Coriolis Mass Flow Meters

Yokogawa Rotamass TI: Precision Coriolis Mass Flow and Density Meters for the Marine Industry

MARINE

The Rotamass TI Coriolis mass flowmeter provides exceptional accuracy for measuring liquids and gases. By capturing direct mass flow, density, and temperature measurements, the system enables the precise calculation of volume flow at operating or reference conditions, density at reference conditions, and concentration measurements for mixable and unmixable fluids. With additional measurement inputs, the Yokogawa Rotamass TI can further determine fluid viscosity for Newtonian liquids or the heating value for gas measurements.

Engineered for the Marine Environment

The Yokogawa Rotamass series is defined by its high-quality German engineering and a unique box-in-box design.

This architecture ensures the meter remains highly accurate and reliable even in the presence of the intense vibrations and pipe stresses common in maritime settings. As a central component in many Insatech Marine Performance Systems, this flowmeter has proven its durability over many years of service.

By combining this world-class instrument with the application experience of Insatech Marine, ship owners are guaranteed an optimized measurement setup for onboard operations.

The series is DNV approved and has been validated through thousands of successful installations in vessel engine rooms and industrial fields worldwide.

Key Features and Operational Advantages

The system offers a range of features designed for the rigors of life at sea:

- Vibration-resistant box-in-box system
- DNV approval for marine use
- Field-proven reliability through thousands of onboard installations
- Direct measurement of mass, density, and temperature
- No requirement for straight pipe runs, allowing for versatile installation
- Fast and uncomplicated commissioning
- Maintenance-free operation with continuous self-monitoring

Total Accuracy: Engineered for Real-World Conditions

Standard flowmeters are often rated for ideal conditions; the Rotamass TI is engineered for the engine room.

The Process Guard Advantage

Real-World Reliability vs.
Lab Specifications

- **Reference Accuracy**
  Up to ±0.05%
- **Reynolds Compensation**
  Corrects for viscosity in real-time
- **Pressure Compensation**
  Maintains stability during line fluctuations
- **Temperature Guard** High-precision internal sensors compensate for thermal expansion

Result: Precise mass flow, density, and concentration measurements, regardless of your process conditions.

The **Process Guard** technology maintains precision by neutralizing the variables that typically compromise measurement data:

- **Advanced Fluid Compensation:** Patented Reynolds and sound-velocity compensation ensure consistent accuracy across all liquid viscosities and gas types.
- **Dynamic Process Adjustment:** Integrated sensors automatically correct for thermal expansion and pressure surges, ensuring stability during rapid process changes.
- **Superior Zero-Point Stability:** Best-in-class stability and a wide turndown ratio deliver reliable, precise readings even at extremely low flow rates.
- **Maximum Signal Integrity:** Advanced transmitter technology eliminates digital-to-analog errors, delivering the sensor's full precision directly to your control system.

Proven Installations in Real Marine Applications

Insatech Marine has extensive experience installing Coriolis mass flow meters on vessels worldwide. The installations shown feature Yokogawa Coriolis meters in demanding marine applications such as engine rooms and fuel systems, ensuring reliable performance under real operating conditions.

Rotamass TI **Supreme**

Precision for Medium Flow

The Rotamass TI Supreme is the premier choice for applications involving medium flow rates. Its performance is designed to remain superior even under the most demanding conditions, such as those involving high aeration or gas voids.

This model delivers unsurpassed accuracy for critical applications where advanced diagnostic functionality is required to ensure process stability.

Common maritime and
industrial applications for the Supreme includes:

- Fuel consumption measurement
- Burner control and process control
- Batching, filling, and dosing
- In-line concentration and density monitoring
- Material and mass balance
- Net oil computing and water cut analysis
- Handling of solvents and gas void fractions

Rotamass **Giga**

Excellence in High-Volume Transfer

The Rotamass TI Giga delivers best-in-class accuracy and versatile installation options for high flow rates. Its unmatched precision at the low end of the measuring range offers maximum adaptability from the initial engineering phase through to final operation.

