

(Intrinsically safe) batch and loading controller
Batching Master 110 (i) and 210 (i)
Flow



Programming manual only valid in combination with the installation manual
Batching Master 110 (i) / 210 (i)

Device Software Version 2.32 (resp. 3.32)

Revision 20.4

IBS BatchControl GmbH
Im Sträßchen 2-4
53925 Kall
Germany



Tel.: +49 2441 9199801
Fax.: +49 2441 9199871
Internet: www.ibs-batchcontrol.com

Safety information



The Batching Master must only be installed by process electronics engineers or qualified electricians who are authorised by the plant operator to carry out these tasks.

The instrument may only be operated by personnel who are authorised and trained by the plant operator.

The Batching Master must only be connected as specified in the electrical data. The upper part of the housing must not be opened, otherwise maintenance of the electrical data is not ensured and the guarantee becomes null and void.

Validity of Installation and Operating Instructions

- These Installation and Operating Instructions apply to all Batching Master models. It is valid only in conjunction with the installation manual Batching Master.
- Your IBS agent will be able to give you information about any improvements or modifications.
- The manufacturer is not responsible for damage caused by incorrect or unauthorised use. Conversions and changes to the instrument must not be made, otherwise the certification and guarantee become invalid.

Contents

1	Operation.....	7
1.1	Switching on the Batching Masters.....	7
1.2	Batching with the Batching Master.....	7
1.3	Fault messages.....	8
1.4	Programming.....	10
2	The parameter level.....	11
2.1	Setting the digital shutoff steps.....	11
2.2	Setting the flow limitation after batch start.....	12
2.3	Setting the analogue shutoff steps.....	12
2.4	Setting a start-up ramp of the analogue output.....	13
2.5	Setting the shut-down ramp of the analogue output.....	13
2.6	Monitoring maximum flow.....	13
2.7	Batch indication.....	14
2.8	Monitoring the overfill quantity.....	14
2.9	Monitoring of sensor break contact inputs.....	14
2.10	Monitoring of sensor break current inputs.....	14
2.11	Monitoring measuring range violation for current inputs.....	14
2.12	Specify fixed values.....	14
2.13	Self optimising overrun compensation.....	15
2.13.1	End value for correction.....	15
2.13.2	Absolute value for maximum deviation.....	15
2.13.3	Flow rate addicted correction from the shut off steps.....	15
2.14	Checksum for certification data.....	16
2.15	Checksum for parameter assignment data.....	16
2.16	Software version custody transfer part.....	16
2.17	Flow rate reduction at batch start.....	16
2.17.1	Function for flow-rate reduction.....	16
3	The structure level.....	17
3.1	Setting the language.....	17
3.2	Setting the function of the digital inputs.....	17
3.2.1	Set.....	17
3.2.2	Start.....	17
3.2.3	Set-Start.....	17
3.2.4	Stop.....	17
3.2.5	Reset.....	17
3.2.6	External failure – ERR at a digital input.....	17
3.2.7	Reset totaliser.....	17
3.2.8	Custom specific release signals.....	17
3.2.9	Enabling the Modbus interface.....	18
3.2.10	Disabling keypad operating.....	18
3.2.11	Activate purge function.....	18
3.2.12	Switching off controller function.....	18
3.2.13	Valve opened contact.....	18
3.2.14	Vale closed contact.....	18

3.2.15	Enabling input for special function.....	18
3.2.16	Selecting the fixed preselection values, fixed setpoints or product pipelines.....	18
3.3	Setting the direction of action of the digital inputs.....	19
3.4	Setting the type of activation of the digital inputs.....	19
3.5	Setting the functions of the digital outputs.....	19
3.5.1	Assigning shut off points to the digital outputs.....	19
3.5.2	Setting a digital output to pulse output.....	19
3.5.3	Setting a digital output as batching indication.....	20
3.5.4	Setting a digital output as a flow alarm.....	20
3.5.5	Setting a digital output as a fault indication.....	20
3.5.6	Setting a digital output as purge indication.....	20
3.5.7	Setting a digital output for additive dosing.....	20
3.6	Setting the direction of action of the digital outputs.....	20
3.7	Interface settings.....	20
3.7.1	Setting the operating mode for interface 1.....	20
3.7.2	Setting the protocol type of interface 1.....	20
3.7.3	Specifying the unit address of interface 1.....	21
3.7.4	Specifying transmission speed of interface 1.....	21
3.7.5	Specifying the function of interface 2.....	21
3.7.6	Setting the protocol type of interface 2.....	21
3.7.7	Specifying the unit address of interface 2.....	21
3.7.8	Specifying transmission speed of interface 2.....	21
3.8	Code entry.....	21
3.9	Locking the keypad.....	22
3.10	Function key assignment.....	22
3.10.1	Shut-off steps on LED.....	22
3.10.2	Fixed select values.....	22
3.10.3	Purge with F1.....	23
3.10.4	Product selection.....	23
3.11	Text entry.....	23
3.12	Valve control.....	24
3.13	Indication of different values from the flow conversion.....	25
3.14	Valve position feedback.....	25
4	Controller settings.....	26
4.1	Flow controller.....	26
4.2	Limiting controller.....	26
4.2.1	Measuring range of flow-rate controller.....	26
4.2.2	Measuring range of limiting controller.....	26
4.3	Control parameter.....	27
4.3.1	Proportional coefficient Kp.....	27
4.3.2	Working point setting OP.....	27
4.3.3	Derivative action gain Kd.....	27
4.3.4	Integral action time Tn.....	27
4.3.5	Derivative action time Tv.....	27
4.3.6	Setpoint start SPS.....	27
4.3.7	Setpoint end SPE.....	27
4.3.8	Set setpoint enable.....	27
4.3.9	Setpoints.....	27

4.3.10	Ramp difference.....	28
4.3.11	Valve time.....	28
4.3.12	Minimal pulse time.....	28
5	Settings in the install level.....	29
5.1	Specifying the type of sensor.....	29
5.2	Setting the measuring range of the flow sensor.....	29
5.2.1	Measuring range unit.....	29
5.2.2	Decimal places.....	29
5.2.3	End of scale value.....	29
5.2.4	Incoming pulses per unit.....	29
5.2.5	Allowed error pulses.....	30
5.2.6	Meter Factor.....	30
5.3	Linearisation of an input signal.....	30
5.4	Pulse output, pulse rate or frequency.....	30
5.4.1	Pulse output, pulse rate.....	30
5.4.2	Pulse output, frequency.....	30
5.5	Limit pre-selection value.....	30
5.5.1	Minimum pre-selection value.....	30
5.5.2	Maximum pre-selection value.....	30
5.6	Entering the overrun quantity.....	31
5.7	Monitoring the minimum permissible flow.....	31
5.7.1	Permissible under-batching quantity.....	31
5.8	Special function for filling and emptying the pipe system.....	31
5.8.1	Application 1.....	32
5.8.2	Application 2.....	32
5.8.3	Application 3.....	32
5.8.4	Application 4.....	32
5.9	Suppressing the flow counting.....	32
5.10	Printer settings.....	33
5.10.1	Waiting time for printout after end of batch.....	33
5.10.2	Starting conditions at batch start.....	33
5.11	Reset totaliser.....	33
5.12	Monitoring the Interface.....	33
5.13	Software function pipeline measuring.....	33
5.14	Additive dosing control.....	33
6	Settings in the calibration and test level.....	34
6.1	Calibrating current inputs.....	34
6.2	Calibrating current outputs.....	34
6.3	Testing inputs and outputs.....	34
7	Error correction of an input signal.....	36
8	Flow conversion menu.....	37
8.1	Possibilities for the flow conversion:.....	37
9	Factory menu.....	38
9.1	Specify fixed preselection values, setpoints or products.....	38
9.2	Controller.....	38

9.3	Purge function and other special functions.....	38
9.4	Custody transfer approved instrument.....	38
9.5	Terminal mode.....	38
9.6	Device number.....	38
9.7	Flow conversion with temperature and density.....	39
9.8	Continuous pipeline measuring.....	39
10	Overview parameter settings.....	40
11	Overview structure level.....	45
12	Overview controller settings.....	51
13	Overview install settings.....	54
14	Overview calibration and test settings.....	58
15	Overview linearisation.....	60
16	Overview Flow Conversion.....	61
17	Factory Settings.....	63

1 Operation

The upper line of the display indicates the preset quantity. In programming mode, the function to be executed is displayed.

The lower line indicates the quantity batched. In programming mode, the value of the function or setting is shown.

You can switch the lower display to flow indication with the [#] key. You can switch to totaliser by pressing the key again. The totaliser indication is only possible when batching is not taking place. The display resets itself after about 4 seconds.

If the flow controller is active, the flow setpoint is displayed in the upper display by pressing the [#] key at the same time as the flow is being indicated in the lower display.

If a limiting controller is switched on, the lower display will show the controlled variable rather than the flow when the [RC] key is pressed. The upper display shows the reference variable. The controller display resets itself to the batched quantity after about 4 seconds.

If the flow conversion mode is active, different values e. g. mass flow, volume flow, standard volume flow, temperature... can be displayed by pressing the up or down arrow keys.

If the lower display indicates flow at the start of batching, it will switch automatically to the batched quantity. The flow can then be displayed again by pressing the [#] key. The display will not automatically revert to batched quantity.

The quantity is always shown with the appropriate unit in each case.

The RC key also contains a red LED to indicate that the remote control interface is on.

Keys F1 to F3 contain additional indicator LEDs. Functions can be assigned to these LEDs.

These LEDs can also be activated via the interface. Keys F1 to F3 and RC can be interrogated via the interface.

1.1 Switching on the Batching Masters

The instrument carries out a self-test as soon as it is connected to the power supply. The instrument number and software version are displayed. All data stored in the FRAM (ferro-electric non-volatile RAM, a non-volatile data memory) is then read.

The most recent preselected and batched quantities are displayed. The instrument waits for an input.

1.2 Batching with the Batching Master

You must press the [Reset] key before the first batching process. The last preselection is reset.

Enter the preselected quantity using the numeric keys [1 to 9]. A decimal point will be displayed in a fixed position.

The preselected value must be confirmed with [Set]. The last batched quantity is set to 0. The Batching Master is now ready to start batching.

Press the [Start] key to start batching. The digital shutoff steps switch on, the current output runs up to 20 mA. Active batching is indicated on the display (B appears at the bottom left). You can interrupt the batching with [Stop] or OFF at any time.

Batching interrupted with Stop can be continued immediately with [Start]. If batching is stopped as the result of an OFF, the fault message must first be reset with [Reset]. You can then continue batching with [Start].

A new batching process can be started immediately with [Set] [Start] if the preselected quantity does not need to be changed.

After stopping, batching can be terminated with [Reset].

After a supply break down you can take up the batch with [Start] again.

1.3 Fault messages

The Batching Master can detect various faults. Batching is interrupted immediately. The fault is reset by pressing the RESET key (see Holding Register 5 and 6).

