SIEMENS

Handbook

SITRANS F C MASSFLO®

MASS flowmeters
Signal converter type MASS 6000

Order no.: FDK:521H1005

DKFD.PS.028.L1.02 - A5E00253653

Siemens Flow Instruments range of coriolis mass flowmeters

Dimension **Size [mm]**	**DI 1.5** 	**DI 3, 6, 15, 25, 40** 
Measuring range [kg/h]	0 - 65	0 - 52,000
Version	1 - pipe system	
Materials [wetted]	1.4439 (stainless steel) 2.4602 (Hastelloy C)	
Liquid temperature [°C]	-50 to +125 -50 to +180	-50 to +180
Liquid pressure [bar]	max. 460	max. 430
Enclosure	AISI 316 stainless steel IP 65	
Ex-approval	EEx ia II C T3 - T6	

Signal converters	**Compact IP 67** 	**19" IP 20 standard version** 	**19" IP 20 with extended outputs** 	**Compact Ex-d** 
Mounting	Compact on sensor or wall mounting	19" panel mounting or wall mounting		Compact on sensor or wall mounting
Materials	Polyamid	Aluminium		AISI 316
Output facilities	1 current 1 frq./pulse 1 relay	1 current 1 frq./pulse 1 relay	3 current 2 frq./pulse 2 relay	1 current 1 frq./pulse 1 relay
Input facilities	1 digital	1 digital	1 digital	1 digital
Display	3 lines 20 characters alfanumeric LCD display			
Communication facilities	Prepared for Siemens Flow Instruments add-on communication module (HART®, Profibus DP, Profibus PA, DeviceNet, CANopen)			
Measurement parameters	Mass flow rate, total mass, density, temperature, volumetric flow rate, total volume, fraction flow, %fraction, total fraction			
Accuracy	0.1% of actual flow			
Ex-approval		[EEx ia] IIC		EEx de [ia/ib] IIC
Supply voltage	24 V d.c./a.c., 50-60 Hz 115/230 V a.c., 50-60 Hz			24 V d.c./a.c., 50-60 Hz

1. Product introduction

SITRANS F C MASSFLO® coriolis mass flowmeters measure flow in kilogrammes. The measurement is independent of changes in process conditions such as temperature, density, pressure, viscosity, conductivity and flow profile.

Siemens Flow Instruments SITRANS F C MASSFLO® mass flowmeters are for the direct measurement of:

- Mass flow rate
- Total mass
- Density
- Temperature
- Volumetric flowrate
- Total volume
- Fraction flow
- % fraction (e.g. °Brix)
- Total fraction

Typical applications are found in all industries. E.g.:

- Water industry: Dosing of chemicals for waste water treatment.
- Food industry: Dairy products, beer, wine, soft-drinks, fruit juices and pulps.
- Chemical industry: Detergents, pharmaceuticals, acids, alkalies.
- Automotive industry: Fuel injection nozzle testing, filling of a.c.units, ABS brake test.
- Other industry: Filling of gas bottles, furnace control for district heating, paper pulp.

SITRANS F C MASSFLO® mass flowmeters are characterised by simplicity:

⇒ Simple to install
⇒ Simple to commission
⇒ Simple to operate
⇒ Simple to maintain

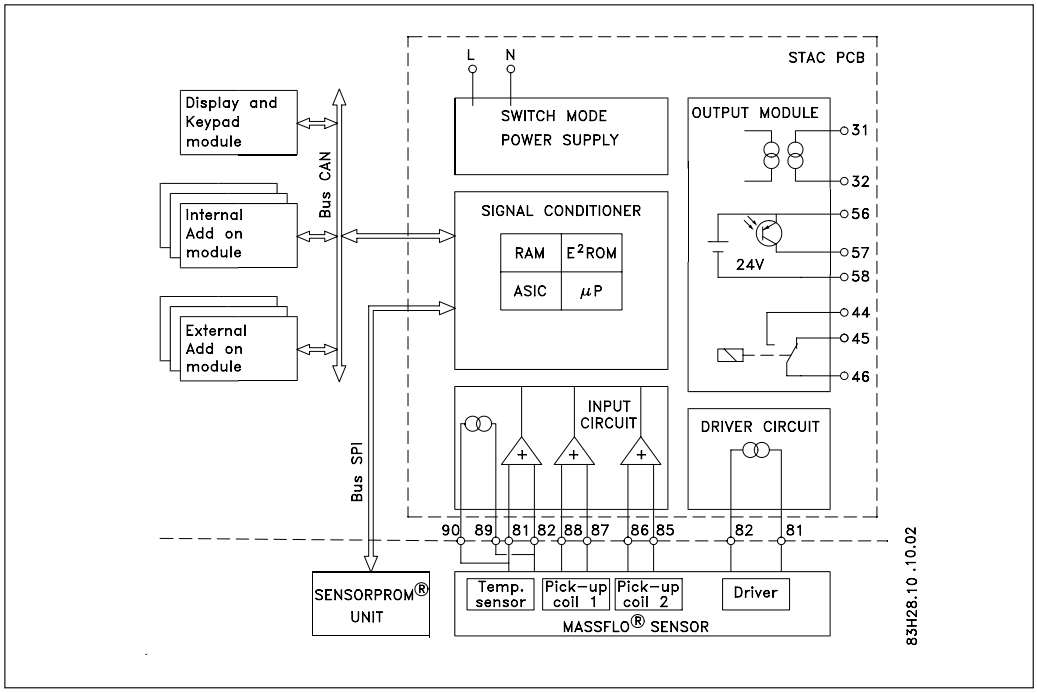
The unique **SENSORPROM® flow memory unit** contains sensor data and signal converter settings. The unit is located on the connection board for the signal converter. Immediately on starting, the signal converter uploads the calibration data and factory settings matching the sensor and commences measurement. All customer application settings are retained in the SENSORPROM® unit. If the signal converter is replaced, the new converter will upload all previous settings and resume measurement without any need for reprogramming.

SITRANS F C MASSFLO® coriolis mass flowmeters are manufactured by Siemens Flow Instruments - one of the worlds leading makers of flowmeters.

⚠ Documentation needs to be consulted.

⚠ The user shall be made aware of that, if the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

1.1 Mode of operation



The flow measuring principle is based on coriolis law of movement. The flowmeter consist of a sensor type 2100 and a signal converter type 6000.

SENSOR
The MASS 2100 sensor is energised by the driver circuit which oscillates the pipe at its resonant frequence.
Two pick-up's, 1 and 2 are placed symmetrically either side of the driver. If liquid or gas flows through the sensor, coriolis force will act on the measuring pipe and cause a pipe deflection which can be measured as a phase shift on pick-up 1 and 2.

SIGNAL CONVERTER
The signal converter consist of a number of function blocks which convert the sensor signals into flow readings.

Driver circuit
This module excitates the sensor at its resonant frequency. The amplitude of the driver signal is automatically regulated via a "Phase Locked Loop", to ensure a stable output from the 2 pick-up's.

Power supply 2 different types of power supply are available. 12 - 24 V a.c./d.c. or a 115 - 230 V a.c. switch mode type.

Input circuit
The flow proportional signal from the 2 pick-up's is conditioned in this circuit to a digital signal for further signal processing. The temperature output from the sensor (PT 1000) is measured with a current loop and a optional amplifier in a wheatstons configuration. The temperature signal is also converted into a 32 bit digital format.

Digital signal processor
The signals from the 2 pick-up's, the temperature measurement and the driver frequency is converted into flow proportional signals used for calculation of mass flow, volume flow, fraction flow, temperature and density. Inaccuracies in the signal converter as a result of long-term drift and temperature drift are monitored and continously compensated for via the self-monitoring circuit. The analog to digital conversion takes place in an ultra low noise ASIC with 23 bit signal resolution. The dynamic range of the signal converter is thus unsurpassed, with a turn down ratio of min. 3000:1.

CAN communication. The signal converter operates internal via a internal CAN communication bus. Signals are transferred to/from a signal conditioner to the display module, internal/external option modules and the dialog module.

Dialog module. The display unit consist of a 3 line display and a 6 key keypad. The display will show a flowrate or a totalizer value as a primary reading.

The output module converts flow data to an analog, a digital and a relay output. The outputs are galvanically isolated and can be individually set to suit a particular application.

2. Technical data

2.1 Sensor MASS 2100. Versions DI 1.5, DI 3, DI 6, DI 15, DI 25, DI 40

Versions	*mm* *inch*	DI 1.5 1/16	DI 3 1/8	DI 6 1/4	DI 15 5/8	DI 25 1	DI 40 1 1/2
							
Inside pipe diameter (Sensor consists of one continuous pipe)	*mm*	1.5	3.0	6.0	14.0	29.7	43.1
Pipe wall thickness	*mm*	0.25	0.5	1.0	1.0	2.0	2.6
Mass flow measuring range	*kg/h*	0-65	0-250	0-1,000	0-5,600	0-25,000	0-52,000
Density	*g/cm³*	0.1-2.9					
Fraction e.g.	*°Brix*	0-100					
Temperature °C							
Standard		–50 to +125	–50 to +180				
High temperature version		–50 to +180					
Liquid pressure measuring pipe [1]							
Stainless steel	*bar*	296	295	327	158	135	125
Hastelloy C-22	*bar*	460	390	430	208	191	173
Materials							
Measuring pipe, flange-,		1.4435/1.4404 (AISI 316 L) (Stainless steel)					
Thread connection as standard		2.4602 (Hastelloy C-22)					
Enclosure and enclosure material		IP 65 and 1.4404 (AISI 316 L) (Stainless steel)					
Enclosure, burst pressure	*bar*	70	190	190	140	90	50
Process connections [2]							
Flange							
DIN 2635, PN 40				DN 10	DN 15	DN 25	DN 40
ANSI B16.5, Class 150				1/2"	1/2"	1"	1 1/2"
ANSI B16.5, Class 600 (Class 300)				1/2"	1/2"	1 "	1 1/2"
Dairy (screwed connector, PN 25/40) [3]							
DIN 11851				DN 10	DN 15	DN 32	DN 40
ISO 2853/BS 4825 part 4 (SS3351)				25 mm	25 mm	38 mm	51 mm
Clamp (PN 16) [3]							
ISO 2852/BS 4825 part 3 (SMS3016)				25 mm	25 mm	38 mm	51 mm
Thread							
ISO 228/1, PN 100		G 1/4"	G 1/4"				
ANSI/ASME B1.20.1, PN 100		1/4" NPT	1/4" NPT				
Cable connection		Multiple plug connection to sensor $5 \times 2 \times 0.35$ mm² twisted and screened in pairs, ext. ∅ 12 mm					
Ex-version [4]		EEx ia II C T3-T6					
Weight approx.	*kg*	2.6	4	8	12	48	48

[1]) Max. at 20 °C, DIN 2413, DIN 17457
[2]) Other connections to order, see chapter 9, ordering
[3]) Material, 1.4401 or corresponding
[4]) Intrinsically safe approval: CENELEC and ASEV

2.2.1 Signal converter MASS 6000 Compact IP 67

	**MASS 6000 Compact IP 67**	
Measurement of	Mass flow [kg/s], volume flow [l/s], fraction [%], °Brix, density [kg/m^3], temperature [°C]	
Current output		
Current	0-20 mA or 4-20 mA	
Load	< 800 ohm	
Time constant	0-30 s adjustable	
Digital output		
Frequency	0-10 kHz, 50% duty cycle	
Time constant	0-30 s adjustable	
Active	24 V d.c., 30 mA, 1 KΩ ≤ R_{load} ≤ 10 KΩ, short-circuit-protected	
Passive	3-30 V d.c., max. 110 mA, 1 KΩ ≤ R_{load} ≤ 10 KΩ	
Relay		
Type	Change-over relay	
Load	42 V / 2 A peak	
Functions	Error level, error number, limit, direction	
Digital input	11-30 V d.c. Ri = 13.6 KΩ	
Functionality	Start/hold/continue batch, 0-point adjust, reset totalizer 1/2, force output, freeze output	
Galvanic isolation	All inputs and outputs are galvanically isolated, isolation voltage 500 volts	
Cut-off		
Low-flow	0-9.9% of maximum flow	
Limit function	Mass flow, volume flow, fraction, density, sensor temperature	
Totalizer	Two eight-digit counters for forward, net or reverse flow	
Display	Background illumination with alphanumerical text, 3 × 20 characters to indicate flow rate, totalized values, settings and faults.	
	Reverse flow indicated by negative sign	
0-point adjustment	Manual via keypad or remote via digital input	
Ambient temperature	Operation: –20 to +50°C, max. rel. humidity 80% to 31°C decreasing to 50% at 40°C according to UL 3101	
	During storage: –40 to +70°C (Humidity max. 95%)	
Communication	Prepared for client mounted add-on modules	
Enclosure		
Material	Fibre glass-reinforced polyamide	
Rating	IP 67 to IEC 529 and DIN 40050 (1 m w.g. for 30 min.)	
Mechanical load	18-1000 Hz random, 3.17G rms, in all directions, to IEC 68-2-36	
Supply voltage	***24 V version***	***230 V version***
Supply	24 V d.c./a.c., 50-60 Hz	115/230 V a.c., 50-60 Hz
Fluctation	24 V d.c., –25 to 25%	+10 to -10%
	24 V a.c., –16 to 25%	
Power consumption	10 W	26 VA
Fuse	230 V version: T400 mA, T 250V (IEC 127) - Not to be changed by user	
	24 V version: T1A, T 250V (IEC 127) - Not to be changed by user	
EMC performance	Emission EN 50081-1 (Light industry)	
	Immunity EN 50082-2 (Industry)	
Namur	Within the value limits according to "Allgemeine Anforderung" with error criteria A in accordance with NE 21	
Evironment	Environmental conditions acc. to UL 3101: Indoor use Altitude up to 2000 m POLLUTION DEGREE 2	
Maintenance	The flowmeter has a built-in error log/pending menu which should be inspected on a regular basis	

2.2.2 Signal converter MASS 6000 19" IP 20

	**MASS 6000 19" IP 20**	
Measurement of	Mass flow [kg/s], volume flow [l/s], fraction [%], °Brix, density [kg/m^3], temperature [°C]	
Current output		
Current	0-20 mA or 4-20 mA	
Load	< 800 ohm	
Time constant	0-30 s adjustable	
Digital output		
Frequency	0-10 kHz, 50% duty cycle	
Time constant	0-30 s adjustable	
Active	24 V d.c., 30 mA, 1 KΩ ≤ R_{load} ≤ 10 KΩ, short-circuit-protected	
Passive	3-30 V d.c., max. 110 mA, 1 KΩ ≤ R_{load} ≤ 10 KΩ	
Relay		
Type	Change-over relay	
Load	42 V / 2 A peak	
Functionallity	Error level, error number, limit, direction	
Digital input	11-30 V d.c., Ri = 13.6 KΩ	
Functionality	Start/hold/continue batch, zero point adjust, reset totalizer 1/2, force output, freeze output	
Galvanic isolation	All inputs and outputs are galvanically isolated, isolation voltage 500 volts	
Cut-off		
Low-flow	0-9.9% of maximum flow	
Limit function	Mass flow, volume flow, fraction, density, sensor temperature	
Totalizer	Two eight-digit counters for forward, net or reverse flow	
Display	Background illumination with alphanumerical text, 3 × 20 characters to indicate flow rate, totalized values, settings and faults.	
	Operation: –20 to +50°C, max. rel. humidity 80% to 31°C decreasing to 50% at 40°C according to UL 3101	
	During storage: –40 to +70°C (Humidity max. 95%)	
Communication	Prepared for client mounted add-on modules	
Enclosure		
Material	Standard 19" insert of aluminium/steel (DIN 41494)	
Dimensions	Width: 21 TE	
	Height: 3 HE	
Rating	IP 20 to IEC 529 and DIN 40050	
Load	Version: 1 G, 1-800 Hz sinusoidal in all directions, to IEC 68-2-6	
EMC performance	Emission EN 50081-1 (Light industry)	
	Immunity EN 50082-2 (Industry)	
Namur	Within the value limits according to "Allgemeine Anforderung" with error criteria A in accordance with NE 21	
Supply voltage	***24 V version***	***230 V version***
Supply	24 V d.c./a.c., 50-60 Hz	115/230 V a.c., 50-60 Hz
Fluctation	24 V d.c., –25 to 25%	+10 to -10%
	24 V a.c., –16 to 25%	
Power consumption	10 W	26 VA
Fuse	230 V version: T400 mA, T 250V (IEC 127) - Not to be changed by user	
	24 V version: T1A, T 250V (IEC 127) - Not to be changed by user	
Evironment	Environmental conditions acc. to UL 3101: Indoor use Altitude up to 2000 m POLLUTION DEGREE 2	
Ex approval	[EEx ia] IIC, DEMKO Ex 99E.125729X	

2.2.3 Signal converter MASS 6000 19" IP 20 with extended outputs

MASS 6000 19" insert version with extended outputs	The MASS 6000 is also available in the 19" version with outputs increased to 3 current outputs, 2 digital outputs, 2 relay outputs, 1 digital input
	Other data is identical to the above

2.2.4 Signal converter MASS 6000 Ex-d

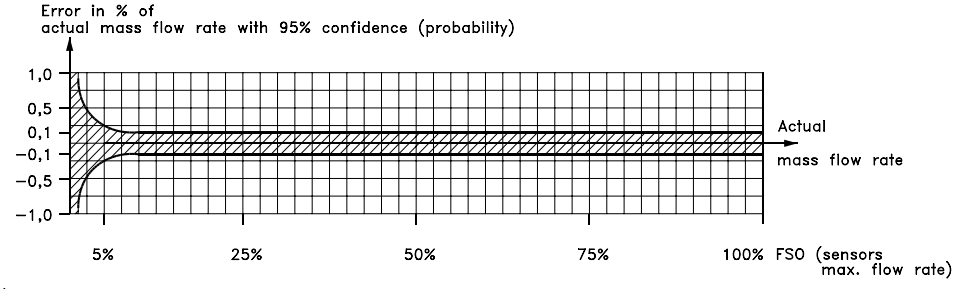
MASS 6000 Ex-d

Measurement of	Mass flow [kg/s], volume flow [l/s], fraction [%], °Brix, density [kg/m^3], temperature [°C]			
Current output	Classified Ex ia, selectable as active or passive outputs. Default setting is passive mode			
Current	0-20 mA or 4-20 mA			
Load	< 350 ohm			
Time constant	0.1-30 s adjustable			
Output characteristics	***Active mode***		***Passive mode***	
(Terminals: 31-32)	U_o	24 V	U_i	30 V
	Io	115 mA	I_i	115 mA
	Po	0.7 W	P_i	0.7 W
	C_o	125 nF	C_i	52 nF
	L_o	2.5 mH	L_i	100 µH
Digital output				
Frequency	0-10 kHz, 50% duty cycle			
Time constant	0.1-30 s adjustable			
Passive	6-30 V d.c., max. 110 mA, 1 KΩ ≤ R_{load} ≤ 10 KΩ			
Output characteristics	***Active mode***		***Passive mode***	
(Terminals: 56-57-58)	Not available		U_i	30 V
			I_i	115 mA
			P_i	0.7 W
			C_i	52 nF
			L_i	100 µH
Relay				
(Terminals: 44-45-46)				
Type	Change-over relay			
Load	30 V / 100 mA			
Functionality	Error level, error number, limit, direction			
Output characteristics	U_i: 30 V, I_i: 100 mA, C_i: 0 nF, L_i: 0 mH			
Digital input				
(Terminals: 77-78)	11-30 V d.c., Ri = 13.6 KΩ			
Functionallity	Start/hold/continue batch, zero point adjust, reset totalizer 1/2, force output, freeze output			
Output characteristics	U_i: 30 V, I_i: 4.8 mA, P_i: 140 mW, C_i: 0 nf L_i: 0 mH			
Galvanic isolation	All inputs and outputs are galvanically isolated, isolation voltage 500 volts			
Cut-off				
Low-flow	0-9.9% of maximum flow			
Empty pipe	Detection of empty sensor			
Density	0 - 2.9 g/cm^3			
Totalizer	Two eight-digit counters for forward, net or reverse flow			
Display	Background illumination with alphanumerical text, 3 × 20 characters to indicate flow rate, totalized values, settings and faults.			
	Reverse flow indicated by negative sign			
Zero point adjustment	Manual via keypad or remote via digital input			
Ambient temperature	Operation: –20 to +50°C			
	During storage: –40 to +70°C (Humidity max. 95%)			
Communication	Prepared for client mounted add-on modules certified for Ex-use			
HART	***Active mode***		***Passive mode***	
(Terminals: 91-92)	U_o	6.51 V	Not available	
	Io	311 mA		
	Po	0.55 W		
	C_o	20 nF		
	L_o	100 µH		
PROFIBUS PA	***Active mode***		***Passive mode***	
(Terminals: 95-96)	Not available		U_i	17.5 V
			I_i	380 mA
			P_i	5.32 W
			C_i	5 nF
			L_i	10 µH

2.2.4 Signal converter MASS 6000 Ex-d *(continued)*

Enclosure					
Material	Stainless steel AISI 316 W1.4435				
Rating	Compact mounted on sensor, IP 67 to IEC 529 and DIN 40050				
	Remote mounted, IP 65 to IEC 529 and DIN 40050				
Load	18 - 1000 Hz random, 1.14 G rms, in all directions, to IEC 68-2-36, Curve E				
EMC performance	Emission EN 50081-1 (Light industry)				
	Immunity EN 50082-2 (Industry)				
Namur	Within the value limits according to "Allgemeine Anforderung" with error criteria A in accordance with NE 21				
Supply voltage	***24 V a.c.***			***24 V d.c.***	
Range	20 to 30 V a.c.			18 to 30 V d.c.	
Power consumption	6 VA I_N = 250 mA, I_{ST} = 2A (30 msec.)			6 VA I_N = 250 mA, I_{ST} = 2A (30 msec.)	
Power supply	The power supply shall be from a safety isolating transformer. Maximal cable core is 2.5□			The power supply shall be from a safety isolating transformer. Maximal cable core is 2.5□	
Ex approval	EEx de [ia/ib] IIC T3-T6, DEMKO Ex 99E.124212X				
	Temperature class	T6	T5	T4	T3
	Process liquid temperature	T < 85°C	85°C < T < 100°C	100°C < T < 135°C	135°C < T < 180°C

2.3 Meter uncertainty Display/frequency and pulse output



DI 1.5	1.0	40	65 kg/h
DI 3	12	125	250 kg/h
DI 6	50	500	1000 kg/h
DI 15	280	2800	5600 kg/h
DI 25	1250	12500	25000 kg/h
DI 40	2600	26000	52000 kg/h

- For flow > 5% of the sensors max. flow rate, the error can be read direct from the curve.
- For flow < 5% of the sensors max. flow rate, use the formula to calculate the error.
- The error curve is plotted from the formula:

$$E = \pm \sqrt{(0{,}10)^2 + \left(\frac{z \times 100}{qm}\right)^2}$$

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

Measuring pipe type		**MASS 2100**					
Measuring pipe version		DI1.5	DI 3	DI 6	DI 15	DI 25	DI 40
Number of measuring pipes		1	1	1	1	1	1
Mass flow: • Linearity error	% of rate	0.10	0.10	0.10	0.10	0.10	0.10
• Repeatability error	% of rate	0.05	0.05	0.05	0.05	0.05	0.05
• Max. zero point error	[kg/h]	0.002	0.03	0.15	0.66	3.0	6.0
Density: • Density error	[g/cm³]	0.001	0.0015	0.0015	0.0005	0.0005	0.0005
• Repeatability error	[g/cm³]	0.0002	0.0002	0.0002	0.0001	0.0001	0.0001
Temperature: • Error	[°C]	0.5	0.5	0.5	0.5	0.5	0.5
Brix: • Error	[°Brix]	0.6	1.2	0.4	0.2	0.2	0.2

Reference conditions (ISO 9104 and DIN/EN 29104)

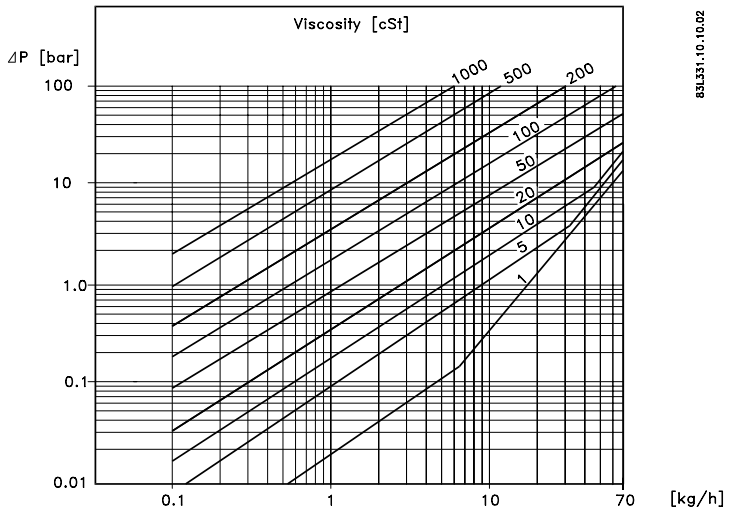
Flow conditions	Fully developed flow profile
Temperature of medium	20°C ± 2K
Ambient temperature	20°C ±2 K
Liquid pressure	2 ± 1 bar
Density	0.997 g/cm³
Brix	40 °Brix
Supply voltage	Un ±1%
Warming-up time	30 min.
Cable length	5 m between converter and sensor

Additions in the event of deviations from reference conditions

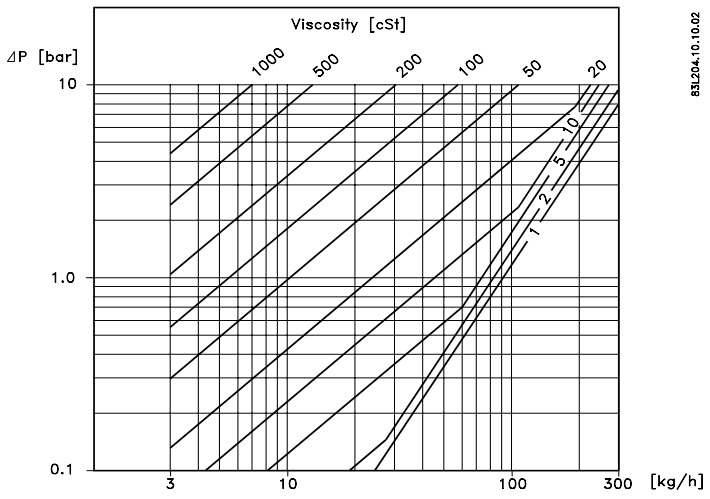
Current output	As pulse output ±(0.1% of actual flow +0.05% FSO)
Effect of ambient temperature	Display/frequency/pulse output: < ±0.003% / K act.
	Current output: < ±0.005% / K act.
Effect of supply voltage	< 0.005% of measuring value on 1% alteration

2.4 Pressure drop

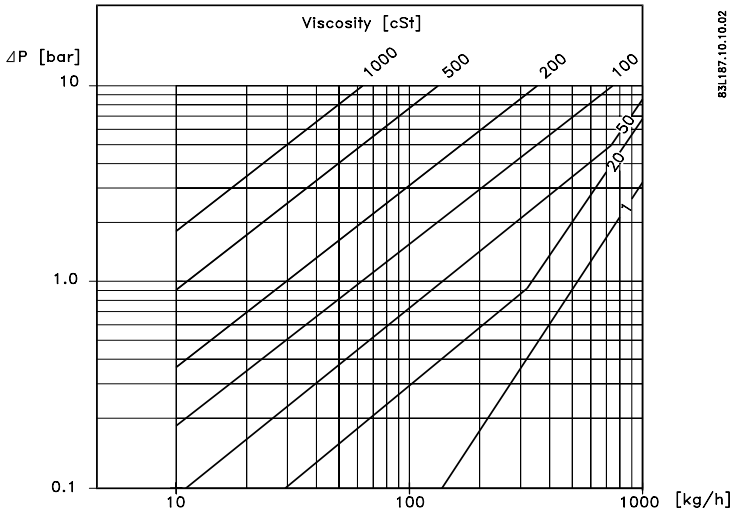
MASS 2100 DI 1.5



MASS 2100 DI 3

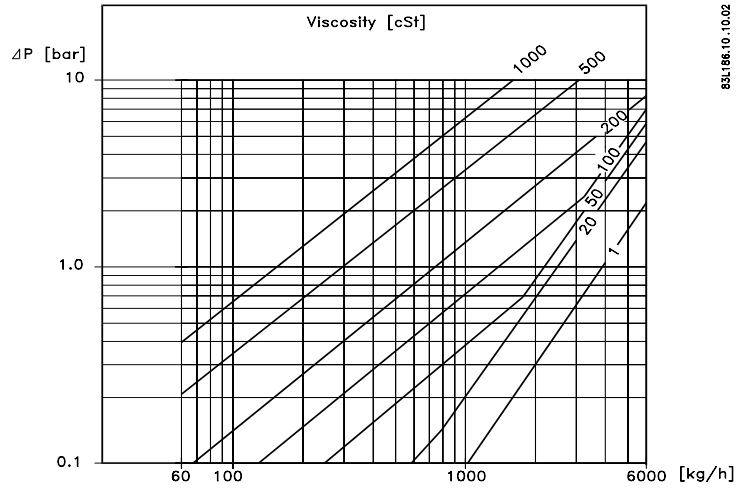


MASS 2100 DI 6

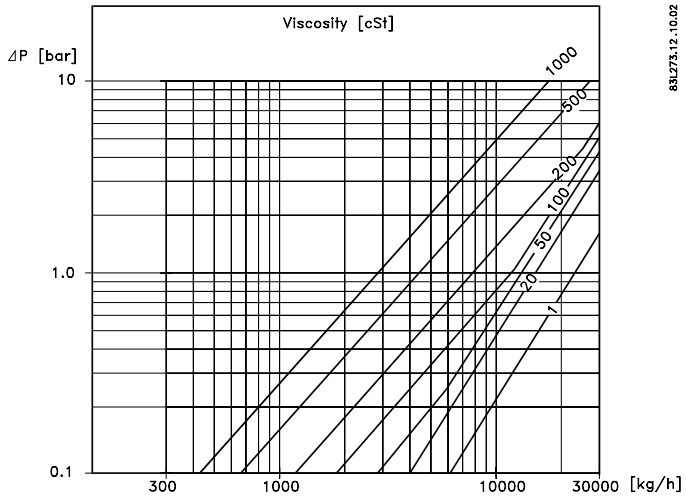


2.4 Pressure drop *(cont.)*

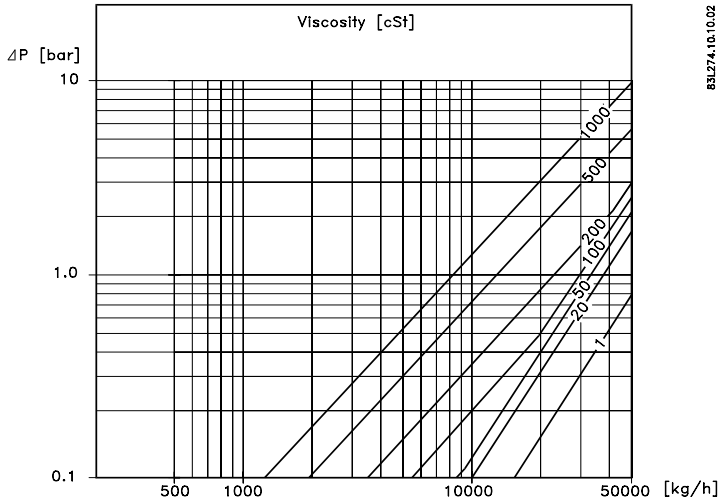
MASS 2100 DI 15



MASS 2100 DI 25



MASS 2100 DI 40



2.5 Sensor cable specification

Basic data	5 x 2 x 0.34 mm^2 twisted and screened in pairs
Diameter	Ø12 mm
Color	Blue
Length	Max. length between converter and sensor is 500 m
Capacitance	Max. 41 pf/m. Only requested for Ex-applications

2.6 HART® Communication Add-on module

Application	All MASS 6000 converters
Communication standard	Bell 202 frequency shift keying (f.s.k.) standard
Communication modes	• Single loop mode
	• Multi-drop mode, 14 slave devices
Communicator	Rosemount Hand held communicator type 275

Cable specification

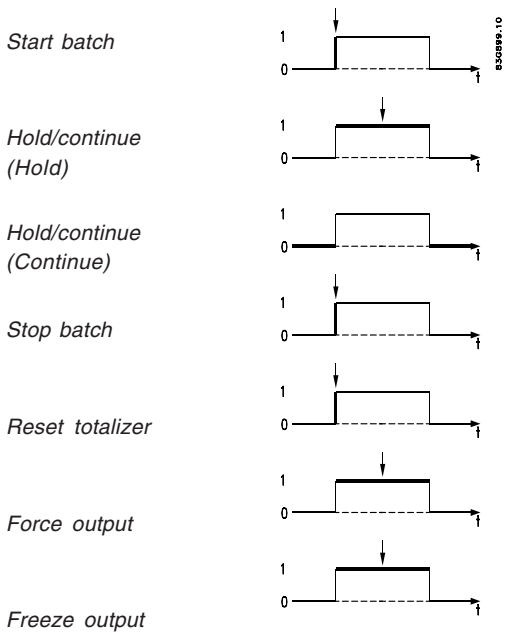
Basic data		
Q [mm^2] CU		≥ 0.2 mm^2/AWG 24
Screen		YES (Overall screen)
Loop resistance	*Min.*	230 Ω
	Max.	800 Ω
Cable capacity		≤ 400 µF/m
Cable length		1500 m
Twisted pair		YES

HART® is a registered trademark of the HART Communication Foundation.