It is designed to handle large-scale transfers without compromising on the minute details of the measurement.

Common maritime and
industrial applications for the Giga includes:

- Bunker transfer measurements
- Ship, truck, and railcar loading
- LNG and bitumen transfer
- Distribution networks and tar handling
- Offshore and onshore bulk operations
- Drilling mud and oil well cementing

Want to know more?

Read more about the Rotamass TI Series

See how the Coriolis principles work

YOKOGAWA

Specifications

	ROTAMASS TI Supreme	ROTAMASS TI Giga
Liquid Process Fluids		
Liquids in general	●	●
Aggresive liquids	●	○
High viscous liquids	○	○
Gaseous Process Fluids		
Gases in general	○	●
Low density gases	○	○
Mixed Process Fluids		
Unmixable or mixable liquids	●	●
Liquids with entrained gas	●	○
Process Conditions		
Process temperature	-196 to +350 °C -321 to +662 °F	-70 to +350 C or +200 C (Giga 2F) -94 to +662 F or +392 F (Giga 2F)
Process pressure up to	100 bar or 250 bar *1 1450 psi or 3626 psi *1	100 bar or 180 bar *1 1450 psi or 2610 psi *1
Line sizes	DN15 to DN125 3/8 in. to 5 in	DN100 to DN250 4 in. to 10 in.
Accuracy		
Mass flow for liquids up to	± 0.1 %	± 0.1 %
Mass flow for gas up to	± 0.35 %	± 0.35 %
Density for liquids up to	± 0.5 g/l	± 2.0 g/l
Turndown flat accuracy	○	○
Materials and Process Connections		
Materials of wetted parts	316L/1.4404	316L/1.4404 or alloy C-22/2.4602 (Giga 1F only)
Flange process connections	EN, ASME, JPI, JIS	EN, ASME, JIS
Threaded process connections	G, NPT	-
Clamp process connections	DIN32676, JIS/ISO2852	-
Sensor Design		
Insulation and heat tracing options	●	●
Rupture disk	●	●
Customer and NAMUR face-to-face length	●	○
Approvals / Certificates		
3-A, EHEDG, EC1935:04 and EC2023:06	●	-
Marine application	●	○
Functional Safety	SIL 2 (SIL3)	
Custody transfer application	NTEP, INMETRO	NTEP, INMETRO
Hazardous area approvals	IECEx, ATEX, UKEx, FM (USA/Canada), NEPSI, INMETRO, PESO, EAC Ex, Taiwan Safety Label, Korea Ex, Japan Ex, ECAS Ex, Ukraine Ex	

● Supported ○ Supported under certain conditions - Not supported

Sizing of Mass Flow Meter **Bunker**

Bunker Control System For Bunker Barge

ROTAMASS TI Supreme (ES)

ROTAMASS TI Giga (EG)