No.	<i>Lower Display</i>	<i>Upper Display</i>	<i>Fault Type</i>
1	FRAM	Error in	Memory error
2	ERR S.-Break NK1 alternate with batched quantity	Preselected quantity	Namur contact 1 sensor break
3	ERR S.-Break NK2 alternate with batched quantity	Preselected quantity	Namur contact 2 sensor break
4	ERR S.-Break mA1 alternate with batched quantity	Preselected quantity	Analogue input 1 sensor break
5	ERR S.-Break mA2 alternate with batched quantity	Preselected quantity	Analogue input 2 sensor break
6	ERR S.-Break mA3 alternate with batched quantity	Preselected quantity	Analogue input 3 sensor break
7	ERR M.-range mA1 alternate with batched quantity	Preselected quantity	Analogue input 1 measurement range violation
8	ERR M.-range mA2 alternate with batched quantity	Preselected quantity	Analogue input 2 measurement range violation
9	ERR M.-range mA3 alternate with batched quantity	Preselected quantity	Analogue input 3 measurement range violation
11	ERR MIN. FLOW alternate with batched quantity	Preselected quantity	Flow rate lower than permitted minimum
12	ERR sensor alternate with batched quantity	Preselected quantity	External fault message (e. g. mass measurement fault)
13	free text1 alternate with batched quantity	Preselected quantity	release 1 not enabled
14	free text 2 alternate with batched quantity	Preselected quantity	release 2 not enabled

No.	Lower Display	Upper Display	Fault Type
15	ERR Over batched alternate with batched quantity	Preselected quantity	Over-batching
16	ERR OFF alternate with batched quantity	Preselected quantity	OFF
17	ERR Printer alternate with batched quantity	Preselected quantity	Printer fault
18	Pres. too less	Pres. quantity	Preselection too small
19	Pres. too great	Pres. quantity	Preselection too large
21	ERR no acknowl. flashing	Preselected quantity	Batch confirmation not present
22	Error pulse alternate with batched quantity	Preselected quantity	Pulse faulty (in case of double pulse)
23	Printer Error alternate with batched quantity	Preselected quantity	Printer error communication error
26	Product Selection Error alternate with batched quantity	Preselected quantity	No product selected
27	extended area crc bad	Preselected quantity	checksum failure
28	API-Calculation Error	Preselected quantity	
29	External Sensor Error	Preselected quantity	Sensor Error at Modbus Master
30	Valve not open	Preselected quantity	Valve open contact not active
31	Valve not closed	Preselected quantity	Valve closed contact not active
32	ERR Communic.	Preselected quantity	Interface: No Watchdog Trigger
	Temperature	Sensor failure	Fault at the temperature input
	Density	Sensor failure	Fault at the density input
	Pressure	Sensor failure	Fault at the pressure input

Faults 1 and 15 are monitored continuously. Faults 2 to 13 are monitored following start. Fault 16 is monitored before starting and after stopping batching. Fault 14 is monitored after stopping batching.

1.4 Programming

To enter the programming level, press the Menu key. The Batching Master displays the current software version and the instrument number for a short time.

If a sub-menu is selected, you can access the next level using the ➤ key. Any entered code is requested. The code request is by-passed if the programming enable switch is on. For certified instruments, the certification data can only be changed by switching on the programming enable switch (install, calibration and characteristic level).

Programming is only implemented when the “Quit programming” menu level is correctly terminated. The programming level is quit via a selection menu by pressing the ◀ key to exit all levels. The “Save” prompt appears. You can change from “No” to “Yes” using the ▲▼ keys. Then the setting is confirmed by pressing the ◀ or [Set] key. All data are saved. The batch controller is in batching mode again. Programming cannot take place during batching (except for the controller function).

2 The parameter level

This chapter describes the setting options in the parameter level.

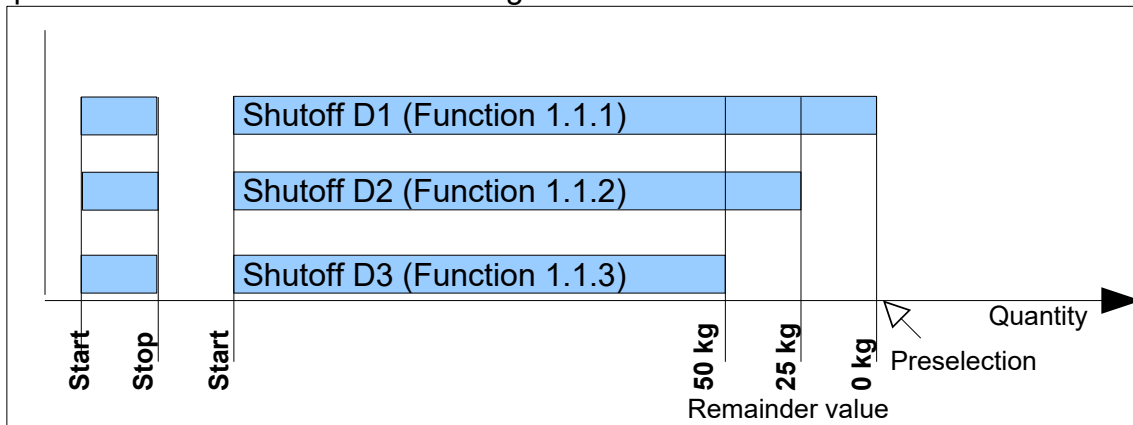
2.1 Setting the digital shutoff steps

There are three digital outputs for switching on/off-valves or pumps during the batch process. shutoff steps D1 to D3 are assigned to digital outputs DA1 to DA3 in the factory setting. These three digital outputs are switched off (opened) at activity of the OFF switch.

These digital outputs switch on at batch start. They switch off as soon as the preselected quantity is reached. If the batch is interrupted by [STOP] or [OFF], the digital outputs also switch off.

Remainder values can be set to prevent overfilling. The digital outputs then switch off before the end of batching. Setting the remainder values for the shutoff steps is carried out in the parameter level function 1.1.x.

If you set the shutoff D3 to 50 kg, D2 to 25 kg and D1 to 0 kg for example, the digital outputs switch as shown in the drawing.



As soon as the batch is started, all three digital outputs switch on. First, shutoff step D3 switches off 50 kg before batch end. Shutoff step D2 switches off 25 kg before batch end. When reaching the preselected quantity (remainder value = 0), shutoff step D1 switches off.

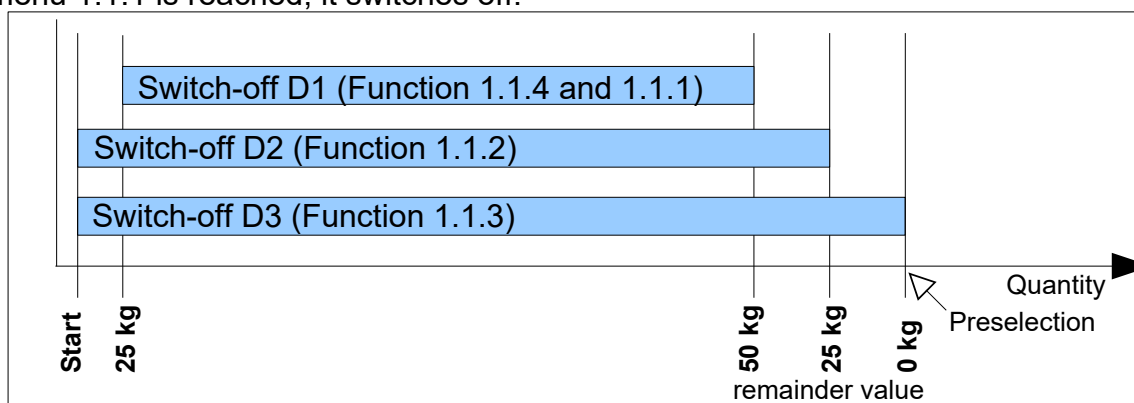
The digital shutoff steps are assigned to the digital outputs in function 2.3.x of the structure level.

The direction of action of the digital outputs can be set in function 2.3.x. Please note that digital outputs DA1 to DA3 always open if an OFF is initiated.

The LEDs in keys F1 to F3 can be assigned to the digital shutoff steps in function 2.7 of the structure level.

2.2 Setting the flow limitation after batch start

The digital output set to “Digital 1 switch-off” switches on after the quantity set in 1.1.4. When the remaining quantity before the end of the batch “D1 switch-off” from menu 1.1.1 is reached, it switches off.

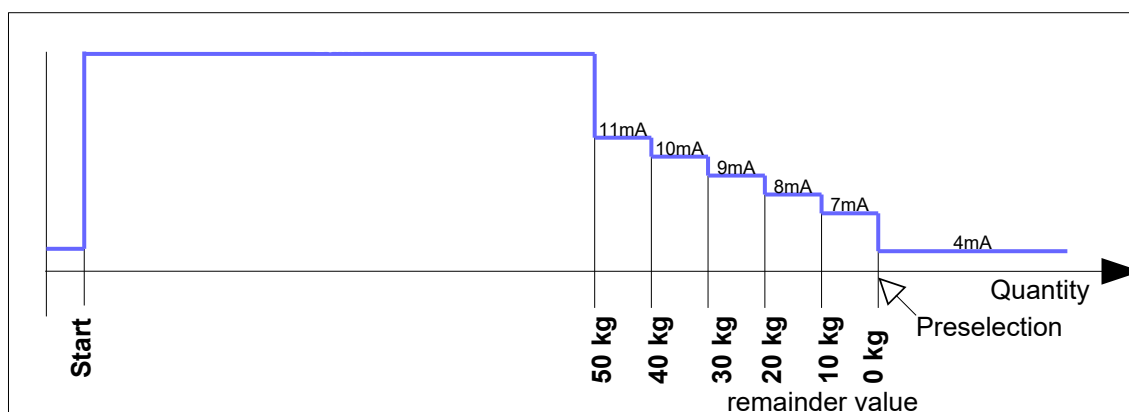


With this setting you can, for example, open a small flow path with D3. After the value from menu 1.1.4 is reached, D1 switches the high flow-rate on. The high flow-rate is switched off at the set remainder value in 1.1.1. D3 switches off the low flow rate when the preselected quantity is reached.

2.3 Setting the analogue shutoff steps

To achieve a more accurate shutoff at the end of a batch, the analogue output can be ramped down to 4 mA in six steps. The point at which a step should be activated before the batch end is entered in function 1.2.x. A current figure is assigned to this value in the next sub-menu. If a flow controller is active, the flow setpoint can be entered. For this, shutoff by flow must be set in function 1.2.1.

The diagram below shows how the preselected values (factory setting) act during a batch.



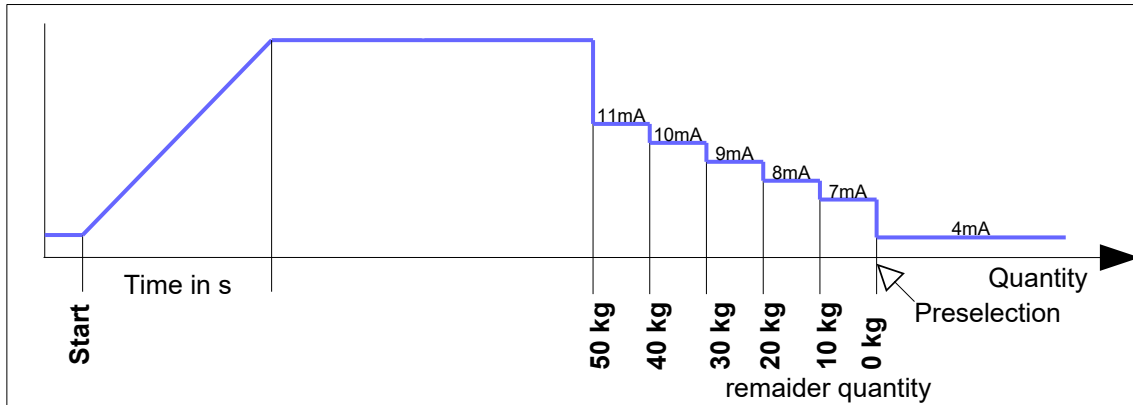
If the batch is stopped using [Stop], the output supplies 4 mA immediately if no shut-down ramp is specified. If OFF is operated, the output supplies no current. A shut-down ramp is not taken into account.

