SIEMENS

Manual, supplement

Edition 01/2006 - Revision 04

SITRANS F C MASSFLO®

MASS flowmeters

Sensor type MASS MC1 DN 50 - DN 150

Technical Documentation (handbooks, instructions, manuals etc.) on the complete product range SITRANS F can be found on the internet/intranet on the following links:

English: http://www4.ad.siemens.de/WW/view/en/10806951/133300

Order no.: FDK-521H1145

SFIDK.PS.028.P4.02

* Q 8 3 R 9 5 Q 5 *

Contents

Introduction

Use of flowmeter, type MC1.. according to specifications

The flowmeter type MC1.. serve to conduct liquids and gaseous media for measuring purposes.

Use according to specifications covers:

- Use within technical limits.
- Consideration of liquid specifications and references.
- Consideration of specifications as to installation, commissioning and maintenance.

It is inappropriate to:

- Use the meter as elastic equalization in pipe systems to compensate for e.g. pipe displacement, pipe vibration, expansion etc.
- Use the meter as footboard for installation purposes.
- Use the meter as support of external loads like pipes etc.
- Change the meter in any way like e.g. decomposition of material in connection with processing, welding and use of accessories and spare parts not approved by Siemens Flow Instruments.

If the meter is not used according to the specifications, the manufacturer cannot be held responsible for any damage occurred.

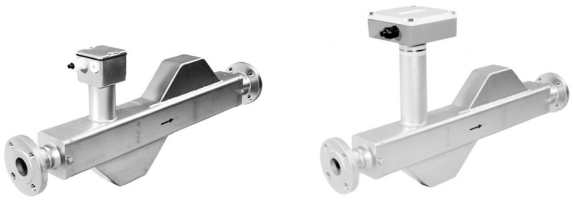
Technical limits:

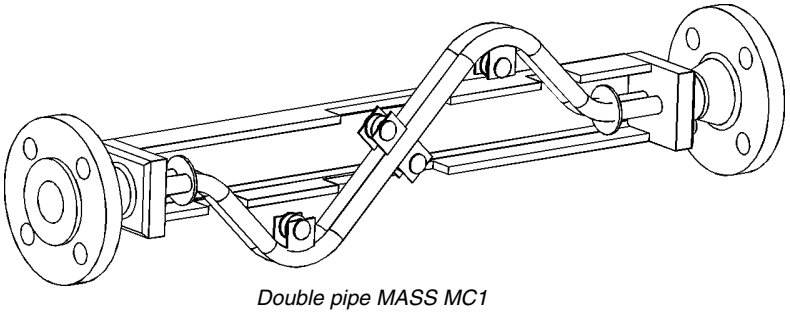
- **Allowed pressure** and **allowed temperature** must be ≤ the pressure and temperature specifications stated in the user manual or the handbook. Always note the specifications on the product label.
- Never go beyond the maximum operation temperature specified for the particular unit.
- **Permissible liquids** are liquids where it has been technically proven or where the user knows from experience and thus can guarantee that neither wetted parts, process connections, flow dispenser nor measuring pipe are influenced/damaged by the chemical and physical properties of the liquid for the estimated lifetime of the products (at least 15 years).
- **Flow and density** must be within the specified limits.

Please note!
If there is a risk that some of the meter parts may be influenced or damaged by the liquid, the flowmeter MC1xxxxxxx1 must be replaced by MC1xxxxxxx2. The latter two types are provided with a special enclosure protecting against fluid leakage. When using the flowmeters in applications not in conformity with the specifications, the user is responsible for any damage that might occur. Only pressures ≤ 40 bar are allowed.

* Refer to the flowmeter specification and user's manual to see the measuring technical properties and measuring technical use.

Siemens Flow Instruments range of coriolis mass flowmeters

Dimension **Size [mm]**	**DN 50, 65, 80, 100, 150** 
Measuring range [kg/h]	0 - 510.000 kg/h at 2 bar P drop at density 1 g/cm^3
Version	2 - pipe system
Materials [wetted]	SS 1.4571 or Hastelloy C4
Liquid temperature [°C]	–50 to +180; EEx: –20 to +180
Liquid pressure [bar]	max. 100
Enclosure	Housing SS 1.4301 Connection box 1, aluminium IP 67
Ex-approval	II 1/2 G EEx em [ib] II C T2 - T6

