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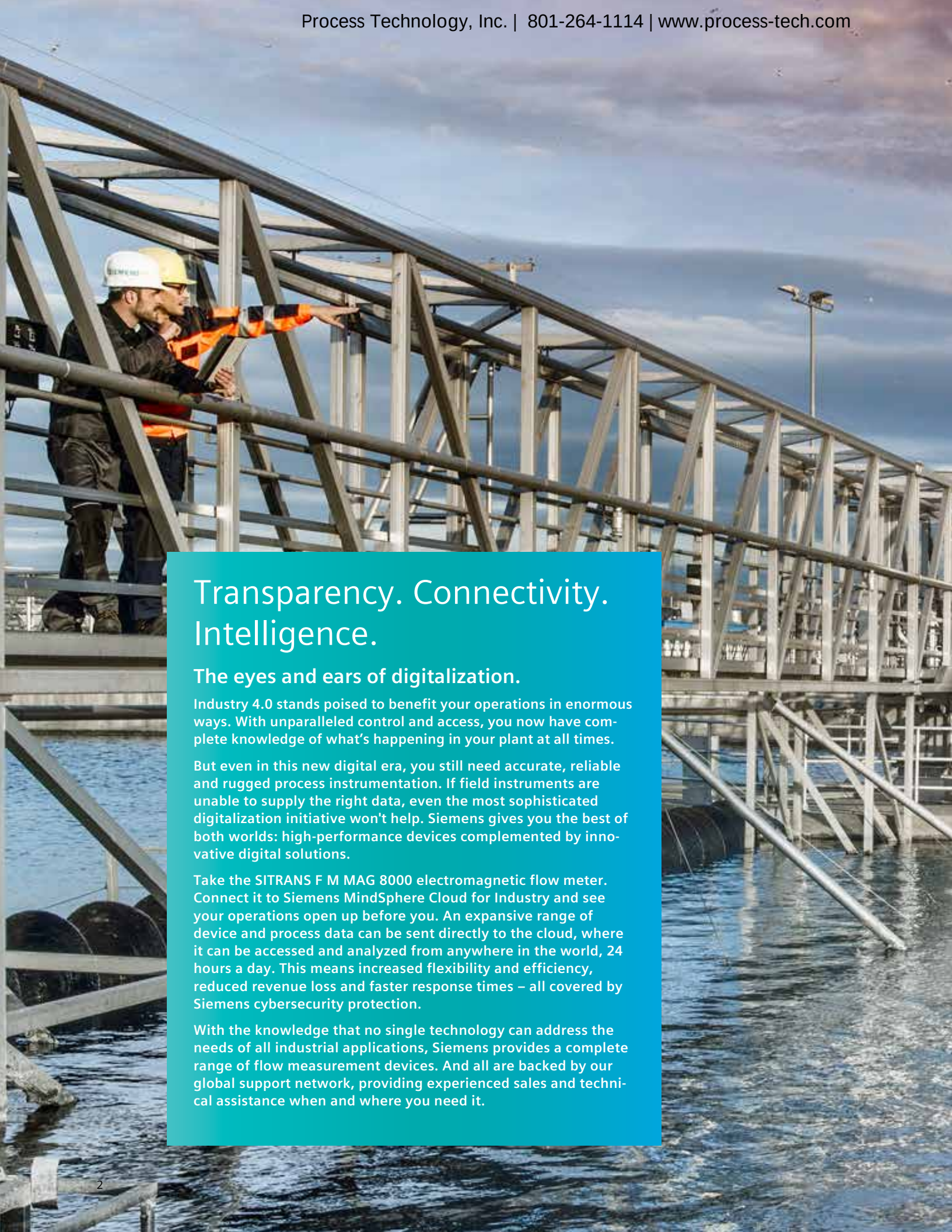
SIEMENS
Ingenuity for life

Flow measurement guide

Complete flow solutions

The right flow instrument for every application.

usa.siemens.com/flow



Transparency. Connectivity. Intelligence.

The eyes and ears of digitalization.

Industry 4.0 stands poised to benefit your operations in enormous ways. With unparalleled control and access, you now have complete knowledge of what's happening in your plant at all times.

But even in this new digital era, you still need accurate, reliable and rugged process instrumentation. If field instruments are unable to supply the right data, even the most sophisticated digitalization initiative won't help. Siemens gives you the best of both worlds: high-performance devices complemented by innovative digital solutions.

Take the SITRANS F M MAG 8000 electromagnetic flow meter. Connect it to Siemens MindSphere Cloud for Industry and see your operations open up before you. An expansive range of device and process data can be sent directly to the cloud, where it can be accessed and analyzed from anywhere in the world, 24 hours a day. This means increased flexibility and efficiency, reduced revenue loss and faster response times – all covered by Siemens cybersecurity protection.

