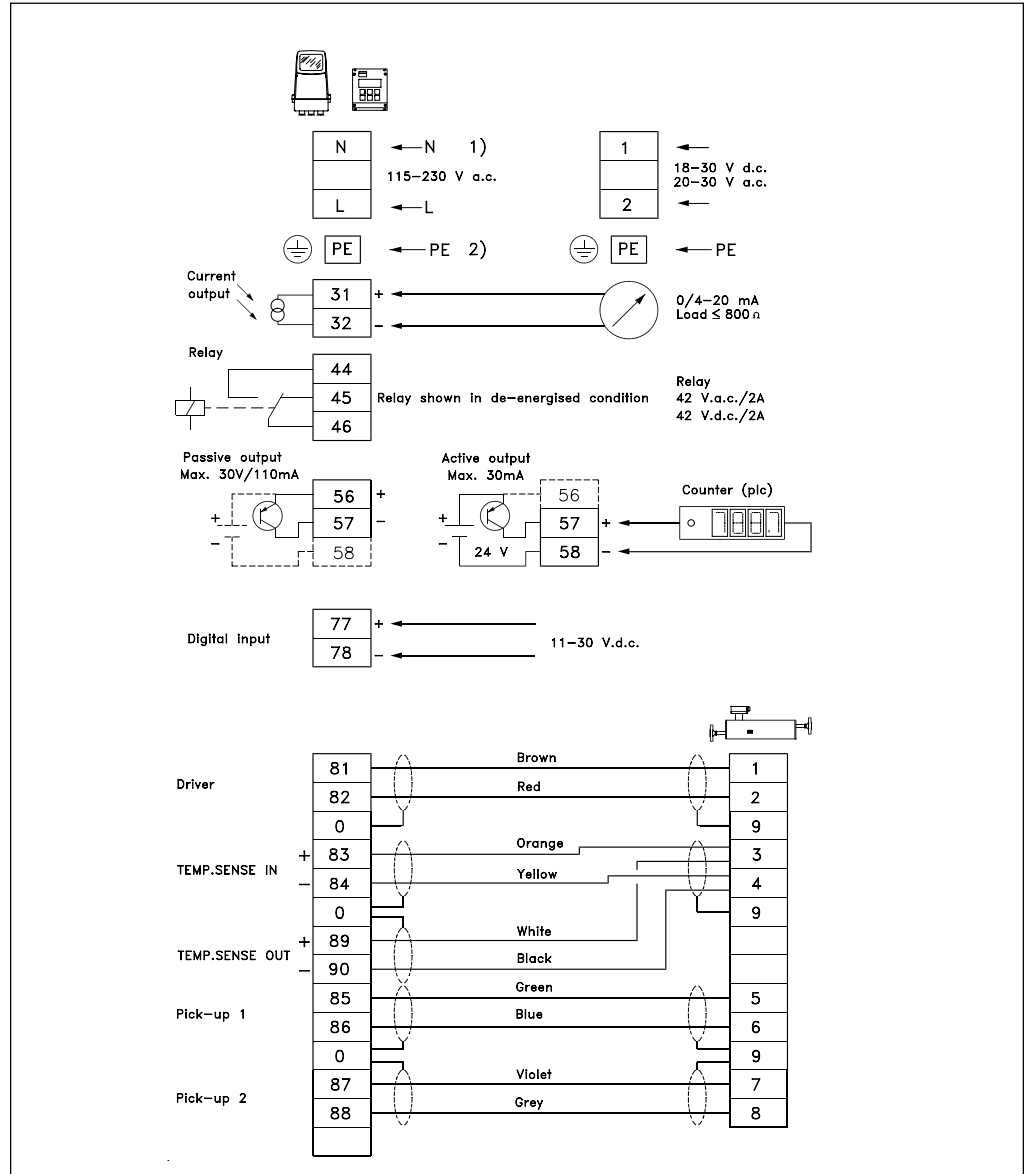


6. Electrical connection

6.1 Signal Transmitter
IP 67 and 19"
(terminal board
083H4260,
083H4253 &
083H4255)



Electrical connect.

Installation

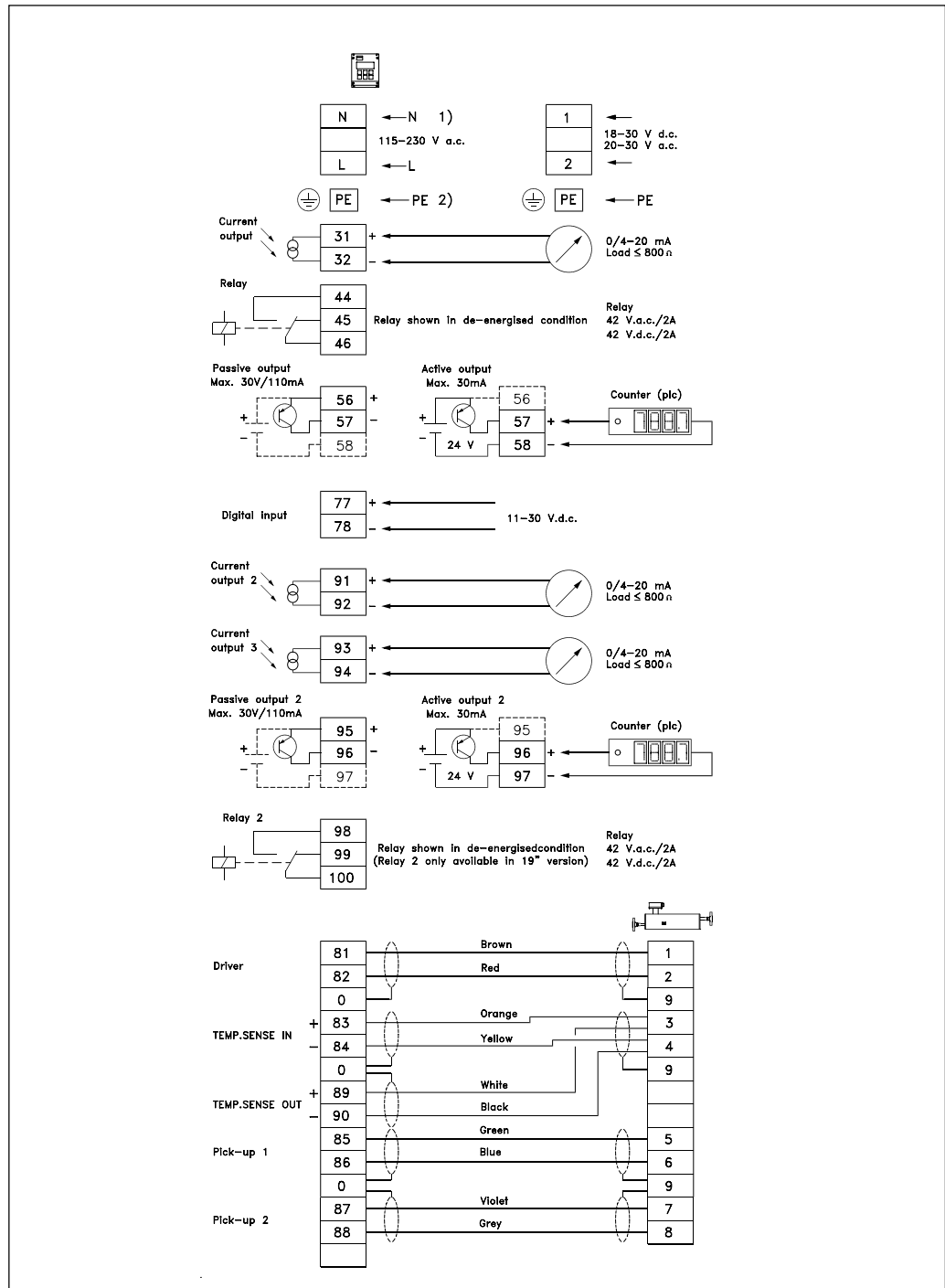
- ⚠ 1) Mains supply 115 to 230 V a.c. from building installation Class II. A switch or circuit-breaker (max. 15 A) shall be included in the building installation. It must be in close proximity to the equipment and within easy reach of the OPERATOR, and it shall be marked as the disconnecting device for 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 10K ohms, it is recommended to connect an external 10K ohms load resistor in parallel to the load.

6.2 Transmitter with extended output's (only 19" version), terminal board 083H4253 & 083H4255



Electrical con.

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.

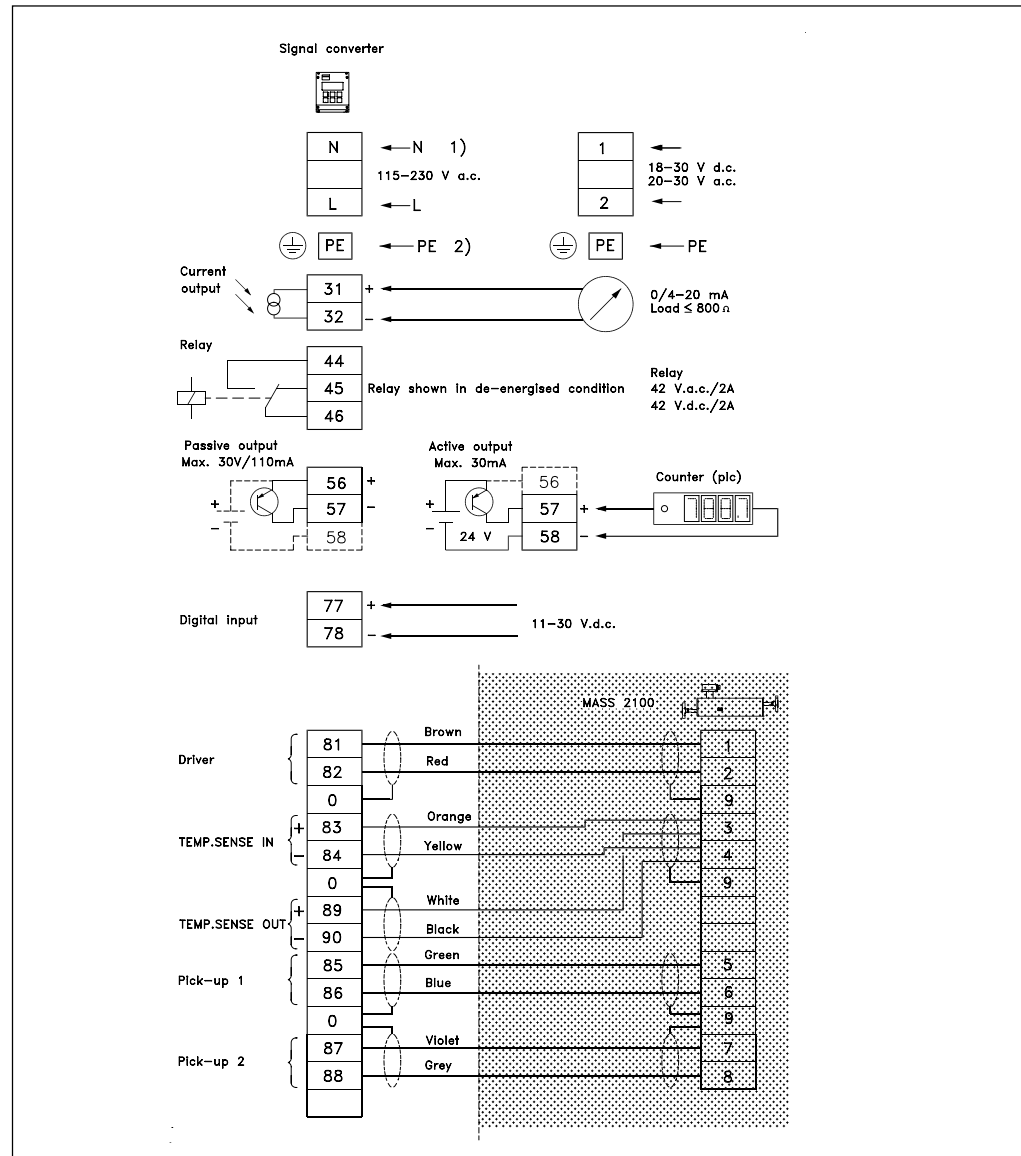
- ⊕ 2) Protective conductor terminal. Required cable min. AGW16 or 1.5[□] Cu. The insulation between the connected mains supply and 24 V a.c./d.c. supply for the flowmeters, models 24 V a.c./d.c. shall at least be rated with double or reinforced insulation at mains voltage.

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 10K ohms, connect an external 10K ohm load resistor in parallel to the load.

