



Field Instrument Solutions

**Pressure / Flow / Temperature /
Density / Concentration**

Bulletin 01A02A01-01EN

www.yokogawa.com/fld

vigilantplant.®
The clear path to operational excellence

YOKOGAWA 

Making critical plant information fully visible is just the beginning of the vigilant cycle.

Envision a plant where people are watchful and attentive while your business responds to change quickly and efficiently. Now picture an operation that delivers non-stop production while confidently expanding your capabilities into the future. Imagine no further. This is the vision and promise behind VigilantPlant, the clear path to operational excellence.

vigilantplant.[®]
The clear path to operational excellence

Seeing clearly gives you the knowledge necessary to anticipate the changes required in your process.

Knowing in advance brings you the speed and flexibility to optimize your plant in real time.

Acting with agility, you are able to adapt to the ups and downs of your business environment.

VigilantPlant excels at bringing out the best in your plant and your people - keeping them fully aware, well informed, and ready to face the next challenge.

Value Chain - Our shared goal is customer satisfaction through operational excellence

We see customer satisfaction as an on-going achievement - a journey more than

a destination. VigilantPlant helps your journey by empowering your value chain, leveraging automation solutions that integrate plant-wide information and optimizing plant life-cycle. When your people are attentive and watchful and

your business responds to change quickly and efficiently, you secure:

- Competitive pricing
- Regulatory compliance
- On-spec product
- On-time delivery

**SEE
CLEARLY**

**ACT
WITH AGILITY**

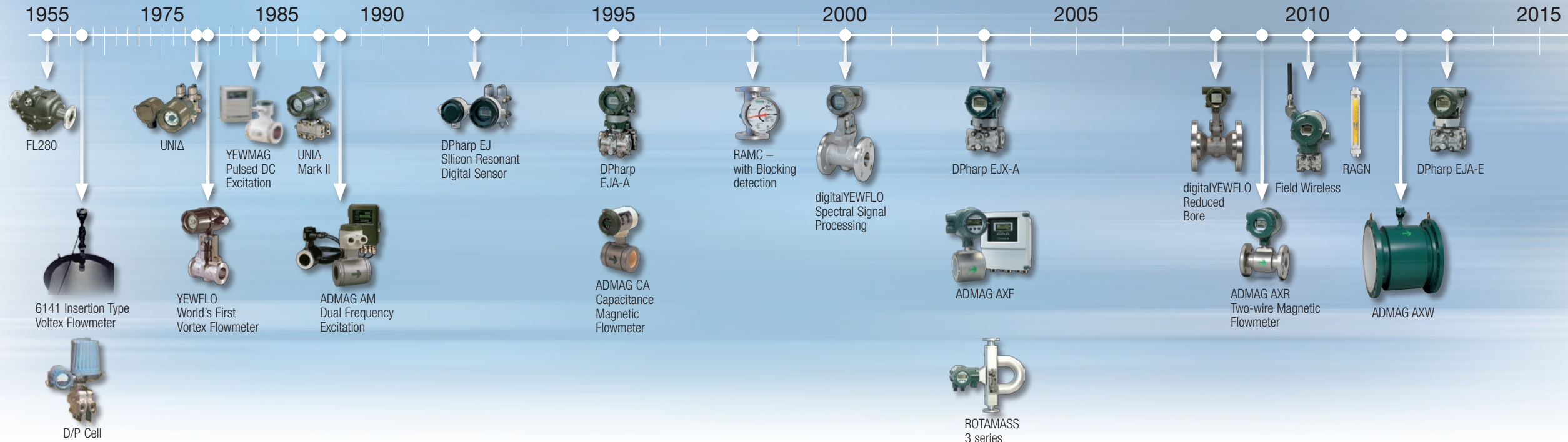
**KNOW
IN ADVANCE**



Yokogawa Field Instrument Solutions – Reliable Measurements for Operational Excellence



From its founding in 1915, Yokogawa Electric Corporation has contributed to society by supplying industry with cutting-edge products based on its measurement, control and information technologies. Always sensitive to changing customer needs, Yokogawa has continued to transform itself and has become a leading company in the global industrial automation and control field. While striving to enhance our corporate value, we remain committed to doing our part as a trustworthy industry partner to realize a more prosperous society.



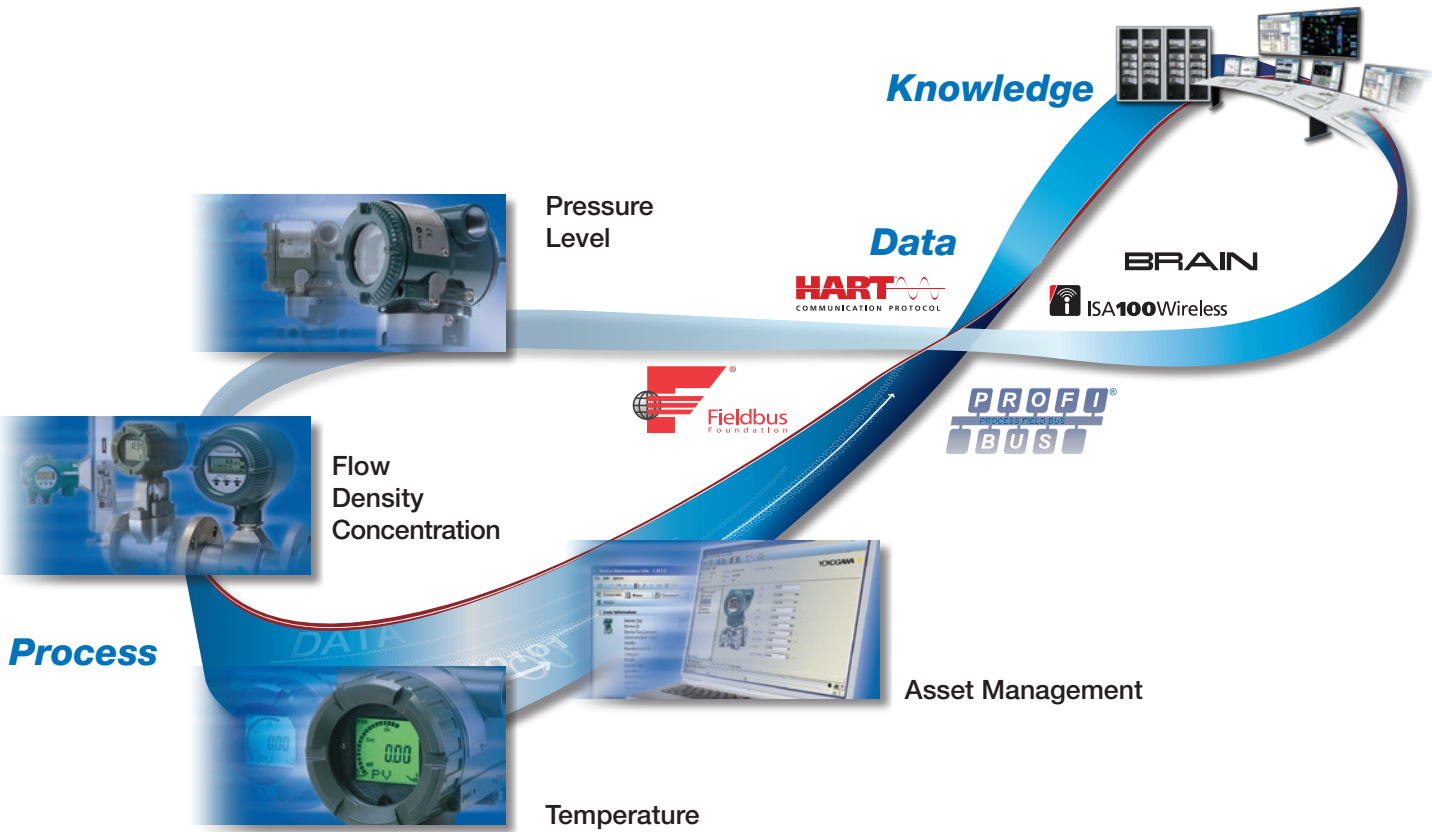
With a strong and committed focus on R&D, Yokogawa continue to develop and deliver innovative products with breakthrough technologies. We introduced the world's first vortex flowmeter, pioneered dual frequency excitation for magnetic flowmeters, revolutionized pressure measurement with the DPharp digital sensor to name a few. Our products are well known in the industry for their robust design, high reliability, superior performance and enduring quality.

Yokogawa products are manufactured in our state-of-art facilities around the globe, certified to ISO standards and managed in conformance to our corporate Quality Management Standards. They are ably supported

by a strong Sales and Service network spanning 90 offices across 55 countries. Millions of Yokogawa field instruments are successfully operating in various industries and diverse applications to the complete satisfaction of our global customer base.

Stable, precise and repeatable process measurements offered by Yokogawa's wide ranging portfolio of field instrumentation products provide improved total performance and reduce process variability to offer a strong platform for realizing safe and optimized operations, sustainable throughout the life time of your plant assets.

Field proven technologies that you can rely upon!



Open your eyes to a world of new opportunities...

Release the trapped intelligence in your field assets to get greater insight into your process. Yokogawa's Field Digital Solutions add new value to your instrumentation assets and plant operations by establishing a reliable digital communications infrastructure to effectively utilize the multi-sensing and advanced diagnostic capabilities offered by our intelligent devices. Yokogawa fully supports open standards like HART, FOUNDATION fieldbus, PROFIBUS, ISA100 Wireless and enabling technologies like FDT/DTM, EDDL to fully ensure customer's freedom of choice by proven and tested interoperability with process automation and asset management systems.

Pressure Solutions

DPharp Digital Transmitters
A new standard for

HIGH PERFORMANCE
SAFETY
and
ROBUSTNESS



Model	EJX	EJA
Accuracy		
0.025%	•	
0.04%	•	•
0.055%		•
Stability		
0.1% of URL for 10 Years	•	
0.1% of URL for 7 Years		•
Turndown		
200:1	•	
100:1		•
Multisensing		
D/P & S/P	•	•
Multi Variable		
D/P, S/P, PT, QV & QM	•	
Communications		
BRAIN, HART, FOUNDATION fieldbus	•	•
PROFIBUS PA	•	•
ISA100 Wireless		•
Agency Approvals		
ATEX, FM, CSA, IEC & TIS	•	•
Safety		
FMECA	•	•
IEC 61508 certification	•	•
Response time		
<= 90 msec	•	•
User Linearisation		
10 segments characterizer	•	•
Alarms		
Contact output	•	

silicon material, DPharp transmitters offer the industry best long term stability specifications under all operating conditions. Superior sensor performance reduces process variability for optimized operations resulting in increased yield and improved product quality. Excellent long term stability extends calibration intervals, reducing total cost of ownership.

