

Yokogawa Flow Solutions



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**PAY CLOSE ATTENTION TO  
DETAIL AND DO NOT LOSE A DROP  
IN THE PROCESS**



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**vigilantplant.™**  
The clear path to operational excellence

**YOKOGAWA**



# Making critical plant information just the beginning of the

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.

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.

**vigilantplant.**<sup>TM</sup>

The clear path to operational excellence

# Information fully visible vigilant cycle.

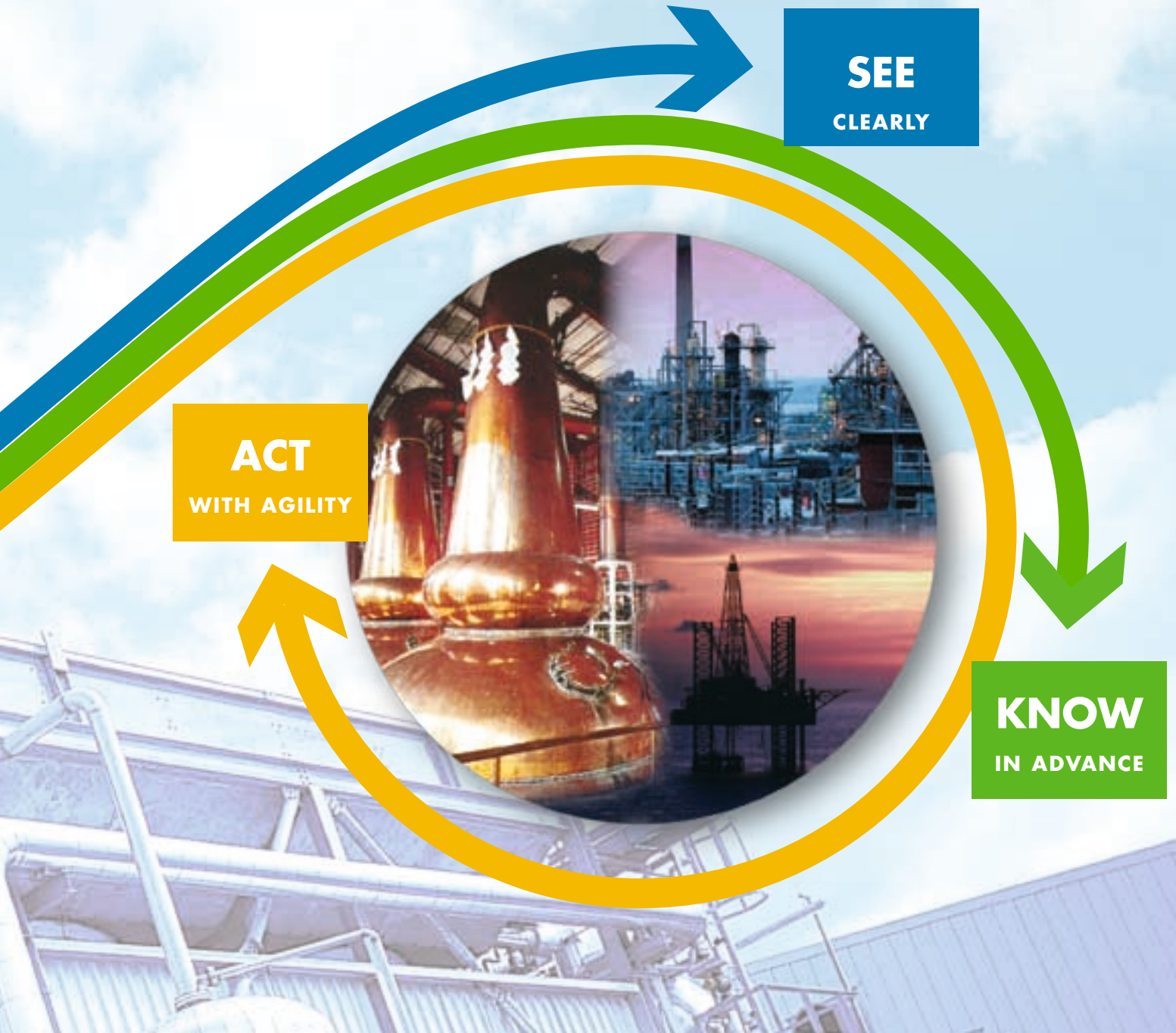
**Value Chain - Our shared goal is customer satisfaction through operational excellence**

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



# Yokogawa's flow selection table

|                       |  | Fluid Type |            |             |                    |                        |                       |                    | Measurement            |                 |           |             |         | Properties    |                          |                           |                |                   |                    |                            |                           |                        |                               |
|-----------------------|--|------------|------------|-------------|--------------------|------------------------|-----------------------|--------------------|------------------------|-----------------|-----------|-------------|---------|---------------|--------------------------|---------------------------|----------------|-------------------|--------------------|----------------------------|---------------------------|------------------------|-------------------------------|
|                       |  | Steam      | Pure gases | Mixed gases | Contaminated gases | High viscosity liquids | Low viscosity liquids | Conductive liquids | Non-conductive liquids | Volumetric flow | Mass flow | Temperature | Density | Concentration | Without auxiliary energy | High measurement accuracy | For large size | Low pressure loss | Wide dynamic range | Bi-directional measurement | High process temperatures | High process pressures | Easy retroactive installation |
| Variable area/float   |  <b>RAMC</b><br>Page 8                      | ●          | ●          | ●           | ○                  | ○                      | ●                     | ●                  | ●                      | ●               |           |             |         |               | ●                        |                           |                | ●                 |                    |                            | ●                         | ●                      | ●                             |
|                       |  <b>RAKD</b><br>Page 9                      |            | ●          | ●           |                    | ○                      | ●                     | ●                  | ●                      | ●               |           |             |         |               | ●                        |                           |                | ●                 |                    |                            | ○                         | ●                      | ●                             |
|                       |  <b>Rotameter (glass)</b><br>Page 10/11    |            | ●          | ●           |                    | ○                      | ●                     | ●                  | ●                      | ●               |           |             |         |               | ●                        |                           |                | ●                 |                    |                            |                           |                        | ●                             |
|                       |  <b>Rotameter (plastic)</b><br>Page 10/11 |            | ●          | ●           | ○                  | ○                      | ●                     | ●                  | ●                      | ●               |           |             |         |               | ●                        |                           |                | ●                 |                    |                            |                           |                        | ●                             |
| Coriolis              |  <b>Rotamass 3 Series</b><br>Page 13      |            | ●          | ●           | ○                  | ●                      | ●                     | ●                  | ●                      | ●               | ●         | ●           | ●       |               | ●                        |                           | ○              | ●                 | ●                  | ●                          | ●                         | ●                      |                               |
| Vortex                |  <b>digitalYEFLO</b><br>Page 15           | ●          | ●          | ●           | ●                  | ○                      | ●                     | ●                  | ●                      | ●               | ○         | ●           |         |               |                          | ●                         | ●              | ●                 | ○                  | ○                          | ●                         | ●                      | ●                             |
| Electro-magnetic      |  <b>ADMAG AXF/SE and RXF</b><br>Page 17   |            |            |             |                    | ●                      | ●                     | ●                  | ●                      | ○               |           |             |         |               | ●                        | ●                         | ●              | ●                 | ●                  | ○                          |                           | ●                      |                               |
| Ultrasonic            |  <b>US 300-Series</b><br>Page 19          |            |            |             |                    | ●                      | ●                     | ●                  | ●                      | ●               | ○         | ○           |         |               |                          | ○                         | ●              | ●                 | ●                  | ●                          | ●                         | ●                      | ●                             |
| Differential pressure |  <b>EJX</b><br>Page 21                    | ●          | ●          | ●           |                    | ●                      | ●                     | ●                  | ●                      | ●               | ○         | ○           |         |               |                          | ●                         | ●              |                   |                    | ○                          | ●                         | ●                      |                               |