6.3 Signal Transmitter 19" Ex-version



Installation

The Transmitter 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 Fluid Components Intl.

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 \oplus terminal. Required cable min. AGW16 or 1.5 \square Cu. Mains voltage terminals must be out of reach for operator to avoid any hazards.

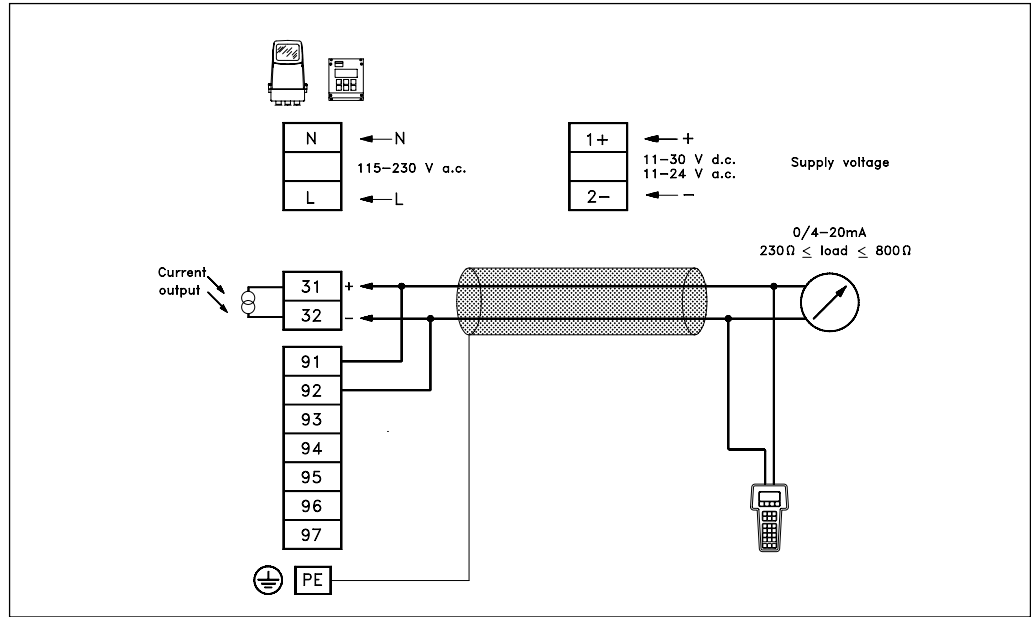
Digital output

If the internal resistance of the loads exceeds 10K ohms, connect an external 10K ohm load resistor in parallel to the load.

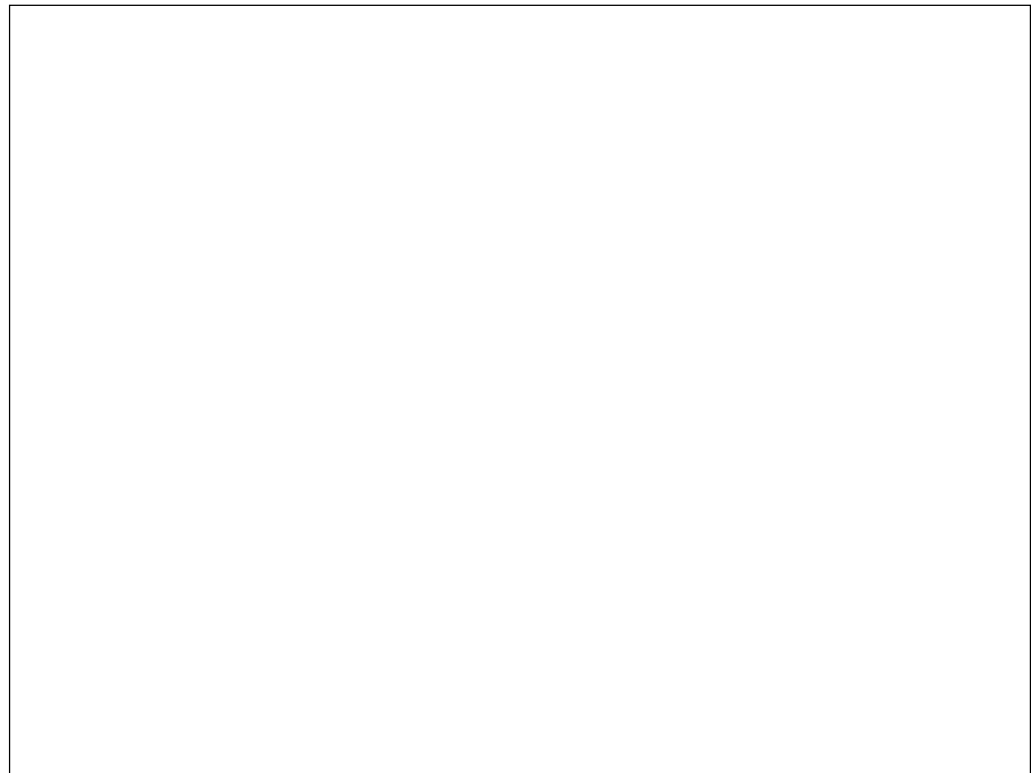
6.4 Connections of add-on modules

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.

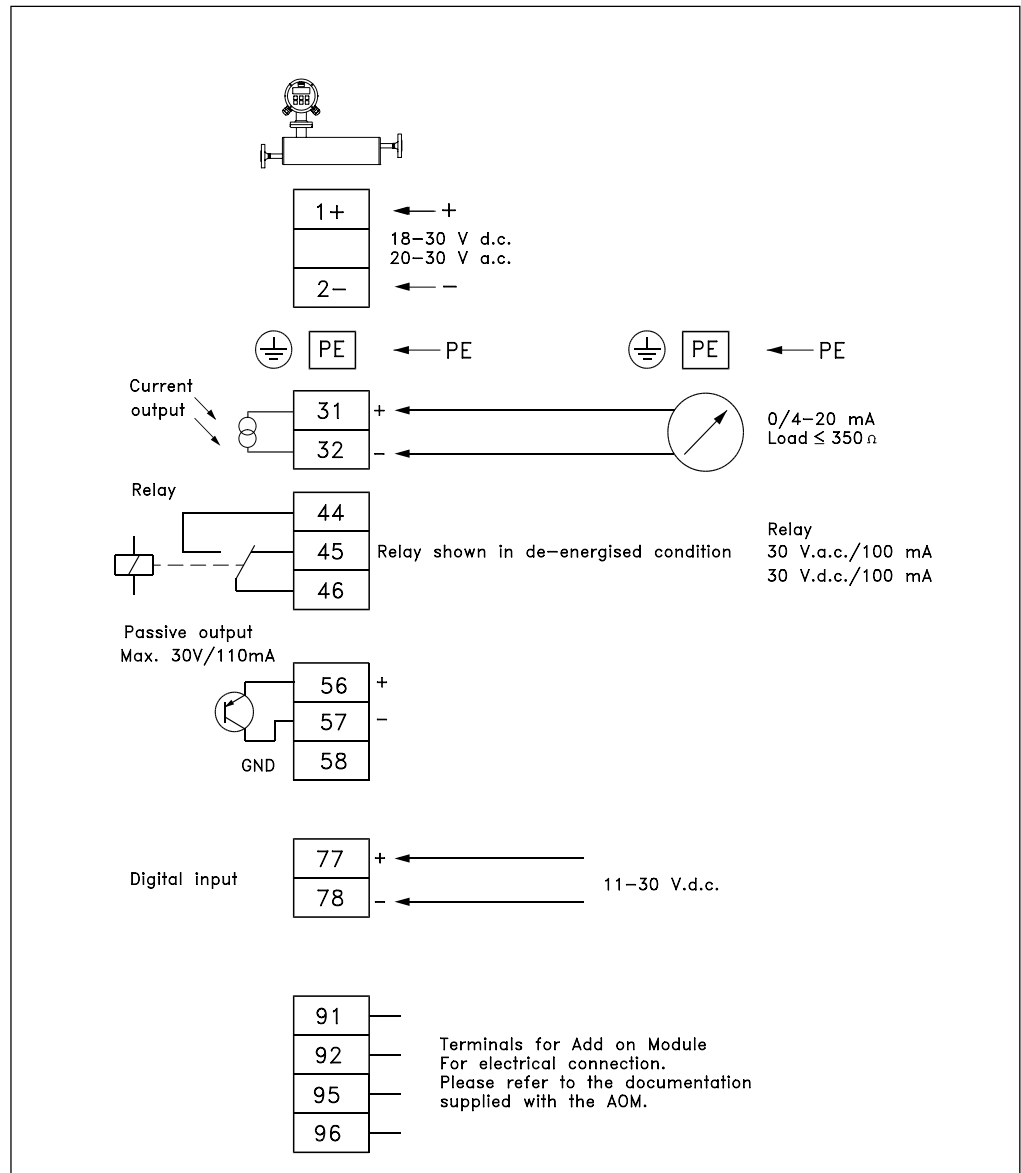
6.5 HART® Communication



6.6 PROFIBUSPA



6.7 Transmitter Compact Ex-d



Electrical connect.

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.

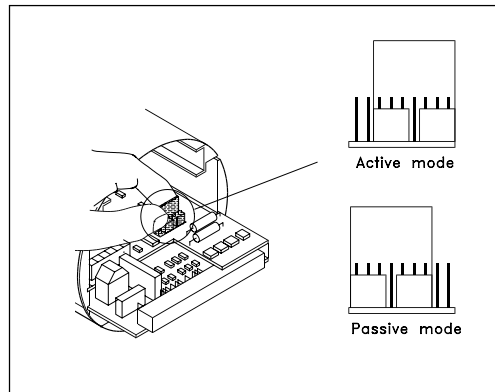
The mains cable is fed through the black PG gland (black indicates increased safety "e") located in the left-hand side as viewed from the front.

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 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 of the transmitter can operate in either active or passive mode to make electrical connection as easy as possible. The default current output in the transmitter is set to passive mode and must be looped powered.

If an active mode is required, a jumper on the transmitter PCB must be put in active position. This is done by taking out the transmitter electronics, follow the instructions in section 5.2.11 or 5.2.12. Jumper position is shown below.

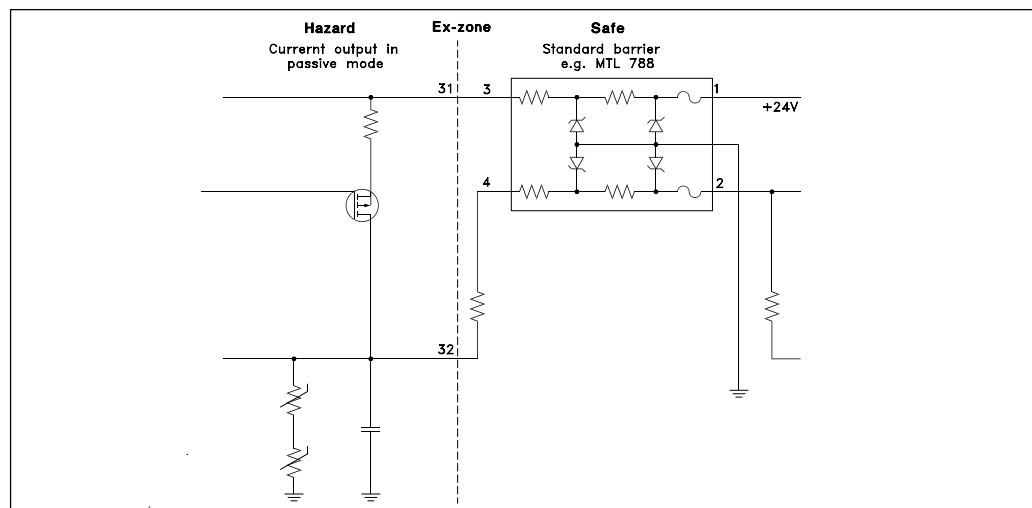
Passive mode: Jumper in right position.
Active mode: Jumper in left position.