Improved plant operations with reduced cost of ownership!

Safety as Standard
DPharp is an active pressure sensor, so even with no pressure applied the resonators oscillate at their natural frequencies. Two independent resonators are utilized. If either one or both fail, the transmitter diagnostics

Best Installed Performance

"DPharp for the digital world" represents Yokogawa's commitment to deliver leading edge solutions. Compact, lightweight, intuitive and intelligent, EJA & EJX series DPharp pressure transmitters simplify all aspects of handling throughout the lifecycle while delivering outstanding best in class performance.

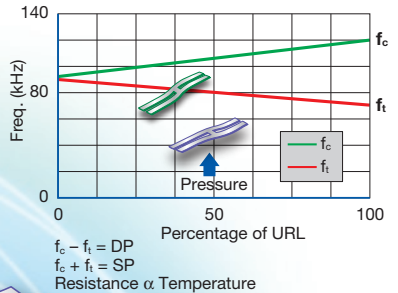
Whether installed in the harsh environmental conditions of an offshore oil production platform, downstream in a refinery, in the burning desert heat or the freezing arctic cold, DPharp transmitters deliver accurate, repeatable, high integrity process measurements.

DPharp delivers High performance, Safety and Robustness that you can rely on for maximizing the lifecycle excellence in your plant!

Working Principle

DPharp digital sensor uses two single crystal silicon resonators vibrating at their natural frequencies. When pressure is applied, one of the resonators goes into tension, while the other goes into compression mode. The CPU directly counts the sensor output frequencies without any additional A/D conversion. Due to the excellent elastic properties of silicon material, the DPharp sensor exhibits greater linearity and repeatability, with no inherent hysteresis. Resonant sensor also provides a large output signal resulting in greater sensitivity and higher turndown.

Digital precision and Superior Total Performance!



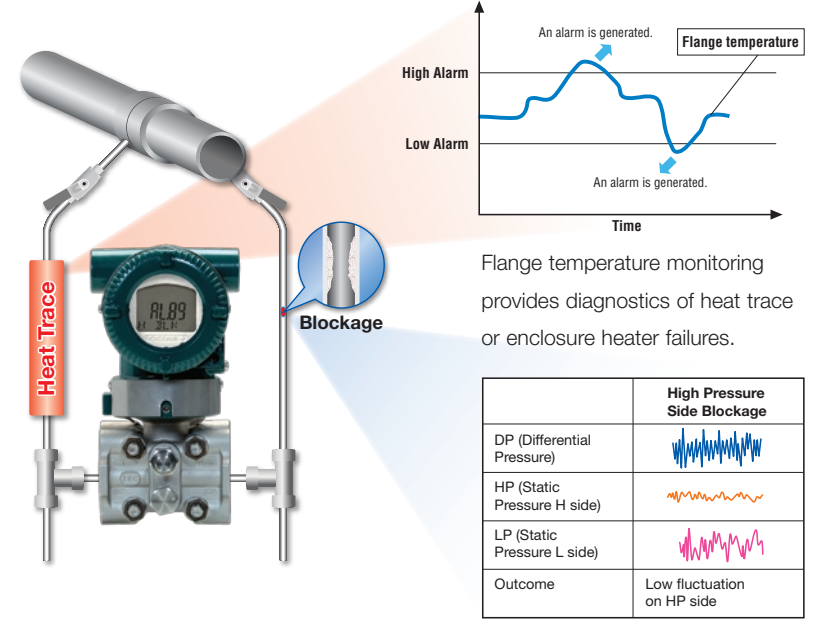
Multi-Sensing

DPharp digital sensor has the unique ability to simultaneously measure static pressure and differential pressure. Additionally capsule and housing temperatures are also measured. Multi-sensing platform enables real-time dynamic compensation for unmatched precision and forms the basis for implementation of advanced diagnostics. These information are available through various digital communication protocols; providing additional insight into your process. Multi-sensing functionality with guaranteed accuracy of static pressure signal allows the process to operate with fewer devices delivering reduced lifecycle costs.

More really does mean less!

High Performance

Long term, accurate and stable measurement in real world conditions is fundamental to realize reliable and efficient plant operation. Transmitters in the field are subjected to continuous variations of ambient and process temperature, static and overpressure conditions affecting the accuracy. DPharp silicon resonant sensor's unique multi-sensing capability provides dynamic compensation for ensuring high accuracy. Coupled with the hysteresis free characteristics of the



detects a capsule error. DPharp sensor is inherently fail-safe with no undiscovered failure modes. A patented reverse calculation algorithm validates internal measurements, calculations and detects any malfunction of the CPU. DPharp transmitters have undergone complete assessment to IEC61508 safety standards by reputed third parties. They are capable of SIL2 single use, SIL3 redundant use, as standard. Same transmitter can be used in control and safety applications which reduces spares inventory and simplifies maintenance.

Plant safety & reliability assured!

Robustness

Robustness of installed instrumentation greatly impacts their reliability and thereby plant availability. DPharp transmitters are designed for harsh industrial environments with rugged dual compartment enclosures. Multiple options are available for housing material, painting, wetted parts and bolting to enhance durability. DPharp transmitters use Hastelloy C-276 isolating diaphragms as standard for

improved corrosion resistance. DPharp transmitters are provided with an inbuilt overpressure protection system protecting the sensor from surge pressures.

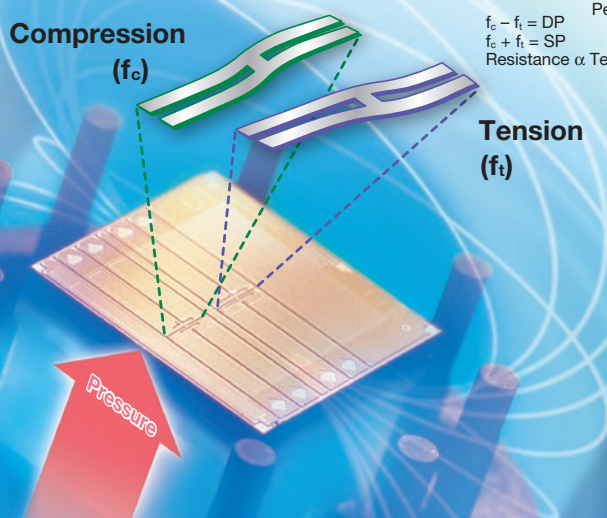
Rugged yet compact construction!

Advanced Diagnostics

EJX series DPharp transmitters offer Impulse Line Blockage Detection (ILBD) and heat trace monitoring diagnostic functionality. The fluctuations of differential and static pressure, capsule and ambient temperature signals from the multi-sensing DPharp sensor are continuously monitored. By statistical calculations and comparison to reference condition, the blockage of high, low or both impulse lines can be determined. Additionally, capsule temperature excursions beyond set limits can be monitored to detect failure of heat tracing.

Increase plant availability by enabling predictive maintenance!


DPharp microsite
<http://www.dpharp.com/>



Flow Solutions



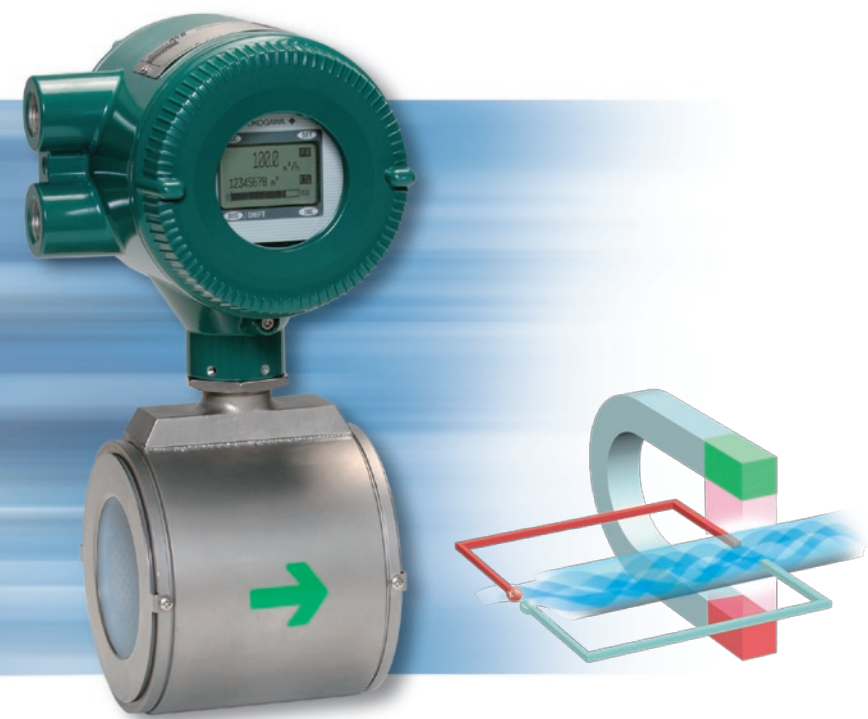
Yokogawa's flow selection table

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Product Lines	Electro-magnetic	 ADMAG AXF, AXW, AXR, & CA Page 10																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														

● best choice ○ possible

Industry																													
Petrochemical				Chemical/Pharmaceutical								Food & Beverage								Power/Pulp Paper/Mining/Water/Others									
Mineral oil	Gasoline/diesel	Tar	Solvents	Air	Lacquer (water based)	Lacquer (diluted)	Cleaning agents	Oxygen	Steam	Acids	Fruit juices	Yoghurt	Fruit purée	Vegetable oil	Milk	Beer	Wine	Water	Waste water	Slurry	Waste gas	Silt	Butane	Propane	Natural gas	Liquid nitrogen	Paper pulp		
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Full bore non-intrusive: The magnetic flowmeter principle



According to Faraday's law of induction, a voltage is induced in a conductive liquid flowing through a magnetic field. It is this voltage, that constitutes the relevant parameter for this measurement. The higher the flow velocity through the magnetic field the larger the induced voltage.

