

# Mass Flowmeters BROCHURE

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ABB Instrumentation

# CoriolisMaster

## Coriolis Mass Flow Measurement

### Made in ABB

Power and productivity  
for a better world™



# Coriolis Mass Flow Measurement With the ABB CoriolisMaster

Your application easily mastered:  
with the CoriolisMaster series made in ABB.

The flexible and extremely precise Coriolis mass flowmeter meets your requirements for various industries and applications with the most diverse measuring ranges – from the smallest water drop to filling ocean going tankers. Take advantage of the versatile CoriolisMaster for reliable measurement of mass and volume flow, density, concentration and temperature.

## CoriolisMaster in an overview

### Unique design

- The CoriolisMaster stands out for its unique S-design. It can be easily installed in any position and orientation where self draining is required.
- Due to its sturdy design, strong signal level and optimized electronics the CoriolisMaster is insensitive to external vibrations and gas content in the fluid.
- It is suitable for fluid temperatures up to 200 °C / 392 °F.

### Modular platform concept

- Flexible connection sizes enable optimal adaption to the process.
- Various accuracy classes provide both simple and highly accurate solutions with one installation length and thereby help to minimize your stock keeping cost.
- Simple and consistent operating concept as the universal modular transmitter can be connected to all sensor sizes.

### Explosion proof design

The universal explosion proof design concept provides the best temperature classes on the market plus international approvals like ATEX, IECEx, FM, NEPSI and GOST.

### Comprehensive diagnostics

- Extensive measuring tube monitoring, for example, detecting a tube rupture or blockage.
- Self-monitoring transmitter.
- Elaborate alarm concept.
- Wide range of communication options provide device information at any time.
- Measuring tube diagnostics to detect abrasion and deposits by storage of device-specific data (finger print). This option allows easy meter verification in the field.

### Concentration measurement

Due to its integral DensiMass software the CoriolisMaster allows for direct Brix measurements, net oil calculations or temperature-standardized concentration calculations. The software provides the largest database currently on the market as a calculating basis and can be activated in the field at any time.

### Communication

- Easily accessible fieldbus address setting, even without power supply.
- Three freely configurable current and pulse outputs, active or passive, are standard.
- Freely configurable contact input and output.
- Simple field optimization for mass and volume flow, density, concentration and temperature measurement.
- Wide range of function tests and simulation routines for commissioning.



### Nominal diameters and maximum measuring ranges

Typ	Nominal Tube diameter	Max. measuring range $Q_{max}$
MS2	"S" DN 1.5 (1/16")	0 ... 65 kg/h (143 lb/h)
MS2	"T" DN 3 (1/10")	0 ... 250 kg/h (551 lb/h)
MS2	"U" DN 6 (1/4")	0 ... 1000 kg/h (2200 lb/h)
MC2	"E" DN 20 (3/4")	0 ... 100 kg/min (220 lb/min)
MC2	"F" DN 25 (1")	0 ... 160 kg/min (353 lb/min)
MC2	"G" DN 40 (1 1/2")	0 ... 475 kg/min (1050 lb/min)
MC2	"H" DN 50 (2")	0 ... 920 kg/min (2030 lb/min)
MC2	"I" DN 65 (2 1/2")	0 ... 1890 kg/min (4170 lb/min)
MC2	"J" DN 80 (3")	0 ... 2460 kg/min (5420 lb/min)
MC2	"K" DN 100 (4")	0 ... 4160 kg/min (9170 lb/min)
MC2	"L" DN 150 (6")	0 ... 11000 kg/min (24300 lb/min)

### Transmitter ME2

- Universal transmitter for all sensors and applications for ambient temperatures between -40 and 60 °C / -40 to 140 °F.
- Remote or integral mount design.
- Continuously rotatable transmitter head in integral design.
- Illuminated graphic display with easy to read clear text menu in various languages.
- Universal menu operating philosophy and easy installation using the 'Easy Set-up' function.
- FRAM technology for rapid transmitter exchange without re-programming.