Important

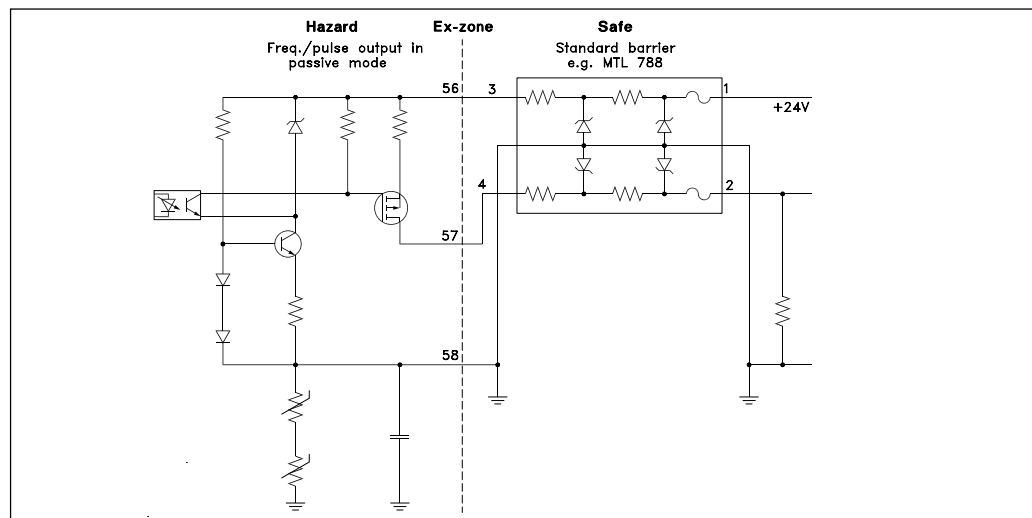
Be aware that in active mode the output shall be considered as a barrier output. The connection is not safe when put in active mode and accidentally connected to a barrier intended for use in passive mode.

6.9 Installation examples

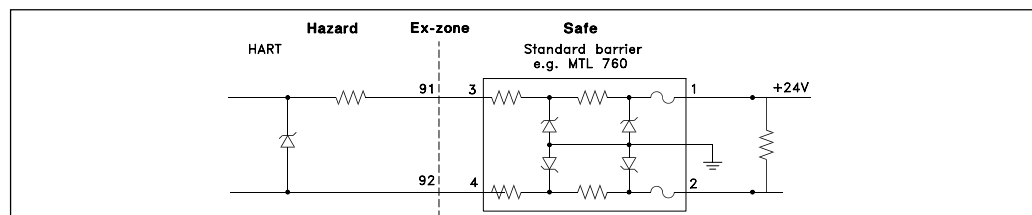
Current output in passive mode



Frequency/pulse output in passive mode

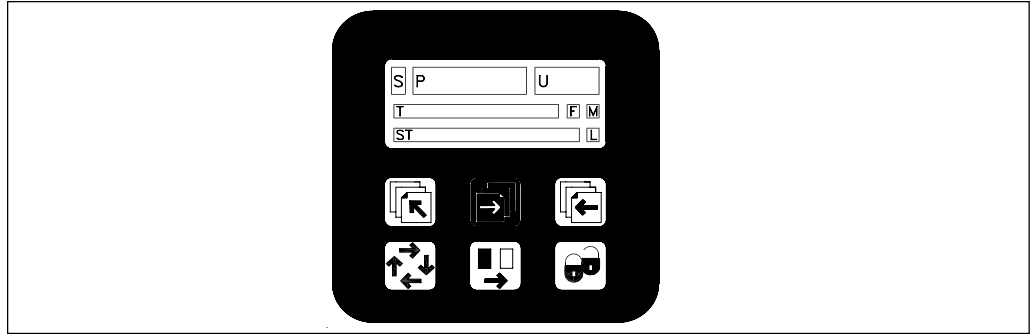


HART output









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.
- FORWARDKEY  This key is used to step forward through the menus. It is the only key normally used by the operator.
- BACKWARDKEY  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 messages. 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 center 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 transmitter 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 flow rate, 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 customized 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.

The setup menu is accessed by pressing the top up key for 2 seconds. The setup menu will operate in two modes:

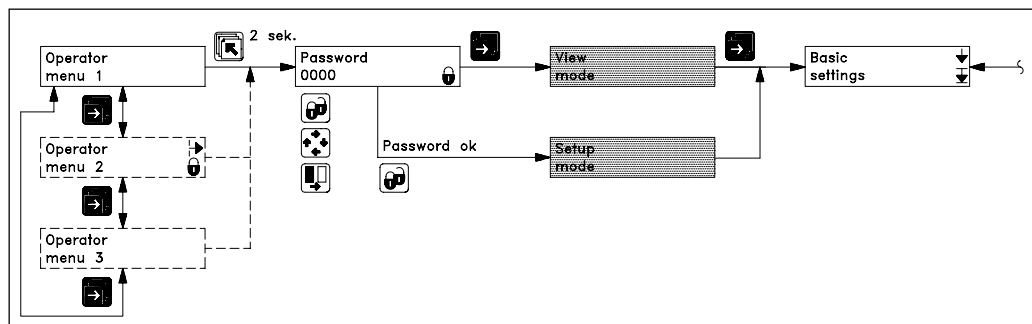
- View mode
- Setup mode

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 back the previous menu. A long press (2 sec.) on the top up key will exit the setup menu and bring back 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)

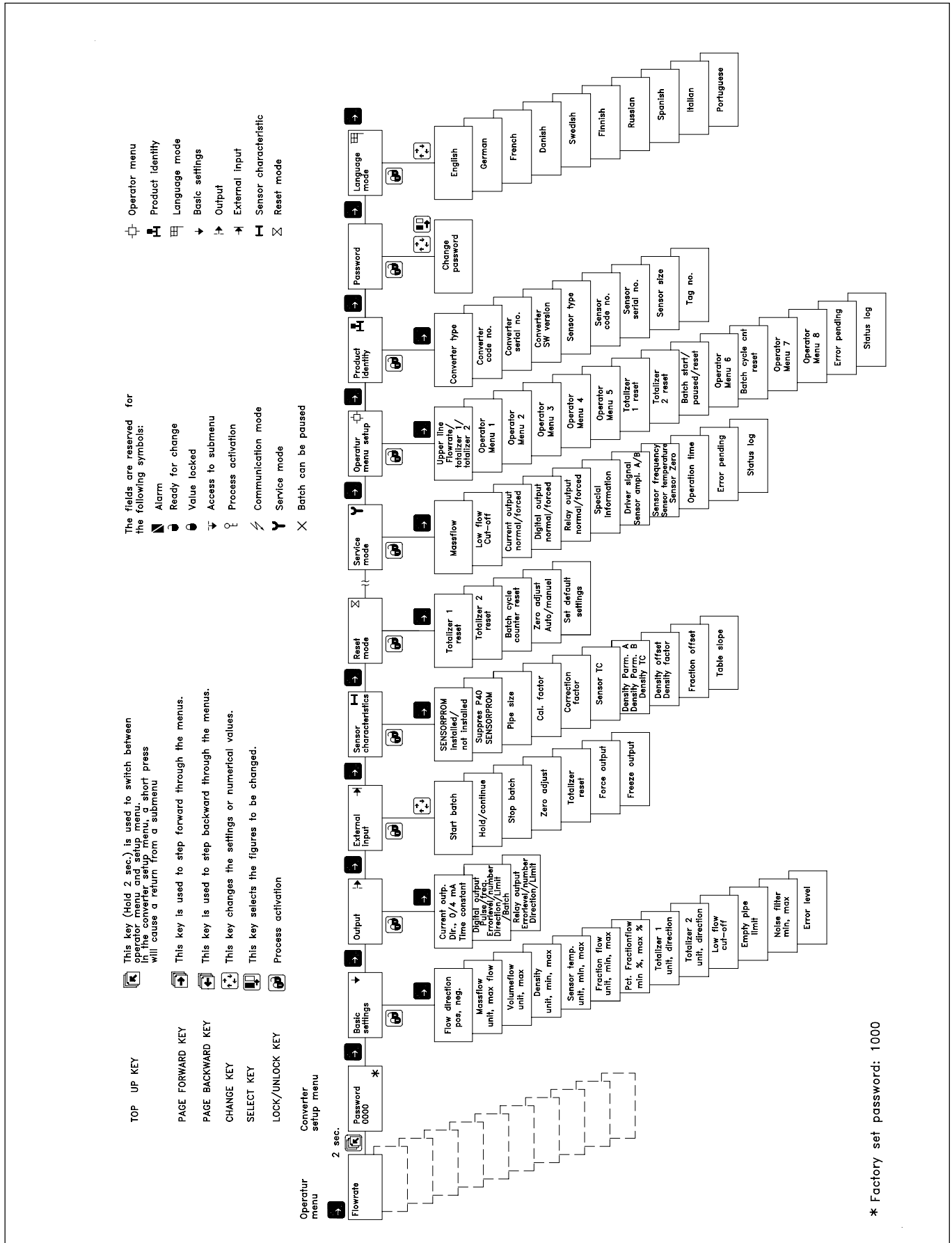
The view mode is always accessed by pressing the forward key when in the password menu.

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.

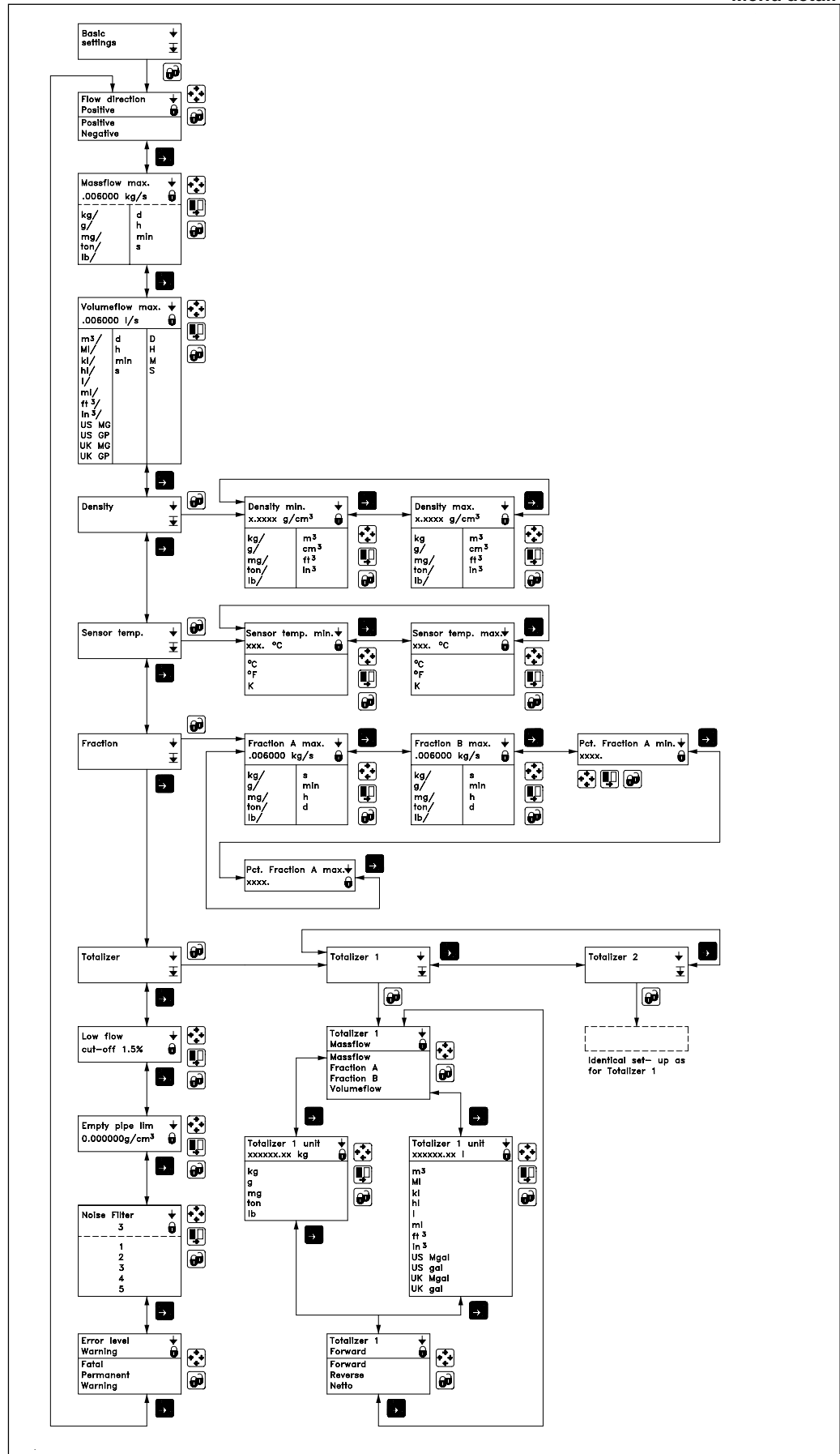
The factory setting of 1000 can be re-established as follows:

- Switch off power supply
- Press the TOP UP key while switching on the power supply

The user code is reset to 1000.



