

# CoriolisMaster mass flowmeter

## Automation solution for mixing applications



High-precision and cost-effective mixing of conductive or non-conductive fluid media

### Measurement made easy

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CoriolisMaster mass  
flowmeter  
Automation solution for  
mixing applications

## Introduction

The task of mixing is encountered in various sectors of the processing industry. This primarily includes the mineral oil industry, food industry, chemical and pharmaceutical industries, as well as the water and sewage industry, in addition to many other areas.

This can be in the manufacture of finished products or in the processing of auxiliary materials or additives. The common base of the process is the requirement that mixing must be conducted according to a defined recipe with high accuracy.

Any deviation from the defined recipe has a direct impact on the quality of the product, as well as the efficiency of the manufacturing process.

Therefore, compliance with the specifications is key to resource-efficient work. In addition, the fluids encountered are exceptionally diverse. It ranges from water, liquid additives and concentrates, to oil, varnish, paint, paraffin, as well as components for varnish manufacture or a variety of viscous fluids.

In the mixing process, distinction is made between quasi-continuous processes or batch-oriented processes. Selection of the suitable method depends on the purpose of the mixing procedure and further processing of the product. However, the mixing and reaction characteristics are of great importance here as well.







## Solution

The automation solution for mixing applications by ABB consists of a flowmeter and the AC500-eCo small control system, along with the BatchControl software solution adapted to the mixing process.

Selection of the measuring principle for the flow rate is essentially dependent on the characteristics of the fluid.

Electromagnetic flowmeters are well-suited for conductive fluids. The standard devices with flanged connection are from the ProcessMaster series, while the devices for hygienic applications are from the HygienicMaster series.

Of course, fluids with low electrical conductivity or other critical features can also be mixed; such as fruit juice and beverage concentrates with high Brix concentrations, fluids with high alcohol content, oily or very fatty fluids, and fluids that form insulating or conductive thin film.

In the case of high viscosity, transmission is made in heated piping. In part, these types of fluids are expensive, so it is advisable from an economic point of view to process the required amounts in as close compliance as possible with the recipe.

Coriolis mass flowmeters are particularly well-suited for this. The CoriolisMaster type FCB100 is used in the standard version. The CoriolisMaster type FCH100 is perfectly suited for hygienic applications. It features hygienic connectors, has electropolished meter tubes and is EHEDG certified. It can therefore be used in any process in the food industry.

The CoriolisMaster is connected to the small control system via Modbus communication. Any required switch inputs or outputs are conducted through the controller. The measured values required for the mix are read from the Coriolis flowmeter by the controller directly via the Modbus. In the case of electromagnetic measurement methods, high-resolution pulse outputs are used for flow transfer.

### Batch mixing process

During the mixing process of a batch, two types of applications are distinguished: those with continuous extraction from the mixing tank during mixing, and those with extraction after the entire mixing operation is complete. Both batch process variants can be executed using appropriate mixing programs

### Continuous extraction during the mixing operation

The entire mixing amount, as well as the number of individual steps are entered by the operator using the touchscreen display. Afterwards, the mixing operation is started on the display or through a contact. The valves and pumps are then automatically activated by the control system's BatchControl software. The installation stops automatically after the entire mixing operation is complete.

### Extraction after the mixing operation is complete

In this variant, only the entire mixing amount needs to be entered by the operator. All the other steps then run automatically.

No matter which variant is selected, the mixing proportion is entered directly by the operator before mixing is started. Additional possibilities include entering the data in a password protected area or transfer from a higher-level system via a communication link.

The mixing valve can be activated in one step, as well as in two steps with a pre-contact. Two-step activation allows for slower addition of a recipe component at the end.

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01 Example of mixing  
from two components

The overrun correction executed in the control system enhances mixing precision. The parameters for the correction can be adjusted by the operator. A quick shut-off valve with repeatable closing times is needed for the mixing system. The valve must be supplied by the customer, and is not included in the ABB scope of delivery. Of course, the system can also be used for volumetric mixing based on the Coriolis mass flowmeter. In the process, the density recorded by the measuring device is used for calculation purposes.

An operator screen has been configured in the control system as a commissioning monitor for the parameterization of the Coriolis mass flowmeter. The device is parameterized beyond the standard mixing operation. The controller also monitors various device messages and alarm parameters that allow interruption of the mixing operation if a critical situation occurs, thus avoiding damage due to incorrect mixing.

