 4X	Aluminum, NEMA 4X Polypropylene, FDA, compliant, NEMA 4X
Ambient temperature	With head-mounted transmitter: -40 to +185 °F Without head-mounted transmitter: Aluminum, -40 to +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"
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
Approvals / certificates	Based on transmitter type used	Based on transmitter type used	Based on transmitter type used

RTD temperature sensors in Thermowells, Explosion Proof

	T13 	T14 	T15 
Application	Petrochemical, refineries	Petrochemical, refineries	Petrochemical, refineries
Measurement probe	Pt100	Pt100	Pt100
Measuring range	-58 to +392 °F / -328 to +1112 °F	-58 to +392 °F / -328 to +1112 °F	-58 to +392 °F / -328 to +1112 °F
Process connection	½" NPT, 316 SS ¾" NPT, 316 SS 1" NPT, 316 SS Socket weld, ¾", 1", 316LSS Weld-in, ¾", 1", 316L SS	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 316SS+ Nipple-Union-Nipple, 316 SS
Output	Dependent on electronics, iTEMP transmitters compatible	Dependent on electronics, iTEMP transmitters compatible	Dependent on electronics, iTEMP transmitters compatible
Connection head	Aluminum, NEMA 4X 316L SS, NEMA 4X	Aluminum, NEMA 4X 316L SS, NEMA 4X	Aluminum, NEMA 4X 316L SS, NEMA 4X
Ambient temperature	With head-mounted transmitter: -40 to +185 °F Without head-mounted transmitter: Aluminum or SS, -50 to +212 °F Field transmitter: With display, -40 to +158 °F Without, -40 to +185 °F	With head-mounted transmitter: -40 to +185 °F Without head-mounted transmitter: Aluminum or SS, -50 to +212 °F Field transmitter: With display, -40 to +158 °F Without, -40 to +185 °F	With head-mounted transmitter: -40 to +185 °F Without head-mounted transmitter: Aluminum or SS, -50 to +212 °F Field transmitter: With display, -40 to +158 °F Without, -40 to +185 °F
Minimum immersion	Tapered thermowell: 4½" Stepped thermowell: 2½" Straight thermowell: 4" Weld-in thermowell: 4½"	Tapered thermowell: 4½" Stepped thermowell: 2½" Straight thermowell: 4" Weld-in thermowell: 4½"	Without thermowell: High temperature, 1¼" Low temperature, ¾"
Immersion length	2½", 4½", 7½", 10½", 13½", 16½", 22½" ½" to 22½", specified in ½" increments	2", 4", 7", 10", 13", 16", 22" ½" to 22", specified in ½" increments	4", 6", 9", 12" 4" to 100", specified in ½" increments
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 connection	½" NPT, 316 SS 1/8" NPT compression 316 SS ¼" NPT compression 316 SS	1/8" NPT compression 316 SS ¼" NPT compression 316 SS	1/8" NPT compression 316 SS ¼" NPT compression 316 SS	½" NPT, 316 SS ¾" NPT, 316 SS 1" NPT, 316 SS Socket weld, ¾", 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 electronics, iTEMP transmitter compatible	Dependent on electronics, iTEMP transmitter compatible	Dependent on electronics, iTEMP transmitter compatible	Dependent on electronics, iTEMP transmitter compatible	Dependent on electronics, iTEMP transmitter compatible	Dependent on electronics, iTEMP transmitter compatible
Connection head	Aluminum and Polypropylene, NEMA 4X	Cable with connector	Cable with connector	Aluminum and Polypropylene, NEMA 4X	Aluminum and Polypropylene, NEMA 4X	Aluminum and Polypropylene, NEMA 4X
Ambient temperature	With head-mounted transmitter: -40 to +185 °F Without head-mounted transmitter: Aluminum -40 to +302 °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			
	T53	T54	T55
			
Application	Chemical, petrochemicals	Chemical, petrochemicals	Chemical, petrochemicals
Measurement probe	TC type: J, K, E, N, or T	TC type: J, K, E, N, or T	TC type: J, K, E, N, or T
Measuring range	-454 to +2500 °F	-454 to +2500 °F	-454 to +2500 °F
Process connection	½" NPT, 316 SS ¾" NPT, 316 SS 1" NPT, 316 SS Socket weld, ¾", 316 SS Weld-in, 1", 316 SS	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 electronics, iTEMP transmitter compatible	Dependent on electronics, iTEMP transmitter compatible	Dependent on electronics, iTEMP transmitter compatible
Connection head	Aluminum and 316L SS, NEMA 4X	Aluminum and 316L SS, NEMA 4X	Aluminum and 316L SS, NEMA 4X
Ambient temperature	With head-mounted transmitter: -40 to +185 °F Without head-mounted transmitter: Aluminum, SS -58 to +212 °F Field transmitter: -40 to +185 °F w/o display -40 to +158 °F w display	With head-mounted transmitter: -40 to +185 °F Without head-mounted transmitter: Aluminum, SS -58 to +212 °F Field transmitter: -40 to +185 °F w/o display -40 to +158 °F w display	With head-mounted transmitter: -40 to +185 °F Without head-mounted transmitter: Aluminum, SS -58 to +212 °F Field transmitter: -40 to +185 °F w/o display -40 to +158 °F w display
Minimum immersion	With thermowell: Tapered, 4½" Stepped, 2½" ¾" straight, 4" Weld-in, 4½"	With thermowell: Tapered, 4½" Stepped, 2½" ¾" straight, 4" Weld-in, 4½"	Without thermowell: 2½"
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
Approvals / certificates	FM, CSA	FM, CSA	FM, CSA

iTHERM® modular RTD thermometer		
	TM40x	TM41x
		
Application	Hygienic and aseptic	Hygienic and aseptic
Insert	Not replaceable	Replaceable
Sensor	Standard thin film 1x Pt100	Standard thin film 1x Pt100 1x Pt100 iTHERM QuickSens 1 x Pt100 iTHERM StrongSens 1x or 2x Pt100 wirewound
Measuring range	-58 to +392 °F	PT100: -328 to +1,112 °F StrongSens: -58 to +932 °F QuickSens: -58 to +392 °F
Process connection	Compression fitting, Tri-Clamp, Microclamp, Clamp connections acc. to ISO2852, Ingold, G3/4" Liquephant, G1" Liquephant, Varivent, SMS1147, Screwed pipe joint acc. to DIN 11851	Compression fitting, Weld-in adapter, Clamp connections acc. to ISO2852, Screwed pipe joint acc. to DIN 11851, Aseptic screwed pipe joint acc. to DIN 11864-1, Metallic sealing system, Thread acc. to ISO228 for Liquephant adapter, APV Inline, Varivent, Ingold, SMS1147, Neumo Biocontrol, T- and corner pieces
Output	4 to 20 mA, HART	4 to 20 mA, HART, PROFIBUS PA, FOUNDATION Fieldbus
Ambient temperature	-40 to +185 °F	With head xmitter: -40 to +185 °F With xmitter and display: -4 to +158 °F QuickNeck: -58 to +284 °F
Approvals / certificates	3-A, EHEDG, ASME BPE, FDA, TSE Certificate of Suitability	3-A, EHEDG, ASME BPE, FDA, TSE Certificate of Suitability, ATEX/IECEx

easytemp™ 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

iTHERM CompactLine	
	TM311
	
Application	Hygienic and general industry
Measurement probe	Pt100 (Class A)
Measuring range	-58-392F
Process Connection	compression fitting, thread, weld-in adapter, Tri-clamp, threaded pipe joint, aseptic threaded pipe joint, Varivent
Output	IO-Link, 4-20mA, switch or Pt100 4-wire
Power supply	10 to 30 VDC
Ambient temperature	-40 to 185F
Immersion length	1.5 to 24"
Approvals/certificates	3A, EHEDG, ASME BPE, FDA

iTHERM® MultiSens											
	Flex TMS01 		Flex TMS02 		Linear TMS11 	Linear TMS12 	Slim TMS21 	Bundle TMS31 		Customized engineered solution	
Type of thermowell	Direct contact	Individual	Direct contact	Individual	Primary	Primary	Annealed tube	Annealed tube with flexible part	Stainless steel flexible rope	PVC coated flexible hose	
Response time	■■■■■	■■■■■	■■■■■	■■■■■	■■■■■	■■■■■	■■■■■	■■■■■	■■■■■	■■■■■	
Diagnostics capabilities	-	-	Advanced	Advanced	Basic	Advanced	-	-	-	-	
Individually replaceable sensors	Yes	Yes	Yes, optional	Yes	Yes	Yes	-	-	-	-	
Layout / bendability	■■■■■	■■■■■	■■■■■	■■■■■	N.A.	N.A.	■■■■■	■■■■■	■■■■■	■■■■■	
Max. number of points	48	48	52	48	16	12	59	59	20	On request	
Profile	linear or 3D	linear or 3D	linear or 3D	linear or 3D	linear	linear	linear	linear	linear	linear	
Max. pressure in bar (psi)	100 (1,450)	100 (1,450)	200 (2,900)	200 (2,900)	240 (3,481)	240 (3,481)	90 (1,305)	90 (1,305)	40 (580)	40 (580)	
Oil & Gas application fit	■■■■■	■■■■■	■■■■■	■■■■■	■■■■■	■■■■■	■■■■■	■■■■■	■■■■■	Silos and storage tanks	
Chemical application fit	■■■■■	■■■■■	■■■■■	■■■■■	■■■■■	■■■■■	■■■■■	■■■■■	■■■■■		

	iTHERM ModuLine		iTHERM SurfaceLine
	TM152, Industrial modular thermometer  TM112, Industrial modular thermometer 	TM611, Surface thermometer 	
Application	Wide range of industries		Demanding, high measurement performance
Thermowell / protection tube	Barstock (drilled) or to be used with thermowell		Without (not intended to use with thermowell)
Max. immersion length on request	84"		-
Process connection	Male thread: G1/2", G3/4", NPT1/2", NPT3/4", NPT 1", NPT 1-1/4", NPT 1-1/2" Internal thread: NPT1/2" Flanges: ASME 1" 150 RF, ASME 1" 300 RF, ASME 1" 600 RF, ASME 1" 900/1500 RF, ASME 1 1/2" 150 RF, ASME 1 1/2" 300 RF, ASME 1 1/2" 600 RF, ASME 1 1/2" 900/1500 RF, ASME 2" 150 RF, ASME 2" 300 RF, ASME 2" 600 RF For welding: NPS 3/4" (26.7 mm), NPS 1" (33.4 mm), NPS 1-1/4" (42.2 mm), NPS 1-1/2" (48.3 mm), 1-3/8" (34.92 mm)		Thread: NPT1/2", NPT3/4", Compression fitting, also spring load: NPT1/4", NPT1/2", Tip shape, straight, stepped, Surface roughness Ra, 0,76 µm (30 µin.), 1,6 µm (63,0 µin.)
Operating temperature range	PT100 TF iTHERM StrongSens: -50 °C ...500 °C, (-58 °F ...932 °F), PT100 TF iTHERM QuickSens: -50 °C ...200 °C, (-58 °F ...392 °F), PT100 WW: -200 °C ...600 °C, (-328 °F ...1.112 °F), PT100 basic TF: -50 °C ...200 °C, (-58 °F ...392 °F), Typ K, max. 1.100 °C, (max. 2.012 °F), Typ J: max. 800 °C, (max. 1.472 °F), Typ N, max. 1.100 °C, (max. 2.012 °F)		-196 °C...400 °C (-320,8 °F...752 °F)
Accuracy	Class AA acc. to IEC 60751, Class A acc. to IEC 60751, Class B acc. to IEC 60751, Class special or standard acc. to ASTM E230, Class 1 or 2 acc. to IEC 60584-2		Depending on application, Class AA acc. to IEC 60751, Class A acc. to IEC 60751, Class B acc. to IEC 60751, Class special or standard acc. to ASTM E230, Class 1 or 2 acc. to IEC 60584-2
Integration head transmitter	Yes (4 ... 20 mA; HART; PROFIBUS PA; FOUNDATION FIELDBUS)		Yes (4 ... 20 mA; HART; IO-Link, PROFIBUS PA; FOUNDATION FIELDBUS)
Ex - approvals	ATEX, CSA C/US, INMETRO, ATEX IECEx		ATEX, ATEX IECEx, CSA C/us, EAC, NEPSI, INMETRO, UKCA
Certification	SIL (Transmitter), CRN		SIL, MID, Marine

iTHERM ModuLine	
	TT152, Barstock thermowell 
Application	Wide range of heavy industries
Head connection	internal thread: 1/2" NPT
Max. immersion length on request	84"
Process connection	To be threaded weld in with flange according to ASME
Thermowell root diameter	5/8...1-1/2"
Medium contact material	Wide selection: 316/316L, 304/304L, Alloy600, AlloyC276, A182 F22, A182 F11, A182 F91, A105, Duplex, PTFE coated, Tantalum sleeve
Wetted part finishing (Ra)	< 0.8 µm (31.50 µin), < 1.6 µm (63.00 µin)
Tip shape	Straight, Tapered, Stepped, partly tapered
Temperature range	-200...1100 °C (-328...2.012 °F), Depending on configuration
Max. process pressure (static)	500 bar (7252 psi), Depending on configuration

Prothermo	
	NMT81 
Measuring principle	Resistance Temperature Detector
Characteristic / Application	High precision average temperature measurement up to 100 m (328 ft)
Max. immersion length on request	up to 100 m (328 ft)
Number of elements	Up to 24 simplex, 12 redundant
Process connection	Flange: DN50...DN80, ASME 2"...4", JIS 10K Threads: 3/4" MNPT2 M20
Operating temperature range	Options: -40 °C...+75 °C (-40 °F...+167 °F) -40 °C...+100 °C (-40 °F...+212 °F) -55 °C...+235 °C (-67 °F...+455 °F) -196 °C...+100 °C (-321 °F...+212 °F)
Accuracy	+/- 0.032 °C (+/- 0.058 °F)
Ex - approvals	CSA C/US, ATEX, IEC Ex, JPN Ex, UK Ex
Option	Water bottom probe

TrustSens sensors		
	TM371 	TM372 
Application	Food & Beverage, Life Science	
Special features	Self-calibration at 118 °C (24 °F)	
Design Basis	Metric Dimensions (millimeters) Available in 316L and 1.4435 (low Delta ferrite) Spring loading in housing or direct immersion available	Imperial Dimensions (inches) Available in 316L Spring loading in housing
Thermowell connection	G3/8 Cap Nut G1/4 male thread for compression fitting QuickNeck M24 female thread, G3/8 female thread	½" NPT male thread QuickNeck QuickNeck with ½" NPT male thread
Housings	Compact Housing with M12 plug (with or without LED indication)	
Type	Single element: Standard thin-film (mineral insulated)	
Vibration Resistance	3 g	
Response time	Depending on configuration. Refer to TI document for details.	
Process Connections	Clamp according to ISO 2852, sanitary connection acc. to DIN 11851, aseptic pipe union acc. to DIN 11864-1, thread acc. to ISO 228 for Liquiphant® adaptor, metallic sealing system, weld-in adaptor, APV-Inline, Varivent®, Ingold connection, SMS 1147, compression fitting; Neumo Biocontrol; T- and corner pieces according to DIN 11865	Tri-Clamp. Clamp according to ISO 2852, cylindrical weld-in (NPS), thread acc. to ISO 228 for Liquiphant adaptor, Varivent®, T- and corner pieces according to DIN 11865
Finish Ra	0.76 µm (30 µin), 0.38 µm (15 µin), Optional: 0.38 µm (15 µin) with electropolish	
Output	4-20 mA; HART	
Range	TF: -40 °C to 160 °C (-40 °F to 320 °F) 374 °F (190 °C) Max temp (optional)	
Approvals	CSA C/US GP	
Certificates / Conformity	3-A, EHEDG, ASME BPE, FDA, TSE Certificate of Suitability, CRN on thermowell	

Thermometer/Thermowell Assembly	
	TM131 
Application	Process Industry
Measurement Probe	RTD or TC Type: J, K, N
Measuring range	-328 to 2012 °F (-200 to 1100 °C) depending on element type
Process Connection	Male thread: G3/8, G1/2", G3/4", G1", NPT1/2", NPT3/4", NPT 1", M14x1.5, M18x1.5, M20x1.5, M27x2, M33x2, R1/2", R3/4" Female thread: M20x1.5, M24x1.5, NPT1/2" Cap-nut: M20x1.5, G1/2", G3/4" Compression fitting: NPT1/2", G1/2", G1" Flange: DN15 PN40 B1, C DN25 PN20, PN40, PN100 B1, B2, C DN40 PN40 B1, DN50 PN40 B1 ASME 1" 150 RF, 1" 300 RF, 1 1/2" 150 RF, 2" 150 RF, 2" 300 RF
Output	Dependent on electronics, iTEMP transmitter compatible
Connection Head	Aluminum, PA, 316L SS
Ambient Temperature	-58 to 302 °F (-50 to 150 °C) Dependent on terminal head and/or mounted transmitter
Minimum immersion	50 mm
Immersion length	50-4500 mm
Approvals/certificates	ATEX, ATEX IECEx, NESPL, IECEx, EAC Ex, CSA C/US, INMETRO