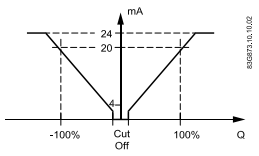
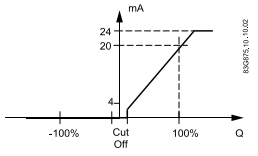
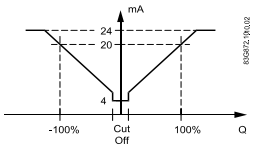
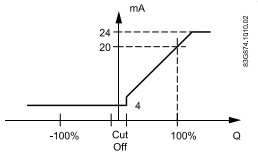
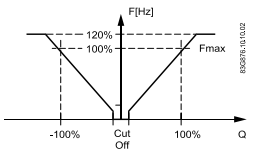
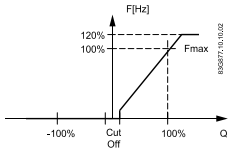
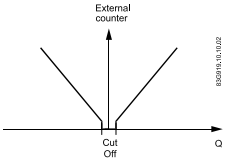
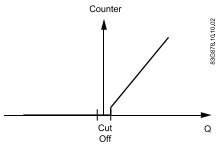
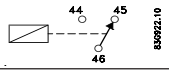
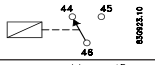
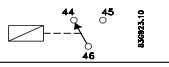
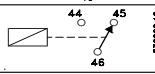
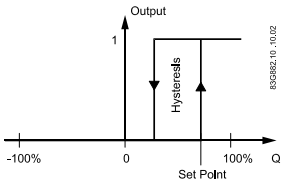
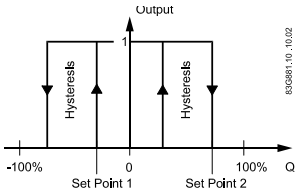
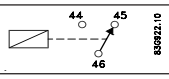
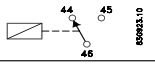
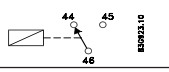
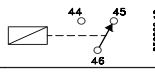
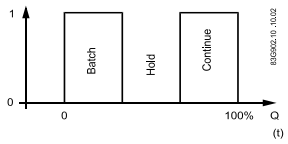
2.7 PROFIBUS® Communication Add-on module

General specification	
Profibus device profile	Class B, V2.0
Flow transducer block parameter sets supported	Class 03 Coriolis
Applicable standard	EN 50170, DIN 19245
Physical layer (transmission technology)	IEC 1158-2
Transmission speed	31.25 kbit/sec.
Number of stations	Up to 32 per line segment. Maximum total of 126
Cable	Two wire twisted pair
Bus termination	Passive line terminaton at both ends

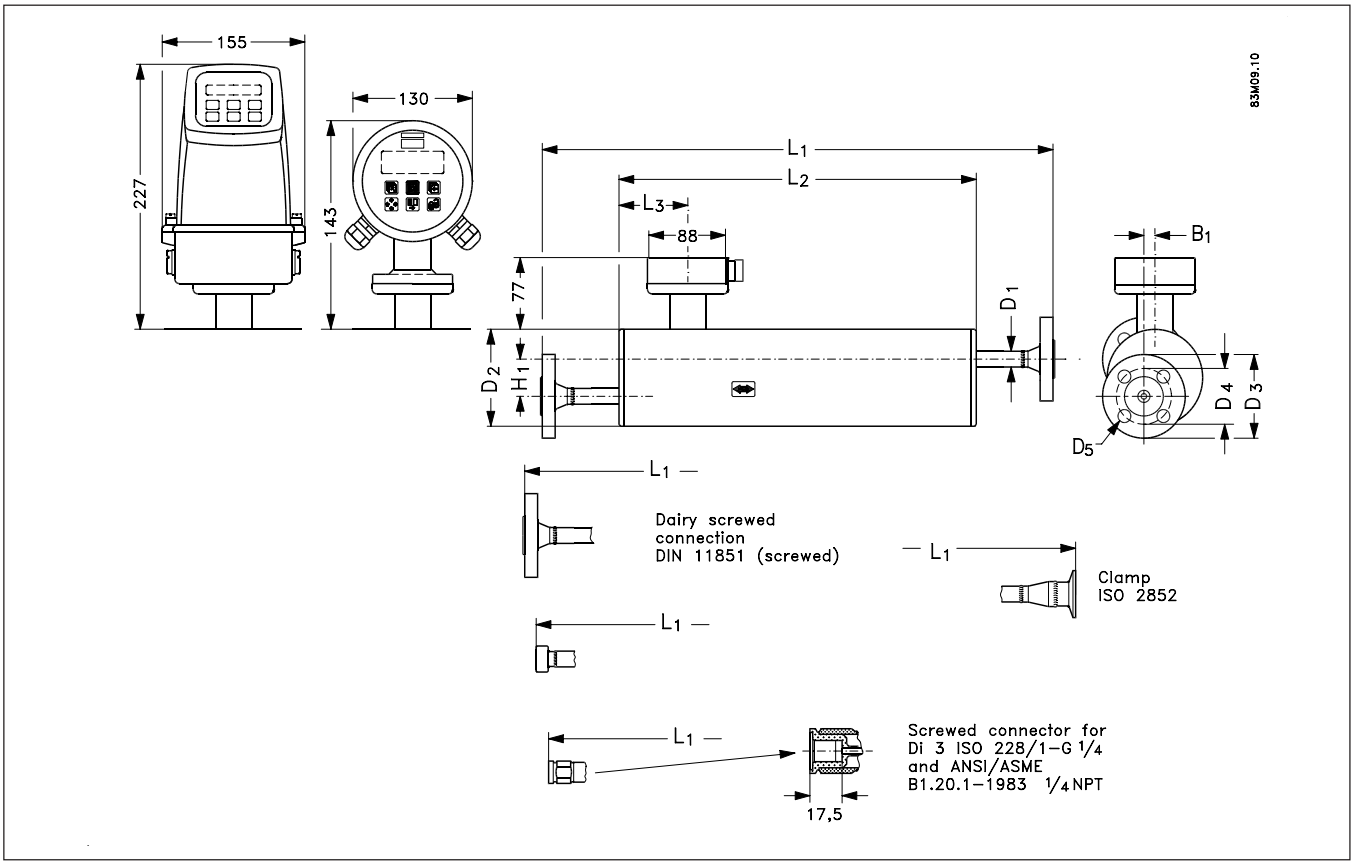
2.8 Input characteristics



2.9 Output characteristics

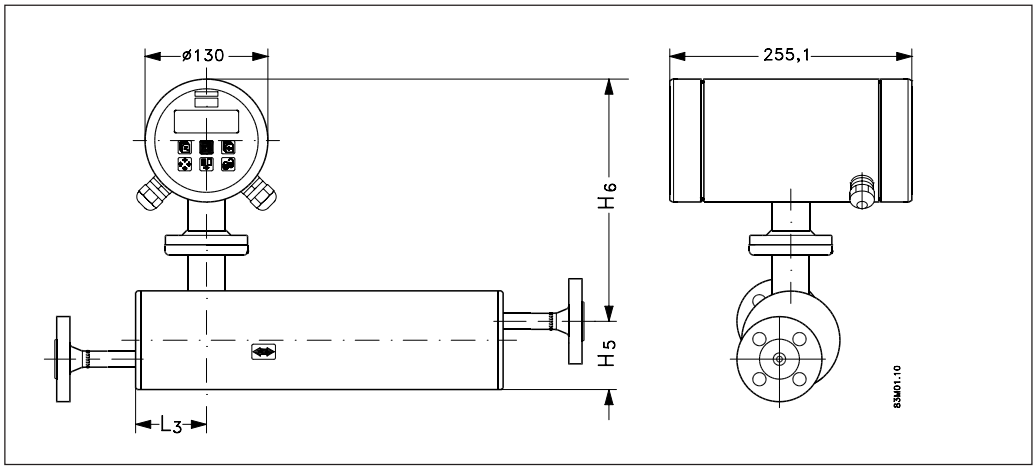
Output characteristics	Bidirectional mode	Unidirectional mode
0-20 mA		
4-20 mA		
Frequency		
Pulse output		
Relay	Power supply off 	Power supply on 
Error relay	No error 	Error 
Limit switch or direction switch *Limit parameters: Flow, density, temperature, fraction*	1 set point 	2 set points 
Example with flow selected as parameter	Low flow (Reverse flow) 	Intermediate flow 
	High flow (Forward flow) 	High flow/ Low flow 
Batch on digital output		

3. Dimensions and weight
3.1 Sensor MASS 2100



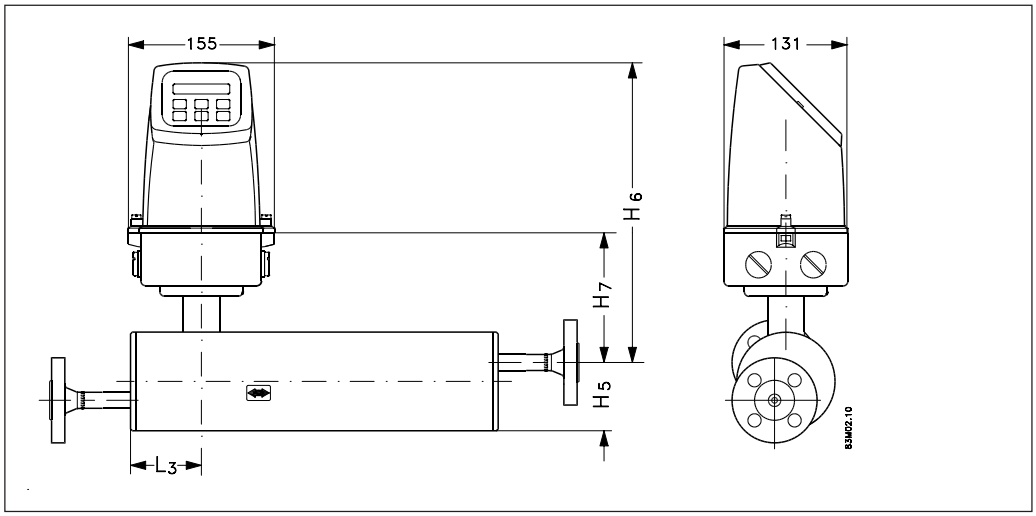
Sensor size	Connections			L1	L2	L3	H1	B1	D1	D2	D3	D4	D5
	Type	Pressure rating	Size	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
DI 3	Pipe thread ISO 228/1 - G 1/4	PN 100	1/4"	400	280	75.0	60	0	21.3	104	-	-	-
	Pipe thread ANSI/ASME B 1.20.1 - 1/4" NPT	PN 100	1/4"	400	280	75.0	60	0	21.3	104	-	-	-
DI 6	Flange DIN 2635	PN 40	DN 10	560	390	62.0	40	12	17.0	104	90.0	60.0	14.0
	Flange ANSI B 16.5	Class 150	1/2"	624	390	62.0	40	12	17.0	104	88.9	60.5	15.7
	Flange ANSI B 16.5	Class 600	1/2"	608	390	62.0	40	12	17.0	104	95.3	66.5	15.7
	Screwed connection DIN 11851	PN 40	DN 10	532	390	62.0	40	12	17.0	104	-	-	-
	Clamp ISO 2852	PN 16	25 mm	570	390	62.0	40	12	17.0	104	-	-	-
DI 15	Flange DIN 2635	PN 40	DN 15	620	444	75.0	44	20	21.3	129	95.0	65.0	14.0
	Flange ANSI B 16.5	Class 150	1/2"	639	444	75.0	44	20	21.3	129	88.9	60.5	15.7
	Flange ANSI B 16.5	Class 600	1/2"	660	444	75.0	44	20	21.3	129	95.3	66.5	15.7
	Screwed connection DIN 11851	PN 40	DN 15	586	444	75.0	44	20	21.3	129	-	-	-
	Clamp ISO 2852	PN 16	25 mm	624	444	75.0	44	20	21.3	129	-	-	-
DI 25	Flange DIN 2635	PN 40	DN 25	934	700	74.5	126	25	33.7	219	115.0	85.0	14.0
	Flange ANSI B 16.5	Class 150	1"	967	700	74.5	126	25	33.7	219	108.0	79.2	15.7
	Flange ANSI B 16.5	Class 600	1"	992	700	74.5	126	25	33.7	219	124.0	88.9	19.1
	Screwed connection DIN 11851	PN 40	DN 32	922	700	74.5	126	25	33.7	219	-	-	-
	Clamp ISO 2852	PN 16	38 mm	940	700	74.5	126	25	33.7	219	-	-	-
DI 40	Flange DIN 2635	PN 40	DN 40	1064	850	71.5	180	0	48.3	273	150.0	110.0	18.0
	Flange ANSI B 16.5	Class 150	1 1/2"	1100	850	71.5	180	0	48.3	273	127.0	98.6	15.7
	Flange ANSI B 16.5	Class 600	1 1/2"	1128	850	71.5	180	0	48.3	273	155.4	114.3	22.4
	Screwed connection DIN 11851	PN 25	DN 50	1090	850	71.5	180	0	48.3	273	-	-	-
	Clamp ISO 2852	PN 16	51 mm	1062	850	71.5	180	0	48.3	273	-	-	-

3.2 Ex-d Compact version



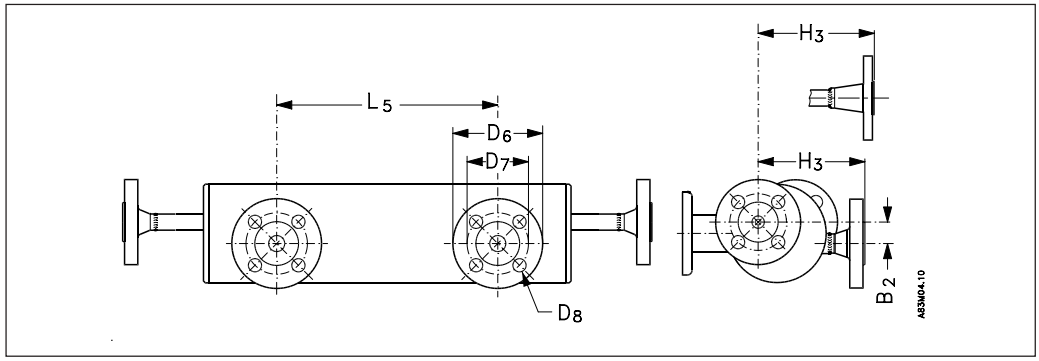
Sensor size	L_3 mm	H_5 mm	H_6 mm	$H_5 + H_6$ mm
3	75	82	307	389
6	62	72	317	389
15	75	87	328	414
25	75	173	332	504
40	75	227	332	558

3.3 IP 67 Compact version



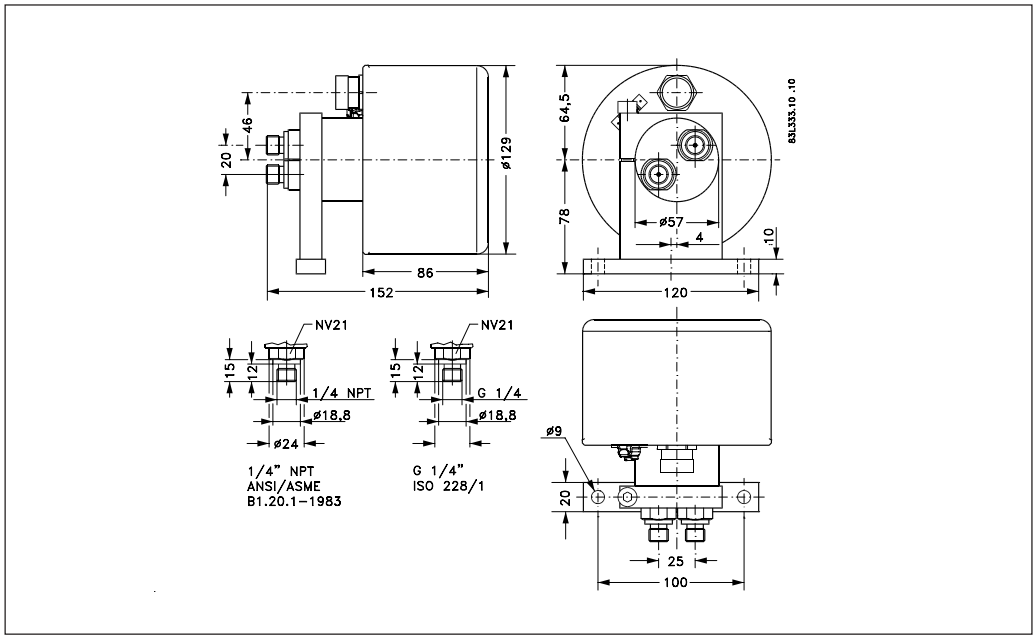
Sensor size	L_3 mm	H_5 mm	H_6 mm	$H_5 + H_6$ mm
3	75	82	246	328
6	62	72	256	328
15	75	87	267	353
25	75	173	271	443
40	75	227	271	497

3.4 Sensor MASS 2100 with "heating jacket"

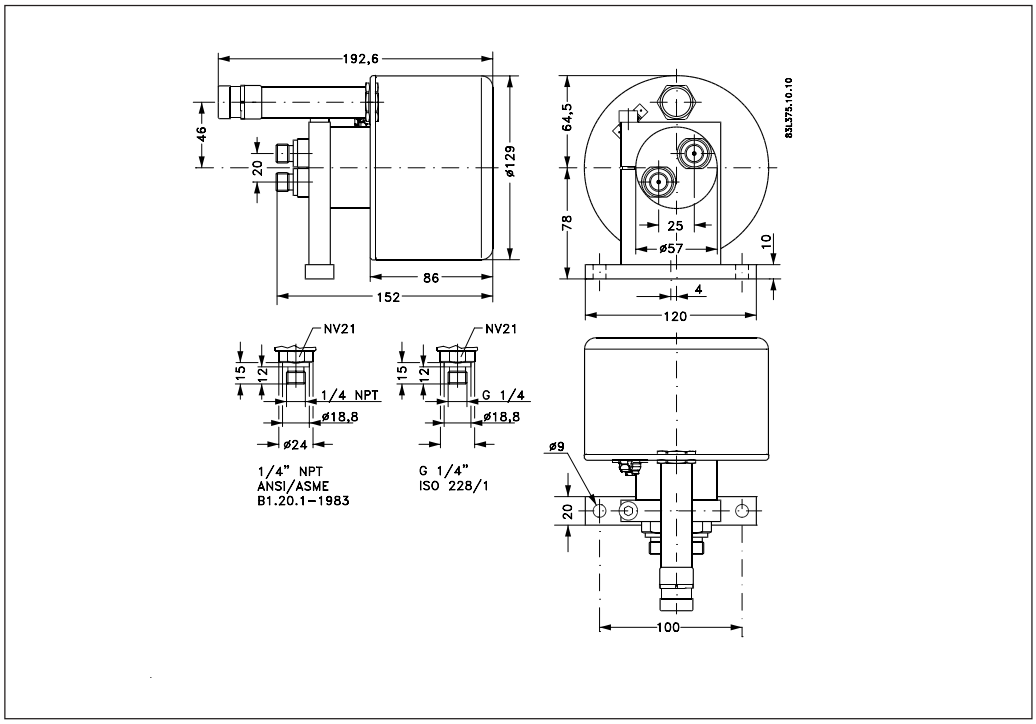


Sensor size	Connections Heated			L5	L3	H3	B2	D6	D7	D8
	Flange	Pressure rating	Size	mm	mm	mm	mm	mm	mm	mm
DI 3	DIN 2635	PN 40	DN 15	234	75.0	122.0	22.0	95.0	65.0	14.0
	ANSI B16.5	Class 150	1/2"	234	75.0	131.6	22.0	88.9	60.5	15.7
DI 6	DIN 2635	PN 40	DN 15	234	62.0	112.0	22.7	95.0	65.0	14.0
	ANSI B16.5	Class 150	1/2"	234	62.0	121.6	22.7	88.9	60.5	15.7
DI 15	DIN 2635	PN 40	DN 15	234	75.0	126.5	31.5	95.0	65.0	14.0
	ANSI B16.5	Class150	1/2"	234	75.0	136.1	31.5	88.9	60.5	15.7
DI 25	DIN 2635	PN 40	DN 15	420	74.5	213.6	60	95.0	65.0	14.0
	ANSI B16.5	Class 150	1/2"	420	74.5	223.2	60	88.9	60.5	15.7
DI 40	DIN 2635	PN 40	DN 15	500	71.5	267.5	43	95.0	65.0	14.0
	ANSI B16.5	Class 150	1/2"	500	71.5	277.1	43	88.9	60.5	15.7

3.5 MASS 2100 DI 1.5



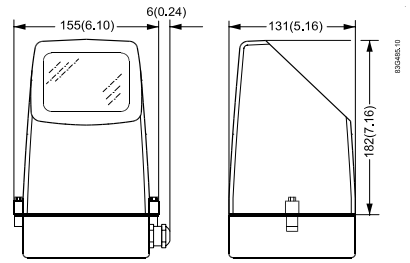
3.6 MASS 2100 DI 1.5 High temperature version -40°C to +180°C



3.7 Signal converter

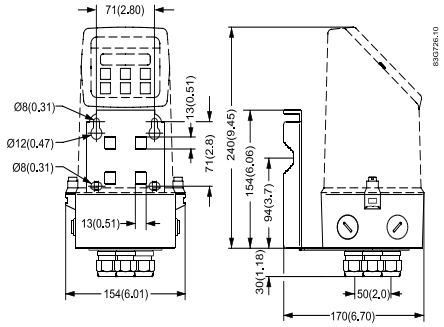
Compact polyamid

Signal converter installed in compact mode



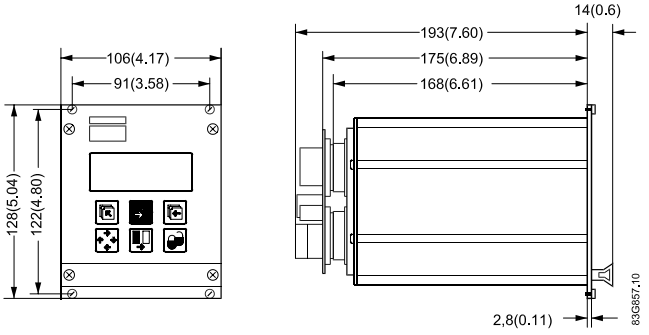
Weight: MASS 6000: 0.75 kg

Signal converter installed remote



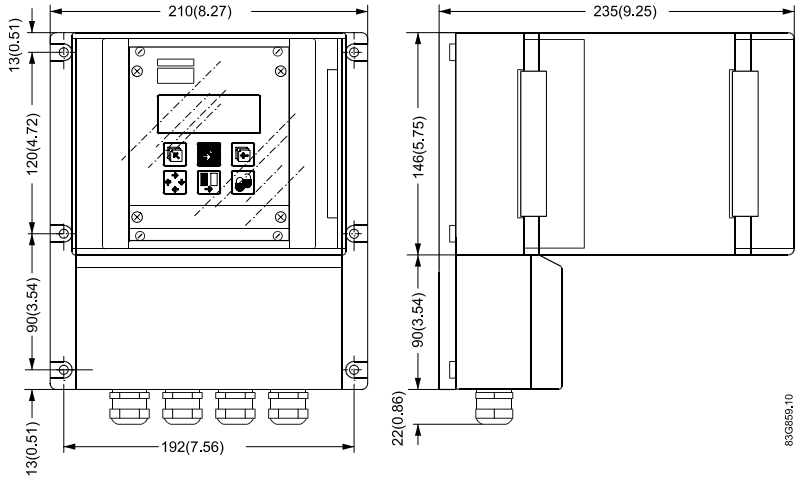
Weight: Wall bracket: 0.9 kg

19" insert, standard unit



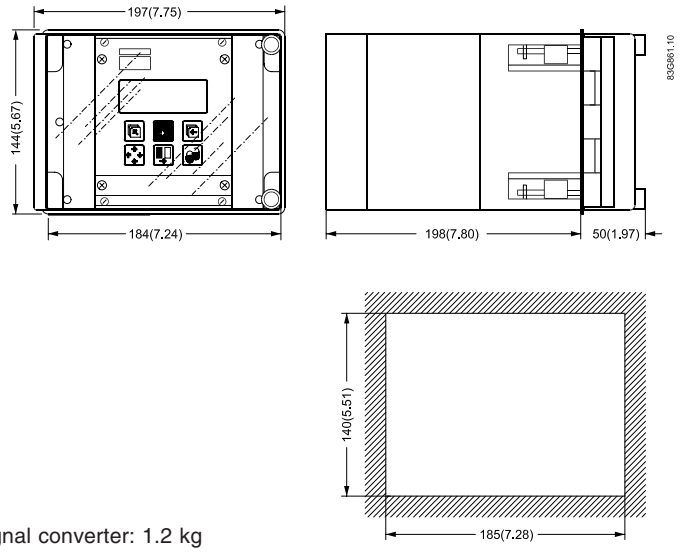
Weight: 0.8 kg

Wall mounting box 21 TE



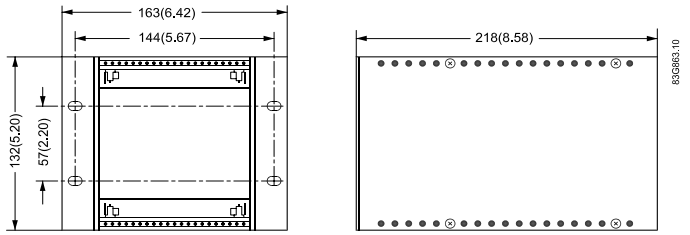
Weight excl. signal converter: 2.3 kg

Panel front unit 21 TE



Weight excl. signal converter: 1.2 kg

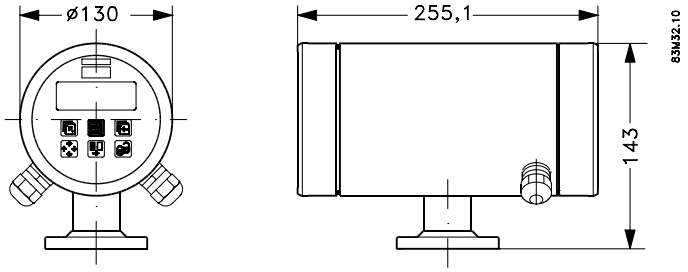
Back of panel unit 21 TE



Weight: 0.7 kg

3.8 Signal converter Ex-d

Compact version



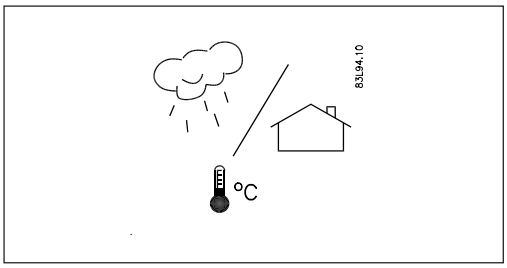
Weight: 2.6 kg

4. Installation of sensor

To ensure the optimum function of measuring equipment it is important that the installation instructions are followed closely, point by point.

4.1 Location

The flowmeter can be located both indoors and outdoors, but the following conditions must be observed:

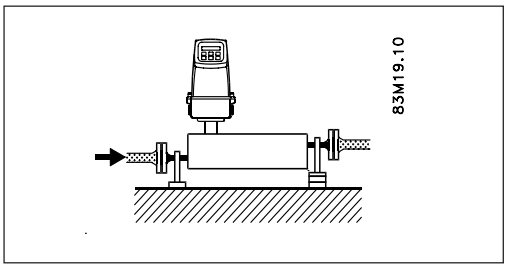


Liquid temperature: –50 to +180°C.
The grade of enclosure can be choosen from IP 20 up to IP 67.

When the temperature difference between a liquid and the surroundings is large, the sensor must be insulated to prevent 2-phase flow and thereby measuring inaccuracy. This applies especially in the case of low flow.

Important!
The sensor must **always** be completely filled with a homogeneous liquid or gas in single phase, otherwise measuring errors will occur.

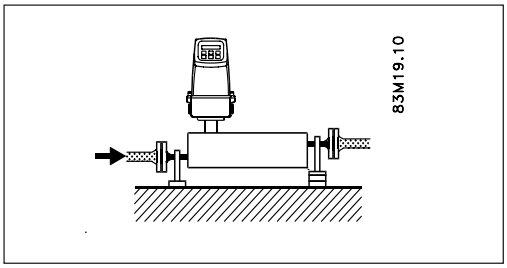
4.2 Cavitation



Avoid cavitation in the system, i.e. sucking in or releasing air into the system, because this may produce errors.

Static back pressure minimum 0.1 - 0.2 bar.

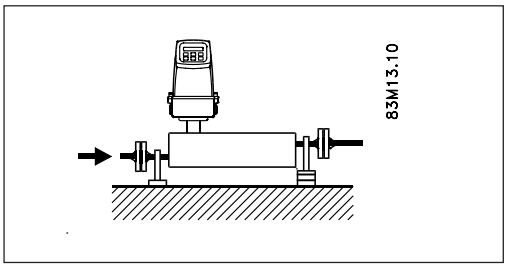
4.3 Air bubbles



Avoid large quantities of air collecting in the sensor because these will disturb measurement. Homogeneous mixtures of air and solids, however, will not disturb measurement.
When there is air in the liquid, installation of an air trap ahead of the meter is recommended.

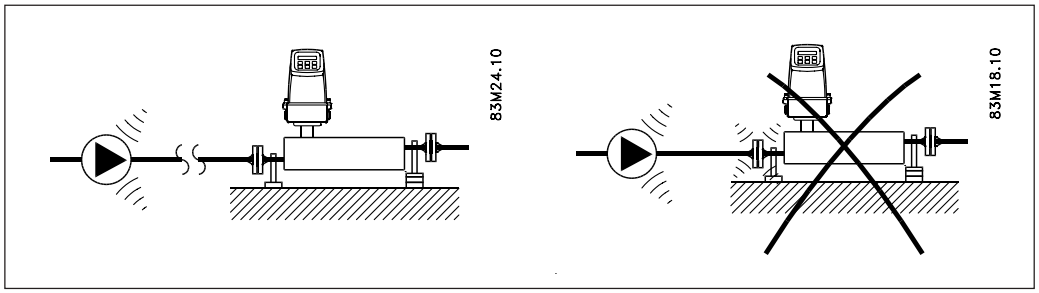
If there is air/gas in the liquid or liquids which are volatile, horizontal sensor mounting is recommended.

4.4 Mounting

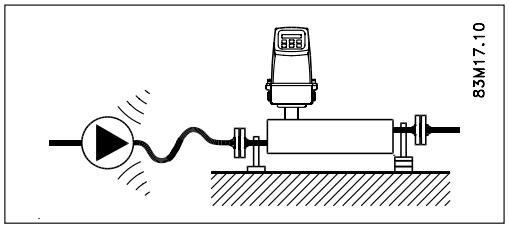


The unit must be mounted on a flat wall or steel frame (vibration-free).