● best choice ○ possible

Petrochemical

Chemical/Pharmaceutical

Food & Beverage

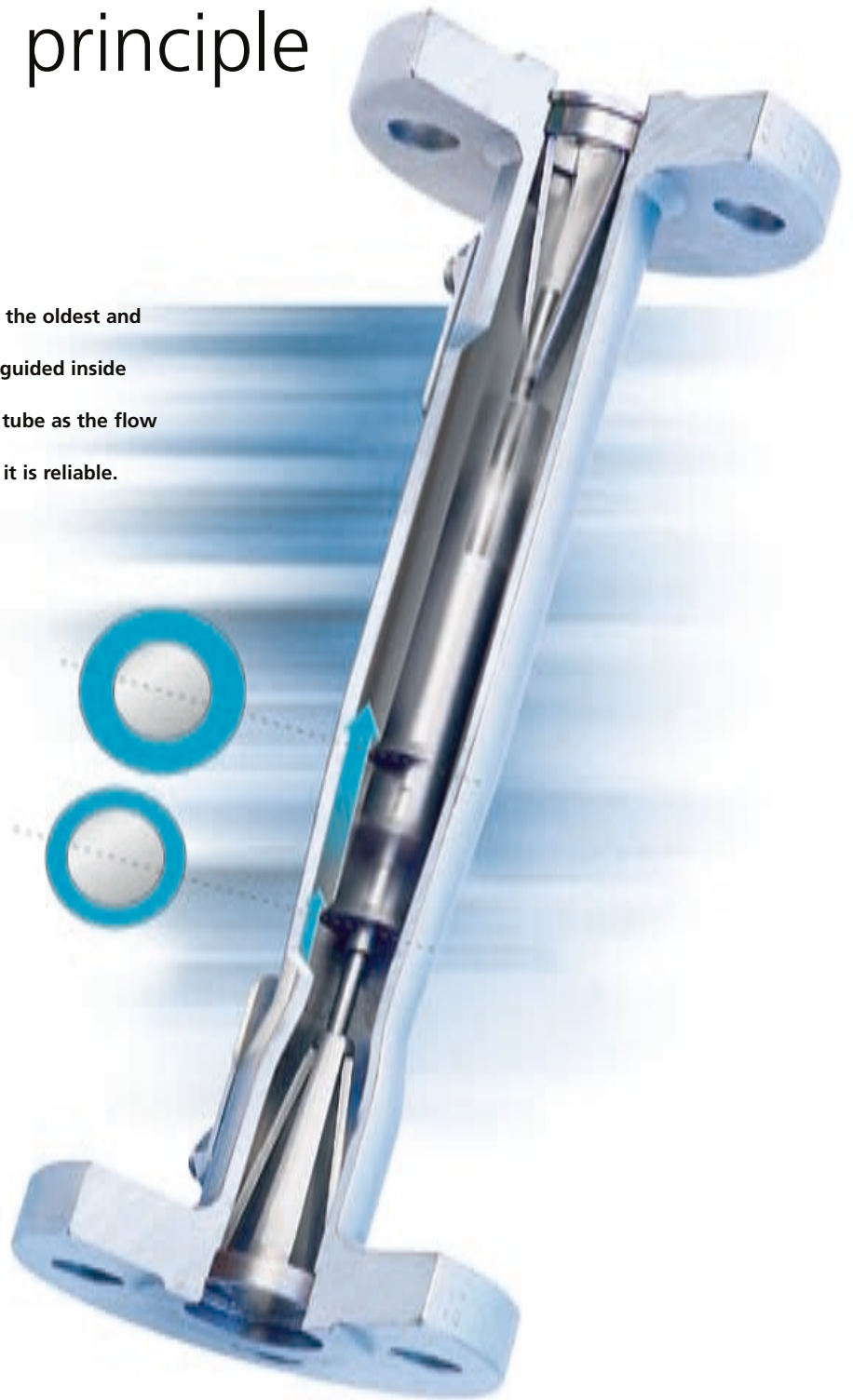
Water/Energy/Other

|  | 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 |   |
|--|-------------|-----------------|-----|----------|-----|-----------------------|-------------------|-----------------|--------|-------|-------|--------------|---------|-------------|---------------|------|------|------|-------|-------------|--------|-----------|------|--------|---------|-------------|-----------------|------------|---|
|  | ●           | ●               |     | ●        | ●   | ●                     | ●                 | ●               | ●      | ●     | ●     | ○            |         | ○           | ○             | ○    | ○    | ○    | ○     | ●           |        |           | ●    |        | ●       | ●           | ●               |            |   |
|  |             | ●               |     | ●        | ○   | ○                     | ●                 |                 | ●      |       | ●     | ○            |         | ○           | ○             |      |      |      |       | ●           |        |           |      |        | ●       | ●           | ●               |            |   |
|  |             | ●               |     | ●        | ○   | ○                     | ●                 | ●               | ●      |       | ●     |              |         |             |               |      |      |      |       | ●           |        |           |      |        | ●       | ●           | ●               |            |   |
|  |             |                 |     |          | ○   |                       | ●                 | ●               | ●      |       |       |              |         |             |               |      |      |      |       | ●           |        |           |      |        | ●       | ●           | ●               |            |   |
|  | ●           | ●               | ●   | ●        | ●   | ●                     | ●                 | ●               | ●      |       | ●     | ●            | ●       | ●           | ●             | ●    | ●    | ●    | ●     | ●           | ●      | ●         | ○    | ●      | ●       | ●           | ●               | ●          | ● |
|  | ○           | ●               | ○   | ●        | ●   | ●                     | ●                 | ●               | ●      | ●     | ●     | ○            |         | ○           | ○             | ○    | ○    | ○    | ○     | ●           | ○      | ○         | ○    |        | ●       | ●           | ●               | ●          |   |
|  |             |                 |     | ○        |     | ●                     |                   | ●               |        |       | ●     | ●            | ●       | ●           |               | ●    | ●    | ●    | ●     | ●           | ●      | ●         |      | ●      |         |             |                 | ●          |   |
|  | ●           | ●               |     | ●        |     | ●                     |                   |                 |        |       | ●     | ○            | ○       | ●           | ●             | ●    | ●    | ●    | ●     | ●           | ●      | ○         |      | ○      |         |             |                 | ○          |   |
|  | ●           | ●               |     | ●        | ○   | ○                     | ●                 | ●               | ●      | ●     | ●     |              |         |             | ○             |      |      |      |       | ●           | ●      |           | ●    |        | ●       | ●           | ●               |            |   |

# Proven technology: The Rotameter (variable area) principle

**The Rotameter (variable area flowmeter) is one of the oldest and mature principles in flow measurement. A float is guided inside a conically shaped tube. The float rises within the tube as the flow increases. This mechanical principle is as simple as it is reliable.**

Due to its operating principle the Rotameters are installed in vertical pipes. Once the process medium flows through the tube, the gravimetric force balances with the flow resistive force in such a way that the position of the float indicates the flow rate value.