Thermometer/ Ceramic Thermowell Assembly				
	TAF11 	TAF12S - with ceramic thermowell 	TAF12D - with thermowell and ceramic internal sheath 	TAF12T - with thermowell and two ceramic internal sheaths 
Application	Process Industry	Process Industry		
Measurement Probe	TC Type: J, K, N, S, R, or B (single or dual element)	TC Type: S, R, or B (single or dual element)		
Measuring range	-40 to 2912 °F (-40 to 1600 °C) depending on element type	32 to 3092 °F (0 to 1700 °C) depending on element type		
Process Connection	Compression fitting: G3/4, G1", G1 1/2", adjustable flange	Compression fitting: G 1/2", G 3/4", G1", adjustable flange		
Output	Dependent on electronics, iTEMP transmitter compatible	Dependent on electronics, iTEMP transmitter compatible		
Connection Head	Aluminum	Aluminum		
Ambient Temperature	-58 to 302 °F (-50 to 150 °C) Dependent on terminal head and/or mounted transmitter	-58 to 302 °F (-50 to 150 °C) Dependent on terminal head and/or mounted transmitter		
Minimum immersion	7 1/2" (200 mm)	7.5" (200 mm)		
Immersion length	up to 157 1/2" (4000 mm)	up to 98" (2500 mm)	up to 137 1/2" (3500 mm)	
Approvals/certificates	CE Mark, PED approval	CE Mark, PED approval		

Thermometer/Ceramic or Metallic Thermowell Assembly	
	TAF16 
Application	Process Industry
Measurement Probe	TC Type: K, J, N, or S (single or dual element)
Measuring range	-40 to 2552 °F (-40 to 1400 °C) depending on element type
Process Connection	Compression fitting: G 1/2", G 3/4", G1", G 1 1/4", G 1 1/2" adjustable flange
Output	Dependent on electronics, iTEMP transmitter compatible
Connection Head	Aluminum
Ambient Temperature	-58 to 302 °F (-50 to 150 °C) Dependent on terminal head and/or mounted transmitter
Minimum immersion	2.5" (75 mm)
Immersion length	up to 178" (4525 mm)
Approvals/certificates	CE Mark, PED approval

Recorders		
	Memograph® M RSG45 	Ecograph® T RSG35 
Recorder type	Graphic data manager, paperless, record, visualize, analyze and communicate	Universal data manager, record, visualize, monitor and communicate
Application	Process monitoring / control	Process monitoring / control
Input	Up to 20 universal or HART, 6 to 14 digital, 8 mathematics channels, Profibus	Up to 12 analog, 6 digital
Input types	V, mV, mA, RTD, TC, frequency, pulse, Profibus DP	V, mV, mA, RTD, TC, frequency, pulse
Setpoint control	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 256 MB, SD card or USB stick	Internal, 128 MB Flash, External, SD card and USB stick
Interface	Integrated WEB server, Profibus, Modbus, USB, TCP/IP, OPC, Ethernet, RS232/485	USB port, Ethernet, RS232/RS485, Integrated web server, Modbus
Display type	7" TFT display, multicolor	5.7" TFT multicolor
Ambient temperature	14 to 122 °F	14 to 122 °F
Power supply	100 to 230 VAC 24 V AC/DC	100 to 230 VAC 24 V AC/DC
Approvals / certificates	CE, UL, FDA 21, CFR 11, ATEX Ex p	CSA, GP, CE, UL

Multi-functional components				
	RIA452 	RIA45 	RIA46 	RIA15 
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 transmitter	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

Inventory Management			
	NXA820/821/822 	NXA85 	SupplyCare 
Measuring principle	Inventory Management Solutions	Inventory Management Solutions	Inventory Management Solutions
Application	Data acquisition Data management Process monitoring and visualization	Data acquisition Data management Process monitoring and visualization	Data acquisition Data management Process monitoring and visualization
Field of Application	Embedded web server, collects measurements from connected field devices for up to 15 tanks and calculates volumes and masses for visualization and operation	A on-premise software for installation on a single station or server client system for monitoring of level and volumes as well as operation in small storage facilities	A software application hosted in the Endress+Hauser cloud for the indication and monitoring of inventories in e.g. tanks and silos
Monitor resolution, display	1280 x 1024 (or better)	1920 x 1080 (or better)	Desktop/PC, laptop, tablet and smartphone (≤ 768 pixels) Minimum 375 × 667
Interfaces	OPC classic, Rest API Tankvision Data Concentrator NXA821 Tankvision Host Link NXA822, Tankvision Professional NXA85	OPC classic OPC UA Modbus Terminalvision NXS85	Web Browser REST API (format: json)

Monitoring		
	Fieldgate FXA42 	NXA83B 
Measuring principle	Fieldgate	Communication Interface
Function	Gateway with web server for recording measurements via Modbus/Analog/HART (via accessory), and transmission to SupplyCare software via Ethernet, WLAN, and cellular	Device for the data acquisition of data for up to 250 tanks and provision to Tankvision Professional NXA85 or other host systems (PLC or DCS)
Input	4x 4...20 mA analog, 4x digital, Pulse counter, Modbus TCP, Modbus RS485	Modbus RS485, Modbus RS232, Modbus TCP, Sakura V1, Whessoe WM550, Enraf GPU/BPM, Saab TRL/2, Varec Mark/Space, SI6280/6290, Tokyo Keiso FW9000
Output	4x digital, Modbus TCP, Modbus RS485	OPC classic, Modbus RS485, Modbus RS232, Modbus TCP, Tankvision Professional NXA85, Tankvision LMS NXA86B, Enraf GPU RS232
Power supply	24V DC	100 - 240 V AC (50/60 Hz)
Dimensions (Wx-HxD)	45 x 100 x 115 mm (1.77 x 3.93 x 4.53 in)	483 x 176 x 260 mm
Communication interface	Ethernet, WLAN, Cellular, Serial RS485	Ethernet, Serielle RS232/ RS485
Configuration	Web server	Web server
Certificates	EAC, FCC, IC	PTB

Connector	
	<p>FieldEdge SGC500</p> 
Benefits	<p>Connects field devices to the Netilion Cloud Secure data transfer via encrypted https communication Transmission of device parameters from connected field devices - Endress+Hauser devices and third-party devices Easy installation and commissioning No integration into customer automation system necessary Connectivity for remote Heartbeat Verification</p>

Loop powered field indicator		
	<p>RIA14</p> 	<p>RIA16</p> 
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 transmitter	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		
	<p>RID14</p> 	<p>RID16</p> 
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)						
	<p>RN221N*</p> 	<p>RMA42</p> 	<p>RLN22</p> 	<p>RLN42</p> 	<p>RNF22</p> 	<p>RNO22</p> 
Component function	Power supply, active barrier for 2-wire systems	Digital process transmitter and control unit for monitoring analog measured values	NAMUR isolating amplifier	NAMUR isolating amplifier	Power feed-in and error message module with relay output	Output isolating amplifier with 1 or 2 channels
Input	1 analog	1 or 2 universal	1 or 2 channels	2 channels	1 or 2 channels	1 or 2 channels
Input types	4 to 20 mA	V, mA, RTD, TC, resistance	NAMUR blocking: < 1,2 mA conducting: > 2,1 mA	NAMUR blocking: < 1,2 mA conducting: > 2,1 mA	24V DC	4 to 20mA / HART passive
Relay outputs/number	N/A	2 SPDT	1	1	1 changeover	N/A
Types of outputs	4 to 20	1 or 2: 0/4 to 20 mA, voltage 1 linearization table, 32 points Mathematics functions Open collector output	1-channel, changeover contact / 2-channel, normally open contact	changeover contact	Uin - 0.8V	4 to 20mA / HART active
Loop power to transmitter	24 VDC, 22 mA	24 VDC, 22 mA	8V DC	8V DC	Single or redundant power supply up to 3.75A	None
Interface	HART	3 push buttons, USB, , HART, FieldCare/DeviceCare	N/A	N/A	N/A	Bidirectional HART
Display type	1 LED	5-digit backlit LCD, alarm markers, bar graph, LED relay indicators	LED lights	LED lights	LED lights	LED lights
Ambient temperature	-4 to +122 °F	-4 to +140 °F	-40 to 140 °F (-40 to 60 °C)	-40 to 140 °F (-40 to 60 °C)	-4 to 140 °F (-20 to 60 °C)	-40 to 158 °F (-40 to 70 °C)
Power supply	20 to 250 VAC/VDC	24 to 230 VAC/VDC	24V DC	20 to 250V AC/DC	24V DC	24V DC
Approvals / certificates	CE, FM, CSA, ATEX	CE, FM, CSA, ATEX, NEPSI, UL	ATEX IECEx II(1)G [Ex ia Ga] IIC, II(1) D [Ex ia Da] IIIC, II3G Ex ec nC IIC Gc, DNV, SIL, SIL 2	ATEX IECEx II(1)G [Ex ia Ga] IIC, II(1) D [Ex ia Da] IIIC, II3G Ex ec nC IIC Gc, DNV, SIL, SIL 2	ATEX IECEx II 3 G Ex ec nC IIC Gc, DNV	ATEX IECEx II(1)G [Ex ia Ga] IIC, II(1) D [Ex ia Da] IIIC, II3G Ex ec IIC Gc, DNV, SIL, SIL 2 SC 3

* Phasing out

Safety barrier, DIN rail mount			
	RB223	RN22	RN42
			
Component function	Loop-powered barrier for separation of 4 to 20 mA signal circuits, one or two channel	1- or 2-channel active barrier or signal doubler	1-channel active barrier, wide range power supply
Input	0/4 to 22 mA or specified accuracy 0 to 40 mA operating range	4 to 20 mA/HART active/passive	4 to 20 mA/HART active/passive
Output	0/4 to 22 mA for specified accuracy 0 to 40 mA operating range (max. current depends on load)	4 to 20 mA/HART active/passive	4 to 20 mA/HART active/passive
Power supply	Loop-powered, 0/4 to 20 mA	24V DC	20 to 250V AC/DC
Loop power supply	-	17.5 V ±1 V at 20 mA	17.5 V ±1 V at 20 mA
Ambient temperature	-4 to +140 °F	-40 to 140 °F (-40 to 60 °C)	-40 to 140 °F (-40 to 60 °C)
Interface	HART communication, bi-directional	HART communication, bi-directional	HART communication, bi-directional
Mounting	Standard top-hat DIN rail	DIN Rail	DIN Rail
Housing	Plastic PC, UL, 940	Polycarbonate	Polycarbonate
Approvals/certificates	CE, FM, CSA, UL, SIL 3, ATEX	ATEX II3G Ex tc IIIC Dc, CSA C/US AIS, I/2/ABCD, EAC [Ex ia Ga] IIC, [Ex ia Da] IIIC, Ex ec IIC Gc, JPN [Ex ia Ga] IIC, [Ex ia Da] IIIC, Ex ec IIC Gc, INMETRO [Ex ia Ga] IIC, [Ex ia Da] IIIC, Ex ec IIC Gc, NEPSI [Ex ia Ga] IIC, [Ex ia Da] IIIC, Ex ec IIC Gc, UK II3G Ex tc IIIC Dc, UK II(1)G [Ex ia Ga] IIC, II(1)D [Ex ia Da] IIIC, II3G Ex ec IIC Gc, ATEX IECEx II(1)G [Ex ia Ga] IIC, II(1)D [Ex ia Da] IIIC, II3G Ex ec IIC Gc, UL C/US, DNV, SIL 2 SC 3	ATEX II3G Ex tc IIIC Dc, CSA C/US AIS, I/2/ABCD, EAC [Ex ia Ga] IIC, [Ex ia Da] IIIC, Ex ec IIC Gc, JPN [Ex ia Ga] IIC, [Ex ia Da] IIIC, Ex ec IIC Gc, INMETRO [Ex ia Ga] IIC, [Ex ia Da] IIIC, Ex ec IIC Gc, NEPSI [Ex ia Ga] IIC, [Ex ia Da] IIIC, Ex ec IIC Gc, UK II3G Ex tc IIIC Dc, UK II(1)G [Ex ia Ga] IIC, II(1)D [Ex ia Da] IIIC, II3G Ex ec IIC Gc, ATEX IECEx II(1)G [Ex ia Ga] IIC, II(1)D [Ex ia Da] IIIC, II3G Ex ec IIC Gc, UL C/US, DNV, SIL 2 SC 3

Power supply		
	RNB130	RNB22
		
Component function	Primary switched-mode power supply	System power supply for DIN rails for one 4 wire sensor or transmitter
Input	100 to 240 VAC	100 to 240 VAC / 110 to 250 VDC
Output	24 VDC	24 to 28V DC power supply
Power supply	85 to 264 VAC	100 to 240V AC/DC
Ambient temperature	-13 to +158 °F	-13 to 158 °F (-25 to 70 °C)
Display element	DC OK LED, green	LED lights
Mounting	Standard top-hat DIN rail	DIN Rail
Housing	Polyamide PA	Polycarbonate
Approvals / certificates	CE	DNV

BTU / Steam manager		
	EngyCal® RH33 BTU meter	EngyCal RS33 Steam calculator
		
Basic application	Custody transfer BTU meter heat/cold given off by liquids	Steam calculator for recording and billing steam mass and energy
Measuring range	Water: 32 to 662 °F Water/glycol (0 to 60% glycol): -40 to +662 °F Liquids: -328 to +1112 °F	Steam: 32 to 1112 °F Pressure: 0 to 14,500 psi
Calculation standards	IAPWS-IF 97, NAMUR NE21, NE43	IAPWS-IF 97, NAMUR NE21, NE43
Measurement/calculation	500 ms interval	500 ms interval
Housing	Wall/pipe mounting, panel or top-hat rail	Wall/pipe mounting, panel or top-hat rail
Inputs	2 Current/pulse, 2 Current/RTD 2 digital (activate tariff counter)	2 Current/pulse, 2 Current/RTD 2 digital (activate tariff counter)
Outputs	0/4 to 20 mA, pulse, 2 relays, 2 digital (open collector), 24 VDC	0/4 to 20 mA, pulse, 2 relays, 2 digital (open collector), 24 VDC
Display/Local operation	160 x 80 dot matrix with rear illumination, 3 soft-key pushbuttons, USB for configuration, 2 LED indicators	160 x 80 dot matrix with rear illumination, 3 soft-key pushbuttons, USB for configuration, 2 LED indicators
Interface	USB, Ethernet TCP/IP, RS485, Modbus TCP, Modbus RTU, M-Bus Internal data logging and logbook	USB, Ethernet TCP/IP, RS485, Modbus TCP, Modbus RTU, M-Bus Internal data logging and logbook
Operating software	Field Data Manager, FieldCare Device Setup	Field Data Manager, 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 operation	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	Battery powered interface module connecting HART and 4 to 20 mA devices to a WirelessHART network	Gateway device for WirelessHART networks. Converts and stores wireless device data in a format compatible with other systems, host applications such as HMI / SCADA tools.
Input	One point to point HART device, one point to point 4 to 20 mA device or up to 4 externally powered HART devices operating in multidrop mode	WirelessHART communication interface
Output	WirelessHART communication interface	Ethernet (10 BASE-T/10 BASE TX), 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 vertical plane, optional remote antenna
Approvals / certificates	CE, FM, CSA, FCC Part 15.247	CE, FCC CFR 47 Part 15, ATEX

Profibus FieldGate	
	Fieldgate SFG500 
Application	Intelligent Ethernet/PROFIBUS gateway providing parallel access to PROFIBUS networks, monitoring of PROFIBUS and HART device status
Input	Profibus listener, master class 2 and HART support via Profibus
Outputs	LAN port access point for client software based FDI/DTM technology
Interface	Embedded Web Server and second LAN port providing service access
Power	18 to 36 VDC
Ambient temperature	+32 °F to 140 °F
Mounting	panel, DIN rail
Housing	Aluminium alloy
Protection	IP 20; NEMA Type 1
Approvals / certificates	CE Mark CE to EN/IEC 61131-2:2007

FieldCare

<p>FieldCare is a state-of-the-art configuration software for configuration out of a central location. There is no need to spend a lot of time in the field anymore.</p> <p>You can either remotely access your devices from your maintenance station or prepare the configuration changes in advance and transfer them point-to-point fast and easily.</p> <p>Your benefits</p> <ul style="list-style-type: none"> One tool to access all field devices regardless of FDI or EDD technology All major communication protocols supported Fast commissioning and device replacement Open for 3rd party drivers and hardware Performs device configuration management when combined with life cycle management Diagnosis of devices according to NAMUR NE 107

Field Communicators			
	Field Xpert SMT50	Field Xpert SMT70	Field Xpert SMT77
			
Application	Field Instrument Configurator, Rugged Industrial PC tablet with FDI/DTM technology software and Microsoft Windows 10 OS for Non-Ex	Field Instrument Configurator, Rugged Industrial PC tablet with FDI/DTM technology software and Microsoft Windows 10 OS for Ex-Zone 2 C1D2	Field Instrument Configurator, Rugged Industrial PC tablet with FDI/DTM technology software and Microsoft Windows 10 OS for Ex-Zone 1 C1D1
User Interface	12.2" multi-touch, high resolution display	11.6" multi-touch, high resolution display	10.1" multi-touch, high resolution display
CPU/ memory	Intel® Sky Lake Core™ m3-7Y30, 4 GB RAM / 128 GB SSD	Intel® Core i5™ 2.7 GHz, 8 GB RAM / 256 GB SSD	Intel® N3710™ 1.6 GHz, 8 GB DDR3L / 128 GB SSD
Camera(s)	2/5MP cameras	2/5MP cameras	2/5MP cameras
Additional Interface	3 USB, Bluetooth 4.2, WiFi, WWAN LTE/ GPS, Ethernet RJ-45	2 USB, Bluetooth 5.0, WiFi, WWAN LTE 4G/ GPS	1 USB, Bluetooth 4.1, WiFi, WWAN LTE/ GPS
Battery	8 hours battery lifetime, Hot Swap 6,300mAh battery	7-14 hours battery life-time, Hot Swap 3,950/ 7,800mAh battery	3-5 hours battery lifetime, Hot Swap 4,200mAh battery
Weight	3.3 lbs	2.6 lbs	5.1 lbs
Ambient Temperature	-4 to 131 °F	14 to 131 °F	-4 to 122 °F
Protection	IP65, MIL-STD-810G	IP65, MIL-STD-810G	IP65
Certificates	-	NEC/CEC Class 1, Div. 2, Group A-D T4	UL Class I, Division 1, Groups A, B, C and D
Approvals	CE, FCC, IC	CE, FCC, IC	CE, FCC, IC