With the knowledge that no single technology can address the needs of all industrial applications, Siemens provides a complete range of flow measurement devices. And all are backed by our global support network, providing experienced sales and technical assistance when and where you need it.

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Sensor sizes from 1/12" to 78" to meet all your process needs.

Electromagnetic

With decades of experience in the field complemented by a worldwide installed base, Siemens is at the top of its class in electromagnetic flow monitoring. SITRANS F M magmeters deliver high-accuracy volume measurement of electrically conductive liquid applications.

For processes requiring standard modular pulsed DC technology, the SITRANS F M portfolio includes a versatile range of sensors and transmitters with approvals to suit every standard – not to mention a variety of options for electrode materials, housings and communication protocols.

Or choose a specialized flow system to fulfill specific industry demands. The SITRANS F M MAG 8000 battery-powered water meter is ideal for abstraction, distribution, revenue and irrigation – no mains power required. The SITRANS F M TRANSMAG 2 with pulsed AC technology stands up to heavy-duty pulp and paper or mining applications.

SITRANS F M MAG 5100W

SITRANS F M MAG 8000

SITRANS F M TRANSMAG 2 911/E

Product	MAG 5100W, MAG 8000	MAG 3100, MAG 3100P, MAG 1100	MAG 1100F	TRANSMAG 2 911/E
Industry/ Application	**Water/Wastewater**	**Chemical/Industrial**	**Food/Beverage**	**High Solids/Noise**
Order No.	7ME65_ _, 7ME68_ _	7ME63_ _, 7ME6110	7ME6140	7ME5610
Line Sizes	MAG6100W: 1" - 78" (84") MAG8000: 1" - 48"	1/12" - 78" (model dependent)	3/8" - 4"	1/2" - 40"
Measurement	Volumetric			
Liquid Types	Conductive liquids - Clean/medium solids/slurries (MAG 8000 - Clean water)			Low conductivity (to 1 microsie-men), high % solids/pulp stock
Process Connections	Flanged		Sanitary	Flanged
Conductivity Requirements	MAG 5100W - 5 µS/cm MAG 8000 - 20 µS/cm	5 µS/cm	5 µS/cm	≥1 µS/cm (0.1 µS/cm depending on medium)
Accuracy	0.2% or 0.4% (model dependent)			≤± 0.5% of measured value
Repeatability	0.1%			0.2%
Pressure Rating	Based on process connection chosen			
Ambient Temperature Limits	-4 to +140°F	-40 to +212°F (model dependent)	-40 to +212°F	-4 to +140°F
Process Temperature	MAG 5100W: 14 to +158°F MAG 8000: 32 to +158°F	-40 to +392°F (model dependent)	-22 to +302°F (model dependent)	-4 to +302°F
Output	MAG 5100W: 4-20 mA, frequency, pulse, relay MAG 8000: Pulse	4-20 mA, frequency, pulse, relay		Not available
Communication	MAG 5100W: HART, FOUNDATION Fieldbus H1, DeviceNet, Modbus RTU/RS485, PROFIBUS PA and DP, Ethernet IP (via external converter) MAG 8000: RS232 serial interface with Modbus RTU (Rx/Tx/GND), RS485 serial interface with Modbus RTU, Encoder interface module (for Itron 200WP), Sensus protocol, 3G/UMTS module with or without analog input cable	HART, FOUNDATION Fieldbus H1, DeviceNet, Modbus RTU/RS485, PROFIBUS PA and DP, Ethernet IP via external converter		HART, PROFIBUS PA
Hazardous Area Approvals	FM, CSA - NI Class I Div. 2 Groups A, B, C, D, ATEX, IECEx, FM, CSA, EAC Ex, NEPSI - Zone 1 Ex d e [ia] ia IIC T6 Gb • ATEX, IECEx, CSA - Zone 21 Ex tD A21 IP67 T85 °C (model dependent)	FM, CSA - NI Class I Div. 2 Groups A, B, C, D, FM - XP IS Class I Div. 1, ATEX, IECEx, FM, CSA, EAC Ex, NEPSI - Zone 1 Ex d e [ia] ia IIC T6 Gb, ATEX, IECEx, CSA - Zone 21 Ex tD A21 IP67 T85 °C (model dependent)	FM, CSA - NI Class I Div. 2 Groups A, B, C, D, ATEX, IECEx, FM, CSA, EAC Ex, NEPSI - Zone 1 Ex d e [ia] ia IIC T6 Gb • ATEX, IECEx, CSA - Zone 21 Ex tD A21 IP67 T85 °C (model dependent)	Not available
Additional Certificates/Approvals	Marine ABS, Drinking Water - NSF/ANSI Standard 61 (model dependent)	Drinking Water - NSF/ANSI Standard 61 (model dependent)	3A, EHEDG (model dependent)	Not available
Verification (MAG 5000 / 6000)	MAG 5100W - Via Verificator MAG 8000 - PDM Qualification Certificate	Verificator		Not available

Precise multiparameter measurements of liquids and gases, including aerated media.