4 Bar Presure before Flow Meter	Temperature 40°C				
Type	**RCES39**	**RCEG1 FX**	**RCEG2 HX**	**RCEG2 FX**	**Duel RCE-G2HX**
Fuel	Max Flow				
MGO 8 cSt (ρ: 850 kg/m3)	133 t/h	300 t/h	600 t/h	1100 t/h	1200 t/h
HFO 180 cSt (ρ: 850 kg/m3)	88 t/h	220 t/h	466 t/h	961 t/h	932 t/h
HFO 380 cSt (ρ: 991 kg/m3)	70 t/h	191 t/h	417 t/h	859 t/h	834 t/h
HFO 500 cSt (ρ: 1090 kg/m3)	63 t/h	179 t/h	399 t/h	812 t/h	798 t/h
5 Bar Presure before Flow Meter	Temperature 40°C				
Type	**RCES39**	**RCEG1 FX**	**RCEG2 HX**	**RCEG2 FX**	**Duel RCE-G2HX**
Fuel	Max Flow				
MGO 8 cSt (ρ: 850 kg/m3)	150 t/h	300 t/h	600 t/h	1100 t/h	1200 t/h
HFO 180 cSt (ρ: 850 kg/m3)	101 t/h	251 t/h	531 t/h	1090 t/h	1062 t/h
HFO 380 cSt (ρ: 991 kg/m3)	79 t/h	221 t/h	480 t/h	991 t/h	960 t/h
HFO 500 cSt (ρ: 1090 kg/m3)	74 t/h	208 t/h	461 t/h	943 t/h	922 t/h
6 Bar Presure before Flow Meter	Temperature 40°C				
Type	**RCES39**	**RCEG1 FX**	**RCEG2 HX**	**RCEG2 FX**	**Duel RCE-G2HX**
Fuel	Max Flow				
MGO 8 cSt (ρ: 850 kg/m3)	165 t/h	300 t/h	600 t/h	1100 t/h	1200 t/h
HFO 180 cSt (ρ: 850 kg/m3)	114 t/h	280 t/h	591 t/h	1100 t/h	1182 t/h
HFO 380 cSt (ρ: 991 kg/m3)	94 t/h	249 t/h	538 t/h	1100 t/h	1076 t/h
HFO 500 cSt (ρ: 1090 kg/m3)	85 t/h	236 t/h	518 t/h	1060 t/h	1036 t/h

Bunker Control System For Receiving Vessel

ROTAMASS TI Supreme (ES)

ROTAMASS TI Giga (EG)

2 Bar Presure before Flow Meter	Temperature 40°C				
Type	**RCES39**	**RCEG1 FX**	**RCEG2 HX**	**RCEG2 FX**	**Duel RCE-G2HX**
Fuel	Max Flow				
MGO 8 cSt (ρ: 850 kg/m3)	93 t/h	219 t/h	456 t/h	1100 t/h	912 t/h
HFO 180 cSt (ρ: 850 kg/m3)	56 t/h	144 t/h	308 t/h	636 t/h	616 t/h
HFO 380 cSt (ρ: 991 kg/m3)	42 t/h	120 t/h	268 t/h	544 t/h	536 t/h
HFO 500 cSt (ρ: 1090 kg/m3)	36 t/h	110 t/h	252 t/h	504 t/h	504 t/h
3 Bar Presure before Flow Meter	Temperature 40°C				
Type	**RCES39**	**RCEG1 FX**	**RCEG2 HX**	**RCEG2 FX**	**Duel RCE-G2HX**
Fuel	Max Flow				
MGO 8 cSt (ρ: 850 kg/m3)	115 t/h	272 t/h	566 t/h	1050 t/h	1132 t/h
HFO 180 cSt (ρ: 850 kg/m3)	73 t/h	184 t/h	392 t/h	811 t/h	784 t/h
HFO 380 cSt (ρ: 991 kg/m3)	57 t/h	158 t/h	348 t/h	712 t/h	696 t/h
HFO 500 cSt (ρ: 1090 kg/m3)	50 t/h	147 t/h	331 t/h	668 t/h	662 t/h

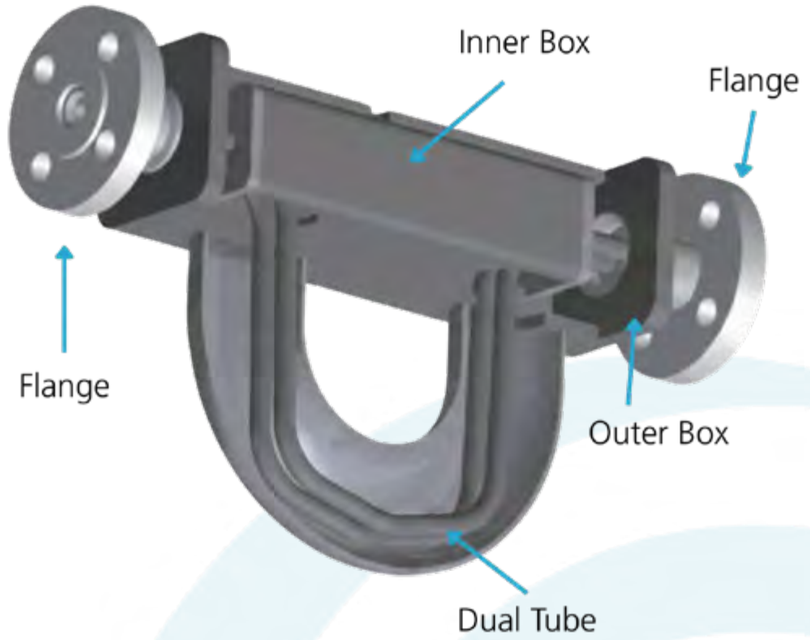
Sizing of Mass Flow Meter **Fuel System**

