

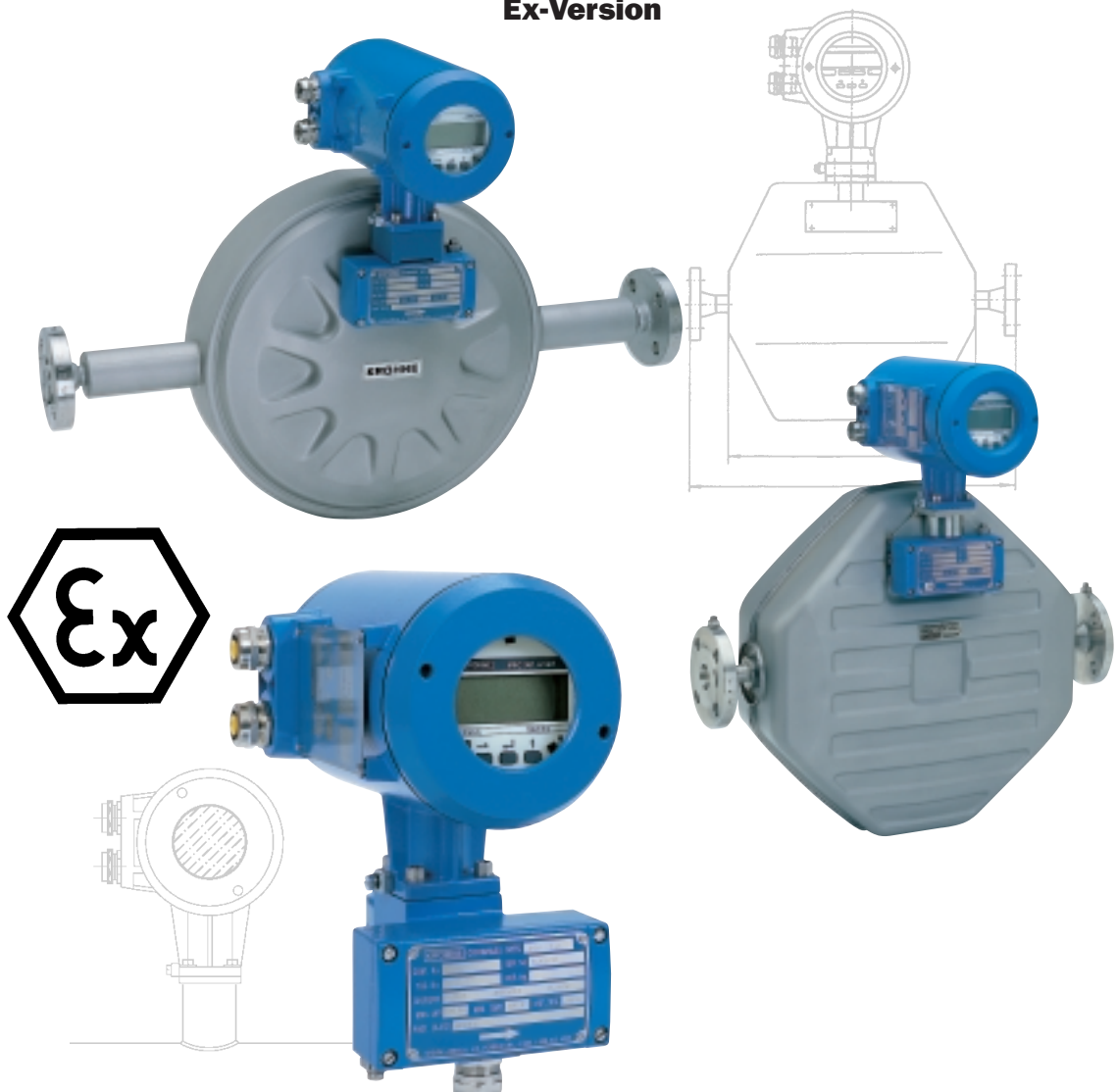
## Addition to the installation and operating instructions

CORIMASS E + P Class

# MFM 3081 K/F

# MFM 2081 K/F

Ex-Version



Variable area flowmeters

Vortex flowmeters

Flow controllers

Electromagnetic flowmeters

Ultrasonic flowmeters

**Mass flowmeters**

Level measuring instruments

Communications engineering

Engineering systems & solutions



These instructions should be used in conjunction with the Standard Installation and Operating Instructions for the MFM 2081/3081 K/F. If you require a copy, please contact your nearest KROHNE Office or representative.