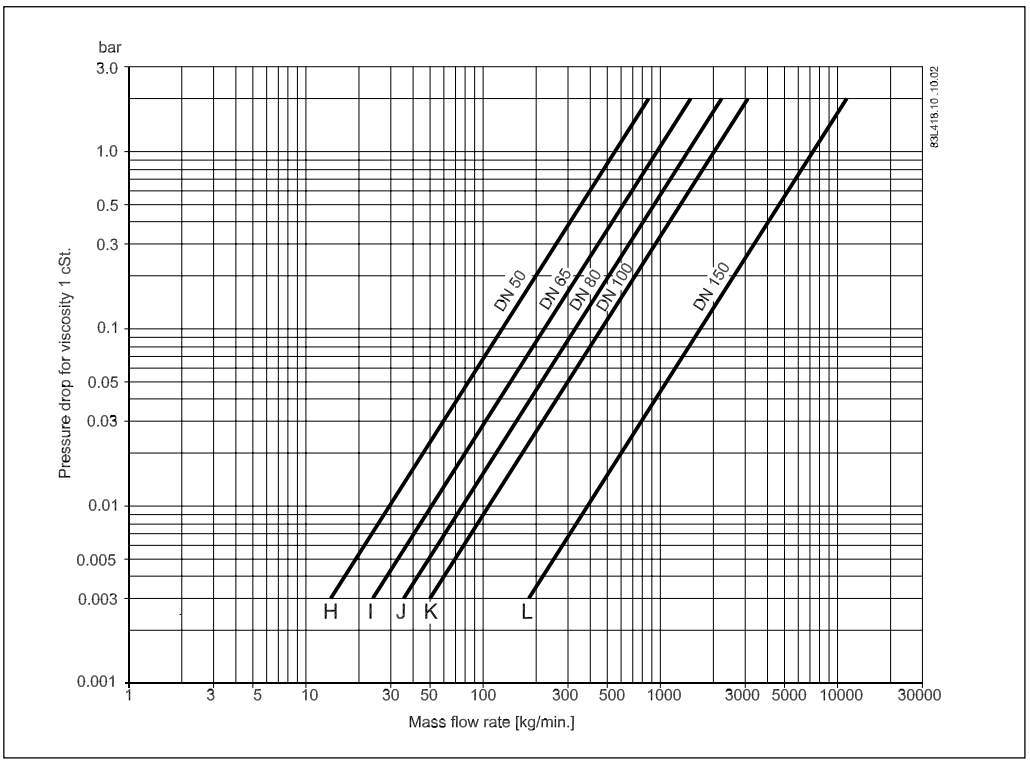


Double pipe MASS MC1

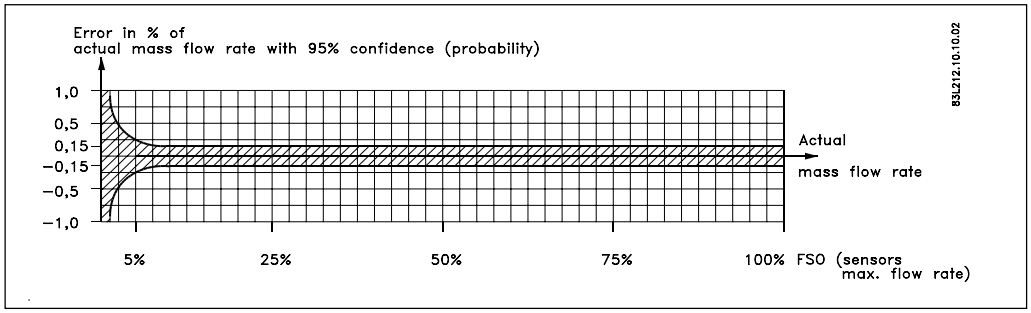
Technical data

Versions	*mm*	50	65	80	100	150
	inch	2	$2^1/_2$	3	4	6
Inside pipe diameter	*2 x mm*	25.0	33.7	38.0	48.3	76.1
Pipe wall thickness	*mm*	1.5	1.5	2.0	2.6	3.2
Mass flow measuring range at pressure drop of 2 bar at 1 g/cm³	*kg/h*	42.600	87.000	113.400	192.000	510.000
Density	*g/cm³*	0.5 - 3.5				
Fraction e.g. Brix	*°Brix*	0 - 100				
Temperature	*Standard*	–50 to +180 °C				
	Ex	–20 to +180 °C				
Liquid pressure measuring pipe Stainless steel (DIN 2413, 20 °C)	*PN*	100	100	100	40	40
Materials	*Measuring pipe*	SS 1.4571 or Hastelloy C4				
	Flange	SS 1.4571 or Hastelloy C4				
Enclosure		IP 67				
Enclosure material/connection box		1.4301 / aluminium				
Process connections		See dimensions				
Electrical connections		Screw terminals, Pg 13.5				
Cable length	*m*	Max. 300				
Cable connection		$5 \times 2 \times 0.35$ mm² twisted and screened in pairs, ext. ∅ 12 mm				
Ex-version ATEX 1388X		II 1/2 EEx em [ib] II C T2-T6				
Weight approx.	*kg*	35	49	59	92	260

Pressure drop



Meter uncertainty (Display/frequency and pulse output MC1 sensors)



	5%	50%	100%
DN 50	2.130 kg/h	21.300 kg/h	42.600 kg/h
DN 65	4.350 kg/h	43.500 kg/h	87.000 kg/h
DN 80	5.670 kg/h	56.700 kg/h	113.400 kg/h
DN 100	9.600 kg/h	96.000 kg/h	192.000 kg/h
DN 150	25.500 kg/h	255.000 kg/h	510.000 kg/h

$$E = \pm \sqrt{(0{,}15)^2 + \left(\frac{z \times 100}{qm}\right)^2}$$

E = Error [%]
Z = Zero point error [kg/h]
qm = Mass flow [kg/h]