7.4 Basic settings



Commissioning

Basic settings
Menu description

The basic setting menu is used for basic configuration of the mass flow meter with a choice of units, minimum and maximum limits for display and analog/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 is to be set using the SELECT key. Press unlock and the value can 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 the SELECT key. The position can be set using the set key. The LOCK key is activated and 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 maximum and minimum 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 CMF-A from 20 Kg/h to .45 lb/min.

Keypad operation	Implementation	Display on Transmitter
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. 000020. kg/h
Push 4 times 	To move the cursor to the num. position	Massflow max. 000020. kg/h
Push 	Until 4 appears	Massflow max. 000040. kg/h
Push once 	To move the cursor to the next num. position	Massflow max. 000040. kg/h
Push 	Till 5 appears	Massflow max. 000045. kg/h
Push once 	To move the cursor to the decimal point	Massflow max. 000045. kg/h
Push 	To position the decimal point correct	Massflow max. 0000.45 kg/h
Push 3 times 	To move cursor to "Kg" unit	Massflow max. 0000.45 kg/h
Push twice 	To change units to lb.	Massflow max. 0000.45Lb/h
Push once 	To move cursor to the "h" unit	Massflow max. 0000.45Lb/h
Push 3 times 	To change "h" to "min"	Massflow max. 0000.45 Lb/min
Push 	To lock the new setting of the mass flowmeter	Massflow max. 000.45 Lb/m
Push twice 	Transmitter reverts to standard operation	

Setting the totalizer The instrument is equipped with two independent totalizers that can be set for totalizing mass flow, fraction A, fraction 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 a 0 to 10% cut-off of the maximum flow can be selected. By default the meter is set to 1.5%.

Setting the empty pipe limit If detection of an empty pipe or of a density value is needed, it can be set under this menu option. If the set density value is measured this will activate a relay or the digital output. In addition will be recorded in the error log.

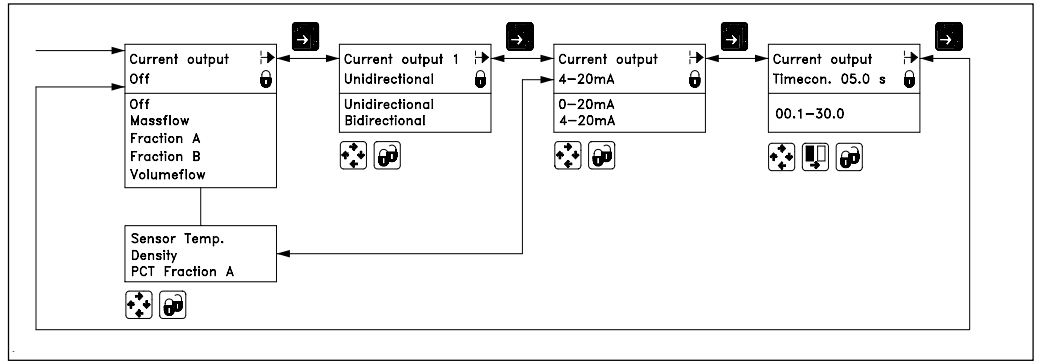
Setting the noise filter The instrument carries out signal processing internally using a patented FFT (Fast Fourier Transformation) algorithm. This technology allows noisy sensor signals to be filtered. For example, if the instrument is exposed to a strongly pulsating flow, varying pumping frequencies 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 instrument 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.

Menu detail

7.5.1 Outputs setting menu

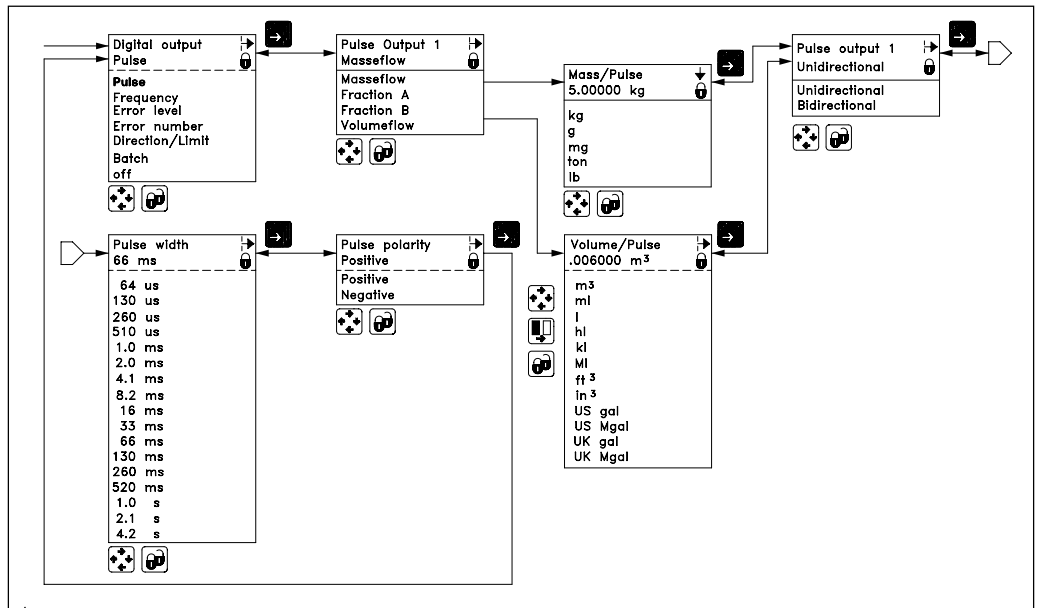
Current output



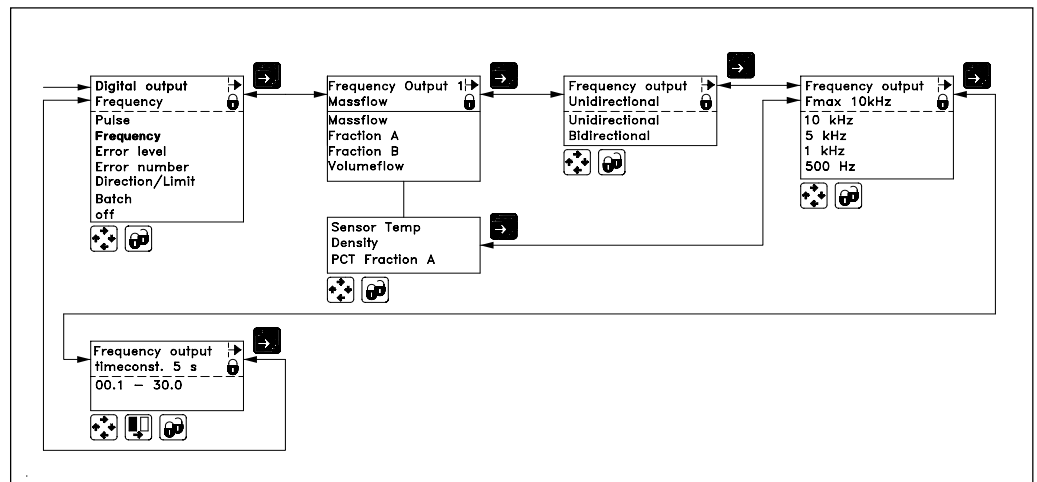
The current output should be set to off when not used, otherwise an error will be pending if the meter detects an open loop.

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.

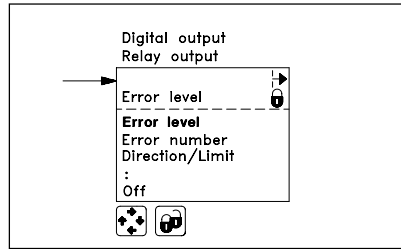


Digital output Frequency



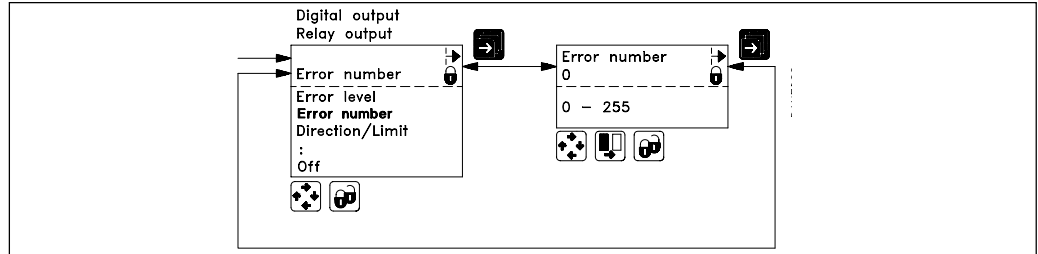
Commissioning

**Digital output
Error level**



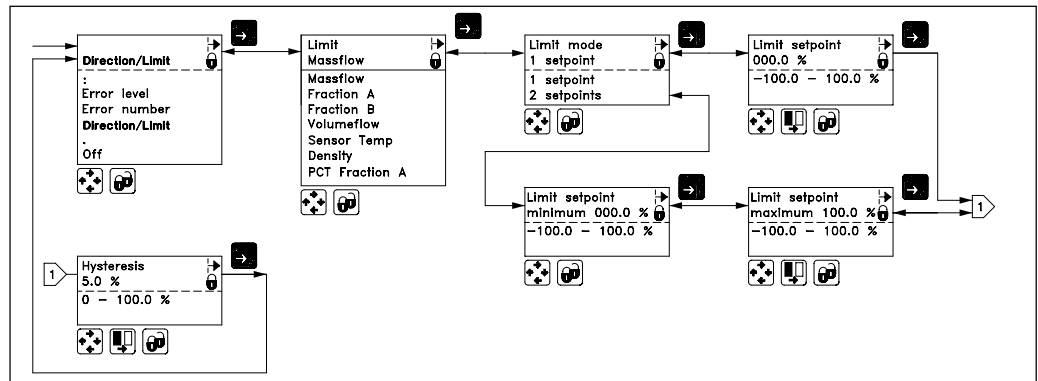
If the error status is to be output at the digital output there are two options. Select error level to output the system's current error status or error number if a specific error is to be indicated by the digital output. Both types of error message are described in more detail in the section **error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

**Digital output
Error number**



Acceptance level is set in the basic settings.

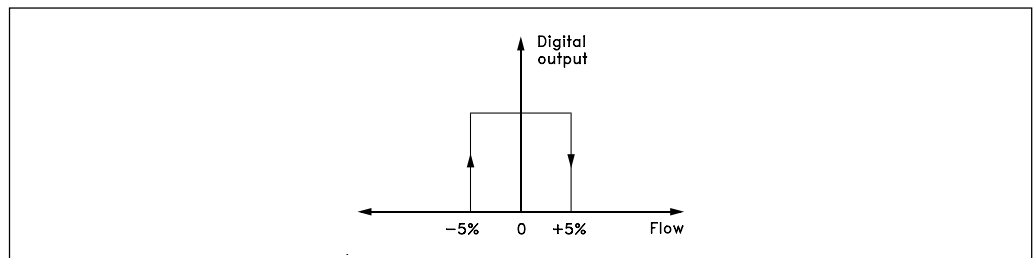
**Digital output
Limit/direction**



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

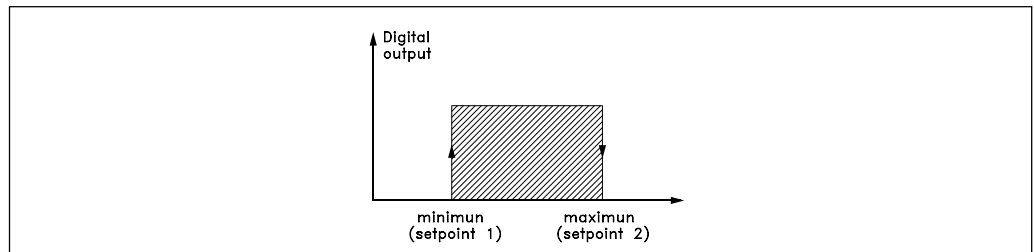
**Digital output
Flow direction
1 set point**