Coriolis

Look no further than the SITRANS F C Coriolis flowmeter family for reliable monitoring of liquids and gases in virtually any application. Siemens Coriolis systems provide precise multiparameter measurements of direct mass flow rate, volumetric flow rate, temperature, density, and fraction flow such as Brix and Plato.

Our digital Coriolis transmitter platform consists of the space-saving SITRANS FCT010, designed for direct integration into process automation systems, and the SITRANS FCT030, which delivers exceptional precision, a 100 Hz update rate and a user-friendly digital interface. Both transmitters can be paired with the high-performance FCS300 sensor or one of three low-flow sensors for batching, dosing and filling.

For compressed natural gas installations, select the ultra-compact SITRANS FCS200 sensor together with the SIFLOW FC070 transmitter, offering custody transfer approval.

SITRANS FC330

SITRANS FC310

SITRANS F C MASS 2100 DI 1.5 and SITRANS FC300

SITRANS F C MASS 2100 DI 3-15 w/ SITRANS FCT010

Product	FC330 (FCS300/FCT030), MASS 2100 w/ FCT010, MASS 2100 w/ FCT030			
Industry/Application	**Chemical/Industrial**	**Oil/Gas**	**Automotive**	**Water/Wastewater**
Order No.	7ME463_, 7ME410_, 7ME440_, 7ME481			
Line Sizes	0.06" to 6"			
Measurement	Mass flow, volumetric flow, temperature, density, fraction			
Process Temperature	-58 to +356 °F (process connection and model dependent)			
Typical Applications	Detergents, bulk chemicals, acids, alkalis, paint mixing systems, solvents and resins	Oil refining, derivatives manufacturing, polymerization, filling of gas bottles, furnace control, test separators, CNG dispensers	Fuel injection nozzle and pump testing, filling of AC units, engine consumption	Dosing of chemicals for water treatment
Process Connections	Flanged, threaded, hygienic threaded and flanged			
Accuracy	Liquid flow: 0.1% of rate, gas flow: 0.4% - 0.5% of rate, density error: 0.0025 g/cm³, temperature: 0.9°F			
Repeatability	Flow: 0.05% to 0.25% of rate, density error: 0.0002 g/cm³			
Pressure Rating	Based on process connection chosen			
Ambient Temperature Limits	-40 to +158°F (model dependent)			
Output	4-20 mA, frequency, pulse, relay, digital input			
Communication	HART 7.5, PROFIBUS PA, PROFIBUS DP, Modbus RS485 RTU			
Hazardous Area Approvals	ATEX, IECEx, cCSAus, FM (Class 1 Div. 1groups A, B, C & D), EAC Ex, cCSAus Zone 1, NEPSI, INMETRO (depending on version and configuration) - Zone 1: Ex d e ia [ia Ga] IIC T6 Gb			
Additional Certificates/Approvals	NTEP 7ME450, NTEP 7ME463 (pending), PED, CRN, OIML R 117 type approval (wide variety of liquids other than water)			

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Simple installation, with no need to cut the pipe or stop the flow.

Clamp-on ultrasonic

With no pressure drop or energy loss, a wide turndown ratio and non-intrusive sensors that can be installed without cutting into the pipe, SITRANS F S clamp-on ultrasonic flowmeters are a superior choice for accurate, cost-effective liquid and gas flow measurement.

For the greatest flexibility in customization, choose the advanced SITRANS FS230 with one- or-two path measurement, multiple I/Os and HART or Modbus communication. For more basic measurement and configuration options at a lower cost, the SITRANS FS220 is an ideal alternative.

All systems measure flow with SITRANS FSS200 clamp-on sensors, which are easy to install and never come into contact with the medium – perfect for pre-existing pipelines and corrosive, toxic or high-pressure or hazardous liquids. Available WideBeam® transit-time sensor technology increases measurement accuracy by reducing sensitivity to any changes in the fluid.