4.5 Vibrations

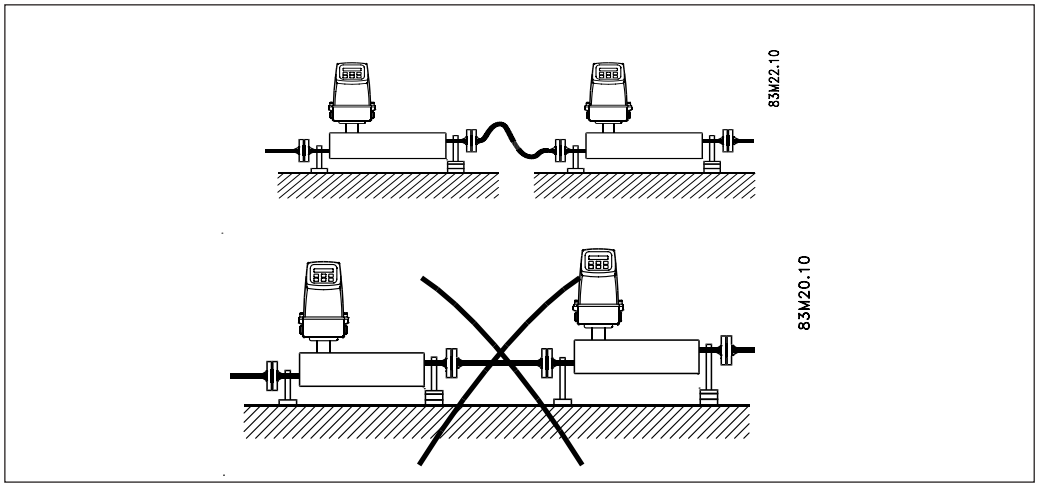


Locate the flowmeter as far away as possible from components that generate mechanical vibration in the piping.



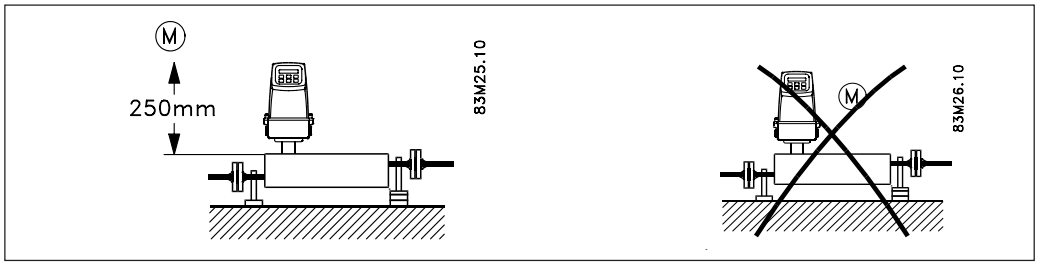
Or ensure that there is no direct connection with them e.g. by using flexible connections.
Altenatively, the flowmeter can be located after a bend.

4.6 Cross-talk



If the flowmeters are located close to each other, e.g. in the same pipe section, the meters may disturb each other in measurement, especially with low flow. Locate the meters with a flexible connection instead of a permanent connection.
Avoid mounting the meter on the same steel frame. I.e. insulate the meters mechanically.

4.7 Magnetic fields

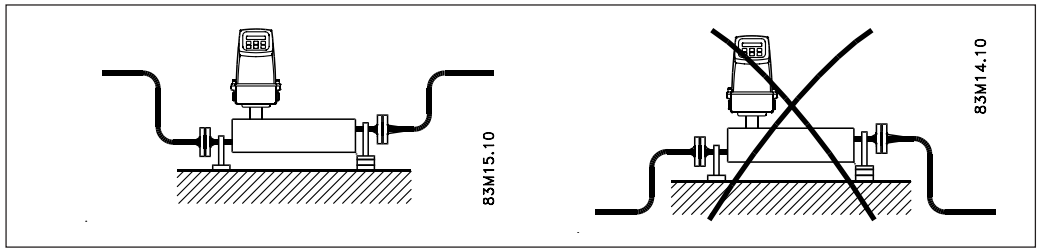


Locate the sensor a minimum of 25 cm from strong magnetic fields (motors, transformers, electrically operated valves, etc.).

4.8 Transportation/ storage

The sensor is a fragile piece of equipment and shall under transportation and storage be placed in the transportation box delivered by Siemens Flow Instruments . If this is not possible, the sensor must be packed so the packing enclosure can withstand the hazards from transportation.

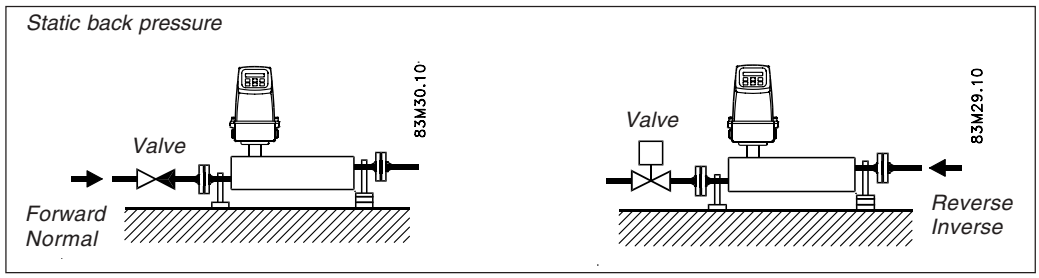
4.9 Horizontal mounting in pipe MASS 2100 DI 3 - DI 40



Locate the sensor low in the pipe system in order to avoid low pressure in the sensor and consequent air separation in the liquid.

If the flowmeter is mounted horizontally it is selfemptying.
With low flow, horizontal mounting is recommended, any air bubbles are easier to remove.

Flow direction



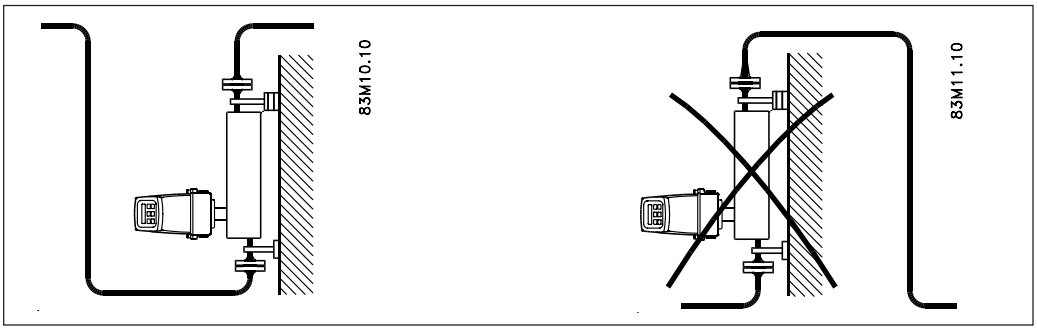
The arrow on the sensor indicates the direction of flow defined as “positive” (the meter is able to measure flow in both directions).
As far as possible, the liquid should flow in the direction of the arrow to avoid partial emptying of the sensor, especially with low flow.
In addition there should be a valve (check/solenoid) that closes when the flow is zero so that the liquid does not flow back and causes partial emptying of the sensor.

0-point adjustment

To facilitate 0-point adjustment, a valve with good shut-off should always be mounted near the sensor.

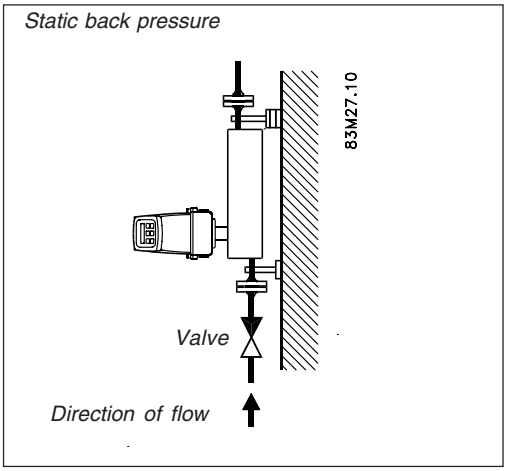
- The sensor should be completely filled with liquid.
- The valve must be closed.
- Wait a few minutes to let the flow stabilise at zero.
- Activate the 0-point adjustment on MASS 6000, see chapter 7 "Setting the 0-point".

4.10 Vertical mounting in pipe



Locate the unit low in the pipe system in order to avoid under pressure in the sensor and consequent air separation in the liquid.

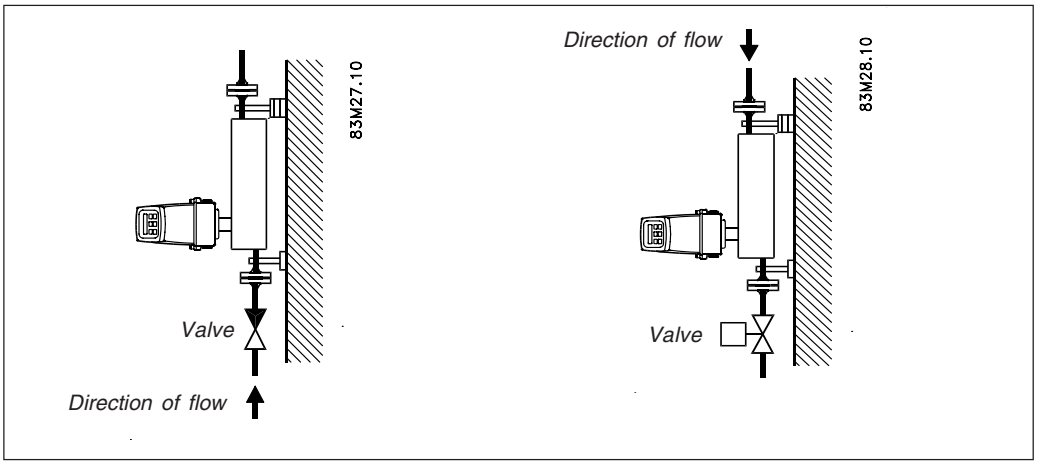
Flow direction



As far as possible, the liquid should flow upwards to make bubble removal easier.
With vertical mounting, a check valve, which closes on zero flow, must always be installed so that the liquid cannot flow back and partially empty the sensor.

The arrow on the sensor indicates positive (forward) flow direction.

0-point adjustment



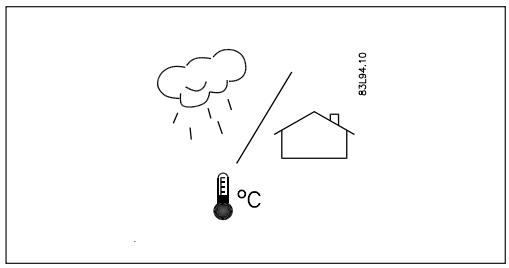
To facilitate 0-point adjustment, a valve with good shut-off should always be mounted in line with the sensor.

- The sensor should be completely filled with liquid.
- The valve must be closed.
- Wait a few minutes to let the flow stabilise at zero.
- Activate the 0-point adjustment on MASS 6000, see chapter 7 "Setting the 0-point".

4.11 MASS 2100 DI 1.5

To ensure the optimum function of the measuring equipment it is important that the installation instructions are followed closely.

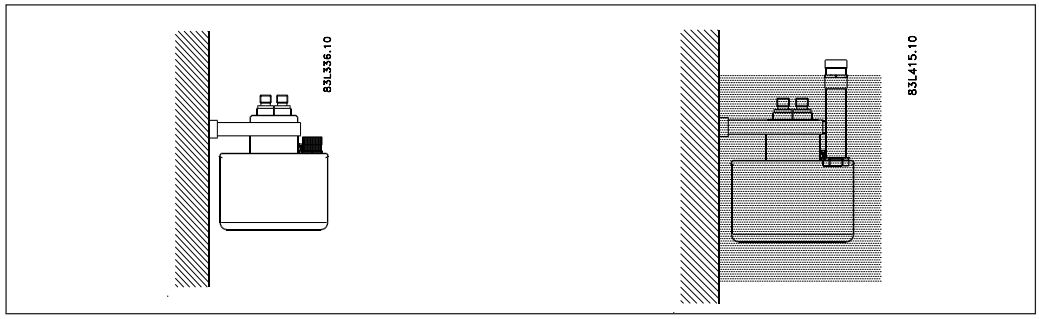
4.12 Location



The flowmeter can be located both indoors and outdoors, but the following conditions must be observed:

Liquid temperature
The MASS 2100 DI 1.5 is available in 2 versions.
Standard version: –40 to +125°C.
High temperature version: –40 to +180°C.

For the high temperature version the multiple plug is raised from the sensor housing by a pipe. It is possible to insulate the sensor and still having access to the plug.



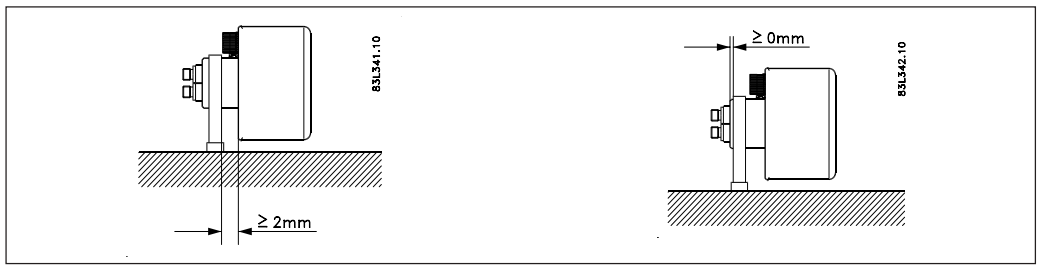
Important
When the temperature difference between a liquid and the surroundings is large, the sensor must be insulated to prevent 2-phase flow and the loss of measuring accuracy. This applies especially in the case of low flow.

The sensor must **always** be completely filled with a homogeneous liquid or gas in single phase, otherwise measuring errors will occur.

If there is air/gas in the liquid or liquids which are volatile, horizontal sensor mounting is recommended.

4.13 Mounting

The mounting bracket supplied with the unit must always be used. The bracket must be mounted on a wall or steel frame which is vibration free and mechanically stable.

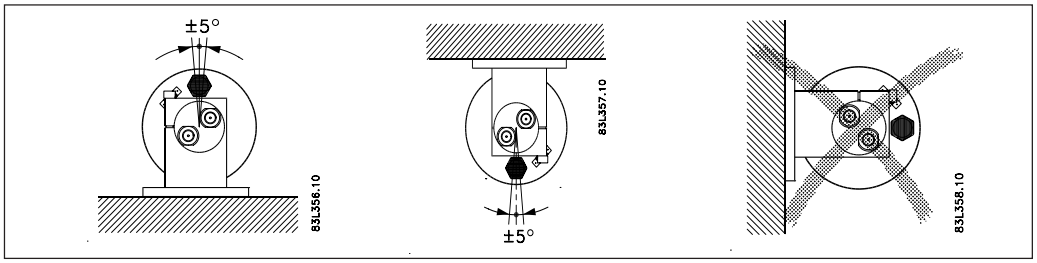


4.14 Horizontal mounting in pipe

Locate the sensor low in the pipe system in order to avoid low pressure in the sensor and consequent air separation in the liquid. Due to the capillary tube effect, the sensor is not self emptying.

With low flow, horizontal mounting is recommended, thereby air bubbles are easier to remove.
To avoid separation of air from the liquid, a back pressure of min. 0.1 - 0.2 bar is recommended.

Multiple plug orientation



To obtain the optimum performance, the multiple plug should be mounted as shown in the drawing. The multiple plug can be turned withing the angles stated.

Flow direction

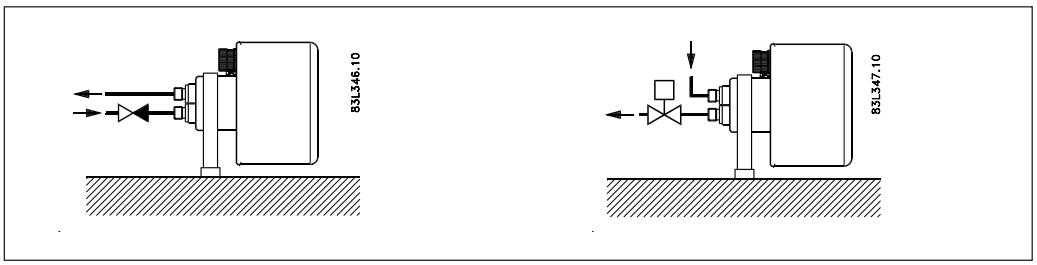
The arrow on the sensor indicates the direction of flow defined as "positive" (the meter is able to measure flow in both directions).

As far as possible, the liquid should flow in the direction of the arrow (on the sensor) to avoid partial emptying of the sensor, especially with low flow.

0-point adjustment

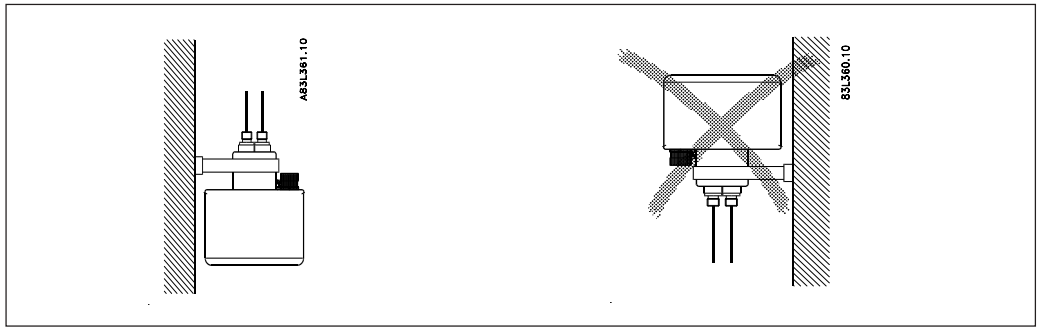
In addition there should be a valve (check/solenoid) that closes when the flow is 0 so that the liquid does not flow back to produce partial emptying of the sensor.

To facililate a good 0-point adjustment a value should always be installed to ensure that 0-flow condition can be obtained.



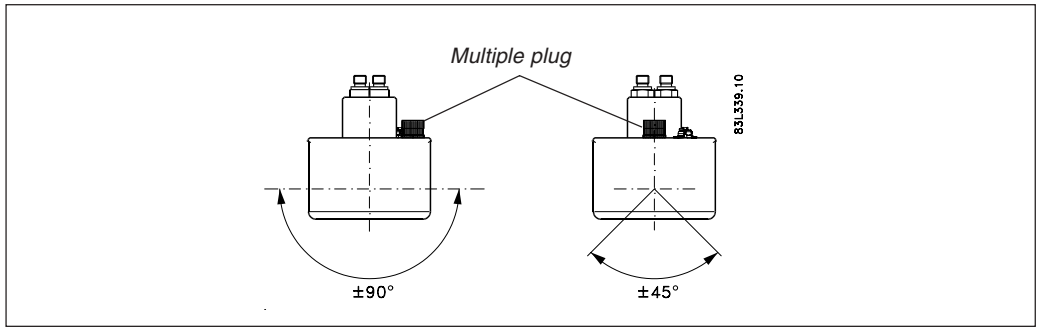
- The sensor should be completely filled with liquid.
- The valve must be closed.
- Wait a few minutes to let the flow stabilise at zero.
- Activate the 0-point adjustment on MASS 6000, see chapter 7 "Setting the 0-point".

4.15 Vertifical mounting in pipe



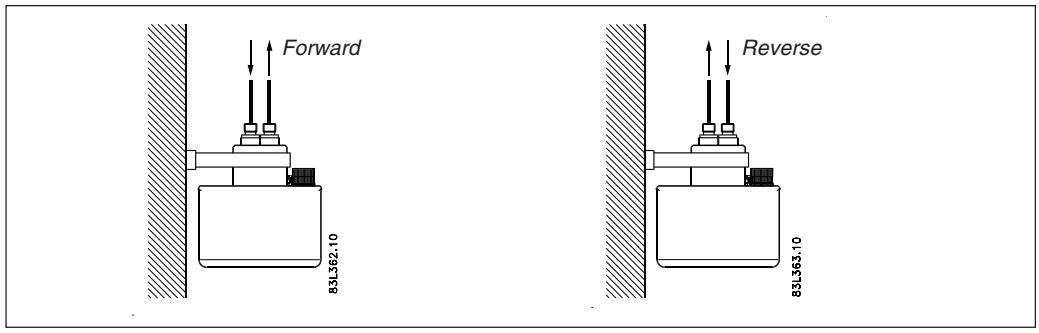
Locate the unit low in the pipe system in order to avoid low pressure in the sensor and consequent air separaton in the liquid.

Multiple plug orientation



With vertical mounting the orientation of the terminal box is not important, rotation, however, is not allowed to exceed the stated angles of the sensor.

Flow direction



The arrow on the sensor indicates the direction of flow defined as "positive" (the meter is able to measure flow in both directions).

4.16 Before commissioning

Warning

Before fitting the sensor please read the max. operating pressure (PN) on the sensor label. The operating pressure indicates the pressure to which the measuring pipe and connections have been dimensioned. As a minimum the sensor has passed a pressure test corresponding to this value. This, however, is not the case with the sensor enclosure (i.e. the enclosure covering the measuring pipe). If for some reason the measuring pipe fractures, a pressure will be generated in the enclosure.

The burst pressure for the MASS 2100 DI 3 - DI 40 enclosure is approximately 50 bar and approximately 70 bar for DI 1.5.

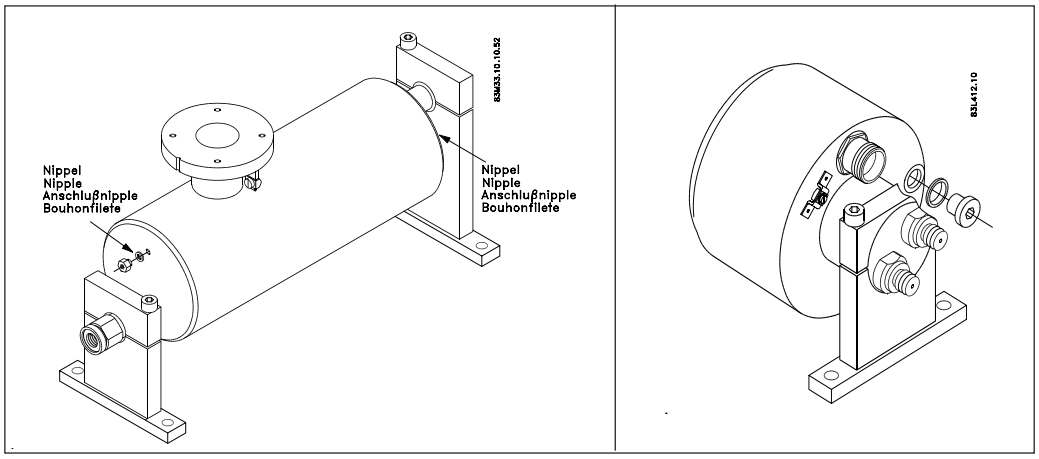
The pressure values are only approximate and therefore cannot be taken as an absolute value indicating when a possible fracture or leakage will occur.
When working with operating pressures/media which may cause pipe fractures and possible injuries to people, equipment or anything else, we recommend special precautions are taken when building-in the sensor i.e. special placement, shielding, pressure release valve or similar.

The sensor enclosure is supplied with a 1/8" nipple. When the nipple is removed a pressure release valve can be connected to automatically shut off the flow to the sensor in case of leakage. For instructions on the mounting, please refer to the section "Mounting of pressure release valve".

4.17 Mounting of pressure release valve

Important
Before removing the nipple from the sensor enclosure, please note the following:
Penetration of humidity, liquid or particles into the sensor must be avoided as it may influence the measurement and in worst case affect the measuring function. This, however, can be avoided when following the procedure below:

1. Place the sensor in a dry and clean place and leave it to accumatise until it reaches ambient temperature, approx. 20 °C.
2. Be careful when disconnecting the nipple and mounting the pressure release valve.
3. Check that the pressure release valve has been correctly mounted and thoroughly tightened so that the sealing ring fits tightly. Always replace old sealing rings with new ones after each dismantling.



4.18 Ex installations

Signal converters
The MASS 6000 can be used in 19" rack version where the sensor can be installed in the ex-area and the converter must be installed in the safe area or as compact Ex-d version for installation in the ex-area.

MASS 2100 for mounting in Ex areas
Approval EEx [ia] IIC T4...T6. DEMKO No. 95D.117700X

MASS 6000 19" Ex for mounting in safe areas
Approval EEx [ia/ib] m IIB T4...T6. DEMKO No. 99E.125729X

MASS 6000 Ex-d system
Approval Ex de [ia] IIC T4...T6. DEMKO No. 99E.124212X

Marking
The marking has the following meaning according to European Norm EN 50014.

E: Certified to CENELEC standard.

Ex: Designates explosion proof material and indicates that the apparatus has been approved in accordance with a certificate issued.

i: "Intrinsic safety" is a protection ensuring that the energy in the electric circuit is too small to ignite the explosive atmosphere. There are two categories of intrinsic safety: "ia" and "ib".

- ia: In intrinsic safety category "ia", the circuit must remain safe, even in the event of two simultaneous errors occurring that are independent of one another.
- ib: In intrinsic safety category "ib" the circuit must remain safe if one error occurs.

d: The enclosure of the of the signal converter is so strong that it can resist an explosion inside the enclosure. The enclosure is dimensioned in a way so that an explosion will not effect the surroundings.

e: "Increased safety" is a constructional safeguard which ensures the apparatus does not contain normally arcing or sparking devices, or hot surfaces that will cause ignition.

II: Designates that the apparatus may be used in all areas (except mining).

B: Indicates the gas group in which the unit may be used.

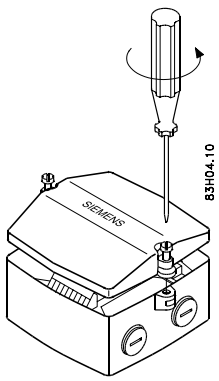
T4...T6 The temperature class describes the maximum temperature which any exposed surface of the equipment may reach. The sensor can have temperature class T3, T4, T5 or T6 depending on the temperature of the media. Please see technical data for the sensor.

T3: Max. surface temperature 200 °C => (Max. media temperature 180 °C)
T4: Max. surface temperature 135 °C => (Max. media temperature 120 °C)
T5: Max. surface temperature 100 °C => (Max. media temperature 90 °C)
T6: Max. surface temperature 85 °C => (Max. media temperature 75 °C)

5. Installation of signal converter

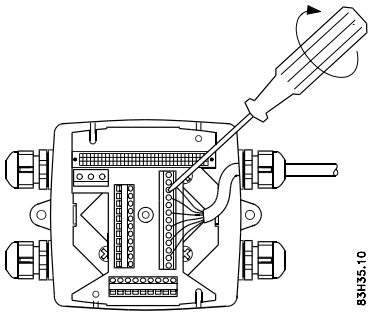
5.1 Compact IP 67 version

1



Remove and discard the terminal box cover of the sensor.

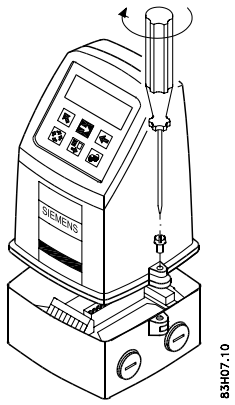
2



Fit the Pg 13.5 cable glands for the supply and output cables.

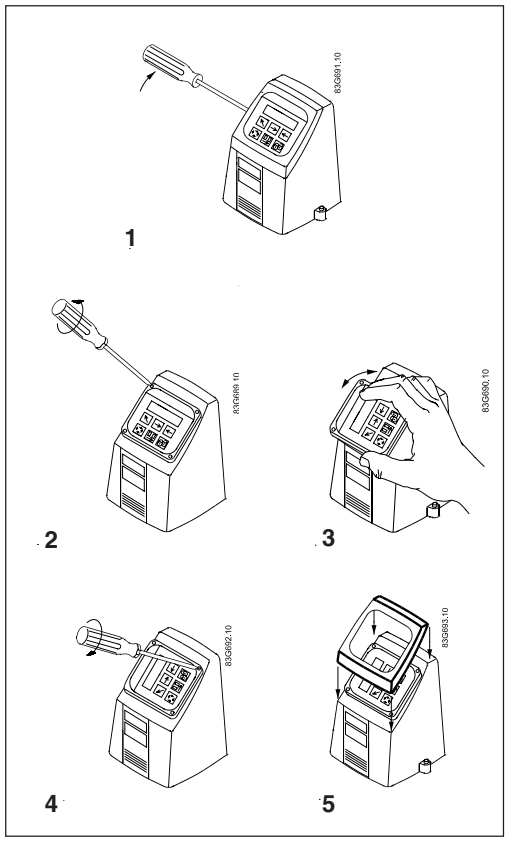
Fit the supply and output cables respectively and tighten the cable glands to obtain optimum sealing.
Please see the wiring diagram for the "Electrical connections".

3



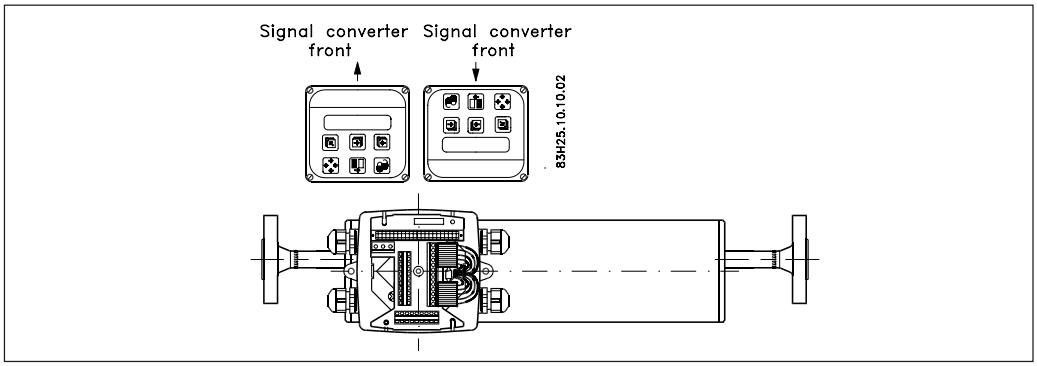
Mount the signal converter on the terminal box.

Turning the control pad

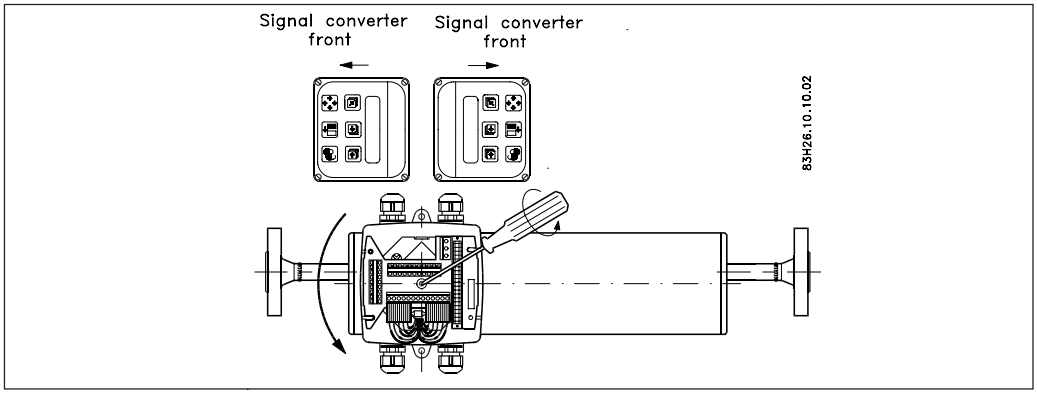


1. Remove the outer frame using a fingernail or a screwdriver.
2. Loosen the 4 screws retaining the control pad.
3. Withdraw the control pad and turn it to the required orientation.
4. Tighten the 4 screws until a mechanical stop is felt in order to obtain IP 67 enclosure rating.
5. Snap-lock the outer frame onto the control pad (click).

Turning the signal converter

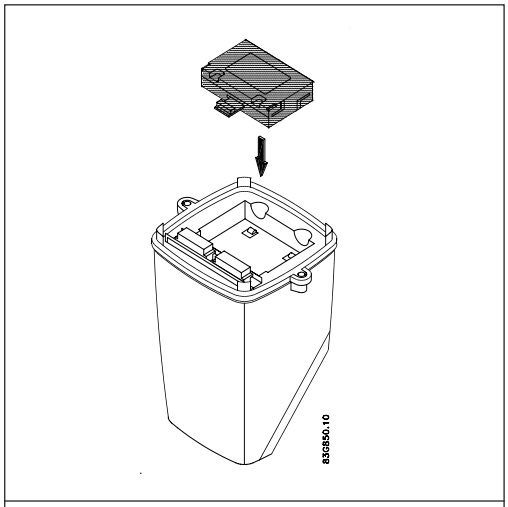


The signal converter can be mounted in either direction as the arrow indicates by turning the PCB but without turning the terminal box.

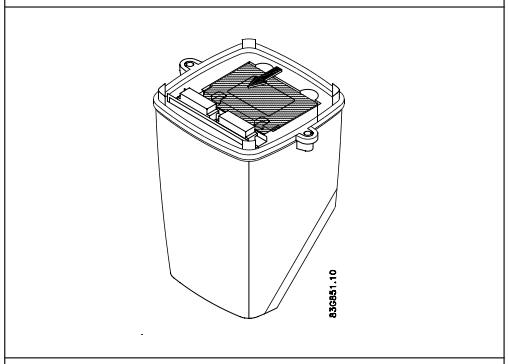


The terminal box can be rotated ±90° in order to optimize the viewing angle of the signal converter display/keypad:
Unscrew the four screws in the bottom of the terminal box. Turn the terminal box to the required position and retighten the screws firmly.