ROTAMASS TI Supreme (ES)

	3 Bar Presure before Flow Meter	Model / Size			
Temp	Type	**RCES34**	**RCES36**	**RCES38**	**RCES39**
	Fuel	Max Flow			
40°C	MGO 8 cSt (850 kg/m3)	3,09 t/h	11,6 t/h	38,2 t/h	115 t/h
85°C	BH HFO 67 cSt (960 kg/m3)	1,44 t/h	8,1 t/h	28,7 t/h	97 t/h
140°C	AH HFO 12 cSt (910 kg/m3)	2,95 t/h	11,5 t/h	38,1 t/h	115 t/h
	5 Bar Presure before Flow Meter	Model / Size			
Temp	Type	**RCES34**	**RCES36**	**RCES38**	**RCES39**
	Fuel	Max Flow			
40°C	MGO 8 cSt (850 kg/m3)	4,14 t/h	15,4 t/h	50 t/h	150 t/h
85°C	BH HFO 67 cSt (960 kg/m3)	2,18 t/h	11,3 t/h	39,6 t/h	131 t/h
140°C	AH HFO 12 cSt (910 kg/m3)	4 t/h	15,2 t/h	50 t/h	151 t/h
	8 Bar Presure before Flow Meter	Model / Size			
Temp	Type	**RCES34**	**RCES36**	**RCES38**	**RCES39**
	Fuel	Max Flow			
40°C	MGO 8 cSt (850 kg/m3)	5 t/h	17 t/h	50 t/h	170 t/h
85°C	BH HFO 67 cSt (960 kg/m3)	3,14 t/h	15,3 t/h	50 t/h	170 t/h
140°C	AH HFO 12 cSt (910 kg/m3)	5 t/h	17 t/h	50 t/h	170 t/h

The Patented Box-in-Box Design

The technical core of the Rotamass TI is its unique, patented box-in-box construction. This design provides the mechanical decoupling essential for maintaining accuracy in demanding marine environments.



The technical core of the Rotamass TI is its unique, patented box-in-box construction. This design provides the mechanical decoupling essential for maintaining accuracy in demanding marine environments.

The principle is elegantly simple: the flowmeter consists of an outer box and an inner box. The outer box is attached to the inlet and outlet connections, serving as the primary structural frame. The inner box houses the sensor pipes in a fixed position, effectively isolating them from the external stresses of the piping system.