### Product liability and warranty

The CORIMASS mass flowmeter MFM 2081/3081 K/F is designed for the direct measurement of mass flow rate, product density and product temperature, and also indirectly enables measurement of parameters such as total mass, concentration of dissolved substances and the volume flow.

For **use in hazardous areas**, special codes and regulations are applicable which are specified in the special "Ex installation and operating instructions" (supplied only with hazardous-duty equipment).

Responsibility as to suitability and intended use of our instruments rests solely with the purchaser.

Improper installation and operation of the flowmeters may lead to **loss of warranty**.

In addition, the "general conditions of sale" forming the basis of the purchase agreement are applicable.

If you need to return CORIMASS flowmeters to KROHNE, please complete the form on the last page of the Installation and Operating manual and return it with the meter to be repaired. KROHNE regrets that it cannot repair or check your flowmeter unless accompanied by this completed form.

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# 1 Description

The mass flowmeter MFM 2081/3081 K EEx and MFM 2081/3081 F EEx consists of two main components:

The Signal Converter, which calculates and displays the measured values and the transducer which supplies the converter with the analog signals.

A Cable Seal, which is screwed into the converter housing, leads the electric signals from the transducer to the converter. The signal cable between the transducer and converter is intrinsically safe.

In the separate version MFM 20381/3081 F EEx the transducer MFS 2000/3000 EEx and the converter MFC 081 F EEx are connected to each other via a shielded multi-conductor cable. The maximum cable length is 50 m.

The converter housing of the compact version MFM 2081/3081 K EEx is permanently screwed onto the transducer and must not be removed at any time.

## Cenelec Approvals

PTB approves the conformity of the mass flow meter according to the harmonized European Standards:

EN50018	"d" - Pressure tight housing for the electronics housing and the terminal compartment
EN50019	"e" - Increased safety for the standard termination compartment
EN50020	"i" - Intrinsically Safe
	"b" for the Zener barriers and all electrical circuits inside the transducer
	"a" for the converter outputs

The following approvals are valid:

Compact P and E meters, including intrinsically safe		
EEx de [ib] IIC T6...T3	MFM 2081 K	PTB Ex 96.D.2037 X
EEx d [ib] IIC T6-T3	MFM 3081 K	
EEx de [ia/ib] IIC T6-T3	MFM 2081 Ki	
EEx d [ia/ib] IIC T6-T3	MFM 3081 Ki	
Converter, remote mounted version, including intrinsically safe		
EEx de [ib] IIC T6-T3	MFC 081 F	PTB Ex 98.D.2037 X
EEx d [ib] IIC T6-T3	MFC 081 Fi	
EEx de [ia/ib] IIC T6-T3		
EEx d [ia/ib] IIC T6-T3		
P meter, remote mounted version		
EEx ib IIC T6-T3	MFS 2000 F	PTB Ex 98.D.2038 X
E meter, remote mounted version		
EEx ib IIC T6-T3	MFS 3000 F	PTB Ex 98.D.2039 X

US-American Approvals		
FM Class I, II & III Div. 1 Group A,B,C,D,E,F,G	MFM 2081 K/F MFM 3081 K/F	J.I.4B8A1.AX
FM Class I, II & III Div. 2 Group A,B,C,D,E,F,G	MFM 2081 K/F MFM 3081 K/F	J.I.4B7A7.AX

## 1.1 Description of the Transducer

The transducer MFS 2000-Ex and MFS 3000-Ex are intrinsically safe units and contains three separated safe circuits. These are:

- Driver Circuit
- Sensor Circuit
- PT100 Circuit

The cables of these circuits are fed through the transducer housing via a special seal. There are various transducer sizes available with different end connection options. Although standard and Ex transducers appear the same, in fact the Ex version has a longer converter mount (neck) and also contains specific clamping diodes fitted across the driver coil. Therefore, it is essential to **avoid** using a standard converter with Ex transducer and vice versa.