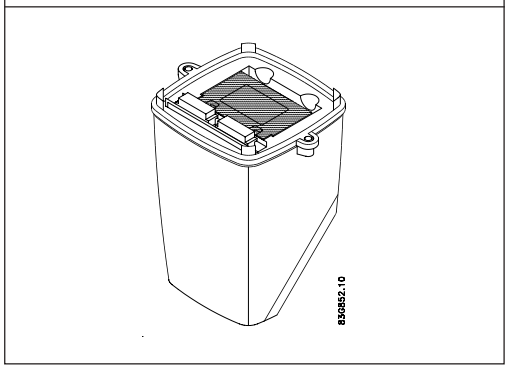
5.2.1 Add-on modules



Unpack the add-on modules and locate it in the bottom of the signal converter as shown.

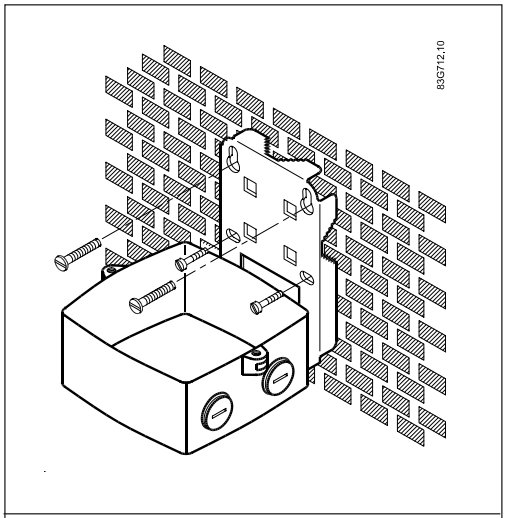


Press the add-on module forwards as far as possible.

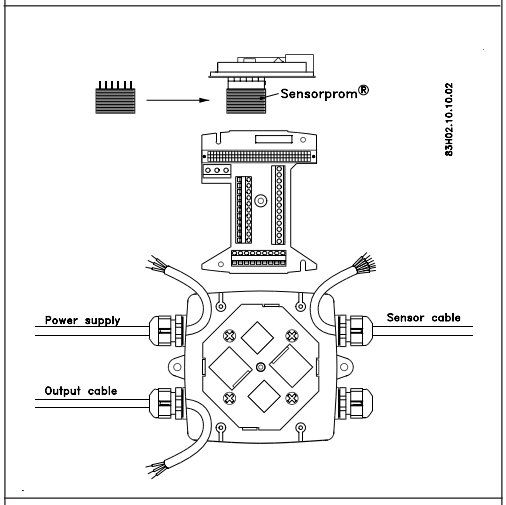


The add-on module has now been installed and the signal converter is ready to be installed on the terminal box.
Communication to the operator menu and electrically inputs and outputs are automatically established at power on.

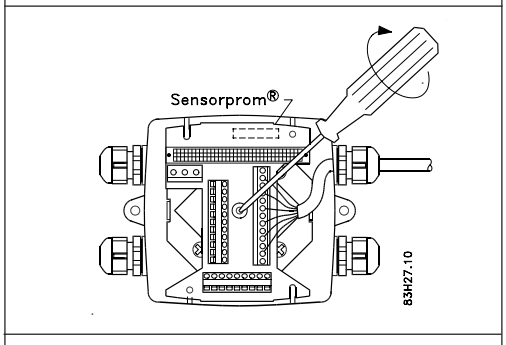
5.2.2 Remote installation Wall mounting Compact IP 67 version



Mount the wall bracket on a wall, pipe or in the back of a panel.

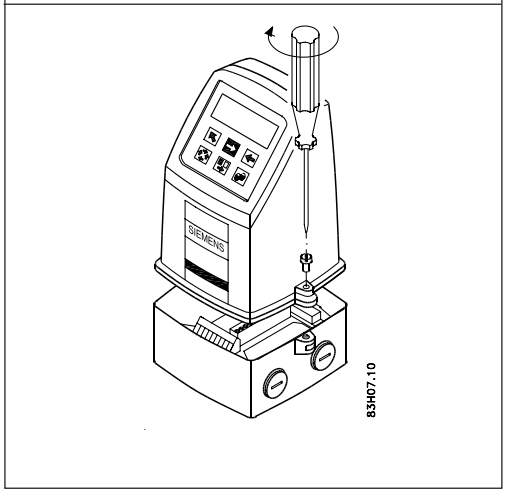


Take the SENSORPROM® unit from the sensor. Mount the SENSORPROM® unit in the wall mounting unit as shown.
The text on the SENSORPROM® unit must turn towards the wall bracket.



Mount the connection plate in the terminal box. Tighten the earthing screw in the centre of the connection box properly.

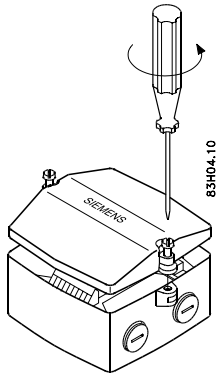
Fit the sensor, supply and output cables respectively and tighten the cable glands to obtain optimum sealing. Please see the wiring diagram for the "Electrical connections".



Mount the signal converter on the terminal box.

5.2.3 Compact IP 67 Installation/ exchange of SENSORPROM® memory unit

1

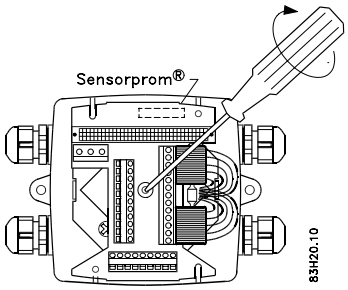


The SENSORPROM® unit is as standard delivered mounted in the terminal box of the sensor as shown.

To fit/exchange the SENSORPROM® unit the following procedure must be followed.

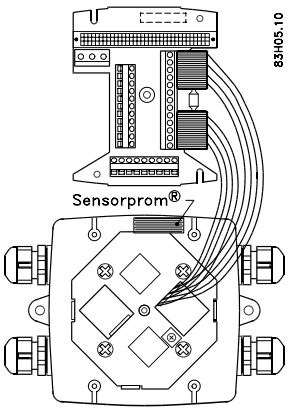
Remove the terminal box cover of the sensor, or remove the signal converter, if this has been installed.

2



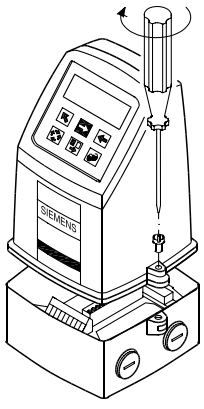
Remove the connection plate in the terminal box by unscrewing the earthing screw in the centre as shown.

3



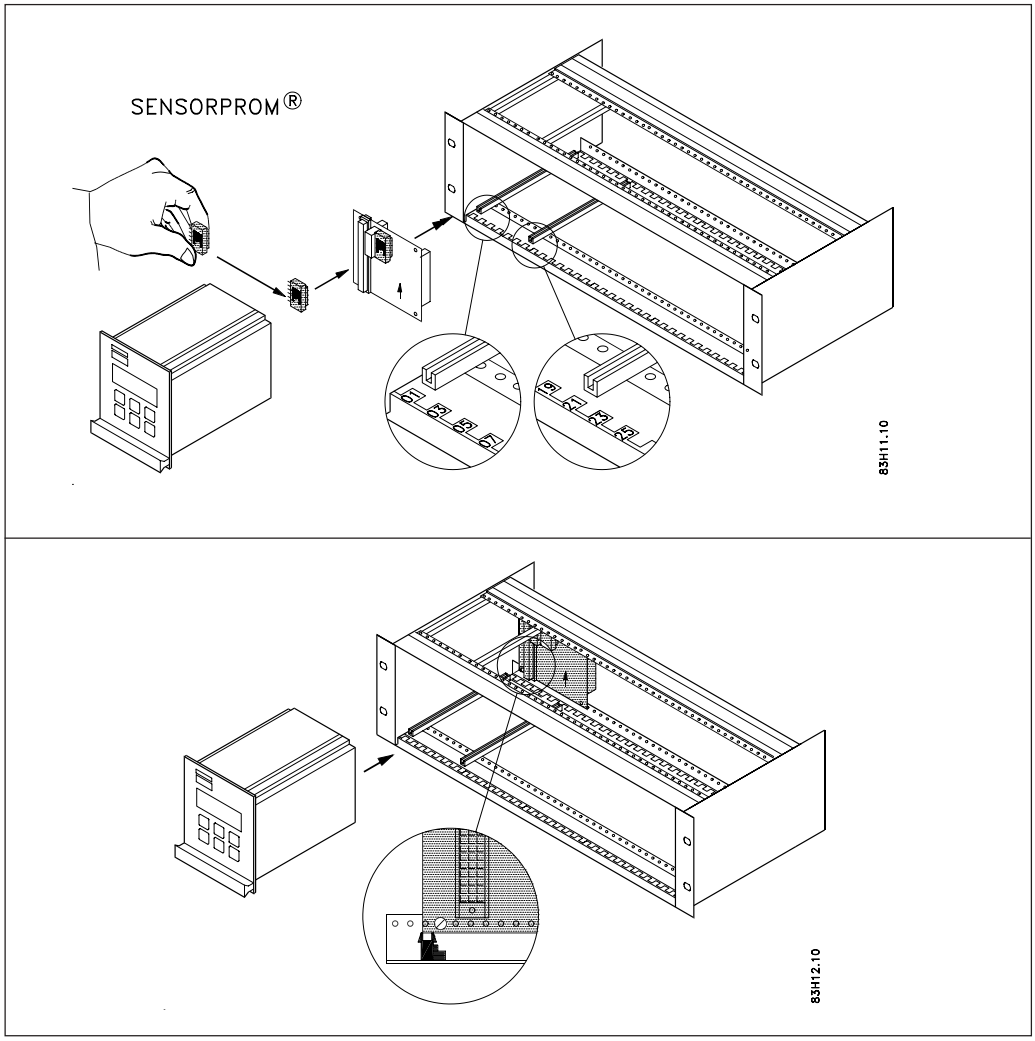
The SENSORPROM® unit is located in the bottom of the terminal box and can easily be fitted/exchanged. Please note the orientation. To re-assemble mount the connection plate in the terminal box and tighten the earthing screw. The text on the SENSORPROM® unit **must** turn towards the wall bracket.

4



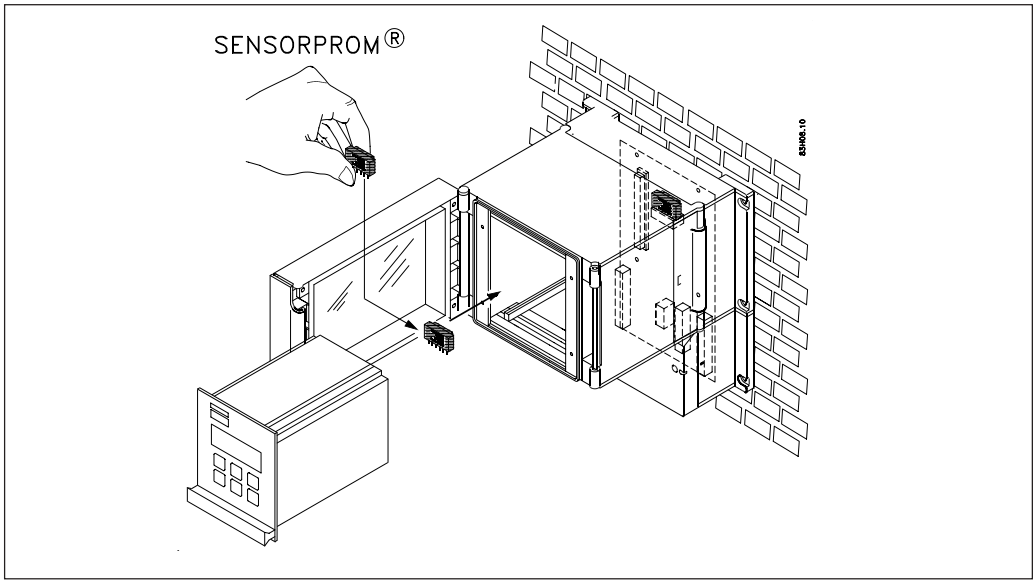
Mount the signal converter on the terminal box.

5.2.4 Remote installation Signal converter in 19" insert



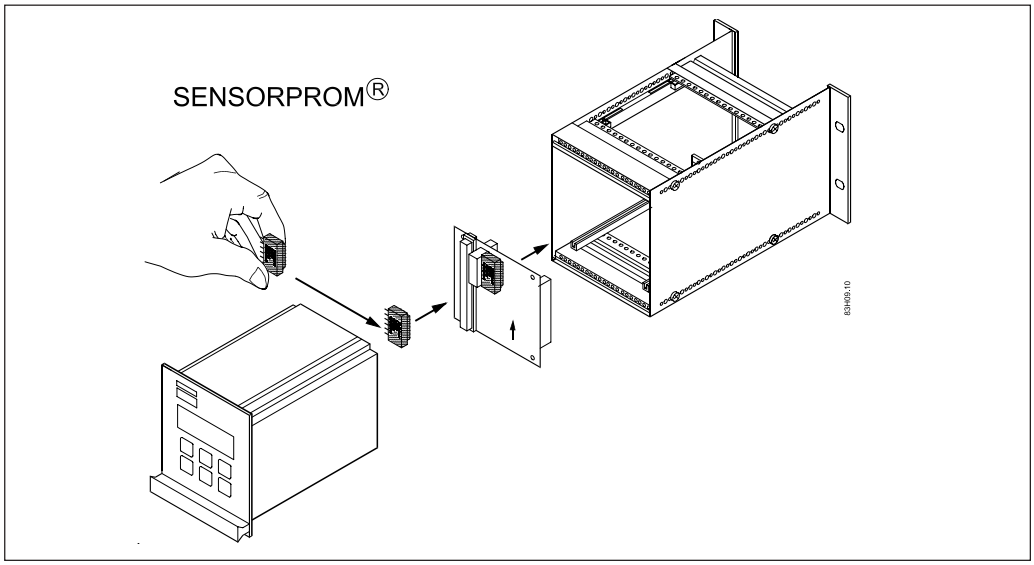
1. Fit the SENSORPROM® unit on the connection board supplied with the signal converter. The SENSORPROM® unit is supplied with the sensor.
2. Mount the guide rails in the rack system as shown. Distance between guide rails is 21 TE. Guide rails are supplied with the rack system and not with the signal converter.
3. Mount the connection board as shown. The mounting screw must be installed just in line with the guide rails.
4. Connect the cables as shown under "Electrical connection".
5. Plug the signal converter into the rack system.

5.2.5 Installation in wall mounting enclosure



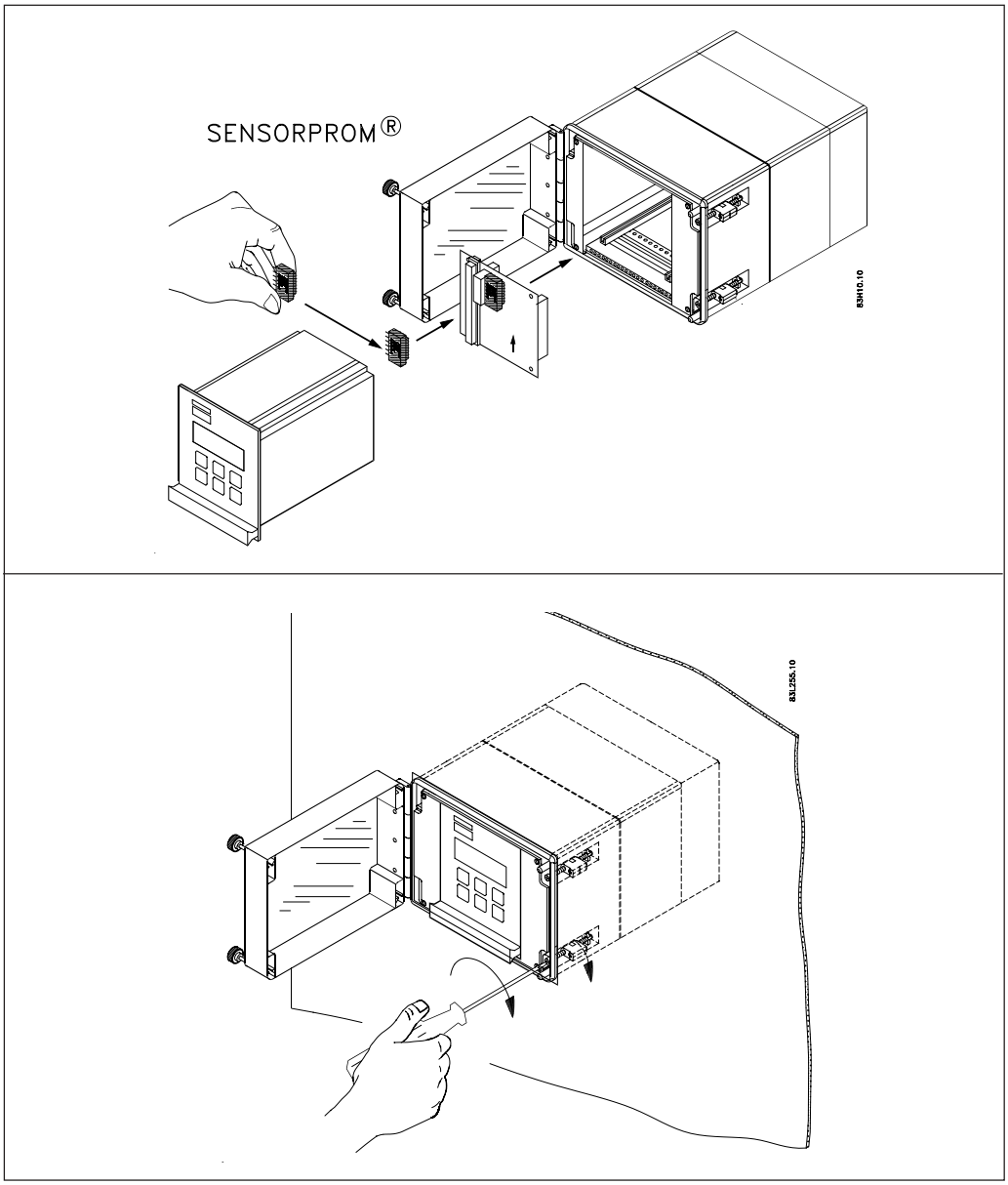
1. Mount the enclosure to the wall with four screws.
2. Mount the SENSORPROM® unit on the connection board as shown.
   The SENSORPROM® unit is supplied with the sensor in the terminal box. The connection board for IP 65 wall mounting boxes must be used.
3. Connect the cables to the terminals, see "Electrical connection".
4. Plug in the signal converter and close the cover.

5.2.6 Installation in the back of a panel



1. Mount the SENSORPROM® unit on the connection board as shown.
   The SENSORPROM® unit is supplied with the sensor.
2. Mount the connection board in the back of the enclosure.
3. Connect the cables as shown under "Electrical connection".
4. Mount the enclosure in the back of a panel with four screws.
5. Plug in the signal converter.

5.2.7 Installation in panel mounting enclosure (front of panel)



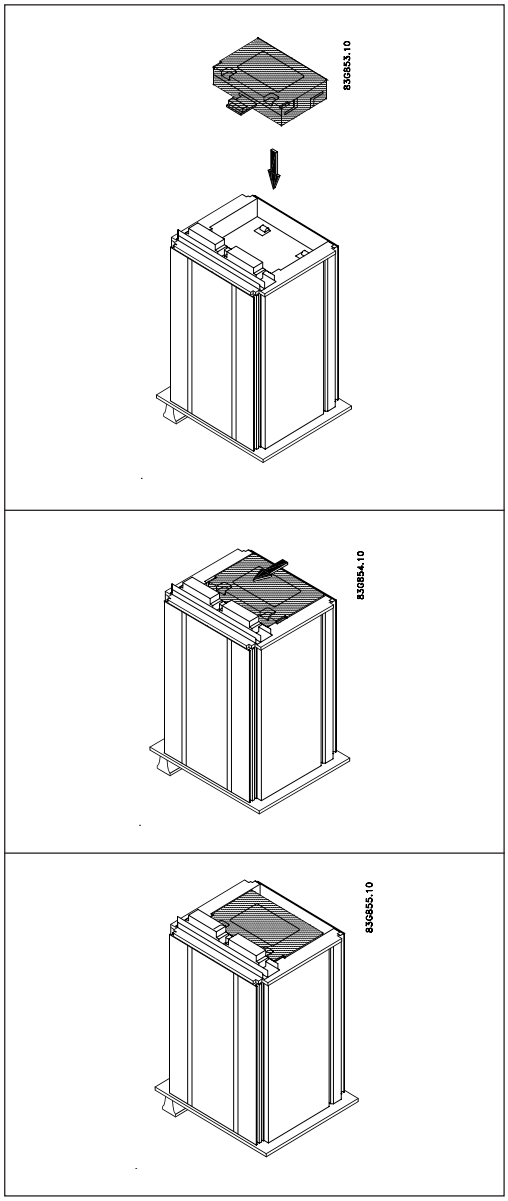
1. Mount the SENSORPROM® unit on the connection board as shown.
   The SENSORPROM® unit is supplied with the sensor.

2. Fit the enclosure in a cut out at the front of a panel. Fasten the four screws accessible at the front.

3. Connect the cables as shown under "Electrical connection".

4. Plug in the signal converter and close the cover.

5.2.8 Add-on modules

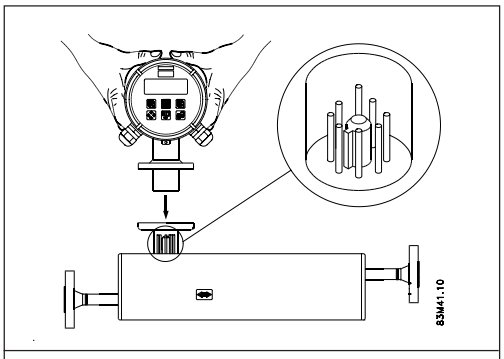


Unpack the add-on module and locate it in the bottom of the signal converter as shown.

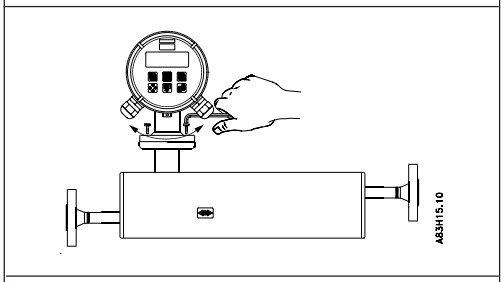
Press the add-on module forwards as far as possible.

The add-on module has now been installed and the signal converter is ready to be installed on the terminal box.
Communication to the operator menu and electrically inputs and outputs are automatically established by power on.

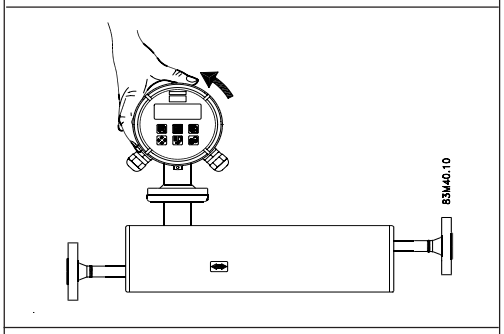
5.2.9 Compact Ex-d version



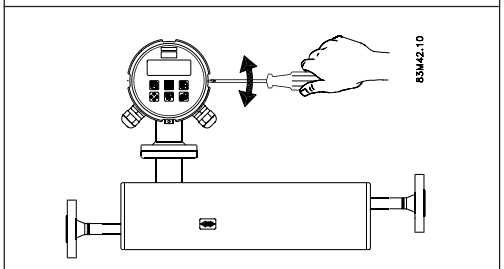
For compact installation mount the converter on top of the sensor interface. Please make sure that it is correctly oriented (note the little tag).
After fitting it can be turned 0-360°.



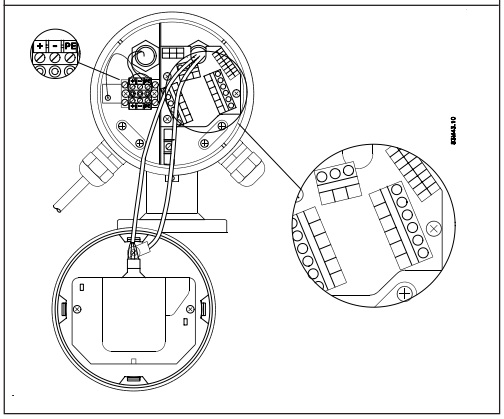
The converter is secured with 4 allen screws (allen key M4).



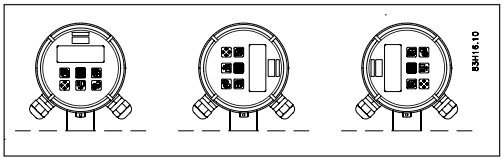
The terminals for inputs, outputs and power supply can be accessed by removing the front cover, turning it counter-clockwise.



The display can be lifted off (i.e. with the tip of a screwdriver or similar) and the terminals are accessible.

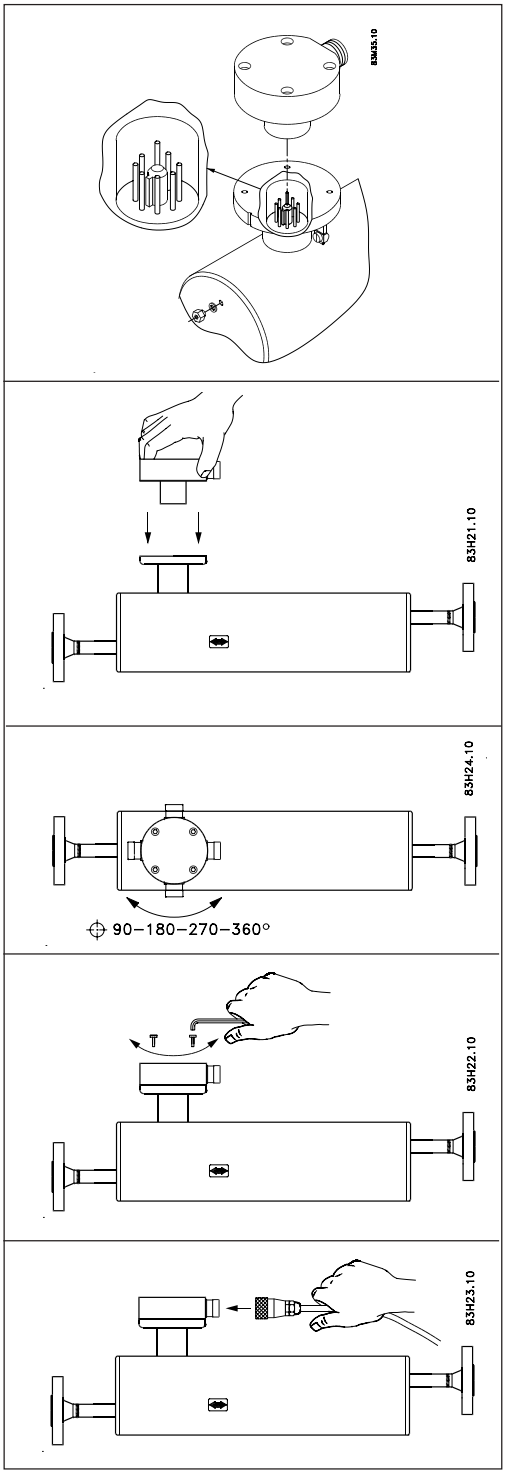


The intrinsic input and output cables must be secured by cable straps, so that they will remain in position should the terminal screws work loose.



The display/keypad can be rotated in steps of 90°. Please note the little tag on the back of the display frame which must correspond to the nut on the converter body when the display/ keypad is replaced. This is essential for obtaining optimum sealing.

5.2.10 Remote installation of multiple plug at the sensor



For remote installation mount the adaptor on top of the sensor interface. If not already mounted.
When fitting the multiple plug, please make sure that it is correctly oriented (note the little tap).

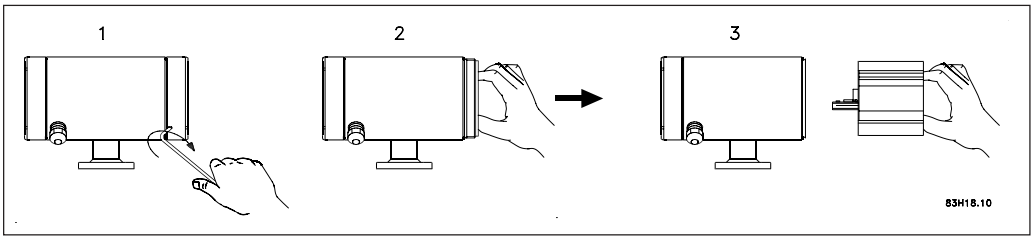
After fitting it can be turned 0 - 360°.

The adaptor can be oriented in 4 directions. Tighten the 4 screws with a 4 mm allen key to secure the adaptor.

Mount the multiple plug in the adaptor and tighten the glands on the plug to obtain optimum sealing.
Note the wire colours when connecting the MASS 6000. Refer to the diagram for electrical wiring, see “Electrical connection”.

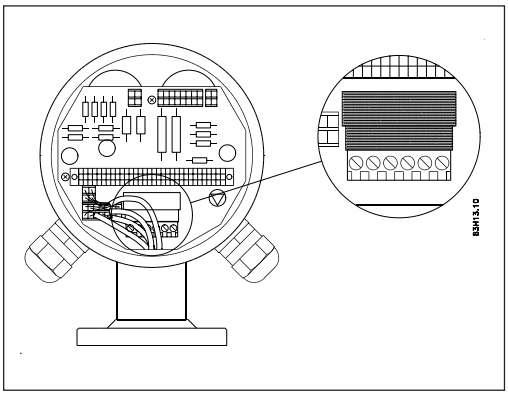
5.2.11 Compact Ex-d version Location of the SENSORPROM® memory unit

The SENSORPROM® unit is normally factory-installed. To fit/exchange the SENSORPROM® unit, the following procedure must be followed.



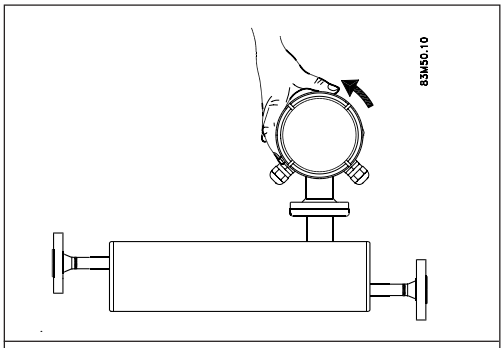
1. Remove the rear cover, by loosening the safety tap allen screw (M3), and turn the rear cover counter-clockwise.

2. Remove the electronics using the holes provided.

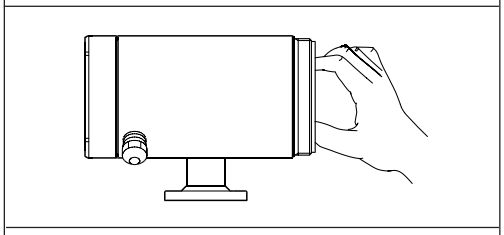


The SENSORPROM® unit is placed at the bottom of the housing.
The SENSORPROM® unit can be installed/removed by screwing/unscrewing the 6 terminal screws connecting the SENSORPROM® unit.
The label on the SENSORPROM® unit must face outwards.

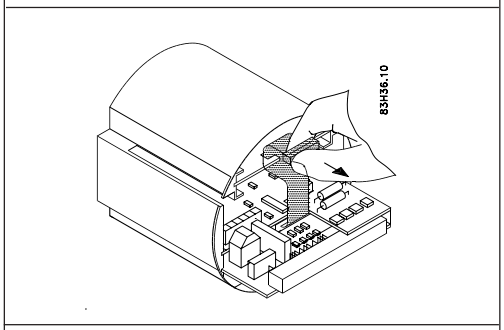
5.2.12 Compact Ex-d version Installation of add-on module



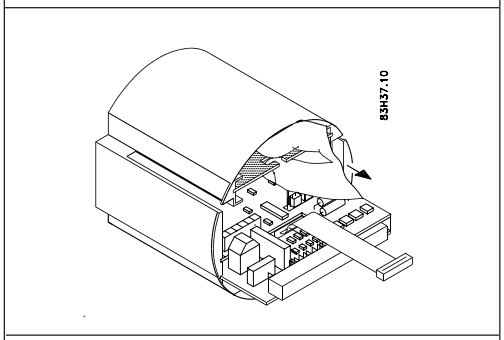
Remove the rear cover, by loosening the safety tap allen screw (M3) and turn the rear cover counter-clockwise.