Analysis Products available from Endress+Hauser

Analysis: pH and ORP

www.us.endress.com/analysis

pH and pH Memosens® Sensors									
	Memosens CPS11E or analog CPS11	Memosens CPS31E or analog CPS31	Memosens CPS41E or analog CPS41	Memosens CPS71E or analog CPS71	Memosens CPS61E	Memosens CPS91E or analog CPS91	Memosens CPS47E	Memosens CPS77E	Memosens CPS97E
									
Application	General Purpose/ Environment/ Chemical	Municipal Water	Process/ Chemical/ Utilities	Process/Chemical	Life Science/ Hygienic	Process/ Precipitates/ Suspended Solids	Process/Environment	Process/ Environment/ Food/Biotechnology	Process/Environment
Parameter	pH	pH	pH	pH	pH	pH	pH	pH	pH
Material	Glass	Glass	Glass	Glass	Glass	Glass	PEEK, FFKM (Perfluoroelastomer)	PEEK, FFKM (Perfluoroelastomer)	PEEK, FFKM (Perfluoroelastomer)
Measuring range	0 to 14 pH	1 to 12 pH	0 to 14 pH	0 to 14 pH	0 to 14 pH	0 to 14 pH	0 to 14 pH	0 to 14 pH	0 to 14 pH
Temperature	5 to 275 °F	5 to 176 °F	5 to 275 °F	32 to 284°F	32 to 284°F	32 to 230°F	5 to 275 °F	5 to 275 °F	5 to 275 °F
Temperature sensor	Pt100/1000, NTC 30K (11E)	Pt100, NTC 30K (31E)	Pt100/1000, NTC 30K (41E)	Pt100/1000, NTC 30K (11E)	NTC 30K	Pt100/1000, NTC 30K (11E)	Pt1000	Pt1000	Pt1000
Process pressure	Applications A and B: 11.6 to 246.5 psi F: 11.6 to 101.5 psi Max 230 psi (analog)	11.6 to 58 psi 15 to 60 psi (analog)	159.5 psi 145 psi (analog)	203 psi 190 psi (analog)	101.5 psi	230 psi 190 psi (analog)	160 psi (11 bar) Abs.	160 psi (11 bar) Abs.	160 psi (11 bar) Abs.
Reference junction	PTFE	Ceramic	Ceramic	Ceramic	Ceramic	Open	Ceramic	Ceramic	Open aperture
Reference	Gel	Gel	Flowing Liquid	Gel	Gel	Solid Gel	Liquid	Gel	Solid gel
Lengths (mm)	120/225/360/425	120	120/225/360/425	120/225/360/425	120/225/360/425	120/225/360/425	120/225/360	120/225/360	120/225/360
Sensor cable	CPK9, CYK10, CYK20	CPK9, CYK10, CYK20	CPK9, CYK10, CYK20	CPK9, CYK10, CYK20	CYK10, CYK20	CPK9, CYK10, CYK20	CYK10, CYK20	CYK10, CYK20	CYK10, CYK20
Approvals / certificates	CSA IS NI; CL I, Div. 1, Group A-D	CSA IS NI; CL I, Div. 1, Group A-D	CSA IS NI; CL I, Div. 1, Group A-D	CSA IS NI; CL I, Div. 1, Group A-D	CE Mark, CSA IS NI; CL I, Div. 1, Group A-D; IECEx, ATEX, Biocompatibility: ISO 10993-5:2009, USP <87>, USP <88> Class VI, 3-A, EHEDG EL Class 1	CSA IS NI; CL I, Div. 1, Group A-D	CE, 3-A, FDA, EHEDG, ASME BPE-2018, EC No. 1935/2004, Biocompatible USP<87>, USP<88>	CE, 3-A, FDA, EHEDG, ASME BPE-2018, EC No. 1935/2004, Biocompatible USP<87>, USP<88>	CE

ORP and ORP Memosens Sensors				
	Memosens CPS12E or analog CPS12/13 	Memosens CPS42E or analog CPS42/43 	Memosens CPS72E or analog CPS72 	Memosens CPS92E 
Application	Process/environment	Food/biotechnology	Process/hygienic	Chemical processes Pulp and paper industry and pigment production
Parameter	ORP	ORP	ORP	ORP / Redox
Material	Glass	Glass	Glass	Sensor shaft: Glass to suit process ORP measuring element: Platinum Metal lead: Ag/AgCl O-ring: FKM Process coupling: PPS fiber-glass reinforced Nameplate: Ceramic metal oxide
Measuring range	-1500 to 1500 mV	-1500 to 1500 mV	-1500 to 1500 mV	-1500 to 1500 mV
Temperature	5 to 275 °F	5 to 275 °F	5 to 275 °F	0 to 110 °C (32 to 230 °F)
Temperature sensor	NTC 30K (12E)	NTC 30K (42E)	NTC 30K (72E)	NTC 30K
Process pressure	232 psi	145 psi	160 psi	0.8 to 14 bar (11.6 to 203 psi) (absolute)
Reference junction	PTFE	Ceramic	Ceramic	
Reference	Gel	KCl liquid	Gel	Gel
Lengths (mm)	120/225/360	120/225/425	120/225/360	120, 225 and 360 mm (4.72, 8.86 and 14.17 inch)
Sensor cable	CPK9, CYK10 (12E)	CPK9, CYK10 (42E)	CPK9, CYK10 (72E)	
Approvals / certificates	CSA IS NI; CL I, Div. 1, Group A-D (12E)	CSA IS NI; CL I, Div. 1, Group A-D (42E)	CSA IS NI; CL I, Div. 1, Group A-D (72E)	ATEX, IECEx, CSA C/US, NEPSI, Japan Ex and INMETRO approvals for use in hazardous areas Zone 0, Zone 1 and Zone 2

Combined pH/ORP Memosens Sensors			
	Memosens CPS16E	Memosens CPS76E	Memosens CPS96E
			
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	5 to 275 °F	32 to 284 °F	32 to 230 °F
Temperature sensor	NTC 30K	NTC 30K	NTC 30K
Process pressure	246.5 psi	203 psi	203 psi
Reference junction	PTFE	Ceramic	Open
Reference	Gel	Gel	Solid gel
Lengths (mm)	120/225	120/225/360/425	120/225/360/425
Sensor cable	CYK10, CYK20	CYK10, CYK20	CYK10, CYK20
Approvals / certificates	CSA IS NI; CL I, Div. 1, Group A-D	CSA IS NI; CL I, Div. 1, Group A-D	CSA IS NI; CL I, Div. 1, Group A-D

pH / ORP Sensors	
	Memosens CPF81E/82E or analog CPF81/82
	
Application	Water/wastewater
Parameter	pH / ORP
Material	PPS / Glass
Measuring range	0 to 14 pH / -1500 to +1500 mV
Temperature	32 to 230 °F
Temperature sensor	Pt100, NTC 30K (81E/82E)
Process pressure	50 psi
Reference junction	PTFE
Reference	Gel
Lengths (mm)	12.5/23/58.5
Sensor cable	Fixed cable, CPK9, CYK10 (81D/82D)
Approvals /certificates	Non-hazardous (CPF82E, CPF81/82), CSA C/US IS Cl. I, Div. 1, Group A-D (CPF81E)

pH / Enamel Coated Sensor	
	Ceramax CPS341D Memosens
	
Application	Water, active ingredient prep, fermentation, biotechnology, food/beverage
Parameter	pH, temperature
Material	Porcelain enamel metal substrate (PEMS)
Measuring range	-2 to 14 pH (0 to 10 pH linear range); 32 to 280 °F measuring range
Temperature	32 to 280 °F
Temperature sensor	NTC 30KΩ
Process pressure	0 to 87 psi
Reference junction	Ceramic
Reference	Ag/AgCl with 3 M KCl and inhibitor
Lengths (mm)	120
Sensor cable	CYK10
Approvals / certificates	General purpose

pH / Memosens Lab				
	Memosens CPL51E	Memosens CPL53E	Memosens CPL57E,	Memosens CPL59E
				
Application	Laboratory	Laboratory	Laboratory/low conductivity	Laboratory/chemical
Parameter	pH	pH	pH	pH
Material	Plastic/Glass	Glass	Glass	Glass
Measuring range	0 to 14 pH	0 to 14 pH	0 to 14 pH	0 to 14 pH
Temperature	32 to 275 °F	32 to 275 °F	32 to 275 °F	32 to 275 °F
Temperature sensor	NTC 30K	NTC 30K	NTC 30K	NTC 30K
Process pressure	Ambient	Ambient	Ambient	Ambient
Reference junction	Open ring	PTFE	PTFE	PTFE
Reference	Solid Gel	Solid Gel	Solid Gel	Solid Gel
Lengths (mm)	120	120	120	120
Sensor cable	CYK20	CYK20	CYK20	CYK20
Approvals / certificates	General purpose	General purpose	General purpose	General purpose

pH / ORP Holder Assemblies						
	Dipfit W CPA111	Dipfit P CPA140	Flowfit P CPA240	Flowfit CPA25	Flowfit CYA21	Dipfit CYA10
						
Application	Water, wastewater, process	Process	Process	Water, clean fluids	Water/Utilities	Water, wastewater
Description	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 sensors	Compact flowthrough	Tanks, sewers, wells, basins, channels or rivers
Area of use	Open tank, channel, closed tank	Closed tank	Piping or bypass	Piping or bypass	Bypass or branch	Fixed installation
Process connection	Suspended, lap joint flange or adjustable flange	3" Class 150 ANSI flange	1" Class 150 ANSI flange	G1 or 1" NPT	6 mm OD open tube	Flange DN50, Flange 2", Chain bracket, Thread
Material	Polypropylene	PVDF or 316L SS	PVDF or 316L SS	Polypropylene	316L SS	Polyethylene
Maximum pressure	60 psi	90 or 145 psi	120 or 145 psi	87 psi	232 psi	Max. 4 bar (relative)
Maximum temperature	+180 °F	+250 or +300 °F	+250 or +300 °F	+180 °F	158 °F	0 to 60 °C (32 to 140 °F)
Immersion depth	20 to 118 inches	20 to 100 inches	N/A	N/A	N/A	10 meters (32.8 feet)
Sensor connection thread	3 x Pg 13.5	PG 13.5 or NPT 1/2"	1 x PG 13.5			
Certificates	N/A	3.1.B EN 10204	3.1.B EN 10204	N/A	N/A	N/A
Associated cleaning systems	Integrated spray cleaning CPR31 or external spray CPR30	Integrated spray cleaning CPR31	Spray cleaning connection G 1/2 and CPR31	Spray cleaning connection with CPR31	N/A	N/A

pH / ORP Holder Assemblies					
	Unifit CPA842	Ecofit CPA640	Cleanfit® W CPA450	Cleanfit CPA871	Cleanfit CPA875
					
Application	Food, beverage and life sciences	Chemical, process	Water, wastewater, process	Water, wastewater, chemical	Life sciences, food & beverage
Description	Process assembly for 12 mm (PG 13.5) sensors such as pH, pH ISFET and oxygen sensors	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	Tank or pipe	Process connection adapter for various electrodes	Open tank or closed tank and piping	Tank or piping	Tank or piping
Process connection	DN25 standard, DN25 B. Braun, Clamp 1.5" short, Clamp 1.5" long, Clamp 2" long, Clamp 1.5" angled 15 degrees, DN50 Dairy, Varivent flange N (DN40 to 125)	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, Alloy C22, PVDF or PEEK	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	232 psi	150 psi	60 psi	116 or 232 psi	116 or 232 psi
Maximum temperature	+280 °F	+70 °F (+285 °F, SS version)	+265 °F	+14 to +284 °F (158° PVDF)	+14 to +284 °F
Immersion depth	1.16" to 3.25" (fitting dependent)	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	EHEDG, ASME BPE, FDA, 3-A	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, Pharmaceuticals 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
			
Application	Chemical, power, process	Water, wastewater, process	Water, wastewater, process
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
Area of use	Tank or piping (min. 4" 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
Material	PVDF, PEEK, 316L SS, Hastelloy C4, Titanium	316L SS	Polypropylene, PVDF, PEEK
Maximum pressure	60 or 145 psi	60, 90, or 145 psi	60, 90, or 145 psi
Maximum temperature	+32 to +284 °F	+180 or +285 °F	+180 or +265 °F
Immersion depth	5.8 to 11.2 inches	2.4 to 9.3 inches	2.8 to 8.1 inches
Sensor connection thread	Pg 13.5	Pg 13.5	¾" NPT (CPF 81/82)
Certificates	3.1.B EN 10204	3.1.B EN 10204	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

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 
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, total chlorine, free bromine and ozone	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, total chlorine, free bromine and ozone	2-wire transmitter for pH, ORP, conductivity, dissolved oxygen, concentration
Measurement range	Dependent on connected sensor type	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, ProfiNet, 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, ProfiNet, Modbus (TCP/485) or EtherNet/IP) and discrete outputs	1 x 4 to 20 mA + HART, 2 x 4 to 20 mA + HART, Profibus PA or Foundation Fieldbus 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.	One digital Memosens or analog sensor
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, ProfiNet, 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, ProfiNet, 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 CSA C/US Cl. I, Div. 2 GPs A-D Option: Transmitter Cl. I, Div 2; Digital sensor Cl. I, Div. 1.	CE mark CSA C/US Cl. I, Div. 2 GPs A-D Option: Transmitter Cl. I, Div 2; Digital sensor Cl. I, Div. 1.	CE, FM, CSA

pH / ORP Handheld	
	Liquiline Mobile CML18 
Application	Laboratories in life science, water, wastewater, chemical, food/beverage
Measurement type	pH, ORP, conductivity, dissolved oxygen
Measurement range	Sensor dependent
Outputs	Display, Bluetooth
Sensor input	Memosens receptacle or M12 cable
Additional inputs	None
Power	Inductive charger (qi qualified)
Ambient temperature	14 to 140 °F
Mounting	Handheld or sensor mounted
Operation	Display and two soft keys
Housing	Polycarbonate
Protection	IP66
Approvals / certificates	47 CFR 15.247

pH / ORP Transmitters		
	Liquiline CM82 Digital Memosens Compact Transmitter 	Liquiline CM72 Digital Memosens Compact Transmitter 
Application	Process, industrial	Process, industrial
Measurement type	Memosens pH, ORP, conductive conductivity, dissolved oxygen	Memosens pH, ORP, conductive conductivity, dissolved oxygen
Measurement range	Dependent on connected sensor type	pH: 2-14 (fixed) ORP: 1500 to +1500 mV (fixed) Conductivity: 0 to 20µs/cm, 500µs/cm, 20 ms/cm or 500 ms/cm Oxygen: 0 to 200µg/l or 20 mg/l
Output	4-20 mA (loop powered); HART	4-20 mA (loop powered)
Input	None	None
Power supply	12.6 to 30 VDC (alarm current >20mA) 14 to 30 VDC (alarm current <4 mA)	12.6 to 30 VDC (alarm current >20mA) 14 to 30 VDC (alarm current <4 mA)
Ambient temperature	0 to 185 °F (-20 to 85 °C)	0 to 185 °F (-20 to 85 °C)
Mounting	Sensor mounted	Sensor mounted
Operation	Bluetooth interface (optional)	Fixed output
Housing	PEEK; NEMA 6, IP76/68	PEEK; NEMA 6, IP76/68
Approvals / certificates	CSA C/US General Purpose CSA C/US IS Cl.1 Div. 1	CSA C/US General Purpose CSA C/US IS Cl.1 Div. 1

Automatic Cleaning	
	Cleaning solution injector CYR10B 
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

* Electrode, electrode holder, spray nozzles are purchased separately

pH Buffers	
	pH calibration buffers CPY20-#### 
Application	pH probe calibration/verification
Measurement Type	pH
Values	2.00, 4.00, 7.00, 9.00, 9.22, 10.00, 12.00
Quantities	20x18 ml for 4.00 and 7.00 buffers 250 ml, 1000 ml, 5000 ml
Approvals / certificates	NIST and PTB traceable

Memosens	
	
Application	Food and beverage, chemical, water, wastewater, process industries
Description	Digital transmission of sensor signals via cable using contactless inductive connection. Current calibration data is stored in sensor head.
Area of use	Use with Memosens inductive sensors via CYK10 cable and fixed cable sensors via Memosens communication protocol
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