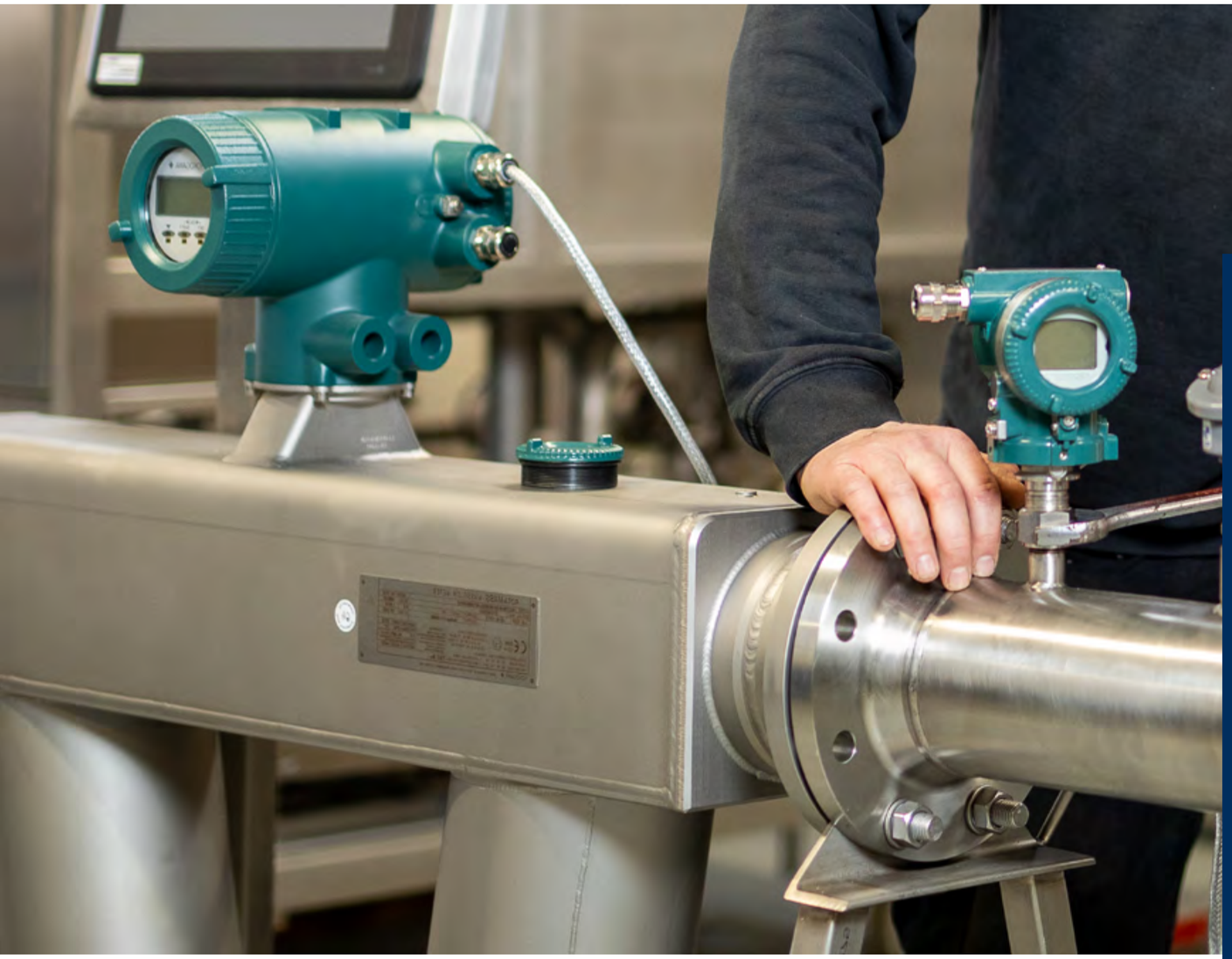
By diverting mechanical stress - such as vibration, torque, or pipe misalignment - around the sensor piping rather than through it, the result is a significantly more accurate measurement and a stable zero-point. This ensures your flowmeter remains reliable and precise, requiring far fewer adjustments over its operational life.

Want to know more?

Read more about the Rotamass TI Series

See more about the Box-in-Box solution

High Flexibility for Individual Applications



The Rotamass TI series is engineered to adapt to your specific operational needs. Thanks to a wide range of I/O combinations and standard process connections, the Rotamass TI allows for a highly individual configuration tailored to your existing system.

Optimized Design for Restricted Spaces
Installation is streamlined and cost-effective. Because the flowmeter is available with a diverse array of process connections, it can often be integrated directly without the need for additional adapters. Furthermore, the short face-to-face length can be combined with specific installation options to fit even the most restricted engine room layouts.