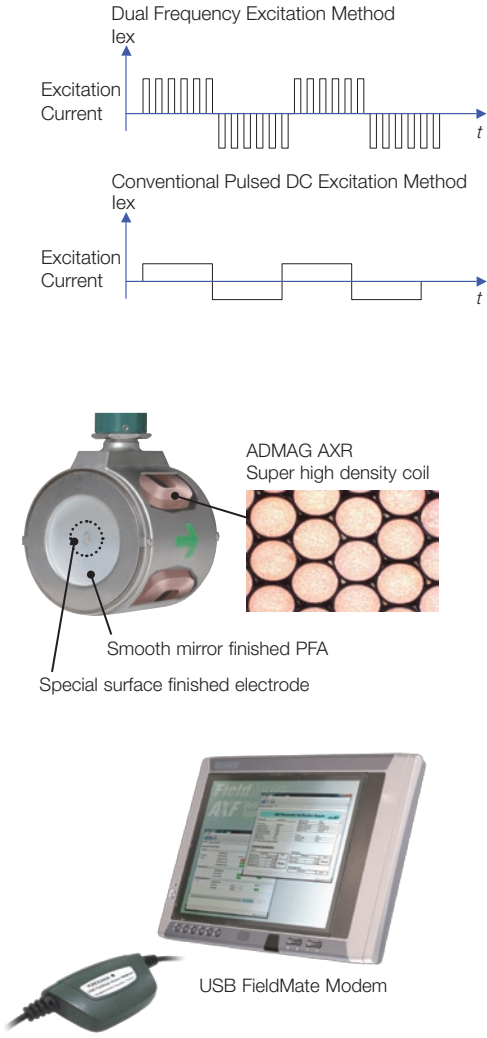
The advantages of this principle are obvious: No parts of the instrument obstruct the flow; no moving parts to diminish accuracy by wear and tear. Sanitary requirements are met to the highest degree. The magnetic flowmeter principle is an ingenious – but simple – method, which guarantees accurate measurement for all flow ranges.

Applying this principle to practical flow measurement results in a tube with magnetic coils attached to the outside and electrodes assembled on the inside of the tube. The coils set up a magnetic field through the entire tube. A conductive liquid flowing through this tube generates a voltage, which is detected by the electrodes. The simplicity of Faraday's Law is utilized by Yokogawa's ADMAG to provide a non obstructive magnetic flowmeter that will address all your instrumentation requirements.

ADMAG AXF & AXR provide with its optimized dual-frequency excitation the highest signal-to-noise ratio of all comparable magnetic flowmeters on the market. Therefore stable measurement values are achieved even when measuring multiphase liquids or mediums with low conductivity. Accurate measurement for all flow rates can be realized.

AXR provides stable measurements in spite of limited power supply due to two-wire. Flow noise reduction is achieved by smooth mirror finished PFA liners and special surface finished electrodes. This is further enhanced with aligned super high density coils that generate a stronger magnetic field.

By utilizing AXF Verification Tool which is an advanced option of FieldMate, its healthiness can be verified without having to remove the AXF from process line, reported in printing and stored in a database in an organized manner. AXF Verification Tool is useful in supporting plant maintenance practices.



ADMAG Total Solution:

ADMAG series covers from simple application to difficult one widely and provides the best solution.

Pulp & Paper	Chemical, Water	KP, DIP, Black liquor, Pulp slurry		Adhesive fluid, High consistency pulp slurry
Food & Beverage		Beer, Beverage, Milk, Raw material, Water	High speed batch, Retort food, Cream	Pure water, Alcohol, Syrup,
Mining	ADMAG AXW™	Mineral slurry, Chemical		
Water & Waste water	Water purifier, Water for industrial use,			Desalination
Chemical	Solution liquid, Corrosive fluid		Electrolysis bath	Adhesive fluid, Low conductivity
Steel	Cooling water	ADMAG AXR™	Blast furnace tuyere, Electric furnace tuyere	ADMAG CA
Power	Cooling water, sea water		Desulphurization, Denitration	Pure water

Low ← Difficulty of application → High

Series Name	ADMAG AXF	ADMAG AXW	ADMAG AXR	ADMAG CA
Wiring	Four-wire	Four-wire	Two-wire	Four-wire
Sizes	2.5 to 2600 mm (0.1" to 104")	500 to 1800mm (20" to 72")	25 to 200 mm (1" to 8")	15 to 200 mm (0.5" to 8")
End Connections	Flange, Wafer, Union joint, Sanitary (Clamp, Uni on, Butt weld)	Flange	Flange, Wafer	Wafer
Electronics (Converter)	Integral, Remote (AXFA11/ AXFA14)	Remote (AXFA11)	Integral	Integral
Measuring Range	0 to 191,134 m³/h (0 to 841,540 GPM - US)	0 to 91,608 m³/h (0 to 403,341 GPM - US)	0 to 1,130 m³/h (0 to 4,979 GPM - US)	0 to 1130 m³/h (0 to 4,979 GPM - US)
Liner Material	Fluorocarbon PFA, Polyurethane rubber, EPDM rubber, Ceramics, Natural soft rubber	Fluorocarbon PTFE, Natural hard rubber, Natural soft rubber, Polyurethane rubber	Fluorocarbon PFA	Ceramics
Electrode Material	JIS SUS316L (AISI 316L SS/EN 1.4404 equiv.), Hastelloy C276 equiv., Platinum-iridium, Tantalum, Titanium, Tungsten Carbide	JIS SUS316L (AISI 316L SS/EN 1.4404 equiv.), Hastelloy C276 equiv.	JIS SUS316L (AISI 316L SS/EN 1.4404 equiv.), Hastelloy C276 equiv., Platinum-iridium, Tantalum	Not Applicable (Non-wetted)
Process Temp. Range	-40 to +180° C (-40 to +356° F)	-10 to +120° C (+14 to +248° F)	-40 to +130° C (-40 to +266° F)	-10 to +120° C (+14 to +248° F)
Pressure Range up to	4 MPa (580 psi)	1 MPa (145 psi)	4 MPa (580 psi)	4 MPa (580 psi)
Ambient Temperature	-40 to +60° C (-40 to +140° F)	-10 to +60° C (+14 to +140° F)	-40 to +55° C (-40 to +131° F)	-20 to +50° C (-4 to +122° F)
Accuracy	±0.35 % of rate (standard) ±0.2 % of rate (optional)	±0.35 % of rate	±0.5% of rate	±0.5% of rate
Display	3 Line graphical Display, Multi Language	3 Line graphical Display, Multi Language	3 Line graphical Display, Multi Language	1 Line Display
- Ex-Approvals - Safety	- ATEX, FM, CSA, IECEx, TIIS	Not Applicable	- ATEX, FM, IECEx, TIIS - TUV Certified SIL 2 (SIL3 redundant use) as standard	- FM, CSA, TIIS
Signal Outputs/ Inputs	4 to 20 mA, Pulse/Alarm/Status output, Status input	4 to 20 mA, Pulse/Alarm/Status output, Status input	4 to 20 mA, Pulse/Alarm/Status output	4 to 20 mA, Pulse/Alarm output
Communication	HART, BRAIN, FOUNDATION fieldbus, PROFIBUS	HART, BRAIN	HART 5/ HART 7, BRAIN	BRAIN
Power Supply	100 to 240 V AC, 100 to 120 V DC, 24 V DC/AC	100 to 240 V AC, 100 to 120 V DC, 24 V DC/AC	14.7 to 42 V DC (Two-wire)	100 to 240V AC, 100 to 120V DC, 24V DC
Protection Class	IP66/ IP67, Type 4X, IP68	IP66/ IP67, IP68	IP66/ IP67, Type 4X	IP67, Type 4X
Cable Length	200 m (660 ft)	200 m (660 ft)	Not Applicable (Integral only)	Not Applicable (Integral only)

For details, refer to GS.

ADMAG microsite
<http://www.admagaxf.com/>

Total process control: Coriolis mass flowmeter

This high precision flow measurement principle is unaffected by fluctuating line pressures and changes in viscosity or temperature.

Even the physical properties of the fluid such as, high viscosity fluids (slurries and pastes) or tough environmental conditions will not affect the accuracy.

The Coriolis principle empowers the precise measurement of mass flow, density and temperature which allows the calculation of the volume flow rates, flow velocity or even the concentration of a medium mixture or Net Oil Computing (NOC).