If the preselected quantity is less than the remainder value of a shutdown step, the shutdown step becomes active immediately.

2.4 Setting a start-up ramp of the analogue output

To prevent pressure hammers in the pipework, the current output to the valve is ramped up at the batch start from 4 to 20 mA.

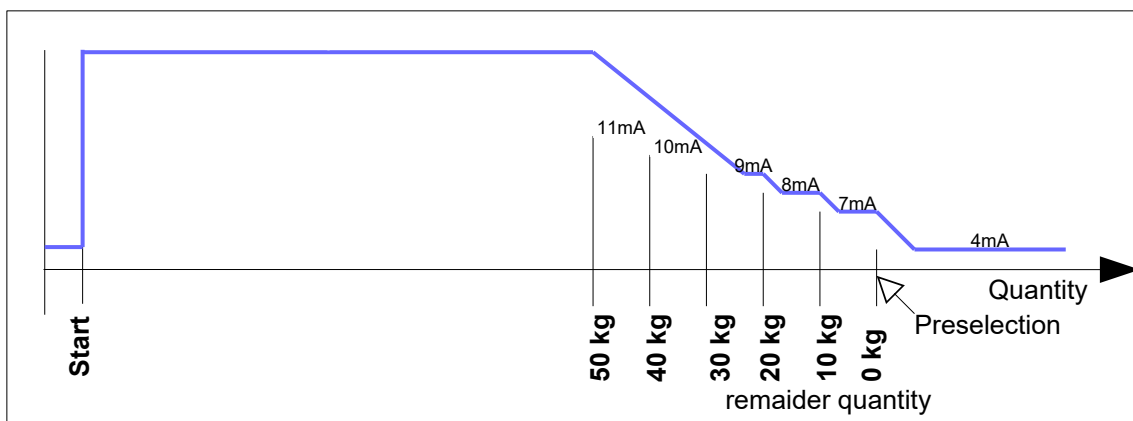
The ramp time can be programmed in function 1.3. Up to 9999 seconds can be specified for the time required to move the actuator from 4 mA to 20 mA.



2.5 Setting the shut-down ramp of the analogue output

To prevent pressure hammers in the pipework, the current output to the valve can be ramped down from 20 to 4 mA if the shut-down steps are working at the end of the batch or if the batch will be interrupted by the stop key. The ramp doesn't work if the OFF is activated.

The ramp time can be programmed in function 1.4. A value up to 9999 seconds can be specified. The time must be specified so small that there is no overfilling.



2.6 Monitoring maximum flow

A maximum permissible flow can be specified in function 1.5. This function can be assigned to a digital output (function 2.3.x). By setting the operating direction you receive a minimum or maximum flow alarm. This digital output switches when the specified flow is exceeded. Entering a value of 0 will disable flow monitoring. In the event of a flow alarm, no further message is shown on the display and the batch is not interrupted.

2.7 Batch indication

Function 1.6 enables a digital output to be used for batch indication. A digital output has to be assigned to the batch indication in function 2.3.x.

There are two types (continuous or pulse) of batch indication available.

In the first type, the digital output is switched from the batch start to the end. The batch must be fully terminated. If the batch is interrupted with [Stop] (preselected quantity not reached), the batching indication remains on. The batch indication only switches off when an interrupted batching process is terminated with [Reset].

In the second version, the batching indication is not on all the time. A pulse is given at the end of a batch. The pulse duration is set to menu 1.6.2 in seconds.

2.8 Monitoring the overfill quantity

A value for the maximum permissible overfill quantity can be entered in function 1.7.1. If this value is exceeded, a fault message appears on the display. The digital output assigned to the fault message in function 2.3.x is switched.

In function 1.7.2 the time is set, how long the overfill quantity should be monitored after the batch is terminated. This is necessary if, for example, the mass measuring device runs empty after a time and issues pulses even though no medium is flowing.

2.9 Monitoring of sensor break contact inputs

If a Batching Master has been configured for pulse or double pulse input, the Namur contact sensor break can be monitored. The used contact inputs are monitored for open circuit or short-circuit if sensor break is switched on in function 1.8.1 or 1.8.2. If a fault occurs, an active batch process is stopped and the fault message is issued.

2.10 Monitoring of sensor break current inputs

If you have configured the Batching Master as a current input or a limiting or tracking controller, the current sensor break can be monitored. The used current inputs are monitored for currents less than 3.2 mA by activated sensor break monitoring in functions 1.8.3 to 1.8.5. If a fault occurs, an active batch process is stopped and the fault message is given.

2.11 Monitoring measuring range violation for current inputs

If your Batching Master has been configured as a current input or a limiting or tracking controller, current measuring range violation can be monitored. The used current inputs are monitored for currents exceeding 20.4 mA when monitoring is switched on in functions 1.8.6 to 1.8.8. If a violation occurs, an active batch process is stopped and the fault message is given.

2.12 Specify fixed values

You can order a special function that enables you to specify three fixed pre-selection values or controller setpoints. These pre-selections are selected about digital inputs (see functions 2.2.0) or function keys.

The three fixed pre-selection values can be specified in function 1.9.x. In function 3.1.11 to 3.1.13 (flow controller) or 3.2.11 to 3.2.13 (limiting controller) you can specify the controller setpoints.

2.13 Self optimising overrun compensation

If a batch is controlled via digital outputs with attached on/off valves or pumps, it can due to different product properties or plant conditions (e. g. pump pressure) to the over batch or under batch.

To correct this, you can turn on the automatic tracking corrections function in 1.10.0. Both correction functions contribute to the shut off values of the digital outputs, which are referred as digital shutoff 1 to 3 in menu 1.1.0. The analogue shutoff steps are not changed.

Note:

- Only batches, which are done without stops and error messages are used for the compensation calculation. The third shutoff point is used for calculation reference.
- Don't forget to activate the flow monitoring in function 4.8.0. A value for the allowed under-filling must be set. The minimum allowed flow (4.8.1) with the times (4.8.2 and 4.8.3) and an allowed under-filling (4.8.4) must be set.
- To detect an overfilling, the print out waiting time in function 4.11.2 must be set. The correction of the shut up steps is calculated after this waiting time. During this waiting time no new start is possible.



Note!

2.13.1 End value for correction

The overfilling or under-filling value is determined. All three shut off points are moved accordingly for the next batch.

You set the factor for overfilling compensation in function 1.10.1. The input value is in percent. The function is off if 0 % is set. You can see the current shutoff values in the function 1.1.0.

Example:

The over-batch is 10 kg. If function 1.10.1 is set to 10 % as correction factor, the digital shut off points are set back 1 kg, so that the next batch is shut off 1 kg earlier.

2.13.2 Absolute value for maximum deviation

You set the maximum batch deviation that is used for calculation in function 1.10.2. All batches with greater deviations are not used for calculation the correction. If 0 is being entered, the function is switched off.

2.13.3 Flow rate addicted correction from the shut off steps

You set the flow rate addicted correction factor in function 1.10.3. At the third shut off the current flow rate is compared with the flow rate from the last batch. If the current flow rate is less than the last flow rate, the shut off points are set near to the batch end. If the flow rate is greater, the shut off points are set away from the batch end. The new shut off point 3 can work first at the next batch. The function 1.10.3 is disabled if set to 0. The set value of shut off correction is set for a ten percent change from the maximum flow rate.

Example:

In function 1.10.3 (flow corr.) 10 kg is set. At the last batch the flow rate was 50000 kg/h (measuring range 100000 kg/h). At the current batch the flow rate is 40000 kg/h. So the flow rate is 10% less (from maximum flow rate) as in the last batch. The first and the second shut off steps will be activated 10 kg later as in the last batch.

2.14 Checksum for certification data

A checksum of all certification data is generated and is displayed on the LCD at function 1.11.

2.15 Checksum for parameter assignment data

A checksum of all data unrelated to certification is generated and displayed on the LCD at function 1.12.

2.16 Software version custody transfer part

The software version from the custody transfer software part is displayed at function 1.13.

2.17 Flow rate reduction at batch start

In menu item 1.14, a reduction of the flow rate after batch start is configured. The reduced flow rate can be determined over a quantity or over a time period.

2.17.1 Function for flow-rate reduction

Flow reduction after batch start is switched off by default.

If "4-20 mA value" is selected, the current value from parameter 1.14.4 is used for the flow reduction. If shut-off stages or the actuator output of a flow or limiting controller are active, these have priority.

If "Flow set point" is selected, the flow rate set point is taken from parameter 1.14.5 to reduce the flow rate after starting dosing. If the active flow set point or shut-off set point is less than the "Flow set point", the smaller set points are used for flow control.

The quantity after batch start for which a reduced flow rate is desired is set in menu 1.14.2. If a time for which the reduced flow rate is desired is to be entered, this is set in menu 1.14.3.

3 The structure level

3.1 Setting the language

Select the menu language in function 2.1.

3.2 Setting the function of the digital inputs

Functions 2.2.1, 2.2.4, 2.2.7, 2.2.10 and 2.2.13 are used to set the functions of the digital inputs.

3.2.1 Set

If a digital input is set to “Set” the input behaves in the same way as the [Set] key.

3.2.2 Start

If a digital input is set to “Start” the input behaves in the same way as the [Start] key.

3.2.3 Set-Start

If a digital input is set to “Set-Start” the input behaves as if the Set key has been pressed followed by the Start key.

3.2.4 Stop

If a digital input is set to “Stop” the input behaves in the same way as the [Stop] key.

3.2.5 Reset

If a digital input is set to “Reset” the input behaves in the same way as the [Reset] key.

3.2.6 External failure – ERR at a digital input

If a digital input is set to "external fault", the active batch is interrupted when actuated and the fault is indicated on the LCD or the fault output.

3.2.7 Reset totaliser

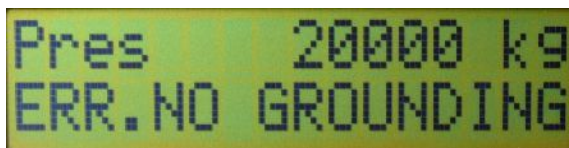
If the digital input is set to “Tot. reset”, the totaliser will be reset if the input is activated.

3.2.8 Custom specific release signals

If a digital input is programmed to “Release 1” or “Release 2”, you can start a batch process only if the digital input is activated. Otherwise a failure message will be shown in the second display line. This can be cancelled with the [RESET] key. The release signal is controlled during the batch.

In menu items 2.8.1 and 2.8.2, you can enter any text with a maximum length of 16 characters instead of "Release 1" or "Release 2". The texts from holding register 1151 are stored via the interface.

Example:



3.2.9 Enabling the Modbus interface

If the digital input is set to "Interface enable", it is possible to read and write to the registers if the input is activated. The LED RC lightened.

3.2.10 Disabling keypad operating

You disable the keypad operation if the digital input is activated. Single keys could be enabled with function 2.6.x.