Whether you require the **Essential** or **Ultimate** transmitter, our project team works closely with you to tailor a solution that fits your vessel perfectly.

Essential Transmitter

A cost-effective solution for general applications.

- Multilingual wizard for easy setup and guidance through the main configuration
- **Event Management** as unique and useful support to run the process effectively and safely
- Data mobility provided by microSD card for easy transfer to other devices for fast setup or to pc for in-dept process analysis or remote service
- Widest range of I/O combinations in the market for most flexible adjustment to the existing system periphery
- Universal power supply to install the device anywhere in the world
- Hart, Modbus communication

Ultimate Transmitter

Provides various additional features for demanding and critical applications.

- Patented **Tube Integrity** function and Total Health Check for inline meter verification without disturbing running measurements
- **Features on demand** for easy expansion of special functions via software activation key
- Batching function and Viscosity function
- **Dynamic Pressure Compensation** for consistently accurate and stable measurement even with significant fluctuations in operating pressures
- Inline concentration measurement
- Integrated net oil computing acc. API standard
- Hart, Modbus, Foundation Fieldbus, Profibus PA communication

Installation

The Rotamass TI is designed for a straightforward mechanical installation. While precision instruments typically require perfect piping alignment, the patented box-in-box design significantly expands installation tolerances. This makes it an ideal choice for retrofitting into existing systems where space is tight and conditions are less than ideal.

Whether you prefer to handle the installation in-house or want a full-service solution,
Insatech Marine offers a support level that fits your project:

- **Self-Installation with Expert Guidance**
  The hardware's robust design allows your crew to perform the installation. We provide the necessary documentation and technical guidance to ensure the meter is positioned correctly for long-term performance.

- **Commissioning & Final Verification**
  Our most popular option. Your team installs the meter, and an Insatech technician attends the vessel to finalize the setup, perform zero-point adjustment, and verify the system is fully optimized.

- **Full Turnkey Installation**
  For complete peace of mind, let Insatech manage the entire process. From the initial survey to the final handover, we handle the installation and commissioning, ensuring a perfect setup from day one.

Installation anywhere, anytime
We commission your flow meter system while your vessel remains in service, providing expert support at sea, in port, or during dry dock

At sea

In port

In dry dock

Service, maintenance and support

Our technicians are ready for service on-board your vessel at all times

Even the most advanced instrumentation requires expert care to maintain peak performance. With over 30 years of specialized experience in flow measurement, we provide comprehensive service and maintenance tailored to the Yokogawa Rotamass TI Coriolis series.

Maintaining Precision and Minimizing Downtime
Precision can drift over time due to operational wear. Our technicians ensure your measurements remain within strict tolerances, offering on-site maintenance, repairs, and calibrations to minimize process interruptions. Whether you are optimizing a high-accuracy Coriolis system or managing legacy differential pressure meters, we provide the technical expertise to keep your media flowing.

Lifecycle Management and Strategic Upgrades
Should your equipment reach the end of its lifecycle, we offer strategic advice on replacements - assisting you in upgrading to the latest Rotamass TI technology or finding a cost-effective solution that meets your specific requirements.

Increase your competitive advantage by reducing costs via performance and efficiency improvements on your vessel

MARINE

Insatech A/S
Næstvedvej 73C
DK-4720 Præstø Danmark

Tel. +45 5537 2095
marine@insatech.com

www.insatechmarine.com

This is a series of information booklets produced by Insatech Marine. Other booklets can be found at www.insatechmarine.com. The folder is printed on FSC-certified paper.

FSC is an international certification scheme for tree and paper. In FSC forests no more trees are utilized than what can be re-produced. FSC is a guarantee of the protection of wildlife and vegetation, and an assurance that forest workers are secured in terms of education, occupational security and salary.

© Insatech A/S
Reproduction of text or excerpts of this is authorized provided the source is acknowledged.