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



2 set points

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

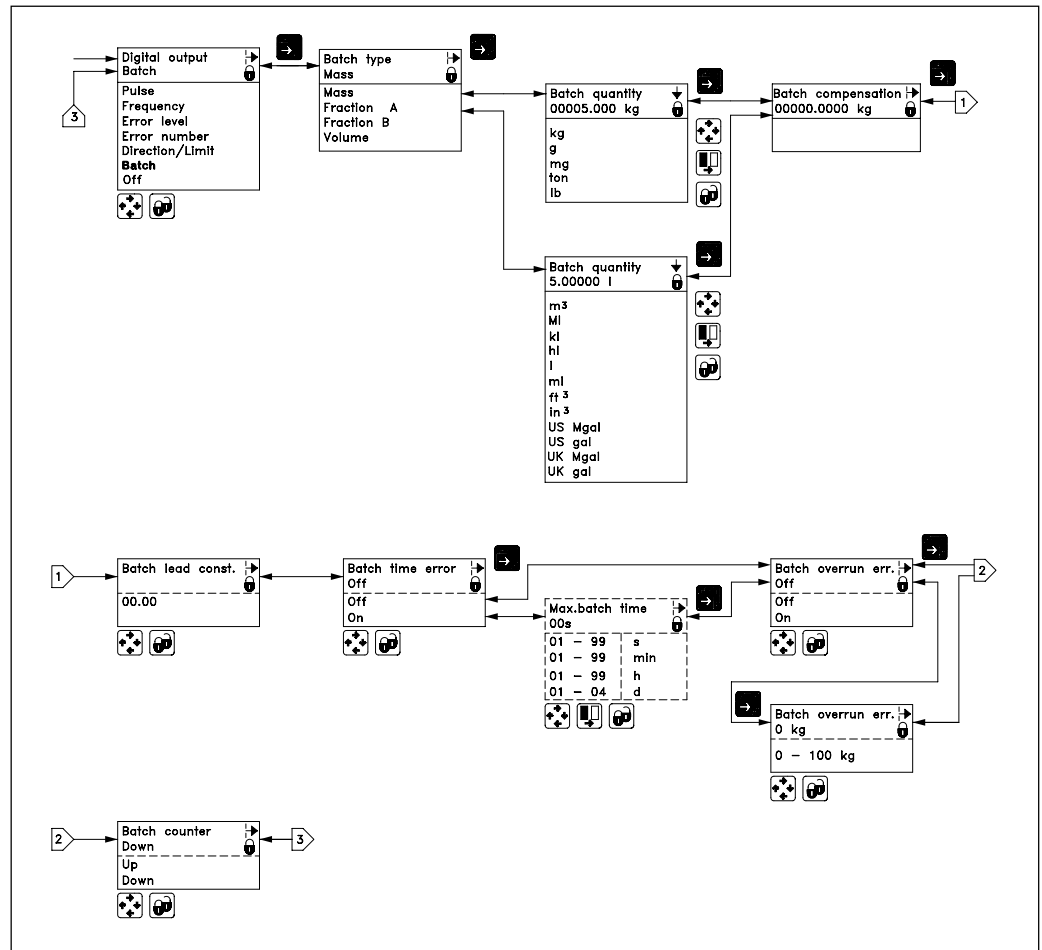


2 separate set points

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.

Menu detail

Digital output
Batch menu



Batch
Menu description

Batch menu

Batching can be set to mass or volume. The desired quantity is called the **batch quantity**.

Batch compensation allows addition/subtraction of a fixed quantity in order to compensate for valve delays, etc.

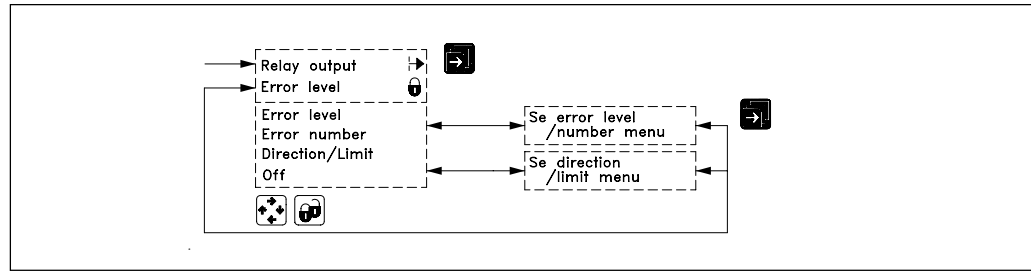
Compensation to be carried out dynamically, i.e. independently of the flow rate in the system, the transmitter can calculate the system's time constant – this is known as the **lead const.**

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

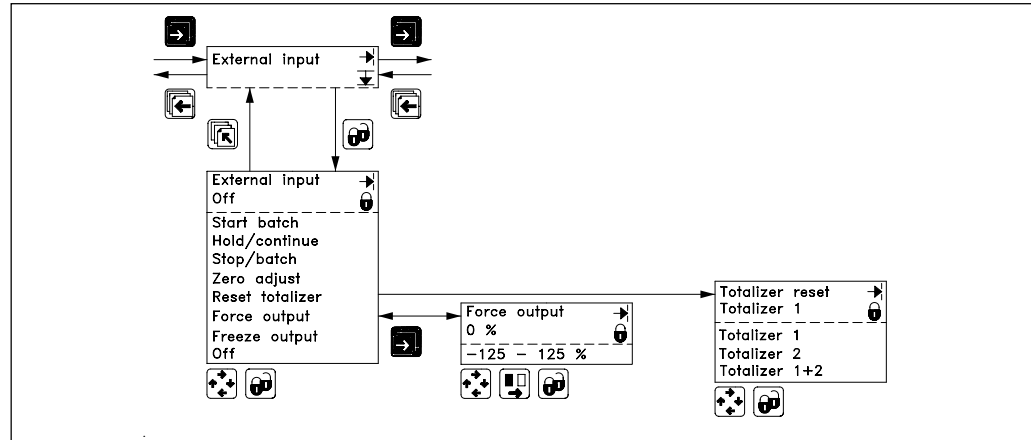
Batch counter is used to set the batch display. If **up** is selected the display counts from 0 up to the selected **batch quantity**. If **down** is selected it counts down from **batch quantity** to 0 for each batch. The operator can follow the progress when running in a batch application.

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 relay output is identical as is the digital output.

7.5.3 External input



External input menu

The transmitter 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. The following functions can be selected:

Start batch. If the transmitter is used for batching this can be activated automatically by 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.

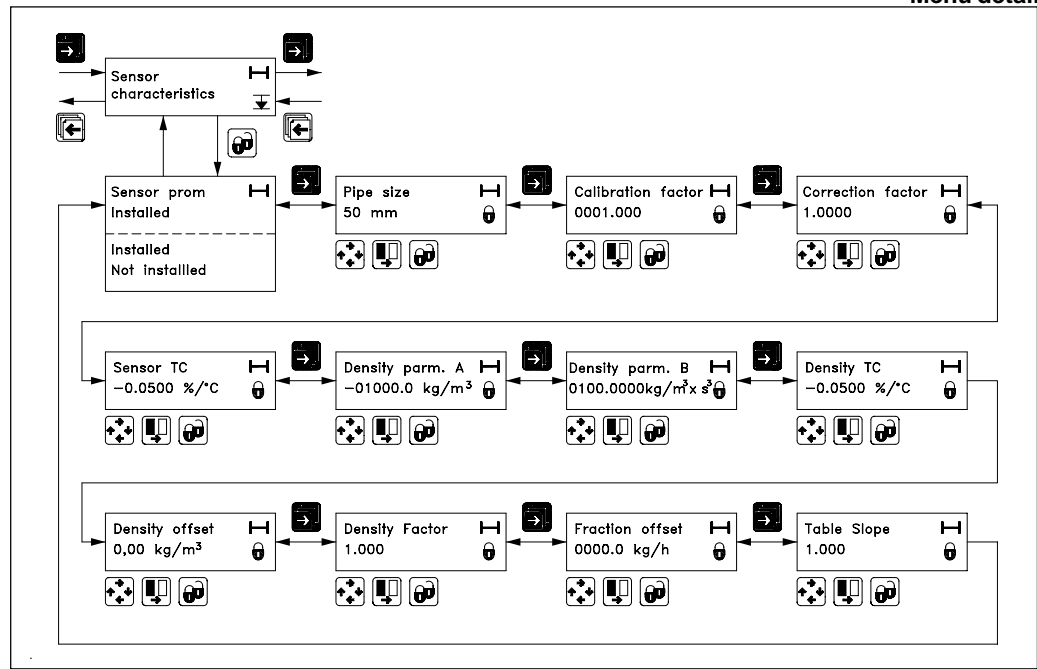
Zero adjust activates the automatic 0-point adjustment.

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 100% is selected, 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 an offset needs to be added to the density measurement this is done with **density** offset.

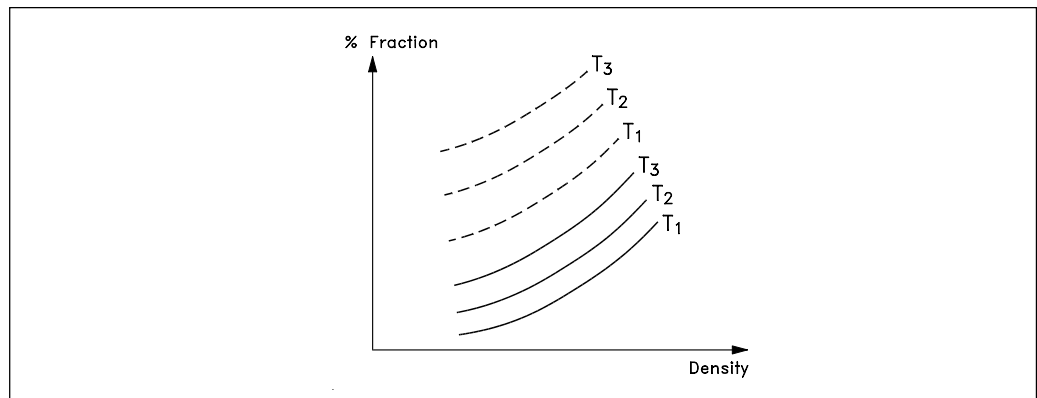
If the fraction flowmeter function is used it is possible to customize the function in accordance with the following equation:

$$\text{Fraction} = Ax + B, \text{ where}$$

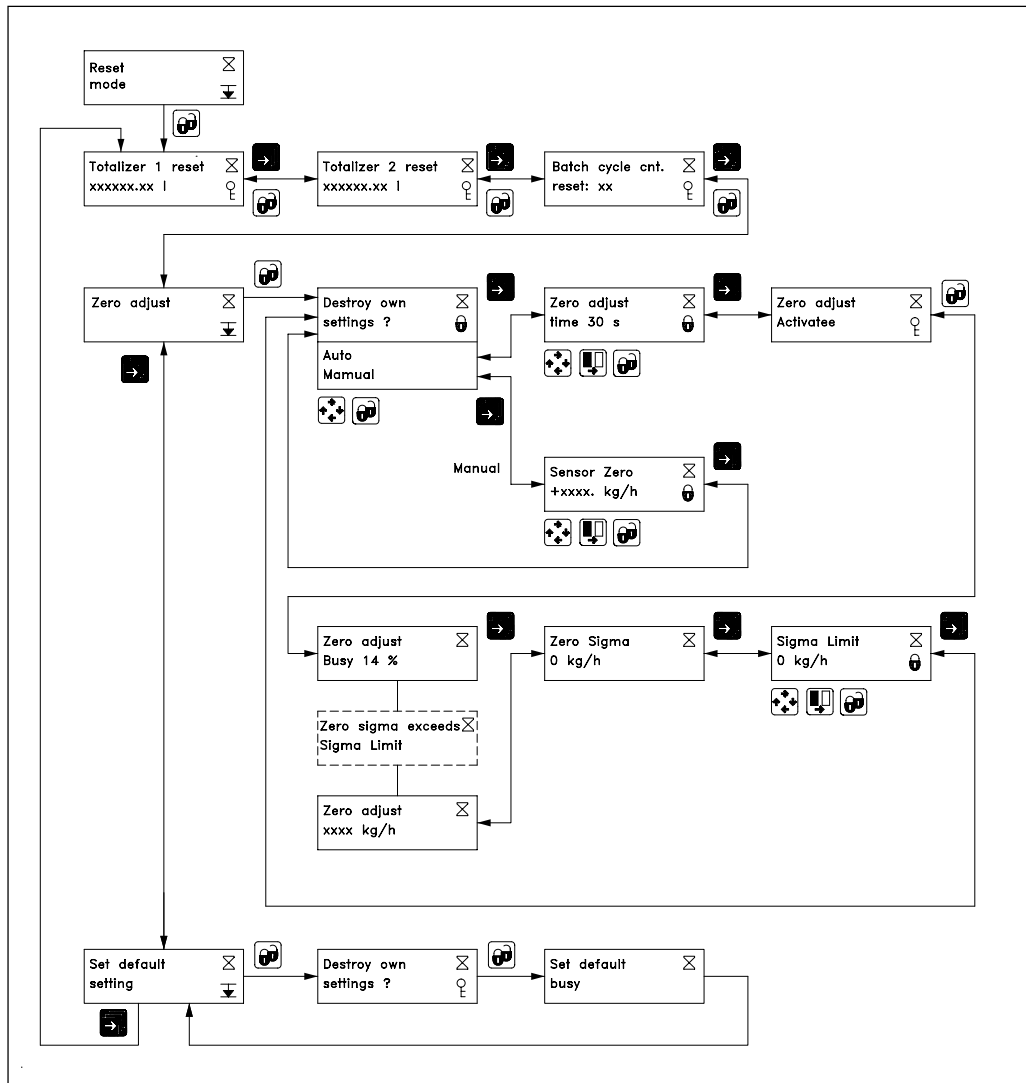
A = Table slope

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.