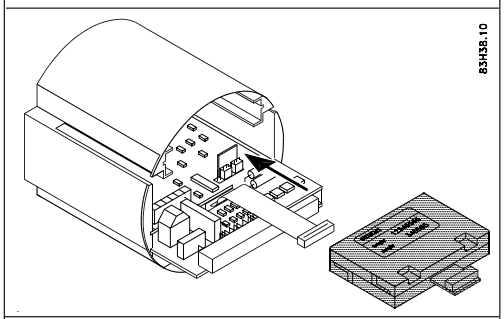
Remove the electronics using the holes provided.



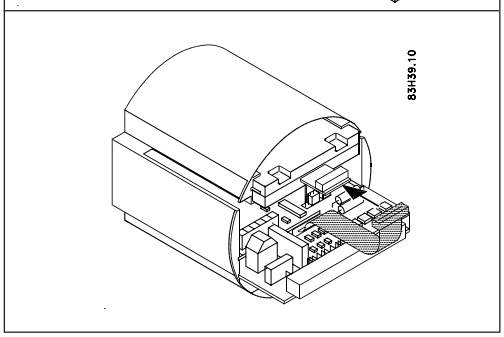
Remove the flat cable from the plate.



Remove the plate from the module bay.



The add-on module is fitted at the bottom of the converter insert as shown. The label text on the add-on module should face upwards as shown.
The add-on module is fitted with the connector facing outwards of the enclosure.



The add-on module can be pressed into position.
Connect the flat cable connector to the module and power up. The add-on module is automatically initialised. The menu's are now visable on the display/keypad of the MASS 6000.

Warning

Ex-compliance of add-on module

When installing the add-on module in the MASS 6000 Ex-d, only Ex modules which have been approved can be used.

All modules, which can be used, have been clearly marked with the Ex-symbol and Ex-approval No. – the position can be seen below.

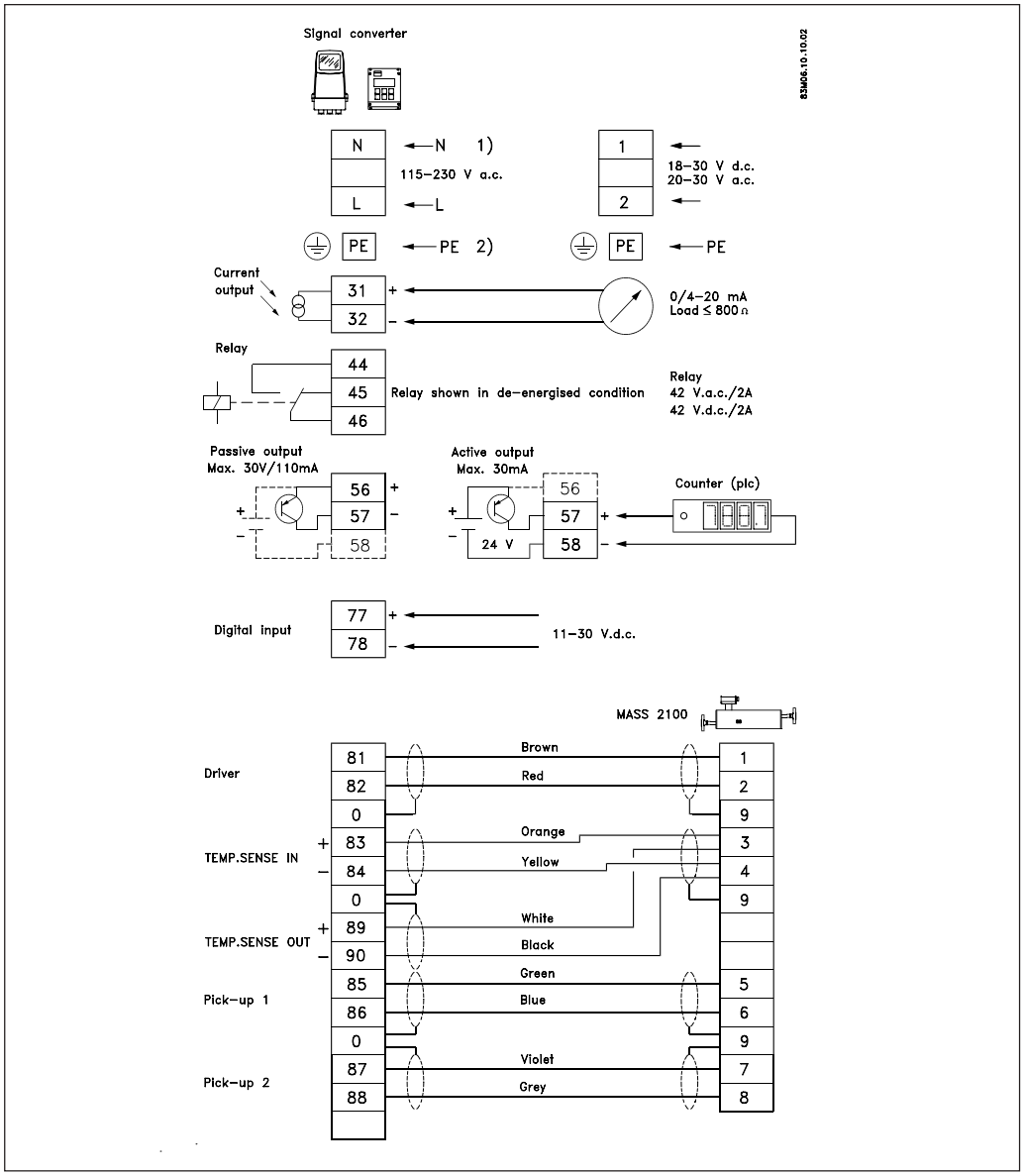
Installation and wiring, instructions supplied with the module must be followed.

In case of service or installation of add-on module

If the electronics is to be replaced or an add-on module is to be installed, this can be done by dismantling the cover located in the back of the enclosure.
To reduce the risk of ignition of hazardous atmospheres, disconnect the equipment from the supply circuits before opening. Keep assembly tightly closed when in operation.

6. Electrical connection

6.1 Signal converter MASS 6000 IP 67 and 19" (terminal board FDK:083H4260, FDK:083H4253 & FDK:083H4255)



Installation

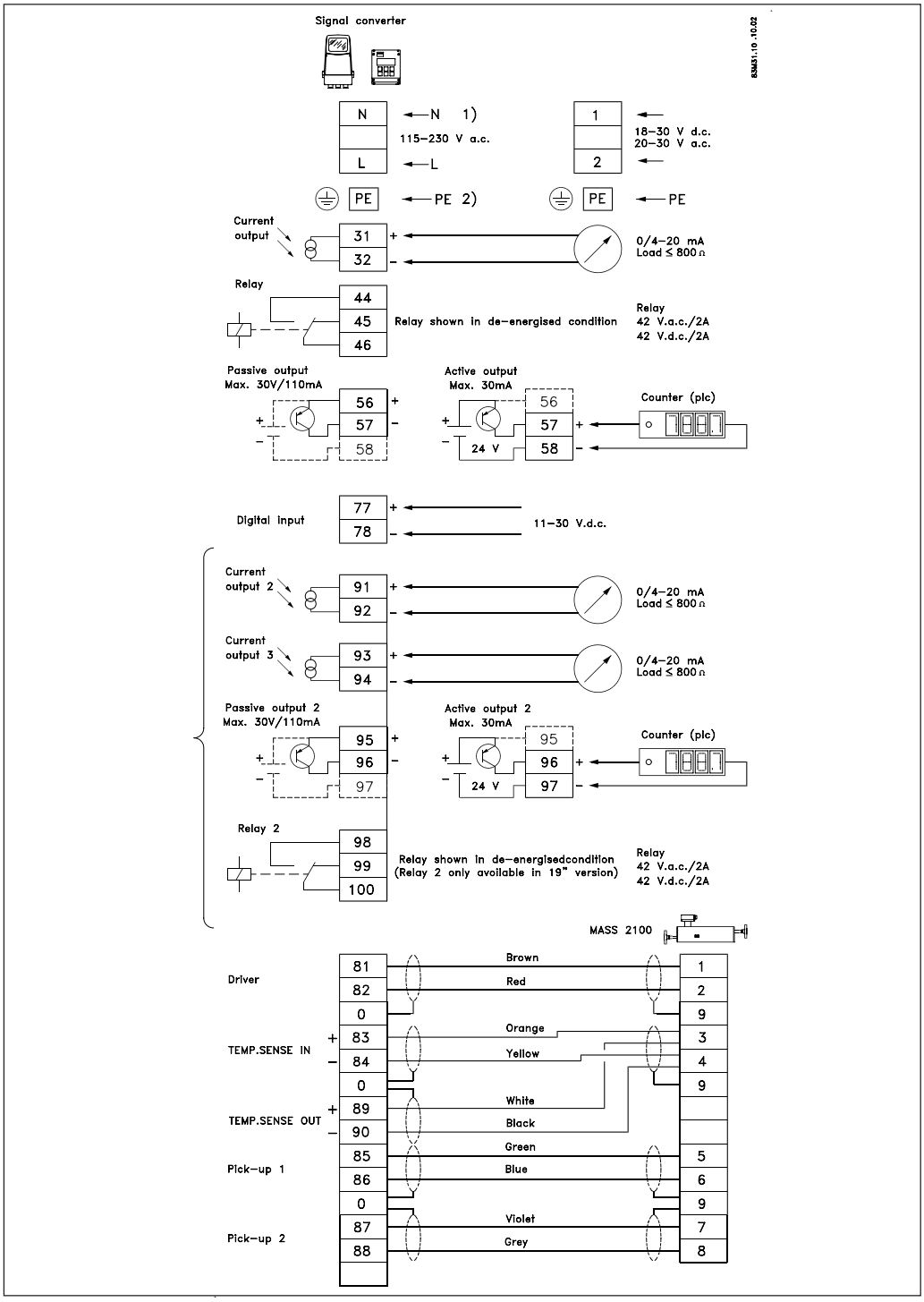
⚠ 1) Mains supply 115 to 230 V a.c. from building installation Class II. A switch or circuit-breaker (max. 15 A) shall be included in the building installation. It must be in close proximity to the equipment and within easy reach of the OPERATOR, and it shall be marked as the disconnecting device for the equipment.

⏚ 2) Protective conductor terminal. Required cable min. AGW16 or 1.5 □ Cu.
The insulation between the connected mains supply and 24 V a.c./d.c. supply for the flowmeters, models 24 V a.c./d.c. shall at least be rated with double or reinforced insulation at mains voltage.

For field wiring installation **National Installation Code** shall be met of the country, where the flowmeters are installed.

Digital output
If the internal resistance of the loads exceeds 10KΩ, it is recommended to connect an external 10KΩ load resistor in parallel to the load.

6.2 Signal converter MASS 6000 with extended output's (only 19" version), terminal board FDK:083H4253 & FDK:083H4255



Installation

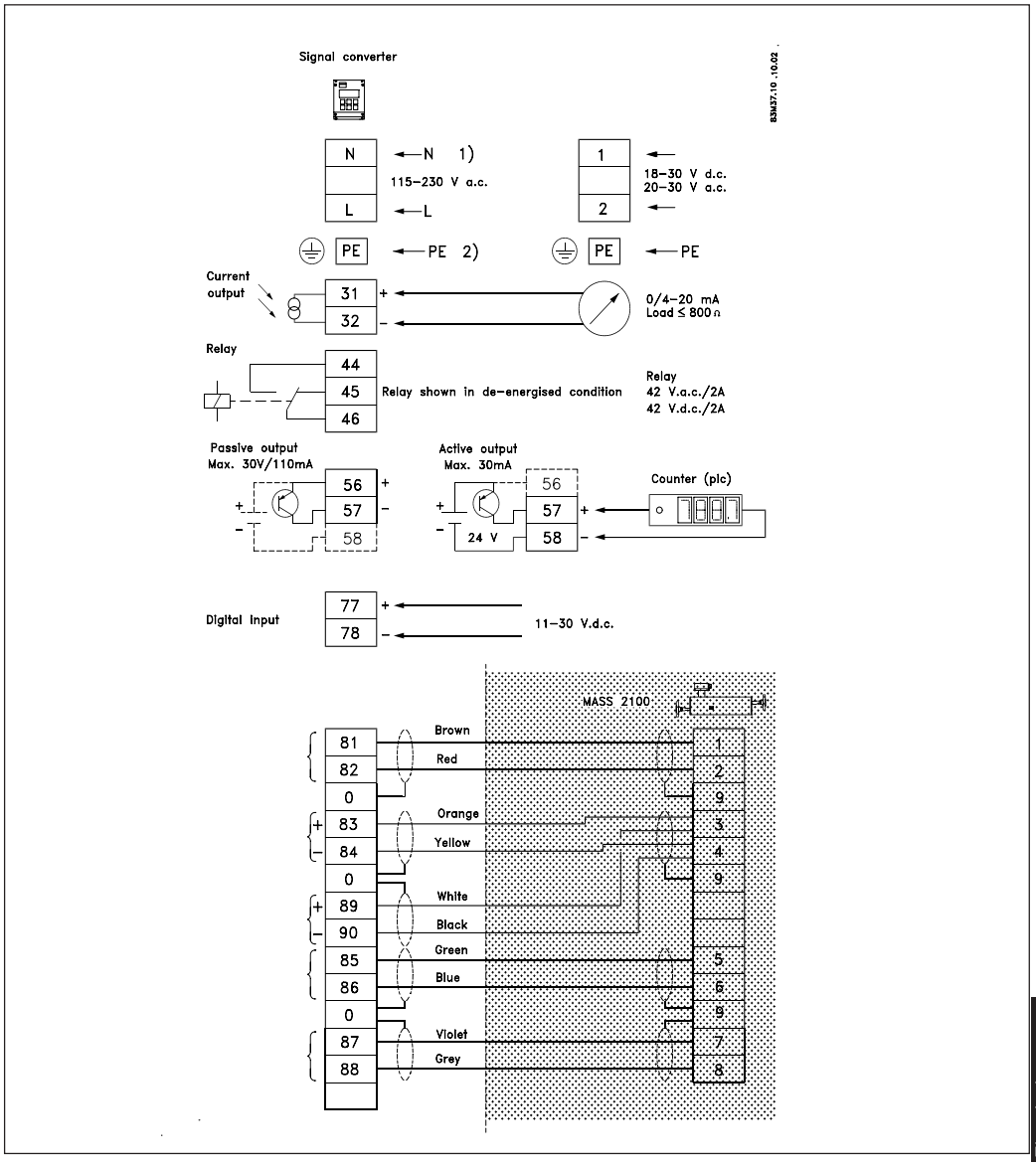
⚠ 1) Mains supply 115 to 230 V a.c. from building installation Class II. A switch or circuit-breaker (max. 15 A) shall be included in the building installation. It must be in close proximity to the equipment and within easy reach of the OPERATOR, and it shall be marked as the disconnecting device for the equipment.

⏚ 2) Protective conductor terminal. Required cable min. AGW16 or 1.5 □ Cu.
The insulation between the connected mains supply and 24 V a.c./d.c. supply for the flowmeters, models 24 V a.c./d.c. shall at least be rated with double or reinforced insulation at mains voltage.

For field wiring installation **National Installation Code** shall be met of the country, where the flowmeters are installed.

Digital output
If the internal resistance of the loads exceeds 10KΩ, it is recommended to connect an external 10KΩ load resistor in parallel to the load.

6.3 Signal converter MASS 6000 19" Ex-version



Installation

The MASS 6000 signal converter must be installed in the safe area where as the sensor can be installed in the hazardous area.

All cables and installations in hazardous areas must conform to the national code of practise.

The cables from the sensor must be kept apart from all other cables on the connection board. Maximum cable length is 500 m.

If the converter becomes defective, the converter can only be serviced at Siemens Flow Instruments A/S.

1) Mains supply 115 to 230 V a.c. from building installation Class II. A switch or circuit-breaker shall be included in the building installation. It must be in close proximity to the equipment and within easy reach of the operator, and it shall be marked as the disconnecting device for the equipment.

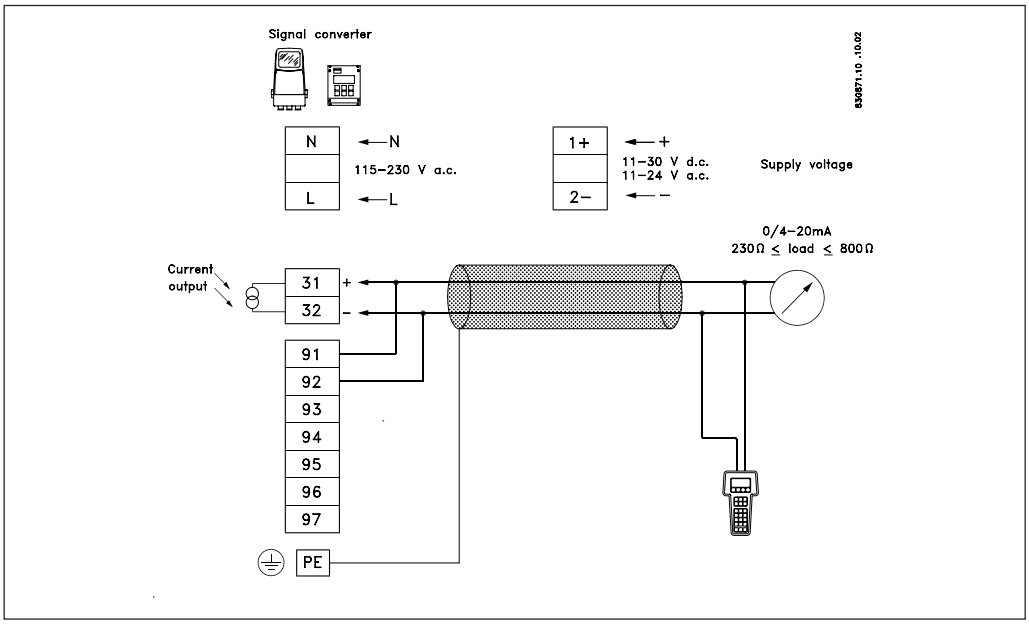
2) Protective earth connected to PE ⏚ terminal. Required cable min. AGW16 or 1.5 □ Cu. Mains voltage terminals must be out of reach for operator to avoid any hazards.

Digital output
If the internal resistance of the loads exceeds 10KΩ, it is recommended to connect an external 10KΩ load resistor in parallel to the load.

6.4 Connections of add-on modules

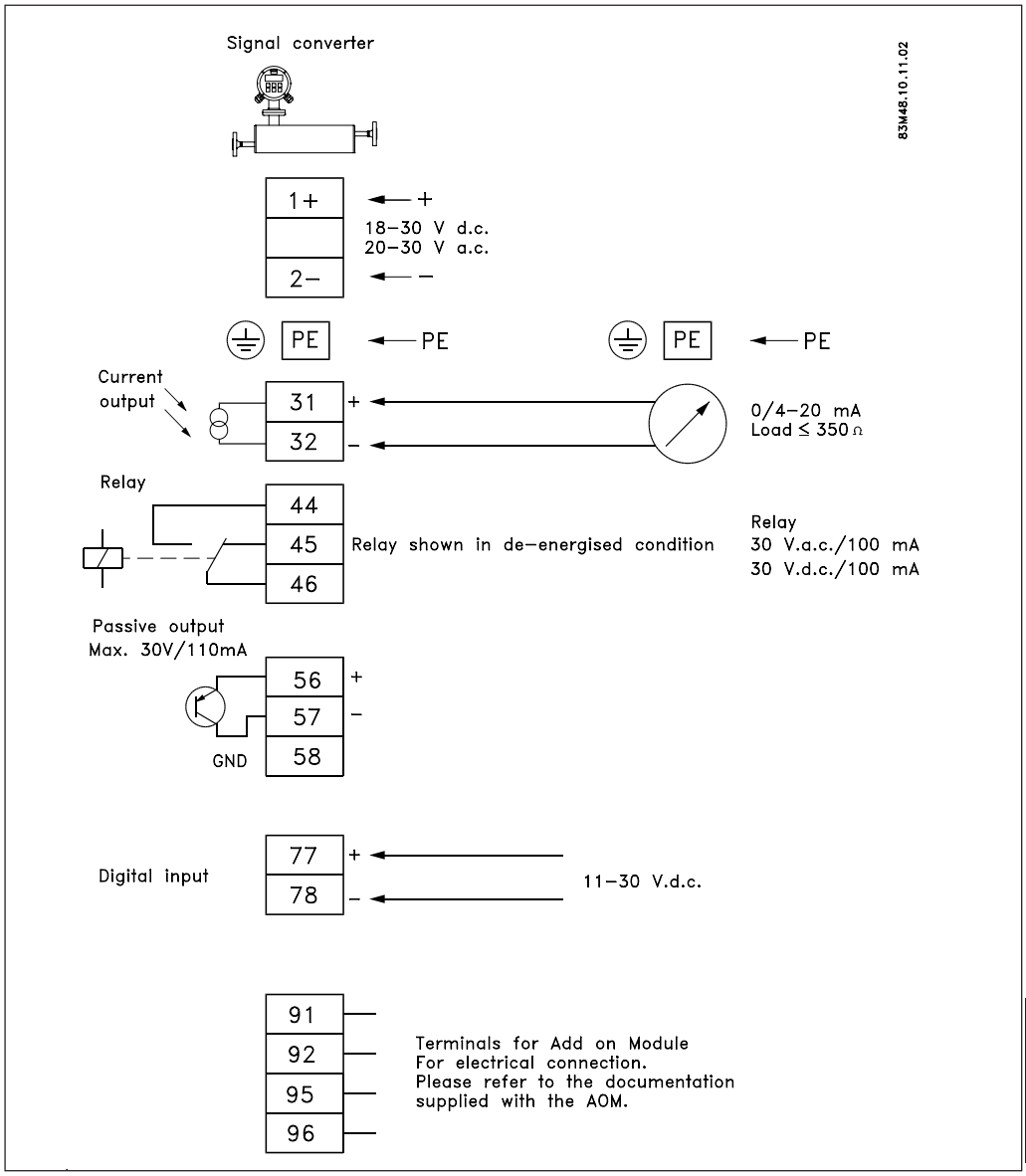
When the add-on module has been installed, the electrical connections are available on terminal rows 91-97 no matter the version.
The correct electrical connection can be seen in the documentation supplied with the add-on module.

6.5 HART® communication



6.6 PROFIBUS PA

6.7 Signal converter MASS 6000 Compact Ex-d



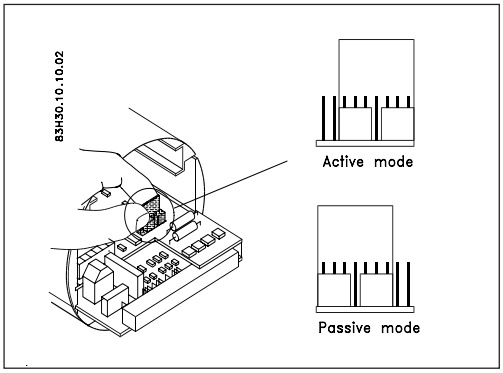
Electrical connections are made through the front of the signal converter, in the terminal housing. This housing is accessed by removing the front lid as described in chapter 5.

The cover is retained via a wire. The terminal housing is equipped with 1 PG 13.5 EEx e gland and 1 PG 13.5 EEX "i" gland.
The mains cable is fed through the black PG gland (black indicates increased safety "e") located in the left-hand side as viewed from the front.
The outputs are fed through the blue PG gland (the colour blue indicates intrinsically-safe circuit "i") located on the right-hand side. According to the Ex document issued, use of other glands is permitted provided that these are as a minimum EEx-approved in category "e".

Important

The power supply terminals shall be from a safety isolating transformer.
Maximal cable core is 2.5 □.

6.8 Setting of active or passive current output mode



The current output in MASS 6000 can operate in either active or passive mode to make electrical connection as easy as possible. The current output in MASS 6000 is default set to passive mode and must be looped powered.
If an active mode is required, a jumper on the converter PCB must be put in active position. This is done by taking out the converter electronics, follow the instructions in section 5.2.11 or 5.2.12. Jumper position is shown below.

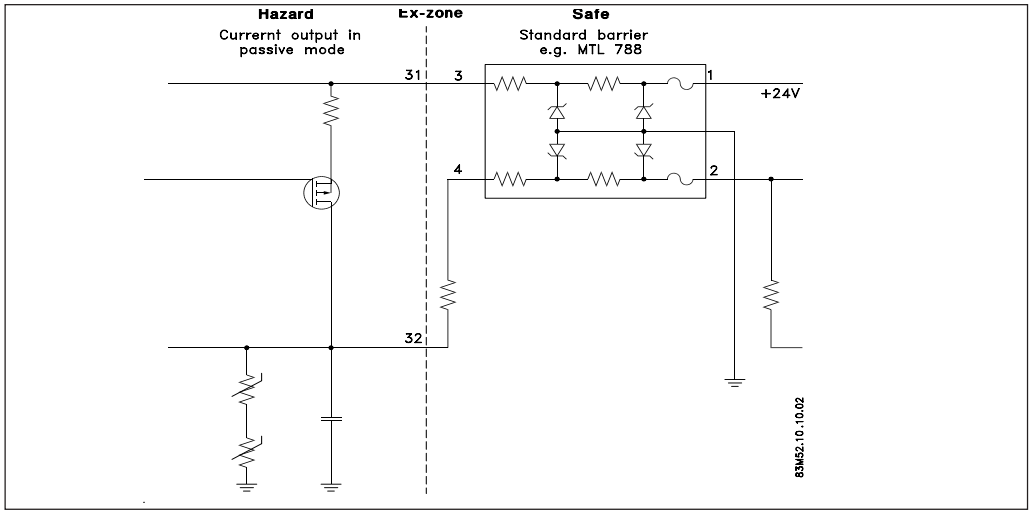
Passive mode: Jumper in right position.
Active mode: Jumper in left position.

Important

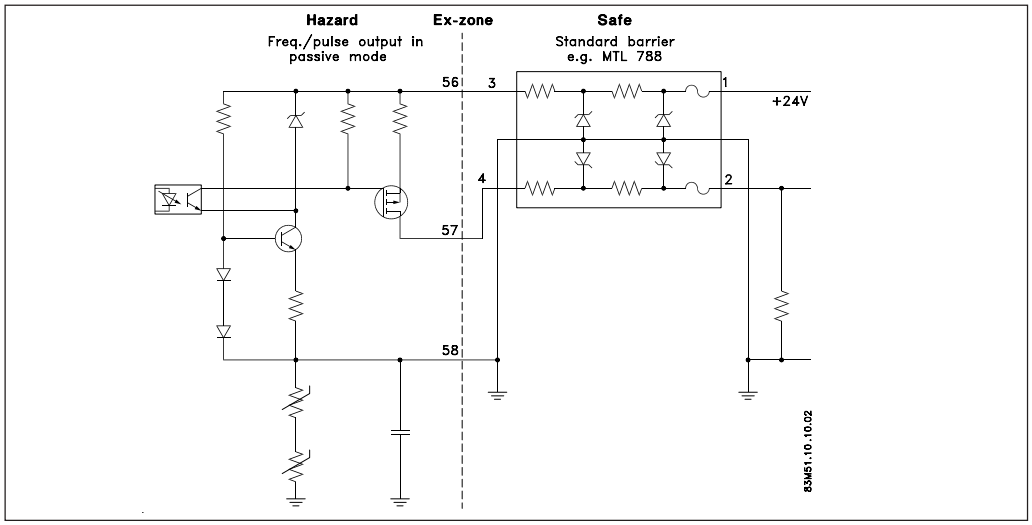
Be aware that in active mode the output shall be considered as a barrier output. The connection is not safe when put in active mode and accidentally connected to a barrier intended for use in passive mode.

6.9 Installation examples

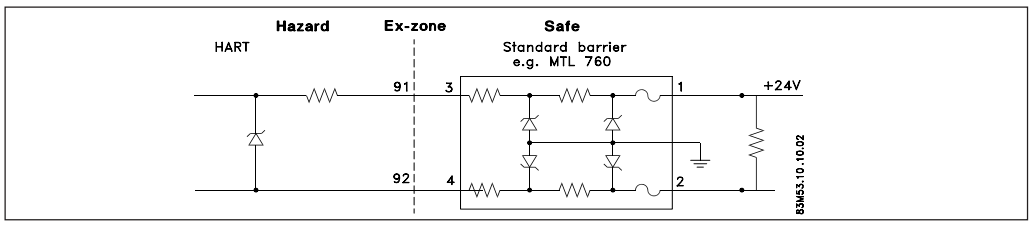
Current output in passive mode



Frequency/pulse output in passive mode

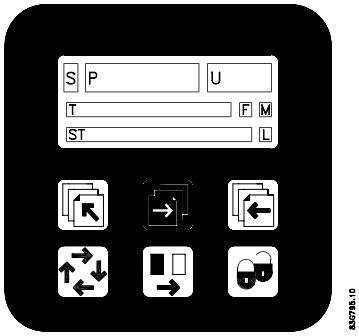


HART output



7. Commissioning

7.1 Keypad and display layout



Keypad

The keypad is used to set the flowmeter. The function of the keys are as follows:

TOP UP KEY		This key (hold 2 sec.) is used to switch between operator menu and setup menu. In the converter setup menu, a short press will cause a return to the previous menu.
FORWARD KEY		This key is used to step forward through the menus. It is the only key normally used by the operator.
BACKWARD KEY		This key is used to step backward through the menus.
CHANGE KEY		This key changes the settings or numerical values.
SELECT KEY		This key selects the figures to be changed.
LOCK/UNLOCK KEY		This key allows the operator to change settings and gives access to submenus.

Display

The display is alphanumerical and indicates flow values, flowmeter settings and error messsages.

The upper line is for primary flow readings and will always show either mass flowrate, volume flowrate, density, temperature, totalizer 1 or totalizer 2. The line is divided into 3 fields.

S: Sign field
P: Primary field for numerical value
U: Unit field

The centre line is the title line (T) with individual information according to the selected operator or setup menu.

The lowest line is the subtitle line (ST) which either will add information to the title line or keep individual information independent of the title line.

F: The alarm field. Two flashing triangles will appear by a fault condition.

M: The mode field. The symbols indicate the following.

Communication mode	Basic settings
Service mode	Output
Operator menu	External input
Product identity	Sensor characteristic
Language mode	Reset mode

L: The lock field. Indicates the function of the lock key.

Ready for change	Access to submenu (Press)
Value locked	RESET MODE: Zero setting of totalizers and initialization of setting

7.2 Menu build-up

The menu structure of a specific type of signal converter is shown in a menu overview map. Details of how a specific parameter is set is shown in a menu detail map for the specific parameter. The menu structure is valid for the title and subtitle line only. The upper line is for primary readings only and will always be active with either mass flowrate, volume flowrate, density, temperature, totalizer 1 or totalizer 2.

The menu is built up in two parts. An **operator menu** and a **setup menu**.

Operator menu
The operator menu is for daily operation. The operator menu is customised in the **operator menu** setup. The signal converter always starts in the **operator menu** no. 1. The page forward and page backward keys are used to step through the operator menus.

Setup menu
The setup menu is for commissioning and service only.

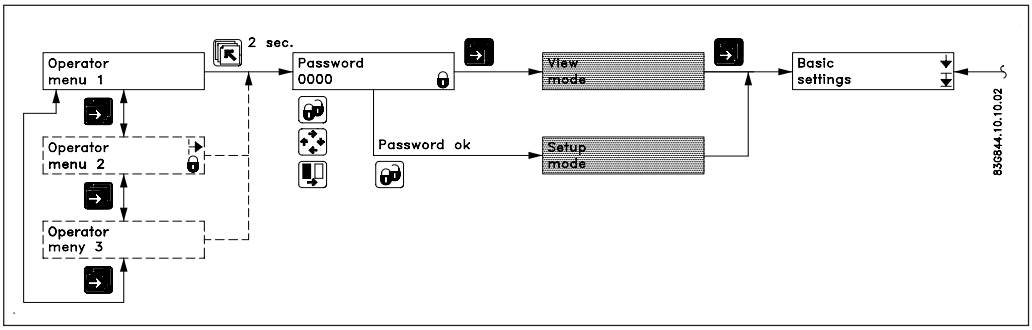
Access to the setup menu is gained by pressing the top up key for 2 seconds. The setup menu will operate in two modes:
- View mode
- Setup mode

View mode is a read only mode. The pre-selected settings can only be scanned.