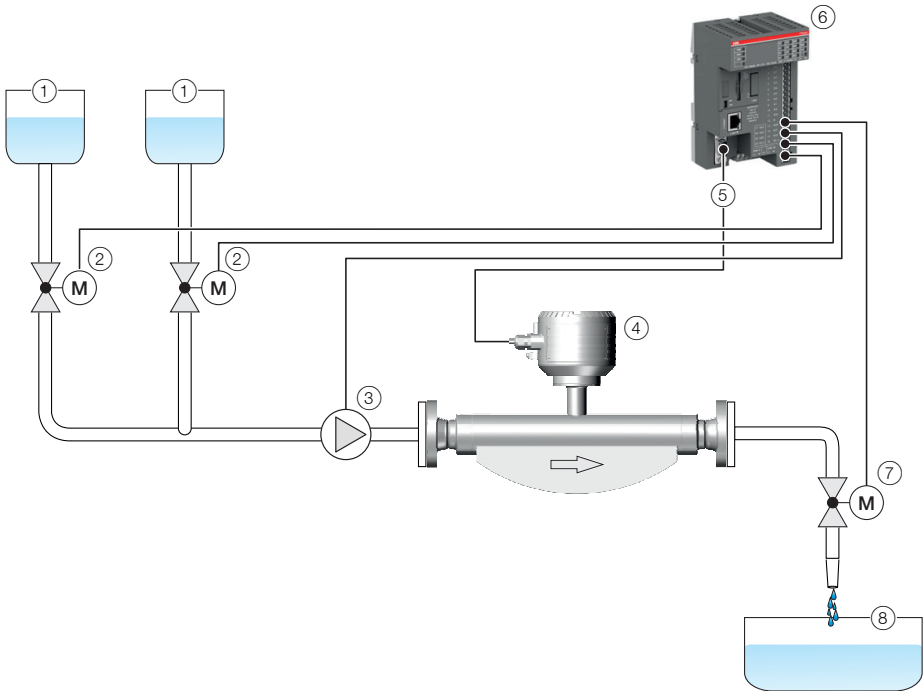
Component configuration

Mixing can be conducted using different installation layouts. Two types are presented below.

Mixing from two components with central pumping

The fluids to be mixed are transferred from two buffer tanks using a pump.

The valves on the tank outlets and the pump are operated by the controller. The mixing operation and therefore the recipe accuracy is executed through the mixing valve behind the flowmeter.



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Pos.	Description
①	Buffer tank
②	Buffer tank shut-off valve
③	Feed pump
④	CoriolisMaster flowmeter

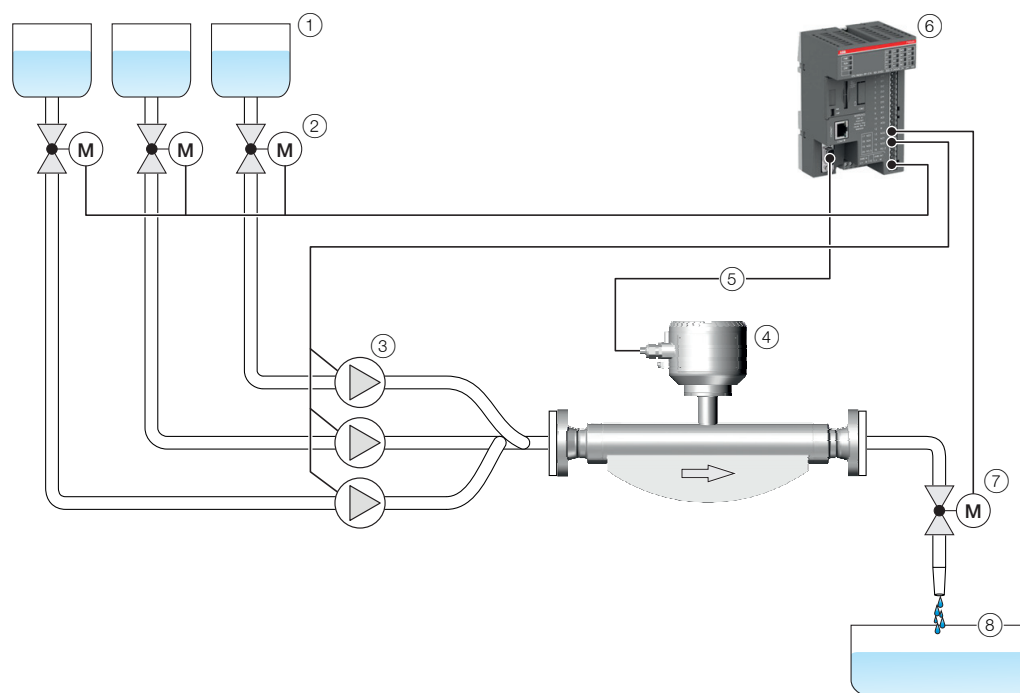
Pos.	Description
⑤	Modbus connection to controller
⑥	Small control system with BatchControl program
⑦	Mixing shut-off valve
⑧	Mixing tank