Automatic Cleaning		
	Cleanfit Control 	Liquiline Control CDC90 
Application	Chemical, Food, Pharmaceutical, Water, Wastewater, Power	Up to 2 measuring points where the sensor requires frequent calibrations, maintenance, and precise, reproducible measurement and/or in a difficult location
Measurement Type	pH, ORP, conductivity, oxygen	pH/ORP
System Capabilities	Pneumatic retractor control, sensor cleaning and rinsing	Fully automatic system for pH and ORP measuring points in all industries
System Components*	Liquiline CM44x transmitter, Cleanfit Control CYC25, pneumatic retractable assembly (with electric position switches), CYR10 injector (optional)	CDC90, pH and/or ORP sensor, CPA87X or CPA47X retractable assembly, CYK10
Basic Functions	Sensor insertion and retraction, cleaning and rinsing control programmed for daily or weekly operation.	Cleaning and calibration of sensors
Power Supply	24 VDC ±10%	100 to 230 V AC
Ambient Temperature	+10 to +113 °F (-10 to +45 °C)	0 to 45 °C (32 to 113 °F)
Mounting	Wall mount or pole mount	Panel mount
Programming	Liquiline CM44x transmitter with relay outputs	Cleaning and calibrating of the sensor with assembly retraction and insertion into measuring and service position
Housing	Polycarbonate, IP66/67, NEMA 4X	
Protection	IP64	IP66
Approvals / certificates	CE Mark	Non Hazardous

Digital to Analog Converter	
	CYM17 Converter 
Application	Life Sciences, benchtop fermentation measurement
Measurement type	pH, dissolved oxygen
Measurement range	Sensor dependent
Outputs	pH: M12 4-pin, mV signal according to Nernst equation Oxygen: T82 socket, 0-60 mA with 60 nA at 100% saturation
Sensor input	Memosens M12 for pH and dissolved oxygen
Additional inputs	None
Power	USB power supply, 5 V DC
Ambient temperature	23 to 122 °F
Mounting	Tabletop
Housing	Aluminum
Approvals / certificates	General purpose

Memocheck® *	
	Memocheck CYP02E 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	CYP02E: 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	CYP02E: 5 to 158 °F CYP03D: 0 to 122 °F
Approvals / certificates	CYP02E: FM/CSA IS NI Cl. I, Div. 1&2, GP A-D CYP03D: CSA IS NI Cl. I, Div. 1&2, GP A-D

* 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								
								
Application	Industrial, water	Industrial high temperature	Pure, ultrapure water	Pure, ultrapure water	Pure, ultrapure water	Water, wastewater	Life Sciences, Biopharmaceutical, Food/beverage, Industrial	Laboratory
Parameter	Conductivity	Conductivity	Conductivity	Conductivity	Conductivity	Conductivity	4-pole conductivity	Conductivity
Material	316L SS	316 Ti SS	316L SS	316L SS	316Ti SS	Graphite	Ceramic, platinum, stainless steel	Stainless Steel/ Ceramic
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	1 µS/cm to 500 mS/cm	5 µS/cm to 200 mS/cm
Temperature	-22 to +320 °F	-4 to +482 °F	Threaded: -4 to +212 °F Tri-Clamp: -4 to +266 °F -4 to +248 °F CLS15E	23 to 248 °F 23 to 266 °F, CLS16E	14 to 140 °F	-4 to +275 °F	23 to 248 °F	0 to 100 °C (32 to 212 °F)
Temperature sensor	Integrated Pt100	Integrated Pt100	Integrated Pt100 (CLS15), Pt1000 (CLS15E)	Integrated Pt100/ Pt1000 (CLS16B), Pt1000 (CLS16E)	Integrated Pt100	Integrated Pt100 (CLS21), Pt1000 (CLS21E)	Integrated Pt1000	Pt1000
Process pressure	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	247 psi at 68 °F 131 psi at 248 °F	Ambient
Insertion depth	Minimum 2"	Minimum 2"	Minimum 1.26"	Minimum 0.79"	Minimum 1.38"	Minimum 0.63"	4.72", minimum 0.59" to wall	120 mm (4.72 inch)
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	½" NPT (PES)	¾" NPT (PES) 1" NPT (PES) 2" Tri-clamp* (PES or SS)	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	CYK71	CYK71	CYK71, CYK10 (CLS15E)	CPK9, CYK10 (CLS16E)	CYK71	CYK71, CYK10 (CLS21E)	CYK10	CYK20
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/CSA IS/NI Cl. I, Div.1&2, GP A-D	FM/CSA IS/NI Cl. I, Div. 1&2, GP A-D	General purpose	FM/CSA IS/NI Cl. I, Div. 1&2, GP A-D	FM/CSA IS/NI Cl. I, Div. 1&2, GP A-D	General purpose

Conductivity Sensors			
			
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/CSA IS/NI Cl. I, Div. 1&2, GP A-D	General purpose	General purpose, 3A, EHEDG, FDA, USP class VI, FM (when used with Liquiline M CM42)

Conductivity Holder Assemblies				
				
Application	Water, wastewater, process	Chemical, wastewater, process	Water/Utilities	Water, wastewater
Description	Single installation point, CLS21 or CLS50 electrode, immersion holder	Single installation point for CLS50 electrode, immersion holder, bayonet style	Compact flowthrough	Tanks, sewers, wells, basins, channels or rivers
Area of use	Open channels, basins, tanks	Open tank, channel, closed tank	Bypass or branch	Fixed installation
Process connection	Adjustable flange, suspension bracket, mounting bracket	3" Class 150 ANSI flange	6 mm OD open tube	Flange DN50, Flange 2", Chain bracket, Thread
Material	Polypropylene	316L SS, PVDF	316L SS	Polyethylene
Maximum pressure	Non-pressurized systems	145 psi	232 psi	Max. 4 bar (relative)
Maximum temperature	176 °F	302 °F	158 °F	0 to 60 °C (32 to 140 °F)
Immersion depth	3 to 10 ft	1.5 to 7.5 ft	N/A	10 meters (32.8 feet)
Sensor connection thread	G1, G¾	G¾	PG 13.5 or NPT 1/2"	1 x PG 13.5
Certificates	N/A	N/A	N/A	N/A
Associated cleaning systems	External spray cleaning (CLR30 spray head)	N/A	N/A	N/A

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/UV254, free chlorine, total chlorine, free bromine and ozone	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, total chlorine, free bromine and ozone	2-wire transmitter for pH, ORP, conductivity, dissolved oxygen, concentration
Measurement range	Dependent on connected sensor type	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, ProfiNet, 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, ProfiNet, 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.	One digital Memosens or analog sensor
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, ProfiNet, 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 CSA C/US Cl. I, Div. 2 GPs A-D, Option: Transmitter Cl. I, Div 2; Digital sensor Cl. I, Div. 1.	CE mark CSA C/US Cl. I, Div. 2 GPs A-D, Option: Transmitter Cl. I, Div 2; Digital sensor Cl. I, Div. 1.	CE mark FM IS NI, Cl. I, Div 1, Groups A-D or CSA IS NI, Cl. I, Div 1, Groups A-G

Conductivity Transmitters		
	Liquiline CM82 Digital Memosens Compact Transmitter	Liquiline CM72 Digital Memosens Compact Transmitter
		
Application	Process, industrial	Process, industrial
Measurement type	Memosens pH, ORP, conductive conductivity, dissolved oxygen	Memosens pH, ORP, conductive conductivity, dissolved oxygen
Measurement range	Dependent on connected sensor type	pH: 2-14 (fixed) ORP: 1500 to +1500 mV (fixed) Conductivity: 0 to 20µS/cm, 500µS/cm, 20 ms/cm or 500 ms/cm Oxygen: 0 to 200µg/l or 20 mg/l
Output	4-20 mA (loop powered); HART	4-20 mA (loop powered)
Input	None	None
Power supply	12.6 to 30 VDC (alarm current >20mA) 14 to 30 VDC (alarm current <4 mA)	12.6 to 30 VDC (alarm current >20mA) 14 to 30 VDC (alarm current <4 mA)
Ambient temperature	0 to 185 °F (-20 to 85 °C)	0 to 185 °F (-20 to 85 °C)
Mounting	Sensor mounted	Sensor mounted
Operation	Bluetooth interface (optional)	Fixed output
Housing	PEEK; NEMA 6, IP76/68	PEEK; NEMA 6, IP76/68
Approvals / certificates	CSA C/US General Purpose CSA C/US IS Cl.1 Div. 1	CSA C/US General Purpose CSA C/US IS Cl.1 Div. 1

Conductivity Handheld	
	Liquiline Mobile CML18
	
Application	Laboratories in life science, water, wastewater, chemical, food/beverage
Measurement type	pH, ORP, conductivity, dissolved oxygen
Measurement range	Sensor dependent
Outputs	Display, Bluetooth
Sensor input	Memosens receptacle or M12 cable
Additional inputs	None
Power	Inductive charger (qi qualified)
Ambient temperature	14 to 140 °F
Mounting	Handheld or sensor mounted
Operation	Display and two soft keys
Housing	Polycarbonate
Protection	IP66
Approvals / certificates	47 CFR 15.247

Conductivity Calibration	
	Conductivity calibration Conductal CLY421
	
Application	Pharmaceutical, food, ultrapure water
Measurement type	Conductivity calibration
Measurement range	Up to 20 µS/cm or MΩ, 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

Steam Water Analysis System SWAS Compact Plus	
	SWAS Compact Plus CSOL-PC1WM1
	71604587 with cation exchanger, 110-230 VAC 71604588 with cation exchanger, 24 VDC 71604589 without cation exchanger, 110-230 VAC 71604590 without cation exchanger, 24 VDC
	
Application	Industrial boiler water, condensate, feedwater, make up water
Measuring Type	pH, conductivity, and dissolved oxygen
Measuring Range	Measuring range conductivity: 0.04...20µS/cm (CLS15E-**HC10A) 0.1...200µS/cm (CLS15E-**HC10B) Measuring range pH: 5...12 pH (CPS11E-**7AAS2) Measuring range DO: 5 ppb ... 60ppm (COS22E-**12**LB*) 1 ppb ... 10ppm (COS22E-**22**LB*) 4 ppb ... 10ppm (COS81E-**24**LB*)
Flow cell	Up to x4 Memosens sensors in series
Operating pressure	30 to 500 psi (2 to 34.5 bar)
Transmitter	CM444
Outputs	With CM444: Up to eight 0/4-20 mA outputs, alarm relay, up to four relay outputs (SPDT), Digital fieldbuses (HART, Profibus DP, ProfiNet, Modbus (458 or TCP) or EtherNet/IP, discrete outputs
Power Supply	110-230 VAC or 24 VDC
Display/Local interface	Liquiline CM444
Ambient temperature	40 to 464 °F (5 to 240 °C)
Mounting	Wall mountable TRESPA/Stainless steel panel
Operation	Local interface via LCD display, menu-driven soft keys and navigator knob. Optional IP addressable subserver. Optional HART, Profibus DP, ProfiNet, Modbus (TCP or 485) or EtherNet/IP. Integreas with Fieldcare DeviceCare, Field Data Manager and W@M asset management
Housing (transmitter)	Polycarbonate housing, IP66/67, Nema 4X
Approvals/Certification	Non Hazardous, ASME PTC 19.11-2008

Conductivity Calibration Solutions	
	Precision calibration solution CLY11
	
Application	Field calibration for conductivity electrodes
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

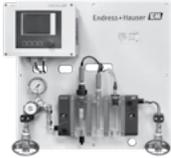
Analysis: Disinfection

Disinfection Sensors					
	Chlorine dioxide Memosens CCS50E 	Free chlorine Memosens CCS51E 	Total chlorine Memosens CCS53E 	Free Bromine Memosens CCS55E 	Ozone Memosens CCS58E 
Application	Drinking and process waters	Drinking and process water	Wastewater and utilities in all industries	Sea water and utilities	Drinking, process and waste water
Parameter	Chlorine dioxide (ClO ₂)	Free Chlorine (HOCl)	Total Chlorine	Free Bromine (HOBr)	Dissolved Ozone
Material	PVC, PVDF, FKM (Viton)	PVC, PVDF, FKM (Viton)	POM, PVDF, FKM	PVC, PVDF, FKM (Viton)	PVC, PEEK and SS
Measuring range	0 to 5 mg/l (ppm) 0 to 20 mg/l (ppm) 0 to 200 mg/l (ppm)	0 to 5 mg/l (ppm) 0 to 20 mg/l (ppm) 0 to 200 mg/l (ppm)	0 to 5 mg/l (ppm) 0 to 20 mg/l (ppm)	0 to 5 mg/l (ppm) 0 to 20 mg/l (ppm) 0 to 200 mg/l (ppm)	0.1 to 2 mg/l (ppm)
Temperature	0 to 55 °C (32 to 130 °F)	0 to 55 °C (32 to 130 °F)	0 to 55 °C (32 to 130 °F)	0 to 55 °C (32 to 130 °F)	0 to 45 °C (32 to 110 °F)
pH value range	0 to 14	4 to 9	4 to 9	5 to 10	4 to 9
Maximum back pressure	14.5 psi (1 bar)	14.5 psi (1 bar)	14.5 psi (1 bar)	14.5 psi (1 bar)	14.5 psi (1 bar)
Installation	CYA27 Flowfit, CYA112 Flexdip	CYA27 Flowfit	CYA27 or CYA112	CYA27 or CYA112 Flexdip	CYA27 or CYA112
Sensor cable	CYK10 Memosens	CYK10 Memosens	CYK10	CYK10 Memosens	CYK10
Transmitter	CM44x(R)	CM44x(R)	CM44x(R)	CM44x(R)	CM44x(R)
Approvals / certificates	CSA C/US NI Cl. I, Div. 2, GP A-D	CSA C/US NI Cl. I, Div. 2, GP A-D	CSA C/US NI Cl. I, Div. 2, GP A-D	CSA C/US NI Cl. I, Div. 2, GP A-D	CSA C/US NI Cl. I, Div. 2, GP A-D

Disinfection Flow Holder Assemblies	
	Flowfit CYA27 
Application	Drinking, process water
Description	Flow assembly designed to hold up to 6 disinfection and PG 13.5 sensors
Material	PMMA, PVDF, FKM, titanium
Maximum pressure	58 psi
Maximum temperature	0 to 60 °C (32 to 140 °F)
Measured water flow	up to 10.46 gal/h (40 l/h)
Sensor connection	Internal thread for disinfection and PG 13.5 sensors

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-level 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

Disinfection Transmitters		
	Liquiline CM442/CM444/CM448 Digital Memosens 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, ammonium, nitrate, SAC/UV254, free chlorine, total chlorine, free bromine and ozone	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, total chlorine, free bromine and ozone
Measurement range	Dependent on 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, ProfiNet, 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, ProfiNet, 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	-4 to +140 °F	CM442: 32 to 140° F, CM444 and CM448: 32 to 120 °F, External display: 0 to 140 °F
Mounting	Wall, pipe, panel 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, ProfiNet, 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, ProfiNet, EtherNet/IP, Modbus digital. Integrates with FieldCare/DeviceCare, Field Data Manager and W@M asset management.
Housing	Polycarbonate plastic housing	Remote display: IP66, NEMA 4x when properly mounted.
Approvals / certificates	CE Mark CSA C/US Cl. I, Div. 2 GPs A-D Option: Transmitter Cl. I, Div 2; Digital sensor Cl. I, Div. 1.	CE mark CSA C/US Cl. I, Div. 2 GPs A-D Option: Transmitter Cl. I, Div 2; Digital sensor Cl. I, Div. 1.