# Economical: Modular and flexible

**Rotameters are completely modular and flexible. The measuring tube can be made of glass, plastic or metal – depending on the application.**

If the tube is made of metal, the float position is transferred to an external indicator via a magnetic coupling. In the case of glass and plastic tubes you can simply view the float position to get a reliable reading of the flow rate.

The mechanical nature of the measuring principle provides a flow device that does not require any electrical power supply. However, there are many applications in process plants that do require electronic indication and transmission of the measured flow rate to other associated devices. This capability has considerably expanded the range of applications for the variable area flowmeter.



# Robust and universal: Rotameter **RAMC** – the original



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



Flame proof version (Ex-d)

At first glance the instrument looks impressive with its all stainless steel design. A closer look reveals a unique patented “float blockage” detection system. 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, and intrinsically safe outputs are available as an option.

If you value flexibility in a flowmeter – from the measurement of air to highly aggressive liquids – in situ replacement of the indicator without degradation of performance – and the interchangeability of floats – then the RAMC is the right choice for you.

The RAMC combines all the advantages of the variable area principle with robust design, reliable measurement, with or without power, culminating in a truly universal flowmeter for gases, liquids and steam applications.

|                      |  |
|----------------------|--|
| Sizes                | DN 15 to DN 150 (1/2" to 6")   |
| End Connections      | DIN EN Flanges, ASME Flanges<br>Male thread DIN 11851, Triclamp<br>Female thread G & NPT   |
| Measuring Range      | Water 20°C (68°F): 2.5 l/h to 130 m³/h<br>Air 20°C (68°F): 1 bar (15 psi) abs:<br>75 l/h to 1400 m³/h  |
| Material             | 1.4404 (AISI 316L); PTFE   |
| Process Temp. Range  | -180°C to +370°C (-292°F to 698°F)   |
| Pressure Range up to | 100 bar (1450 psi)<br>Higher pressures on request  |
| Ambient Temperature  | -20°C to 100°C (-4°F to 212°F)   |
| Accuracy             | Class 1.6/2.5 VDI/VDE  |
| Indicator            | Analog scale plate/LCD   |
| Ex-approvals         | ATEX/SAA/NEPSI   |
| Inputs/Outputs       | Analog 0-20 mA/4-20 mA   |
| Communication        | HART, PC tool Pacticeware<br>Profibus PA, Foundation Fieldbus  |
| Power Supply         | 230 V AC 4-wire, 115 V AC 4-wire<br>24 V DC 3-wire, 24 V DC 2-wire   |
| Protection Class     | IP 65 (IP 66/IP 67)  |
| Comments             | Limit switches available<br>Patented float blocking detection<br>Housing: plastic, aluminium, stainless steel<br>Flame proof/dust proof/SIL 2 applicable<br>Special options on request |



# Small in size, big in performance: Rotameter **RAKD**



The RAKD is the smaller brother of the RAMC – is robust in design – for low flows and high pressure applications.

The RAKD differentiates itself from other comparable variable area meters by means of its light and guided float design. This feature avoids oscillations caused by gas compressibility, resulting in a very stable measurement.

This design has a direct bearing on stability – pressure loss is lower by two-thirds compared to other comparable meters.

The RAKD variable area flowmeter is highly accurate, particularly for low flows and high pressure applications. Once again no auxiliary energy is required.

|                        |   |
|------------------------|---|
| Sizes                  | DN 15 to DN 25 (1/2" to 1")   |
| End Connections        | DIN EN Flanges, ASME Flanges<br>Female thread G & NPT<br>Cutting ring, Nozzle   |
| Measuring Range        | Water 20°C (68°F):<br>1 l/h to 250 l/h<br>Air 20°C (68°F); 1bar (15 psi) abs:<br>40 l/h to 8000 l/h                                   |
| Material               | 1.4571 (AISI 316Ti)   |
| Process Temp. Range    | -25°C to +250°C (-13°F to +482°F)   |
| Process Pressure up to | 160 bar (2320 psi)  |
| Ambient Temperature    | -20°C up to 100°C (-4°F up to 212°F)  |
| Accuracy               | Class 4 VDI/VDE   |
| Indicator              | Analog scale plate  |
| Ex-approval            | ATEX  |
| Signal Outputs/ Inputs | Analog 4-20 mA  |
| Communication          | Service Box   |
| Power Supply           | 24 V DC 2-wire  |
| Protection Class       | IP 65 (on request IP 67)  |
| Comments               | Limit switches available<br>Fine control valves available<br>Differential pressure controller available<br>Special options on request |
| Electrical Connections | Quickon   |

# Trust your own eyes: Rotameter **RA-Series**

The flow metering tube is transparent giving you full insight into the process and position of the float – a scale on the outside of the tube indicates the true flow rate. All the measurement tubes in this series of variable area flowmeters are made of either glass or plastic.

A Rotameter is a truly modular flowmeter. The variety in cones, floats, scales, process connections and options combine to make the Yokogawa Rotameter suitable for a very wide range of applications. An example is our glass meter which resists highly corrosive mediums, is antistatic and especially suitable for low flow gas measurement.

Rotameter gets its name from the rotating float. Special diagonal notches cause the float to rotate. This eliminates friction and guarantees very stable behaviour and highest accuracy; oscillations are eliminated by using low density floats.

This simple and affordable flowmeter has a very broad application range, smart design and decades of proven performance.