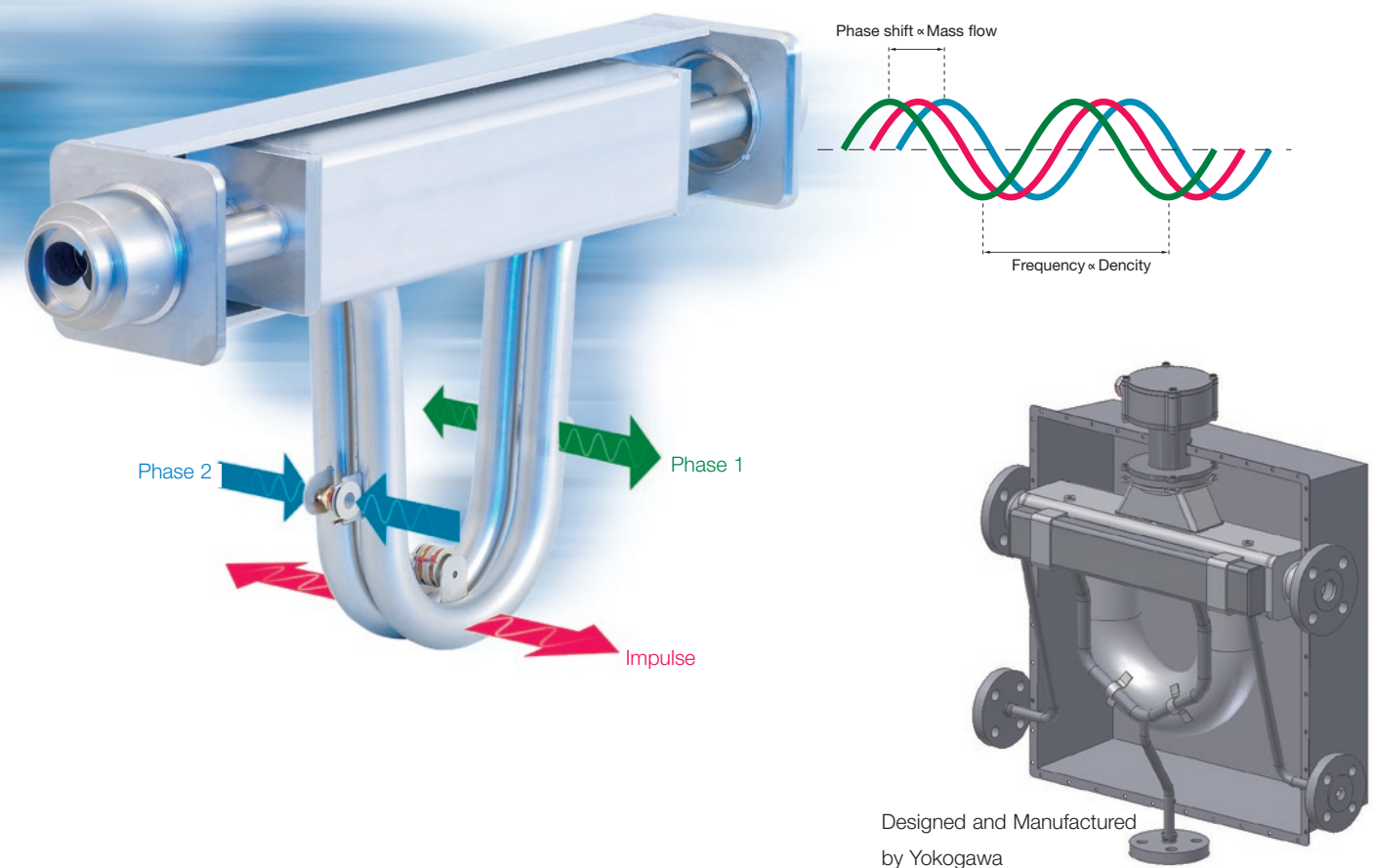
The detector tubes are excited by an electro-magnetic driver at their resonant frequency. When the fluid passes through the tubes the effect of the Coriolis forces deflects the tubes minutely.

The interaction in the tubes between the natural resonant frequency and the minute deflection due to the Coriolis effect is detected as a small phase shift by two electro-magnetic sensors.

This phase shift is a direct measure of the mass flow passing through the detector. The change in resonant frequency of the tubes is a measure of the density of the fluid in the meter.

Yokogawa's unique box-in-box-design employs a supreme decoupling of the measuring element from the piping and its influences are abolished resulting in a fluctuating zero stability and less accurate measurement.

Combined with modern digital technology and signal processing this measurement principle is unsurpassed in accuracy, stability and rangeability.



Versatile and durable Flow & Density measurement with ROTAMASS 3 Series

When it comes to measuring mass flow, temperature and density precisely in one, the ROTAMASS is the right choice.

The new ROTAMASS LR being the world's smallest dual bent tube Coriolis flowmeter extends Yokogawa's ROTAMASS Low Flow Line for gas and liquid flow measurement in an extraordinary manner.



Being unique in the low flow Coriolis market, the ROTAMASS LR uses an inline temperature sensor for exact and fast measurement in the process temperature range of -50°C up to +150°C as standard.

The ROTAMASS 3 Series shows high flexibility and multi-variable features - ranging from measuring very low flows of 10,5 g/h up to large flows of 600 t/h to temperatures from -200°C up to +350°C to accomplish various and demanding applications.

For the prevention of fluid component separation or gas condensation, a factory fitted insulation, a heat jacket or both can be provided for measuring e.g. heavy fuel oil.

ROTAMASS showing outstanding accuracy and long term stability obtains accuracy class 0.3 & 0.5 according OIML R117-1, accuracy class 0.3 according NIST Handbook 44, and is the ideal flowmeter for custody transfer metering systems.

Special features such as online concentration measurement, corrosion detection, empty tubes detection or the advanced diagnostic capability for entrained gas (2 phase flow) are integrated and communication through HART, FOUNDATION fieldbus or Modbus RTU is supported.

The ROTAMASS fulfills highest safety requirements for use in hazardous areas and SIL applications.

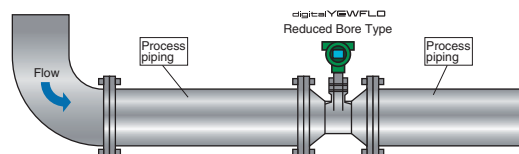
For Pipe Sizes	DN 8 to 200 ¼" to 8" 8 to 200 mm
End Connections	Flange, threaded or Clamp
Electronics	Integral, remote field or rack mount
Measuring Range	Up to 600 t/h (0 to 22046 lb/min)
Tube Material	Stainless steel 1.4404 (316L) or Hastelloy 2.4602 (C 22)
Process Temp. Range	-200 to +350°C (-328 to +662°F)
Tube Process Pressure	Up to 440 bar (6381 psi) for SS316L
Ambient Temperature	-40 to +55°C (-40 to +131°F)
Accuracy Mass Flow*	±0.1 % (liquid) ±0.5 % (gas)
Accuracy Density	±0.5 or ±1 g/l (options K6 or K4)
Accuracy Temperature	±0.5°C
Display	4 Line backlight LCD, Multi language
Ex-approvals	ATEX, FM (US, C), IECEx, NEPSI, GOST KOSHA, INMETRO
Custody transfer/type approval	MID, NTEP, SPRING, SIRIM
Approvals hygienic design	3A, EHEDG
Signal Outputs/Inputs	2 x 4 to 20 mA (1 x HART), 2 x pulse/frequency/status output 1 status input
Communication	HART, FOUNDATION fieldbus, Modbus RTU
Power Supply	90 to 264 V AC, 20.5 to 28.8 V DC
Protection Class	IP67
Comments	Advanced diagnostic features as standard Up to 300 m (1000 ft) between sensor and converter Heat tracing versions available (options /T2 or /T3) Suitable for high gas content (size dependant) Slugflow detection and compensation Special options on request Suitable for SIL applications

* of measured value

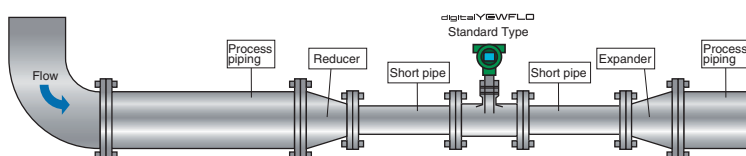
Long Term Stability: Vortex flowmeter

The next generation in vortex measurement is the digitalYEWFLO. Combining the field proven sensor and body assemblies used in over 400,000 units installed worldwide, with unique digital electronics and possessing Yokogawa's SSP technology the digitalYEWFLO provides the ultimate in accuracy and stability. The digitalYEWFLO Reduced Bore Type reduces the minimum required flow rate by five and minimizes the upstream & downstream pipe lengths.

New instrumentation using Reduced Bore Type



Traditional instrumentation



Yokogawa's "Spectral Signal Processing" SSP analyzes the fluid conditions and uses the data to select the optimal settings for the application, providing features never seen before in a vortex flowmeter. The signals from the piezo crystals inside the shedder bar are monitored constantly. Intelligent noise functions eliminate noise, thus providing vibration immunity and high stability, even at low flows. The user interface is a two line LCD display giving flow rate and totalized value simultaneously as well as functional data and diagnostic information.

The multi-variable version with its temperature sensor embedded in the shedder bar is used primarily for steam and energy measurement. The digitalYEWFLO is highly suited in applications with temperatures as low as -196°C or as high as +450°C. In the upstream oil industry, the digitalYEWFLO is an ideal flowmeter with high pressure applications up to flange ratings up to ANSI Class 2500. Dual sensor versions are also available for safety applications.

For Pipe Sizes	15 to 400 mm (1/2" to 16")
End Connections	Flange or wafer Reduced bore: 1 size down R1 Reduced bore: 2 size down R2
Electronics	Integral or Remote
Measuring Range	0.3 to 4000 m ³ /h (0 to 18000 GPM - US), e.g. for water
Body Material	Stainless steel SCS 14 A (1.4410) Stainless steel CF8M (1.4408) Carbon steel (WCB)
Shedder Bar Material	Stainless steel 1.4517 / 1.4462 CW-12MW, CF8M
Process Temp. Range	-196 to +450°C (-321 to +842°F)
Pressure Range up to	ANSI Class 2500 / PN 420
Ambient Temperature	-29 to +85°C (-20 to +185°F)
Accuracy	±0.75% of rate (liquid) ±1% of rate (gas and steam)
Display	2 Line LCD
Ex-approvals	ATEX, FM, CSA, SAA, IECEx, TIS, GOST, NEPSI
Signal Outputs/ Inputs	4 to 20 mA, pulse/alarm output
Communication	HART, BRAIN, FOUNDATION fieldbus
Power Supply	10.5 to 42 V DC
Protection Class	IP67 (Type 4X)
Max. Distance Sensor - converter	30 m (100 ft)
Special Features	Self diagnostic functionality Built-in temperature sensor for Mass flow calculation Special options on request

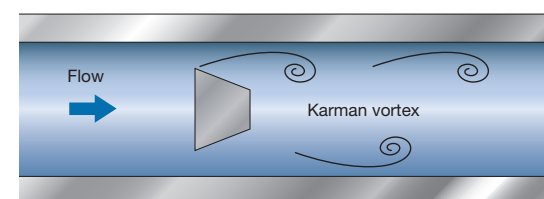
For details, refer to GS

Reduced Bore Type



Empowered Technology: digitalYEWFLO

Flow measurement is – if you will – nothing but a message providing information. The information is most accurate if the measurement takes place right at the heart of the flow stream. This was the philosophy at Yokogawa when in 1968 the world's first instrument to measure the flow of flue gas was developed.