$Q_{max.}$ at 2.0 bar pressure loss at 1 g/cm^3

Measuring pipe type		**MASS MC1**				
Measuring pipe version		DN 50	DN 65	DN 80	DN 100	DN 150
Number of measuring pipes		2	2	2	2	2
Mass flow:						
• Linearity error	% of rate	0.15	0.15	0.15	0.15	0.15
• Repeatability error	% of rate	0.1	0.1	0.1	0.1	0.1
• Max. zero point error	[kg/h]	5.52	11.34	14.76	24.96	66.00
Density:	***(Standard)*** [g/cm^3]	0.005	0.005	0.005	0.005	0.005
• Density error	***(Extended)*** [g/cm^3]	0.001	0.001	0.001	0.001	N/A
• Range	[g/cm^3]	0-3.5	0-3.5	0-3.5	0-3.5	0-3.5
• Repeatability error	[g/cm^3]	0.0001	0.0001	0.0001	0.0001	0.0001
Temperature: • Error	[°C]	1.0	1.0	1.0	1.0	1.0
Brix: • Error	[°Brix]	0.2	0.2	0.2	0.2	N/A

N/A = Not available

Reference conditions (ISO 9104 and DIN/EN 29104)

Flow conditions	Fully developed flow profile
Temperature of medium	20°C ± 2K
Ambient temperature	20°C ±2 K
Liquid pressure	2 ± 1 bar
Density	0.997 g/cm^3
Brix	40 °Brix
Supply voltage	Un ±1%
Warming-up time	30 min.
Cable length	5 m between transmitter and sensor

Installation

Assembly and installation flowmeter primary

Inspection
Before installing the flowmeter primary, check for mechanical damage due to possible improper handling during shipment. All claims for damage are to be made promptly to the shipper.

Installation requirements/System design information
The MASS MC1 is suitable for in- and outdoor installations. The standard instrument meets the requirements of Protection Class IP 67. The primary is bidirectional and can be installed in any orientation.
It is important to assure that the meter tubes are always completely filled with fluid.
The corrosion resistance of the fluid wetted materials must be evaluated.
The following points are to be considered during installation:

The preferred flow direction is indicated by the arrow on the flowmeter primary. Flow in this direction will be indicated as positive (a forward/reverse flow calibration is available as on option).

Installation orientation
- The MASS MC1 operates in all orientations. The optimal installation orientation is vertical with the flow upwards.

Supports
- In order to support the weight of the flowmeter primary and to assure reliable measurements when external effects exist (e.g. vibrations), the primary should be installed in rigid pipelines. Two supports or hangers should be installed symmetrically and stress free in close proximity to the process connections.

Shut off devices
- To conduct a system zero adjustment, shut off devices are required in the pipeline.
  - in horizontal installations at the outlet
  - in vertical installations at the inlet
- When possible, shut off devices should be installed both up- and downstream of the flowmeter primary.

Inlet straight sections
- The mass flowmeter does not require any flow conditioning inlet straight sections. Care should be exercised to assure that any valves, gates, sight glasses etc. do not cavitate and are not set into vibration by the flowmeter primary.

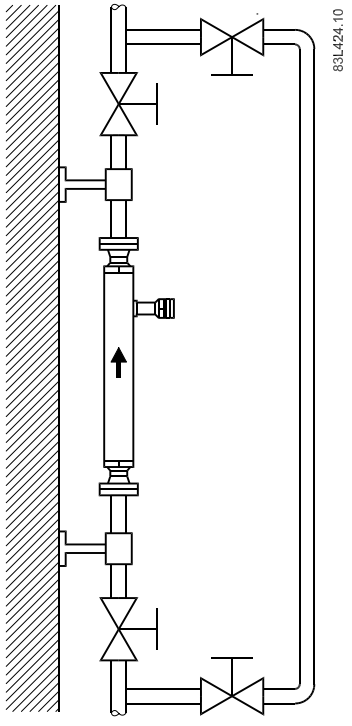
Installation *(continued)*

System design information

- The presence of gas bubbles in the fluid may result in erroneous measurements, particularly in the density measurement. Therefore the flowmeter primary should not be installed at the highest point in the system.
  Advantageous are installations in low pipeline sections, at the bottom of a U-section in the pipeline (invert).
- Long drop lines downstream from the flowmeter primary should be avoided to prevent the meter tube from draining.
- The connecting pipelines should be axially centered to assure a stress free installation.
- The flowmeter primary should not come into contact with any other objects. Attachments to the housing are not permissible.
- When the cross-section of the connecting pipeline is larger than the flowmeter primary size, suitable standard reducers can be installed.
- If strong vibrations exist in the pipeline, they should be damped using elastic pipeline elements. The damping devices must be installed outside the supported flowmeter section and outside the section between the shut off devices. The direct connection of flexible elements to the flowmeter primary should be avoided.
- Make sure that any dissolved gases, which are present in many liquids, do not outgas. The back pressure at the outlet should be at least 0.2 bar.
- Assure that operation below the vapor pressure cannot occur when a vacuum exists in the meter tube or for fluids which boil readily.
- The flowmeter primary should not be installed in the vicinity of strong electromagnetic fields, e.g. near motors, pumps, transformers etc.
- When operating more than one meter in one or multiple interconnected pipelines, the meter primaries should be spaced distant from each other or the pipelines should be decoupled to prevent cross talk.

Zero adjustment

- In order to adjust the zero under operating conditions it must be possible to reduce the flow rate „ZERO“ while the meter tube is completely filled. A bypass line is optimal when the process cannot be shut down. It is important for accurate measurements that during the zero adjustment there are no gas bubbles in the flowmeter primary. It is also important that the pressure and temperature in the meter tube be the same as that which exists during operation.