RAGK/RAGL

RAGH

RAGG

RAQN

|                                      | RAGK/RAGL   | RAGH/RAGG  | RAQN   |
|--------------------------------------|---|--|--|
| Sizes                                | 1/4" to 3/8", 6 to 12 mm  | 1/4" to 2 1/2" DN 15 to DN 40  | 3/8" to 2"   |
| End Connections                      | NPT; cutting ring;<br>Swageloc<br>Nozzle  | Female threads; Nozzle<br>Glue socket<br>DIN EN flanges                        | Female threads<br>Glue socket  |
| Measuring Range                      |   |  |  |
| Water 20°C (68°F):                   | 0.0025 l/h to 600 l/h   | 0.0025 ml/h to 10 m³/h   | 10 l/h to 10 m³/h  |
| Air 20°C (68°F); 1 bar (15 psi) abs: | 0.2 l/h to 6300 l/h   | 0.1 l/h to 250 m³/h  | 160 l/h to 250 m³/h  |
| Material                             | 1.4571 (AISI 316TI);<br>Polypropylene; PTFE;<br>Various float materials available   | 1.4571 (AISI 316TI);<br>Steel; PVC; PTFE;<br>Various float materials available | Steel, PVC;<br>Various float materials available   |
| Measuring Tube                       | Borosilicate Glass  | Borosilicate Glass   | Polyamide or Polysulfone<br><i>Polyamide Polysulfone</i>                                   |
| Process Temp. Range                  | Max. 130°C<br>(Max. 266°F)  | Max. 130°C<br>(Max. 266°F)   | Max. 60°C<br>(Max. 140°F) Max. 100°C<br>(Max. 212°F)                                       |
| Pressure Range up to                 | 16 bar (232 psi)  | Depending on measuring tube size:<br>6 to 16 bar (87 to 232 psi)               | 10 bar (145 psi)   |
| Ambient Temperature                  | 0°C up to 80°C<br>(32°F up to 176°F)  | 0°C up to 80°C (32°F up to 176°F)  | <i>Polyamide Polysulfone</i><br>0°C to 60°C 0°C to 80°C<br>(32°F to 140°F) (32°F to 176°F) |
| Accuracy                             | Class 1.6/2.5/4 (sphere 6) VDI/VDE  | Class 1.6 VDI/VDE  | Class 2.5/4 VDI/VDE  |
| Indicator                            | Direct reading scale  | Direct reading scale   | Direct reading scale   |
| Comments                             | Limit switches available<br>Pressure controller available<br>Valves available; Differential<br>Special options on request | Limit switches available<br>Valves available<br>Special options on request     | Limit switches available<br>Special options on request                                     |

# No limitation: Rotameter customized solutions

The Rotameter is known all over the world as a reliable measurement instrument and nowadays is synonymous with the variable area flowmeter principle. We built this reputation on customer oriented solutions.



We have the ability to design and manufacture customer specific solutions. Especially Rotameters where we have almost a century of experience in manufacturing specific sizes, utilizing special materials and creating special scales. All you need to do is tell us what is necessary to fulfil your requirements and we will provide the solution.

Our customers have the opportunity to develop with us a specific solution for their application and take advantage of almost 100 years of experience. The result is a Rotameter designed and built for your specific application.

# Total reliability: The Coriolis mass flowmeter principle

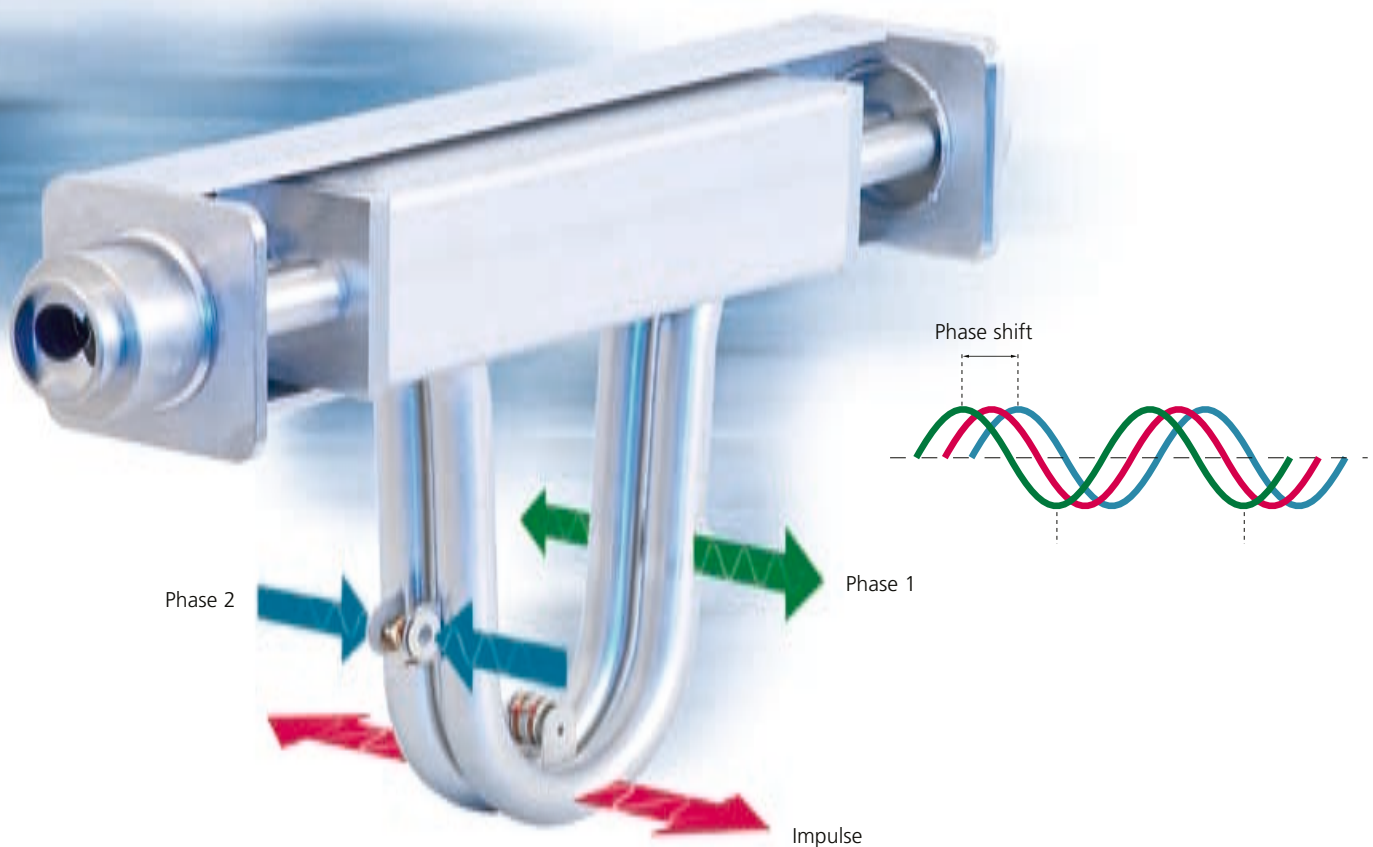
**This high precision measurement principle is unaffected by fluctuating line pressures and changes in viscosity or temperature. Not even the physical properties of the fluid such as, high viscosity fluids (slurries and pastes) or the environmental conditions will affect the accuracy.**

The Coriolis principle enables the precise measurement of mass flow, density, temperature and volume flow. 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 small phase shift is a direct measure of the mass flow passing through the detector. The change in resonance frequency of the tubes is a measure of the density of the fluid in the meter.