## 02 Example of mixing from several components

### Mixing from several tanks using in-house feed pumps

This variant can also be executed using the system. The mixing operation and activation of the components is carried out automatically. The number of contacts and signal outputs of the control system are appropriately adjusted.

The combination of several measuring devices, as well as various types of flowmeters is also possible. This makes sense if, for example, tiny quantities need to be dosed. Depending on the choice of measuring device, connection to the control system is also made via the Modbus or through impulse signals. Additional individual variants are conceivable and can be executed depending on the project.



02

Pos.	Description
①	Buffer tank
②	Buffer tank shut-off valve
③	Feed pumps
④	CoriolisMaster flowmeter

Pos.	Description
⑤	Modbus connection to controller
⑥	Small control system with BatchControl program
⑦	Mixing shut-off valve
⑧	Mixing tank

03 Operator screens for entering set point and recipe when mixing two components with continuous extraction from the mixing tank

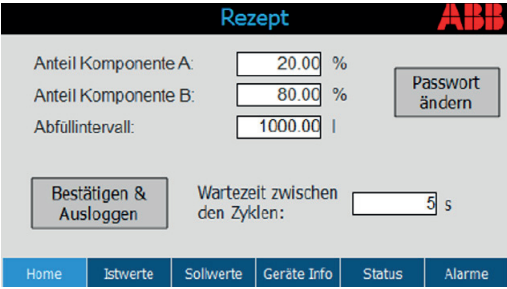
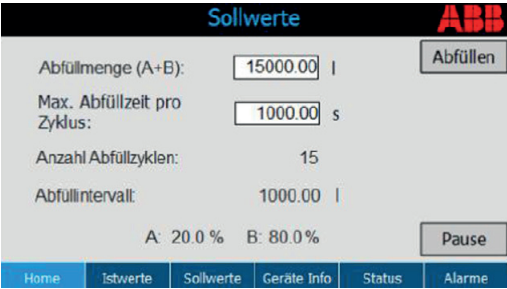
04 Operator screens for entering set point and recipe for the batch mixing process

05 Trend monitor operator screen

## Operator interface views

The BatchControl solution is operated via a touchscreen display. Entries are made in views grouped according to function. Password protection is provided to secure against unintended entries.

As an additional option, the possibility of saving process data on SD cards is possible. For later analysis and documentation of the process quality, the data saved in csv format can be evaluated.

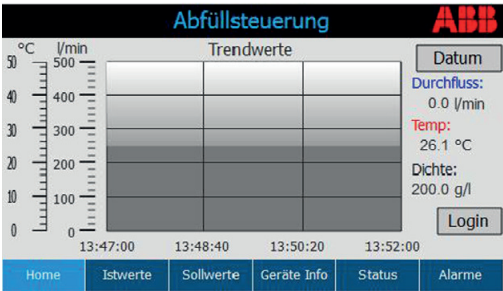


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Graphic presentation of measured values for flow rate, density and temperature for the Coriolis mass flowmeter over time.



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Additional views for device status of the CoriolisMaster, as well as parametrization possibilities round out the functionality.

06 CoriolisMaster  
FCB100

07 CoriolisMaster  
FCH100

## Customer benefit

The automation of mixing operations using the ABB system solution offers a number of advantages to the user. Personal monitoring of the processes is no longer necessary. The system is completely self-sufficient. This allows for considerable improvement of process effectiveness.

Product quality is enhanced thanks to precise compliance with mix proportions. At the same time, raw material waste is reduced to a minimum.

This is done through the use of measuring devices with high precision of up to 0.1 % with regard to flow rate.

By doing so, recipe accuracies in volume mixes of better than 0.02 l were achieved using a device with DN 25 nominal diameter.