SITRANS F clamp-on ultrasonic family

Product	FS230, FS220,	FS230, FS220	FS230, FS220	FS230	FS230	FS230
Industry/ Application	**Water**	**Wastewater**	**HVAC**	**Oil/Gas**	**Chemical/Industrial**	**Power**
Order No.	7ME3723, 7ME3570	7ME3723, 7ME3570	7ME3723, 7ME3570	7ME3723	7ME3723	7ME3723
Line Sizes	1/2" - 394"					
Measurement	Volumetric					
Liquid Types	Clean, dirty, entrained gas (model dependent)		Clean liquid	Hydrocarbon, gas (model dependent)	Clean, dirty, entrained gas, gas (model dependent)	
Mounting	Clamp-on (not process wetted)					
Sensor Types	WideBeam transit time			Widebeam transit time	WideBeam transit time	
Paths/ Channels	Single path, dual path4 path (model dependent)		Single path	Single path dual path 4 path (model dependent)	Single path, dual path, 4 path (model dependent)	
Accuracy	FS230 - 0.5%, FS220 - 1%	0.5%	FS230 - 0.5% FS220 - 1%	0.5%		
Repeatability	0.1%					
Pressure Rating	Not applicable (sensors are not exposed to process pressure)					
Ambient Temperature Limits	-40 to +446°F (model dependent)					
Process Temperature	-40 to +140°F (model dependent)					
Output	4-20 mA, frequency, pulse, relay					
Communication	HART, BACnet MSTP/BACnet IP, Modbus RTU and TCP/IP, Ethernet IP, Johnson N2, VT100 RS232 (model dependent)		HART 7.5, Modbus RTU RS485 (Ethernet IP and BACnet available via external converter)	HART, BACnet MSTP/BACnet IP, Modbus RTU and TCP/IP, Ethernet IP, Johnson N2, VT100 RS232 (model dependent)		

Combines flow, pressure and temperature monitoring into one user-friendly, two-wire device.

Vortex

The SITRANS FX330 is an all-in-one vortex solution for flow, pressure and temperature measurement of steam, gases and liquids – ideal for HVAC and auxiliary systems and versatile enough for use in many process applications. From saturated and superheated steam to raw chemicals, from compressed air to crude oil, measure it all with the FX330.

The digitally based flow meter offers fully welded sensor construction, plug-and-play installation and Intelligent Signal Processing for maximum reliability – plus enhanced functions like SIL 2 certification, an integrated heat meter and NAMUR NE107 status alarms.

SITRANS FX330

Product	FX330			
Industry/ Application	**Clean, Low-Viscosity Liquid**	**Saturated and Superheated Steam**	**Gas**	**Heat Metering**
Order No.	7ME261_, 7ME271_			
Line Sizes	Wafer: 1/2" - 4" Flanged: 1/2" - 12"			
Measurements	Volume flow, corrected volume flow, mass flow, density, temperature, pressure, heat energy			
Process Connections	Flanged or wafer			
Accuracy	Volume flow: Liquids: Re≥ 20,000 ± 0.75% of measured value, 10000 < Re < 20,000 ± 2.0% of measured value Gases and vapors: Re ≥ 20,000 ± 1.0% of measured value, 10,000 < Re < 20,000 ± 2% of measured value Mass flow/corrected volume flow: Gases and vapors: Re ≥20,000 ± 1.5% of measured value, 10,000 < Re < 20,000 ± 2.5% of measured value Mass flow: Liquids/water: Re ≥ 20,000 ± 1.5% of measured value, 10,000 < Re < 20 000 ± 2.5% of measured value			
Repeatability	0.1%			
Pressure Rating	Based on process connection chosen			
Ambient Temperature Limits	-40 to +185°F (model dependent)			
Process Temperature	-40 to +465°F			
Output	4-20 mA, frequency, pulse, relay			
Communication	HART 7, FOUNDATION Fieldbus (pending)			
Hazardous Area Approval (Model Dependent)	ATEX: II2 G Ex ia B, ATEX II2 G Ex d C, ATEX II3 G Ex nA D, ATEX II2 D Ex tb E QPS: IS Class I Div.1 F, QPS XP Class I Div.1 G, QPS NI Class I Div. 2 H, QPS DIP Class I, III Div. 1 J IECEx: II2 G Ex ia K, IECEx II2 G Ex d L, IECEx II3 G Ex nA M, IECEx II2 D Ex tb			
Additional Certifi-cates/Approvals	SIL 2 according to IEC 61508			

Advanced digital transmitters can be paired with any differential pressure flow element.

Differential pressure

One of the most widely utilized and accepted methods of flow measurement in the world, differential pressure (DP) flow meters have been employed for many years to measure liquids, gases and steam.