Setup mode is a read and write mode. The pre-selected settings can be scanned and changed. Access to the setup mode is protected with a password. The factory set password is 1000.

Access to a submenu in the set up menu is gained by the lock key. A short press on the top up key will bring you back to the previous menu. A long press (2 sec.) on the top up key will exit the setup menu and bring you back to the operator menu no. 1.

7.2.1 Password



The SETUP MENU can be operated in two different modes:

VIEW MODE (Read only)
CHANGE MODE (Read and write mode)

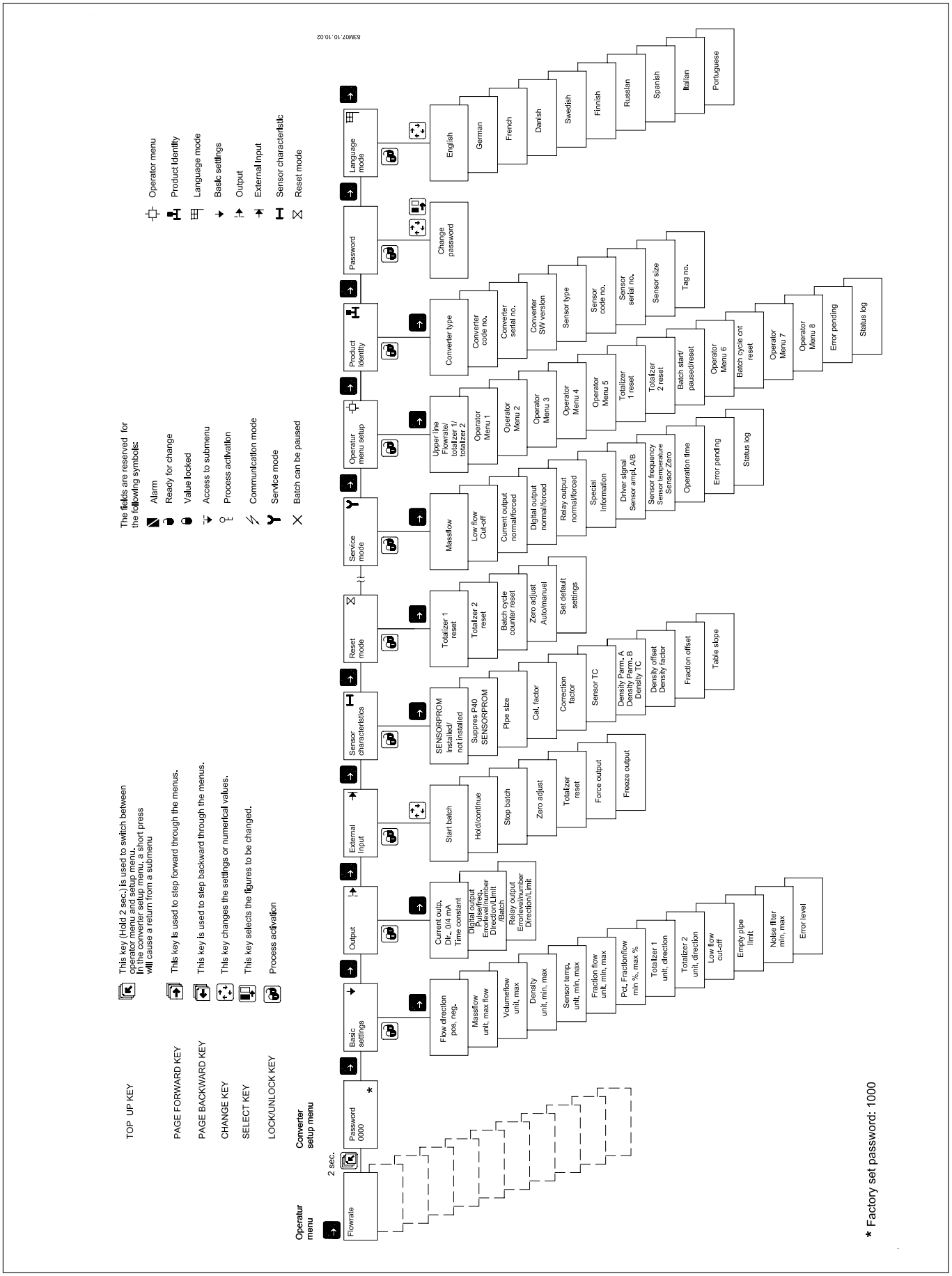
Access to view mode is always gained by pressing the forward key when in the password menu.

Access to change mode is protected by a user code. The user code is factory set to 1000, but can be changed to any value between 1000 and 9999 in the change password menu.

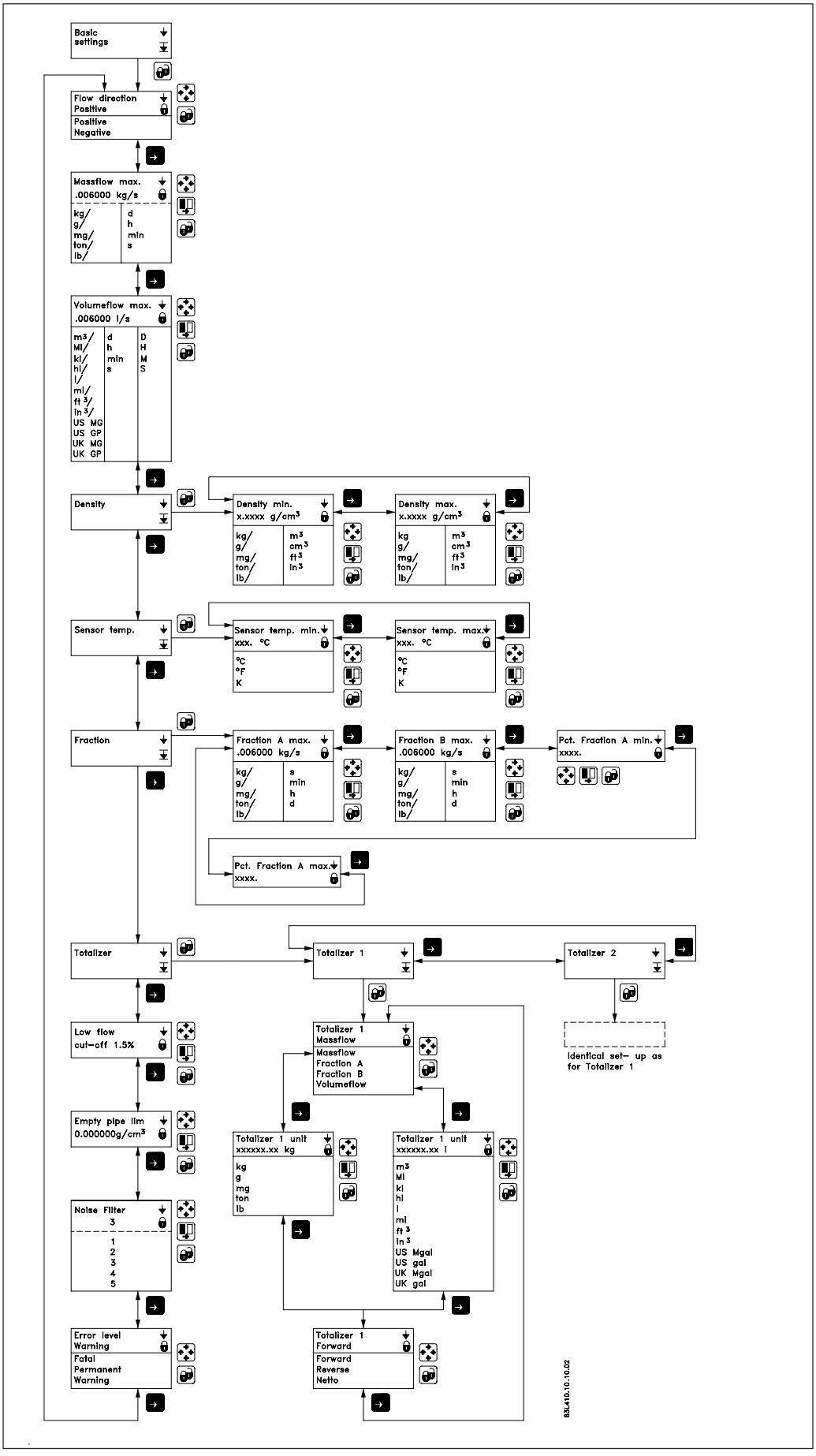
The factory setting of 1000 can be re-established as follows:
- Switch off power suppply
- Press the TOP UP key while switching on the power supply

The user code is now reset to 1000.

7.3 MASS 6000


Operatur menu
2 sec.
Converter setup menu
Flowrate
Password 0000 *
Basic settings
Output
External Input
Sensor characteristics
Reset mode
Service mode
Operatur menu setup
Product Identity
Password
Language mode
Flow direction pos, neg.
Massflow unit, max flow
Volumeflow unit, max
Density unit, min, max
Sensor temp. unit, min, max
Fraction flow unit, min, max
Pct. Fractionflow min %, max %
Totalizer 1 unit, direction
Totalizer 2 unit, direction
Low flow cut-off
Empty pipe limit
Noise filter min, max
Error level
Current outp. Dir., 0/4 mA Time constant
Digital output Pulse/freq. Error level/number Direction/Limit /Batch
Relay output Error level/number Direction/Limit
Start batch
Hold/continue
Stop batch
Zero adjust
Totalizer reset
Force output
Freeze output
SENSORPROM installed/ not installed
Suppres P40 SENSORPROM
Pipe size
Cal. factor
Correction factor
Sensor TC
Density Parm. A Density Parm. B Density TC
Density offset Density factor
Fraction offset
Table slope
Totalizer 1 reset
Totalizer 2 reset
Batch cycle counter reset
Zero adjust Auto/manuel
Set default settings
Massflow
Low flow Cut-off
Current output normal/forced
Digital output normal/forced
Relay output normal/forced
Special Information
Driver signal Sensor ampl. A/B
Sensor frequency Sensor temperature Sensor Zero
Operation time
Error pending
Status log
Upper line Flowrate/ totalizer 1/ totalizer 2
Operator Menu 1
Operator Menu 2
Operator Menu 3
Operator Menu 4
Operator Menu 5
Totalizer 1 reset
Totalizer 2 reset
Batch start/ paused/reset
Operator Menu 6
Batch cycle cnt reset
Operator Menu 7
Operator Menu 8
Error pending
Status log
Converter type
Converter code no.
Converter serial no.
Converter SW version
Sensor type
Sensor code no.
Sensor serial no.
Sensor size
Tag no.
Change password
English
German
French
Danish
Swedish
Finnish
Russian
Spanish
Italian
Portuguese
TOP UP KEY
This key (Hold 2 sec.) is used to switch between operator menu and setup menu. In the converter setup menu, a short press will cause a return from a submenu
PAGE FORWARD KEY
This key is used to step forward through the menus.
PAGE BACKWARD KEY
This key is used to step backward through the menus.
CHANGE KEY
This key changes the settings or numerical values.
SELECT KEY
This key selects the figures to be changed.
LOCK/UNLOCK KEY
Process activation
The fields are reserved for the following symbols:
Alarm
Ready for change
Value locked
Access to submenu
Process activation
Communication mode
Service mode
Batch can be paused
Operator menu
Product identity
Language mode
Basic settings
Output
External Input
Sensor characteristics
Reset mode
Service mode
Operatur menu setup
Product Identity
Password
Sensor characteristic
Reset mode
83M07.10.10.02
* Factory set password: 1000

7.4 Basic settings



Basic settings Menu description

The basic settings menu is used for basic configuration of the mass flowmeter with a choice of units, minimum and maximum limits for display and analogue/digital outputs for all measurement parameters, i.e. mass flow, volume flow, fraction, temperature and density.

Setting of min./max. values and units

Numerical values are entered by placing the cursor in the field that you wish to set using the SELECT key. Press unlock and the value can then be changed using the change key. The desired value is locked by activating LOCK.

Positioning of the decimal point is carried out by placing the cursor below the decimal point using SELECT key. The position can now be set using the change key. The LOCK key is then activated; the decimal point is now positioned.

Selecting the unit: place the cursor below the unit using SELECT key. Set the desired unit using CHANGE key. Activate the LOCK key to save the setting. Place the cursor below the time scale using SELECT key and choose the desired time scale using CHANGE, then save the desired value by activating the LOCK key.

The max. and min. values set will then apply to all current and frequency/pulse outputs, e.g. where the min. value will correspond to 0/4 mA depending on the setting of the current output and the max. will correspond to 20 mA.

***Example*; programming of max. mass flow**

As example we want to change the default setting of the maximum mass flow on a MASS 2100 DI 1.5 from 20 kg/h to 6.5 kg/h

Keypad operation	Implementation	Display on MASS 6000
Push for 2 sec.	To access the user password	Password 0000
Push once	To unlock password	CHANGE 0000
Push once	To enter 1000 as password	CHANGE 1000
Push once	To lock password and to enter the menu	CONV.SETUP MODE> Basic settings
Push once	To enter basic setting submenu	Flow direction Positive
Push once	To go to mass flow max. setting	Massflow max. 000020. kg/h
Push once	To change num. value	Massflow max. **0**00020. kg/h
Push 4 times	To move the cursor to the num. position	Massflow max. 0000**2**0. kg/h
Push	Until 6 appears	Massflow max. 0000**6**0. kg/h
Push once	To move the cursor to the next num. position	Massflow max. 00006**0**. kg/h
Push	Until 5 appears	Massflow max. 00006**5**. kg/h
Push once	To move the cursor to the decimalpoint	Massflow max. 000065**.** kg/h
Push	To position the decimal point correct	Massflow max. 00006**.**5 kg/h
Push	To lock the new setting of the mass flowmeter	Massflow max. 00006.5 kg/h
Push twice	MASS 6000 reverts to standard operation	

Setting the totalizer

The MASS 6000 is equipped with two independent totalizers that can be set for totalizing mass flow, fraction A, faction B or volume.
Forward: only flow in a positive direction is totalized.
Reverse: only flow in a negative flow direction is totalized.
Net: the total net flow is measured.

Setting the low-flow cut-off

In certain applications flow signals are not required below a given flow. In this menu you can freely select between 0 and 10% cut-off of the maximum setting of the mass flow. By default the meter is set to 1.5%.

Setting the empty pipe limit

If detection of an empty pipe or you wish to detect a density value this can be set under this menu option. If the density value set is measured this will activate a relay or the digital output in addition will be recorded in the error log.

Setting the noise filter

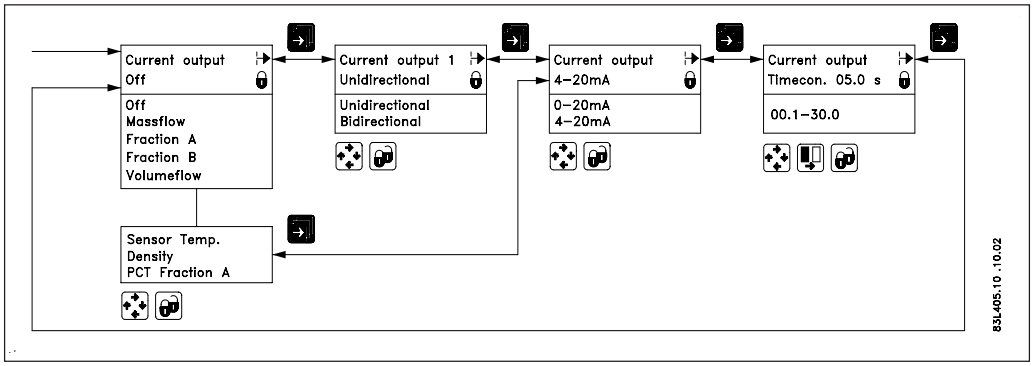
The MASS 6000 carries out signal processing internally using a patented FFT (Fast Fourier Transformation) algorithm. This technology allows sensor signals encumbered with noise to be filtered. For example, if the MASS 2100 sensor is exposed to a strongly pulsating flow, varying pumping frequencies or strong pressure gradient, etc. this can in certain cases result in noise on the pick-up signals, with measurement error as a result. This measurement error can be reduced by increasing the filtration under the menu option ***noise filter***. Setting 5 represents the maximum possible filtration and setting 1 represents the minimum possible filtration.

Setting the error level

The MASS 6000 contains a particularly informative error monitoring system that the user can configure according to need. The system is described in more detail in the section on error handling.

7.5.1 Outputs setting menu

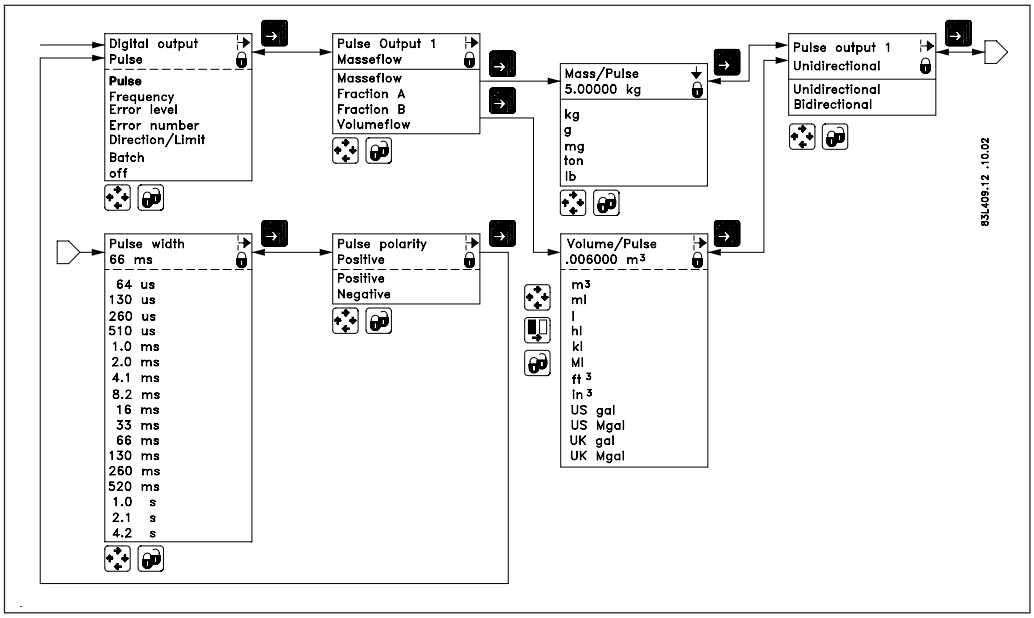
Current output



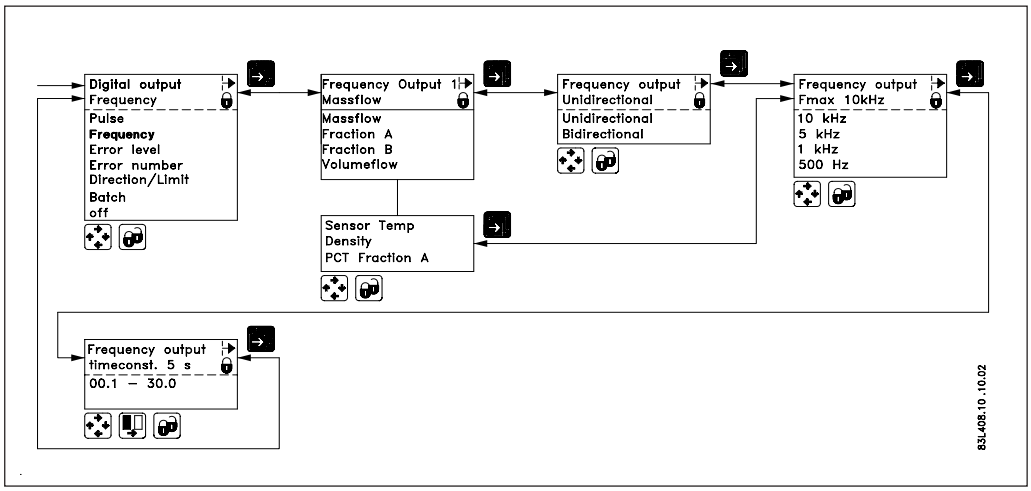
The current output should be set off when not used, otherwise an error will be pending if the meter detects an open loop.

Digital output Pulse

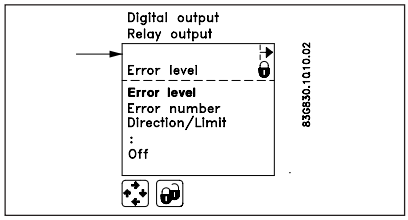
The **digital output** menu can be used for generating a frequency proportional output signal, for pulse signal (totalizing), indicating error level/number, limit or flow direction or as batch output. Only one function can be implemented for each output section.



Digital output Frequency

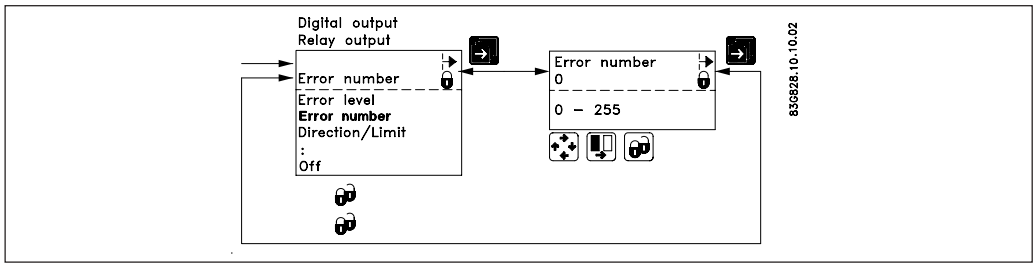


Digital output Error level



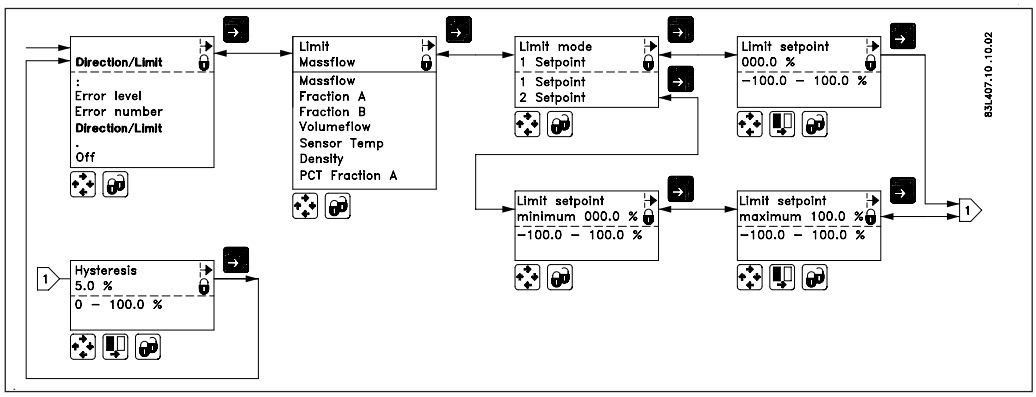
If you want to have the error status output at the digital output there are two options. Select error level to output the system's current error status or error number if you want to have one specific error indicated by the digital output.
Both types of error message are described in more detail in the section **error system**.

Digital output Error number



Acceptance level is set in the basic settings.

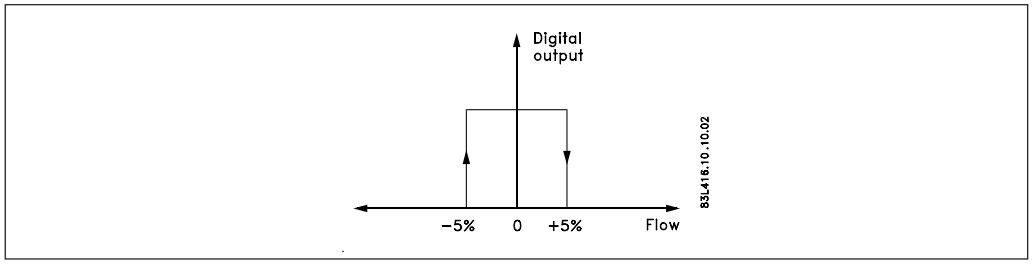
Digital output Limit/direction



Limit switches are available for both digital and relay output and can be used for mass flow, fraction, volume flow, temperature or density.

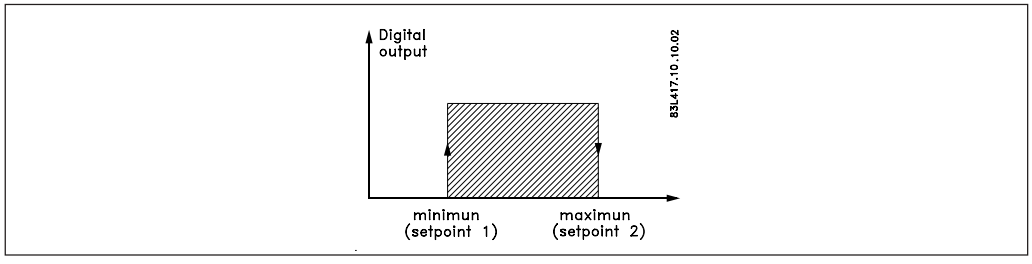
Digital output Flow direction 1 set point

If you want to set the output to show flow direction then select: 1 set point at 0% flow; hysteresis 5%.



2 set points

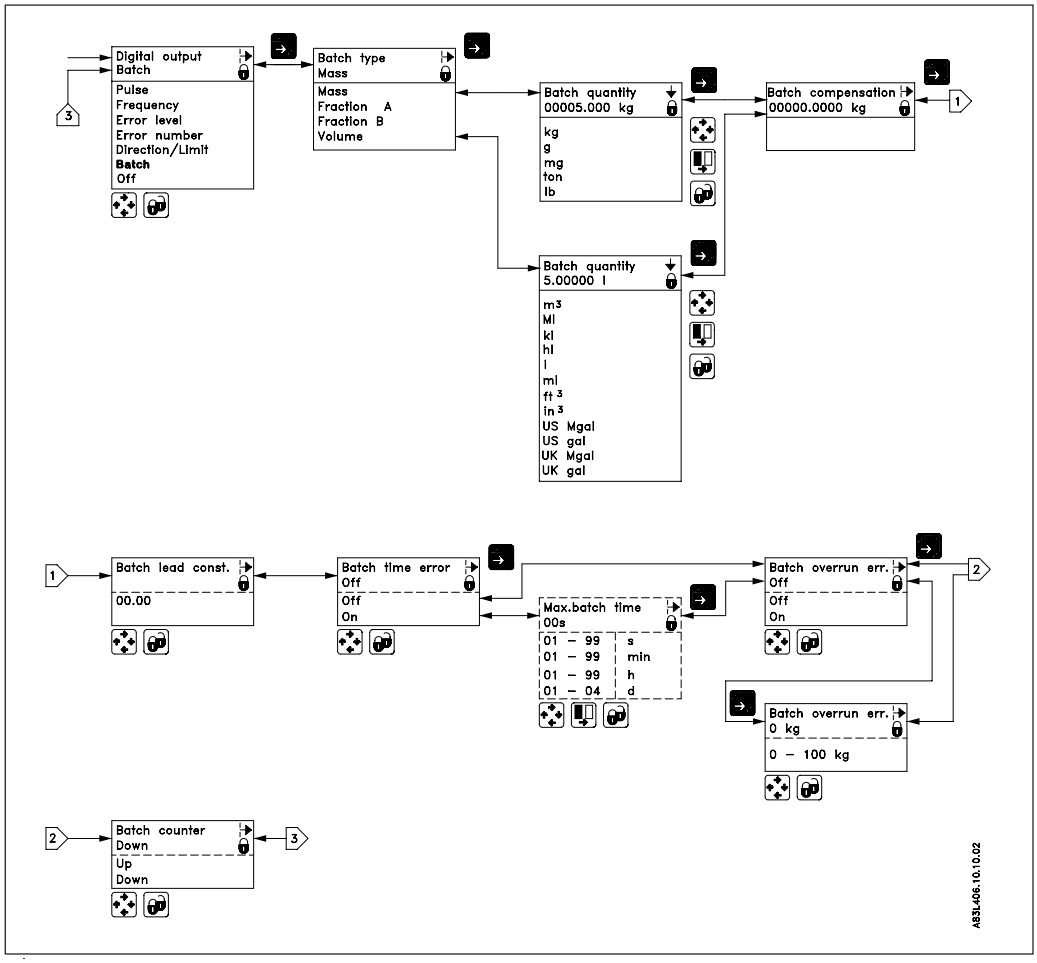
If you wish to have a flow, temperature, density or fraction **area** monitored via the digital output then select 2 set points.



2 separate set points

If 2 set points have to activate two separate outputs, each set point has to be selected individually one for digital output and the other for relay output.

Digital output
Batch menu



Batch
Menu description

Batch menu
In the batch menu of the MASS 6000 batching can be set to mass or volume. The desired quantity is called the ***batch quantity***.

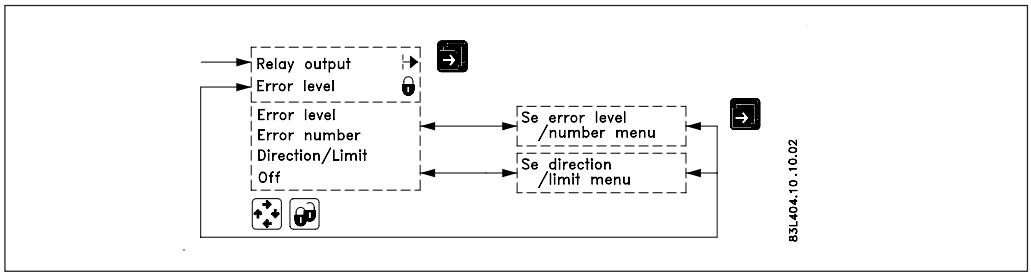
Batch compensation allows you to add/subtract a fixed quantity in order to compensate for valve delays, etc.
If you wish this compensation to be carried out dynamically, i.e. independently of the flow rate in the system, the MASS 6000 can calculate the system's time constant – this is known as the ***lead const***.

Batch time error is used to monitor that a batch is executed within the specified period, which is set via ***max. batch time***. If the batch is not completed within the time set an error message will output via Errorlog/pending.

Batch overrun error monitors that the quantity passing through the valve when it is closed does not exceed the quantity set. This function can detect irregular valve function due to blockage, failure to close due to wear, etc. The error is notified via the errorlog/pending function.

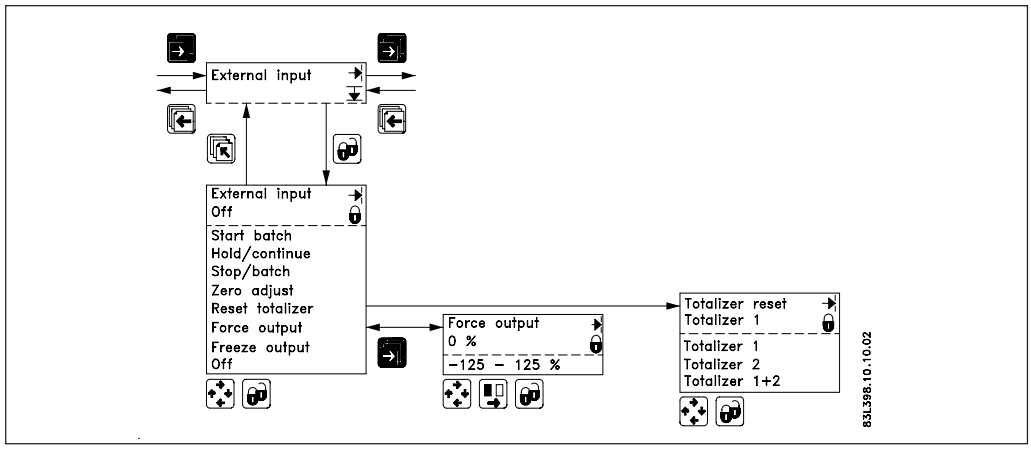
Batch counter is used to set the batch display. If **up** is selected the display counts from 0 upwards to the selected ***batch quantity***. If **down** is selected it counts down from ***batch quantity*** to 0 for each batch. The operator can follow the progress when running in a batch application.

7.5.2 Relay output



The output functions error level, error number and direction/limit can also be implemented on the relay output. Programming of the realy output is identical as for the digital output.

7.5.3 External input



External input menu
The MASS 6000 has one digital input available. If the input is activated with a logic signal (11 - 30 V d.c.) the meter carries out the activity selected under the menu option. You can select the following functions:

Start batch. If the MASS 6000 is used for batching this can be activated automatically via this function.

Hold/continue is also used in connection with batching and on being activated for the first time will pause the batch. When activated again it will continue the batch.

Stop batch will stop the batch, i.e. the digital output goes to logic 0. The batch is then reset.