In order to fulfil the Ex certification requirements, it is absolutely necessary to comply with the technical data. The maximum allowed process temperatures are:

MFS 3000 / E meter	200°C
MFS 2000 / P meter	200°C
MFS 2000 / P meter high temperature option, 60°C environmental temperature	240°C
MFS 2000 / P meter high temperature option, 55°C environmental temperature	255°C

## 1.2 Description of the Converter

The Ex converter is available in two different versions:

### The 'de' version

The electronics are placed in a pressure tight section of the converter housing, protection class 'd', while the termination compartment is not pressure tight. The converter housing may be fitted with different cable glands such as NPT, PG16 or NPF glands for the mains supply and the input/output cables. The protection class of the termination compartment in 'e'.

### The 'd' version

The electronics as well as the termination compartment are placed in a pressure tight housing. The termination compartment is not fitted with any gland for the mains supply or the input/output cables. The customer is responsible for fitting an Ex approved cable gland into the PG16 thread of the housing. There are various suppliers for such cable glands on the market. The protection class of the termination compartment is 'd'.

For both cases the required waiting time between switching off the electronics and opening the housing has to be considered. The waiting time is mentioned on the data plate of the system and amounts to 25 minutes for T6 and 10 minutes for T5.

The Ex protection of the system is not valid if the electronics housing is not closed securely. Make sure after opening the converter housing, to close it fully with the enclosed wrench.

The programming of the converter may also be performed with a closed lid by using the supplied magnet. Three magnet sensors are assembled on the display board, which allow the user to operate the converter without touching the display itself.

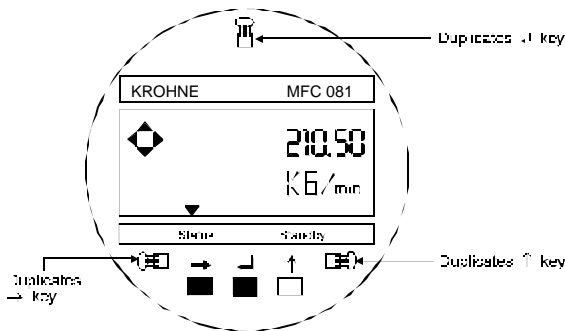


Fig. 1: Converter

After opening the converter housing as described above, one of the following operations may be performed by the local KROHNE service engineer :

- Replace supply fuse F9
- Changing electronics
- Changing supply voltage setting
- Changing EPROM's

These operations are to be performed in an identical manner to the standard converter. (Please refer to the standard operation manual). Make sure the correct mains fuse (right value, ceramic body, 1500A breaking capacity) and the corresponding fuse label on the fuse housing is used. Fuses and labels may be ordered from KROHNE.

Using wrong fuses violates the Ex approval and may damage the system. The earthing metal sheet of the electronic must be fastened firmly with the screw onto the converter housing!



The converter should be 'high pot' tested according to a specific procedure. Therefore, it is not permitted to change output modules or any other hardware components (except the list mentioned above by the local service engineer) without repeating the 'high pot' test. Please contact KROHNE for advice.

### 1.3 Installation of MFM 2081 / MFM 3081 EEx

In order to get the highest possible accuracy, the user is advised to carry out the pipework installation as described in the standard manual.

Further requirements / differences are listed below:

- The ideal installation factor of an EEx unit is much higher than of a standard system due to Zener barriers and clamping diodes the EEx system consumes more power during running. The high installation factor does not mean a lower accuracy.
- The installation factor should have a value as indicated in the following table.

Meter Size	Installation factor
MFM 2081 K/F	< 50
MFM 2081 K/F Ex	< 100
MFM 3081 K/F	< 20
MFM 3081 K/F Ex	< 60

The correct operation of the Zener barriers inside the converter are only guaranteed with a robust and safe connection of the converter housing with potential earth (potential compensation PA). Please use the outer earthing connector at the square flange of the converter housing for earthing.

In case the converter housing has a pressure tight termination compartment, make sure the connected cable glands / adapters have an Ex certification.

## 2 Electrical installation

### 2.1 Location and connecting cables

#### Location

Do not expose the compact flow meter to direct sunlight. Install a sunshade if necessary.

#### Connecting cables

To conform to protection category requirements, observe the following recommendations:

- Fit blanking plug PG 16 and apply sealant to unused cable entries.
- In case if the terminal area is EEd, please use approved blanking plug.
- Do not kink cables directly at cable entries.
- Provide water drip point (U bend in cable).
- Do not connect rigid conduit to cable entries.
- If cables are a tight fit, enlarge inside diameter of cable gland by removing the appropriate ring(s) from the seal.