Furthermore, by using the Coriolis mass flowmeter as a measuring device, measurement errors due to air pockets in the mix of mass percentages are eliminated. In addition, the special form of the meter tube in the CoriolisMaster offers lower pressure loss when compared to other device types. This also allows for the mixing of thick and high-viscosity fluids.

The standardization of the system components and easy implementation of individual programming provides a number of advantages. Implementation based on a small control system allows for cost-effective adaptation to specific requirements and therefore easy integration with existing production processes. This also applies to the easy to implement connection to higher-level systems.

Even in operation, the system features intuitive use and easy handling. Function-specific views on the display provide the operator with a quick and clear overview. Optionally, recording of individual batches can be integrated into the controller system. The mixing process data is available in table form as a csv file and offers a base for various process assessments. Aside from business-related tasks, the system can also be used for quality assurance, process optimization or traceable documentation of product quality.

## Product information



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	CoriolisMaster FCB130 / FCB150	CoriolisMaster FCH130 / FCH150
Nominal diameter	DN 15 to DN 150, adapted to the required flow rate	DN 25 to DN 80, adapted to the required flow rate
Process connection	Flange according to DIN 2501 / EN 1092	Pipe fitting in accordance with DIN 11851
Material used for sensor	Stainless steel 1.4404	Stainless steel 1.4404 or 1.4435, polished, in accordance with EHEDG and FDA
Measuring accuracy for mass flow	Up to 0.1 %	Up to 0.1 %
Permissible measuring medium temperature	-50 to 205 °C	-50 to 205 °C
Outputs	Modbus RTU, 2 additional configurable digital outputs	Modbus RTU, 2 additional configurable digital outputs
Power supply	24 V DC	24 V DC
Specification		

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08 ProcessMaster  
FEP300

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09 HygienicMaster  
FEH300



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	ProcessMaster FEP300	HygienicMaster FEH300
Measuring principle	Electromagnetic flowmeter	Electromagnetic flowmeter
Nominal diameter	DN 3 to DN 2000, adapted to the required flow rate	DN 3 to DN 100, adapted to the required flow rate
Process connections	Flange according to DIN 2501 / EN 1092	Variable process connections. Pipe fitting according to DIN 11851, welded spud and other
Liner / electrodes	Selection according to medium	PFA / stainless steel, 1.4539
EHEDG and FDA compliant	–	Yes
Measuring accuracy	Up to 0,2 %	Up to 0,2 %
Outputs	4 to 20 mA, Impulse, Status	4 to 20 mA, Impulse, Status
Power supply	24 V DC, 230 V AC	24 V DC, 230 V AC
Operation	ABB universal measurement technology operating concept	ABB universal measurement technology operating concept
Specification		



10 Batch controller  
AC500-eCo PM554-TP



11 TFT operating panel  
CP620



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Compact controller AC500-eCo	Operating panel CP620
Inputs: 8 binary inputs	Control panel with touchscreen, screen size 4.3" or larger
Outputs: 6 binary outputs as transistor outputs	Display screen: TFT Color / LED
Load capacity of transistor output: 24 V DC, 0.5 A, maximum 5 W	User flash memory: 128 MB
Communications interface to mass flowmeter: Modbus RTU	Serial interfaces: RS-232, RS-485, RS-422
Program memory: 128 kByte, with special software for fill operations	Ethernet port: 2 x 10 / 100 Mbit/s
	USB port: 1 x version 2.0
	Power supply: 18 to 30 V DC, 0.4 A (at 24 V)
Specification	



## Notizen



## Notizen

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**ABB Limited****Measurement & Analytics**

Howard Road, St. Neots  
Cambridgeshire, PE19 8EU  
UK

Tel: +44 (0)870 600 6122

Fax: +44 (0)1480 213 339

Mail: [enquiries.mp.uk@gb.abb.com](mailto:enquiries.mp.uk@gb.abb.com)

**ABB Inc.****Measurement & Analytics**

125 E. County Line Road  
Warminster, PA 18974  
USA

Tel: +1 215 674 6000

Fax: +1 215 674 7183

**ABB Automation Products GmbH****Measurement & Analytics**

Dransfelder Str. 2  
37079 Goettingen  
Germany

Tel: +49 551 905-0

Fax: +49 551 905-777

Mail: [vertrieb.messtechnik-produkte@de.abb.com](mailto:vertrieb.messtechnik-produkte@de.abb.com)

**[abb.com/flow](http://abb.com/flow)**



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