Disinfection Analysis Systems			
	CSOL-PA1WM1	Expansion Panel – CSOL-PA1WM1	Disinfection Systems
	71601473 	71601473 	71662003 
Application	Free chlorine, free bromine, chlorine dioxide, dissolved ozone	Flow and holder assembly for adding disinfection sensors to an existing disinfection analysis system with a CM444 transmitter.	Total chlorine, chlorine dioxide
Measurement Type	Amperometric	Sensors and cables sold separately	Amperometric
Measuring Range	Free Chlorine: 0 to 200 ppm Free Bromine: 0 to 200 ppm Chlorine Dioxide: 0 to 200 ppm Dissolved Ozone: 0 to 2 ppm	Sensor dependent	Total Chlorine: 0 to 20 ppm Chlorine Dioxide: 0 to 200 ppm
Flow cell	CYA27	CYA27	CYA27
Operating Pressure	Controlled to 15 psi with lead-free regulator	Controlled to 15 psi with lead-free regulator	Controlled to 15 psi with lead-free regulator
Transmitter	CM442 or CM444	None. Sensors connect to existing disinfection system with CM444 transmitter	CM442 or CM444
Outputs	With CM442: Two 0/4-20 mA outputs, alarm relay and two discrete outputs. With CM444: Up to eight 0/4-20 mA outputs, alarm relay, up to four relay outputs (SPDT), Digital fieldbuses (HART, Profibus DP, ProfiNet, Modbus (485 or TCP) or EtherNet/IP), discrete outputs.		With CM442: Two 0/4-20 mA outputs, alarm relay and two discrete outputs. With CM444: Up to eight 0/4-20 mA outputs, alarm relay, up to four relay outputs, (SPDT), Digital fieldbuses (HART, Profibus DP, ProfiNet, Modbus (485 or TCP) or EtherNet/IP), discrete outputs
Inputs	CM442: Memosens Disinfection sensor and Memosens CPS31E pH CM444: Memosens Disinfection and Memosens CPS31E pH and up to six additional sensors.		CM442: Memosens Disinfection sensor CM444: Memosens Disinfection sensor and up to six additional sensors.
Power Supply	120-240 VAC, 50-60 Hz		120-240 VAC, 50-60 Hz
Display/Local Interface	Liquiline CM442 or CM444		Liquiline CM442 or CM444
Ambient Temperature	CM442: 0-140 °F CM444: 0-120 °F		CM442: 0-140 °F CM444: 0-120 °F
Mounting	Wall mountable TRESPA panel	Wall mountable TRESPA panel	Wall mountable TRESPA panel
Operation	Local interface via LCD display, menu-driven soft keys and navigator knob. Optional IP addressable webserver. Optional HART, Profibus DP, ProfiNet, Modbus (TCP or 485) or EtherNet/IP. Integrates with Fieldcare/ DeviceCare, Field Data Manager and W@M asset management.		Local interface via LCD display, menu-driven soft keys and navigator knob. Optional IP addressable webserver. Optional HART, Profibus DP, ProfiNet, Modbus (TCP or 485) or EtherNet/IP. Integrates with Fieldcare/ DeviceCare, Field Data Manager and W@M asset management.
Housing (transmitter)	Polycarbonate housing, IP66/67, Nema 4X		Polycarbonate housing, IP66/67, Nema 4X
Approvals/Certification	Transmitters: CE marked, CM442 and CM444: CSA C/US General purpose, System: EPA compliant to Method 334.0		Transmitters: CE marked CM442 and CM444: CSA C/US General purpose System: EPA compliant to Method 334.0

Analysis: Dissolved Oxygen

Dissolved Oxygen Sensors				
	Memosens COS81E	Memosens COS22E	Memosens COL37E	Memosens COL57E
				
Application	Life Sciences, Biopharmaceutical, Food/beverage, Industrial	Food and beverage, life sciences, power	Water, wastewater	Laboratory
Parameter	Optical dissolved oxygen, Oxygen, Temperature	Sterilizable amperometric dissolved oxygen	Optical oxygen	Dissolved Oxygen
Material	316L SS, FKM (fluoroelastomer), EPDM (Ethylene Propylene Diene Monomer), Silicon	316L SS, Silicone membrane cap (FDA), PTFE, steel mesh	Stainless steel	Stainless Steel
Measuring range	U-Cap: 4 µg/L to 30 mg/L; 4 ppb to 30 ppm; 0.1 to 700 hPa; 0.05 to 330% saturation C-Cap: 4 µg/L to 26 mg/L; 4 ppb to 26 ppm; 0.1 to 600 hPa; 0.05 to 285% saturation.	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 to 200 %SAT	0 to 200% SAT
Temperature sensor	Integrated Pt1000	Integrated NTC 22 kΩ	PT1000	PT1000
Ambient temperature	23 to 212 °F (-5 to 100 °C)	-13 to 158° F (-25 to +70 °C)		
Process temperature	32 to 140 °F (0 to 60 °C) C cap 32 to 175 °F (0 to 80 °C) U cap	-5 to +135 °C (23 to 175 °F)	-5 to +60 °C (23 to 140 °F)	-5 to +60 °C (23 to 140 °F)
Process pressure	0 to 190 psi (0.02 to 13 bar) absolute	12 bar (174 psi)	1 bar, not intended for continuous measurement in process	Ambient
Shaft length	120, 160, 220, 320 420 mm	120, 225, 360, 420 mm	120 mm (4.72 inch)	120 mm (4.72 inch)
Process connection	PG 13.5 thread	PG 13.5 thread	Inductive, digital connection head with Memosens 2.0 technology	
Sensor cable	CYK10 Memosens	COK21 (COS22), CYK10 (COS22E)		
Transmitter	Liquiline CM42, CM442/CM444/CM448, CM442R/CM444R/CM448R	COS22: Liquisys M COM223F/COM253F COS22E: Liquiline® CM42, CM442/444/448 and CM442R/444R/448R		
Approvals / certificates	CSA C/US IS NI Cl. I, Div. 1&2, GP A-D	CSA IS NI Cl. I, Div. 1&2, GP A-D		General purpose

Dissolved Oxygen Sensors		
	COS61D digital sensor with Memosens communications or Oxymax W COS61 (Optical sensor) 	Oxymax W COS51E Digital sensor with Memosens communications 
Application	Water, wastewater, fish farming	Water, wastewater, fish farming
Parameter	Optical (luminescence/fluorescence) dissolved oxygen	Amperometric dissolved oxygen
Material	316 Ti SS, POM, Silicon (fluorescence layer)	POM
Measuring range	0 to 20 ppm 0 to 200% saturation 0 to 400 hPa	0.01 to 100 ppm 0.00 to 1000% saturation 0 to 2000 hPa
Temperature sensor	Integrated NTC	Integrated NTC 30KΩ
Ambient temperature	-20 to +60 °C (0 to 140 °F)	-5 to +60 °C (23 to 140 °F)
Process temperature	-5 to +60 °C (20 to 140 °F)	-5 to +60 °C (20 to 140 °F)
Process pressure	0 to 10 bar (145 psi)	0 to 5 bar (72.5 psi)
Shaft length	N/A	N/A
Process connection	COS61: G1" thread COS61D: Combination ¾" MNPT and G1" thread	Combination ¾" MNPT and G1" thread
Sensor cable	COS61: Fixed cable or TOP68 with CYK71 cable COS61D: Fixed cable	CYK10
Transmitter	COS61: Liquisys M COM223/253, COS61D: Liquiline CM442/444/448 and CM442R/444R/448R	Liquiline CM42, CM442/444/448 and CM442R/444R/448R
Approvals / certificates	CSA US NI Cl. I, Div. 2 GP A-D T6	CSA IS/NI Cl. I, Div. 1&2, GP A-D

Dissolved Oxygen Holder Assemblies	
	Dipfit CYA10 
Application	Water, wastewater
Description	Tanks, sewers, wells, basins, channels or rivers
Area of use	Fixed installation
Process connection	Flange DN50, Flange 2", Chain bracket, Thread
Material	Polyethylene
Maximum pressure	Max. 4 bar (relative)
Maximum temperature	0 to 60 °C (32 to 140 °F)
Immersion depth	10 meters (32.8 feet)
Sensor connection thread	1 x PG 13.5

Dissolved Oxygen and Multi Parameter Transmitters			
	Liquiline CM442/CM444/CM448 Digital Memosens Field Transmitter 	Liquiline CM442R/CM444R/CM448R Digital Memosens DIN Rail-mount Transmitter 	Liquiline 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/UV254, free chlorine, total chlorine, free bromine and ozone	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, total chlorine, free bromine and ozone	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, ProfiNet, 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, ProfiNet, 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 Memosens technology inductive conductivity sensors Analog sensors: pH, differential pH, IsFET pH, ORP, two and four electrode conductivity/resistivity, and inductive conductivity/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, ProfiNet, 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, ProfiNet, 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. CSA C/US Cl. I, Div. 2 GPs A-D Option: Transmitter Cl. I, Div 2; Digital sensor Cl. I, Div. 1.	CE mark. CSA C/US Cl. I, Div. 2 GPs A-D Option: Transmitter Cl. I, Div 2; Digital sensor Cl. I, Div. 1.	CE mark FM IS NI, Cl. I, Div 1, Groups A-D or CSA IS NI, Cl. I, Div 1, Groups A-G

Dissolved Oxygen Transmitters		
	Liquiline CM82 Digital Memosens Compact Transmitter 	Liquiline CM72 Digital Memosens Compact Transmitter 
Application	Process, industrial	Process, industrial
Measurement type	Memosens pH, ORP, conductive conductivity, dissolved oxygen	Memosens pH, ORP, conductive conductivity, dissolved oxygen
Measurement range	Dependent on connected sensor type	pH: 2-14 (fixed) ORP: 1500 to +1500 mV (fixed) Conductivity: 0 to 20µs/cm, 500µs/cm, 20 ms/cm or 500 ms/cm Oxygen: 0 to 200µg/l or 20 mg/l
Output	4-20 mA (loop powered); HART	4-20 mA (loop powered)
Input	None	None
Power supply	12.6 to 30 VDC (alarm current >20mA) 14 to 30 VDC (alarm current <4 mA)	12.6 to 30 VDC (alarm current >20mA) 14 to 30 VDC (alarm current <4 mA)
Ambient temperature	0 to 185 °F (-20 to 85 °C)	0 to 185 °F (-20 to 85 °C)
Mounting	Sensor mounted	Sensor mounted
Operation	Bluetooth interface (optional)	Fixed output
Housing	PEEK; NEMA 6, IP76/68	PEEK; NEMA 6, IP76/68
Approvals / certificates	CSA C/US General Purpose CSA C/US IS Cl.1 Div. 1	CSA C/US General Purpose CSA C/US IS Cl.1 Div. 1

Dissolved Oxygen Handheld	
	Liquiline Mobile CML18 
Application	Laboratories in life science, water, wastewater, chemical, food/beverage
Measurement type	pH, ORP, conductivity, dissolved oxygen
Measurement range	Sensor dependent
Outputs	Display, Bluetooth
Sensor input	Memosens receptacle or M12 cable
Additional inputs	None
Power	Inductive charger (qi qualified)
Ambient temperature	14 to 140 °F
Mounting	Handheld or sensor mounted
Operation	Display and two soft keys
Housing	Polycarbonate
Protection	IP66
Approvals / certificates	47 CFR 15.247

Digital to Analog Converter	
	CYM17 Converter 
Application	Life Sciences, benchtop fermentation measurement
Measurement type	pH, dissolved oxygen
Measurement range	Sensor dependent
Outputs	pH: M12 4-pin, mV signal according to Nerst equation Oxygen: T82 socket, 0-60 mA with 60 nA at 100% saturation
Sensor input	Memosens M12 for pH and dissolved oxygen
Additional inputs	None
Power	USB power supply, 5 V DC
Ambient temperature	23 to 122 °F
Mounting	Tabletop
Housing	Aluminum
Approvals / certificates	General purpose

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: G1½ 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 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 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 CUS50D with Memosens communications	Turbimax CUS51D with Memosens communications	Turbimax CUS52D with Memosens communications
			
Application	Wastewater, industrial	Water, wastewater	Water, wastewater
Parameter	Turbidity and Total Suspended Solids (TSS)	Turbidity and Total Suspended Solids (TSS)	Turbidity, temperature
Measurement method	Light attenuation/absorption	90° and 135° back-scatter, 4-beam pulsed light, 860 nm LED	90 °F scattered light, 860 nm (Infrared)
Material	316Ti SS or PPS; PTFE optical sensor head	316L SS, sapphire optical window	316L SS or PEEK /PPS, sapphire optical window
Measuring range	Absorbance: 0.00 to 5.00 Au or 0.000 to 10.000 OD Turbidity: 40 to 4,000 FAU Solids: 0 to 25 g/L (sludge)	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	Integrated NTC	N/A	Integrated NTC
Ambient temperature	-4 to 140 °F	-4 to +140 °F	-4 to 185 °F
Process temperature	-4 to 185 °F	23 to 120 °F	316L SS: -4 to 185 °F; Plastic: -4 to 140 °F
Process pressure	0.5 to 4.5 bar (7.3 to 65.3 psia)	0.5 to 10 bar (7 to 145 psia)	316L SS: 7.3 to 134 psi; Plastic: 7.3 to 87 psi
Process connection	Combination 3/4" MNPT and G1" thread 2" Tri-clamp (depends on sensor version)	Combination 3/4" MNPT and G1" thread	Combination 3/4" 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	Submersible, optional accessories available for flow through and insertion installations
Sensor cable	Fixed	Fixed	Fixed
Transmitter	Liquiline® CM442/444/448 or CM442R/444R/448R	Liquiline® CM442/444/448 or CM442R/444R/448R	Liquiline® CM442/444/448 or CM442R/444R/448R
Approvals	Non-hazardous	Non-hazardous	Non-hazardous

Sludge Level Sensor	
	Turbimax CUS71D with Memosens communications
Application	Water, wastewater
Parameter	Submersed Ultrasonic Interface Level Sensor (with or without wiper)
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 3/4" 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
					
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 CUS51D
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: G1 1/4 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: G1 1/4 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, 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, ProfiNet, 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, ProfiNet, 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, ProfiNet, 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, ProfiNet, 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 CSA C/US Cl. I, Div. 2 GPs A-D Option: Transmitter Cl. I, Div 2; Digital sensor Cl. I, Div. 1	CE mark CSA C/US Cl. I, Div. 2 GPs A-D Option: Transmitter Cl. I, Div 2; Digital sensor Cl. I, Div. 1.

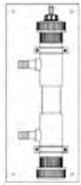
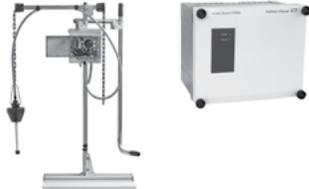
Automated cleaning	
	<p>CYR52</p> 
Application	Ultrasonic cleaning with CUA252 or CUA 262
System capability	Automatic ultrasonic turbidity sensor cleaning
System components	CYR25 controller and ultrasonic transducer
Basic function	On-line sensor ultrasonic cleaning
Power supply	115 VAC
Ambient temperature	+14 to 140 F (-10 to 60 C)
Mounting	Wall mount control, flow assembly clamp
Control	Liquiline transmitter relay
Controller housing	Polycarbonate, IP66/67, NEMA 4X
Transducer rating	IP 68
Approval	General purpose

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 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 CA80AL Aluminum 	Liquiline System CA80AM Ammonium 	Liquiline System CA80CR Chromate 	Liquiline System CA80FE Iron 	Liquiline System CA80NO Nitrite 	Liquiline System CA80PH Orthophosphate 	Liquiline System CA80TP Total Phosphorous 
Applications	Drinking water, wastewater	Wastewater treatment	Industrial water	Drinking water	Water, wastewater treatment	Wastewater treatment	Municipal and industrial wastewater
Measurement type	Colorimetric: Pyrocatechol violet method	Colorimetric: Indophenol blue method	Colorimetric: Diphenylcarbazide method	Colorimetric: Ferrozine method	Colorimetric: Naphthylamine method	Colorimetric: Molybdenum blue or Molybdate vanadate yellow method	Digestion and colorimetric: Molybdenum Blue
Parameter	Al (ppb, µg/L)	NH ₄ - N (ppm)	Cr (VI), CrO ₄ (mg/L, µg/L, ppm, ppb)	Fe (ppm, mg/L, ppb, µg/L)	NO ₂ , NO ₂ - N (µg/L, ppm)	PO ₄ - P (ppm)	Total Phosphorus (ppm, mg/L)
Measuring ranges	15 to 1,000 ppb (µg/L)	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 20 ppm (mg/L) (yellow method) 0.5 to 50 ppm (mg/L) (yellow method)	0.05 to 10 ppm (mg/L) 0.5 to 50 ppm (mg/L) (With optional dilution module)
Outputs	Standard: Two 0/4-20 mA Optional <ul style="list-style-type: none"> ■ Up to four additional 0/4-20 mA ■ Profibus DP, PROFINET, Modbus 485, Modbus TCP or EtherNet/IP ■ Webservice ■ Up to 4 relays 	Standard: Two 0/4-20 mA Optional <ul style="list-style-type: none"> ■ Up to four additional 0/4-20 mA ■ Profibus DP, PROFINET, Modbus 485, Modbus TCP or EtherNet/IP ■ Webservice ■ Up to 4 relays 	Standard: Two 0/4-20 mA Optional <ul style="list-style-type: none"> ■ Up to four additional 0/4-20 mA ■ Profibus DP, PROFINET, Modbus 485, Modbus TCP or EtherNet/IP ■ Webservice ■ Up to 4 relays 	Standard: Two 0/4-20 mA Optional <ul style="list-style-type: none"> ■ Up to four additional 0/4-20 mA ■ Profibus DP, PROFINET, Modbus 485, Modbus TCP or EtherNet/IP ■ Webservice ■ Up to 4 relays 	Standard: Two 0/4-20 mA Optional <ul style="list-style-type: none"> ■ Up to four additional 0/4-20 mA ■ Profibus DP, PROFINET, Modbus 485, Modbus TCP or EtherNet/IP ■ Webservice ■ Up to 4 relays 	Standard: Two 0/4-20 mA Optional <ul style="list-style-type: none"> ■ Up to four additional 0/4-20 mA ■ Profibus DP, PROFINET, Modbus 485, Modbus TCP or EtherNet/IP ■ Webservice ■ Up to 4 relays 	Standard: Two 0/4-20 mA Optional <ul style="list-style-type: none"> ■ Up to four additional 0/4-20 mA ■ Profibus DP, PROFINET, Modbus 485, Modbus TCP or EtherNet/IP ■ Webservice ■ Up to 4 relays
Inputs	<ul style="list-style-type: none"> ■ Up to four Memosens sensors (optional) ■ Two analog inputs (optional) 	<ul style="list-style-type: none"> ■ Up to four Memosens sensors (optional) ■ Two analog inputs (optional) 	<ul style="list-style-type: none"> ■ Up to four Memosens sensors (optional) ■ Two analog inputs (optional) 	<ul style="list-style-type: none"> ■ Up to four Memosens sensors (optional) ■ Two analog inputs (optional) 	<ul style="list-style-type: none"> ■ Up to four Memosens sensors (optional) ■ Two analog inputs (optional) 	<ul style="list-style-type: none"> ■ Up to four Memosens sensors (optional) ■ Two analog inputs (optional) 	<ul style="list-style-type: none"> ■ Up to four Memosens sensors (optional) ■ Two analog inputs (optional)
Power supply	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)	41 to 104 °F (5 to 40 °C)
Operation	Liquiline Transmitter. Back light transfective display. Push button with navigator knob	Liquiline Transmitter. Back light transfective display. Push button with navigator knob	Liquiline Transmitter. Back light transfective display. Push button with navigator knob	Liquiline Transmitter. Back light transfective display. Push button with navigator knob	Liquiline Transmitter. Back light transfective display. Push button with navigator knob	Liquiline Transmitter. Back light transfective display. Push button with navigator knob	Liquiline Transmitter. Back light transfective display. Push button with navigator knob
Housing	Amorphous thermoplastic alloy (ASA-Polycarbonate) or stainless steel						
Approvals/certificates	CE Marked, CSA C/US General Purpose						