3.2.11 Activate purge function

If the digital input is set to "purge", the actuator output ramps up to 20 mA when the input is activated. The lower display shows "purge". You can't purge during the batch. The function is described in more detail on page 31.

3.2.12 Switching off controller function

The controller function is switches off as long as the digital input is activated.

3.2.13 Valve opened contact

The valve opened contact is monitored (see function 2.11.1).

3.2.14 Vale closed contact

The valve closed contact is monitored (see function 2.11.2).

3.2.15 Enabling input for special function

If the digital input is set to "SF enable", function 4.9 is enabled if the input is activated (see special rinsing function page 31).

3.2.16 Selecting the fixed preselection values, fixed setpoints or product pipelines.

Digital input 4 can be assigned to "Selection 1" and digital input 3 to "Selection 2". These digital inputs can then be used to select one of three fixed values. If only one fixed value is required, it is sufficient to set digital input 4 to "Selection 1". If up to three fixed selection values are required, digital input 3 must be set to "Selection 2".

The selection is made according to the following table:

	Value 1	Value 2	Value 3
Selection 1 Digital input 4	1	0	1
Selection 2 Digital input 3	0	1	1

The fixed values can also be selected using function keys F1 to F3. To enable this, set in function 2.7.3 the function keys to fixed selection. The corresponding selection comes into force as soon as the function key is pressed. The LED in the key you pressed lights up.

3.3 Setting the direction of action of the digital inputs

Functions 2.2.2, 2.2.5, 2.2.8, 2.2.12 and 2.2.14 are used to set the direction of action of a digital input. The “normally open” setting means that a contact must be closed to activate the function. The direction of action is reversed in the “normally closed” setting.

3.4 Setting the type of activation of the digital inputs

Functions 2.2.3, 2.2.6, 2.2.9, 2.2.13 and 2.2.15 are used to specify whether the function of the digital input is to be triggered by a level or an edge.

If, for example, a digital input is set to “Stop” with the action “Fixed level”, the batch cannot be started until the Stop is deactivated. If, however, the “Stop” function is set to “Edge”, batching is interrupted by the digital input but can be restarted. The activation of the stop input does not need to be interrupted for a restart to take place. Another stop will only be initiated by activating the stop input again (edge).

3.5 Setting the functions of the digital outputs

A number of functions can be assigned to the five digital outputs. Note that digital outputs 1 to 3 are switched off when the OFF is operated.

The factory setting of the digital outputs is as follows:

Digital output 1	Digital shut off point 1
Digital output 2	Digital shut off point 2
Digital output 3	Digital shut off point 3
Digital output 4	Batching indication
Digital output 5	Fault indication

If menu 2.9 valve control is set to “two-steps”, digital output 1 is used as NC contact and digital output 2 is used as NO contact. The menu for setting digital output 1 and 2 are not available.



Note!

3.5.1 Assigning shut off points to the digital outputs

The shut off points entered in functions 1.1.1 to 1.1.3 can be assigned to the digital outputs. In the factory setting, the three shut off points are assigned to digital outputs 1 to 3. When the OFF is operated, digital outputs 1 to 3 are switched off immediately by the hardware. In addition, switch off takes place by the micro-controller.

“ERR OFF active” appears in the lower display line.

3.5.2 Setting a digital output to pulse output

The current flow rate can be given out on the digital outputs in the form of pulses. The maximum frequency is 150 Hz.

Setting the pulse increment is carried out in function 4.4.

3.5.3 Setting a digital output as batching indication

You can assign the batch indication (function 1.6) to the digital output. This permits termination of batching to be transmitted to a higher-level system.

3.5.4 Setting a digital output as a flow alarm

The flow alarm (function 1.5) can be shown on the digital outputs.

3.5.5 Setting a digital output as a fault indication

A fault indication can be assigned to a digital output so that faults which cause batching to be interrupted can be passed on to a higher-level system. This output switches immediately a fault occurs.

3.5.6 Setting a digital output as purge indication

The output switched if the purge function is active.

3.5.7 Setting a digital output for additive dosing

The digital output is used for additive batch control.

3.6 Setting the direction of action of the digital outputs

Functions 2.3.2, 2.3.4, 2.3.8 and 2.3.10 are used to set the direction of action of a digital output. The “normally open” setting means that the contact closes when the function is triggered. The direction of action is reversed in the “normally closed” setting.

3.7 Interface settings

The Batching Master owns two serial data interfaces. The settings are performed in the sub menu 2.4.0.

The interface can be controlled by a watchdog. Within a specified time a Modbus flag must be reset, otherwise a communication error is displayed. The settings are done over the interface and described in the manual “MODBUS-Register Batching Master”.

3.7.1 Setting the operating mode for interface 1

In function 2.4.1 it is possible to select between the following operation modes:

The setting “read only” only allows the read out of the data from the Batching Master. At the setting “read/write” it is also allowed to write data to the Batching Master. The LED inside the RC key is lightning if the mode is “read/write”.

3.7.2 Setting the protocol type of interface 1

In function 2.4.2, you can choose between Modbus RTU and Modbus ASCII and DIN 66348. If DIN 66348 is selected, a MEW is emulated.

The Batching Master interface works with the following parameters (settings):

Modbus RTU:	Modbus ASCII:
- Data bits: 8	- Data bits: 7
- Stop bits: 1	- Stop bits: 1
- Parity: Even	- Parity: Even

3.7.3 Specifying the unit address of interface 1

In function 2.4.3 it is possible to enter the unit address between 1 and 255.

3.7.4 Specifying transmission speed of interface 1

The baud rate is specified in function 2.4.4. The maximum baud rate is 19200 bps for intrinsically safe units and 115200 bps for non-ex equipment.

3.7.5 Specifying the function of interface 2

In function 2.4.5 it is possible to select between Modbus slave and Modbus master. If the interface 2 works as a slave the Batching Master communicates with a top system. If the interface 2 is set to E&H Promass, Krohne MFC010 or Emerson Micromotion the Batching Master is a Modbus master and able to read out the process data (flow rate, density and temperature) from a flow meter via the interface.

3.7.6 Setting the protocol type of interface 2

If Modbus Slave is selected, you can choose between Modbus RTU and Modbus ASCII in function 2.4.6.

The Batching Master interface works with the following parameters (settings):

Modbus RTU:	Modbus ASCII:
- Data bits: 8	- Data bits: 7
- Stop bits: 1	- Stop bits: 1
- Parity: Even	- Parity: Even

3.7.7 Specifying the unit address of interface 2

In function 2.4.7. it is possible to enter the unit address for the second interface between 1 and 255.

3.7.8 Specifying transmission speed of interface 2

The baud rate for the second interface is specified in function 2.4.8. The maximum baud rate is 19200 bps for intrinsically safe units and 115200 bps for non-ex equipment.

3.8 Code entry

Access to all levels can be code protected. The code is entered in functions 2.5.1 to 2.5.7.

Function 2.5.4, setpoint, prevents the controller setpoint from being modified (only if the controller is active).

The programming enable switch is located on the Batching Master 210 (i) next to the terminals. On the Batching Master 110 (i) the switch is located behind the terminals.

If the programming switch is ON, the install level, calibration and test level and linearisation level are blocked with code. If function 8.4 custody transfer is ON the levels are blocked always. If the programming switch is OFF, this levels are not blocked.

3.9 Locking the keypad

The keypad can be enabled and locked using function 2.6.1.

Function 2.6.2 has two settings: The Reset key can be enabled complete or only for the failure reset, even if the keypad is locked.

Function 2.6.3 enables the SET key, even if the keypad is locked.

Function 2.6.4 enables the START key, even if the keypad is locked.

Function 2.6.5 enables the STOP key, even if the keypad is locked.

Function 2.6.6 enables the function keys, even if the keypad is locked.

Function 2.6.7 enables the numeric keys, even if the keypad is locked.

3.10 Function key assignment

You can assign various functions to the function keys using function 2.7.

3.10.1 Shut-off steps on LED

The digital shut-off steps can be assigned to the LEDs in keys F1 to F3. The LEDs indicate the status of the digital outputs that are set to digital shut-off. The function keys have no function.

3.10.2 Fixed select values

The fixed select values are assigned to function keys F1 to F3. If a function key is pressed, the associated LED lights. If the function preselect values is enable, the preselection appears in the display. A batch is started with [Set][Start]. If the user is not allowed to enter a preselection other than the fixed pre-selections, the keypad must be locked. The Set, Start, Stop, Reset and function keys can then be enabled individually.

For fixed controller setpoints, the preset setpoints are activated. When selecting a product, the corresponding digital output is switched so that product paths can be switched.

3.10.3 Purge with F1

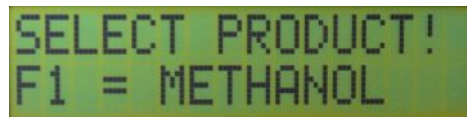
This purge function can be used to open the batching valve when no batching process is activated. Then the pipe can be emptied, cleaned or filled. This purging function can be assigned to the F1 button. By pressing the F1 button the output signal to the batching valve opens to 20 mA. Then the LED in the F1 button lights and the LCD shows purge in the lower display.

This purge function can be switched off by pressing the F1 button once more. It is also possible to program a digital output so that he switches during the time when this purge process is activated.

3.10.4 Product selection

A product can be selected using the function keys F1- F3 (F1 is assigned to the digital shut off step 1, F2 to digital shut-off step 2 and F3 to digital shut-off step 3).

After the confirmation of the pre-set input value with [Set], the first display line shows the question text. If a function key is pressed, the LED in the key lights and in the second display line the product text is shown which is associated to the selected product way.



The selected product has to be confirmed by pressing [Set]. Then the batch can be started. If the batch start, only the selected digital shut-off step switches and the 4-20 mA output signal to the batching valve opens.

The question text and the 3 product texts can have maximal 16 characters. These texts can be programmed by the Modbus interface.

3.11 Text entry

The texts for releases, station name etc. could be edited in menu 2.8. If no text is specified, a standard text is used.

function	default texts	description
2.8.1	Release 1	Release digital input
2.8.2	Release 2	Release digital input
2.8.3	Station name	Information about PLS or PCC
2.8.4	Product select	
2.8.5	Product 1	
2.8.6	Product 2	
2.8.7	Product 3	
2.8.8	Wait for release	Message waiting time special function
2.8.9	Text for delay	Message delay time special function

3.12 Valve control

In menu 2.9 is set the type of valve, either an analogue valve or a two step control valve. The controller function (flow-rate control) from Batching Master is used for controlling the two-step-control-valve.

If the two-step-control-valve is selected, in the controller level the additional points “3.1.15 valve set time” and “3.1.16. minimum pulse length” are listed.

For controlling the two-step-control-valve the digital output 1 is connected to the N. C. control valve (normally closed) and the digital output 2 is connected to the N. O. control valve (normally open).

The current output provides the setpoint of the two step valve controller.

<i>status</i>	<i>control valve (N. C) at digital output 1</i>	<i>control valve (N. O.) at digital output 2</i>	<i>remarks</i>
close valve	not energised (control valve closed)	not energised (control valve open)	valve closed
open valve	energised, open (control valve open)	energised (control valve closed)	valve opened
to continue in position	not energised, closed (control valve closed)	energised, (control valve closed)	valve position not changed

The five shut up steps must be set to “flow rate” in menu 1.2.1. The shut up steps and the controller set-points are configured in menu 1.2.2, 1.2.3, ff.