MS2

### Sensor MS2

- Contoured single tube design
- DN 1.5 / 3 / 6 / 10 / 15 (1/16" / 1/8" / 1/4" / 1/2")
- 0.15 % / 0.25 % / 0.4 % of range
- Density accuracy 10 g/l
- $T_{medium}$  -50 ... 180 °C (-58 ... 356 °F)
- Standard pressure rating up to PN 100 ASME CI 600
- Higher pressure ratings on request



MC2

### Sensor MC2

- S-shape twin tube design
- DN 15 ... DN 150 (1/2 ... 6")
- 0.1 % / 0.15 % / 0.25 % / 0.4 % of range
- Density accuracy up to 1 g/l
- $T_{medium}$  -50 ... 200 °C (-58 ... 392°F)
- Standard pressure rating up to PN 100 ASME CI 600
- Higher pressure ratings on request



MC2 Hygienic

### Sensor MC2 Hygiene

- S-shape twin tube design
- DN 15 ...DN 80 (1/2 ... 6")
- 0.1 % / 0.15 % / 0.25 % / 0.4 % of range
- Density accuracy up to 1 g/l
- EHEDG-certified
- $T_{medium}$  -50 ... 200 °C (-58 ... 392°F)
- Polished tubes and fittings

**ABB is a leader in power and automation technologies. We enable you to improve performance and use power efficiently. The starting point of both efficiency increase and energy saving is always high-accuracy measurement. ABB's CoriolisMaster provides extremely precise measuring results. Direct mass flow measurement, for example, allows for exact dosing of raw materials. This is how CoriolisMaster helps you increase efficiency and save resources.**

# Coriolis Mass Flow Measurement Using the ABB CoriolisMaster

## Your chemical and petrochemical applications easily mastered

The CoriolisMaster is ideal for filling or dosing of oils, solvents and chemicals. It measures online the mass and volume flow, density, concentration and temperature of different fluids. The high-precision density measurement provides superior accuracy for quality checking of the products or for inline blending, for example, automatic mixing of different product components. As an integral part of the standard software you will find the greatest database for concentration measurement on the market.

### Product details

- Excellent temperature classes in explosion hazardous areas. Example:  $T_{med}$  200 °C / 392 °F at  $T_{amb}$  60 °C / 140 °F, even with integral design models.
- Unique flexible explosion proof design concept – “e” and “i” in one electronic package, switchable.
- Comprehensive explosion proof design concept including solutions for zone 0, zone 1 and zone 2.
- Flameproof enclosure offers special protection for critical processes.
- Double safety through type of protection [ia] with three passive outputs and contact input and output.
- Type tested and standardized according to NAMUR.
- NACE conformity.
- Heatable up to 200 °C / 392 °F.
- SIL assessed.
- Insensitive to noise from gas or solid content in the fluid.

### Examples of typical fluids

- Sodium hydroxide
- Isopropanol
- Methanol
- Sulfur
- Sulfuric acid
- Nitric acid
- Benzol
- Crude oil
- Benzine
- Kerosine
- Polymers





# Your food & beverage and pharmaceutical applications easily mastered

The CoriolisMaster is used for many applications in dairies, breweries, the alcohol industry, the beverage industry and starch production. Direct calculation of concentration like Brix, Plato or Baumé provides advantages for blending processes of, for example, fruit juices or for the fat content adjustment of milk. As the CoriolisMaster is insensitive to noise from gas or solid content in the fluid it is ideal for the most demanding applications.

## Product details

- Direct mass flow measurement with an accuracy of  $\pm 0.1\%$  of range.
- Density measurement with an accuracy of 0.001 kg/l.
- Excellent cleanability, EHEDG certified.
- CIP and SIP suitable up to 200 °C / 392 °F.
- Polished fluid wetted parts.
- Flexible, hygienic fitting concept.  
(For example Tri-Clamp or DIN11864).
- Measurement of both conductive and non-conductive fluids.
- Insensitive to noise for example from external vibrations or from gas and solid content in the fluid.