High Pressure type (ANSI Class 1500)



Large size, 400mm

The basic principle of vortex shedding is visible in daily life. The fluttering of a flag in the wind is a prime example.

Applied to Yokogawa digitalYEWFLO the vortex shedding is produced by the use of a unique designed bluff body (shedder bar), flat faced placed in the pipe perpendicular to the flowing fluid. As fluid passes the shedder bar, alternating vortices are created with a frequency that is directly proportional to the fluid velocity. Two sensitive piezo crystals, hermetically sealed inside the shedder bar measure the bending forces generated by the vortices throughout the whole diameter.

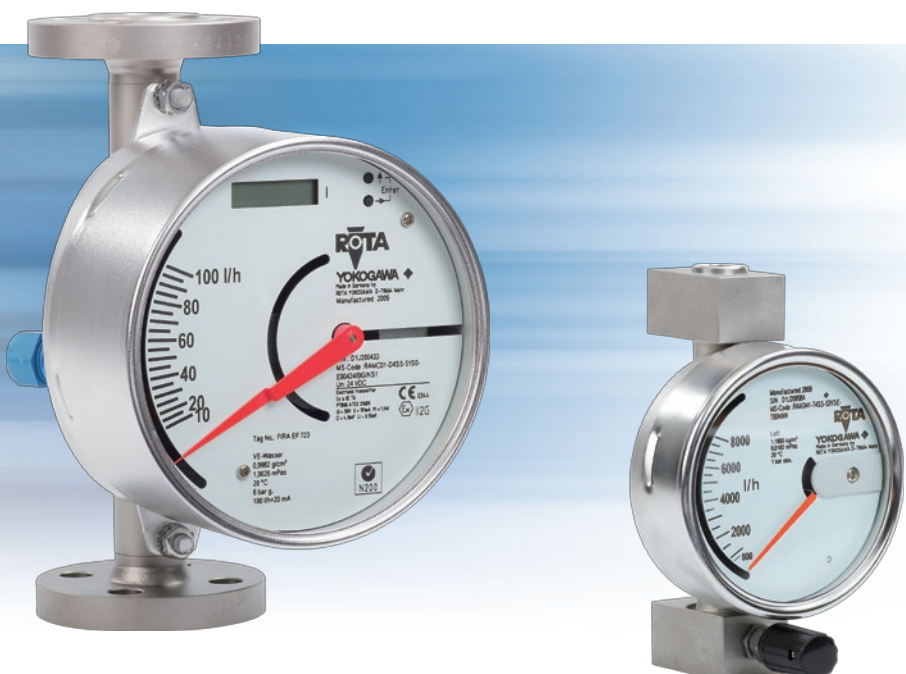
The advantages of this design are clear: relatively low pressure loss, very stable signal and no moving parts resulting in a very reliable flow measurement over time.

The robust digitalYEWFLO vortex flowmeter offers benefits that result in better process control, providing you the information to see clearly if changes are required to optimize your process. The instrument offers reliable usage on liquids, gases and steam within a wide temperature range, making it a very universal flowmeter for the process industry.

Cut away of Shedder bar with temperature sensor for multi-variable version.



Robust and universal: Rotameter® Metal Series



What makes these Rotameters different from other brands is known by many users, who value the ease of installation and trouble-free operation.

At first glance the RAMC looks impressive with its all stainless steel design. Operational safety is of the utmost importance in any flowmeter, and the RAMC is no exception – wetted parts are available in a variety of materials as well as intrinsically safe outputs or an explosion proof housing.

The RAKD differentiates itself from other comparable variable area meters by means of its light and guided float design - pressure loss is lower by two thirds. Further this design avoids oscillations caused by gas compressibility, resulting in a very stable measurement and is ideal for low flows and high pressure applications.

Model	RAMC	RAKD
For Pipe Sizes	15 to 150 mm 1/2" to 6"	6, 8, 10, 12, 15, 25 mm 1/4", 3/8", 1"
End Connections	Flanges, threaded or Triclamp	Flanges, threaded, cutting ring, nozzle
Measuring Range	Water +20°C (+68°F): 2.5 l/h to 130 m³/h Air +20°C (+68°F): 1 bar (15 psi) abs: 75 l/h to 1400 m³/h	Water +20°C (+68°F): 1 l/h to 250 l/h Air +20°C (+68°F): 1 bar (15 psi) abs: 40 l/h to 8000 l/h
Material	1.4404 (AISI 316L); PTFE lining; Hastelloy, Monel, Titanium on request	1.4571 (AISI 316Ti), Hastelloy or Monel on request
Process Temperature Range	-180 to +370°C (-292 to +698°F)	-25 to +250°C (-13 to +482°F)
Pressure Range up to	100 bar (1450 psi) Higher pressures on request	160 bar (2320 psi) Higher pressure on request
Ambient Temperature	-40 to +100°C (-40 to +212°F)	-20 up to +100°C (-4 up to +212°F)
Accuracy (qG = 50%) acc. VDE/VDI 3513-2	1.6% 2.5%	4%
Indicator	Analog scale plate/LCD	Analog scale plate
Ex-approvals	ATEX, FM (US,C), IECEx, NEPSI, GOST, KOSHA, CCOE	ATEX, FM (US), CSA, IECEx, NEPSI, GOST, KOSHA, CCOE
Inputs/Outputs	Analog 0 to 20 mA/4 to 20 mA	Analog 4 to 20 mA
Communication	HART, PROFIBUS PA	—
Power Supply	24 V DC 2-wire, 24 V DC 3-wire 230 V AC 4-wire, 115 V AC 4-wire	24 V DC 2-wire
Protection Class	IP66/67	IP66/67
Comments	Fail Safe Limit switches available Patented float blockage detection system Housing: aluminium or stainless steel Flame proof/dust proof Suitable for SIL applications	Fail Safe Limit switches available Fine control valves available Pressure controller available
Electrical Connections	—	Easy installation with Quickon connector

Know your flow: Rotameter® Glass and Plastic Series



The Rotameter (variable area flowmeter) is one of the oldest and mature principles in flow measurement. The medium passes through the metering tube from bottom to top and consequently rises the float until equilibrium of the three forces has been achieved. The flow rate value is indicated by the top of the float. This mechanical principle is as simple as it is reliable.

In the case of glass and plastic tubes you can simply view the float position. If the tube is made of metal, the float position is transferred to an external indicator via a magnetic coupling. Due to its operating principle the Rotameters are installed in vertical pipes.

Rotameters got their name from the rotating float developped by ROTA and are nowadays synonymous with the variable area flowmeter principle. Special diagonal notches cause the float to rotate. This eliminates friction and guarantees very stable behaviour and highest accuracy.

A Rotameter is a truly modular flowmeter. The variety in cones, floats, scales, process connections and options make it suitable for a very wide range of applications.

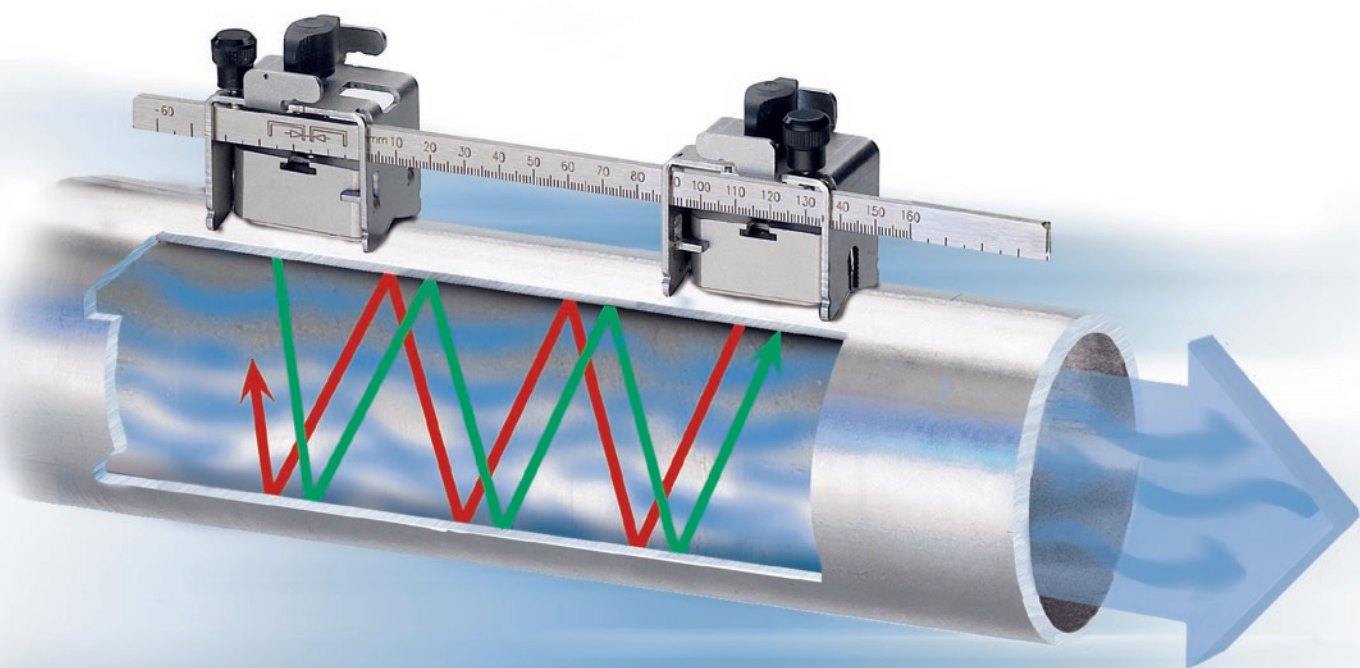
The original Rotameter from Yokogawa is known all over the world for its decades of proven performance and our century of experience in manufacturing specific sizes or special scales. We built this reputation on customer oriented solutions.

With the Rotameter RAGN being the worlds first Glass Rotameter suitable for SIL applications, Yokogawa becomes complete and unique to provide safety excellence with Glass and Metal variable area flowmeters.