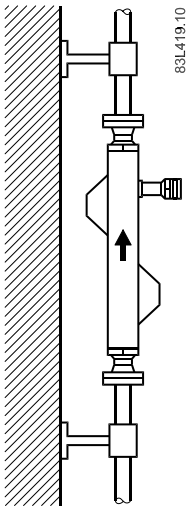
*Zero adjustment with a **by-pass line***

Installation *(continued)*

Vertical installations

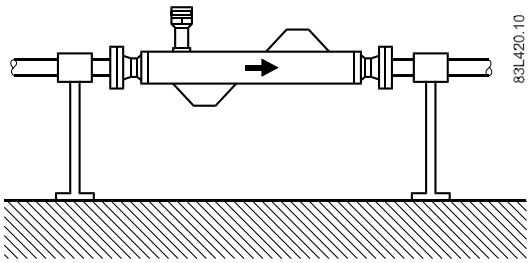
The optimal installation orientation is a vertical installation with an upward flow as shown in the following figure. This has the advantage that any solids contained in the fluid will settle downward and gas bubbles will move upward out of the meter tube when the flow rate is zero. Additionally, it is easy to drain the meter tube. Deposits can thereby be avoided.

Vertical orientation



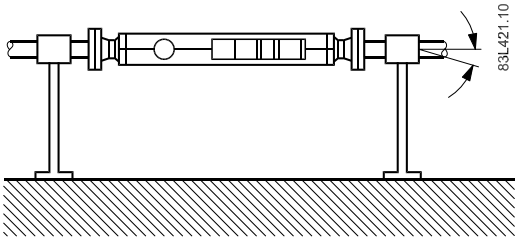
*Vertical installation, **self-draining** (upward flow)*

Horizontal orientation



Horizontal installation

Horizontal installation, self-draining

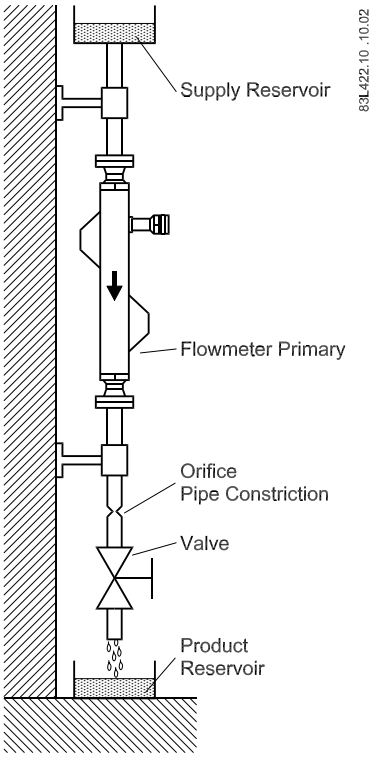


*Horizontal installation, **self-draining**, α 2 – 4°*

Installation in a drop line

The installation recommendation shown in the following figure is only possible if a pipeline reduction or orifice with a smaller crosssection can be installed to prevent the flowmeter primary from being partially drained during the measurements.

*Installation in a **drop line***



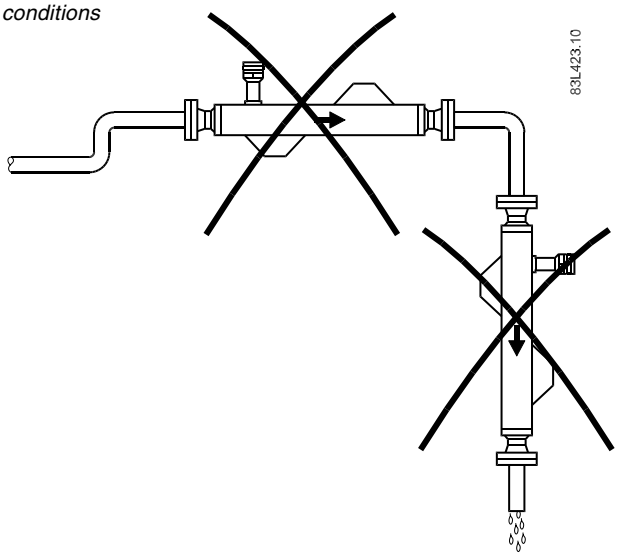
Installation *(continued)*

Difficult installation locations
The accumulation of air or gas bubbles in the meter tube can lead to increased inaccuracies. Some difficult installations are shown in the following figure.
Installations at the highest point in the system (figure A) can result in the formation of air pockets which can lead to appreciable inaccuracies.
Another difficult installation condition is immediately upstream of a free discharge (figure B) in a drop line.

Note
Check that the coordination between the flowmeter primary and the transmitter SENSOR-PROM® unit is correct. The instruments which belong together have the same end characters on the Instrument Tag, e.g., X001 with Y001 or X002 with Y002.

