

# Flow Measurement

## SITRANS F C

### Transmitter MASS 6000 Ex d compact/remote

#### Overview



MASS 6000 is based on the latest developments within digital signal processing technology – engineered for high performance, fast flow step response, fast batching applications, high immunity against process noise, easy to install, commission and maintain.

The MASS 6000 transmitter delivers true multiparameter measurements i.e.: Mass flow, volume flow, density, temperature and fraction flow.

The MASS 6000 Ex d transmitter is manufactured in stainless steel (AISI 316L) and able to withstand harsh installation conditions in hazardous applications within the process and chemical industry. The conservative choice of material guarantees the user a low cost of ownership and a long trouble-free life-time. The Ex d can be compact mounted on all sensors of type MASS 2100 DI 3 to DI 40, and can be used in remote version for all types of MASS 2100.

#### Benefits

- Fully stainless steel flameproof EEx d enclosure, ensuring optimum cost of ownership
- Intrinsically safe keypad and display directly programmable in hazardous area
- ATEX-approved transmitter which can be mounted in hazardous area Zone 1 or Zone 2.
- Sensor and transmitter interface intrinsically safe EEx ia IIC
- Exchange of transmitter directly in hazardous area without shut-down of process pipe line due to ia IIC sensor/transmitter interface.
- Dedicated mass flow chip with the latest ASIC technology
- Fast batching and flow step response with an update rate of true 30 Hz
- Superior noise immunity due to a patented DFT (Discrete Fourier Transformation) algorithm
- Front end resolution better than 0.35 ns improves zero point stability and enhances dynamic turn-down ratio on flow and density accuracy.
- Advanced diagnosis and service menu enhances troubleshooting and meter verification.
- Built-in batch controller with compensation and monitoring comprising 2 built-in totalizers
- Multi-parameter outputs, individual configurable for mass flow, volume flow, density, temperature or fraction flow such as BRIX or PLATO
- 1 current output, 1 frequency/pulse and 1 relay as standard output
- Current output can be selected as passive or active output

- Digital input for batch-control, remote zero adjust or forced output mode
- All outputs can be forced to preset value for simulation, verification or calibration purposes.
- User-configurable operation menu with password protection
  - 3 lines, 20 characters display in 11 languages
  - Self-explaining error handling/log in text format
  - Keypad can be used for controlling batch as start/stop/hold/reset
- SENSORPROM technology automatically configures transmitter at start-up providing:
  - Factory pre-programming with calibration data, pipe size, sensor type, output settings
  - Any values or settings changed by users are stored automatically
  - Automatically re-programming any new transmitter without loss of accuracy
  - Transmitter replacement in less than 5 minutes. True "plug & play"
- 4-wire Pt1000 temperature measurement ensures optimum accuracy on mass flow, density and fraction flow
- Fraction flow computation based on a 5th-order algorithm matching all applications
- USM II platform enables fitting of add-on bus modules without loss of functionality:
  - All modules can be fitted as true "plug & play"
  - Module and transmitter automatically configured through the SENSORPROM
- Installation of the transmitter to the sensor is simple "plug & play" via the sensor pedestal.

#### Application

SITRANS F C mass flowmeters are suitable for all applications within the entire process industry where there is a demand for accurate flow measurement in hazardous area. The meter can measure both liquids and gases.

The main applications for the MASS 6000 Ex d transmitter can be found in:

- Chemical process industry
- Pharmaceutical industries
- Automotive industry
- Oil and gas industry
- Power generation and utility industry

#### Design

The transmitter is designed in an Ex d compact stainless steel enclosure which can be compact mounted on the MASS 2100 sensor range DI 3 to DI 40, and remote mounted for the entire sensor series.

The MASS 6000 Ex d is available as standard with 1 current, 1 frequency/pulse and 1 relay output and can be fitted with add-on modules for bus communication.

- Flameproof „d“ enclosure
- Enclosure stainless steel, IP67/NEMA 4X as compact and IP66/NEMA 4 as remote
- Supply voltage 24 V AC/DC
- MASS 6000 Ex d is ATEX approved together with all MASS 2100 sensors, but can **not** be used together with MC2 Ex versions

### Transmitter MASS 6000 Ex d compact/remote

#### Function

The following functions are available:

- Mass flow rate, volume flow rate, density, temperature, fraction flow
- 1 current output, 1 frequency/pulse output, 1 relay output, 1 digital input
- All outputs can be individually configured with mass, volume, density etc.
- 2 built-in totalizers which can count positive, negative or net
- Low flow cut-off
- Density cut-off or empty pipe cut-off, adjustable
- Flow direction
- Error system consisting of error-log, error pending menu
- Operating time
- Uni/bidirectional flow measurement
- Limit switches with 1 or 2 limits, programmable for flow, density or temperature
- Noise filter setting for optimization of measurement performance under non-ideal application conditions
- Full batch controller
- Automatic zero adjustment menu, with zero point evaluation feed back
- Full service menu for effective and straight forward application and meter troubleshooting

#### Technical specifications

<b>Measurement of</b>	Mass flow [kg/s (lbs/min)], volume flow [l/s (gpm)], fraction [%], °Brix, density [kg/m <sup>3</sup> (lbs/ft <sup>3</sup> )], temperature [°C (°F)]
<b>Current output</b>	Classified EEx ia, selectable as active or passive outputs. Default setting is active mode.
Current	0 ... 20 mA or 4 ... 20 mA
Load	< 350 Ω
Time constant	0 ... 99.9 s adjustable
<b>Current characteristics</b>	
Active mode	U <sub>o</sub> = 24 V, I <sub>o</sub> = 82 mA, P <sub>o</sub> = 0.5 W, C <sub>o</sub> = 125 nF, L <sub>o</sub> = 2.5 mH
Passive mode (max input from external barrier)	U <sub>i</sub> = 30 V, I <sub>i</sub> = 100 mA, P <sub>i</sub> = 0.75 W, C <sub>i</sub> = 52 nF, L <sub>i</sub> = 100 μH
<b>Digital output</b>	
Frequency	0 ... 10 kHz, 50 % duty cycle
Time constant	0.1 ... 30 s adjustable
Passive	6 ... 30 V DC, max. 110 mA, 1 kΩ ≤ R <sub>load</sub> ≤ 10 kΩ
<u>Output characteristics</u>	
Active mode	Not available
Passive mode (max input from external barrier)	U <sub>i</sub> = 30 V, I <sub>i</sub> = 100 mA, P <sub>i</sub> = 0.75 W, C <sub>i</sub> = 52 nF, L <sub>i</sub> = 100 μH
<b>Relay</b>	
Type	Change-over relay
Load	30 V/100 mA
Functionality	Error level, error number, limit, direction
Output characteristics	U <sub>i</sub> = 30 V, I <sub>i</sub> = 100 mA, P <sub>i</sub> = 0.75 W, C <sub>i</sub> = 0 nF, L <sub>i</sub> = 0 mH

<b>Digital input</b>	11 ... 30 V DC (R <sub>i</sub> = 13.6 kΩ)
Functionality	Start/hold/continue batch, zero point adjust, reset totalizer 1/2, force output, freeze output
Output characteristics	U <sub>i</sub> = 30 V, I <sub>i</sub> = 3.45 mA, P <sub>i</sub> = 0.10 W, C <sub>i</sub> = 0 nF, L <sub>i</sub> = 0 mH
<b>Galvanic isolation</b>	All inputs and outputs are galvanically isolated, isolation voltage 500 V.
<b>Cut-off</b>	
Low-flow	0 ... 9.9% of maximum flow
Empty pipe	Detection of empty sensor
Density	0 ... 2.9 g/cm <sup>3</sup>
<b>Totalizer</b>	Two eight-digit counters for forward, net or reverse flow
<b>Display</b>	<ul style="list-style-type: none"> <li>• Background illumination with alphanumerical text, 3 × 20 characters to indicate flow rate, totalized values, settings and faults. Time constant as current output</li> <li>• Reverse flow indicated by negative sign</li> </ul>
<b>Zero point adjustment</b>	Via keypad or remote via digital input
<b>Ambient temperature</b>	
Operation	-20 ... +50 °C (-4 ... +122 °F)
Storage	-40 ... +70 °C (-40 ... +158 °F) (Humidity max. 95 %)
<b>Communication</b>	Add-on modules: HART, PROFIBUS PA, FOUNDATION Fieldbus H1
<b>HART</b>	
Active mode	U <sub>o</sub> = 6.88 V, I <sub>o</sub> = 330 mA, P <sub>o</sub> = 0.57 W, C <sub>o</sub> = 20 nF, L <sub>o</sub> = 100 μH
Passive mode (max input from external barrier)	U <sub>i</sub> = 10 V, I <sub>i</sub> = 200 mA, P <sub>i</sub> = 0.5 W, C <sub>i</sub> = 0 nF, L <sub>i</sub> = 0 μH
<b>PROFIBUS PA</b>	
Active mode	Not available
Passive mode	U <sub>i</sub> = 17.5 V, I <sub>i</sub> = 380 mA, P <sub>i</sub> = 5.32 W, C <sub>i</sub> = 5 nF, L <sub>i</sub> = 10 μH
<b>FOUNDATION Fieldbus H1</b>	
Active mode	Not available
Passive mode	U <sub>i</sub> = 17.5 V, I <sub>i</sub> = 380 mA
<b>Enclosure</b>	
Material	Stainless steel AISI 316 mat. no. 1.4435
Rating	<ul style="list-style-type: none"> <li>• Compact mounted on sensor: IP67/NEMA 4X to IEC 529 and DIN 40050</li> <li>• Remote mounted: IP66/NEMA 4 to IEC 529 and DIN 40050</li> </ul>
Load	18 ... 1000 Hz random, 1.14 G rms, in all directions, to IEC 68-2-36, Curve E