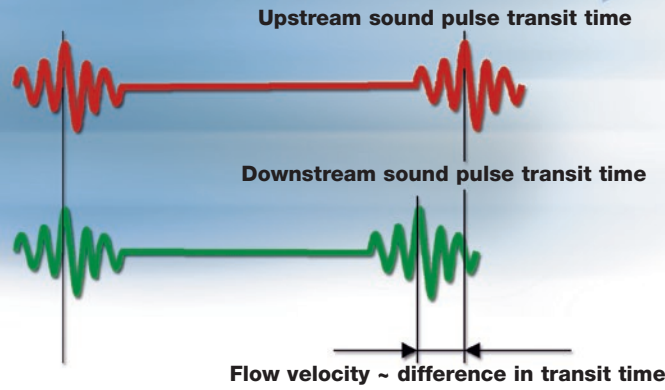


Model	RAGK/RAGL	RAGN	RAQN
For Pipe Sizes	6, 8, 10, 12 mm 1/4" to 3/8"	15 to 65 mm 1/2" to 2 1/2"	— 3/8" to 2"
End Connections	NPT; cutting ring; Swageloc Nozzle	Flanges threaded or Clamp	Female threads Glue socket
Measuring Range Water +20°C (+68°F): Air +20°C (+68°F); 1 bar (15 psi) abs:	0.0025 l/h to 600 l/h 0.2 l/h to 6300 l/h	2 ml/h to 10 m³/h 0.1 l/h to 160 m³/h	10 l/h to 10 m³/h 160 l/h to 250 m³/h
Material	1.4571 (AISI 316Ti) Polypropylene Various float materials available	SS 316L, PVDF Various float materials available	Steel, PVC Various float materials available
Measuring Tube	Borosilicate Glass	Borosilicate Glass	Polyamide or Polysulfone
Process Temp. Range	Max. +130°C (Max. +266°F)	-25 to +100°C (-13 to +212°F)	Max. +60°C (Max. +140°F)
Pressure Range up to	16 bar (232 psi)	Depending on measuring tube size: 6 to 16 bar g (87 to 232 psi)	10 bar (145 psi)
Ambient Temperature	0 to +80°C (+32 to +176°F)	0 to +80°C (+32 to +176°F)	0 to +60°C (+32 to +140°F)
Accuracy (qG 50%) acc. VDE/VDI 3513-2	1.6%/2.5%/4% (sphere 6%)	1.6%/2.5%	2.5%/4%
Indicator	Direct reading scale	Direct reading scale	Direct reading scale
Comments	Limit switches available Pressure controller available Valves available Special options on request	Suitable for SIL applications Turnable splinter shield Retrofittable limit switches Connection box Valves	Limit switches available Special options on request

Clamp-on ultrasonic flowmeter



It can happen that some users are not aware of the developments in the latest techniques in ultrasonic flow measurement. The innovative, clamp-on ultrasonic flowmeter utilizes the transit time principle and meters liquid and high-pressure gas flows without penetrating the process pipe.



How does it work? In transit time ultrasonic flowmeters, a sound wave is introduced to the flowing fluid in such a way that the sound wave alternately travels against the flow in one direction (upstream) and with the flow in the other direction (downstream). The difference in transit time of the wave is proportional to the flowing velocity of the fluid.

By multiplying this velocity with the area of the pipe, volumetric flow is calculated.

Users interested in the practical advantages of non-intrusive, easy to install, highly accurate measurement should consider the clamp-on ultrasonic flowmeter.

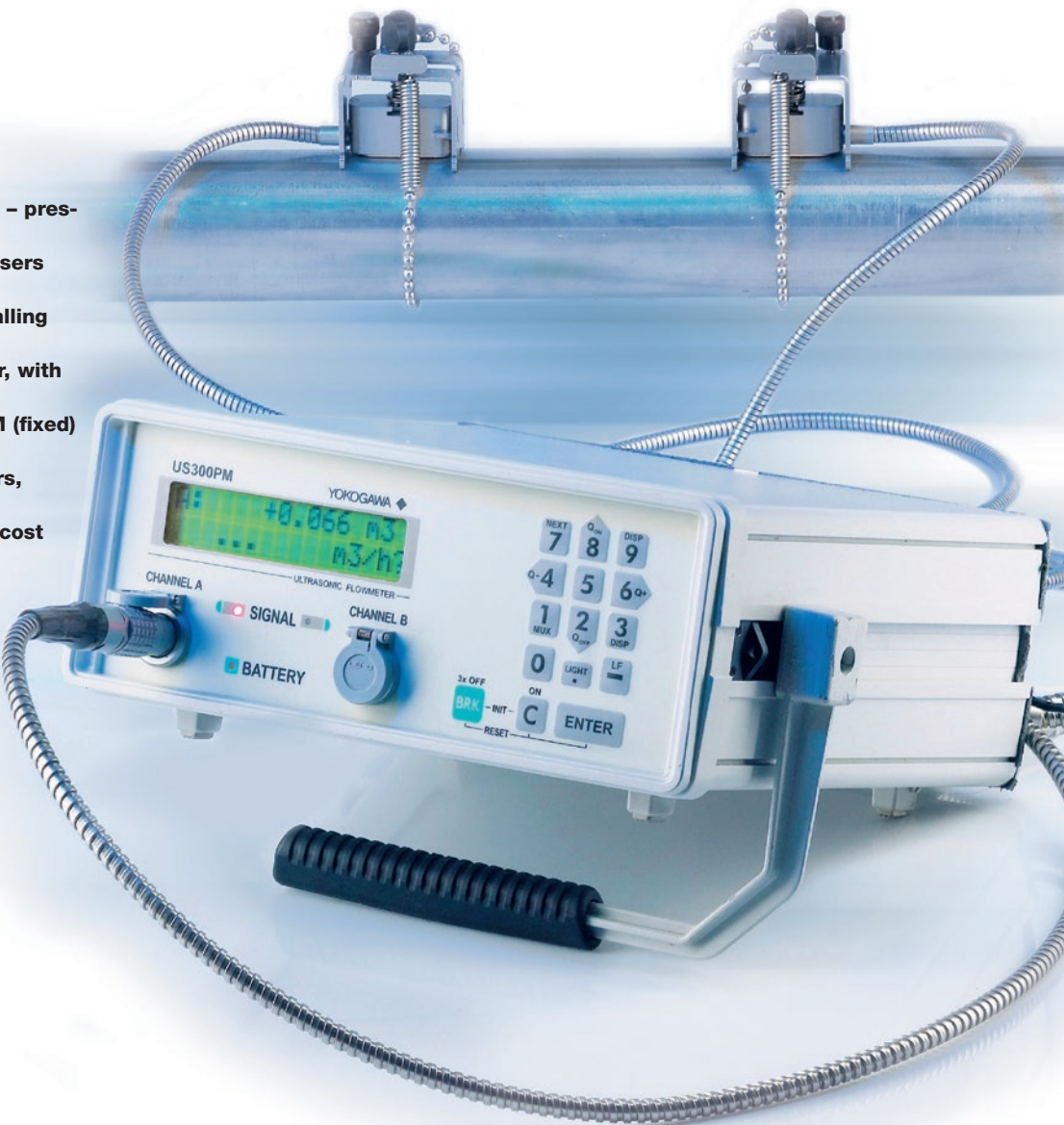
High performance non-intrusive flow measurement: US300

Process downtime – pipe wall coating – pressure loss – wear and tear! For many users these are typical concerns when installing and maintaining a flowmeter. However, with the US300PM (portable) and US300FM (fixed) the advantages are – “dry” transducers, lack of moving parts and an installed cost independent of pipe size are all contributing to a minimum cost of ownership.



The US300 Series provides many solutions to typical problem areas encountered in today's flow operations. Significant features are the advanced dual μ P correlation transit time signal processing; the matched pair stainless steel transducers eliminate zero offsets,

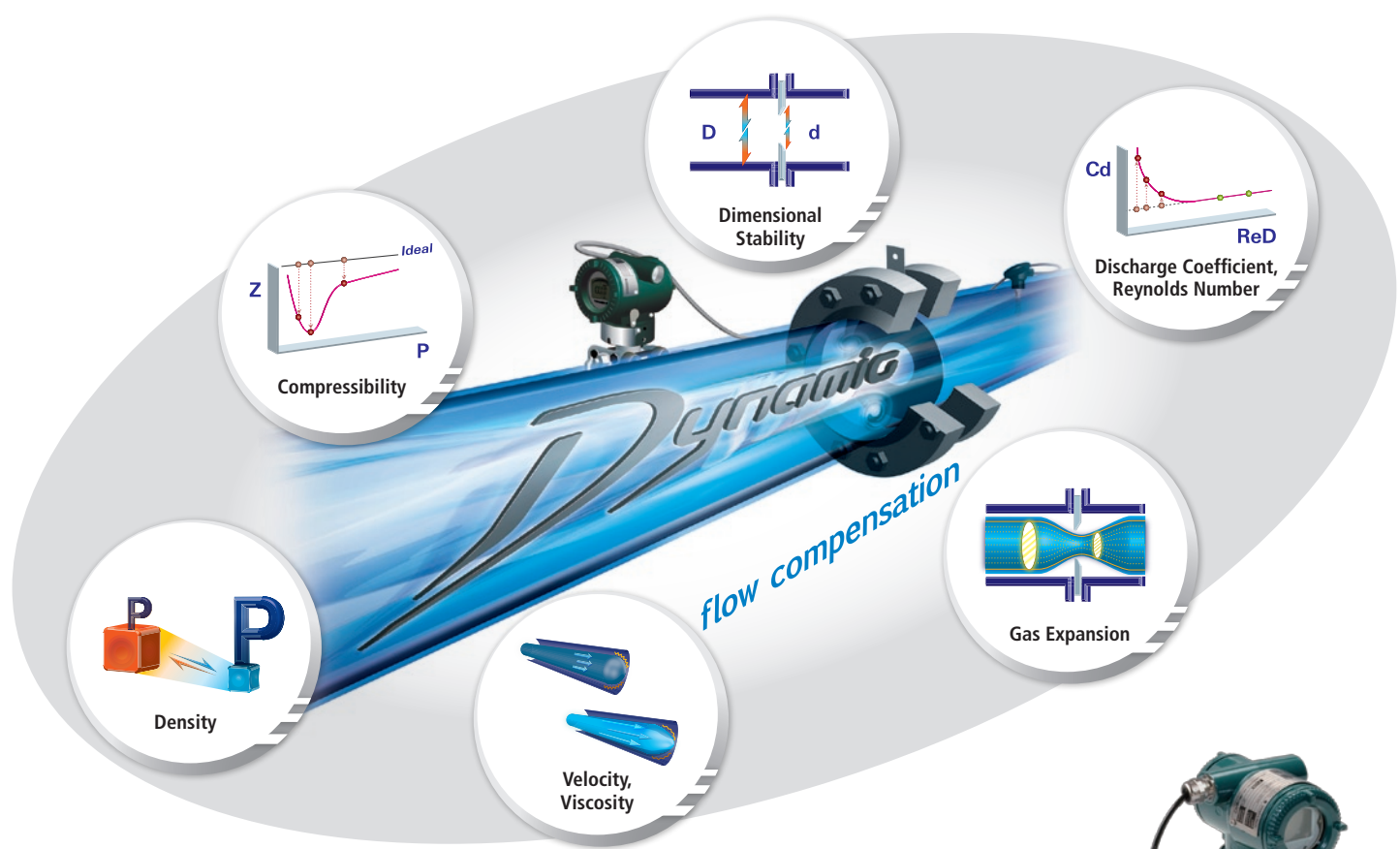
whilst warranting excellent linearity. You can measure volumetric flow, sound velocity, and mass flow on all pipe sizes up to 6.5 m in diameter.