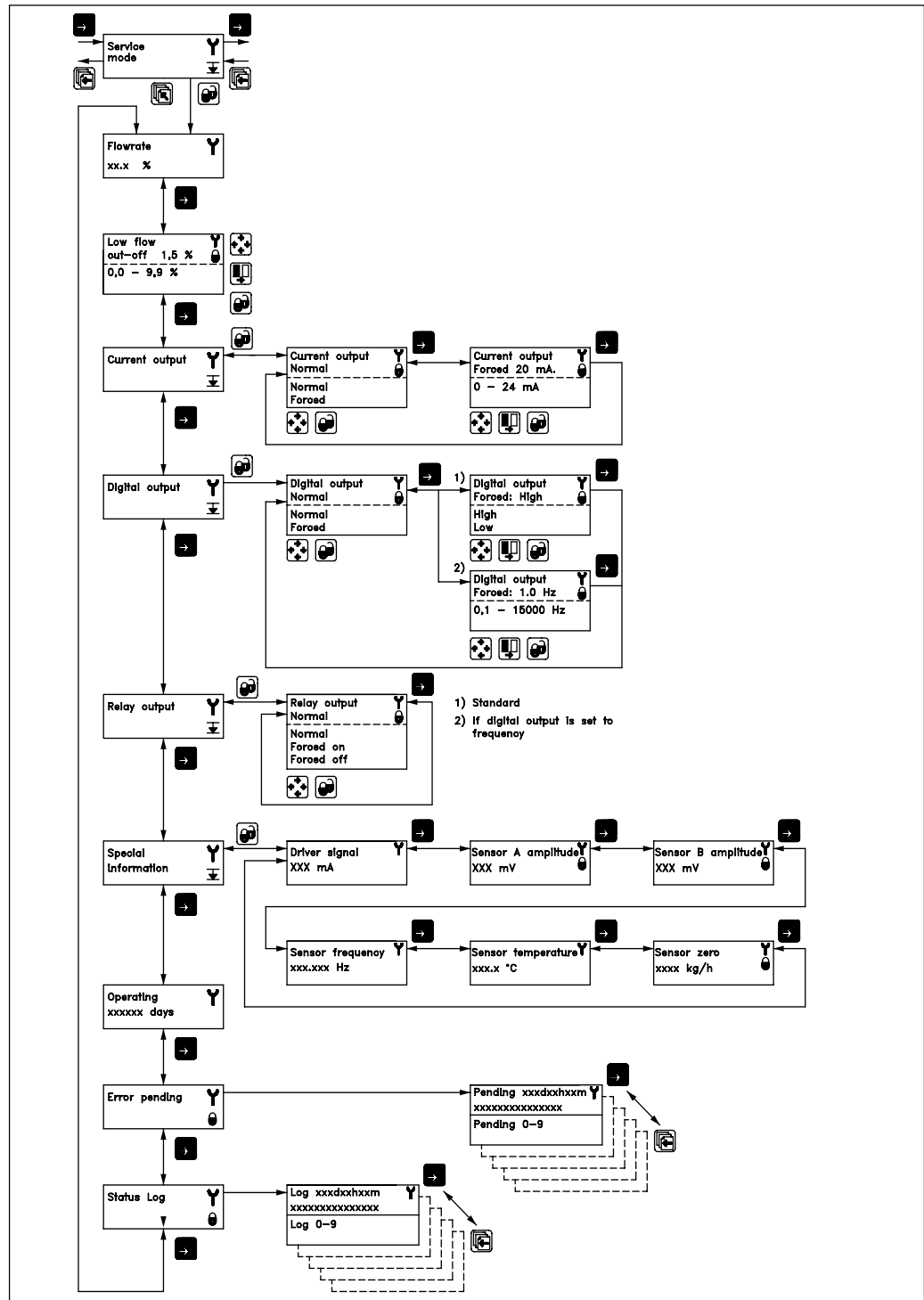
Zero adjust time determines the period of time for the automatic 0-point adjustment. As default a period of 30 sec. is used which normally is enough for a stable 0-point measurement. If the flowmeter is used where small flow rates are measured very accurately, a longer integration time can be selected, 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 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 Fluid Components Intl. 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 will remain at power down situations.

Example; setting the 0-point

Keypad operation	Implementation	Display
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
	Transmitter preforms 0-point adjustment	Counting up from 0 to 100%
	New 0-point is calculated and stored in SENSORPROM ^â	Zero adjust +yyyyyy kg/h
Push twice/ hold 3 sec. 	Transmitter reverts to standard operation	

7.5.6 Service mode



All previous settings are re-initialized 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 %, while tests are being conducted in SERVICE MODE.

Low flow cut-off can be used to suppress 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 damping created by mechanical noise such as vibrations. The driver output circuit can deliver 36 mA maximum.

Size	Driver freq. [Hz]	Driver current [mA]
CMF - A	120	12
CMF - B	110	7
CMF - C	135	15
CMF - D	165	15
CMF - E	125	10
CMF - F	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 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 errorous conditions.

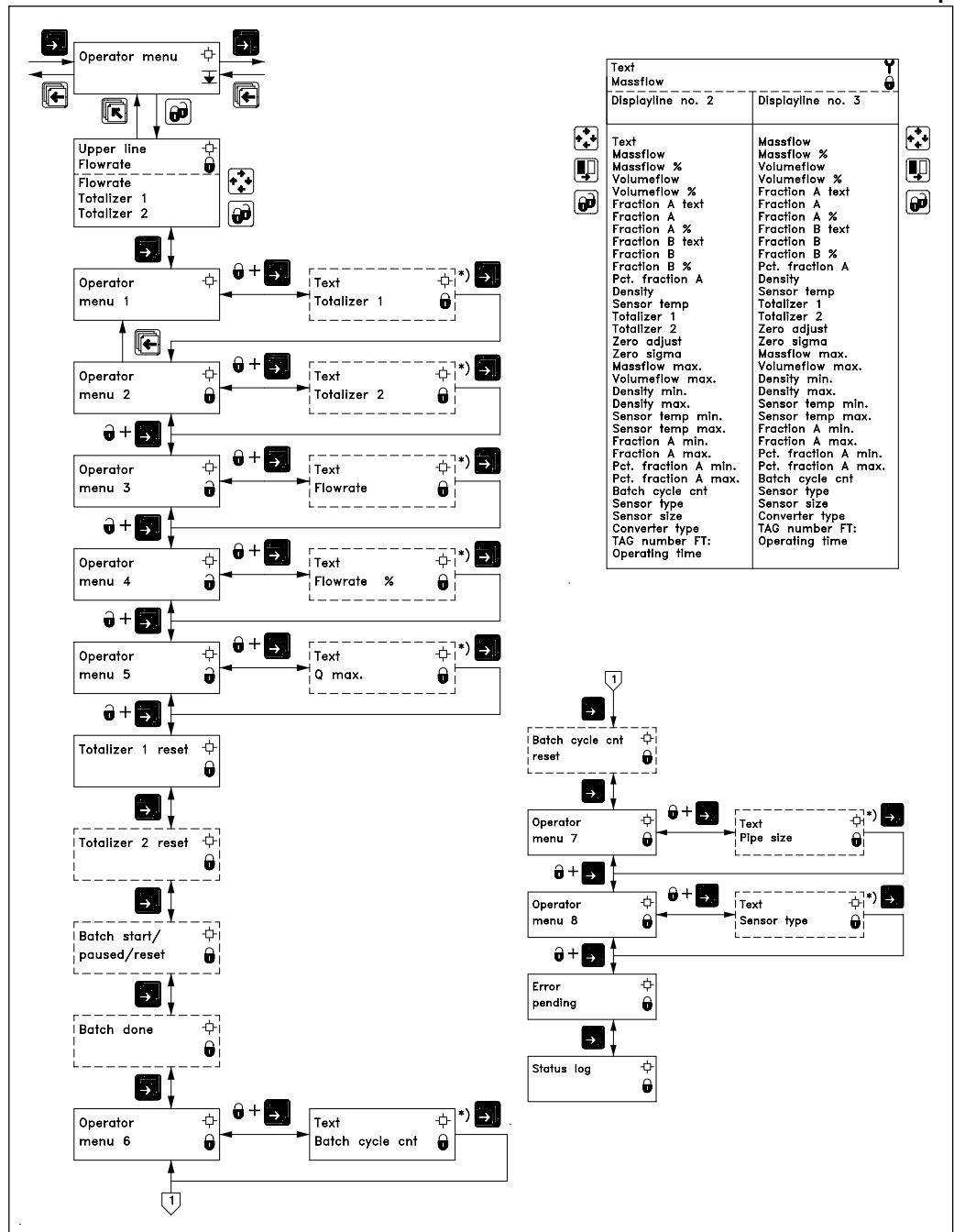
Sensor frequency gives the resonant frequency of the sensor in Hz. The frequency is dependent on dimension as well as the density of the liquid measured, see table below. Values more than ± 20 Hz away of the values in the table indicate problems, check cabling, connection and operation conditions.

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. Furthermore, 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.

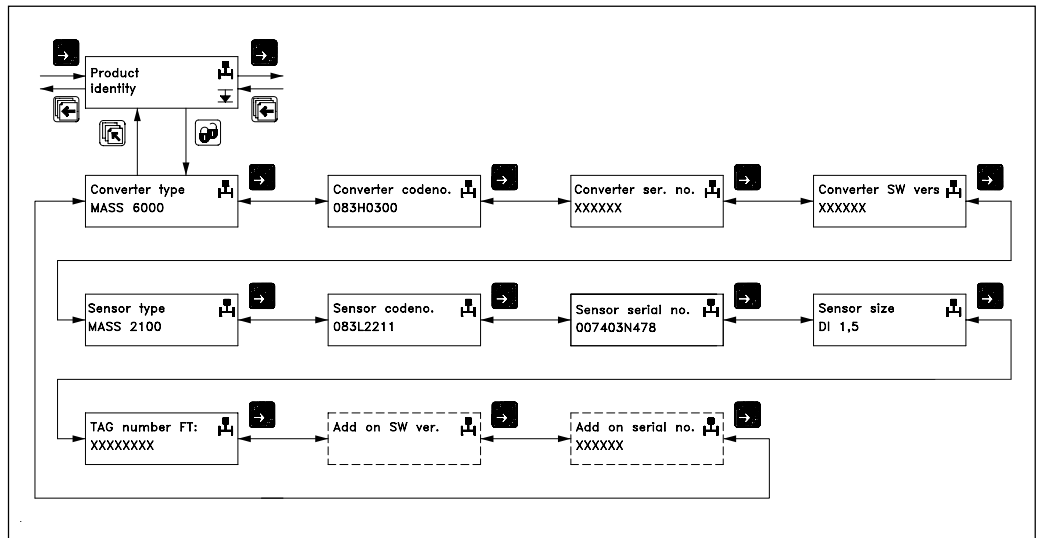
- A closed lock key in the operator menu setup, means that the menu is enabled when viewing the operator menu.
- A open lock key symbol, means that the menu is not available in the operator menu.

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.