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#### Supply voltage

24 V AC

- Range 20 ... 30 V AC
- Power consumption 6 VA  $I_N = 250$  mA,  $I_{ST} = 2$  A (30 ms)
- Power supply The power supply shall be from a safety isolating transformer. Maximal cable core is 1.5 mm<sup>2</sup>.

24 V DC

- Range 18 ... 30 V DC
- Power consumption 6 VA  $I_N = 250$  mA,  $I_{ST} = 2$  A (30 ms)
- Power supply The power supply shall be from a safety isolating transformer. Maximal cable core is 1.5 mm<sup>2</sup>.

#### EMC performance

Emission EN/IEC 61000-6-4 (Industry)

Immunity EN/IEC 61000-6-2 (Industry)

#### NAMUR

Within the value limits according to "Allgemeine Anforderung" with error criteria A in accordance with NE 21

#### Ex approval

EEx de [ia/ib] IIC T6, DEMKO 03 ATEX 135253X

Temperature class:

- T6
- T5
- T4
- T3
- Process liquid temperature:
  - $T < 85$  °C (185 °F)
  - $85$  °C  $< T < 100$  °C (185 °F  $< T < 212$  °F)
  - $100$  °C  $< T < 135$  °C (212 °F  $< T < 275$  °F)
  - $135$  °C  $< T < 180$  °C (275 °F  $< T < 356$  °F)

#### Selection and Ordering data

Order No.

#### SITRANS F C MASS 6000 transmitter

Transmitter Ex d for remote mounting inclusive of wall mounting kit

7ME4110-

2 - - - - A

#### Enclosure

Ex d SS with 5 m (16.5 ft) cable  
Ex d SS with 10 m (32.8 ft) cable  
Ex d SS with 25 m (82.0 ft) cable

G  
H  
J

#### Output configuration

1 current, 1 frequency, 1 relay

A

#### Supply voltage

24V AC/DC

2

#### Ex approvals

ATEX

1

#### Display/Keypad

With display

1

#### Serial communication

No communication  
HART  
PROFIBUS PA Profile 3  
FOUNDATION Fieldbus H1

A  
B  
F  
J

#### Cable gland

M20

1

#### Operating instructions for SITRANS F C MASS 6000 Ex d

##### Description

Order No.

Operating instructions for SITRANS F C MASS 6000 Ex d

- English

A5E02944883

This device is shipped with a Quick Start guide and a CD containing further SITRANS F literature.



All literature is also available for free at:  
<http://www.siemens.com/flowdocumentation>

Note:


Only communication modules with Ex approvals are allowed.

Please also see [www.siemens.com/SITRANSOrdering](http://www.siemens.com/SITRANSOrdering) for practical examples of ordering

**Selection and Ordering data***Spare parts for MASS 6000 Ex d*

Description	Order No.	
<b>Wall mounting kit for remote Ex d</b> inclusive of sensor cable of		
• 5 m	<b>FDK-083H0231</b>	
• 10 m	<b>FDK-083H0232</b>	
• 25 m	<b>FDK-083H0233</b>	
<b>Ex d transmitter insert</b>	<b>FDK-083H3061</b>	
<b>Front lid</b>	<b>FDK-085U2373</b>	
<b>Screws and washers between pedestal and sensor</b> (4 pcs.), seal (1 pc.)	<b>FDK-085U2374</b>	
<b>Display and keypad</b>	<b>FDK-083H0235</b>	

Add-on module for remote and compact MASS 6000 Ex d

Description	Order No.	
HART	<b>FDK-085U0226</b>	
PROFIBUS PA Profile 3	<b>FDK-085U0236</b>	
FOUNDATION Fieldbus H1	<b>A5E02054250</b>	