## Examples of typical fluids

- Alcohol
- Oils
- Fats
- Mashers
- Pastes
- Concentrates
- Acids
- Leaches
- Milk products
- Gyle
- Flavors
- Mayonnaise
- Beer
- Cream
- Spirits
- Sugar
- Chocolate
- Whey
- Demineralized water
- Juices



# Coriolis Mass Flow Measurement Using the ABB CoriolisMaster

Your power and water & waste water applications easily mastered

The CoriolisMaster enables the measurement of mass and volume flow, density, concentration and temperature with a single measuring instrument. It is also well-proven for lime milk density measurement. Contrary to radioactive density measurement no radioactive material is required for Coriolis measurement. Other typical applications are the dosing of expensive biocides and high-precision fuel supply to burners in power plants where an important increase in efficiency is achieved through direct fuel mass flow measurement.

## Product details

- Direct mass flow measurement with an accuracy of  $\pm 0.1\%$  of range.
- Density measurement with an accuracy of 0.001 kg/l.
- Process safety through sturdy design and thick wall tubes.
- Virtually wear-free, no moving mechanical parts contained.
- Heatable up to 200 °C / 392 °F.
- Insensitive to noise for example from external vibrations or from gas and solid content in the fluid.

## Examples of typical fluids

- Crude oil
- Diesel
- Biodiesel
- Ethanol
- Lime milk
- Ferrous oxide
- Biocide
- Iron salt solution
- Demineralized water



## Your pulp and paper applications easily mastered

The CoriolisMaster sets the standards for the measurement of mass and volume flow, density, concentration and temperature in color and coating kitchens. It is perfect for the measurement of expensive chemicals, for air content measurement around the head box and for especially precise measurement of high viscosity fluids whilst maintaining a huge turndown ratio. Online density measurement simplifies, for example, quality control of colors.

### Product details

- Direct mass flow measurement with an accuracy of  $\pm 0.1\%$  of range.
- Density measurement with an accuracy of 0.001 kg/l.
- Sturdy design and thick wall tubes.
- Virtually wear-free, no moving mechanical parts contained.
- Insensitive to noise from gas or solid content.

### Examples of typical fluids

- Slimicide
- Optical brightener
- Calcium carbonate
- Defoamer
- Synthetic thickener
- Synthetic binder
- Wet strength agent
- Oils and fuels
- Lubricants
- Sodium hydroxide
- Coating colors
- Kaolin
- Talc
- Biocide
- Starch
- Black liquor
- White liquor







CoriolisMaster  
Flow measurement made  
easy for the upstream  
Oil and Gas industry

Power and productivity  
for a better world™



# CoriolisMaster FCB330/350

## Simply fits your purpose

### The most important data at a glance

Nominal sizes			
1/2" / 15 mm	0...1,507 bbl/d*	17,637 lb/h	8,000 kg/h
1" / 25 mm	0...6,596 bbl/d*	77,162 lb/h	35,000 kg/h
2" / 50 mm	0...16,960 bbl/d*	198,416 lb/h	90,000 kg/h
3" / 80 mm	0...47,110 bbl/d*	551,156 lb/h	250,000 kg/h
4" / 100 mm	0...98,000 bbl/d*	1,146,404 lb/h	520,000 kg/h
6" / 150 mm	0...162,000 bbl/d	1,895,975 lb/h	860,000 kg/h

Ex approvals	ATEX / IECEx Zone 1/2
	cFMus Div 1/2
	NEPSI Zone 1/2
Wetted materials	316L or Hasteloy C
Communication	HART
Ambient temperature	-4...140 °F (-20...60 °C)
	-40...140 °F (-40...60 °C)

CoriolisMaster FCB330	CoriolisMaster FCB350
Accuracy for liquids	
Mass: 0.4 % o.r. / 0.25 % o.r.	Mass: 0.15 % / 0.1 % o.r.
Volume: 0.4 % o.r. / 0.25 % o.r.	Volume: 0.15 % o.r.
Density: 0.01 g/cc	Density: 0.002 g/cc or 0.001 g/cc
Accuracy for gases	
Mass: 1 % o.r.	Mass: 0.5 % o.r.
Measuring medium temperatures	
-58...320 °F (-50...160 °C)	-58...392 °F (-50...200 °C)

\* at 50 lb/ft<sup>3</sup>, please size with your respective density

# CoriolisMaster FCB330/350

## The better alternative

Highest measuring accuracy, easy installation and handling, compact and space-saving design.