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



# Versatile and durable: ROTAMASS 3 Series

Whenever the task is to measure mass flow, density, temperature and volume flow, the ROTAMASS is the right choice. The ROTAMASS 3 Series is the best-in-class mass flowmeter featuring discrete, parallel, thick-walled, seamless tubes that are uniquely decoupled from process vibration and pipeline stress.



The ROTAMASS measures gases and liquids – even with paste-like consistency – from zero-flow and at temperatures of up to 350°C (662°F). With its state of the art measuring features, e.g. online concentration measurements and diagnostic capabilities for entrained gas and solid particles, the ROTAMASS sets the standard.

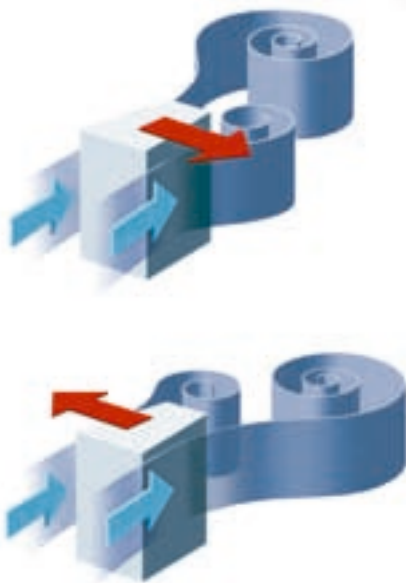
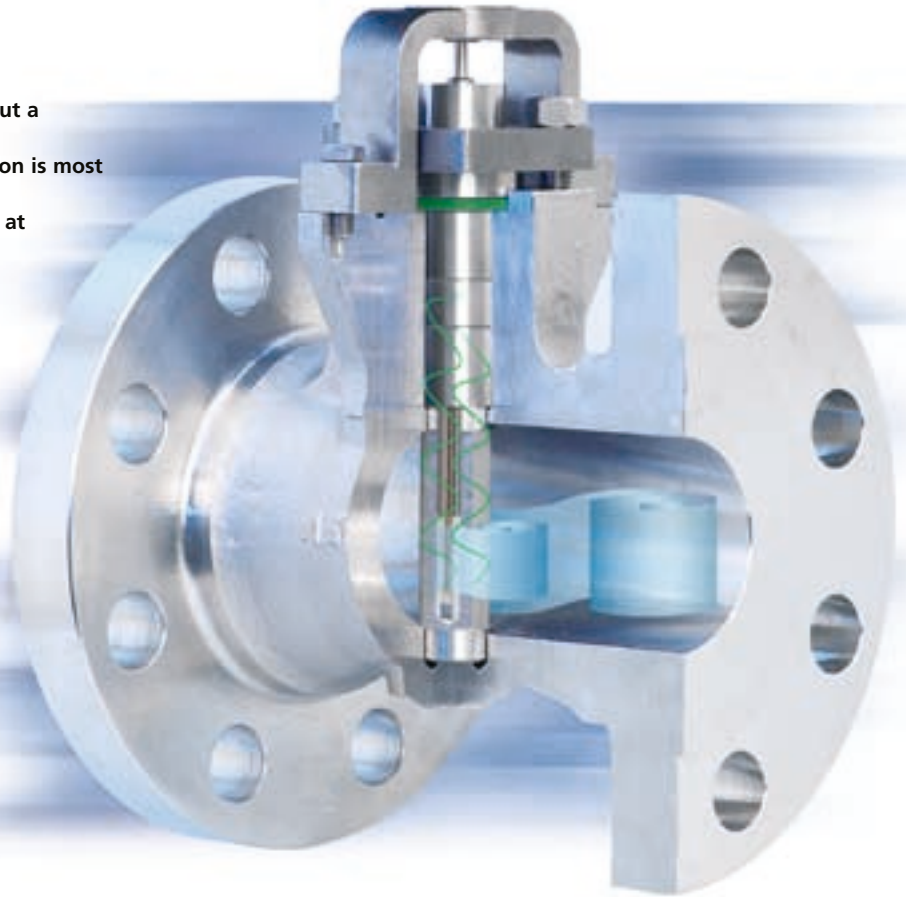
The ROTAMASS is easy to clean. When mounted in a vertical pipe the flowmeter is self draining and it meets the highest surface area treatment quality standards for sanitary applications with EHEDG and 3A approval. The ROTAMASS meets the highest requirements for use in hazardous areas. With its unique, robust “box-in-box-design” the ROTAMASS is decoupled from external oscillations and mechanical stresses.

The ROTAMASS 3 Series is the solution for any fluid that is pumped through a pipe – from oil to milk, from liquefied gas to molten tar. It can be installed in process plants or on a truck without any compromise in accuracy and stability. No other flowmeter offers so many features and such a high return on investment as the ROTAMASS 3 Series Coriolis Flowmeter.

|                        |   |
|------------------------|---|
| For Pipe Sizes         | DN 8 to 200 (¼" to 8")  |
| End Connections        | Flange or threaded  |
| Electronics            | Integral or remote  |
| Measuring Range        | 0 to 300 t/h (0 to 11023 lb/m)  |
| Measuring Tube         | Stainless steel 1.4404 (316L),<br>Hastelloy 2.4602 (C 22),<br>Titanium 3.7035 (B265 Gr. 2)  |
| Process Temp. Range    | -200°C to +350°C (-328°F to +662°F)   |
| Process Pressure up to | 280 bar (4000 psi)  |
| Ambient Temperature    | -40° C to 50° C (-40°F to 122° F)   |
| Accuracy*              | ±0.1 % liquid<br>±0.5 % gas   |
| Display                | 4 Line LCD backlit  |
| Ex-approvals           | ATEX, FM, CSA, UCIEE, GOST  |
| Signal Outputs/Inputs  | 2 x 4 to 20 mA,<br>2 x pulse/frequency/status output<br>1 status input  |
| Communication          | HART, Foundation Fieldbus<br>PC tool Pactware   |
| Power Supply           | 90 to 264 V AC<br>20,5 to 28,8 V DC   |
| Protection Class       | IP 67   |
| Comments               | Advanced diagnostic features as standard<br>Up to 300 m (1000 ft) between sensor and converter<br>Heat tracing as standard available<br>Suitable also for high gas content<br>Slugflow detection and compensation<br>Special options on request |
|                        | * of measured value   |

# Long Term Stability: The vortex flowmeter principle

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.



The basic principle of vortex shedding is visible in daily life. The fluttering of a flag in the wind is a prime example. The frequency of the vortices is an indication of wind speed. Applied to flow measurement vortex shedding is produced by the use of a blunt, normally flat faced body placed in the pipe perpendicular to the flowing fluid. As fluid passes the blunt body or shedder bar, alternating vortices are created with a frequency that is directly proportional to the fluid velocity.

The vortex technology is ideally suited and applicable for measuring clean gases, steam and low viscous liquids.

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

# Empowered Technology: digitalYEWFLOW

The next generation in vortex measurement is the digitalYEWFLOW.