For Pipe Sizes	25 to 6500 mm (1" to 255")
Electronics	Portable or fixed
Measuring Range	0 to 110000 m ³ /h (0 to 484320 GPM - US)
Housing Material	Aluminium (powder coated) Water and dust proof IP54 (EN60529)
Transducer Material	Stainless steel, PEEK
Process Temp. Range	-30 to +200°C (-22 to +392°F)
Pressure Range up to	Line pressure
Ambient Temperature	-10 to +60°C (-14 to +140°F)
Accuracy*	Volumetric flow ± 1 to $\pm 3\%$ Flow velocity $\pm 0.5\%$
Display	2 Line LCD
Signal Outputs	4 to 20 mA
Communication	RS232; interface for PC and printer
Power Supply	6 V/4 Ah (battery) 100 to 240 V AC
Protection Class	IP65 (fixed unit); IP65/IP67 (transducer)
Comments	Special options on request

* of measured value

Multivariable Transmitter Flow Solutions



The EJX910A/930A multivariable transmitter is a sophisticated flowmeter designed to maximize the full potential of differential flowmetering. The DPharp's Multi-Sensing capability combined with an onboard flow computer, enables our EJX910A/930A to fully characterize the process conditions and therefore, optimize the total flow measurement.

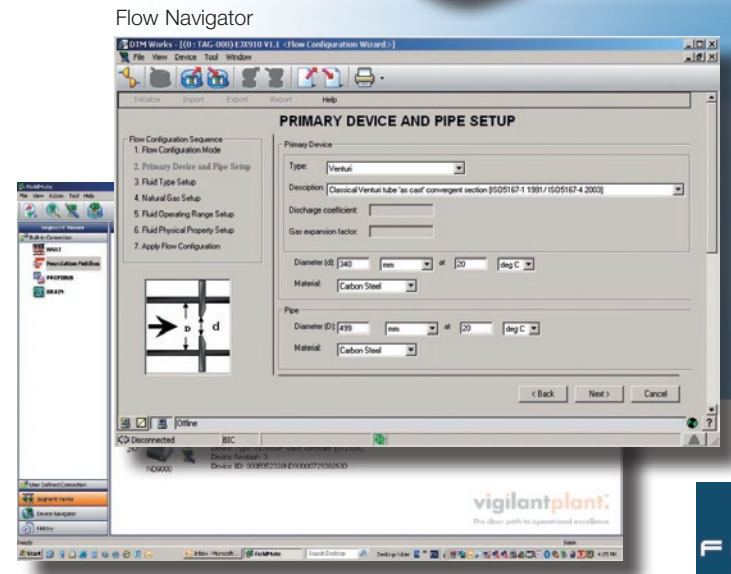
Traditional differential pressure transmitters are only sized at one particular point, the nominal process conditions, around which their accuracy holds true, this ultimately limits their

turndown to approximately 5:1 and in some applications 3:1. The flow accuracy degrades significantly the further the flow is from the nominal process conditions. In contrast, our EJX910A/930A multivariable flowmeter is able to characterize the full flow profile and is not limited to the nominal process conditions.

Dynamic flow compensation allows the EJX910A/930A multivariable flowmeter to eliminate errors in the differential flow calculations and to model the flow profile more precisely. Variations in the flowing medium caused by expandability, compressibility, viscosity and density



are compensated, along with the dimensional changes of the primary element and pipeline caused by temperature. Every 100 milliseconds the onboard flow computer calculates and updates the flow model, improving the accuracy to better than or equal to 1% of the flow rate while also extending the turndown to 10:1 on flow.



The EJX910A/930A currently supports a number of primary elements: Orifice plates, Venturi's and Nozzles in accordance with ISO 5167 (1991 & 2003). While averaging pitot tubes are not covered by an industry standard they are still supported by our EJX910A/930A. This ensures application versatility by allowing end users to optimize their plant operations with the selection of an appropriate primary element.

The Flow Navigator for (FSA120) flow configuration wizard simplifies the handling and commissioning of the EJX910A/930A by breaking down the entry of the required process parameters into logical and convenient blocks within the EJX910A/930A DTM. As a configuration tool, the FSA120 also allows online simulation and offline flow modeling, enabling end users to check the validity of the flowmeter parameters prior to installation.

A further advantage of the Flow Navigator configuration tool is the use of existing FDT/DTM technology. FDT is an open industry interface or frame application while DTM is the specific device manager. This allows the EJX910A/930A DTM to be used in any compliant FDT frame application, exposing its full Multi-Variable measurement & diagnostic capabilities without restriction.

Accuracy	±1% of mass flow rate over 10:1 flow range (100:1 differential pressure range)
Static Pressure Range/Span	Range: 0 to 320 bar abs Span: 10 to 320 bar abs
Temperature Range/Span	Range: -200 to +850 °C Span: +10 to +1050 °C
Output Signal	Flow rate, differential pressure, static pressure, ext. temperature, total flow 4-20mA and pulse output
Communication	HART, FOUNDATION fieldbus

Temperature Solutions

The quality that you've come to expect.

YTA Series



Accuracy

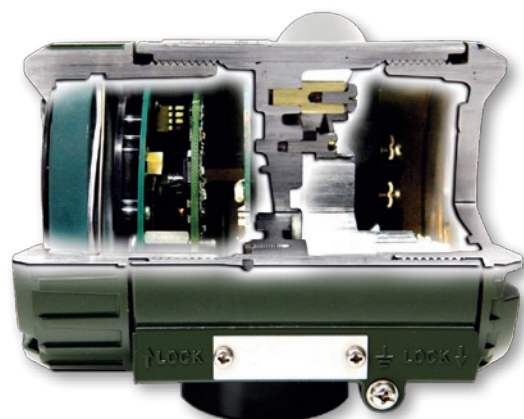
YTA series enables advanced linearization of 17 types of industrial temperature sensors and input signals such as mV or Ohms (Ω). Utilizing a selected high grade 16bit A/D converter allows YTA to achieve a best in class performance of 0.02% of span or $\pm 0.1^\circ\text{C}$.

Stability

YTA's stability is inherited from its meticulous product design and development philosophy. Containing a precision internal reference, YTA can detect and automatically correct for any instability, delivering a 5 year stability guarantee.

Robustness

Robust dual compartment housing with hermetically sealed terminals ensure a long service life, even in the harshest of industrial environments. The durable epoxy paint maximizes chemical resistance, for maximum protection in marine environments where salt spray and semi immersion are common a stainless housing is available.

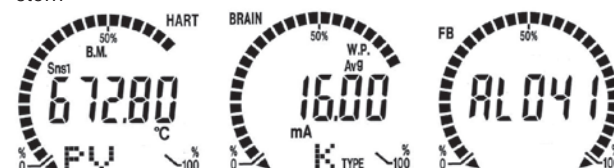


Easy Installation

Easier installation, commissioning and operation, universal inputs keeps inventory costs low while allowing our YTA series to fulfill a wide range of options, which means you can specify a YTA series transmitter to suit virtually all applications. From field mounted to head mounted (Hockey puck), failed sensorbackup or differential temperature measurements, there is a YTA temperature transmitter to suit your requirements.

Clear informative Indicator

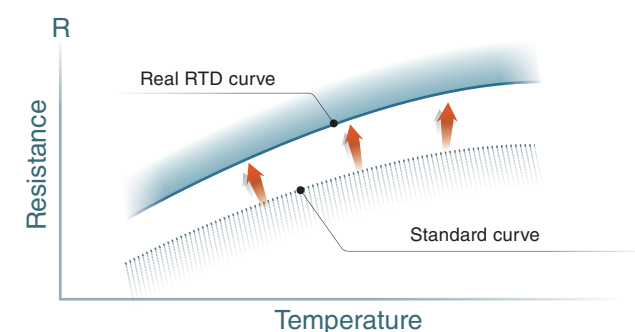
YTA's large informative indicator clearly displays the current status and process information at a glance. A 32 segment circular bar graph provides a clear graphical feedback of the process measurement, while the measurement value itself is displayed in the center along with the correct measurement units. Below the measurement value a dot matrix area keeps you updated with diagnostic information, such as measurement and alarm status etc...



YTA320

Sensor Matching

The linear curve which is assumed to relate temperature and resistance for RTD's, causes minor errors in the final temperature measurement. For the highest accuracy temperature measurement, the specific RTD characteristics described by the Calendar Van Dusen coefficients are programmed into our YTA temperature transmitter.



Failed Sensor Backup

YTA has an automatic failed sensor backup function that transfers seamlessly to the standby sensor when needed. When the primary sensor fails, the transmitter will automatically switch over to the standby, secondary sensor. An error message is displayed on the local indicator and an alarm message is generated for the host system and asset manager.