3.13 Indication of different values from the flow conversion

With the arrow up and down buttons you can switch to different values from the flow conversion (option). The normal batching display is shown after 10 seconds without pressing the arrow up or down buttons. You can also press [SET] or [arrow left] to leave this display.

In 2.10 you enable the indication from the different values of the flow conversion. More information about flow conversion you will find in the optional manual flow conversion. Following settings are available:

<i>function</i>	<i>description</i>
2.10.1	Batched mass
2.10.2	Batched volume
2.10.3	Batched standard-volume
2.10.4	mass flow
2.10.5	volume flow
2.10.6	standard-volume flow
2.10.7	current temperature
2.10.8	current pressure
2.10.9	current density
2.10.10	average temperature (only after batch end)
2.10.11	average density
2.10.12	calculated density
2.10.13	mass totaliser
2.10.14	volume totaliser
2.10.15	standard volume totaliser

3.14 Valve position feedback

The Batching Master can supervise the valve position. After batch start, the valve open contact must be active within the specified time in function 2.11.1. If not, the batch will stop and the error message appears. The valve feedback "Valve open" or "Valve closed" must be assigned to a digital input (e. g. 2.2.1 ff.).

As long as the valve shall be fully open, an interruption of the valve open contact stopped the batch immediately. As soon as the shut-off steps are active, the valve open signal is no longer monitored.

In function 2.11.2 is set the time for the valve closed contact to supervise closing the valve. Are the times set to 0 s the valve position feedback functions is deactivated.

4 Controller settings

A controller function can be ordered as an option. This function allows a physical quantity to be controlled during batching. The controller type is set in function 3. You can use the flow controller and the limiting controller simultaneously.

The setpoint can be set even during batching. Press the [#] key ([RC] key for limiting controller). The upper display shows the setpoint, the lower display the current value. The setpoint can be changed by pressing [Reset], entering a new setpoint using keys [0] to [9] and then pressing [Set]. The controller display remains active for approx. 4 seconds. After this, the batching data (preset quantity, batched quantity) is displayed. If the setpoint was not changed, the Batching Master returns to the operating mode after 10 seconds if no key is pressed.

4.1 Flow controller

During the batch the flow is controlled. In the function 1.2.1 you can select whether flow values or mA values are used as shut off steps. These are indicated at displayed flow controller as setpoint. If the batch is interrupted, the last manipulated variable is stored. If there is no start-up ramp set, the setpoint is reached quickly.

The flow controller setpoint can also be specified externally on analogue input 3. For this the controller must be switched to FLOW tracking controller in the function 3.1.1.

4.2 Limiting controller

A second physical quantity (e.g. temperature) can be controlled by the limiting controller during batching. Analogue input 2 is used for the controlled variable. The calculated manipulated variable limits the upper value of the analogue output. The shut off steps or ramps remain unchanged as long as the limiting function does not intervene.

The limiting controller setpoint can also be specified externally on analogue input 3. To do this, the function 3.2.1 must be switched to "Remote Control".

4.2.1 Measuring range of flow-rate controller

The measuring range of the flow controller results from the full scale value from menu items 4.2.2 and 4.2.3 and is therefore fixed.

4.2.2 Measuring range of limiting controller

The unit for the limiting controller is specified in function 3.2.2. You can choose no unit, %, °C, bar or pH.

The position of the decimal point is set in function 3.2.3. Up to three decimal places can be displayed.

Set the measuring range start at 4 mA in the function 3.2.4. In the function 3.2.5 set the measuring range end at 20 mA. A can enter values between -9999 and +9999. The decimal point appears at a fixed position.

4.3 Control parameter

You can set all the usual control parameters in functions 3.1.2 to 3.1.13 for the flow controller respectively in functions 3.2.6 to 3.2.17 for the limiting controller.

4.3.1 Proportional coefficient Kp

The proportional coefficient Kp in function 3.1.2 either 3.2.6 is set in the factory to 1.0. A negative proportional coefficient inverts the direction of action of the controller.

4.3.2 Working point setting OP

With a P controller, the operating point OP (Y_0) is set in function 3.1.3 either 3.2.7. The factory setting is 0.0%.

4.3.3 Derivative action gain Kd

The derivative action gain Kd (or Vv) in function 3.1.4 either 3.2.8 is set in the factory setting to 1.00.

4.3.4 Integral action time Tn

The integral action time in function 3.1.5 either 3.2.9 is set in the factory to "Off". This is displayed when 5000 is entered.

4.3.5 Derivative action time Tv

The derivative action time in function 3.1.6 either 3.2.10 is set in the factory to 0 sec.

4.3.6 Setpoint start SPS

Use function 3.1.7 either 3.2.11 to specify the lowest setpoint that can be adjusted by the user.

4.3.7 Setpoint end SPE

Use function 3.1.8 either 3.2.12 to enter the highest setpoint that can be adjusted by the user.

4.3.8 Set setpoint enable

Use function 3.1.9 either 3.1.13 to enable the changing of setpoint through the user. Otherwise only the setpoint in menu 3.1.10 or 3.1.14 is used. Then the programming level must be entered for each setpoint change.

4.3.9 Setpoints

Use function 3.1.10 to 3.1.13 or 3.2.14 to 3.2.17 to indicate the possible setpoints. The first setpoint is the current setpoint, which is currently set or selected. The following three target setpoints are fixed setpoints which can be set.

4.3.10 Ramp difference

During the start ramp the flow controller is not active. The flow rate reaches fast within the ramp time the maximum flow. As soon as the control deviation is within the set parameter in function 3.1.14, the flow controller is activated.

4.3.11 Valve time

For controlling a electro-hydraulic digital control valve the valve set time is preset in function 3.1.15.

4.3.12 Minimal pulse time

Please set the minimal pulse time for the electro-hydraulic digital control valve in function 3.1.16.

5 Settings in the install level

All important settings that affect the sensor and measuring range are set in the install level (Function 4.0). This level can only be enabled by the programming switch at certified custody transfer instruments.

5.1 Specifying the type of sensor

You determine in the function 4.1 to which input the measuring signals are connected for flow rate, temperature, density and pressure. You can select between current, pulse and double pulse input. Different mass flow meter could be readout direct from the Batching Master using the second serial interface.

In addition, the measuring values can also be transmitted by the interface. You can use this for checking the flow conversion function.

A flow sensor with current output must be connected to analogue input 1. Flow sensors with pulse output, connect to the pulse input 1. In the case of certified custody transfer sensors with a second pulse output, connect the second output to pulse input 2. Namur type sensor outputs are also connected to the pulse input. Sensor break monitoring is switched on in function 1.8.x.

Mass flow meters, you want to read out over the Modbus-interface, connect please to the second serial interface.

5.2 Setting the measuring range of the flow sensor

The measuring range of the flow sensor is specified in function 4.2.x.

5.2.1 Measuring range unit

The measuring range unit is set in function 4.2.1. You can choose between kg, g, mg, l, ml, t, m³ and "no unit".

5.2.2 Decimal places

The number of decimal places are specified in function 4.2.2. All measured values are displayed to this level of precision.

5.2.3 End of scale value

Then in the function 4.2.3 you set the end of scale value.

5.2.4 Incoming pulses per unit

For flow meters with pulse output, the increment per pulse is entered in function 4.2.4. The number of pulses must be entered to the last decimal place on the display.

Example:

The measuring range of 10000 kg/h should be displayed with one decimal place. The sensor supplies 10 pulses/kg. An increment per pulse of 1 pulse / 0.1 kg must be entered.

5.2.5 Allowed error pulses

If a double pulse input is specified, the ratio from one error pulse to x pulses is set in function 4.2.5. If more error pulses are counted, the batch stopped.

5.2.6 Meter Factor

The multiplier for the flow rate correction is indicated in menu item 4.2.6. The default setting is 1.0000 and can be set between 0.0000 and 2.0000.

5.3 Linearisation of an input signal

In menu item 4.3 you set which measurement signal input is to be corrected using the linearisation of the characteristic (menu 6.x, see page 36). Possible applications are the error correction of a flow sensor or the storage of a steam pressure curve for the pressure-maintaining function during liquefied gas shipments.

5.4 Pulse output, pulse rate or frequency

You can select the pulse output between count pulses or frequency according to the flow rate. When the flow conversion is activated, the pulses correspond to the dosing quantity set in 7.1.1.

When set to count pulses, it can happen that the output frequency is not continuous (pulse blocks). When set to frequency, the number of current amount may differ.

5.4.1 Pulse output, pulse rate

It is possible to specify how many pulses are output per last displayed decimal place. The maximum frequency is 150 Hz.

5.4.2 Pulse output, frequency

It is possible to specify frequency from pulse output at maximum flow rate. The maximum frequency is 150 Hz.

5.5 Limit pre-selection value

For limiting the pre-selected value for users, you can specify the setting range.

5.5.1 Minimum pre-selection value

The minimum permissible pre-selection can be set in menu 4.5. This setting is required in particular for certified custody transfer instruments.

5.5.2 Maximum pre-selection value

The maximum permissible pre-selection can be set in function 4.6.

5.6 Entering the overrun quantity

If the Batching Master shows a constant quantity less than actually delivered for every batch, an overrun quantity (the quantity not measured by the sensor) can be entered in function 4.7. To ensure the preselected quantity is batched, the cut-off stages start earlier by this amount. At the end of batching, the overrun quantity is added by the Batching Master and the current quantity should then agree with the preselected quantity. The overrun quantity can not be set by units with flow conversion function.

5.7 Monitoring the minimum permissible flow

In menu 4.8 it is possible to program the values for the minimum flow rate monitoring. This important security function take care that a batch will be stopped at a too less flow rate. The reason could be a failure of the flow meter or a failure in the batch system. The failure message in case of this failure is “Err Min-Flow”.

The minimum flow rate that must be present during batching is entered in function 4.8.1.

Specify in function 4.8.2, how long the flow rate may remain below the value set in function 4.8.1 after starting. If the flow rate does not reach the minimum permissible value within this time, the batch is interrupted with a fault message.

If the minimum flow rate is exceeded, the time in 4.8.3 is valid. This time indicates how long the flow can be less during the batch as specified in function 4.8.1 without a fault message.

5.7.1 Permissible under-batching quantity

In menu 4.8.4 it is possible to program maximal allowed under-batching quantity. If the batch will be stopped with “Err-Min Flow” and the batched quantity is very close to the pre-set value then the batch will be finished and not interrupted with the failure message.

5.8 Special function for filling and emptying the pipe system

A rinsing function is implemented in function 4.9. This can be ordered as an option and is enabled at the factory.

The following applications can be implemented with this rinsing function:

- Filling the batching line before batching
 1. for a fixed time
 2. until a liquid detector detects product behind the flow sensor
- Closing a circulating line before the start of batching

The three digital outputs D1 to D3 are assigned to digital shut-off steps D1 to D3. A digital input is set to SF enable.

For all functions that need an enable signal, the enable is via a pulse. Whenever a filter time greater than 0 sec (Off) is entered in function 4.9.1, the enable input must always be activated. The signal must not be interrupted for longer than the specified time. If the enable signal is interrupted for longer than this, batching is stopped. The error message from menu 2.8.1 appears on the display. Batching can be re-started.

5.8.1 Application 1

Once the Start signal has been given, the digital output assigned to digital shut-off step D3 is active. A text from menu 2.8.8 is shown.