Combining the field proven sensor and body assemblies used in over 200 000 units installed worldwide, with unique digital electronics and possessing Yokogawa's SSP technology the digitalYEWFLOW provides the ultimate in accuracy and stability.

Yokogawa's "Spectral Signal Processor" 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 patented dual sensors, inside the shedder bar are monitored constantly. Intelligent noise functions eliminate noise, thus providing vibration immunity and high stability, even at low flows.

The diagnostic system provides valuable user information about fluid conditions while analyzing the process and assessing the installation conditions or application. 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 meter with its temperature sensor embedded in the shedder bar is used primarily for steam and energy measurement. There it allows the direct mass flow measurement.

The digitalYEWFLOW is highly suited in applications where the temperature can be as low as -200°C or as high as +450°C.

In the oil industry the digitalYEWFLOW is an ideal flowmeter because it can be used at very high pressures. Flange connections up to PN 250/ANSI Class 2500 are available.



|  |   |
|--|---|
| For Pipe Sizes                           | DN15 to 400 (0.5" to 16")   |
| End Connections                          | Flange or wafer   |
| Electronics                              | Integral or remote  |
| Measuring Range                          | 0.3 to 4000 m <sup>3</sup> /h<br>(0 to 18000 GPM - US), e.g. for water  |
| Body Material                            | Stainless steel SCS 14 A (1.4410)<br>Stainless steel 1.4408 (CF8M)<br>Stainless steel 1.4552 (CF8C)<br>Carbon steel (WCB)           |
| Shedder Bar Material                     | Stainless steel 1.4517 / 1.4301<br>Duplex stainless steel (DCS1)<br>Duplex stainless steel (CD4MCu)<br>Hastelloy C276 equiv. 2.4819 |
| Process Temp. Range                      | -196°C to +450°C (-321°F to +842°F)   |
| Pressure Range up to                     | PN 420 /ANSI Class 2500   |
| Ambient Temperature                      | -40° C to 85° C (-40° F to 185° F)  |
| Accuracy*                                | ±0.75 % liquid, ±0.5 % temp.<br>±1 % gas and steam  |
| Display                                  | 2 Line LCD  |
| Ex-approvals                             | ATEX, FM, CSA, SAA, IECEx,<br>TIIS, GOST  |
| Signal Outputs/ Inputs                   | 4 to 20 mA, pulse/alarm output,<br>Temperature output   |
| Communication                            | HART or BRAIN, Foundation Fieldbus  |
| Power Supply                             | 10.5 to 42 V DC   |
| Protection Class                         | IP 67 (NEMA 4x)   |
| Max. Distance Sensor – Signal converter: | 30 m (100 ft)   |
| Special Features                         | Self diagnostic functionality<br>Built-in temperature sensor for<br>Mass flow calculation<br>Special options on request             |

\* of measured value

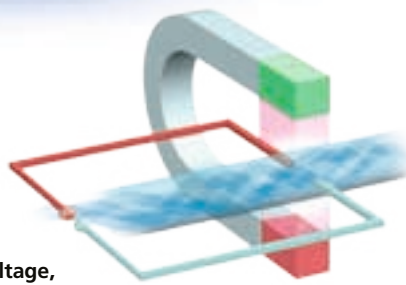
# Full bore non-intrusive: The magnetic flowmeter principle

**Reliable flow measurement for special applications like slurries and suspensions, low velocity flows or low conductive fluids is guaranteed using the ADMAG AXF series with its dual frequency excitation principle.**

The simplicity of Faraday's Law is utilized by Yokogawa's ADMAG AXF to provide a non obstructive magnetic flowmeter that will address all your instrumentation requirements. ADMAG AXF provides with its optimized dual-frequency coil 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.

This enables you to solve your easy and your most difficult flow applications with one single device. The self-diagnosis-function detects product build-up or coating on the electrode surfaces, and makes maintenance predictable as information on how to correct the problem will be displayed. ADMAG AXF is also available with various sanitary process connections making it ideal for the food and pharma industry.

**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 electrode 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.



# No more guesswork – maintenance is predictable: **ADMAG AXF™**

With an optional accuracy specification of 0.2% process optimization is no problem.

RXF is a latest member within the Yokogawa magmeter portfolio. This meter is dedicated to the water industry. RXF provides all necessary features for this industry including newest diagnostic features and communication protocols for water projects. The flanged flow tubes with hard rubber liner are available in various flange ratings.

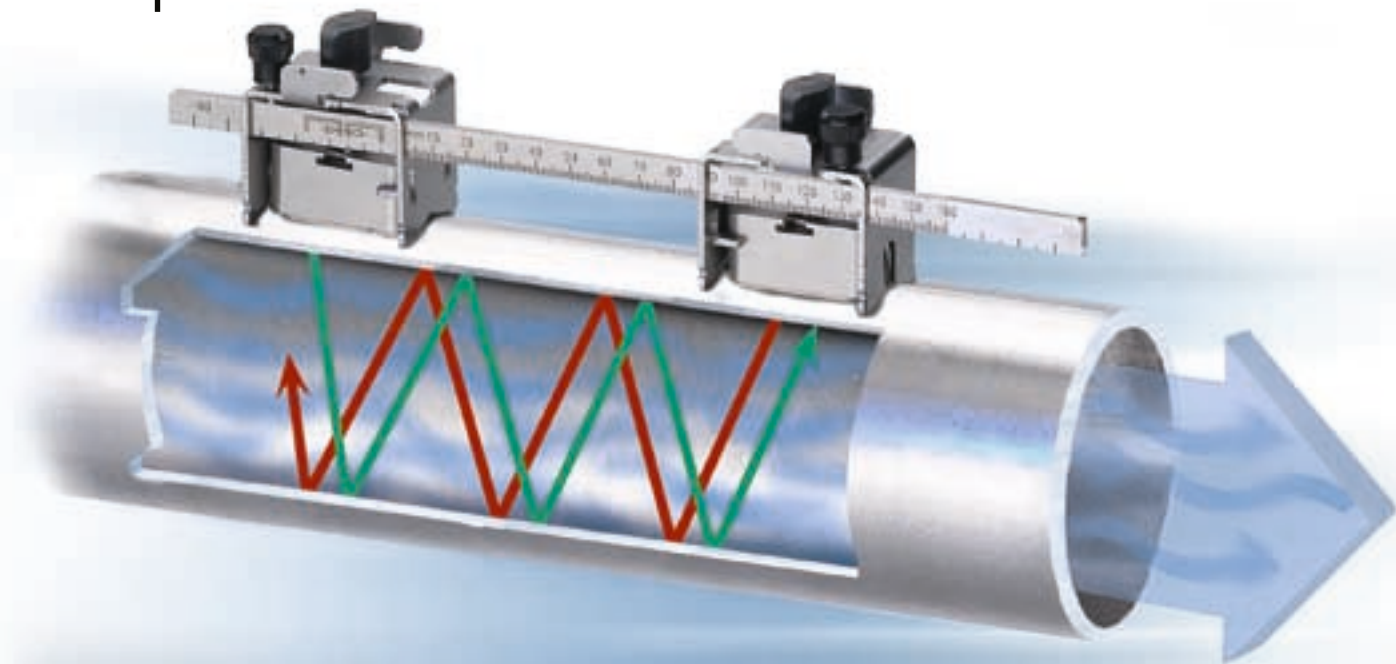
ADMAG SE is a meter optimized for the process industry addressing the special needs of the chemical industry with its PFA lined flowtube in flange and wafer style. The various electrode materials available make the ADMAG SE an economical solution for the process industry.