Analyzer systems			
	Liquiline System CA80HA Hardness 	Liquiline System CA80SI Silica 	CA76NA Sodium 
Applications	Process waters, drinking water	Industrial water; boiler feed; condensate	Steam, water, condensate
Measurement Type	Colorimetric: Phthalein purple complex method	Colorimetric: Heteropoly blue method	Potentiometric NA Ion specific electrode
Parameter	CaCO ₃ (mg/l, µg/L, ppm, ppb)	SiO ₂ (mg/L, µg/L, ppm, ppb)	Na (µg/L, ppb)
Measuring Ranges	0 to 80 mg/l (ppm)	0.5 to 200 ppb (µg/L) 50 to 5000 ppb (µg/L)	0.1 to 2000 µg/l (ppb) 0.1 to 9999 µg/l (ppb)
Outputs	Standard: Two 0/4-20 mA Optional <ul style="list-style-type: none"> ■ Up to four additional 0/4-20 mA ■ Profibus DP, PROFINET, Modbus 485, Modbus TCP or EtherNet/IP ■ Webserver ■ Up to 4 relays 	Standard: Two 0/4-20 mA Optional <ul style="list-style-type: none"> ■ Up to four additional 0/4-20 mA ■ Profibus DP, PROFINET, Modbus 485, Modbus TCP or EtherNet/IP ■ Webserver ■ Up to 4 relays 	<ul style="list-style-type: none"> ■ Up to six 0/4- 40 mA ■ Two relays - alarms/warnings ■ Profibus DP
Inputs	<ul style="list-style-type: none"> ■ Up to four Memosens sensors (optional) ■ Two analog inputs (optional) ■ Up to 4 discrete inputs (optional) 	<ul style="list-style-type: none"> ■ Up to four Memosens sensors (optional) ■ Two analog inputs (optional) ■ Up to 4 discrete inputs (optional) 	None
Power Supply	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)
Operation	Liquiline Transmitter. Back light transfective display. Push button with navigator knob.	Liquiline Transmitter. Back light transfective display. Push button with navigator knob.	Local display with six button interface.
Housing	Amorphous thermoplastic alloy (ASA-Polycarbonate) or stainless steel	Amorphous thermoplastic alloy (ASA-Polycarbonate) or stainless steel	IP 65 Electronics housing, with open system components
Approvals/Certificates	CSA C/US General Purpose, CE Marked	CSA C/US General Purpose, CE Marked	CE Marked

Analyzer sample preparation systems				
	Liquiline System CAT810 Sample preparation system 	TSP: 71317631 Collection vessel for use with CAT820 or CAT860 	Liquiline System CAT820 Sample preparation system 	Liquiline System CAT860 Sample preparation system 
Applications	Wastewater Treatment; outlet low solids.	Wastewater treatment; for use with CAT820 or CAT860	Wastewater Treatment; sludge.	Wastewater Treatment; inlet with fat or oils present.
Filter type	50 µm stainless sieve filter.	0.1 or 0.4 µm ceramic filter	0.1 or 0.4 µm ceramic filter	0.1 or 0.4 µm ceramic filter
Back flush	Compressed air or water	Compressed air or chemical	Compressed air.	Cleaning solution and compressed air.
Filtrate delivery method	Back pressure in filter system to deliver adequate flow to analyzer	Peristaltic pump from CAT820 or CAT860	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; using CAT820 or CAT860	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)	60 psi (4 bar) maximum	Atmospheric	Atmospheric
Ambient Temperature	39 to 104 °F (4 to 40 °C)	40 to 100 °F (5 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	None	IP66/67	IP55
Power Supply	115/230 VAC for timer version	None	115/230 VAC with hose heater	115/230 VAC with hose heater
Sample distance	N/A	Filter to pump: <ul style="list-style-type: none"> ■ 9.8 ft (3 m), 16.4 ft (5 m) Pump to analyzer: <ul style="list-style-type: none"> ■ 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: <ul style="list-style-type: none"> ■ 9.8 ft (3 m), 16.4 ft (5 m) Pump to analyzer: <ul style="list-style-type: none"> ■ 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: <ul style="list-style-type: none"> ■ 9.8 ft (3 m), 16.4 ft (5 m) Pump to analyzer: <ul style="list-style-type: none"> ■ 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	Wall mount	Pole or wall	Wall or analyzer stand

Analysis: TOC

Analyzer, TOC			
	CA72TOC	CA78TOC	CA79TOC
			
Application	Industrial and municipal wastewater treatment	Semiconductor and power	Life Science
Analyzer function	Continuous TOC measurement	Ultra Pure Water TOC	Ultra Pure Water TOC with System Suitability test function
Analyzer type	Catalytic, high temperature oxidation	UV oxidation with differential conductivity	UV oxidation with differential conductivity
Measurement range	2 to 50,000 mg/l TOC	0.5 to 1,000 ppb TOC	0.5 to 1,000 ppb TOC
Detection limit	2 mg/l TOC with IR detector 500 ppm	0.1 ppb	0.1 ppb
Response time	7 minutes	50 seconds	50 seconds
Output	0/4 to 20 mA selectable Dry contact relay for high, low limit and slope Dry contact relay fault signal	0/4-20 mA and NO/NC error contact; Optional second 0/4-20 mA channel	0/4-20 mA and NO/NC error contact; Optional second 0/4-20 mA channel
Power supply	0-230 VAC or 0-115 VAC option	100/240 VAC, 50-60 Hz	100/240 VAC, 50-60 Hz
Display/local operation	16 line, 40 characters, backlit LCD graphics display 21 key operation, RS232C for data output	Color touch screen	Color touch screen
Data presentation	6-hour graphic (14 day scrollable); current value with 5-digit resolution	TOC value, conductivity and temperature with time graph	TOC value, conductivity and temperature with time graph
Monitoring	Warning logs, malfunctions, limit value alarms and calibration for previous 4 weeks, leakage alerts, defective probe, general errors for measuring cell, dilution water failure	High level TOC and conductivity, leak detection, UV level, sampling error and system checks	High level TOC and conductivity, leak detection, UV level, sampling error and system checks
Data storage	14 days in RAM; 90 days with diskette drive	Measurement data via USB	Measurement data via USB
Ambient temperature	40 to 104 °F	50 to 113 °F (10 to 45 °C)	50 to 113 °F (10 to 45 °C)
Sample handling	Bypass sampler with prep and self-cleaning coarse filter	Particle free, 7.25 psi max., <122°F, <2 µS/cm conductivity	Particle free, 7.25 psi max., <122°F; <2 µS/cm conductivity
Sample flow rate	0.1 to 35 GPM depending on sample bypass system	~14 ml/min	~14 ml/min
Approvals		Non-hazardous	Non-hazardous; 21 CFR Part 11 compliant

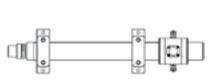
Analysis: Nutrient

Wastewater nitrate, ammonium, etc	
	ISEmax CAS40D with Memosens communications 
Application	Wastewater
Measurement type	Ion-selective electrode system
Input	Ammonium, nitrate, potassium, chloride, pH
Measurement range	0.1 to 1000 mg/l NH ₄ -N 0.1 to 1000 mg/l NO ₃ -N 1 to 1000 mg/l potassium 1 to 1000 mg/l chloride
Ambient temperature	-4 to +120 °F
Process temperature	36 to 100 °F, max 6 psi
Sensor	PVC, glass, polyethylene (wetted parts dependent on electrodes used), O-rings EPDM
Sensor cable	328 feet maximum
Sensor mounting	Upright post with boom (CYH112 / CYA112)
Approvals / certificates	CE, Non-hazardous

	UV, nitrate or SAC sensor	Spectrometer
	Viomax® CAS51D with Memosens communications 	CAS80E with Memosens communications 
Application	Drinking, process, industrial and waste water	Drinking, surface, process, waste and industrial water
Parameter	Nitrate or SAC	Nitrate, SAC, TOC, COD, BOC, DOC, APHA, Turbidity, TSS
Material	316L SS, quartz glass, EPDM O-rings	316L SS, titanium, quartz, sapphire, EPDM O-rings
Measuring range	NO ₃ -N: 0.1 to 50 mg/l; Clear water and activated sludge NO ₂ -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 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 410 mg/l) Organic load at inlet, industrial	TOCeq: 0 to 8000 mg/l CODeq: 0 to 20 000 mg/l BODeq: 0 to 5000 mg/l SAC254: 0 to 1000 /m TU: 0 to 800 FAU TSS: 0 to 10 000 mg/l NO ₃ -N: 0 to 500 mg/l APHA/Hazen: 0 to 500 Hazen
Ambient temperature	-4 to +140 °F	-20 to 60 °C (-4 to 140 °F)
Process temperature	41 to 120 °F	0 to 50 °C (32 to 122 °F)
Process pressure	7 to 145 psia	0.5 to 10 bar (7.3 to 145 psi) (absolute)
Insertion depth	Cuvette gap must be submerged	Cuvette gap must be submerged
Process connection	¾" NPT, G1	¾" NPT, G1
Sensor cable	Fixed, Memosens, maximum 328 ft	Fixed, Memosens, maximum 328 ft
Approvals	Non-hazardous	Non-hazardous, CSA C/US General Purpose

Water/Wastewater Transmitters		
	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, 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
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, ProfiNet, 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, ProfiNet, 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, ProfiNet, 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, ProfiNet, 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 CSA C/US NI Cl. I, Div. 2 GP A-D Option: Transmitter Cl. I, Div. 2, Digital sensor Cl. I, Div. 1. GP A-D.	CE mark CSAC/US NI Cl. I, Div. 2 GP A-D Option: Transmitter Cl. I, Div. 2; Digital sensor Cl. I, Div. 1. GP A-D

Modular Holder Assemblies		
	Flexdip CVH112	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 float 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, ISEmax CAS40D	Flexdip CVH112
Material	Stainless steel and plastic	Stainless steel and PVC
Ambient temperature	-4 to +140 °F	-4 to +140 °F
Main pipe height	20", 40", 71"	Lengths vary depending on application
Cantilever arm length	20", 40", 59"	N/A

Holder Assemblies		
	Flowfit CYA251	71110000
		
Application	Process, wastewater	Clean water
Description	Flow assembly for nitrate/SAC (CAS51D), turbidity (CUS51D), dissolved oxygen (COS51E, COS61D)	Flow assembly for UV Nitrate (CAS51D)
Material	PVC, EPDM (seals)	PVC
Maximum pressure	87 psi at 68 °F	
Temperature	32 to 120 °F	
Flow rate	53 gal/hr for oxygen, 26.5 for turbidity and UV nitrate	
Sensor connection	Compression fitting	Compression, o-rings
Holder installation	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	Wall mount with 6 mm OD hose connection

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, ProfiNet 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 from 1 liter (24 containers) to 60 liter (1 container), containers made of PE or glass depending on application	Various sizes and combinations available from 1 liter (24 containers) to 20 liter (1 container), containers made of PE or glass depending on application
Transmitter	Liquiline CM44x	Liquiline CM44x
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, Non-hazardous	CE, Non-hazardous

Analysis: Process Photometers

Concentration and Color Sensors		
	Model OUSAF21 Flow through optical	Model OUSAF22 Flow through optical
		
Transmitter type	Liquiline CM44P	Liquiline CM44P
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 XP Cl. I, Div. 1 Grps B-D	4 watt incandescent, rated for FM XP Cl. I, Div. 1 Grps B-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	Liquiline CM44P
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, Non-hazardous
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, single channel	OUSAF46 Flow through UV, dual channel
		
Transmitter type	Liquiline CM44P	Liquiline CM44P
Application	Phase separation, Chromatography	Phase separation, Chromatography
Sensor type	Spectral absorbance in UV range	Spectral absorbance in UV range
Measurement wavelength	254 to 365 nm	254 to 365 nm
Path length	0.5 to 100 mm	0.5 to 100 mm
Lamp	Low pressure mercury vapor, 4 watt FM XP Cl. I, Div. 1, Grps B-D	Low pressure mercury vapor, 4 watt Non-hazardous
Detector type	UV enhanced silicone detector	UV enhanced silicone detector
Output	Low level current	Low level current
Window material	Fire polished quartz or sapphire	Fire polished quartz or sapphire
Maximum temperature	194 °F continuous; with PEEK isolators, 266 °F	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
Process connection	FNPT, Tri-Clamp, 150/300 lb flange	Tri-Clamp, 150/300 lb flange, FNPT
Sensor material	316L SS	316L SS

Turbidity Sensor	
	Model OUSTF10 Flow through scattered light
	
Transmitter type	Liquiline CM44P
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 XP Cl. I, Div. 1 Grps B-D
Output	Low level current, ppm or FTU
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	Liquiline CM44P
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	¾" FNPT
Sensor material	316L SS Teflon® head

Suspended Solids and Interface Sensor	
	OUSAF12 Flow through optical 
Transmitter type	Liquiline CM44P
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 XP Cl. I, Div. 1 Grps B-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 
Application	Chemical, Food, Pharmaceutical	Chemical, Food, Pharmaceutical
Measurement type	Multi-parameter transmitter for process photometers and Memosens 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), EtherNet/IP), ProfiNet	Up to eight 0/4-20 mA outputs, up to four relays (SPDT), discrete outputs, digital fieldbuses (HART, Profibus, Modbus (TCP/485), EtherNet/IP), ProfiNet
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, ProfiNet, 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, ProfiNet, 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, CSA C/US NI Cl. I, Div. 2 GP A-D	CE Mark, CSA C/US NI Cl. 1, Div. 2 GP A-D

Flow Assembly		
	OUA260 	CYA680 
Application	Flow assembly for certain OUSAF sensors for the measurement of UV and NIR absorption, color and turbidity	Holder for one or two 120 mm, PG13.5 sensors
Sensor types	OUSAF44/45/46/10/12/22 and OUSTF10	pH, 4-pole conductivity, dissolved oxygen
Optical path lengths	0.5 mm to 90 mm	N/A
Line sizes	¼" to 4"	0.25", 0.5", 0.75", 1", 1.5", 2"
Optical window materials	Pyrex, quartz, sapphire	N/A
Materials	316L SS, titanium, Hastelloy, PEEK, Kynar	316L SS
O-rings/sealing material	Viton, silicone, EPDM, Kalrez	EPDM, Kalrez, Viton
Process connections	Tri-Clamp, 150 lb/300 lb ANSI RF flanges, NPT female, Swagelock BVCO, Swagelock tube, tube stub	Tri-clamp
Process temperature	32 to 266 °F (Ensure compatible with process temperature of selected sensor)	Sensor specific
Process pressure	Up to 1450 psi depending on material, line size and process connection	Sensor specific

Analysis: Software

Multichannel, multiparameter PC software for Memosens sensors	
	Memobase® Plus 
Functions	<ul style="list-style-type: none"> ▪ Measure ▪ Calibrate ▪ Document
Multiparameter and multichannel	<ul style="list-style-type: none"> ▪ Up to 4 parallel measurements of pH, DO, Conductivity ▪ Enable use of same sensors as in process ▪ Store single measurement or data-logging over time ▪ Export to PDF or Excel
Calibration	<ul style="list-style-type: none"> ▪ 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	<ul style="list-style-type: none"> ▪ 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)