### 2.2 Electrical Connection on converter without intrinsically safe outputs



Please ensure that the information about power given on the dataplate corresponds to the locally available mains voltage.

- Note information given on the instrument dataplate (voltage, frequency)!
- **Electrical connection in conformity with IEC 364** or equivalent national standard.
- Special regulations apply to installation in **hazardous areas**. Please refer to separate "Ex" installation instructions.

- The **PE protective ground conductor must** be connected to the separate U-clamp terminal in the terminal box of the signal converter.
- Do not cross or loop the **cables in the terminal box** of the signal converter. Use separate (PG or NPT) cable glands for power and output cables.
- Ensure that the **screw thread of the round cover** on the terminal box is well greased at all times.  
**NOTE:** The grease used must be non-corrosive to aluminium; it must be resin- and acid-free.
- Protect **sealing ring** from damage.

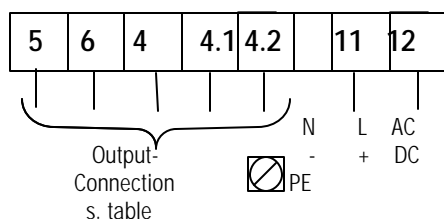


Fig. 2: Power and signal connections for MFC 081 K/F without intrinsically safe outputs

The tables below show the possible input output connection for the converter. The exact configuration depends on which optional output modules were fitted in the factory.

#### Table of input/output connections

Nr.	Option 1 (Current, pulse, alarm and input)	Option 2* (2x current, not galvanically isolated)
5	Common (-)	Common (-)
6	Current output (+)	Current output 1 (+)
4	Control input	Control input
4.1	Pulse output	Current output 2 (+)
4.2	Status output (active)	Status output (passive)

\* The inputs/outputs share a common signal ground which is galvanically isolated from the ground (PE)

In addition, the signal may need protection from external interferences. The use of screened cables and a filter capacitor next to any counter is recommended (Fig. 3).

It is possible to connect the pulse output without an external voltage supply. However to do this the function of the status output must be sacrificed. (Fig. 4)

If the alarm output is used to power the pulse signal then the following settings must be made in the menus:

- (i) Fct. 3.5.1 ALARM FUNCTION must be set to OFF.
- (ii) Fct. 3.5.2 ALARM ACTIVE LEVEL must be set to ACTIVE LOW.

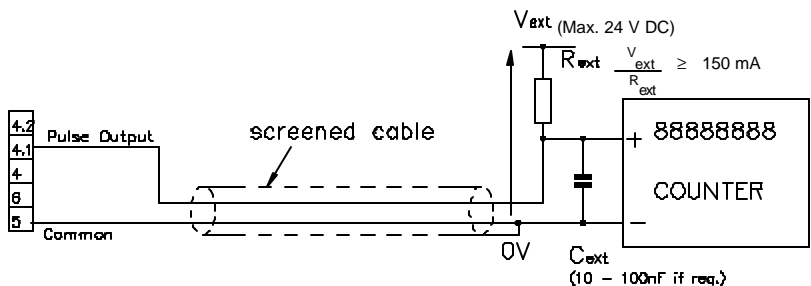


Fig. 3: Preferred connections to an external counter with separate power supply (Example). For correct wiring see tables of input/output connections

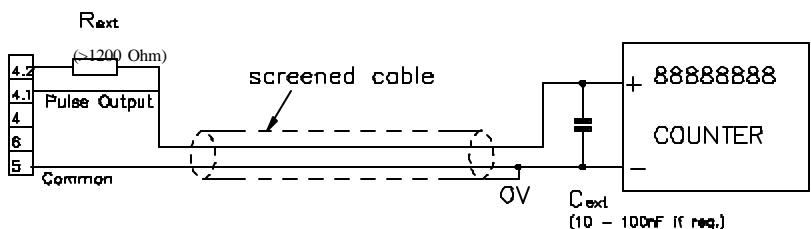


Fig. 4: Connection without external voltage source (Example). For correct wiring see tables of input/output connections