After enabling via the SF enable digital input, digital shut-off steps D2 and D1 switch. The positioner output ramps up. Batching indication is active. The Batching Master meters the flow.

5.8.2 Application 2

Once the Start signal has been given, the digital output assigned to digital shut-off step D3 is active. A text from menu 2.8.8 (waiting time) is shown.

After the time in function 4.9.2 "t to batch" has expired, D2 and D1 are also active. The positioner output ramps up. Batching indication is active. The Batching Master meters the flow.

5.8.3 Application 3

Once the Start signal has been given, the digital output set to digital shut-off step D3 is active. A text from menu 2.8.8 (waiting time) is shown.

If the SF enable is issued via the digital input within the wait time set in function 4.9.3, D2 and D1 are also active. The positioner output ramps up. Batching indication is active. The Batching Master meters the flow. If enable is not issued within this time, D3 drops out. An error message from menu 2.8.1 (no Release) is shown. This procedure can be started again with Start.

5.8.4 Application 4

A delay time is entered in function 4.9.4.

Once the Start signal has been given, the digital output set to digital shut-off step D3 is active.

After expiry of the time "t to batch" (Function 4.9.2, see Application 2) or after enabling via the SF enable digital input (see Application 2), D3 becomes inactive. D2 and D1 are active after the delay time set here. During this time the text from menu 2.8.9 (delay) is shown. The positioner output ramps up. Batching indication is active. The Batching Master meters the flow.

5.9 Suppressing the flow counting

When the input signal is to be evaluated is specified in function 4.10 'Metering'. By default, the input signal is always evaluated.

With the rinsing function, it makes sense to evaluate the input signal only during active batching (during "b"). The input signal is evaluated by the start of batching to end. The evaluation occurs further on even if temporary stopped.

There are also some applications in which it is desirable that the input signal is only evaluated during a started batch (during Start). The input signal is evaluated only if the batch is started. If the batch is temporary stopped, the input signal is not evaluated.

With the settings "during batch" and "during start", a run-on of the product at the end of batch is not recorded.

5.10 Printer settings

5.10.1 Waiting time for printout after end of batch

The delay before printing/storing, because medium flow continued for a short time after stopped batch and must be evaluated, should be entered in function 4.11.2.

5.10.2 Starting conditions at batch start

The start conditions of a batch if no PCC is connected or active are specified in function 4.11.3. If "no stop" is selected, batching can continue even though the PCC is inactive. For custody transfer devices, set "no restart". If "no restart" is set, a new batch can only be started if the PCC is active again and the data set is stored/printed.

5.11 Reset totaliser

To reset all three totaliser, set function 4.12 to reset.

5.12 Monitoring the Interface

In menu item 4.13 "Interface" it is determined whether the interface to the PCC is monitored. As soon as the programming switch is set to custody transfer, no further changes are possible.

5.13 Software function pipeline measuring

The Batching Master could be used as Pipeline-Master. In this case no batch function is available.

The measuring variables from the mass flow meter are read out with the second serial interface from Batching Master and printed to the printer periodically or on request. The measuring and count values are indicated at the display. More information are available in a separate manual.

5.14 Additive dosing control

For additive dosing controls, a digital output controls a valve or a dosing pump. All settings are done in function 4.15.0. In addition to the batch a defined pulse issued. The pulse length is set in function 4.15.1. The batch quantity, after that a pulse is issued, is set in function 4.15.2.

6 Settings in the calibration and test level



This level is blocked for custody transfer locked devices. If settings have to be made in the calibration and test level, activate this level with the programming switch. The seal must be broken to do this.

Please note that, in this level, all outputs may switch and up to 22 mA may flow from the current output. You must ensure that the switching of digital outputs or setting an output current poses no danger to personnel and plant.

6.1 Calibrating current inputs

To calibrate the current inputs, connect a current source to the current input that is to be calibrated.

The three current inputs are calibrated in functions 5.1.1 to 5.1.6.

Example: calibrating current input 2.

Connect a current source to current input 2 and apply 4 mA. In function 5.1.3 you enter the programming level by pressing [➤] (display flashes). Returning by pressing [◀] or [Set] saves the present current as the 0% value.

Now apply a current of 20 mA from the current source. Change to function 5.1.4 with [▲]. Enter the programming level with [➤] (display flashes) and exit this again immediately with [◀]. The 100% value is now saved. The other current inputs are programmed in the same way.

6.2 Calibrating current outputs

To calibrate the current output, connect an ammeter to the current output.

Enter function 5.1.7 and change to the programming level with the [➤] key. Set the current using the [▲▼] keys. When the 0% value of 4 mA is reached, exit the programming level using the [◀] key. Setting of the 100% value setting is performed in function 5.1.8.

6.3 Testing inputs and outputs

To enable the function of the batching Master to be checked quickly, a test level is included in functions 5.2.1 to 5.2.12. All the inputs and outputs of the Batching Master can be tested.

Function 5.2.1 tests the digital inputs. Each activated input is displayed on the LCD.

Function 5.2.2 tests the digital outputs. Use number keys 1 to 5 to switch the associated digital output and the LED in the front while the key is held down. Note that this can also take place on site and may consequently initiate undesired actions.

Function 5.2.3 and 5.2.4 can be used to display the present input frequency on the pulse inputs.

Function 5.2.5 checks the pulse inputs for sensor break.

Functions 5.2.6 to 5.2.8 enable the present output current on the three analogue outputs to be displayed.

Functions 5.2.9 to 5.2.11 cause a test current of 4, 12 or 20 mA respectively to be output by the current output. Note that this can also take place on site and may consequently initiate undesired actions.

Function 5.2.12 is used to test the keypad. Each key pressed is shown on the display. This level is exited using the [>] key and cannot be displayed.

Function 5.2.13 carries out an LCD test.

7 Error correction of an input signal

To correct non-linear input signals, use the function “6.0 Linearisation”.

Assignment of the input for error correction is carried out in Function 4.3. Only one input can be linearised.

There are 25 nodes available at 5% intervals from -10% to +110%. The nodes in Functions 6.1 to 6.25 specifies the correction at this node. A meter factor of 0.0000 to 2.0000 can be set.

Example:

A flow meter is connected to analogue input 1.

You have determined that, at an output current of 5.6 mA (corresponding to 10% from the maximum flow rate), the sensor does not have a flow rate of 10000 kg/h as expected but only 9000 kg/h. The flow rate must therefore be corrected by a factor of 0.9000.

For error correction select analogue input 1 at function 4.3.

To correct this error, switch to Function 6.5 (node 10%) and change the value from 1,0000 to 0,9000 with the keys [0 to 9].

This change has the result that a current of 5.6 mA is evaluated as a value of 9000 kg/h (real flow rate) at the Batching Master. All nodes set to 1,0000 are not corrected.

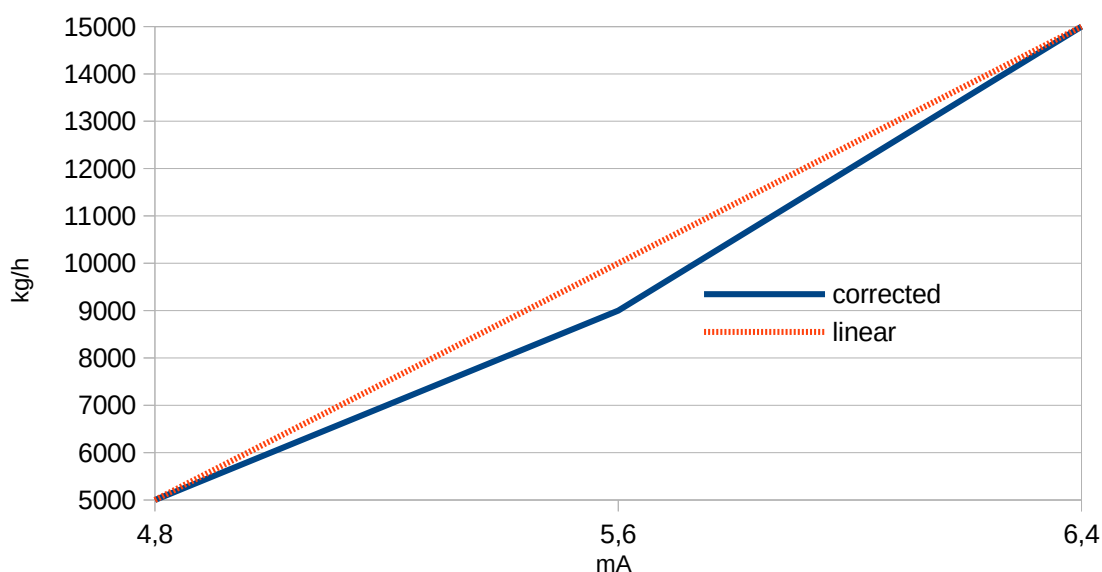


Figure 1: Detail of the corrected input signal

8 Flow conversion menu

The setting for the flow conversion functions have to be done in menu 7.0

Flow rate input can be the mass flow or volume flow. These input can be converted to standard volume based at standard temperature (mostly 15°C). It is also possible to convert from mass to volume or from volume to mass.

As pre-set value, batched quantity and current flow rate at the display of the Batching Master always the selected batch dimensions under 7.1 will be displayed. The other flow values can be shown in the display menu flow conversion. Use the up and down arrow keys to switch between the individual values.

All meter readings of the flow conversion can also be printed in the document after the batch.

This conversions can be done with the temperature signal, the density signal and/or the pressure signal.

8.1 Possibilities for the flow conversion:

Flow input signal	Conversing to:	Conversion method:
volume	mass or standard volume	Method 1, linear
mass	volume or standard volume	Method 1, linear
volume	mass or standard volume	Method 2, API tables
mass	volume or standard volume	Method 2, API tables
volume	mass or standard volume	FAME DIN EN 14214
mass	volume or standard volume	FAME DIN EN 14214

The flow conversion is described in a separate document.

9 Factory menu

Various software options can be ordered. These options can be enabled in the factory menu. The code is not accessible to users. You can see which functions are available.

This software functions are only present if they was ordered as an option.

9.1 Specify fixed preselection values, setpoints or products

Three fixed preselection values, three setpoints for the flow controller, three setpoints for the override-controller or three products can be specified. The selection is done by using the digital inputs or the function keys F1 to F3.

9.2 Controller

In addition to metering the quantity, a controller can be activated.

This allows the flow rate to be held more constant (flow controller).

It is also possible to monitor the pressure or temperature and control the batching appropriately (limiting controller).

Both controller could be active simultaneously.

9.3 Purge function and other special functions

This function has been added so the pipework can be purged.

You will find a complete description in Paragraph 8.8 et sqq..

9.4 Custody transfer approved instrument

If the Batching Master is specified with certification for custody transfer, all the parameters that contain certification data can only be accessed by switching on the programming enable. The seal must be broken to do this.

9.5 Terminal mode

You can switch the batching master to terminal mode by the interface. The terminal mode should only be used at stopped batching, because the user can't observe and stop the Batching Master.

Via interface you can write to the LC-Display and poll the keys. A communication to a priority systems can be build in this way.

9.6 Device number

Every Batching Master has a unique device number that is set at the factory and cannot be changed by the customer. By pressing the menu key, the device number and the software version is shown for approximately one second.