The Siemens DP portfolio includes the P320 and P420 digital pressure transmitters. Paired with traditional flow elements such as orifice plates, venturi tubes or averaging pitot tubes, P320/P420 provide smart transmitter features and performance to new or existing DP measurement points. And the P320/P420 are the first pressure transmitters on the market to feature remote safety handling, reducing commissioning time in applications where safety is critical.

SITRANS P320

SITRANS P420

Product	P320/P420
Industry/Application	**Chemical, Oil/Gas, Energy, Marine, Water/Wastewater**
Order No.	P320: 7MF03_ P420: 7MF04_
Measurement	Volumetric (differential pressure)
Typical Applications	For use with any differential pressure flow elements (orifice plates, pitot tubes, venturi meters, etc.).
Fluid Type	wLiquid or gas
Accuracy	P320: 0.065% P420: 0.04%
Pressure/Temperature Effect on DP	Pressure: 0.1% / 1015 psi Temperature: 0.075 / 50°F (P420)
Pressure Rating	Up to 6092 psi
Ambient Temperature Limits	-40 to +185°F
Process Temperature (Sensor)	-40 to 212°F
Discrete I/O	No
Data Logging	No
SCADA Network	No
Protocols	4-20 mA/HART, PROFIBUS PA (in preparation), FOUNDATION Fieldbus (in preparation)
Hazardous Area Approvals	FM is/xp, CSA is/xp, ATEX, Exia/ib, Exd, NEPSI, SIL, NSF

Device integration from the field to the world

These days, it's an absolute must that your process instruments are always accessible – whether a device is local, the centerpiece of a plant or on the other side of the globe. Siemens provides you with the components you need to stay connected and in control.

Communication Protocols

Only in conjunction with fieldbuses can the advantages of digital communication be fully realized, including better transmission of measured values while maintaining the original accuracy, diagnostic options and remote parameterization. Our process instruments support all major industry standards for modern fieldbus communication, including HART, PROFIBUS, PROFINET, FOUNDATION Fieldbus and Modbus – making them suitable for use in all automation systems.

SIMATIC PDM (Process Device Manager)

SIMATIC PDM is a flexible tool for operation of more than 4,000 different field devices and other automation components over the entire lifecycle of your plant. Featuring a graphical user interface and intuitive Quick Start wizards for configuration, parameterization, diagnostics and maintenance, PDM can be connected directly to a local field device or universally implemented as a central Maintenance Station.

SITRANS Library

Intelligent process instruments are equipped with smart features previously accessible only with additional programming effort. This gap is being closed by SITRANS Library. Offering device-specific faceplates, SITRANS Library software facilitates the integration of these specialized functions into the SIMATIC PCS 7 process control system for easier operation, faster troubleshooting and a new degree of transparency.

MindSphere

To maximize the efficiency of a process or plant, operators must be able to turn real-time data into actionable insights. MindSphere is an open and secure IIoT platform allowing users to create apps that use operational data for predictive maintenance and resource optimization. This data is captured on-site by your instruments and transferred to the MindSphere cloud, where it can be accessed 24/7 by authorized users.

Sales and support

Custom engineering

Siemens brings a wealth of engineering expertise together with an expansive portfolio of products and services. This winning combination enables us to design innovative and cost-effective solutions to resolve your most challenging applications in the process industries.

Service around the world

Plants must function reliably at all times – which makes effective, efficient process instrumentation and analytics an indispensable requirement.You also need to be certain of fast and competent service from your supplier. Siemens is a global company that reacts locally. Whether you require consulting, quick delivery or installation of new devices, the Siemens network of specialists is available to you around the world, wherever your location.

Siemens Industry Online Support (SIOS)

Our online support system offers rapid, comprehensive assistance regardless of time or location. Manuals, technical data, certificates, downloads, support requests: we have it all.
Explore SIOS at: **http://support.industry.siemens.com**

PI training

Maximize your skills with factory-certified training

Siemens provides a full schedule of Process Instrumentation training opportunities for Siemens employees, channel partners, and customers. The PI Introductory Training courses are designed for new sales and service employees to learn the product lines, technologies and applications. These courses are also prerequisites for the advanced technology courses, which provide in-depth application training.

Designed for hands-on learning, all courses are led by field-tested instructors who combine extensive application and instrumentation knowledge with seasoned training experience. Our PI Training Center is specifically designed to optimize your classroom time. It is fully equipped with application simulation stations, a full range of PI instruments and complete industrial communication networks.

For current information and schedules, visit our website at:

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Siemens Process Instrumentation offers best-in-class measurement and seamless integration into your automation system. We are the total solution provider for flow, level, pressure, temperature, weighing, positioners and more.

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