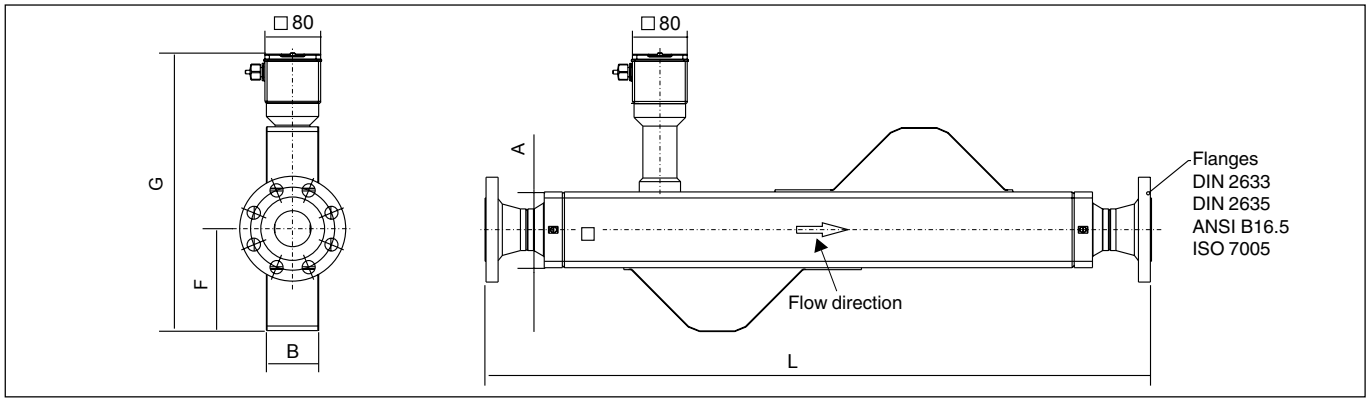
Pressure drop
The pressure drop through the instrument is a function of the properties of the fluid and the flow rate. The **Sizing Program** can be used to calculate the pressure drop.

Difficult installation conditions



Dimensions

Remote design, flanged construction, DIN/ANSI

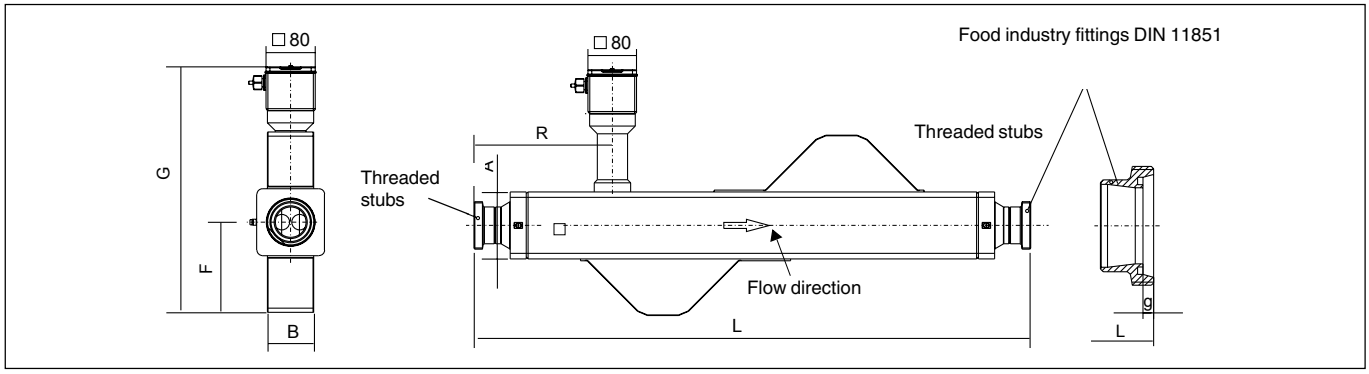


Meter size			Process connection size		L					G[1])	F	B	A	Weight
	Inch	*DN*	*Inch*	*DN*	DIN 2635 PN 40	DIN 2637 PN 100	ANSI CL 150	ANSI CL 300	ANSI CL 600					*[kg]*
H	2	50	2	50	940	979	970	980	1001	403	148	80	110	34
			2½	65	1100	1148	1218	1228	1166	403	148	80	110	38
I	2½	65	2	50	1220	1259	1250	1260	1281	429	164	97	130	43
			2½	65	1100	1148	1218	1228	1249	429	164	97	130	47
			3	80	1220	1260	1240	1260	1282	429	164	97	130	50
J	3	80	2½	65	1330	1256	1365	1375	1396	456	186	108	140	56
			3	80	1220	1260	1240	1260	1282	456	186	108	140	58
			4	100	1480	N/A	1500	1520	N/A	456	186	108	140	69
K	4	100	3	80	1640	N/A	1660	1680	N/A	500	215	131	170	84
			4	100	1480	N/A	1500	1520	N/A	500	215	131	170	91
			6	150	1778	N/A	On req.	N/A	N/A	500	215	131	170	120
L	6	150	6	150	2040	N/A	2070	2090	N/A	613	285	190	260	260

[1]) = For EEx add 54 mm

All dimensions in mm.