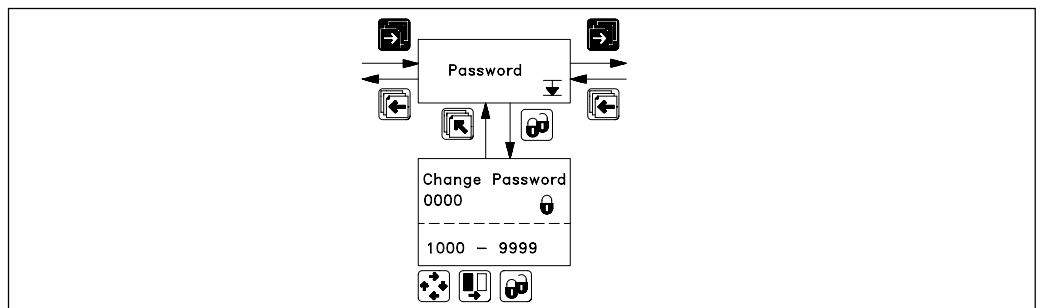
Menu setup

7.5.8 Product identity

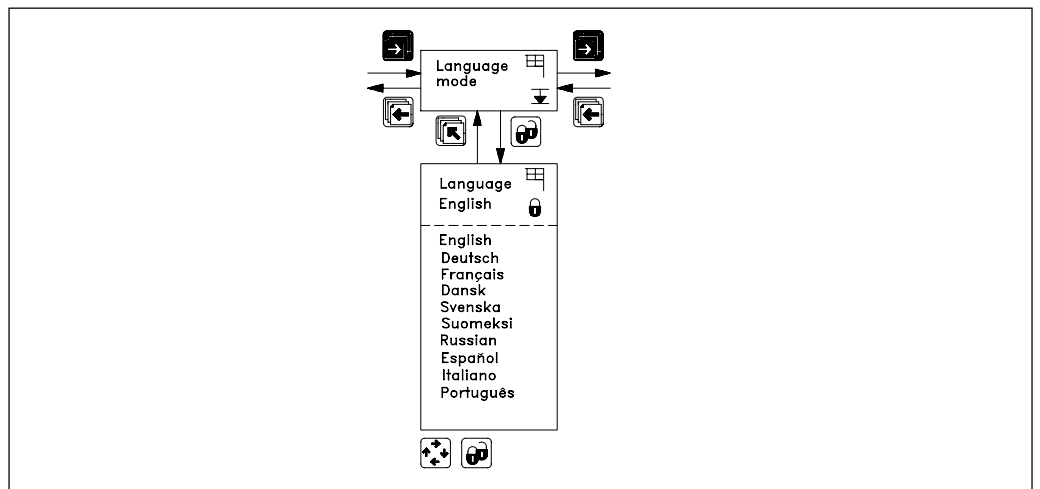


Software version of add-on module is only available if the add-on module has been installed.

7.5.9 Change password

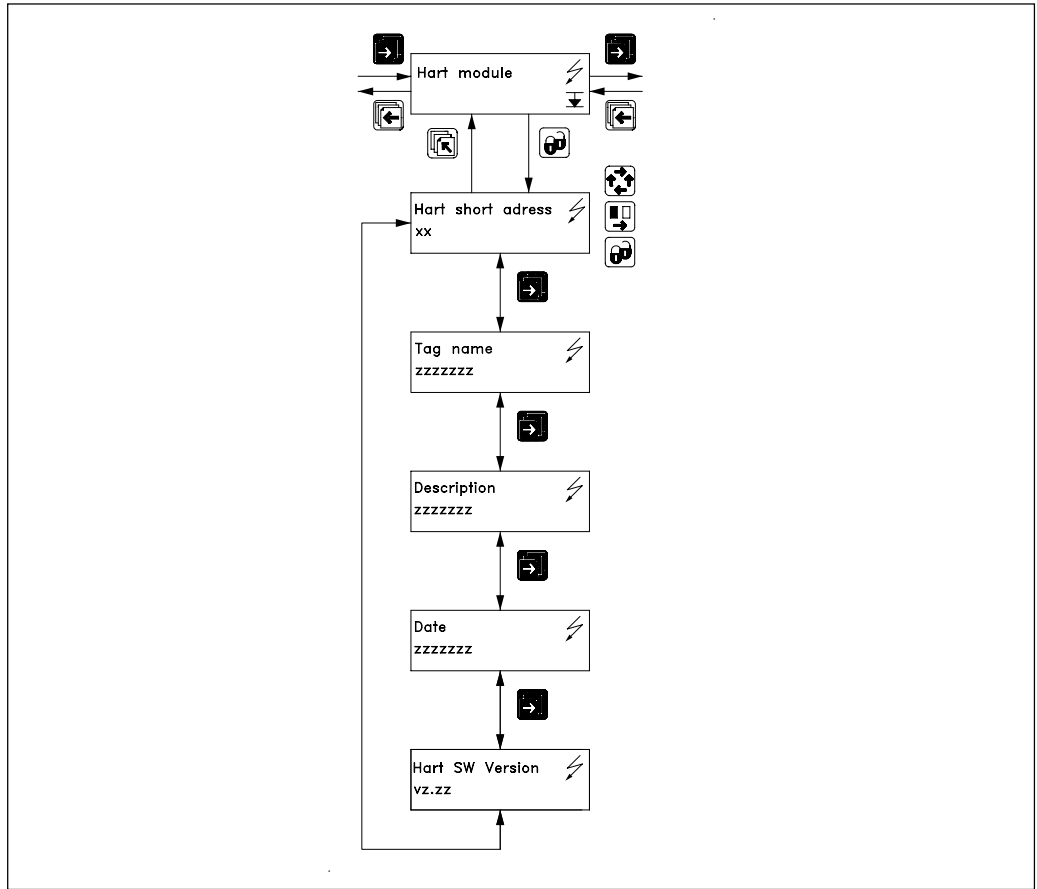


7.5.10 Language mode

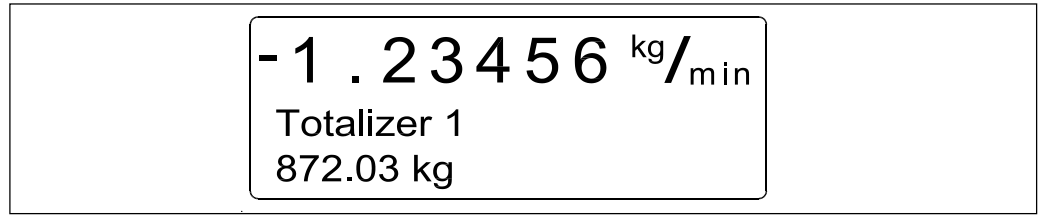


Commissioning

7.5.11 HART® communication (Add-on module)



7.6.1 Operator menu
Flowrate



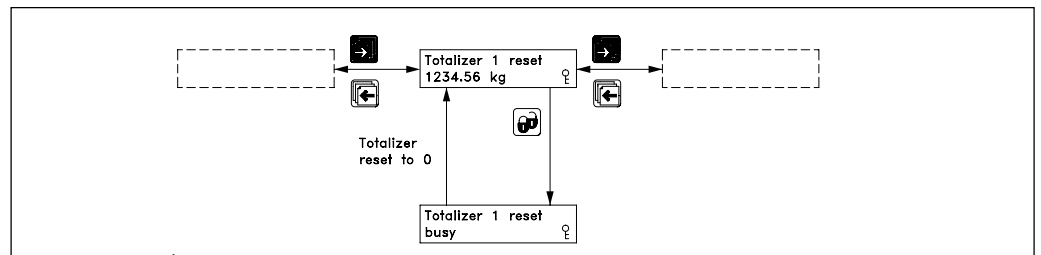
The 1st displayline will always be active and show the value enabled in the operator menu setup.

- 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.

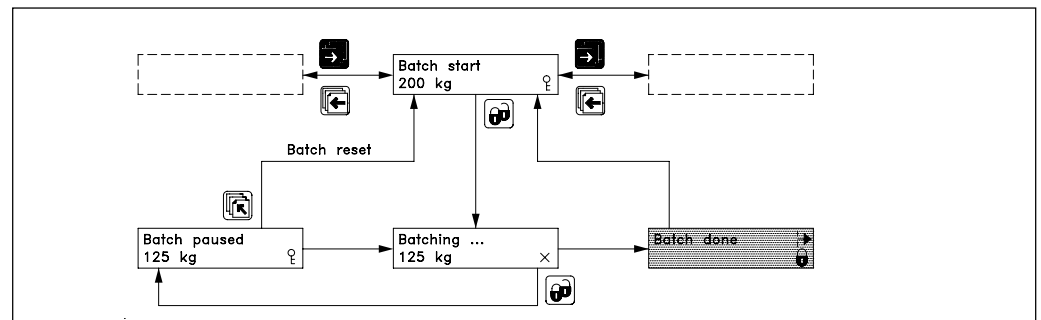
- Mass flow rate
- Volume flow rate
- Density
- Temperature
- Totalizer
- Totalizer reset
- Batch control
- Batch cycle counter
- Batch cycle counter reset.

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.

Commissioning

7.7.1 Parameters

Parameter	Factory setting	Settings available
Password		
<i>Password</i>	1000	1000 – 9999
Basic settings		
<i>Flow direction</i>	Positive	Positive, negative
<i>Massflow max.</i>	Dim. dependent	Dim. dependent
- Weight units	Dim. dependent	mg, g, kg, ton, lb
- Time units	Dim. dependent	s, min, h, d
<i>Volumeflow max.</i>	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
<i>Density</i>		
- 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
<i>Sensor temp.</i>		
- Minimum	-50 °C	-250 °C - +250 °C
- Maximum	+250 °C	-250 °C - +250 °C
- Temperature units	°C	°C, °F, K
<i>Fraction A/B max.</i>	Application dependent	Application dependent
- Weight units	kg	mg, g, kg, ton, lb
- Time units	h	s, min, h, d
<i>Totalizer 1</i>	Mass flow	Mass flow, fraction A, fraction B, volume flow
	Forward	Forward, reverse, net
	Dim. dependent	mg, g, kg, ton, lb
<i>Totalizer 2</i>	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
<i>Low flow cut off</i>	1.5 %	0 – 9.9 %
<i>Empty pipe limit</i>	Dim. dependent	-20000.0 g/cm ³ - +20000.0 g/cm ³
<i>Noise filter</i>	3	1 (min.) to 5 (max.)
<i>Error level</i>	Warning	Fatal, permanent, warning
Output		
<i>Current output 1</i>	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
<i>Digital output 1</i>	Pulse	Pulse, frequency, error level, error number, direction/limit, batch, off
<i>Pulse</i>	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 us, 130 us, 260us, 510 us, 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
<i>Frequency</i>	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
<i>Error number</i>	Off	0 - 255

<i>Direction/limit</i>	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 %
<i>Batch</i>		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
<i>Relay output 1</i>	Off	Error level, error number, direction/limit, off
External input <i>External input</i>	Off	Start batch, hold/continue (batch), stop batch, zero adjust, totalizer reset, force output, freeze output, off
Sensor characteristics		
<i>Correction factor</i>	1	-99.999999 – 99.999999
<i>Density offset</i>	0	-9999.9999 – 9999.9999 kg/m ³
<i>Density factor</i>	1	-9.999999 – 9.999999
<i>Fraction offset</i>	0	-9999.9999 – 9999.9999 kg/h
<i>Table slope</i>	1	-9999.9999 – 9999.9999
Language	English	English, German, French, Danish, Swedish, Finish, Spanish, Russian, Italian, Portugese
Operator menu <i>Primary field</i>	Mass flow	Mass flow, volume flow, fraction A, pct. fraction A, fraction B, totalizer 1, totalizer 2, sensor temp., density
<i>Title/subtitle line</i>	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
CMF - A	20		125	20		125	1	g	g	1	ml	ml
CMF - B	75	-	500	75	-	500	1	g	g	1	ml	ml
CMF - C	300	-	2000	300	-	2000	10	g	g	10	ml	ml
CMF - D	1500	-	10000	1500	-	10000	1	kg	kg	1	l	l
CMF - E	7500	-	50000	7500	-	50000	1	kg	kg	1	l	l
CMF - F	25000	-	100000	25000	-	100000	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

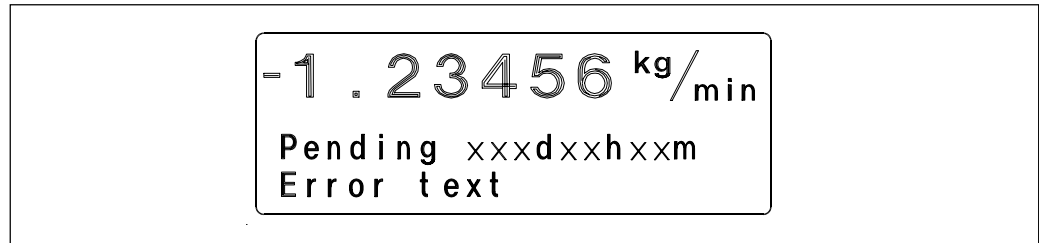
The first 9 standing errors are stored in “error pending”. When an error is removed it clears from “error pending”.