9.7 Flow conversion with temperature and density

The measuring value could be corrected with the current inputs with temperature and/or density signals. Additionally a pressure correction is possible.

With this function it is possible to make a flow conversion to mass flow, volume flow or standard volume flow.

Corrections can be done based on the API tables, by a linear formula or with a special linear formula for biodiesel.

The parametrization occurs in level 7.0.

9.8 Continuous pipeline measuring

In this application the Batching Master receives the data process signals and counter values from a connected flow meter. These information are shown in the Batching Master. The PCC 400 prints these data out in a programmed time circle. These data are also shown at the Modbus interface for the transfer to a supervisory system.

10 Overview parameter settings

<i>Fct.</i>	<i>description</i>	<i>setting range</i>	<i>set value</i>	<i>P.</i>
1.0	parameter main menu			11
1.1.0	sub menu digital shutoff			11
1.1.1	digital shutoff 1	unit: as measuring range 4.2.1, decimal point 4.2.2 setting range: 0 to 9999999 factory setting: 0		11
1.1.2	digital shutoff 2	unit: as measuring range 4.2.1, decimal point 4.2.2 setting range: 0 to 9999999 factory setting: 0		11
1.1.3	digital shutoff 3	unit: as measuring range 4.2.1, decimal point 4.2.2 setting range: 0 to 9999999 factory setting: 10		11
1.1.4	digital delay 1	unit: as measuring range 4.2.1, decimal point 4.2.2 setting range: 0 to 9999999 factory setting: 10		11
1.2.0	sub menu analogue shutoff			12
1.2.1	shutoff	setting range: current flow factory setting: current		12
1.2.2.	analogue shutoff1	unit: as measuring range 4.2.1, decimal point 4.2.2 setting range: 0 to 9999999 factory setting: 50		12
1.2.3	analogue out 1	unit: mA setting range: 4.00 - 20,00 mA factory setting: 11 mA or: 0 to 9999999 unit as measuring range 4.2.1, decimal point 4.2.2 factory setting: 5000		12
1.2.4	analogue shutoff 2	see 1.2.1 factory setting: 40		12
1.2.5	analogue out 2	see 1.2.2 factory setting: 10 mA or 4000		12
1.2.6	analogue shutoff 3	see 1.2.1 factory setting: 30		12

<i>Fct.</i>	<i>description</i>	<i>setting range</i>	<i>set value</i>	<i>P.</i>
1.2.7	analogue out 3	see 1.2.2 factory setting: 9 mA or 3000		12
1.2.8	analogue shutoff 4	see 1.2.1 factory setting: 20		12
1.2.9	analogue out 4	see 1.2.2 factory setting: 8 mA or 2000		12
1.2.10	analogue shutoff 5	see 1.2.1 factory setting: 10		12
1.2.11	analogue out 5	see 1.2.2 factory setting: 7 mA or 1000		12
1.3	Start up ramp	unit: s setting range: 0 to 9999 factory setting: 0		13
1.4	Shut down ramp	unit: s setting range: 0 to 9999 factory setting: 0		13
1.5	Flow alarm	unit: as measuring range 4.2.1, decimal point 4.2.2 setting range: 0 to 9999999, (0 shown as OFF) factory setting: OFF		13
1.6.0	sub menu batch indication			14
1.6.1	batch-indication	unit: no setting range: on, pulses, (after batch is finished, a pulse is given) factory setting: ON		14
1.6.2	pulse length	unit: s setting range: 0 to 99.9s factory setting: 2s		14
1.7.0	sub menu overflow quantity			14
1.7.1	Overflow quantity	unit: as measuring range 4.2.1, decimal point 4.2.2 setting range: 0 to 9999999 factory setting: 9999999		14

Overview parameter settings

Fct.	description	setting range	set value	P.
1.7.2	time overfill quantity	only displayed if 1.7.1 < 9999999 unit:: s setting range: 0 to 9999, (0 displayed as continual) factory setting: continual		14
1.8.0	sub menu sensor break / measuring range overflow			14
1.8.1	sensor break / short circuit namur contact 1	unit: no setting range: sensor break OFF, sensor break ON factory setting: sensor break OFF		14
1.8.2	sensor break / short circuit namur contact 2	unit: no setting range: sensor break OFF, sensor break ON factory setting: sensor break OFF		14
1.8.3	sensor break current input1	unit: no setting range: sensor break OFF, sensor break ON factory setting: sensor break OFF		14
1.8.4	sensor break current input 2	unit: no setting range: sensor break OFF, sensor break ON factory setting: sensor break OFF		14
1.8.5	sensor break current input 3	unit: no setting range: sensor break OFF, sensor break ON factory setting: sensor break OFF		14
1.8.6	measuring range overflow current input 1	unit: no setting range: sensor break OFF, sensor break ON factory setting: sensor break OFF		14
1.8.7	measuring range overflow current input 2	unit: no setting range: sensor break OFF, sensor break ON factory setting: sensor break OFF		14

Fct.	description	setting range	set value	P.
1.8.8	measuring range overflow current input 3	unit: no setting range: sensor break OFF, sensor break ON factory setting: sensor break OFF		14
1.9.0	sub menu fixed preselection	(not for controller setpoints see controller settings)		14
1.9.1	fixed preselection 1	unit: as measuring range 4.2.1, decimal point 4.2.2 setting range: 0 to 9999999 factory setting: 0		14
1.9.2	fixed preselection 2	unit: as measuring range 4.2.1, decimal point 4.2.2 setting range: 0 to 9999999 factory setting: 0		14
1.9.3	fixed preselection 3	unit: as measuring range 4.2.1, decimal point 4.2.2 setting range: 0 to 9999999 factory setting: 0		14
1.10.0	Self-optimising overrun quantity			15
1.10.1	Final value for correction	unit: % setting range: 0 to 100% factory setting: 0%		15
1.10.2	maximum deviation	unit: as measuring range 4.2.1, decimal point 4.2.2 setting range: 0 to 9999 factory setting: 9999		15
1.10.3	flow correction	unit: as measuring range 4.2.1, decimal point 4.2.2 setting range: 0 to 9999 factory setting: 0 (OFF)		15
1.11	checksum part custody transfer			16
1.12	checksum part parameter settings			16
1.13	Software version custody transfer			16
1.14.0	Reduced flow after start-up			
1.14.1	Function	setting range: OFF 4–20mA value setpoint-flow factory setting: OFF		
1.14.2	Batched quantity for reduced flow rate	setting range: 0–9999999 factory setting: 0 (AUS)		

Overview parameter settings

<i>Fct.</i>	<i>description</i>	<i>setting range</i>	<i>set value</i>	<i>P.</i>
1.14.3	Time for reduced flow rate	setting range: 0–9999s factory setting: 0s (AUS)		
1.14.4	Current for reduced flow rate	setting range: 4,00–20,00mA factory setting: 8,00mA		
1.14.5	Flow rate set-point for reduced flow rate	Einstellbereich: 0 – 9999999 Werkeinstellung: 0		

11 Overview structure level

<i>Fct.</i>	<i>description</i>	<i>setting range</i>	<i>set value</i>	<i>P.</i>
2.0	structure main menu			17
2.1	Select language	unit: no setting range: German, English, French, Russian factory setting: Deutsch		17
2.2.0	sub menu settings digital inputs			17
2.2.1	function digital input 1	setting range: no function, SET, START, SET-START, STOP, RESET, external failure, totaliser reset, release 1, release 2, interface on, Keypad enable, purge, controller off, Valve open, valve closed, special function release, factory setting: no function n/a at two step valve		17
2.2.2	direction of action digital input 1	setting range: normally open, normally closed factory setting: normally open		17
2.2.3	type of action digital input 1	setting range: level, flank factory setting: level		17
2.2.4	function digital input 2	setting range: no function, SET, START, SET-START, STOP, RESET, external failure, totaliser reset, release 1, release 2, interface on, Keypad enable, purge, controller off, Valve open, valve closed, special function release, factory setting: no function n/a at two step valve		17
2.2.5	direction of action digital input 2	setting range: normally open, normally closed factory setting: normally open		17
2.2.6	type of action digital input 2	setting range: level, flank factory setting: level		17
2.2.7	function digital input 3	setting range: no function, SET, START, SET-START, STOP, RESET, external failure, totaliser reset, release 1, release 2, interface on, Keypad enable, purge, controller off, Valve open, valve closed, special function release, fixed selection switch 2 factory setting: no function		17

<i>Fct.</i>	<i>description</i>	<i>setting range</i>	<i>set value</i>	<i>P.</i>
2.2.8	direction of action digital input 3	setting range: normally open, normally closed factory setting: normally open		17
2.2.9	type of action digital input 3	setting range: level, flank factory setting: level		17
2.2.10	function digital input 4	setting range: no function, SET, START, SET-START, STOP, RESET, external failure, totaliser reset, release 1, release 2, interface on, Keypad enable, purge, controller off, Valve open, valve closed, special function release, fixed selection switch 1 factory setting: no function		17
2.2.11	direction of action digital input 4	setting range: normally open, normally closed factory setting: normally open		17
2.2.12	type of action digital input 4	setting range: level, flank factory setting: level		17
2.2.13	function digital input 5	setting range: no function, SET, START, SET-START, STOP, RESET, external failure, totaliser reset, release 1, release 2, interface on, Keypad enable, purge, controller off, Valve open, valve closed, special function release factory setting: no function		17
2.2.14	direction of action digital input 5	setting range: normally open, normally closed factory setting: normally open		17
2.2.15	type of action digital input 5	setting range: level, flank factory setting: level		17
2.3.0	sub menu settings digital outputs			19
2.3.1	function digital output 1	setting range: no function, shut off 1, shut off 2, shut off 3, pulse output, batch indication, flow alarm, error message, purge, additive batching factory setting: shut off 1		19
2.3.2	direction of action digital output 1	setting range: normally open, normally closed factory setting: normally open		19
2.3.3	function digital output 2	setting range: no function, shut off 1, shut off 2, shut off 3, pulse output, batch indication, flow alarm, error message,		19

Fct.	description	setting range	set value	P.
		purge, additive batching factory setting: shut off 2		
2.3.4	direction of action digital output 2	setting range: normally open, normally closed factory setting: normally open		19
2.3.5	function digital output 3	setting range: no function, shut off 1, shut off 2, shut off 3, pulse output, batch indication, flow alarm, error message, purge, additive batching factory setting: shut off 3		19
2.3.6	direction of action digital output 3	setting range: normally open, normally closed factory setting: normally open		19
2.3.7	function digital output 4	setting range: no function, shut off 1, shut off 2, shut off 3, pulse output, batch indication, flow alarm, error message, shut off 1 reverse, purge, additive batching factory setting: batch indication		19
2.3.8	direction of action digital output 4	setting range: normally open, normally closed factory setting: normally open		19
2.3.9	function digital output 5	setting range: no function, shut off 1, shut off 2, shut off 3, pulse output, batch indication, flow alarm, error message, purge, additive batching factory setting: error message		19
2.3.10	direction of action digital output 5	setting range: normally open, normally closed factory setting: normally open		19
2.4.0	sub menu interface settings			20
2.4.1	function	setting range: read / write, read only factory setting: read / write		20
2.4.2	Protocol 1 (for interface 1)	setting range: MODBUS RTU, MODBUS ASCII DIN66348 factory setting: RTU		20
2.4.3	Address 1 (for interface 1)	setting range: 1 to 255 factory setting: 1		21
2.4.4	Baud rate 1 (for interface 1)	setting range: 2400, 4800, 9600, 19200, 38400 76800, 115200		21