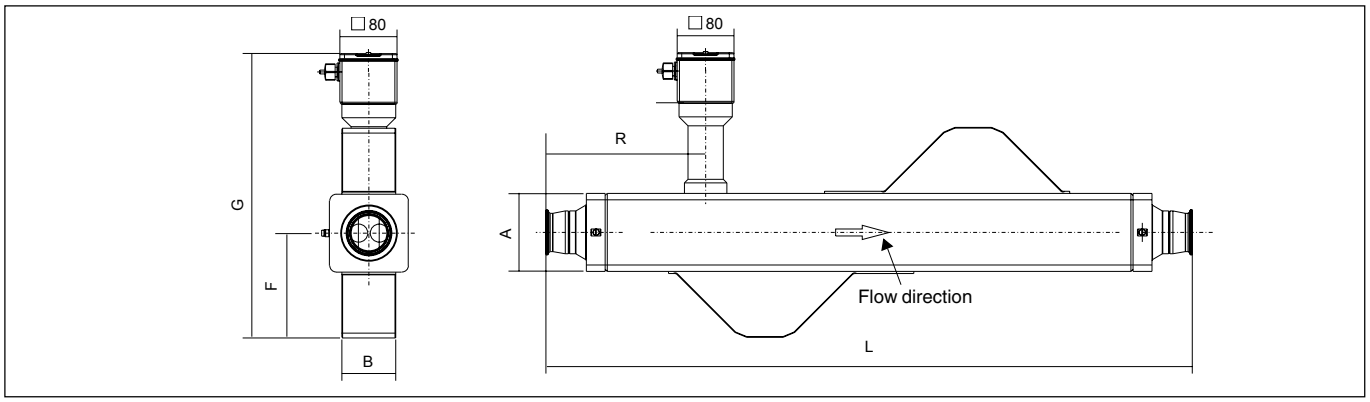
Remote design, food industry fittings, DIN 11851



Meter size		Process connection size			L	g	G*)	F	B	A	R	Weight
		Inch	*DN*									*[kg]*
H	(50)	2	50	Rd 78 x 1/6	918	7	403	148	80	110	177	30
		2½	65	Rd 95 x 1/6	1081	8	403	148	80	110	254	34
I	(65)	2	50	Rd 78 x 1/6	1197	7	429	164	97	130	291	40
		2½	65	Rd 95 x 1/6	1081	8	429	164	97	130	227	44
		3	80	Rd 110 x 1/6	1200	8	429	164	97	130	281	47
J	(80)	2½	65	Rd 95 x 1/6	1310	8	456	186	108	140	319	54
		3	80	Rd 110 x 1/6	1200	8	456	186	108	140	258	56
		4	100	Rd 130 x 1/4	1463	10	456	186	108	140	381	60
K	(100)	3	80	Rd 95 x 1/6	1618	8	500	215	131	170	401	82
		4	100	Rd 130 x 1/4	1463	10	500	215	131	170	314	86

All dimensions in mm.

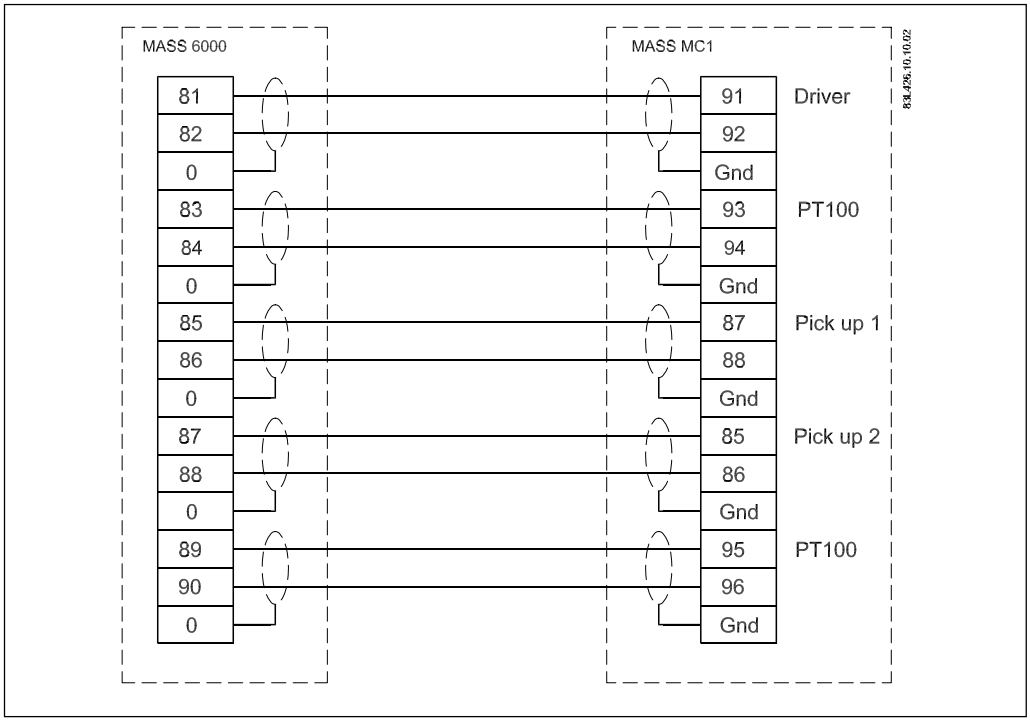
Remote design, Tri-clamp ISO 2852



Meter size		Process connection size		L	G[1])	F	B	A	R	Weight
		Inch	*DN*	±3						*[kg]*
H	(50)	2	50	913	403	148	80	110	225	26
		2½	65	1073	403	148	80	110	305	27
I	(65)	2	50	1192	429	164	97	130	335	36
		2½	65	1073	429	164	97	130	275	37
		3	80	1180	429	164	97	130	328	38
J	(80)	2½	65	1302	456	186	108	140	378	45
		3	80	1180	456	186	108	140	296	44
		4	100	1448	456	186	108	140	430	46
K	(100)	3	80	1598	500	215	131	170	440	71
		4	100	1448	500	215	131	170	365	69