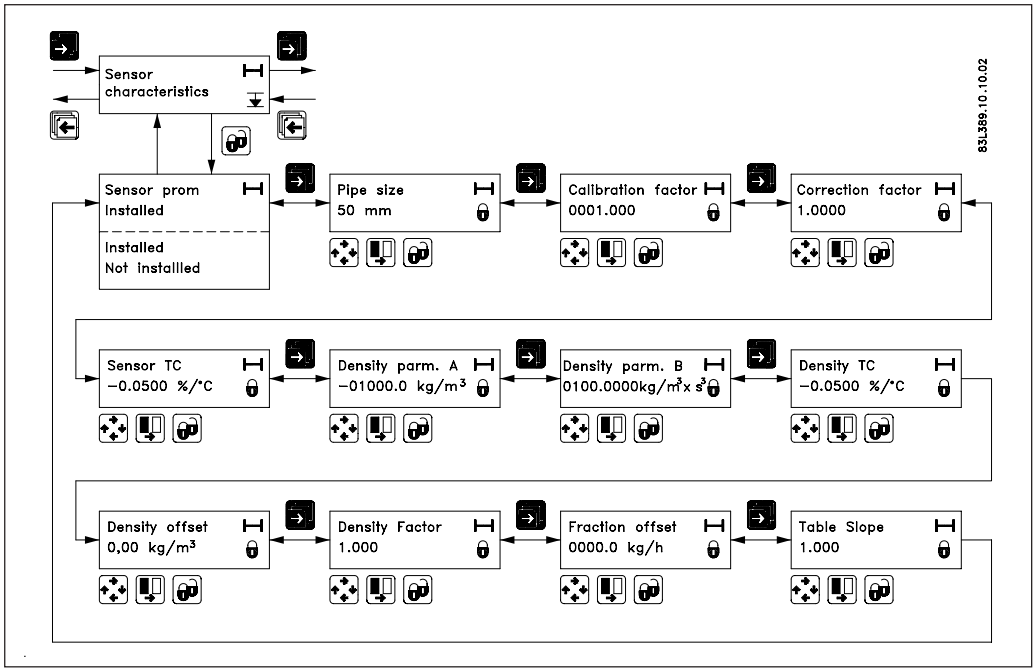
Zero adjust activates the automatic 0-point adjustment.

Reset totalizer can be used to reset internal totalizer 1, 2 or both.

Force output forces all outputs to adopt the value selected in the menu. For example, if you select 100% this means that on activation of external output the current output will show 20 mA and the frequency output will show 10,000 kHz if set to 0 - 10 kHz.

Freeze input freezes all the current measured values in the display and outputs.

7.5.4 Sensor characteristics

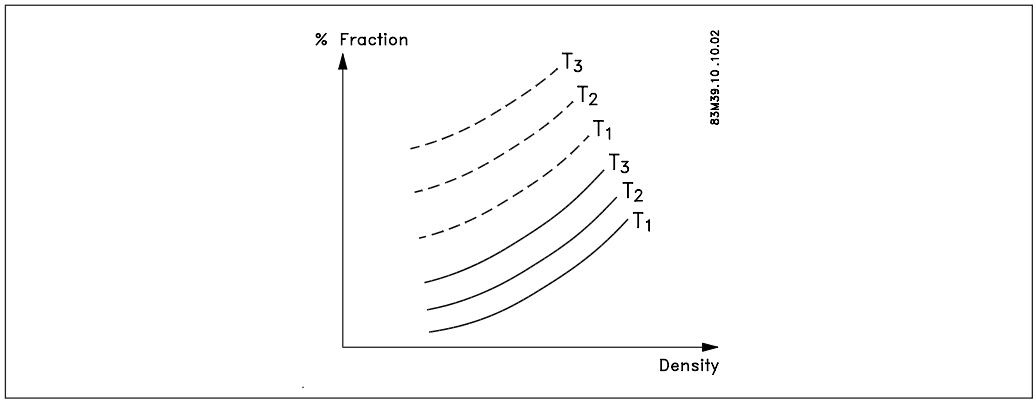


Correction factors

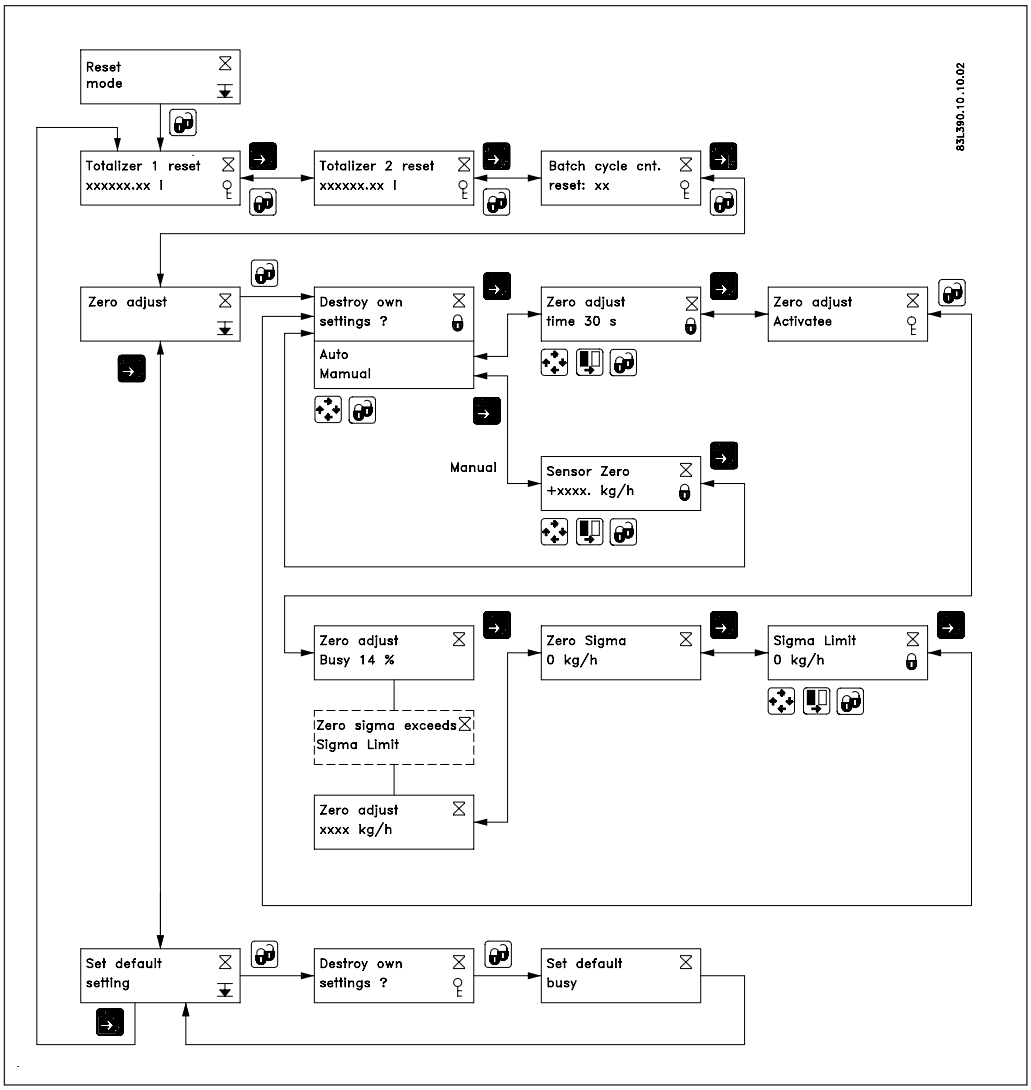
When the SENSORPROM® memory unit is installed only the parameters **correction factor, density offset, fraction offset and table slope** can be changed.
If you wish to change the mass flow measurement a percentage shift can be set under the menu option ***correction factor***. The change affects all flow-related values.
If you wish to change the density measurement a percentage shift can be set under the menu option ***density factor***.
If you want to add an offset to the density measurement this is done with **density** offset.
If the fraction flowmeter function is used it is possible to customize the function in accordance with the following equation:

Fraction = Ax + B, where

A = Table slope
B = Fraction offset
x = Measured fraction



7.5.5 Reset mode



Reset mode
Menu description

Reset mode
In the reset mode menu the totalizer 1 and 2 and the batch cycle counter can be reset.

0-point adjustment
0-point adjustment of the flow meter is done in the zero adjust menu. The adjustment can be made automatically where the meter measures and calculates the correct 0-point. In manual mode the 0-point can be programmed if this is known. Normally the *automode* is used.

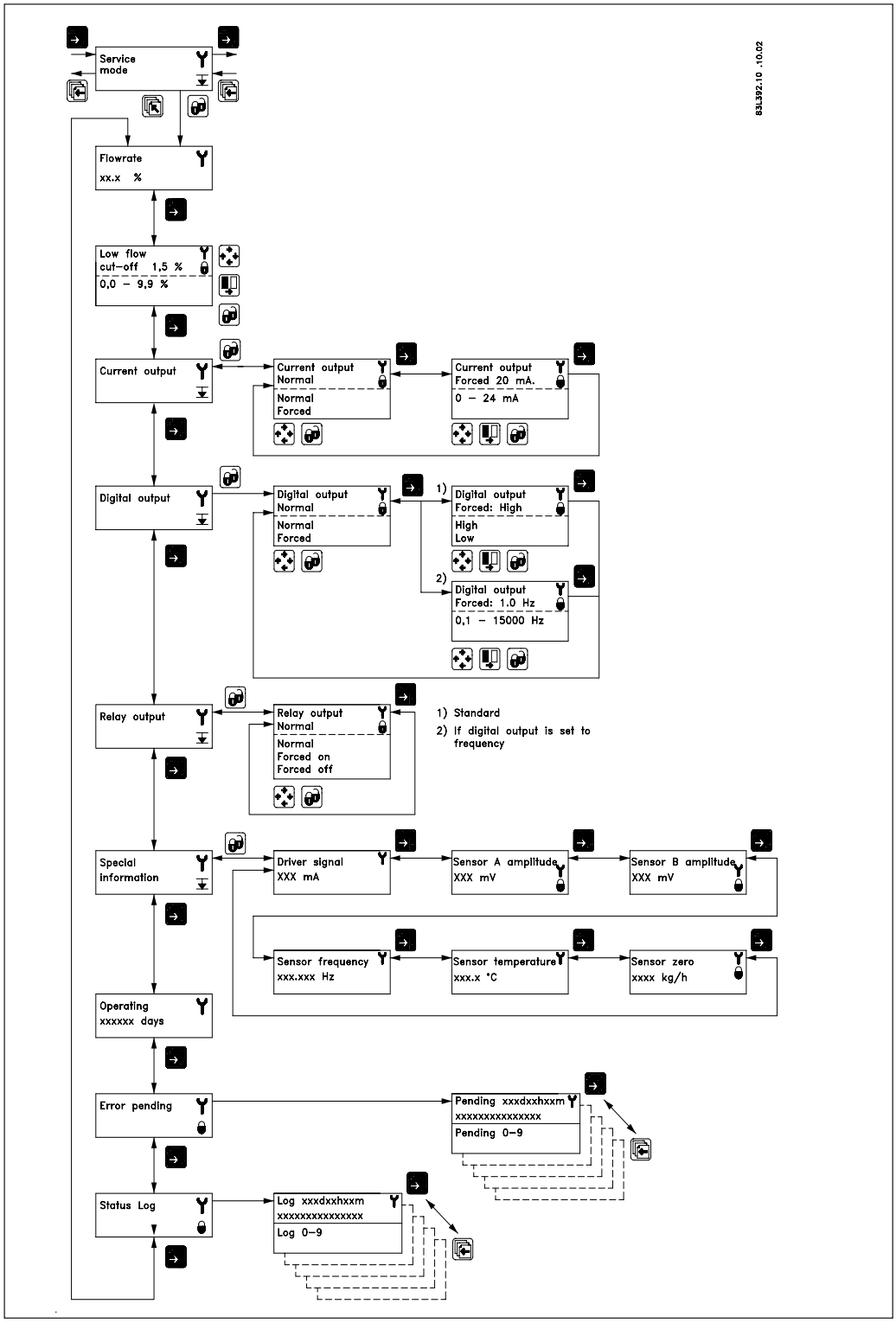
Zero adjust time determines the period of time for the automatic 0-point adjustment. As default a period of 30 sec. is used which normally is enough for a stable 0-point mesurement. If however the flowmeter is used where small flow rates are measured very accurately, a longer integration time can be selected, to obtain better 0-point measurement.

Setting the 0-point is carried out by activating *zero adjust*. A number of individual 0-point measurements are then made. The 0-point found is shown as **zero adjust**. The value **zero sigma** shows the standard deviation of the individual measurements made. The standard deviation (zero sigma) must be within a window, which is pre-defined by Siemens Flow Instruments . This window is called **sigma limit**. If the standard deviation is outside the window the following message is shown in the display: “Zero sigma exceeds sigma limit”. In this case check the installation, ensure that the pipe is full and that there is absolute 0-flow present. Then repeat the 0-point adjustment. The new 0-point is automatically stored in the SENSORPROM® and hence will remain at power down situations.

***Example;* setting the 0-point**

Keypad operation	Implementation	Display on MASS 6000
Push for 3 sec.	To access the user password	Password 0000
Push once	To unlock password	CHANGE 0000
Push once	To enter 1000 as password	CHANGE 1000
Push once	To lock password and to enter the menu	CONV.SETUP MODE> Basic settings
Push 4 times	To go to reset mode menu	Reset mode
Push once	To enter the reset mode menu	Totalizer 1 reset xxx. G
Push twice	To go to zero adjust menu	Zero adjust
Push once	To enter the zero adjust menu	Zero adjust Auto
Push twice	To go to zero adjust activation	Zero adjust +xxxxxx kg/h
Push once	To activate the 0-point adjustment routine	Zero adjust +xxxxxx kg/h
	MASS 6000 preforms 0-point adjustment	Counting up from 0 to 100%
	New 0-point is calculated and stored in SENSORPROM®	Zero adjust +yyyyyy kg/h
Push twice/ hold 3 sec.	MASS 6000 reverts to standard operation	

7.5.6 Service mode



All previous settings are re-initialised when service mode is exited using the top up key.

The error system
The error system is divided into an error pending list and a status log list. Time is gained as days, min. and hours since the error has occurred.

The first 9 pending errors are stored in error pending. When an error is removed it is removed from error pending.

The last 9 errors are stored in the error log. When an error is removed it is still kept in error log. Errors in error log is kept in 180 days.

Error pending and error log are accessible when enabled in the operator menu.

Service mode
Menu description

Service mode
The service mode menu can be used to check the flowmeters operation or as diagnostic tools for trouble shooting.

Flow rate indicates the actual flow rate in %, whilst tests are being conducted in SERVICE MODE.

Low flow cut-off can be used to supress fluctuating flow transients while experimenting.

Current output can be used to simulate a given flow, temperature, density signal etc. The feature can be used to check/calibrate connected equipment. Under ***current output forced*** a value between 0 and 24 mA can be set.
If 3 current outputs are used the function can also be used for identification of the individual outputs by activating these in turn.

Digital output can also be simulated. If the output is selected as limit functions or batch a high or low state can be simulated. If the digital output is used as flow, density or temperature output, a signal of 1 to 12,500 Hz can be simulated.

Relay output is used to simulate the relay as on or off.

Special information is used for making diagnosis of the sensor function under the present operating conditions. This makes it possible to reveal errors caused by errors in the sensor itself or errors due to application conditions disturbing the sensor function.

Driver signal indicates the current which is necessary to drive the sensor. The driver current is dependant of sensor size. In the table below the typical values for normal operation conditions are displayed. The driver current will increase if there is damping in the application, such as air/gas bubbles, hydraulic generated noise such as flow pulsations or dampning created by mechanical noise such as vibrations. The driver output circuit can deliver 36 mA maximum.

Size	Driver frq. [Hz]	Driver current [mA]
DI 1.5	120	12
DI 3	110	7
DI 6	135	15
DI 15	165	15
DI 25	125	10
DI 40	125	12

Pick-up 1/2 amplitude indicates the signal level at the two pick-up's. In normal operation conditions the level should be greater than 50 mV. A lower value indicates damping in the system and can typically be due to air/gas bubbles in the sensor.
The signal on pick-up 1 and 2 should be within the same value ±20 mV. A bigger difference indicates noise in the system due to hydraulic or mechanical errous conditions.

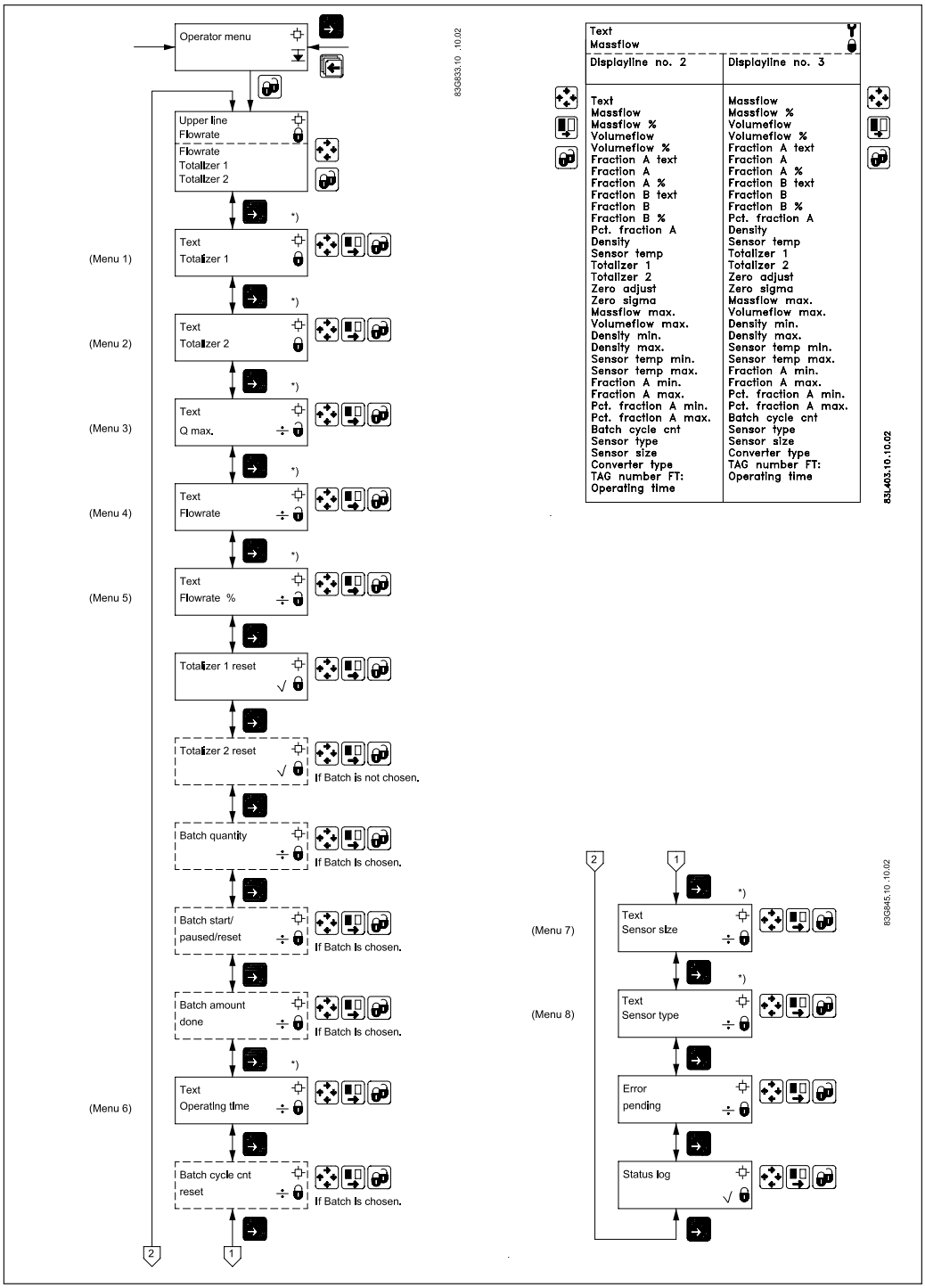
Sensor frequency gives the resonant frequency of the sensor in Hz. The frequency is dependent on dimension as well as the density of the liquid measured, see table below. Values more than ±20 Hz away of the values in the table indicate problems, check cabling, connection and operation conditions.

Sensor temperature gives the actual temperature of the sensor. The function can be used to see whether possible errors occur because the sensor is exposed to an excessively high temperature. Futhermore, errors due to missing/wrong connection of the temperature transmitter between sensor and converter can be detected.

Sensor zero can be used to check whether the zero point of the meter is satisfactory.

Operating time indicates how many days the signal converter has been in operation.

7.5.7 Operator menu setup



The upper line is always active and can never be deselected.

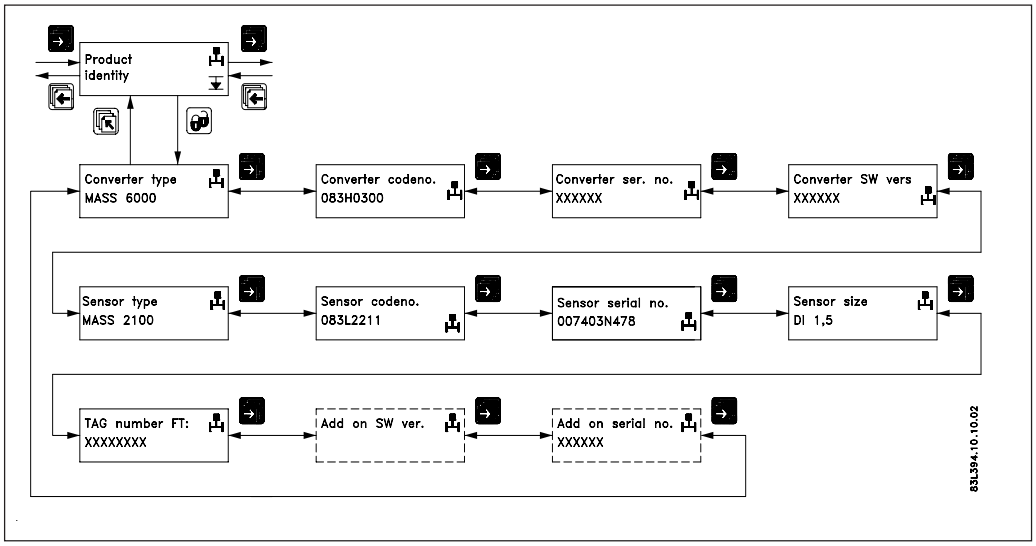
The two lower lines are for individual operator information. The forward key is used by the operator to scroll through information.

- A closed lock key in the operator menu setup, means that the menu is enabled when viewing the operator menu.
- A open lock key symbol, means that the menu is not available in the operator menu.

The middle line can either be used as a heading “Text line” for the lower line, or as a value reading. A flow reading can be individually selected for each menu.

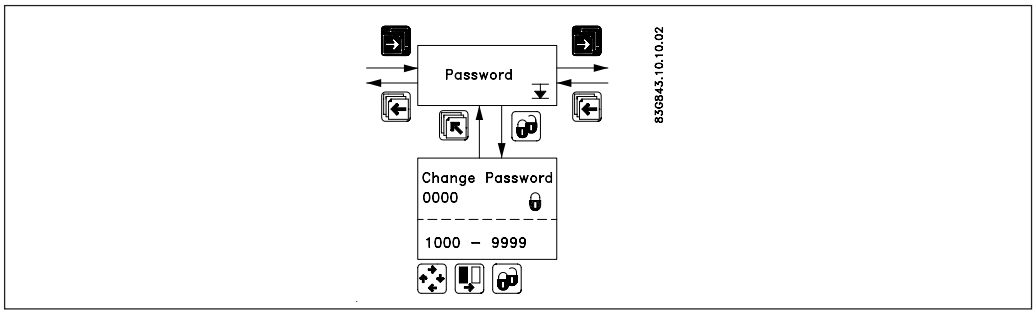
The lower line may be used for an additional flow reading to the reading already available in the upper line.

7.5.8 Product identity

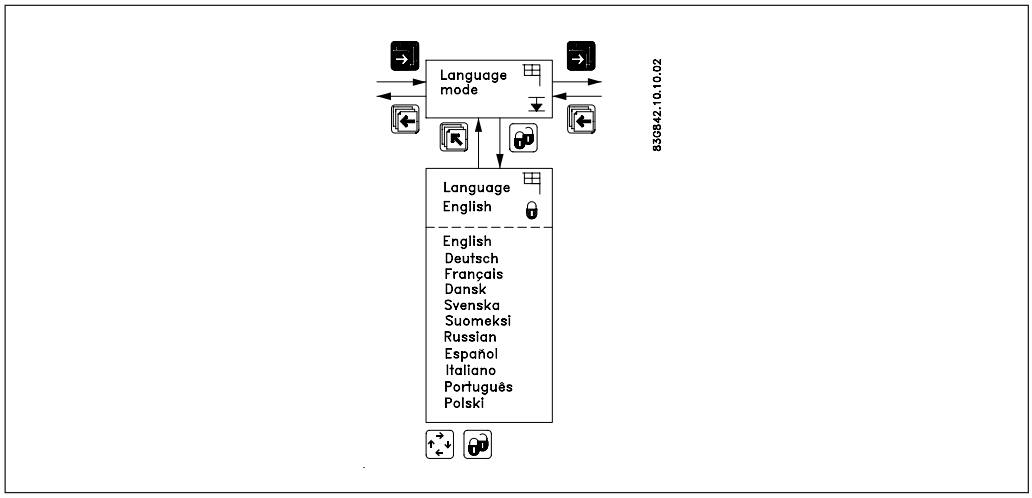


Software version of add-on module is only available if the add-on module has been installed.

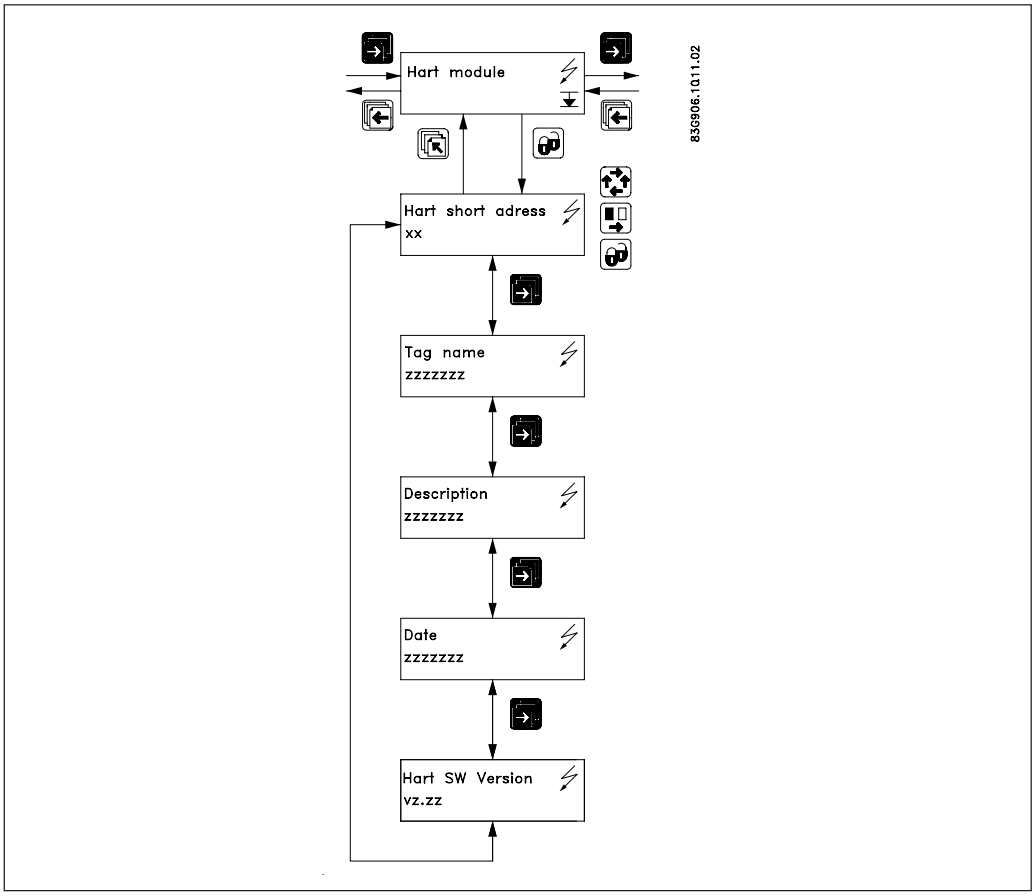
7.5.9 Change password



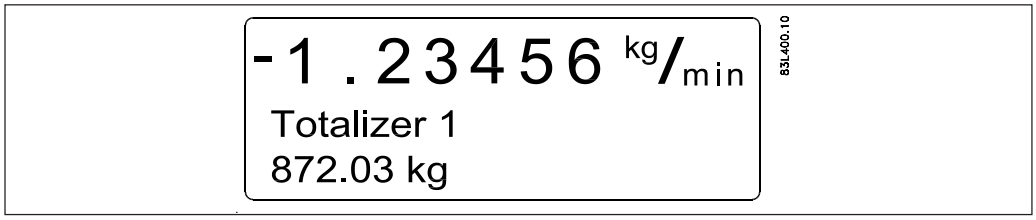
7.5.10 Language mode



7.5.11 HART® communication (Add-on module)



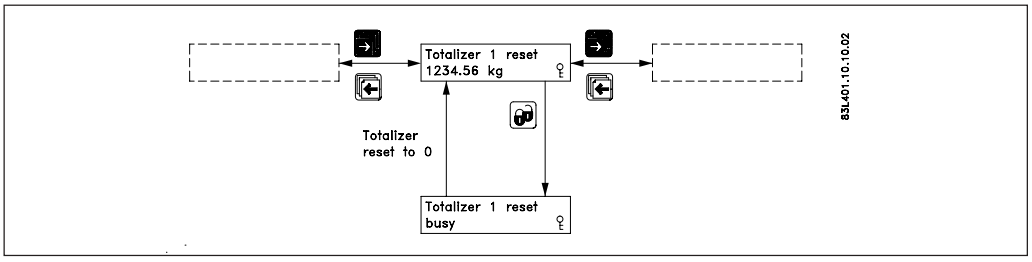
7.6.1 Operator menu Flowrate



The 1st displayline will always be active and show the value enabled in the operator menu setup.
- Massflow rate, volumeflow rate, density, temperature, totalizer1, totalizer2
- Totalizer 2

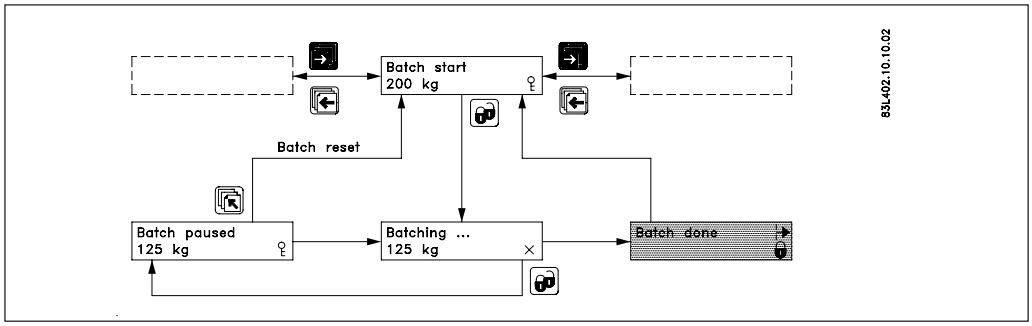
The 2nd and 3th display lines are individually set in the operator menu. The page forward key steps through the enabled settings.
- Massflow rate
  Volumeflow rate
  Density
  Temperature
- Totalizer
- Totalizer reset
- Batch control
- Batch cycle counter
- Batch cycle counter reset
- .
- .

7.6.2 Totalizer



A totalizer is reset by pressing the lock key when the corresponding totalizer reset window is open.

7.6.3 Batch



A batch can be started, paused or stopped from the operator menu, in addition to the externally operated batch control. The batch is controlled using the lock and the top up keys.

The lock key:
- Starts the batch
- Holds the batch (pause) when pressed during batching
- Continue the batch when pressed during a pause.

The top up key resets a batch completely during a pause.

Batch cycle counter The accumulated number of performed batches can be viewed when enabled in the operator menu setup.

Batch cycle counter reset The batch cycle counter is reset by pressing the lock key in the “batch cycle cnt reset” menu.