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 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.

9.0 Spare Parts

9.1 Transmitter

Compact IP 67



Description	Version	Enclosure	FCI P/N	Symbol
Transmitter for compact (Integral) mounting or replacement of remote transmitter (Does not include mounting unit or bracket)	115/230 V a.c. 50/60 Hz	IP 67, fiber-glass reinforced polyamide	083H0222	
	11-30 V d.c./ 11-24 V a.c	IP 67, fiber-glass reinforced polyamide	083H0223	
Transmitter for remote mounting. Includes wall mounting unit and bracket	115/230 V a.c. 50/60 Hz	IP 67, fiber-glass reinforced polyamide	083H0217	
	11-30 V d.c./ 11-24 V a.c	IP 67, fiber-glass reinforced polyamide	083H0218	

Wall mounting kit

Description	FCI P/N	Symbol
Wall mounting unit for IP 67 version with Wall bracket, 4 Pg 13.5 cable glands	085U1001	

Spare parts for compact (Integral) IP 67

Description	Version	FCI P/N	Symbol
Connection plate/PCB	115-230 V/ 12-24 V	083H4260	
Terminal box kit, consisting of polyamid terminal box, cable/connector between PCB and sensor pedestal, PCB, seal and screws (4 pcs.) for mounting on sensor		083H3060	
Standard Pg 13.5 screwed cable entries for above cables (nickel-plated brass)	2-off	083G0227	
Standard Pg 13.5 screwed cable entries type Jacob 50.013PA for above cables (Ø 9-10 mm) in black polyamide 212°F (100°C)	2-off	083G0228	
Pg 13.5 (M) x 1/2 FNPT adapter Nickel-plated brass		017945-01	
Sealing screws for sensor/transmitter	2-off	085U0221	
Stainless steel (AISI 316) terminal box with lid		085U1000	
Polyamid terminal box Complete incl. terminals excl. lid		085U1002	
Polyamid lid for terminal box		085U1003	

9.2 Compact (Remote) Ex-d

Spare parts for compact(Integral) Ex-d

Description	FCI P/N	Symbol
Transmitter Compact Ex de [ia] T3-T6 for mounting on top of CMF B through F sensor	083H0221	

Description	FCI P/N	Symbol
Ex-d converter insert	083H3061	
Front lid	083U2348	
Screws between pedestal and sensor (4 pcs.)	083X1407	

9.3 Transmitter 19" (Remote) Standard version



Description	Version	Supply voltage	FCI P/N	Symbol
CMF B through F transmitter 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	083H0200	
		24 V a.c./d.c.	083H0201	
	3 current outputs 2 frq./pulse outputs 2 relay outputs	115-230 V.a.c./ 50/60Hz	083H0204	
		24 V a.c./d.c.	083H0205	
CMF B through F transmitter IP 20 19" version with IP 66 wall mounting enclosure	1 current output 1 frq./pulse output 1 relay output	115-230 V.a.c./ 50/60Hz	083H0208	
		24 V a.c./d.c.	083H0209	
	3 current outputs 2 frq./pulse outputs 2 relay outputs	115-230 V.a.c./ 50/60Hz	083H0212	
		24 V a.c./d.c.	083H0213	

9.4 Transmitter (Remote) 19" Ex-version





Description	Version	Supply voltage	FCI P/N	Symbol
Transmitter, [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	083H0202	
		24 V a.c./d.c.	083H0203	
	3 current outputs 2 frq./pulse outputs 2 relay outputs	115-230 V.a.c./ 50/60Hz	083H0206	
		24 V a.c./d.c.	083H0207	
CMF B through F transmitter, [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	083H0210	
		24 V a.c./d.c.	083H0211	
	3 current outputs 2 frq./pulse outputs 2 relay outputs	115-230 V.a.c./ 50/60Hz	083H0214	
		24 V a.c./d.c.	083H0215	



9.5 Panel mounting kits

Description	FCI P/N	Symbol
Panel mounting kit for 19" insert (21 TE) IP 65 enclosure in ABS plastic for panel-front mounting	083F5030	
Panel mounting kit for 19" insert (42 TE) IP 65 enclosure in ABS plastic for panel-front mounting (Holds 2 transmitters)	083F5031	
Back of panel mounting kit for 19" insert (21 TE) IP 20 enclosure in aluminium	083F5032	
Back of panel mounting kit for 19" insert (42 TE) IP 20 enclosure in aluminium (Holds 2 transmitters)	083F5033	
Front cover (7 TE)	083F4525	

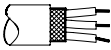
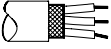


**Wall boxes
(Without back plates/PCB)**

Description	FCI P/N	Symbol
Wall mounting enclosure for 19" version (21 TE) IP66	083F5037	
Wall mounting enclosure for 19" version (42 TE) IP66	083F5038	


**Backplates/PCB for
19" versions**

Description	Enclosure	Version	FCI P/N	Symbol
Transmitter IP 20	19"	12-24 V 115-230 V	083H4272	
Transmitter [EEx ia] IIC IP 20	19"	12-24 V 115-230 V	083H4273	
Transmitter for wall mounting enclosure	Wall unit	12-24 V 115-230 V	083H4274	
Transmitter [EEx ia] for wall mounting enclosure	Wall unit	12-24 V 115-230 V	083H4275	


9.6 Cables and connectors

Description	Length ft (m)		FCI P/N	Symbol
Cable with multiple plug Standard blue cable between Transmitter and Sensor 5 x 2 x 0.34 mm ² twisted and screened in pairs Temperature range -4 to 230°F (-20 to +110° C)	15 (5)		083H3015	
	30 (10)		083H3016	
	80 (25)		083H3017	
	165 (50)		083H3018	
	240 (75)		083H3054	
	480 (150)		083H3055	
Cable with multiple plug High temperature cable between high temperature Transmitter and Sensor 5 x 2 x 0,34 mm ² twisted and screened in pairs Temperature range -94 to +392°F (-70 to +200°C)	15 (5)		083H3057	
Multiple plug for cable mounting			083H5056	
Adaptor for CMF B through F (To convert integral transmitter sensor assembly to remote configuration)			083L5052	

**9.7 SENSORPROM®
memory unit**

2 kB SENSORPROM® unit (Sensor serial no. must be specified when ordering)	083H4410	
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9.8 Add-on module

Description	FCI P/N	Symbol
HART®	085U0226	
Profibus PA	085U0227	
CANopen	085U0228	
DeviceNet	085U0229	
Profibus DP	085U0230	

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 defective 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 initialization the check of the saved totalizer value has failed. It is not possible to rely on the saved totalizer value. The totalizer value must be reset manually in order to rely on future readings	Active	Active
20	W20 - Totalizer 2 Reset manually	During initialization the check of the saved totalizer value has failed. It is not possible to rely on the saved totalizer. 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 occurred 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 defective	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.	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 amplitude 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 Transmitter

Symptom	Output signals	Error code	Cause	Remedy
Empty display	Minimum		1. Supply voltage 2. Transmitter defective	1. Check supply voltage 2. Replace Transmitter
No flow signal	Minimum		1. Current output deselected 2. Digital output deselected 3. Reverse flow direction	1. Activate current output 2. Activate digital output 3. Change direction
		W31	Measuring pipe empty	Ensure that the measuring pipe is full
		F60	Internal error	Replace Transmitter
	Undefined	P42	1. No load on current output 2. Transmitter defective	1. Check cables/connections 2. Replace Transmitter
		P41	Initializing error	Switch off Transmitter, wait 5 seconds 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 2. Air bubbles in medium 3. Vibrations 4. Pump noise	1. Increase time constant 2. Ensure medium does not contain air bubbles 3. Ensure that the sensor is mounted on a rigid frame without vibrations 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 Instrument
	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

8.2 Check for air in the system

In case of large air collections non-homogenously distributed in the sensor, the air in the liquid can disturb the flowmeter and lead to incorrect measurement, whereas homogenously 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-homogeneously 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 sources

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

Check whether the 0-point is within the accuracy specifications given by Fluid Components Intl. Check 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).

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. multiply 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.

INDEX

Symbols

0-point adjustment	24, 62
1 set point	58
19" insert, standard unit	20
2 separate set points	58
2 set points	58
2-phase flow	22

A

Adaptor	41
Add-on modules	33
Air bubbles	22
Air generation sources	75
Air trap	22
Alarm field	51

B

Back of panel unit	21
Backward key	51
Basic settings	55
Batch compensation	59
Batch counter	59
Batch menu	59
Batch overrun error	59
Batch quantity	59
Batch time error	59
Build-up ordering	77
Burst pressure	29

C

CAN communication	6
Cavitation	22
Change key	51
Change password	67
Communication standard	14
Compact polyamid	20
Converter insert	43
Correction factor	61
Correction factor, density offset, fraction offset	61
Cross-talk	23
Current output	57
Current output forced	65
Current output in passive mode	50

D

DEMKO	30
Density factor	61
Dialog module	6
Digital output	57
Digital signal processor	6
Dimension-dependent factory setting	71
Display	51
Driver circuit	6
Driver current [mA]	65
Driver frq. [Hz]	65
Driver signal	65

E

Empty pipe limit	56
Enclosure, burst pressure	6
Error level	58
Error level	56

Error log	64
Error number	58
Error numbers	73
Error pending	64
Error system	64
Ex-area	30
Ex-compliance of add-on module	44
External input	60

F

Factory setting	70
Fatal error	72
Fit/exchange the SENSORPROM®	35
Flexible connections	23
Flow direction	24, 25, 27
Flow measuring principle	6
Force output	60
Forward key	51
Freeze input	60
Frequency/pulse output in passive mode	50

G

Gas	22
-----------	----

H

HART®	14
"Heating jacket"	18
Hold/continue	60
Horizontal mounting	24
Hysteresis	71

I

Increased safety "e"	49
Input circuit	6
Inside pipe diameter	6
Intrinsic in- and output cables	40
Intrinsically-safe	49

J

Jumper position	50
-----------------------	----

L

Language mode	67
Limit/direction	58
Linearity error	11
Liquid pressure	6
Lock/unlock key	51
Low flow	24
Low-flow cut-off	56

M

Mass flow measuring range	6
Materials	6
Max. batch time	59
Max. frequency	70
Max. operating pressure (PN)	29
Max. zero point error	11
Mechanical vibration	23
Menu structure	52
Multiple plug	41

N

Noise filter 56
 Numerical values 55

O

Operating time 65
 Operator menu 52
 Operator menu setup 66
 Ordering procedure 76
 Output mode 70
 Output module 6

P

Panel front unit 21 TE 21
 Password 52
 Permanent errors 72
 Pick-up 1/2 amplitude 65
 Pipe wall thickness 6
 Positioning of the decimal point 55
 Primary field for numerical value 51
 Process connections 6
 Product identity 67
 Profibus device profile 14
 Pulse polarity 70
 Pulse width 70

R

Re-initialized 64
 Reference conditions 11
 Repeatability error 11
 Reset mode 62
 Reset totalizer 60
 Resonant frequency 6

S

Select key 51
 Selecting the unit 55
 Sensor frequency 65
 Sensor temperature 65
 SENSORPROM® flow memory unit .. 5
 Service mode 65
 Setting the 0-point 62
 Setup menu 52
 Setup mode 52
 Sigma limit 62
 Sign field 51
 Spare parts 78
 Special information 65
 Start batch 60
 Static back pressure 22
 Stop batch 60

T

Temperature class 30
 Time constant 70
 Top up key 51
 Totalizer 56
 Transmitter Ex-d 21
 Transportation/storage 23
 Turning the control pad 32
 Turning the transmitter 32

U

Unit field 51
 User code 52

V

Vertical mounting 25
 View mode 52

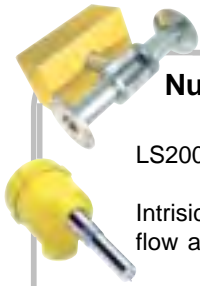
W

Wall mounting box 21 TE 20
 Warning 72

Z

Zero adjust 60, 62
 Zero adjust time 62
 Zero sigma 62

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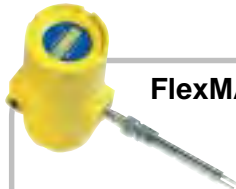
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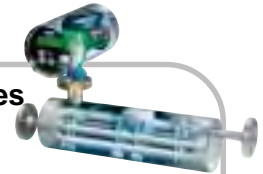
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