Optical Analysis – Raman spectroscopy

	Raman Rxn2 lab-to-process analyzer	Raman Rxn4 process analyzer
	Raman Rxn2 	Raman Rxn4 
Principle of measurement	Laser-based Raman spectroscopy for solid, liquid, or gas analysis	Laser-based Raman spectroscopy for solid, liquid, or gas analysis
Field of applications	Chemical: polymerization, extrusion monitoring, polymer blending, catalysis investigation; Pharmaceutical: reaction chemistry, yield crystallization, polymorph, blending, drying, granulations Biopharmaceutical: bioprocess monitoring and control, PAT/QbD applications, cell culture, fermentation, downstream operations, cGLP/cGMP compatible Food & Beverage: zonal heterogeneity, fermentation	Chemical: reaction monitoring, blending, catalysis investigations Oil & Gas: LNG, refining, energy measurements Polymer: polymerization reaction monitoring, extrusion monitoring, polymer blending Pharmaceutical: API reaction monitoring, crystallization, polymorph Biopharmaceutical: bioprocess monitoring and control, PAT/QbD applications, cell culture, fermentation, downstream operations, cGLP/cGMP compatible Food & Beverage: mapping of meats and fish, fermentation, reaction monitoring
Laser wavelength	532 nm, 785 nm, 1000 nm	532 nm, 785 nm, 1000 nm
Temperature and relative humidity	Operating temp: 15 to 30 °C (59 to 86 °F). Storage temp: -15 to 50 °C (5 to 122 °F) Relative humidity: 20-80%, non-condensing	Base model/hybrid operating temp: 5 to 35 °C (41 to 95 °F) for 532 nm or 785 nm, 5 to 30 °C (41 to 86 °F) for 1000 nm. Enclosure configuration operating temp (all wavelengths): 5 to 50 °C (41 to 122 °F) Storage temp: -15 to 50 °C (5 to 122 °F) Relative humidity: 20-80%, non-condensing
Input voltage	100-240 V, 50-60 Hz, ±10%	Base model/hybrid: 100-240 V, 50-60 Hz, ±10% Enclosure configuration: 120 V ±10%, 60 Hz -OR- 230 V ±10%, 50/60 Hz
Power consumption	400 W (max), 250 W (typical start-up), 120 W (typical running)	Base model/hybrid: 400 W (max), 250 W (typical start-up), 120 W (typical running) Enclosure configuration: 1560 (max), 1560 (typical start-up), 750 (typical running)
Unit dimensions (width x height x depth)	Benchtop model: 279 x 483 x 592 mm (10.99 x 19.02 x 23.31 in.); Mobile cart model: 685 x 1022 (to tabletop) x 753 mm (26.97 x 40.24 x 29.65 in.)	Base model/hybrid: 483 x 267 x 556 mm (19.02 x 10.52 x 21.89 in.) Enclosure configuration (with optional trolley): 1175 x 1480 x 826 mm (46.26 x 58.27 x 32.52 in.)
Weight	Base model: 32 kg (71 lb.); mobile cart model: 93 kg (205 lb.)	Base model: 28.5 kg (63 lb.) Enclosure configuration: 185.5 kg (409 lb.) with optional trolley
Sampling probe compatibility	Rxn-10 (with accessory optics), Rxn-40, Rxn-41, Rxn-45, and Rxn-46; starter configuration: Rxn-10 (with accessory optics); hybrid configuration: Rxn-20 (with accessory optics) and one other Endress+Hauser Raman probe	Rxn-10 (with accessory optics), Rxn-40, Rxn-41, Rxn-45, and Rxn-46; hybrid configuration: Rxn-20 (with accessory optics) and one other Endress+Hauser Raman probe
Channels	Single channel (standard), with optional four channel capability; single channel starter and two channel hybrid configurations also available (785 nm only)	Single channel (standard), with optional four channel capability; two channel hybrid configuration also available (785 nm only)
Hazardous area certifications	ATEX, CSA, IECEx	Base model/hybrid: ATEX, CSA, IECEx (contact Support for enclosure configuration options)
Connection interface	OPC, Modbus, and HTTPS (contact Sales for other options)	OPC, Modbus, and HTTPS (contact Sales for other options)
Installation options	Benchtop (standard) or mobile wheeled cart	19-inch rack package; NEMA 4X enclosure (wall mountable, mobile trolley or fixed stand) also available

Raman Rxn5 process gas analyzer	
	Raman Rxn5 
Principle of measurement	Laser-based gas-phase Raman spectroscopy
Field of applications	Hydrogen production/purity, HyCO production, methanol production, ammonia production, hydrogen recycle, gas turbine fuel feed, synthetic natural gas/IGCC power plants
Process measurement points	Reformers (SMR, POX, ATR), gasifiers (coal, petcoke, waste, biomass), shift converters, hydrotreaters, hydrocrackers, CO ₂ removal, finished product synthesis loops
Measurement parameters	Composition analysis of gas mixtures containing many of the following gases: H ₂ , N ₂ , O ₂ , CO, CO ₂ , H ₂ S, CH ₄ , C ₂ H ₄ , C ₂ H ₆ , Cl ₂ , F ₂ , HF, BF ₃ , SO ₂ , CO ₂
Laser wavelength	532 nm
Measurement range	Concentrations between 0.1 and 100% (by volume)
Input voltage	90-264 VAC, 47-63 Hz standard
Max power	<300 Watts max (typical start-up), 200 Watts (typical running)
Communication	Serial: RS485, Modbus TCP/IP
User interface	Touchscreen color LCD display
Fiber optic cable length	Up to 250 m
Unit dimensions (width x height x depth)	457 x 834 x 254 mm (18.00 x 32.84 x 10.00 in.)
Weight	61 kg (135 lb.)
Temperature	Operating temperature: -20 to 50 °C (-4 to 122 °F) (solid state cooling – no vortex or other external cooling required) Recommended storage: -30 to 60 °C (-22 to 140 °F)
Channels	Up to four (a dedicated laser per probe allows for simultaneous operation)
Sampling probe compatibility	Rxn-30 probe (gas)
Hazardous area certifications	ATEX, CSA, IECEx
Installation options	IP56 wall-mounted, sealed/purged enclosure

Raman spectroscopic probes for liquid-phase bioprocess analysis				
	Rxn-10 probe with bIO-Optic 	Rxn-10 probe with Raman optic system for single use 	Rxn-45 probe 	Rxn-46 probe 
Field of applications	For use with continuous in-line measurement in benchtop bioreactor/ fermentor applications requiring headplate entry	For use with disposable fittings for single-use bioreactors (SUBs)	Cell culture: glucose, lactate, cell density, titer, amino acids, and more Fermentation: glucose, glycerol, acetate, methanol, ethanol, biomass and more	Cell culture: glucose, lactate, cell density, titer, amino acids and more
Laser wavelength	785 nm, 1000 nm	785 nm, 1000 nm	785 nm, 1000 nm	785 nm
Laser maximum	Maximum power into probe head: <499 mW	Maximum power into probe head: <499 mW	Maximum power into probe head: <499 mW	Maximum power into probe head: <499 mW
Sample interface	Temperature, bIO-Optic: -30 to 150 °C Temperature ramp: ≤30 °C/min Pressure, bIO-Optic: ≤200 psig Temperature, Rxn-10 probe: -10 to 70 °C Pressure, Rxn-10 probe: ambient	Temperature, single use optic: 0 to 100 °C Temperature ramp: ≤30 °C/min Pressure, singleuse optic: n/a Temperature, Rxn-10 probe: -10 to 70 °C Pressure, Rxn-10 probe: ambient	Temperature: -30 to 150 °C Temperature ramp: ≤30 °C/min Pressure: ≤200 psig	Temperature: probe is non-contact; operating temp: 10 to 50 °C Pressure: n/a (probe is non-contact)
Wetted materials	bIO-Optic body: 316L stainless steel Window: Proprietary material, optimized for bioprocesses Process connection: PG13.5 Surface finish: Ra 15 with electropolish Adhesive: USP Class VI and ISO 10993 compatible	Not applicable to this optic	Body: 316L stainless steel Window: Proprietary material, optimized for bioprocesses Process connection: PG13.5 for industry standard sensor housings, welded port connectors available Surface finish: Ra 15 with electropolish Adhesive: USP Class VI and ISO 10993 compatible	Body: n/a Window: n/a Process connection: Sartorius BioPAT Spectro® Surface finish: n/a Adhesive: n/a
Fiber optic cable	Design: PVC jacketed, proprietary construction Connections: proprietary electro-optic (EO), or FC to EO fiber converter(s) for non-embedded systems Temperature: -40 to 70 °C Minimum bend radius: 152.4 mm Length: Contact Sales for available lengths	Design: PVC jacketed, proprietary construction Connections: proprietary electro-optic (EO), or FC to EO fiber converter(s) for non-embedded systems Temperature: -40 to 70 °C Minimum bend radius: 152.4 mm Length: Contact Sales for available lengths	Cable sold separately	Cable sold separately
Immersible length (mm)	bIO-Optic: 120, 220, 320, 420	Dimensions vary according to single use bioreactor vendor port and fitting type	120	n/a
Immersible diameter (mm)	bIO-Optic: 12	Dimensions vary according to single use bioreactor vendor port and fitting type	12	n/a
Sterilization method	Autoclave	n/a	SIP/CIP	n/a

Raman spectroscopic probes for liquid-phase analysis

	Rxn-10 probe with immersion optic	Rxn-40 probe	Rxn-41 probe
			
Field of applications	Can be used in reaction vessels, laboratory reactors, or process streams. Ideal for quick liquids, slurries and semi-solids measurements in the lab for a variety of applications.	Chemical: reaction monitoring, blending, catalyst monitoring, feed and final product monitoring Polymer: polymerization reaction monitoring, extrusion monitoring, polymer blending Pharmaceutical: API reaction monitoring, crystallization, polymorph, blending Oil & Gas: any hydrocarbon analysis	Chemical: reaction monitoring, blending, feed and final product monitoring Polymer: polymerization reaction monitoring, polymer blending Pharmaceutical: API reaction monitoring, crystallization, polymorph, drug substance production unit operation Oil & Gas: any hydrocarbon analysis
Laser wavelength	532 nm, 785 nm, 1000 nm	532 nm, 785 nm, 1000 nm	532 nm, 785 nm, 1000 nm
Laser maximum	Maximum power into probe head: <499 mW	Maximum power into probe head: <499 mW	Maximum power into probe head: <499 mW
Sample interface	Temperature, immersion optic: -30 to 120 °C (316L stainless steel), -30 to 280 °C (C276 alloy), -30 to 300 °C (Grade 2 titanium) Temperature ramp: ≤30 °C/min Pressure, immersion optic: Minimum pressure (Bara): full vacuum (0 Bara) but not ultrahigh vacuum (UHV) where outgassing may be a concern Maximum pressure (Barg): 68.5 (316L stainless steel), 74.0 (C276 alloy), and 29.0 (Grade 2 titanium) Temperature, Rxn-10 probe: -10 to 70 °C Pressure, Rxn-10 probe: ambient	Temperature, Rxn-40 mini configuration: -30 to 120 °C (316L stainless steel), -30 to 150 °C (C276 alloy), -30 to 150 °C (Grade 2 titanium) Temperature, Rxn-40: -30 to 120 °C (316L stainless steel), -30 to 280 °C (C276 alloy), -30 to 300 °C (Grade 2 titanium) Temperature ramp: ≤30 °C/min Pressure: dependent on material choice and probe size. Contact Sales for more details Flange: ANSI B16.5 and DIN EN1092 Type B flanges available upon request	Temperature: -30 to 120 °C (316L stainless steel), -30 to 150 °C (C276 alloy), -196 to 70 °C (C276 alloy, and hybrid construction for cryogenic use), -30 to 150 °C (Grade 2 titanium) Temperature ramp: ≤30 °C/min Pressure: dependent on material choice and probe size. Contact Sales for more details Flange: up to 305 mm diameter, ASME B16.5 or DIN EN1092 Type B flanges available upon request
Wetted materials	Immersion optic metal: C276 alloy (316L stainless steel or Grade 2 titanium upon request) Immersion optic window: high-purity sapphire, proprietary compression fit non-brazed design	Metal: C276 alloy, 316L stainless steel, or Grade 2 titanium Window: high-purity sapphire	Metal: C276 alloy, 316L stainless steel, Grade 2 titanium, or a hybrid metal combination (316L stainless steel, C276 alloy) Window: high-purity sapphire
Fiber optic cable	Design: PVC jacketed, proprietary construction Connections: proprietary electro-optic Temperature: -40 to 70 °C Minimum bend radius: 152.4 mm Length: Contact Sales for available lengths	Cable sold separately	Cable sold separately
Immersible length (mm)	Immersion optic: ¼" sealed: 152.4 or 203.2 ½" sealed: 152.4, 304.8, or 457.2	Rxn-40 mini configuration: 36 Rxn-40: maximum immersible length is dependent on material choice	Maximum immersible length is dependent on material choice
Immersible diameter (mm)	Immersion optic: ¼": 6.35 ½": 12.7	12.7, 19.05, 25.4	25.4 or 60.325 (25.4 only for Grade 2 titanium)
Hazardous area certifications	n/a	ATEX, CSA, and IECEx	ATEX, CSA, and IECEx

Raman spectroscopic probes for gas-phase analysis

	Rxn-30 probe
	
Field of applications	Chemical: ammonia, methanol, HyCO Gas-phase streams in refining: hydrogen production and recycle fuel blending, fuel characterization Power & Energy: Integrated Gasification Combined Cycle (IGCC) power plants, gas turbines Life Sciences/Food & Beverage: fermentations, offgas, volatiles
Laser wavelength	532 nm
Laser maximum	Maximum power into probe head: <499 mW
Sample interface	Operating temperature, probe head: -20 to 150 °C Temperature ramp: <6 C/min Max pressure: 68.9 Barg (at sample)
Wetted materials	316/316L stainless steel, PTFE, sapphire, fused silica glass
Fiber optic cable	Cable sold separately
Gas stream filtration	20 µm or better Integrated 20 µm particulate filter standard
Hazardous area certifications	ATEX, CSA, and IECEx

Raman flow cell	
	<p>KRFC</p> 
Field of applications	Downstream bioprocessing
Measuring principle	Raman spectroscopy
Temperature	Operating: 0 to 40 °C / 32 to 104 °F Storage: -20 to 60 °C / -4 to 140 °F
Relative humidity	Storage: < 90 % non-condensing
Unit dimensions (width x height x depth)	46 x 25 x 11 mm 1.8 x 1.0 x 0.4 inch
Sampling probe compatibility	Raman Rxn-10
Sampling optic compatibility	Micro flow bench
Pressure	Max pressure: 4.8 barg / 70 psig
Wetted materials	Body: 316L stainless steel Window: Proprietary material, optimized for bioprocesses Surface finish: Ra 15 with Electropolish to ASME BPE SF4 finish Adhesive: USP Class VI and ISO 10993 compatible
Sterilization method	CIP/SIP
Process connection	5/16-24 flat bottom ferrules Up to 3/16 inch OD tubing
Fluid path thickness	2.5 mm
Flow conditions	Laminar
Flow cell maximum volumetric flowrate	15 mL/min

Raman calibration and verification kits		
	<p>KRCAL</p> 	
Field of applications	Standardize Raman bioprocess system for lab-to-process scalability. Available for our multi optic (and single-use optic) systems, Raman flow assembly, and Rxn-46 probe	
Measuring principle	Raman spectroscopy	
Liquid	Immersion	Flow cell
Temperature	Operating: 0 to 40 °C / 32 to 104 °, Storage: -15 to 50 °C / 5 to 122 °F	Operating: 0 to 40 °C / 32 to 104 °F, Storage: -15 to 50 °C / 5 to 122 °F
Relative humidity	Storage: < 80 % Non-Condensing	Storage: < 80 % Non-Condensing
Unit dimensions (width x height x depth)	Kit: 235 x 192 x 85 mm, 9.3 x 7.6 x 3.4 inch	Kit: 235 x 192 x 85 mm 9.3 x 7.6 x 3.4 inch
Weight	Kit: 1.5 kg / 3.3 lbs	Kit: 1.5 kg / 3.3 lbs
Sampling probe compatibility	Raman Rxn-10 (with bio multi or single-use optic)	Raman Rxn-10 (with flow bench or Rxn-46 probe)
Spectral intensity reference	Calibration Reference Standard	Calibration Reference Standard
Spectral intensity output repeatability (at time of certification)	< ±2 %	< ±2 %
Long-term spectral uncertainty (at any wavelength)	±6.05 %	±6.05 %
Spectral intensity calibration range	CRS-785: 790.7 to 1074.5 nm	CRS-785: 790.7 to 1074.5 nm

Raman flow bench	
	<p>KRFB</p> 
Field of applications	Downstream bioprocessing
Measuring principle	Raman spectroscopy
Operating	0 to 40 °C / 32 to 104 °F Storage: -10 to 50 °C / 14 to 122 °F
Unit dimensions (width x height x depth)	254 x 102 x 66 mm 10.0 x 4.0 x 2.6 inch
Sampling probe compatibility	Raman Rxn-10
Sampling optic compatibility	Micro flow cell

Raman bio multi optic	
	<p>KRBMO</p> 
Measuring principle	Raman spectroscopy
Temperature	0 to 100 °C / 32 to 212 °F
Sampling probe compatibility	Raman Rxn-10
Sampling sleeve compatibility	Raman bio sleeve
Wetted material sample compatibility	non-contact

Raman bio sleeve	
	<p>KRBSL</p> 
Measuring principle	Raman spectroscopy
Temperature	-30 to 150 °C / -22 to 302 °F
Sampling probe compatibility	Raman Rxn-10
Sampling optic compatibility	bio multi optic
Pressure	Max pressure: 13.8 barg / 200 psig
Wetted materials	Body: 316L stainless steel Window: Proprietary material, optimized for bioprocesses Surface finish: Ra 15 with Electropolish to ASME BPE SF4 finish Adhesive: USP Class VI and ISO 10993 compatible
Immersible length	120 or 220 mm 4.73 or 8.67 inch
Immersible diameter	12 mm 0.48 inch
Sterilization method	Autoclave, gamma irradiation
Process connection	PG13.5