The failed sensor can then be replaced without losing vital process information. This allows the sensor to be replaced at the next convenient maintenance period, avoiding unnecessary trips to the field and a possible unscheduled plant shutdown.



YTA320

Field/Direct Sensor Mount Transmitter

Accuracy $\pm 0.05\%$

5 Year Stability

Optional SST housing

Dual Sensor Input

Sensor matching

Sensor Redundancy backup

Averaging and Differential Temperature

Programmable Display with Bar graph

20 inputs RTD, TC, mV & OHM

TÜV Certified

SIL 2 Safety Requirement as standard

YTA110 & YTA310

Field/Direct Sensor Mount Transmitter

Accuracy $\pm 0.1\%$ & $\pm 0.05\%$

5 Year Stability

Optional SST housing

Programmable Display with Bar graph

20 inputs RTD, TC, mV & OHM

TÜV Certified

SIL 2 Safety Requirement as standard



YTA50

P.C. Programmable

Head mount Transmitter

Accuracy $\pm 0.2\%$

16 inputs RTD, TC, mV & OHM

YTA70

Head mount Transmitter

Accuracy $\pm 0.2\%$

16 inputs RTD, TC, mV & OHM



Field Wireless Solutions

Building a wireless future to last



Yokogawa has focused on the following three key features.

- 1. Reliability: reliable high-performance field wireless and redundant technologies**
- 2. Flexibility: flexible architecture that supports the full range, from small to large-scale plants**
- 3. Openness: open ISA100.11a standard that allows third-party field wireless devices to be connected**

This new system has been developed in line with Yokogawa's "Grow" concept of helping customers to grow and enabling ourselves to evolve and continue to offer timely solutions.



Toward More Reliability and Larger Scale

Conventional small field wireless systems are mainly installed as additional monitoring tools in areas with a clear line-of-sight such as tank yards and wastewater treatment facilities. Such systems offer only limited advantages such as improved inventory management, reduced regular visual checking, automated environmental measurement, and reduced wiring costs.

In contrast, plant-wide field wireless systems can cover both a large number of measuring points in a small area packed with production equipment where wireless devices are difficult to install, as well as the entire plant. This allows customers to set up wireless devices anywhere in their plants and manage data from those devices to improve plant-wide production efficiency.

Technologies to support a highly reliable field wireless system

Reliable Radio

YOKOGAWA Field Wireless has excellent receiving efficiency and the feature is high reliability of wireless physical layers (Reliable Radio). The technology enabled the 600m long distance communication with standard antenna if there is no obstacle. The low packet error rate is realized under the environment of multi path in "Pipe Jungle".

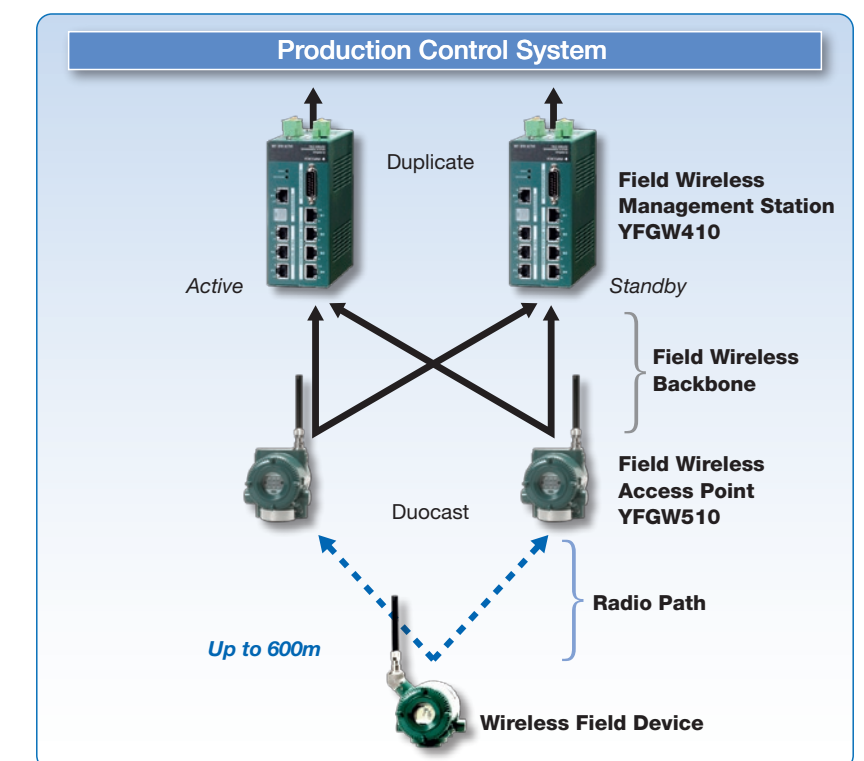
Duocast

"Duocast" is a redundancy technology for the wireless path specified in the ISA100.11a standard. In the conventional mesh-topology network, if communication is not established in a path, data is then sent via another path. However, this may affect real-time performance because the data is not sent in the same time slot, but in a later time slot even in the same superframe.

On the other hand, Duocast simultaneously sends two identical data in the same time slot, and provided either data is successfully transmitted, real-time performance is maintained. Therefore, Duocast is ideal for ensuring the redundancy of mission-critical wireless paths and helps improve reliability while securing low latency.

Redundancy of Field Wireless Backbone

The network between the YFGW510 and YFGW410 is called a wireless backbone network. Its redundancy is specified by the ISA100.11a standard to improve the reliability of the network and is achieved by the redundant YFGW410 stations. Either of the dual YFGW410 stations can deal with disconnections and errors of the wireless backbone network, and malfunctions of the other YFGW410.



Field Wireless microsite
<http://field-wireless.com/en/>

Fieldbus Segment Indicator



Every asset can benefit from the increased insight that FVX brings



Compact and robust design with high reliability

Yokogawa has a long history to supply highly reliable products which is well recognized in the market. The FVX mechanical design is built on the field proven hardware platform of our EJX pressure transmitters. The compact and robust construction with light weight body of 1.2kg is well suited for harsh industrial environments and ensures reliable plant operations.

Powerful functionality offers wider application than traditional indicators

FVX offers a complete suite of FOUNDATION fieldbus compliant function blocks such as Multiple Analog Output (MAO), Arithmetic (AR), Input Selector (IS), Signal Characterizer (SC), Integrator (IT) and PID. It also offers Link Master (Back-up LAS) and online software download functionality as standard features.

Intuitive design enables easy operation

The full dot matrix display with backlight indicates information clearly even at conditions with low ambient lighting. Text and graphic indications well organized in the intuitive design to enable easy operation and realize full functionality. Three line display supports bargraph, icons, scroll bar with direction and page information. Squawk functionality enables easy identification of the device.

Current consumption	15 mA
Power requirement	9 to 32 V DC
Ambient temperature limit	-20 to +70°C (-4 to +158°F)
Ambient humidity	0 to 100% RH
Integral display	32 lines x 84 column dot matrix LCD Max 16 variables 3 line indication as Tag No. 32 alphanumeric Process value 10 character Units of 10 alphanumeric 14 alphanumeric for Black tag, Status, and parameter Display scroll function Backlight function
Function block and Execution time	2X MAO block/20 ms 2X Input selector blocks/30 ms 2X PID blocks/45 ms 2X Arithmetic blocks/30 ms 1X Signal characterizer block/30 ms 1X Integrator block/30 ms
Link master function	Supported
Software download function	Download class: Class 1(FF-883)
Agency approval	ATEX, FM, IECEx, CSA, TIS
Weight	1.2 kg (2.6 lb)
Communication	FOUNDATION fieldbus

Asset Management Solutions

Maximizing the value of plant assets through digital field network

FieldMate™ Family

Yokogawa's intelligent field device a best-in-class and reliable digital solution meets present and future needs in the all industry by providing leading, reliable, interoperable solutions that simplify, maintain and manage the digital life cycle. The Field Digital Solutions ensure true interoperability achieving along with the benefits of advanced diagnostics in devices such as our EJX series of pressure transmitters. A key component in achieving the interoperability is the FDT/DTM technology with FieldMate "One tool for all over device lifecycle". This is a robust industrial communication platform and parameter visualization technology, using a common frame application window, (look & feel) to address multiple communication protocols transparently.

FieldMate PC based Versatile Device Management Wizard

One tool for all

One integrated tool handles parameter setting for intelligent field devices, regardless of who supplies the devices and what particular field communication protocols are used. FieldMate enables quicker device configuration and problem solving, reducing complex and time-consuming work steps.

One tool over device lifecycle

While doing maintenance work on your field devices, FieldMate automatically stores the maintenance work log from initial configuration through start-up and operation.

Leading edge technologies

- Multi Protocol Access: BRAIN, FOUNDATION fieldbus H1, HART, PROFIBUS and ISA100.11a
- Plug & Play: Instant device recognition upon connection
- Graphical device management: Intuitive user display optimized for each field device



FieldMate Handheld Communicator

The YHC5150X FieldMate Handheld communicator is a full function DD Direct HART communicator that supports Universal, Common Practice, and Device Specific commands for commissioning, configuration, and maintenance operations.

Yokogawa's First DD Direct Intrinsically Safe Handheld HART Communicator

- Reads manufacturers' DDs in their native format without the need for translations
- HART-compliant modem communicates with any registered or unregistered HART Device
- Features an ergonomic, handheld design
- Enhanced 4.3" diagonal anti-glare touchscreen with color graphic display (no stylus required)
- Full QWERTY keyboard for commissioning new transmitters
- On Demand Help Menus and teachable device-specific short cuts
- More than twice the battery capacity of any handheld communicator
- Manage device information through by FieldMate PC connection
- Integrated multi-language support



vigilantplant.®

The clear path to operational excellence

SEE
CLEARLY

KNOW
IN ADVANCE

ACT
WITH AGILITY

VigilantPlant is Yokogawa's automation concept for safe, reliable, and profitable plant operations. VigilantPlant aims to enable an ongoing state of Operational Excellence where plant personnel are watchful and attentive, well-informed, and ready to take actions that optimize plant and business performance.

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