|                                    | ADMAG AXF  | ADMAG SE   | RXF   |
|------------------------------------|--|--|---|
| Sizes                              | 2 mm to 2600 mm (0.1" to 100")   | DN 15 to DN 400 (0.5" to 16")  | 15 mm to 1000 mm (0.5" to 40")                                      |
| End Connections                    | Flange or wafer  | Flange or wafer  | Flange  |
| Electronics                        | Integral or remote   | Integral or remote   | Integral or remote  |
| Measuring Range                    | 0 to 191000 m <sup>3</sup> /h<br>(0 to 869000 GPM - US)  | 0 to 4500 m <sup>3</sup> /h<br>(0.8 to 20560 GPM - US)   | 0 to 27400 m <sup>3</sup> /h<br>(0 to 120800 GPM - US)              |
| Liner Material                     | PFA, PU, EPDM, Ceramic, Natural soft rubber  | PFA  | Hard rubber   |
| Electrode Material                 | Stainless steel 1.4404 (SUS316L)<br>Hastelloy C276 equiv., Platinum,<br>Tantalum, Titanium, Tungsten Carbide | Stainless steel 1.4404 (SUS316L)<br>Hastelloy C276 equiv., Tantalum, Titanium,<br>Platinum-Iridium, Tungsten Carbide | Stainless steel 1.4404 (SUS316L)<br>Hastelloy C276 equiv. 2.4819    |
| Process Temperature Range          | -40° C to +180° C (-40° F to +356° F)  | -40° C to +130° C (-40° F to +266° F)  | -10° C to +90° C (14° F to +194° F)                                 |
| Pressure Range up to               | 2/4 MPa (290/580 psi)  | 2/4 MPa (290/580 psi)  | 2/4 MPa (290/580 psi)   |
| Ambient Temperature                | -20° C to +60° C (-4° F to +140° F)  | -20° C to +60° C (-4° F to +140° F)  | -20° C to +60° C (-4° F to +140° F)                                 |
| Accuracy*                          | ±0.35 % (standard), ±0.2 % (optional)  | ±0.5 %   | ±0.5 %  |
| Display                            | 3 Line graphical Display   | LCD with background illumination   | 3 Line graphical Display  |
| Ex-Approvals                       | ATEX, FM, CSA, IECEx, TIIS, GOST   | ATEX, FM, CSA, SAA   |   |
| Signal Outputs/Inputs              | 4 to 20 mA,<br>Pulse/alarm output status input   | 4 to 20 mA,<br>Pulse/alarm output status input   | 4 to 20 mA,<br>Pulse/alarm output status input                      |
| Communication                      | HART, BRAIN, Foundation Fieldbus   | HART or BRAIN  | HART, BRAIN, Foundation Fieldbus                                    |
| Power Supply                       | 80 to 264 V AC, 47 to 63 Hz<br>90 to 130 V DC, 20.4 to 28.8 V DC/AC  | 80 to 127 V AC, 180 to 264 V AC, 47 to 63 Hz<br>20.4 to 28.8 V DC/AC   | 80 to 264 V AC, 47 to 63 Hz<br>90 to 130 V DC, 20.4 to 28.8 V DC/AC |
| Protection Class                   | IP67/68 (NEMA 4x)  | IP67 (NEMA 4x)   | IP67/68 (NEMA 4x)   |
| Max. Dist. Sensor-Signal Converter | 200 m (660 ft)   | 300 m (1000 ft)  | 200 m (660 ft)  |

Special options on request \* of measured value

# NONE-wetted flow measurement: The clamp-on ultrasonic flowmeter principle



Upstream sound pulse transit time

Downstream sound pulse transit time

Flow velocity ~ difference in transit time

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  $\mu\text{P}$  correlation transit time signal processing; the matched pair stainless steel transducers eliminate zero offsets, whilst warranting

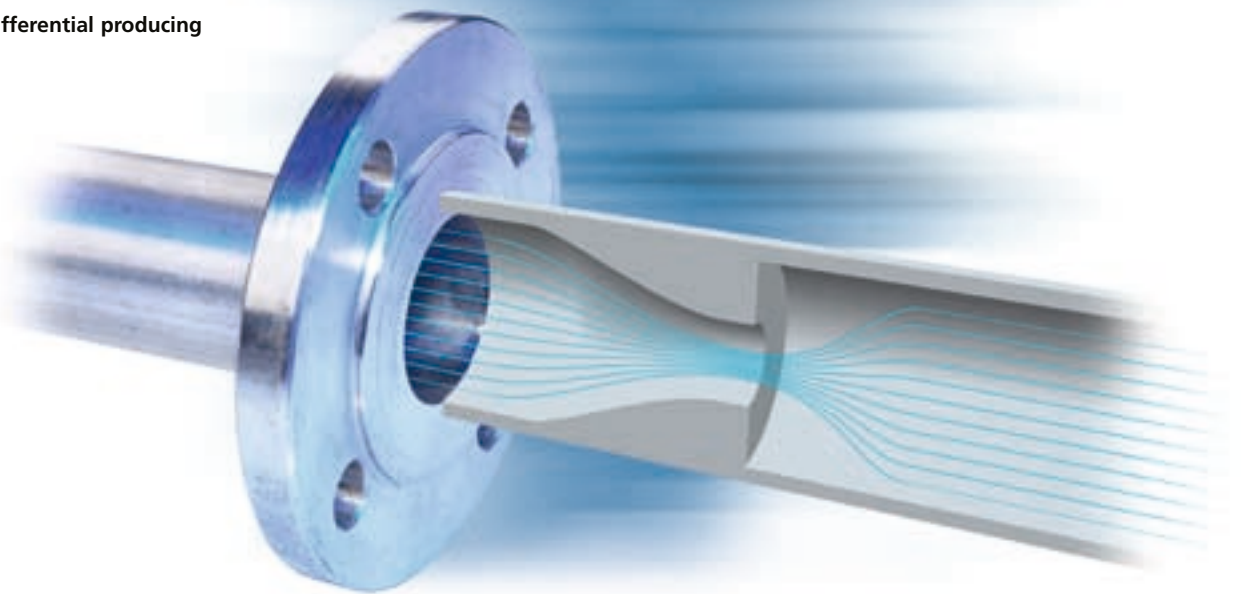
excellent linearity. You can measure volumetric flow, sound velocity, and mass flow on all pipe sizes up to 6.5 m in diameter.