### CoriolisMaster simply fits!

- Measurement of flow rate (mass and volume), density, temperature and concentration with only one meter for minimal investment costs
- Minimum installation space requirements due to compact design
- Minimum lifetime costs: minimum pressure drop, no moving parts, no wear-out
- Self-draining: no measuring media residues remain in the meter



# CoriolisMaster FCB330/350

## Maintenance-free



With no moving parts, CoriolisMaster is practically wear-free and the ideal replacement for mechanical meters.

- No moving parts to wear out and replace over time
- No filters or straightening veins required
- Lower life cycle cost than mechanical meters
- No up and downstream pipe runs required
- Compact design perfect for tight spaces
- Self-draining capability: no residue buildup



# CoriolisMaster FCB330/350

## Top performance



Multi-variable device that incorporates high capacity flow rates and excellent zero stability for high turndown applications.

- Mass, density, temperature, volume and % concentration (water cut) in one flowmeter
- High capacity flow measurement
- Excellent zero stability
- > 100:1 turndown with extreme accuracy
- Perfect for dynamic dump cycles

# CoriolisMaster FCB330/350

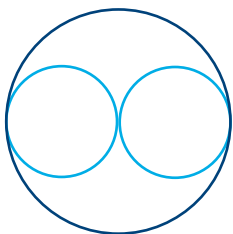
## Suitable for gas entrainment



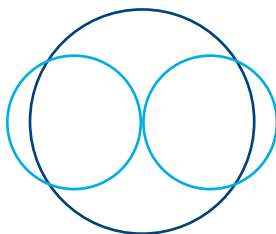
Optimal tube geometry, digital signal processing (DSP) and enhanced two-phase flow algorithms suitable for difficult GVF applications.

- Less pressure drop: yielding less phase “decoupling”, smaller bubble sizes and higher velocity (resulting in less profile asymmetry and “hold up” within sensor)
- No location for gas accumulation regardless of tube orientation (horizontal or vertical), unlike other Coriolis manufacturers
- Less error due to entrained gas: mass flow rate of gas-entrained oil is close to bulk flow rate of entire fluid stream
- Enhanced algorithms yielding higher accuracy and less multiphase noise sensitivity

**Others**



**Low pressure drop  
CoriolisMaster FCB series**



# CoriolisMaster FCB330/350

## The better alternative



One Coriolis meter designed for most upstream and midstream flow applications.

- Net oil measurement (water cut)
- Production and test separators
- Natural gas and condensate
- Natural gas liquids (NGLs and LNGs)
- Density measurement for production water
- LACT units
- Pipe line metering



CoriolisMaster  
FCB300/FCH300  
The better alternative  
Accurate flow measurement  
for liquids and gases

Power and productivity  
for a better world™





# CoriolisMaster

## Simply fits your purpose

### The most important data at a glance

Nominal sizes	
DN15 (1/2") (FCB300)	0...8,000 kg/h (17,637 lb/h)
DN25 (1") (FCB300/FCH300)	0...35,000 kg/h (77,162 lb/h)
DN50 (2") (FCB300/FCH300)	0...90,000 kg/h (198,416 lb/h)
DN80 (3") (FCB300/FCH300)	0...250,000 kg/h (551,156 lb/h)
DN100 (4") (FCB300)	0...520,000 kg/h (1,146,404 lb/h)
DN150 (6") (FCB300)	0...860,000 kg/h (1,895,975 lb/h)
Ex approvals	ATEX Zone 0/1/2
	cFMus Div 1/2
	NEPSI 0/1/2
Wetted materials	1.4404/1.4435 (316L) or Hasteloy C
Communication	HART
Ambient temperature	-20...60 °C (-4...140 °F)
	-40...60 °C (-40...140 °F)

### FCB330 and FCB350 compact general purpose meter

One of the most cost saving meters on the market today – save on installation, pump power and spares costs with this new class-leading coriolis mass flowmeter.