[1]) = For EEx add 54 mm

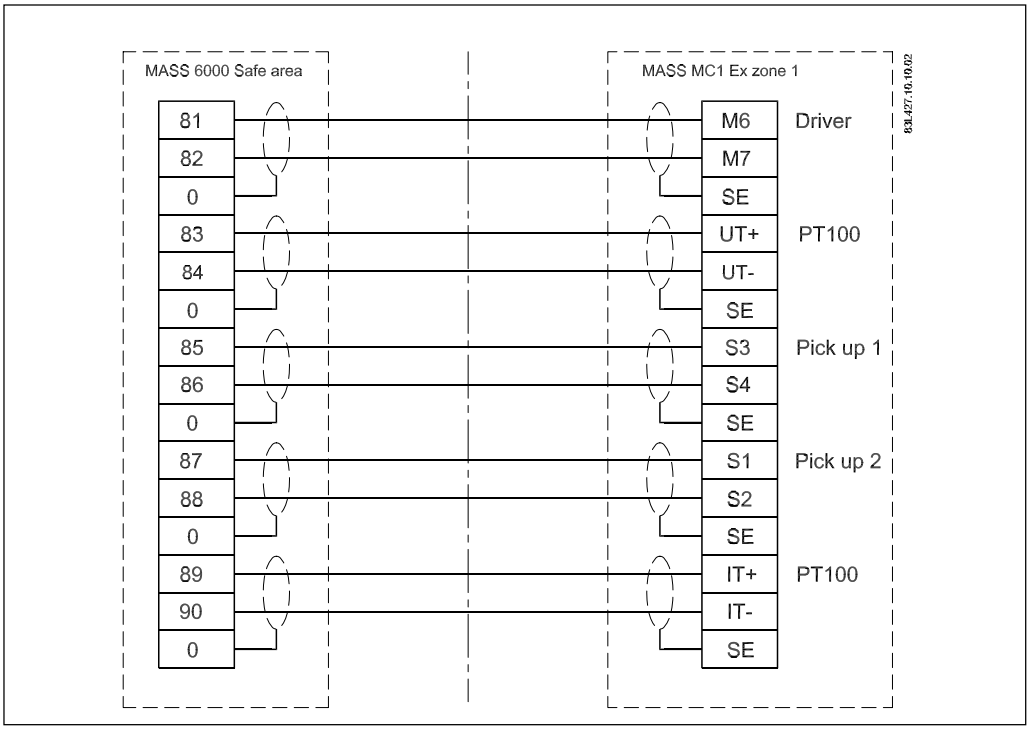
Electrical connection



Electrical connection for Ex application

MASS 6000 and MASS MC1 in Ex application:
„e“ certified products (increased safety) to a certain voltage level can be connected to equipment in the safe area which are designed to guarantee no higher voltage than specified on the „e“ certified equipment.

For the MASS 6000 / MC1 this means:
All secondary circuits/terminals can be considered as limited circuits with non-hazardous voltage of max. 60 V.
The MC1 sensor certified as „e“ up to 60 V.
This means that the MASS 6000 and MC1 can be connected with no further approvals.
Equipment connected to the signal outputs (current, pulse etc) must however obtain the same high degree of isolation from mains supply as the MASS 6000 (Class 2 transformer or Class 1).



Selection and ordering data for MASS MC1

	Order-No.							Order code
SITRANS F C flow sensors MASS MC1	**7ME**	**4**	**3**	**0**	**0**	**-**		
Nominal diameter								
W 1.4571/316Ti								
DN 50	**1**	**A**						
DN 65	**1**	**B**						
DN 80	**1**	**C**						
DN 100	**1**	**D**						
DN 150	**1**	**E**						
Hastelloy C4								
DN 50	**2**	**A**						
DN 65	**2**	**B**						
DN 80	**2**	**C**						
DN 100	**2**	**D**						
DN 150	**2**	**E**						
Nominal pressure								
PN 40		**A**						
PN 100		**B**						
Class 150		**C**						
Class 300		**D**						
Class 600		**E**						
Clamps/screwed-connections		**F**						
Process connections								
Flange EN 1092-1								
DN 50 (PN 40/PN 100)			**2**	**0**				
DN 65 (PN 40/PN 100)			**2**	**1**				
DN 80 (PN 40/PN 100)			**2**	**2**				
DN 100 (PN 40)			**2**	**3**				
DN 150 (PN 40)			**2**	**4**				
Flange ASME/ANSI								
2“ (class 150/300/600)			**3**	**0**				
2 ½“ (class 150/300/600)			**3**	**1**				
3“ (class 150/300/600)			**3**	**2**				
4“ (class 150/300)			**3**	**3**				
6“ (class 150/300)			**3**	**4**				
Dairy screwed connection to DIN 11851								
DN 50 (PN 25)			**4**	**0**				
DN 65 (PN 25)			**4**	**1**				
DN 80 (PN 25)			**4**	**2**				
DN 100 (PN 25)			**4**	**3**				
Dairy clamp connection DIN 32676 Tri-clamp								
50 mm clamp (PN 16)			**5**	**0**				
66 mm clamp (PN 10)			**5**	**1**				
81 mm clamp (PN 10)			**5**	**2**				
100 mm clamp (PN 10)			**5**	**3**				
Configuration								
Flow and density (5 kg/m³)					**1**			
Flow, Brix/Plato and density (1 kg/m³)					**2**			
Flow and density (1 kg/m³)					**5**			
Flow, fraction (specified by customer) and density (1 kg/m³)					**9**			**N0Y**
Ex-approval								
Without explosion protection						**A**		
With explosion protection						**B**		
Cable								
No cable (see accessories)							**A**	
Calibration								
Standard							**1**	
Matched pair							**2**	