|                       |  |
|-----------------------|--|
| For Pipe Sizes        | 10 mm to 6500 mm (0.4" to 25")                                   |
| Electronics           | Portable or fixed  |
| Measuring Range       | 0 to 110000 m <sup>3</sup> /h<br>(0 to 484320 GPM - US)          |
| Housing Material      | Aluminium (powder coated)<br>Water and dust proof IP54 (EN60529) |
| Transducer Material   | Stainless steel, PEEK  |
| Process Temp. Range   | -30°C to +400°C (-22°F to +752°F)                                |
| Pressure Range up to  | Line pressure  |
| Ambient Temperature   | -10°C to +60°C (-14°F to +140°F)                                 |
| Accuracy*             | Volumetric flow $\pm 1-3\%$<br>Flow velocity $\pm 0.5\%$         |
| Display               | 2 Line LCD   |
| Ex-Approvals          | ATEX transducer  |
| Signal Outputs/Inputs | 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);<br>IP65/IP67/IP68 (transducer)                |
| Comments              | Special options on request                                       |

\* of measured value

# Proven devices for many applications: Differential pressure

One of the longest established principles of measuring flow is to detect the differential pressure across a differential producing primary element.



The primary differential element produces an increase in fluid velocity with a predictable drop in line pressure across an orifice plate, venturi, or pitot tube as defined by Benoulli's famous equation. The differential pressure across the device is proportional to the square root of the fluid flow in the pipe. This technology can be easily applied to line sizes from 15 mm to 1500 mm.



Flow Computer

For low flow measurement an integral orifice assembly with a bore from 0.508 mm to 6.350 mm is available with a low flow differential pressure transmitter.



Low flow integral orifice measurement by EJA 115

# The digital evolution continues:



In order to meet the increasing demand within the process industry, Yokogawa provides you with the innovative **DP harp EJX Series of digital differential pressure transmitters. Designed with accuracy, robustness, repeatability and stability in mind.**

EJX delivers an unequalled performance across the board, wherever you need to deploy your differential pressure measurements. From offshore platforms in harsh environments to onshore refineries, chemical and other processing plants.

Yokogawa's Multi-sensing digital sensor technology enables you to increase the number of measurement per process penetration, which in turn leads to improve process security, increased plant safety and a reduction of your overall maintenance effort.

Our new EJX 910A multivariable transmitter is able to deliver five process measurements (DP, P, T, QM & QV) and a first in class performance of 1 % mass flow rate at up to 10:1 turndown (100:1 DP range) with a choice of two independent output modes: 4-20 mA and/or Pulse output.

We also provide the industries best stability guarantee of 0.1% of URL for 10 years, and that's 0.01% of URL per year. Furthermore the EJX Series is approved TÜV for SIL 2 safety applications.



## Differential Pressure Transmitter EJX 110A

| Capsule                       | L capsule   | M capsule  | H capsule  |
|-------------------------------|---|--|--|
| Measurement Range             | -10 to 10 kPa<br>(-40 to 40 in H <sub>2</sub> O)  | -100 to 100 kPa<br>(-400 to 400 in H <sub>2</sub> O) | -500 to 500 kPa<br>(-2000 to 2000 in H <sub>2</sub> O) |
| Measurement Span              | 0.1 to 10 kPa<br>(0.4 to 40 in H <sub>2</sub> O)  | 0.5 to 100 kPa<br>(2 to 400 in H <sub>2</sub> O)     | 2.5 to 500 kPa<br>(10 to 2000 in H <sub>2</sub> O)     |
| Max. Working Pressure         | 16 MPa (2300 psi)   | 25 MPa (3600 psi)                                    | 25 MPa (3600 psi)                                      |
| Accuracy                      | ±0.04 % of span   | ±0.04 % of span                                      | ±0.04 % of span  |
| Stability                     | -   | ±0.1 % of URL per 10 years                           | ±0.1 % of URL per 10 years                             |
| Output Signal                 | 4 to 20 mA DC, two wire transmission with digital communication (BRAIN or HART protocol), Foundation Fieldbus, pulse output (H/L alarm) |  |  |
| Power Supply                  | 10.5 to 42 V DC   | 10.5 to 42 V DC                                      | 10.5 to 42 V DC  |
| Integral Indicator (optional) | LCD digital indicator, including 5-digit numerical display, 6-digit 16-segment unit display, bar-graph                                  |  |  |

## MultiVariable EJX 910A

|                              |   |                         |  |
|------------------------------|---|-------------------------|--|
| Accuracy                     | ±1 % of mass flow rate over 10:1 flow range (100:1 differential pressure range) |                         |  |
| Static Pressure Range / Span | Range: 0 to 250 bar abs   | Span: 10 to 250 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 |                         |  |

# Yokogawa's Flow Center of Excellence in Europe:

**In 1995 Yokogawa expanded its presence in Europe with the acquisition of the Rota company, well known and synonymous with the world famous Rotameter variable area flowmeter. Rota Yokogawa, located in southern Germany, looks back on almost a century of experience in flow measurement and has successfully managed the transition from a traditional enterprise into a company operating in the global Yokogawa network.**

Yokogawa's flow center of excellence supports a variety of flow measurement principles including Rotameter (VA), Coriolis massflow, electro-magnetic, vortex, ultrasonic and differential pressure head flowmeters.

The flow center provides a wide range of services, providing the support to customers and the Yokogawa sales organisation by advising and solving flow measurement problems, after sales services and application consultancy. In the modern training center, Yokogawa sales staff and customers have the possibility to enhance their flow measurement knowledge.

Yokogawa's flow calibration facility is an official member of the Deutsche Kalibrierdienst (DKD) and the flow rig is accredited by PTB (Physikalisch Technische Bundesanstalt). The DKD certification is recognized in all major European countries.



Re-calibration of a flowmeter is an unwelcome interruption in your operating process. Our service teams will be at your disposal to react immediately to your specific needs. You might need an urgent re-calibration back on site the





next day, or a detailed re-calibration schedule for your complete plant, including other manufacturer's flow-meters, Yokogawa will act accordingly. Our experienced engineers will offer you a solution tailored to your needs. This is our commitment to you.

Please contact your local sales and service organisations for further information on our services.

**YOKOGAWA'S  
FLOW CENTER OF EXCELLENCE  
at ROTA YOKOGAWA.**



# vigilantplant.™

*“The clear path to operational excellence”*

A Yokogawa Commitment to Industry

**vigilance.®**



What does Yokogawa **vigilance** mean to the future of your business? **Quality**. Through products that are built from the ground up and tested to the last hour, you're ensured continuous operation and more uptime. **Innovation**. Your business will benefit from new insights and capabilities, bringing true predictability to your process. **Foresight**. As the market changes, you'll have solutions that give you the continuity and flexibility to plan ahead and grow. Our partners know the difference. With Yokogawa, you can count on a lifetime of plant efficiency, from instrumentation to operation support. Let us be vigilant about your business.

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