### Additional input/output options

No.	Option 4*	Option 5*	Option 6
	(Current and RS 485)	(Current and Modbus)	(1 Current, 1 Dual phase pulse output and input)
5	Common (-)	Common (-)	Common (-)
6	Current output 1 (+)	Current output 1 (+)	Current output 1 (+)
4	TX/RX	TX/RX	Control Input
4.1	TX/RX	TX/RX	Pulse Output A
4.2	+5V	+5V	Pulse Output B

No.	Option C	Option D	Option E	Option F
	(2 Current, Pulse and Input)	(3 Current and Pulse)	(3 Current and Input)	(3 Current and Alarm)
5	Common (-)	Common (-)	Common (-)	Common (-)
6	Current output (+)	Current output 1 (+)	Current output 1 (+)	Current output 1 (+)
4	Current output 2 (+)	Current output 2 (+)	Current output 2 (+)	Current output 2 (+)
4.1	Control Input	Current output 3 (+)	Current output 3 (+)	Current output 3 (+)
4.2	Pulse Output	Pulse output	Control Input	Status output (passive)

The pulse output and status outputs are passive outputs.  
\*Refer to separate RS 485 or Modbus manual"



### 2.3 Electrical connection on converter with intrinsically safe outputs



Please ensure that the instrument power supply information given on the data plate corresponds to the locally available power supply to be used.

- Note information given on the instrument data plate (voltage, frequency)!
- Electrical connection in conformity with IEC 364 or equivalent standard.
- The PE ground conductor must be connected to the separate U-clamp terminal in the terminal box of the signal converter.
- Do not cross or loop the cables in the back of the converter. Please use separate cable entries (PG or NPT) for power and signal cables.  
Ensure that the screw thread of the round cover on the terminal box is well greased at all times.
- NOTE: The grease used must be non corrosive to aluminium; typically it must be resin- and acid free.
- Protect the sealing ring from damage.

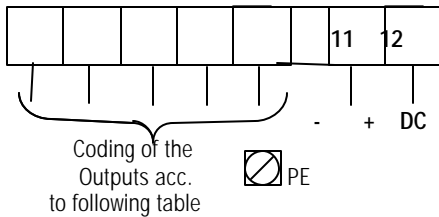


Fig. 5: Power and signal connections for MFC 081 K/F with intrinsically safe outputs

#### Coding of Outputs

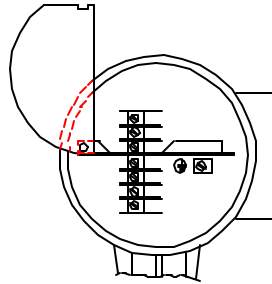
Term. No.	Variant G (1 Current, 1 Pulse intrinsic safe)	Variant H (1 Current, 1 Status output intrinsic safe)	Variant K (1 Current, 1 Control input, intrinsic safe)
I 1	Current output (+)	Current output (+)	Current output (+)
I 1L	Current output (-)	Current output (-)	Current output (-)
B	Current output (+)	Status output. (+)	Control input(+)
B.L	Pulse output (-)	Status output. (-)	Control input(-)

Term. No.	Variant L (2 Current, intrinsic safe)	Term. No.	Variant M (1 Current, 1 Bus intrinsic safe)
I 1	Current output 1 (+)	I 1	Current output 1 (+)
I 1L	Current output 1 (-)	I 1L	Current output 1 (-)
I 2	Current output 2 (+)	D	Bus
I 2L	Current output 2 (-)	D.L	Bus



Please note, that the power supply terminals are behind a lid. To connect, shift lid upwards, connect power and close lid again.



### 2.3.1 Technical information of the Intrinsically safe outputs

#### Variant G,H K,L

type of protection intrinsically safe EEx ia IIC resp. EEx ib IIC to connect with intrinsically safe circuits with following maximum values:

$$\begin{array}{ll} U_i \leq 30 \text{ V} & C_i = 5 \text{ nF} \\ I_i \leq 250 \text{ mA} & L_i = 0 \\ P_i \leq 1.0 \text{ W} & \end{array}$$

#### Variant M

type of protection intrinsically safe EEx ia IIC resp. EEx ib IIC to connect with intrinsically safe fieldbus with following maximum values (FISCO):

$$\begin{array}{ll} U_i \leq 30 \text{ V} & C_i = 5 \text{ nF} \\ I_i \leq 300 \text{ mA} & L_i = 0 \\ P_i \leq 4.2 \text{ W} & \end{array}$$