Additional information	Order code
Please add „-Z“ to order No. and specify order code(s) and plain text	
Pressure testing certificate	**C11**
Material certificate	**C12**
Welding certificate	**C13**
Factory certificate according to EN 10204 2.2	**C14**
Factory certificate according to EN 10204 2.1	**C15**
Tag name plate, stainless steel	**Y17**
Tag name plate, plastic	**Y18**
Customer specific transmitter setup	**Y20**
Customer specified, matched pair (5x2)	**Y60**
Customer specified calibration (5x2)	**Y61**
Customer specified, matched pair (10x1)	**Y62**
Customer specified calibration (10x1)	**Y63**
Special version	**Y99**

Accessories

Description	**Order No.**
Cables from MC1 sensor to MASS 6000 transmitter	
10 m (32 ft)	**FDK:083H3001**
25 m (82 ft)	**FDK:083H3002**
25 m (82 ft)	**FDK:083H3003**
150 m (492 ft)	**FDK:083H3004**

Spare parts

Description	**Order No.**
2 kB SENSORPROM unit (Sensor Serial No. and Order No. must be specified by ordering)	**FDK:083H4410**

Please also see www.siemens.com/SITRANSFordering for practical examples of ordering.

MASS 6000 IP 67 compact/remote

	Order-No.
SITRANS F C MASSFLO **MASS 6000 transmitter**	**7ME 4 1 1 0 -**
	A A 0 - A 0
Transmitter for wall mounting IP67/NEMA4X, fibre-glass reinforced polyamide (1 current output, 1 frq./pulse output and 1 relay output)	
Version Remote	**2**
Supply voltage 115/230 V AC, 50...60 Hz 24 VAC/DC	**1** **2**
Display/Keypad with display	**1**
Serial communication No communication HART PROFIBUS PA PROFIBUS DP MODBUS	**A** **B** **C** **D** **E**

Wall mounting kit

Description	Order no.	Symbol
Wall mounting unit for IP 67 version Wall bracket, 4 Pg 13.5 cable glands	**FDK:085U1001**	

Spare parts for compact IP 67/NEMA 4X

Description	Version	Order no.	Symbol
Connection plate/PCB	115-230 V/ 12-24 V	**FDK:083H4260**	

MASS 6000 19" insert/ 19" wall mounting

	Order-No.
SITRANS F C MASSFLO **MASS 6000 transmitter** Transmitter for rack and wall mounting	**7ME 4 1 1 0 -** 2 | | | | - | | A 0
Enclosure	
19 inch insert IP20/NEMA 1	C
19 inch insert in IP66/NEMA 4	E
Output configuration	
1 current, 1 frequency, 1 relay	A
3 current, 2 frequency, 2 relay	C
Supply voltage	
115/230 V AC, 50/60 Hz	1
24VAC/DC	2
Ex Approvals	
No Ex-approval	0
Display/Keypad	
With display	1
Serial communication (Only possible to connect to MASS 6000 version with 1 current output)	
No communication	A
HART	B
PROFIBUS PA	C
PROFIBUS DP	D
MODBUS	E

Attention (Ex applications)!
MC1 Ex version sensors must only be connected to MASS 6000 standard. The connector board must be replaced by a connection board approved FDK:083H4294 or FDK:083H4295 (see connection boards/PCB for MASS 6000 and MC1 sensors).

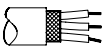
Wall mounting enclosure (With back plate/PCB for Ex)

Description	Order no.	Symbol
Wall mounting enclosure for MASS 6000 19" version IP 65 (21 TE)	**FDK:083H4296**	

Back plates/PCB for 19" versions

Description	Enclosure	Version	Order no.	Symbol
Transmitter IP 20	19"	12-24 V 115-230 V	**FDK:083H4272**	
Transmitter IP 20 for Ex application	19"	12-24 V 115-230 V	**FDK:083H4294**	
Transmitter for wall mounting enclosure	Wall unit	12-24 V 115-230 V	**FDK:083H4274**	
Transmitter for wall mounting enclosure, IP 65 for Ex application	Walll unit	12-24 V 115-230 V	**FDK:083H4295**	

Cables and connectors

Description		Order no.	Symbol
	Length		
Cable	10 m	**FDK:083H3001**	
Standard cable between MASS 6000 and MC1 5 x 2 x 0,34 mm^2 twisted and screened in pairs Temperature range minus 20 C to plus 110 C	25 m	**FDK:083H3002**	
	75 m	**FDK:083H3003**	
	150 m	**FDK:083H3004**	

SENSORPROM® memory unit

2 kB SENSORPROM® unit (Sensor serial no. must be specified by ordering)	**FDK:083H4410**	

We have checked the contents of this manual for agreement with the hardware and software described. Since deviations cannot be precluded entirely, we cannot guarantee full agreement. However, the data in this manual are reviewed regularly and any necessary corrections included in subsequent editions. Suggestions for improvement are always welcomed.

Technical data subject to change without prior notice.

Siemens Flow Instruments A/S
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