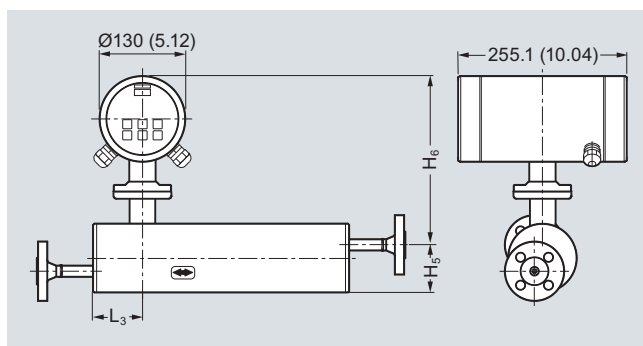
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## Dimensional drawings

MASS 6000 Ex d compact version

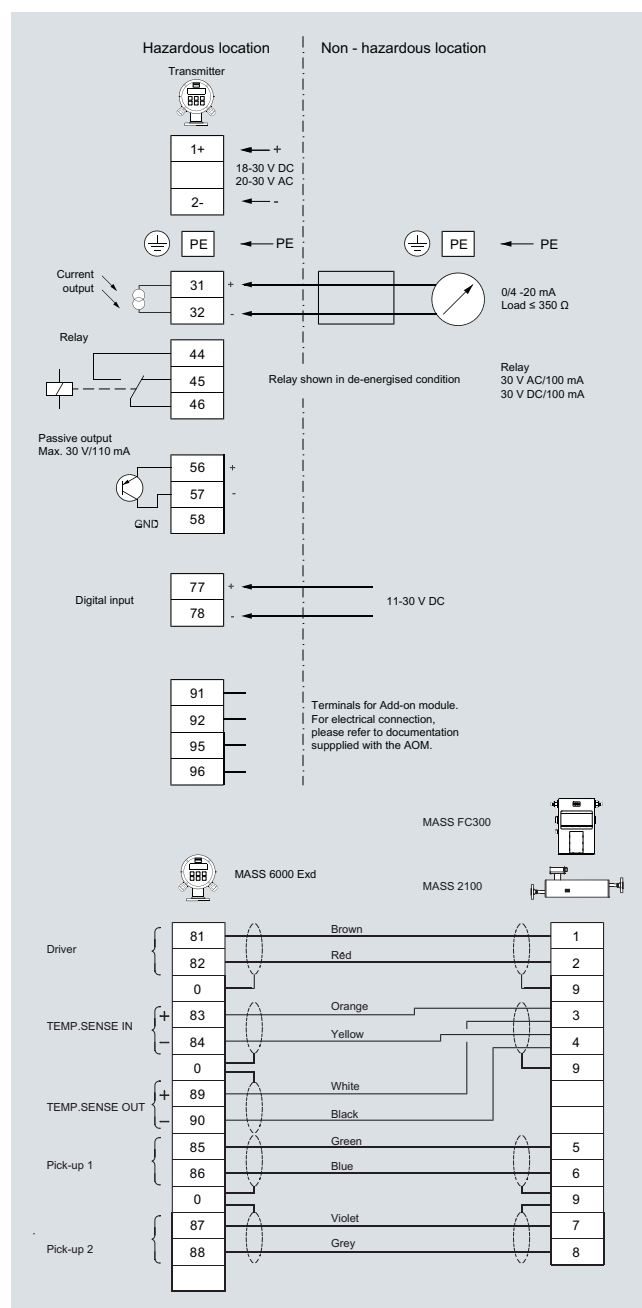


Dimensions in mm (inch)

Sensor size [Di (inch)]	L <sub>3</sub> [mm (inch)]	H <sub>5</sub> [mm (inch)]	H <sub>6</sub> [mm (inch)]	H <sub>5</sub> + H <sub>6</sub> [mm (inch)]
3 (1/8)	75 (2.95)	82 (3.23)	247 (9.72)	329 (12.95)
6 (¼)	62 (2.44)	72 (2.83)	257 (10.12)	329 (12.95)
15 (½)	75 (2.95)	87 (3.43)	267 (10.51)	354 (13.94)
25 (1)	75 (2.95)	173 (6.81)	271 (10.67)	444 (17.48)
40 (1½)	75 (2.95)	227 (8.94)	271 (10.67)	498 (19.61)

## Schematics

**Electrical connection compact or remote**



#### MASS 6000 Ex d remote version

Weight: 3 kg (6.6 lbs)