7.7.1 Parameters

Parameter	Factory setting	Settings available
Password		
Password	1000	1000 – 9999
Basic settings		
Flow direction	Positive	Positive, negative
Massflow max.	Dim. dependent	Dim. dependent
• Weight units	Dim. dependent	mg, g, kg, ton, lb
• Time units	Dim. dependent	s, min, h, d
Volumeflow max.	Dim. dependent	Dim. dependent
• Volume units	Dim. dependent	m^3, ml, l, hl, kl, Ml, ft^3, in^3, US G, US MG, UK G, UK MG
• Time units	Dim. dependent	s, min, h, d
Density		
• Minimum	+0.1 g/cm^3	-20000.0 kg/m^3 - +20000.0 kg/m^3
• Maximum	+2.0 g/cm^3	-20000.0 kg/m^3 - +20000.0 kg/m^3
• Weight units	g	mg, g, kg, ton, lb
• Time units	cm^3	cm^3, m^3, ft^3, in^3
Sensor temp.		
• Minimum	-50 °C	-250 °C - +250 °C
• Maximum	+250 °C	-250 °C - +250 °C
• Temperature units	°C	°C, °F, K
Fraction A/B max.	Application dependent	Application dependent
• Weight units	kg	mg, g, kg, ton, lb
• Time units	h	s, min, h, d
Totalizer 1	Mass flow	Mass flow, fraction A, fraction B, volume flow
	Forward	Forward, reverse, net
	Dim. dependent	mg, g, kg, ton, lb
Totalizer 2	Volume flow	Mass flow, fraction A, fraction B, volume flow
	Forward	Forward, reverse, net
	Dim. dependent	m^3, ml, l, hl, kl, Ml, ft^3, in^3, US G, US MG, UK G, UK MG
Low flow cut off	1.5 %	0 – 9.9 %
Empty pipe limit	Dim. dependent	-20000.0 g/cm^3 - +20000.0 g/cm^3
Noise filter	3	1 (min.) to 5 (max.)
Error level	Warning	Fatal, permanent, warning
Output		
Current output 1	Off	Mass flow, fraction A, fraction B, volume flow, sensor temp., density, pct. fraction A, off
• Direction	Unidirectional	Unidirectional, bidirectional
• Output mode	4 – 20 mA	0 - 20 mA, 4 - 20 mA
• Time constant	5 s	0 – 30 s
Digital output 1	Pulse	Pulse, frequency, error level, error number, direction/limit, batch, off
Pulse	Mass flow	Mass flow, fraction A, fraction B, volume flow
• Amount/pulse	Dim. dependent	Dim. dependent
• Pulse polarity	Positive	Positive, negative
• Pulse width	66 ms	64 µs, 130 µs, 260 µs, 510 µs, 1.0 ms, 2.0 ms, 4.1 ms, 8.2 ms, 16 ms, 33 ms, 66 ms, 130 ms, 260 ms, 520 ms, 1.0 s, 2.1 s, 4.2 s
Frequency	Off	Mass flow, fraction A, fraction B, volume flow, sensor temp., density, pct. fraction A
• Direction	Unidirectional	Unidirectional, bidirectional
• Max. frequency	10 kHz	500 Hz, 1 kHz, 5 kHz, 10 kHz
• Time constant	5 s	0 – 30 s
Error number	Off	0 - 255

Direction/limit	Off	Mass flow, fraction A, fraction B, volume flow, sensor temp., density, pct. fraction A
• Limit mode	1 set point	1 set point, 2 set points
• Setpoint(s)	0 % (0/100 %)	-100 – 100 %
• Hysteresis	5 %	0 – 100 %
Batch		Mass, fraction A, fraction B, volume
• Quantity	5 kg , 5 l	0 – 9999999 kg, 0 – 9999999 l
• Compensation	0 kg , 0 lq	-100000 – 100000 kg, -100000 – 100000 l
• Counter	Down	Up, down
Relay output 1	Off	Error level, error number, direction/limit, off
External input *External input*	Off	Start batch, hold/continue (batch), stop batch, zero adjust, totalizer reset, force output, freeze output, off
Sensor characteristics *Correction factor*	1	-99.999999 – 99.999999
Density offset	0	-9999.9999 – 9999.9999 kg/m^3
Density factor	1	-9.999999 – 9.999999
Fraction offset	0	-9999.9999 – 9999.9999 kg/h
Table slope	1	-9999.9999 – 9999.9999
Language	English	English, German, French, Danish, Swedish, Finish, Spanish, Russian, Italian, Portugese
Operator menu *Primary field*	Mass flow	Mass flow, volume flow, fraction A, pct. fraction A, fraction B, totalizer 1, totalizer 2, sensor temp., density
Title/subtitle line	Mass flow	Massf low, mass flow %, volume flow, volume flow %, fraction A text, fraction A, fraction A %, fraction B text, fraction B, fraction B %, pct. fraction A, density, sensor temp, totalizer 1, totalizer 2, batch cycle cnt.

7.7.2 Dimension-dependent factory setting

Sensor type	Mass flow			Volume flow			Pulse output & factory setting					
	Factory setting kg/h	Min.	Max.	Factory setting kg/h	Min.	Max.	Mass pr. pulse	Pulse unit	Totalizer pulse unit	Volume pr. pulse	Pulse unit	Totalizer pulse unit
DI 1.5	20		125	20		125	1	g	g	1	ml	ml
DI 3	75	-	500	75	-	500	1	g	g	1	ml	ml
DI 6	300	-	2000	300	-	2000	10	g	g	10	ml	ml
DI 15	1500	-	10000	1500	-	10000	1	kg	kg	1	l	l
DI 25	7500	-	50000	7500	-	50000	1	kg	kg	1	l	l
DI 40	25000	-	100000	25000	-	100000	10	kg	kg	10	l	l
DN 10	1500	-	10000	1500	-	10000	1	kg	kg	1	l	l
DN 25	7500	-	40000	7500	-	40000	1	kg	kg	1	l	l
DN 50	25000	-	160000	25000	-	160000	10	kg	kg	10	l	l

7.8.1 Error handling

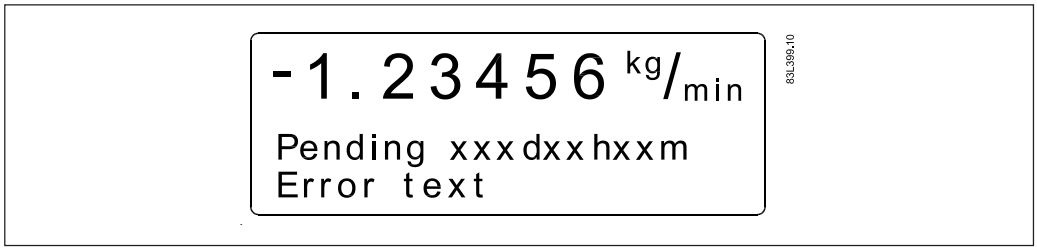
Error system
The converter system is equipped with an error and status log system with 4 groups of information.
- Information without a functional error
- Warnings which may cause malfunction in the application. The cause of the error may disappear on its own
- Permanent errors which may cause malfunction in the application.
- Fatal error which is essential for the operation of the flowmeter

2 menus are available in the service and operator menus for registration of information and errors
- Error pending
- Status log

Error pending
The first 9 standing errors are stored in “error pending”. When an error is removed it clears from “error pending”.
The acceptance level for “error pending” can be individual configured to a particular application. The acceptance level is set in the “basic setting” in the setup menu.

Acceptance levels
- Fatal error: Fatal errors are registered as errors
- Permanent errors (Permanent and fatal errors are registered as errors)
- Warning (Default value): Warnings, permanent and fatal errors are registered as errors

The error information is displayed in the title and subtitle line. The title line will show the time since occurrence of error. The subtitle line will flash between an error text and a remedy text. The error text will indicate type of error (I, W, P or F), error no. and the error text. The remedy text will inform the operator of the action to take to remove the error.



Status Log
Like “error pending” except that information, warnings, permanent and fatal errors are always stored in the “status log”. The “status log” stores the last 9 message during the last 180 days.

Alarm field
The alarm field on the display will always flash with an error pending.

Error output
The digital and relay output can be individually activated by an error (error level). The relay output is default selected to error level. An output can also be selected to activate on a single error number.
The alarm field, error output and error pending will always operate together.
The analog output will turn to a 1 mA level when in the 4-20 mA mode.

Operator menu
Error pending and status log are as default enabled in the operator menu.

7.8.2 List of error numbers

Error No.	Error text Remedy text	#Comment	Outputs status	Input status
1	**I1 - *Power on*** OK	Power on has activated	Active	Active
2	**I2 - *Add-on Module*** Applied	A new module has been added to the system	Active	Active
3	**I3 - *Add-on Module*** Install	An add-on module is defect or has been removed. This can also be an internal add-on module	Active	Active
4	**I4 - *Param. corrected*** OK	A less vital parameter in the converter has been replaced by its default value	Active	Active
20	**W20 - *Totalizer 1*** Reset manually	During initialisation the check of the saved totalize value has failed. It is not possible to rely on the saved totalizer value any more. The totalizer value must be reset manually in order to rely on future readings	Active	Active
20	**W20 - *Totalizer 2*** Reset manually	During initialisation the check of the saved totalize value has failed. It is not possible to rely on the saved totalizer value any more. The totalizer value must be reset manually in order to rely on future readings	Active	Active
21	**W21 - *Pulse overflow*** Adjust pulse settings	Actual flow is too big compared with pulse width and mass/pulse	Reduced pulse width	Active
22	**W22 - *Batch timeout*** Check installation	Duration of batching has exceeded a predefined max. time	Batch output on zero	Active
23	**W23 - *Batch overrun*** Check installation	Batch quantity has exceeded a predefined maximum overrun mass or volume	Batch output on zero	Active
24	**W24 - *Batch neg. flow*** Check flow direction	Negative flow direction during batch	Active	Active
30	**W30 - *Flowsaturated*** Adjust max. flow	Flow is above $Q_{max.}$ settings	Max. 120 %	Active
31	**W31- *Empty pipe***	Pipe is empty	Zero	Active
32	**W32 - *Temp. to high*** Adjust temperature	The temperature of the fluid has exceeded the max. temperature rating of the sensor (180 °C)	Active	Active
33	**W33 - *Temp. to low*** Adjust temperature	The temperature of the fluid has exceeded the min. temperature rating of the sensor (-50 °C)	Active	Active
34	**W34 - *Zero Adj. fail*** Check flow = zero	The zero-point adjustment values are outside the limit because there is not zero flow in the sensor. Check zeroflow conditions, valves, pumps etc.	Active	Active
35	**W35 - *Current Out 1*** Check max. settings	Current output exceeds 120%. Ensure that the sensor is correctly sized and check max. flow setting	Active	Active
36	**W36 - *Freq/Pulse Out1*** Check max. settings	Freq/Pulse output exceeds 120%. Ensure that the sensor is correctly sized and check max. flow setting	Active	Active
40	**P40 - *SENSORPROM®*** Insert	SENSORPROM® unit not installed	Active	Active
41	**P41 - *Parameter range*** Switch off and on	A parameter is out of range. The error will disappear at the next power-on	Active	Active
42	**P42 - *Current output*** Check cables	Current loop is disconnected or the loop resistance is too big	Active	Active
43	**P43 - *Internal error*** Switch off and on	Internal error	Active	Active
49	**P49 - *Protec. viol.*** Switch off and on	Too many errors occured at the same time. Some ***errors*** are not detected correctly	Active	Active
50	**P50 - *Temp. cable*** Check cable	Error in temperature sensor, check cables and connectors	Active	Active
51	**P51 - *Pick-up 1*** Check cable/install.	Pick-up 1 amplitude too low. Check cables or application for damping (air/gas in liquid)	Active	Active
52	**P52 - *Pick-up 2*** Check cable/install.	Pick-up 2 amplitude too low. Check cables or application for damping (air/gas in liquid)	Active	Active
60	**F60 - *CAN comm. error*** Converter/add-on module	CAN bus communication error. An add-on module, the display module or the converter is defect	Zero	Inactive
61	**F61 - *SENSORPROM® err.*** Replace	It is not possible to rely on the data in SENSORPROM® unit	Active	Active
62	**F62 - *SENSORPROM® ID*** Replace	The SENSORPROM® unit ID do not comply with the product ID. The SENSORPROM® unit is from another type of product SITRANS F C MASSFLO, SITRANS F US SONOFLO etc.	Zero	Inactive
63	**F63 - *SENSORPROM®*** Replace	It is not possible to read from the SENSORPROM® unit	Active	Active
70	***F70 - Pick-up phase***	Check cables/polarity	Active	Active
71	***F71 - Driver phase***	Check cables/polarity	Active	Active
80-83	***F80, 81, 82, 83 - Internal error***	Restart or replace	Active	Active
84	***F84 - Sensor level***	Pick-up amplitud saturated	Active	Active
97	***F97 - Add-on module to old***	Replace	Active	Active

Error code level:
W = Warning, F = Fatal, P = Permanent

8. Trouble shooting
8.1 MASS 6000

Symptom	Output signals	Error code	Cause	Remedy
Empty display	Minimum		1. Supply voltage	1. Check supply voltage
			2. MASS 6000 defective	2. Replace MASS 6000
No flow signal	Minimum		1. Current output deselected	1. Activate current output
			2. Digital output deselected	2. Activate digital output
			3. Reverse flow direction	3. Change direction
		W31	Measuring pipe empty	Ensure that the measuring pipe is full
		F60	Internal error	Replace MASS 6000
	Undefined	P42	1. No load on current output	1. Check cables/connections
			2. MASS 6000 defective	2. Replace MASS 6000
		P41	Initializing error	Switch off MASS 6000, wait 5 s and switch on again
Indicates flow with no flow in pipe	Undefined		Measuring pipe empty	Select empty pipe limit Ensure that the measuring pipe is full of liquid
Unstable flow signal	Unstable		1. Pulsating flow	1. Increase time constant
			2. Air bubbles in medium	2. Ensure medium does not contain air bubbles
			3. Vibrations	3. Ensure that the sensor is mounted on a rigid frame without vibrations
			4. Pump noise	4. Ensure that pump frequency is different from resonance frequency of sensor
Measuring error	Undefined		Faulty zero-point	Make new zero-point adjustment
		P40	No SENSORPROM® unit	Install SENSORPROM® unit
		F61	Deficient SENSORPROM® unit	Replace SENSORPROM® unit
		F62	Wrong SENSORPROM® unit	Replace SENSORPROM® unit
		F63	Defective SENSORPROM® unit	Replace SENSORPROM® unit
		F80-83	Loss of internal data	Replace MASS 6000
	Maximum	W30	Flow exceeds 120% of $Q_{max.}$	Check $Q_{max.}$ (Basic Settings)
		W21	Pulse overflow • Mass/pulse too small • Pulse width too large	Change mass/pulse Change pulse width
Loss of totalizer data	OK	W20	Initializing error	Reset totalizer manually

T. s.

8.2 Check for air in the system

In case of large air collections non-homogenesously distributed in the sensor, the air in the liquid can disturb the flowmeter and lead to incorrect measurement, whereas homogenesously distributed air and solids will not disturb measurement.

1) 0-point unstable or exceeding limit (SIGMA LIMIT, refer to reset menu)
2) Measurement of mass flow rate incorrect ?
3) Output signal unstable
4) Error symbol on (type W31, W34, F70, F71)

If one or more of the above symptoms is observed, the cause can be that there is air in the liquid. Air in the system can be checked through the following tests:

1. Use of Service Mode
Go to the ***service mode*** menu and read the values under the menu ***driver amplitude***. Compare the values with the table listed in section 7.5. If the current is higher than specified it might be because there are air bubbles in the liquid.

2. Increase of pump pressure
Close the valve, if any, after the sensor. Start the pump and consequently increase the pump pressure. If the 0-point becomes more stable there are non-homogenseously distributed air bubbles in the system.

3. Connection of pick-up signals in parallel (only possible for 19“ versions)
The fault can also be found by connecting pick-up 1 and pick-up 2 in parallel. Move the leads on terminal 85 to terminal 87 on the connection PCB. This will send the same pick-up signal into both channels in the converter.

If the 0-point becomes more stable by one of the above mentioned examples the conclusion is that there is air in the system which affects the flowmeter operation.

Air generation souces
The air can typically be generated by the following causes:

1) Suction pressure of pump too low (pump cavitates)
2) Blocked filter or other obstruction ahead of sensor. This can produce cavitation and air formation
3) Volatile liquid producing air bubbles at low pressure
4) Pressure in sensor too low because too low a pressure in the piping after the sensor
5) Incorrect location of sensor, refer to chapter 4 "Installation of sensor".

8.3 Check of 0-point accuracy

If you want to check whether the 0-point is within the accuracy specifications given by Siemens Flow Instruments , a straight forward way is as follows:

Go to the ***basic settings*** menu, set low flow cut-off to 0%. Go to totalizer 1, select bidirectional mode and select massflow.

Go back to ***operator*** menu, reset the totalizer 1 (if selected in the operator menu, otherwise reset the totalizer in the reset menu).

Now go to ***totalizer 1*** in the operator menu and monitor the value. The totalizer now displays the actual 0-point of the system. Read the totalizer value after 1 min. mutiply the value with 60, this will give the value xxxx.x kg/h. This can for the sensor dimension in question be compared with the specifications given under section 2.3 “Meter uncertainty”, max. zero point error.

9. Ordering

Ordering procedure

MASS 6000 can be ordered and delivered in three basic configurations:

- MASS 6000 19" signal converter for rack mounting and MASS 2100 sensor for separate mounting
- MASS 6000 IP 67 compact signal converter mounted on MASS 2100 sensor
- MASS 6000 Ex-d compact signal converter mounted on MASS 2100 sensor

Compact mounting of electronics and sensor comprises the sensor range DI 3 to DI 40. For practical reasons the MASS 2100 DI 1.5 can only be installed as a separate system.

Ordering is made by means of the "Quick Guide System", in which the most frequently used configurations are listed, in section 9.1. However, if the required system cannot be found here, it is possible to configure as "Build-up System", in section 9.2. Please note that here the system is configured as compact or separate system under „**versions".**
Compact systems have one ordering number, when separate mounting is required you have to specify a code number for the converter and a code number for the sensor.

9.1 Sensor MASS 2100

	Connection	Wetted material	Heated	Configuration	Version EEx ia IIC T4-T6 Code no.
DI 1.5	Thread ISO 228/1 G 1/4"	W. 14435	No heating	Standard	**FDK:083L2211**
			No heating	Density	**FDK:083L2216**
		Hastelloy C-22	No heating	Standard	**FDK:083L2213**
			No heating	Density	**FDK:083L2218**
	Thread ISO 228/1 1/4" NPT, ANSI/ASME	W. 14435	No heating	Standard	**FDK:083L2212**
			No heating	Density	**FDK:083L2217**
		Hastelloy C-22	No heating	Standard	**FDK:083L2214**
			No heating	Density	**FDK:083L2219**

Configuration: *Standard*

	Connection	Wetted material	Heated	Versions			
				EEx ia IIC T3-T6 Code no. FDK:083L	EEx de [ia] IIC T3-T6 Code no. FDK:083L	Compact IP 67, 230 V a.c./d.c. Code no. FDK:083L	Compact IP 67, 24 V a.c./d.c. Code no. FDK:083L
DI 3	Thread ISO 228/1 G 1/4"	W. 14435	No heating	**2551**	**2550**	**2572**	**2709**
		W. 14435	DIN 2635, PN 40	**2552**			
		Hastelloy C-22	No heating	**2553**	**2700**	**2644**	**2714**
	Thread ISO 228/1 1/4" NPT, ANSI/ASME	W. 14435	No heating	**2554**			**2715**
		Hastelloy C-22	No heating	**2555**	**2716**	**2718**	**2717**
DI 6	DN 10, flange DIN 2635, PN 40 Type of contact face DIN 2526 form C	W. 14435	No heating	**2557**	**2556**	**2573**	**2719**
		W. 14435	DIN 2635, PN 40	**2558**			
		Hastelloy C-22	No heating	**2559**	**2720**	**2722**	**2721**
DI 15	DN 15, flange DIN 2635, PN 40 Type of contact face DIN 2526 form C	W. 14435	No heating	**2561**	**2560**	**2574**	**2723**
		W. 14435	DIN 2635, PN 40	**2562**			
		Hastelloy C-22	No heating	**2563**	**2724**	**2600**	**2725**
DI 25	DN 25, flange DIN 2635, PN 40 Type of contact face DIN 2526 form C	W. 14435	No heating	**2565**	**2564**	**2575**	**2627**
		W. 14435	DIN 2635, PN 40	**2566**			
		Hastelloy C-22	No heating	**2567**	**2726**	**2728**	**2727**
DI 40	DN 40, flange DIN 2635, PN 40 Type of contact face DIN 2526 form C	W. 14435	No heating	**2569**	**2568**	**2576**	**2729**
		W. 14435	DIN 2635, PN 40	**2570**			
		Hastelloy C-22	No heating	**2571**	**2730**	**2732**	**2731**

9.2 Build-up ordering

Type no. MASS 2100 - [ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ]

Meter size and process connection ☐ Standard versions

	DI 1.5	DI 3	DI 6	DI 15	DI 25	DI 40
Pipe thread (only available with type of contact faces 'A')						
G 1/4" ISO 228-1, PN 100	1401	1411				
1/4" NPT, ANSI/ASME B 1.20.1, PN 100	1402	1412				
Flange						
DN 10, DIN 2635, PN 40			2221			
DN 15, DIN 2635, PN 40			2222	2232		
DN 25, DIN 2635, PN 40				2233	2243	
DN 40, DIN 2635, PN 40					2245	2255
DN 50, DIN 2635, PN 40						2256
DN 10, DIN 2637, PN 100			2421			
DN 15, DIN 2637, PN 100			2422	2432		
DN 25, DIN 2637, PN 100				2433	2443	
DN 40, DIN 2637, PN 100					2445	2455
DN 50, DIN 2637, PN 100						2456
1/2", ANSI B 16.5, Class 150, (ISO 7005-1, PN 20)			3121	3131		
3/4", ANSI B 16.5, Class 150, (ISO 7005-1, PN 20)			3122	3132		
1", ANSI B 16.5, Class 150, (ISO 7005-1, PN 20)					3143	
1 1/2", ANSI B 16.5, Class 150, (ISO 7005-1, PN 20)					3145	3155
2", ANSI B 16.5, Class 150, (ISO 7005-1, PN 20)						3156
1/2", ANSI B 16.5, Class 600, (ISO 7005-1, PN 100)			3421	3431		
3/4", ANSI B 16.5, Class 600, (ISO 7005-1, PN 100)			3422	3432		
1", ANSI B 16.5, Class 600, (ISO 7005-1, PN 100)					3443	
1 1/2", ANSI B 16.5, Class 600, (ISO 7005-1, PN 100)					3445	3455
2", ANSI B 16.5, Class 600, (ISO 7005-1, PN 100)						3456
Dairy (only available with type of contact faces 'A')						
DN 10, DIN 11851 (screwed connection) PN 40			4221			
DN 15, DIN 11851 (screwed connection) PN 40			4222	4232		
DN 25, DIN 11851 (screwed connection) PN 40				4233		
DN 32, DIN 11851 (screwed connection) PN 40					4244	
DN 40, DIN 11851 (screwed connection) PN 25					4245	
DN 50, DIN 11851 (screwed connection) PN 25						4256
DN 65, DIN 11851 (screwed connection) PN 25						4257
25 mm, Clamp, SMS 3016, ISO 2852, BS 4825 part 3, PN 16			5123	5133		
38 mm, Clamp, SMS 3016, ISO 2852, BS 4825 part 3, PN 16					5146	
51 mm, Clamp, SMS 3016, ISO 2852, BS 4825 part 3, PN 16						5158
25 mm, ISO 2853, SS 3351, BS 4825 part 4 (screwed connection), PN 16			6123	6133		
38 mm, ISO 2853, SS 3351, BS 4825 part 4 (screwed connection), PN 16					6146	
51 mm, ISO 2853, SS 3351, BS 4825 part 4 (screwed connection), PN 16						6158

Type of contact faces

For pipe thread / Dairy connection. State 'A' only	A
End Flange Facings DIN 2526, form C (PN 40), form E (PN 100)/ANSI B 16.5 (ISO 7005-1) type 11	B
End Flange Facings DIN 2512 Nut form N	C
End Flange Facings ANSI B 16.5 (ISO 7005-1) small groove	D

Wetted materials

1.4435 (Stainless steel)	0
2.4602 (Hastelloy C-22)[1]	1

Heated sensor (Except for DI 1.5)

No heating connection	0
Flange heating connection: DIN 2635, PN 40	1
Flange heating connection: ANSI B 16.5 Class 150	2

Version, DI 1.5

Sensor with CENELEC EEx ia IIC T4-T6 DI 1.5 (max. 125 °C)	2
Sensor with CENELEC EEx ia IIC T3-T6 DI 1.5 (max. 180 °C)	3

Versions, DI 3, DI 6, DI 15, DI 25 and DI 40

Sensor with CENELEC EEx ia IIC T3-T6	1
Sensor inclusive compact CENELEC EEx de [ia] IIC T3-T6 converter	D
Sensor inclusive compact IP 67, 24 V a.c/d.c. converter	E
Sensor inclusive compact IP 67, 230 V a.c/d.c. converter	F

Configuration

Standard	0
Density	1
Brix/Plato	2
Fraction flow (specified by customer), contact Siemens Flow Instruments	Z

Flow calibration

Standard calibration included in sensor (3 flow x 2 points)	A
Standard calibration, matched pair (3 flow x 2 points; FDK:085F7351)	B
Customer specified, matched pair (5 flow x 2 points; FDK:085F7372)	C
Accredited calibration (EN 45001), certificate DANAK, matched pair (5 flow x 2 points; FDK:085F7382)	D

Certificate EN 45014 (for wetted parts)[2]

None	0
Pressure testing. EN 10204-2.3	1
None	0
Material certificate EN10204-3.1B	1
None	0
Welding certificate EN 10204-3.1B	1

1) *Only available for connections specified as standard versions, exclusive dariy connection*
2) *Certificate not available for dairy connections, material 1.4404 or 1.4435*

9.3 Signal converter

Compact IP 67

Description	Version	Enclosure	Code no.	Symbol
Signal converter MASS 6000 for compact and wall mounting	115/230 V a.c. 50/60 Hz	IP 67, fibre-glass reinforced polyamide	**FDK:083H0222**	
	11-30 V d.c./ 11-24 V a.c	IP 67, fibre-glass reinforced polyamide	**FDK:083H0223**	
Signal converter MASS 6000 inclusive wall mounting enclosure	115/230 V a.c. 50/60 Hz	IP 67, fibre-glass reinforced polyamide	**FDK:083H0217**	
	11-30 V d.c./ 11-24 V a.c	IP 67, fibre-glass reinforced polyamide	**FDK:083H0218**	

Wall mounting kit

Description	Code 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

Description	Version	Code no.	Symbol
Connection plate/PCB	115-230 V/ 12-24 V	**FDK:083H4260**	
Terminal box kit, consisting of polyamid terminal box, cable/connector between PCB and sensor piedestal, PCB, seal and screws (4 pcs.) for mounting on sensor		**FDK:083H3060**	
Standard Pg 13.5 screwed cable entries for above cables (nickel-plated brass)	2-off	**FDK:083G0227**	
Standard Pg 13.5 screwed cable entries type Jacob 50.013PA for above cables (Ø 9-10 mm) in black polyamide (100°C)	2-off	**FDK:083G0228**	
Sealing screws for sensor/signal converter	2-off	**FDK:085U0221**	
Stainless steel (AISI 316) terminal box with lid		**FDK:085U1000**	
Polyamid terminal box Complete incl. terminals excl. lid		**FDK:085U1002**	
Polyamid lid for terminal box		**FDK:085U1003**	

9.4 Compact Ex-d

Description	Code no.	Symbol
Signal converter MASS 6000 Compact Ex de [ia] T3-T6 for mounting on top of MASS 2100 sensor	**FDK:083H0221**	

Spareparts for compact Ex-d

Description	Code no.	Symbol
Ex-d converter insert	**FDK:083H3061**	
Front lid	**FDK:083U2348**	
Screws between piedestal and sensor *(4 pcs.)*	**FDK:083X1407**	

9.5 Signal converter 19"
Standard version

Description	Version	Supply voltage	Code no.	Symbol
MASS 6000 signal converter IP 20 version for 19" rack and panel mounting	1 current output 1 frq./pulse output 1 relay output	115-230 V.a.c./ 50/60Hz	**FDK:083H0200**	
		24 V a.c./d.c.	**FDK:083H0201**	
	3 current outputs 2 frq./pulse outputs 2 relay outputs	115-230 V.a.c./ 50/60Hz	**FDK:083H0204**	
		24 V a.c./d.c.	**FDK:083H0205**	
MASS 6000 signal converter IP 20 19" version wall mounting enclosure	1 current output 1 frq./pulse output 1 relay output	115-230 V.a.c./ 50/60Hz	**FDK:083H0208**	
		24 V a.c./d.c.	**FDK:083H0209**	
	3 current outputs 2 frq./pulse outputs 2 relay outputs	115-230 V.a.c./ 50/60Hz	**FDK:083H0212**	
		24 V a.c./d.c.	**FDK:083H0213**	

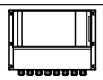
9.6 Signal converter 19"
Ex-version

Description	Version	Supply voltage	Code no.	Symbol
MASS 6000 signal converter, [EEx ia] IIC IP 20 version for 19" rack and panel mounting	1 current output 1 frq./pulse output 1 relay output	115-230 V.a.c./ 50/60Hz	**FDK:083H0202**	
		24 V a.c./d.c.	**FDK:083H0203**	
	3 current outputs 2 frq./pulse outputs 2 relay outputs	115-230 V.a.c./ 50/60Hz	**FDK:083H0206**	
		24 V a.c./d.c.	**FDK:083H0207**	
MASS 6000 signal converter, [EEx ia] IIC 19" version wall mounting enclosure	1 current output 1 frq./pulse output 1 relay output	115-230 V.a.c./ 50/60Hz	**FDK:083H0210**	
		24 V a.c./d.c.	**FDK:083H0211**	
	3 current outputs 2 frq./pulse outputs 2 relay outputs	115-230 V.a.c./ 50/60Hz	**FDK:083H0214**	
		24 V a.c./d.c.	**FDK:083H0215**	

9.7 Panel mounting kits

Description	Code no.	Symbol
Panel mounting kit for 19" insert (21 TE) IP 65 enclosure in ABS plastic for panel-front mounting	**FDK:083F5030**	
Panel mounting kit for 19" insert (42 TE) IP 65 enclosure in ABS plastic for panel-front mounting	**FDK:083F5031**	
Back of panel mounting kit for 19" insert (21 TE) IP 20 enclosure in aluminium	**FDK:083F5032**	
Back of panel mounting kit for 19" insert (42 TE) IP 20 enclosure in aluminium	**FDK:083F5033**	
Front cover (7 TE)	**FDK:083F4525**	

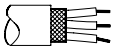
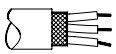
Wall boxes (Without back plates/PCB)

Description	Code no.	Symbol
Wall mounting enclosure for MASS 6000 19" version (21 TE)	**FDK:083F5037**	
Wall mounting enclosure for MASS 6000 19" version (42 TE)	**FDK:083F5038**	

Backplates/PCB for 19" versions

Description	Enclosure	Version	Code no.	Symbol
Signal converter IP 20	19"	12-24 V 115-230 V	**FDK:083H4272**	
Signal converter [EEx ia] IIC IP 20	19"	12-24 V 115-230 V	**FDK:083H4273**	
Signal converter for wall mounting enclosure	Wall unit	12-24 V 115-230 V	**FDK:083H4274**	
Signal converter [EEx ia] for wall mounting enclosure	Walll unit	12-24 V 115-230 V	**FDK:083H4275**	

9.8 Cables and connectors

Description	Length	Code no.	Symbol
Cable with multiple plug Standard blue cable between MASS 6000 and MASS 2100 5 x 2 x 0,34 mm² twisted and screened in pairs Temperature range minus 20 C to plus 110 C	5 m 10 m 25 m 50 m	**FDK:083H3015** **FDK:083H3016** **FDK:083H3017** **FDK:083H3018**	
Cable with multiple plug High temperature cable between MASS 6000 and MASS 2100 5 x 2 x 0,34 mm² twisted and screened in pairs Temperature range minus 70 C to plus 200 C	5 m	**FDK:083H3057**	
Multiple plug for cable mounting		**FDK:083H5056**	
Adaptor for MASS 2100		**FDK:083L5052**	

9.9 SENSORPROM® memory unit

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

9.10 Add-on module

Description	Code no.	Symbol
HART®	**FDK:085U0226**	
Profibus PA	**FDK:085U0227**	
CANopen	**FDK:085U0228**	
DeviceNet	**FDK:085U0229**	
Profibus DP	**FDK:085U0230**	

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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.

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