Raman spectroscopic probes for solid-phase analysis		
		
Field of applications	For non-contact measurement of solids or turbid media or when sample contamination is a concern, suitable for a range of applications including films, pellets, powders, and more	Polymers: extruded pellet quality, crystallinity, density, raw materials Pharmaceutical: crystallinity, polymorphism, granulation, blend uniformity, content uniformity, coating, tableting Chemicals: final product quality, blend impurities, crystallinity, raw materials Food & Beverage: quality of dairy solids, meat and fish composition
Laser wavelength	532 nm, 785 nm, 1000 nm	785 nm
Laser maximum	Maximum power into probe head: <499 mW	Maximum power into probe head: <499 mW
Sample interface	Temperature, non-contact optic: ambient Pressure, non-contact optic: ambient Temperature, Rxn-10 probe: -10 to 70 °C Pressure, Rxn-10 probe: ambient	Temperature: 10 to 40 °C Pressure: ambient
Body and window materials	Non-contact optic body: optic dependent Rxn-10 probe body: 6061 aluminum, 316L stainless steel, and 303 stainless steel Window: optical-grade materials	Body: 316L stainless steel Window: optical-grade materials
Fiber optic cable	Design: PVC jacketed, proprietary construction Connections: proprietary electro-optic (EO), or FC to EO fiber converter(s) for non-embedded systems Temperature: -40 to 70 °C Length: Contact Sales for available lengths Minimum bend radius: 152.4 mm	Design: PVC jacketed, proprietary construction Connections: proprietary electro-optic Temperature: -40 to 70 °C Length: 3, 10, and 15 m available Minimum bend radius: 75 mm
Length (mm)	Non-contact optic: varies based on model Rxn-10 probe (including fiber cable bend radius): 356	Rxn-20 probe (including fiber cable bend radius): 312
Diameter (mm)	10 to 140 mm, depending on optic	48
Working distance	Immersion optic: ¼": 6.35 ½": 12.7	Based on the sampling optic selected
Hazardous area certifications	n/a	ATEX, CSA, and IECEx

Raman enclosed sample compartment	
	
Field of applications	Compatible with Raman non-contact optics including the Rxn-10 and Rxn-20 probe with non-contact optics
Measuring principle	Raman spectroscopy
Unit dimensions (width x height x depth)	209 × 107 × 127 mm* 8.23 × 4.22 × 5.00 inch
Sampling probe compatibility	Raman Rxn-10 (with accessory optics) Raman Rxn-20 (with accessory optics) Raman Rxn-40
Sampling kits	Tablet holder, 10 mm / 0.40 inch cuvette holder, powder holder
Safety features	Electrical interlock
Alternate configuration	No interlock, no electrical configuration

Optical Analysis - Tunable diode laser absorption spectroscopy (TDLAS)

	J22 TDLAS gas analyzer	JT33 TDLAS gas analyzer
		
Principle of measurement	Tunable diode laser absorption spectroscopy (TDLAS)	Tunable diode laser absorption spectroscopy (TDLAS)
Measurement parameters	H ₂ O (moisture) in natural gas, biomethane (RNG), carbon dioxide (CCUS), and hydrogen	H ₂ S (hydrogen sulfide) in natural gas, LNG, biomethane (RNG), carbon dioxide (CCUS), and hydrogen
Measurement range	H ₂ O: 0-500 to 0-6000 ppm (0-24 to 0-284 lb/mmscf) Dewpoint: moisture dewpoint calculations using selectable ASTM D1142 or ISO 18453 methods	0 to 10 ppmv, 0 to 500 ppmv other ranges by request
Communication	I/O 1: Modbus RTU over RS485 or Modbus TCP over Ethernet; I/O2 and I/O3: software configurable; set as relay output, analog input (4-20 mA), analog output (4-20 mA) or digital/status output	I/O1: Modbus RTU/RS485 or Modbus TCP/Ethernet, I/O2 and 3: Relay output or Universal I/O (UIO); UIO can be configured as analog input/output (4-20 mA) or digital/status output. Service web server interface: Ethernet RJ45
Power supply	Without heater: 24 VDC ±20% or 100 to 240 VAC ±10%, 50/60 Hz, 10W With optional heater: 100 to 240 VAC ±10%, 50/60 Hz, 80W	For controller (spectrometer): AC 100 to 240 V tolerance ±10 %, 50/60 Hz, 10W DC 24 V tolerance ±20 %, 10W, UM = AC 250 V For sample conditioning system electronics: AC 100 to 240 V ±10 %, 50/60 Hz, 275W, UM = AC 250 V
Ambient temperature	-20 to 60 °C (-4 to 140 °F)	-20 to 50 °C (-4 to 122 °F), -10 to 60 °C (14 to 140 °F)
Operating pressure range	Inlet pressure: 140-310 kPa (20-45 psig) Sample cell: 800-1200 mbara or 800-1700 mbara (optional)	Application dependent: 800 to 1200 mbara (standard) 800 to 1700 mbara (optional)
Housing materials	Electronics: copper-free aluminum Sample system enclosure: 304 stainless steel Sample system panel: anodized aluminum	Electronics: Coated copper-free aluminum or Cast stainless steel Sample system enclosure: 304 stainless steel or 316 stainless steel Sample system panel: Anodized aluminum Enclosure window (optional): Polycarbonate
Unit dimensions (width x height x depth)	280 x 230 x 114 mm (11 x 9 x 4.5 in.) not including sample conditioning system	609.6 x 1134.8 x 302 mm (24 x 44.7 x 11.9 in.) with enclosed sample conditioning system
Channels	One	One
Degree of protection	IP66, Type 4X	IP66, Type 4X
Hazardous area certification	ATEX / IECEx Zone 1, UKEx Zone 1, CSA Class I, Division 1, CSA Class I, Zone 1	ATEX/IECEx/UKEx Zone 1, CSA Class I, Division 1, CSA Class I, Zone 1

SS2100 TDLAS gas analyzer	
	<p>SS2100</p> 
Principle of measurement	Tunable diode laser absorption spectroscopy (TDLAS)
Target components	H ₂ O, H ₂ S, CO ₂ in hydrocarbon gas streams
Measurement range	Ranges from low ppmv to %
Communication	Analog output: two 4-20mA Isolated, 1200 ohms @ 24 VDC max load Serial: RS232C and Ethernet Protocol: Modbus Gould RTU or Daniel RTU or ASCII Digital outputs: 5, Concentration Alarm, General Fault, Validation Fail, Validation 1 Active, Validation 2 Active Digital inputs: 2, Flow Alarm, Validation Request
Power supply	120 or 240 VAC ±10%, 50-60 Hz, 300W (18-24 VDC – optional for electronics only) 3 Amps max @ 120 VAC, 1.5 Amps max @ 240 VAC Hz
Ambient temperature	-20 to 50 °C (-4 to 122 °F); Optional: -10 to 60 °C (14 to 140 °F)
Operating pressure range	Inlet pressure: 140-350 kPa (20-50 psig) Sample cell: 800-1200 mbara or 950-1700 mbara (optional)
Housing materials	304 or 316L stainless steel Sample system enclosure: 304 or 316L stainless steel
Channels	One; SS2100 H ₂ S analyzer available in 1, 2, or 3 channel configuration (additional H ₂ O and CO ₂ channels available)
Degree of protection	IP66, Type 4X
Hazardous area certifications	CSA Class I, Division 2; CSA Class I, Zone 2
Configuration options	Also available in a two-pack configuration (H ₂ S and H ₂ O or H ₂ S and CO ₂ in natural gas); or a 3-pack configuration (H ₂ S and H ₂ O and CO ₂ in natural gas). See operating instructions for these particular specifications.

SS500 TDLAS H ₂ O analyzer	
	<p>SS500</p> 
Principle of measurement	Tunable diode laser absorption spectroscopy (TDLAS)
Measurement parameters	H ₂ O (moisture) in natural gas
Measurement range	0-100 to 0-5000 ppmv
Communication	Analog output: 1 or 2 4-20mA Isolated, 1200 ohms @ 24 VDC max load (optional) Serial: RS232C Protocol: Modbus Gould RTU or Daniel RTU or ASCII
Power supply	100-240 VAC, 50-60 Hz - standard 12-Volt Sealed lead-acid battery Approx. 8 hours usage time per charge 0.5 Amps @ 120 VAC during recharging
Ambient temperature	-20 to 50 °C (-4 to 122 °F)
Operating pressure range	Inlet pressure: 140-350 kPa (20-50 psig) Sample cell: 700-1400 mbara
Housing materials	Anodized aluminum
Channels	One
Hazardous area certification	CSA Class I, Division 1 CSA Class I, Division 2 CSA Class I, Zone 2
Configuration option	SS500 Simple Sample System

Optical Analysis – Quenched fluorescence (QF)

OXY5500 optical oxygen analyzer	
	<p>OXY5500</p> 
Principle of measurement	Quenched fluorescence (QF)
Applications	Natural gas production, natural gas processing, and vapor recovery units
Measurement parameters	Oxygen
Measurement range	0-100 ppmv to 0-50%
Communication	Analog output: Two 4-20 mA outputs Analog input: One 4-20 mA input (sample pressure) Fieldbus: RS-232C, RS-485, and Ethernet 10/100 with Modbus Output relays: Qty 2, 250 mA max load (concentration and fault alarms) USB 2.0 works with service software only 4 GB internal memory with internal data logging
Power supply	108-253 VAC, 50/60 Hz; 5.3 Watts @ 120 VAC; 6.6 Watts @ 240 VAC; OR 9-30 VDC (CSA), 18-30 VDC (IECEx/ATEX); 4.7 Watts @ 24VDC
Ambient temperature	-20 to 50 °C (-4 to 122 °F)
Operating pressure range	Inlet pressure: 140-275 kPa (20-40 psig) Sample cell: 800-1200 mbara
Housing materials	Electronics: 304 or 316L stainless steel
Unit dimensions (width x height x depth)	280 x 230 x 114 mm (11 x 9 x 4.5 in.) not including sample conditioning system
User interface	LCD display with keypad
Channels	One
Degree of protection	IP64, Type 4X
Hazardous area certifications	ATEX / IECEx - Zone 2, CSA Class I, Division 2

Applicator®	Netilion
	
<p>Applicator is a convenient tool for selection and sizing of the appropriate measuring instrument. Simply enter your parameters and Applicator will determine a reliable selection of suitable devices. www.us.endress.com/applicator</p>	<p>Netilion is an award-winning cloud-based IIoT ecosystem, designed for industrial processes. It connects the physical and digital worlds to send valuable information from the field straight to your phone, tablet or other device. Compliant with ISO 27001 and ISO 27017.</p>

Plan & Start Up		
Device Commissioning	Project Site Services	Project and Commissioning Services
		
<p>Commissioning instrumentation and other field devices requires skills to understand the dozens of settings that may be required for a full configuration. If not executed well, instrumentation commissioning can cause major problems during startup and poor plant reliability. But with the right products and team, it's possible to have a successful project with all critical deliverables for a safe, on time and on budget project.</p>	<p>Are you looking for streamlined installation and commissioning through transparent planning and excellent site management? Our service network can provide full support, high availability and expertise effective and efficient Site Management to ensure smooth start-up system performance with detailed quality test as standard, including Site Acceptance Test (SAT).</p>	<p>Services to plan, lead and control the execution of contracts to ensure their completion on time and on budget while ensuring customer satisfaction (scope and quality).</p>

Support and Education Services			
Connected Support for Wet Chemical Analyzers	Service Portal part of MyEndress+Hauser	Smart Support + Remote Support Technical Services	Training
			
<p>Connected Support is the optimized complement to the CA80 range. It improves service operations and maximizes plant availability. Enabling the remote resolution of technical issues, the service helps reducing process downtimes and ensuring the continuity of measurements, hence it mitigates the risk of non-compliance to water legislation.</p>	<p>Benefit from Endress+Hauser's growing database of knowledge and extensive service expertise from real support cases. The Service Portal provides immediate and swift access to articles on diagnostics and troubleshooting, product and application know-how such as service operations. You can even enter a new case that will be handled by a support expert. Fast and easy, online at any time.</p>	<p>With extensive instrumentation and application knowledge, our technical support team is dedicated to helping you solve issues and improve uptime. Our experts also contribute to developing the knowledge and skillset of your team. Smart Support is expedited technical availability, paired with visual support options to ensure support when and how you need it. Endress+Hauser provides timely remote guidance on service operations that enables you to increase your expertise, to cut diagnostics, troubleshooting and maintenance time and costs, and to improve your process availability.</p>	<p>Gain more expertise from a variety of training We offer training wherever it is most convenient for you: at your site, online, in our local Endress+Hauser sales center or in our specialized training centers. www.us.endress.com/en/events-training/training</p>

Maintain and Comply				
Onsite Calibration Services	Laboratory Calibration	Verification Service	Laboratory Repairs	Field Service
				
<p>Allow Endress+Hauser to support your calibration needs, we are able to execute at the right time and in the right tolerance.</p> <p>We ensure the quality of your products in compliance with relevant standards and regulations. Providing transparent data and accessible documentation from your installed base allow defining effective processes to schedule, track and record the calibration of your critical instruments, and increase plant availability.</p>	<p>From regular checking to validation and calibration generations, Endress+Hauser delivers cost-effective services that cover all your critical measuring points. All of our calibration laboratories and primary facilities are traceable to national and international standards. On-site calibration is available and is performed by our highly trained staff. Calibration services can include adjustment, repair or replacement of the equipment. Calibration labs and on-site calibrations are accredited to ISO 17025.</p>	<p>Control measurement to assess the functional performance of a measuring point by verifying internal parameters with specialized tooling and processes ensuring full traceability.</p>	<p>We offer technical checks, preventative maintenance, and repair followed by functional or even metrological tests as well as calibration in our local or accredited laboratories.</p>	<p>Our dedicated team of factory-trained technicians are always on hand in emergencies for fast and efficient diagnosis and repair.</p>

Calibration parameters, on-site and in the laboratory:

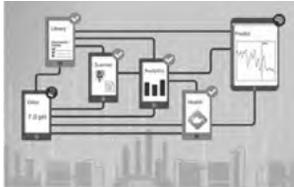
- | | |
|--|---|
| <ul style="list-style-type: none"> Temperature <ul style="list-style-type: none"> ▪ Resistance thermometer ▪ Probe, temperature Transmitter <ul style="list-style-type: none"> ▪ Probe, display Flowmeters <ul style="list-style-type: none"> ▪ Electromagnetic ▪ Vortex ▪ Coriolis ▪ Ultrasonic ▪ Thermal ▪ Mechanical | <ul style="list-style-type: none"> Pressure <ul style="list-style-type: none"> ▪ Manometers ▪ Pressure sensors ▪ Pressure transmitters Conductivity <ul style="list-style-type: none"> ▪ Conductivity measuring chain including cell, transmitter and cable pH <ul style="list-style-type: none"> ▪ pH measuring chain including cell, transmitter and cable |
|--|---|

We can calibrate other parameters on request. Please contact your local Endress+Hauser partner for further information

Manage and Improve		
Calibration Optimization (CIO)	Maintenance Optimization	Consultancy Services
		
<p>Calibration Interval Optimization is a contracted service that allows new and existing calibration customers to reduce costs, where possible, by extending calibrating intervals and reduce risk, where necessary, by reducing calibration intervals. Significantly improve the cost/risk balance that traditional calibration interval strategies offer.</p>	<p>Endress+Hauser offers a range of maintenance services that includes several levels of support (Preventative, Extended, Total) allowing increased control of your maintenance budget.</p> <p>Our Maintenance Optimization offering, Installed Base Analysis, is a site delivered assessment that provides detailed insights needed to help make decisions regarding the maintenance and obsolescence management of your install base process instruments.</p>	<p>Are you looking for the optimal balance between increasing performance, mitigating risks and reducing costs to help reach your organizational objectives?</p> <p>Our experts with specific process and metrological knowledge to enable you to explore ways to optimize your productivity. Help reduce inefficiencies and improve accuracies, leading to increased plant performance.</p>

Flow Metering Solutions	Inventory Management Solutions
	
<p>Skid and cart solutions for safe, accurate and cost-effective transfer operations. Endress+Hauser provides turnkey Flow Metering Solutions to suit your high accuracy requirements during the loading and offloading, bunkering as well as batching processes.</p>	<p>Comprehensive solutions that incorporate a full range of measurement devices and communication systems for data collection and transmission along with inventory management software and value added services. Providing complete inventory visibility 24 hours a day, 7 days a week, anywhere in the world via our intuitive web interface.</p>

Liquid Analysis Solutions	Gas Analysis Solutions
	
<p>Complete solutions for your liquid analytical measuring requirements</p> <ul style="list-style-type: none"> ■ Monitoring stations ranging from panels over cabinets to completely equipped containers ■ Automation solutions including fully automated measuring, cleaning and calibration systems for pH and ORP sensors. 	<p>Endress+Hauser has the specialized expertise required to deliver completely engineered solutions for your critical gas analysis applications. Using our best in class analyzers gives fast, precise, reliable monitoring and control. From sample extraction and transfer to sample conditioning and analysis, we combine core competencies to improve process control.</p>

Netilion

<p>Netilion is an IIoT platform combining digital services and system components to improve the lifecycle and asset management, maintenance, and support of instruments and analyzers. Netilion enables users to keep track of their installed base, documentation and data management, and instruments' performance and health status.</p>

Notes

Notes

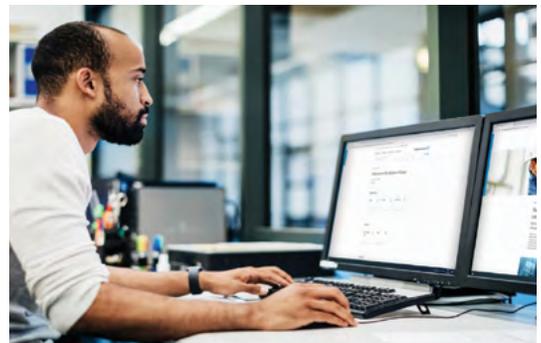


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