### FCH330 and FCH350 meter for hygienic purposes

All the outstanding benefits of the FCB300 series are available as a hygienic version. It comes with EHEDG certification and all wetted parts are polished for superb cleanability. It is available for meter sizes DN25 (1") to DN80 (3").

CoriolisMaster FCB330/FCH330	CoriolisMaster FCB350/FCH350
Accuracy for liquids	
Mass: 0.4 % o.r. / 0.25 % o.r.	Mass: 0.15 % / 0.1 % o.r.
Volume: 0.4 % o.r. / 0.25 % o.r.	Volume: 0.15 % o.r.
Density: 10 g/l	Density: 2 g/l or 1 g/l
Accuracy for gases	
Mass: 1 % o.r.	Mass: 0.5 % o.r.
Measuring medium temperatures	
-50...160 °C (-58...320 °F)	-50...200 °C (-58...392 °F)

# CoriolisMaster

## The better alternative

Highest measuring accuracy, easy installation and handling, compact and space-saving design.

### CoriolisMaster simply fits!

- Measurement of flow rate (mass and volume), density, temperature and concentration with only one meter for minimal investment costs
- Minimum installation space requirements due to compact design
- Minimum lifetime costs: minimum pressure drop, no moving parts, no wear-out
- Self-draining: no measuring media residues remain in the meter



# CoriolisMaster

## Maintenance-free

With no moving parts, CoriolisMaster is practically wear-free and the ideal replacement for mechanical meters.

Many mechanical meter installations require upstream filters, which are likely to cause a pressure drop or blocked pipes and require frequent changes of the filter elements. Additionally, solid particles or gas inclusions may result in increased wear and higher maintenance costs.

As CoriolisMaster has no moving parts, provides one of the lowest pressure drops in the markets and is virtually maintenance-free, it is the better alternative to mechanical meters. The meter design allows for self draining installations preventing any media or solid residues in the meter or piping.

**CoriolisMaster in upstream oil and gas wellhead application**

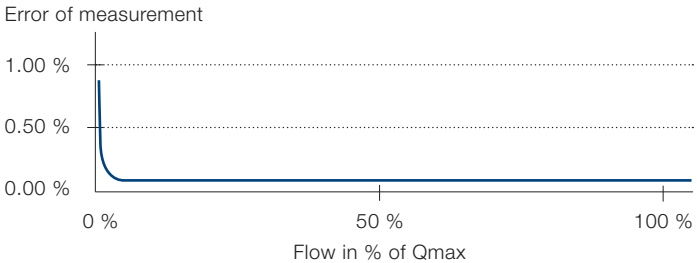


# CoriolisMaster

## Top performance

The design of CoriolisMaster offers unmatched measuring accuracy for liquids and gases.

The excellent zero stability enables measuring spans of 1:100 or larger. The high measuring accuracy of 0.1 % is available over a wide measuring range.



This top performance can be tailored to your needs as different models with different accuracy levels are available. Installation length and handling are identical for all models. The large tube diameter minimizes pressure losses to virtually zero – allowing for up to 50 % pressure loss savings compared to other commercially available products.





# CoriolisMaster

## Easy handling

CoriolisMaster's proven hardware platform provides a modular system with data safety and easy handling.

### Easy handling and data safety

The unique sensor memory concept saves all customer-specific settings and allows for easy hardware exchange without any reconfiguration.

### Concentration measurement

The integrated DensiMass software enables CoriolisMaster to perform direct Brix measurements and Net-Oil or temperature-standardized concentration calculations based on a large application data repository. This feature can be activated in the field even after installation.



# CoriolisMaster

## The better alternative

The precise and multivariable  
CoriolisMaster increases your process  
efficiency.

CoriolisMaster offers accurate direct mass-flow measurement, and direct density measurement in combination with built-in concentration and temperature measurement. The meter measures gases and liquids in direct mass units.

As no inlet and outlet sections are required for CoriolisMaster, space savings up to 40 % can be achieved. Moreover, CoriolisMaster installations are self-draining. No media residues are left in the pipe after filling.

Combined flow and density measurements allow for online quality control and blending in all processes. By providing these functions in a single meter, CoriolisMaster is the perfect solution for your process.

High precision measurement of nitrogen with CoriolisMaster



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