Fct.	description	setting range	set value	P.
		factory setting: 9600		
2.4.5	Function 2 (for interface 2)	setting range: Slave, Master, Promass 84F, Krohne Optimass, Emerson Micromotion factory setting: Slave		21
2.4.6	Protocol 2 (for interface 2)	setting range: MODBUS RTU, MODBUS ASCII DIN66348 factory setting: RTU		21
2.4.7	Address 2 (for interface 2)	setting range: 1 to 255 factory setting: 1		21
2.4.8	Baudrate 2 (for interface 2)	setting range: 2400, 4800, 9600, 19200, 38400, 76800, 115200 factory setting: 9600		21
2.5.0	sub menu code input			21
2.5.1	Code parameter menu	setting range: 0 to 9999999 factory setting: 0		21
2.5.2	Code structure menu	setting range: 0 to 9999999 factory setting: 0		21
2.5.3	Code controller menu	setting range: 0 to 9999999 factory setting: 0		21
2.5.4	Code setpoint setting controller	setting range: 0 to 9999999 factory setting: 0		21
2.5.5	Code install menu	setting range: 0 to 9999999 factory setting: 0		21
2.5.6	Code calibration and test menu	setting range: 0 to 9999999 factory setting: 0		21
2.5.7	Code linearisation	setting range: 0 to 9999999 factory setting: 0		21
2.6.0	sub menu key operation disable / enable			22
2.6.1	key operation disable / enable	setting range: enable, locked factory setting: enable		22
2.6.2	key operation RESET enable despite locking	setting range: RESET enable, RESET disable RESET Error factory setting: RESET disable		22
2.6.3	key operation SET enable despite locking	setting range: SET enable, SET disable factory setting: SET disable		22
2.6.4	key operation	setting range: START enable,		22

Fct.	description	setting range	set value	P.
	START enable despite locking	START disable factory setting: START disable		
2.6.5	key operation STOP enable despite locking	setting range: STOP enable, STOP disable factory setting: STOP disable		22
2.6.6	key operation function keys enable despite locking	setting range: F1-F3 enable, F1-F3 disable factory setting: F1-F3 disable		22
2.6.7	key operation numeric keys enable despite locking	setting range: 0 .. 9 enable, 0 .. 9 disable factory setting: 0 .. 9 disable		22
2.7	sub menu function keys	setting range: no function, LED digital shut off fixed pre-selection, F1 Purge, product selection factory setting: no function		22
2.8	Texts			23
2.8.1	Release 1			23
2.8.2	Release 2			23
2.8.3	Station			23
2.8.4	Product selection			23
2.8.5	Product 1			23
2.8.6	Product 2			23
2.8.7	Product 3			23
2.8.8	Wait for release			23
2.8.9	Delay			23
2.9	Valve control	Setting range: analogue two step valve factory setting: analogue		24
2.10	Indication flow conversion			25
2.10.1	Batched mass	setting range: ON, OFF factory setting: OFF		25
2.10.2	Batched volume	setting range: ON, OFF factory setting: OFF		25
2.10.3	Batched standard-volume	setting range: ON, OFF factory setting: OFF		25
2.10.4	mass flow	setting range: ON, OFF factory setting: OFF		25
2.10.5	volume flow	setting range: ON, OFF factory setting: OFF		25

Overview structure level

<i>Fct.</i>	<i>description</i>	<i>setting range</i>	<i>set value</i>	<i>P.</i>
2.10.6	standard-volume flow	setting range: ON, OFF factory setting: OFF		25
2.10.7	current temperature	setting range: ON, OFF factory setting: OFF		25
2.10.8	current pressure	setting range: ON, OFF factory setting: OFF		25
2.10.9	current density	setting range: ON, OFF factory setting: OFF		25
2.10.10	average temperature	setting range: ON, OFF factory setting: OFF		25
2.10.11	average density	setting range: ON, OFF factory setting: OFF		25
2.10.12	calculated density	setting range: ON, OFF factory setting: OFF		25
2.10.13	mass totaliser	setting range: ON, OFF factory setting: OFF		25
2.10.14	volume totaliser	setting range: ON, OFF factory setting: OFF		25
2.10.15	standard volume totaliser	setting range: ON, OFF factory setting: OFF		25
2.11.0	Position feedback from the valve			25
2.11.1	Time at start	setting range: 0 (OFF) to 9999 s		25
2.11.2	Time at end	setting range: 0 (OFF) to 9999 s		25

12 Overview controller settings

Fct.	description	setting range	set value	P.
3.0	Controller main menu			26
3.1.0	Flow controller			26
3.1.1	Controller type	Setting range: no function flow controller tracking flow controller Factory setting: No function		26
3.1.2	Proportional coefficient Kp	Setting range: -100.0 to 100.0 Unit: none Decimal point: 0,0 Factory setting: 1.0		27
3.1.3	P controller operating point OP	Setting range: -10% to 110% Unit: none Decimal point: 0.0 Factory setting: 0		27
3.1.4	Derivative action gain Kd or Vv	Setting range: 1.00 to 10.00 Unit: none Decimal point: 0,00 Factory setting: 1.00		27
3.1.5	Integral action time	Setting range: 1 to 4999 Unit: s Decimal point: 0 Factory setting: 5000 corresponding to off		27
3.1.6	Derivative action time Tv	Setting range: 0 to 1000 Unit: s Decimal point: 0 Factory setting: 0		27
3.1.7	Setpoint start SPS	Setting range: -9999 to 9999999 Unit: from 3.2.1 or 4.2.0 Decimal point: see above Factory setting: 0		27
3.1.8	Setpoint end SPE	Setting range: -9999 to 9999999 Unit: from 3.2.1 or 4.2.0 Decimal point: see above Factory setting: 100%		27
3.1.9	Setpoint adjustment	Setting range: fixed, variable Factory setting: fixed		27
3.1.10	Setpoint SP	current Setpoint		27
3.1.11	Setpoint SP1			27
3.1.12	Setpoint SP2			27
3.1.13	Setpoint SP3			27
3.1.14	ramp difference	setting range: 0 to 100 % factory setting: 0 %		28

Overview controller settings

Fct.	description	setting range	set value	P.
3.1.15	Valve set time	setting range: 0 to 500s factory setting: 0s		28
3.1.16	minimal pulse time	setting range: 0 to 500s factory setting: 0s		28
3.2.0	Limiting controller			26
3.2.1	Controller type	Setting range: no function limiting controller tracking limiting controller Factory setting: No function		26
3.2.2	Physical unit controller	Setting range: no physical unit, %, °C, bar, pH Factory setting: %		26
3.2.3	Decimal point (not applicable for flow controllers)	Setting range: 0000 000.0 00.00 0.000 Factory setting: 0000		26
3.2.4	Start of scale (not applicable for flow controllers)	Setting range: -9999 to 9999 Unit from 3.2.1 Decimal point from 3.2.2 Factory setting: 0%		26
3.2.5	End of scale (not applicable for flow controllers)	Setting range: -9999 to 9999 Unit from 3.2.1 Decimal point from 3.2.2 Factory setting: 100%		26
3.2.6	Proportional coefficient Kp	Setting range: -100.0 to 100.0 Unit: none Decimal point: 0,0 Factory setting: 1.0		27
3.2.7	P controller operating point OP	Setting range: -10% to 110% Unit: none Decimal point: 0.0 Factory setting: 0		27
3.2.8	Derivative action gain Kd or VV	Setting range: 1.00 to 10.00 Unit: none Decimal point: 0.00 Factory setting: 1.00		27
3.2.9	Integral action time	Setting range: 1 to 4999 Unit: s Decimal point: 0 Factory setting: 5000 corresponding to off		27
3.2.10	Derivative action time Tv	Setting range: 0 to 1000 Unit: s Decimal point: 0 Factory setting: 0		27

<i>Fct.</i>	<i>description</i>	<i>setting range</i>	<i>set value</i>	<i>P.</i>
3.2.11	Setpoint start SPS	Setting range: -9999 to 9999999 Unit: from 4.2.0 Decimal point: see above Factory setting: 0		27
3.2.12	Setpoint end SPE	Setting range: -9999 to 9999999 Unit: from 4.2.0 Decimal point: see above Factory setting: 100%		27
3.2.13	Setpoint adjustment	Setting range: fixed, variable Factory setting: fixed		27
3.2.14	Setpoint SP	currently set (active) setpoint		27
3.2.15	Setpoint SP1			27
3.2.16	Setpoint SP2			27
3.2.17	Setpoint SP3			27

13 Overview install settings

Fct.	description	setting range	set value	P.
4.0	main menu install			29
4.1	Sub menu Selection of Measuring inputs			29
4.1.1	Input for flow signal	setting range: 4–20mA input 1 pulse input 1, double pulse MODBUS-Slave MODBUS-Master factory setting: pulse input 1		29
4.1.2	Input for temperature signal	setting range: 4–20mA input 1 4–20mA input 2 4–20mA input 3 MODBUS-Slave MODBUS-Master factory setting: No input No input		29
4.1.3	Input for density signal	setting range: 4 – 20mA input 1 4 – 20mA input 2 4 – 20mA input 3 Pulse input 2 MODBUS-Slave MODBUS-Master factory setting: No input No input		29
4.1.4	Input for pressure signal	setting range: No input 4 – 20mA input 1 4 – 20mA input 2 4 – 20mA input 3 MODBUS-Slave MODBUS-Master factory setting: No input		29
4.2.0	sub menu measuring range			29
4.2.1	flow unit	setting range: kg, g, mg, l, ml, t, m ³ , no unit factory setting: kg/h		29
4.2.2	decimal point	setting range: 0000 000.0 00.00 0.000 factory setting: 0000		29
4.2.3	end of scale value	setting range: 1 to 9999999 unit: from 4.2.1 factory setting: 100000		29

Fct.	description	setting range	set value	P.
4.2.4	increment per pulse of the pulse input	setting range: 1 to 9999,999 factory setting: 10,000 The setting range refers to the last digit displayed.		29
4.2.5	error pulse / x pulses allowed	setting range: 1 to 9999999 factory setting: 1		30
4.2.6	meter factor	setting range: 0,0000 to 2,0000 factory setting: 1,0000 The flow rate is multiplied by the set factor.		30
4.3	select input to linearisation	setting range: pulse input current input 1 current input 2 current input 3 flow signal OFF (no input) factory setting: OFF		30
4.4	sub menu pulse ration or frequency of pulse output			30
4.4.1	count pulses or frequency	setting range: count pulse, frequency factory setting: count pulse		30
4.4.2	increment per pulse of pulse output	setting range: 1, 10, 100, 1000 factory setting: 1		30
4.4.3	frequency at maximum flow	setting range: 1.00 to 100.00Hz factory setting: 100 Hz		30
4.5	minimum preselection	setting range: 1 to 9999999 factory setting: 1		30
4.6	maximum preselection	setting range: 1 to 9999999 factory setting: 9999999		30
4.7	overrun quantity	setting range: 0 to 9999999 factory setting: AUS (0)		31
4.8.0	sub menu monitoring the flow			31
4.8.1	minimum permissible flow	setting range: 0 to 9999999 factory setting: 0		31
4.8.2	maximum time for minimum flow after start	setting range: 0 to 9999999 unit: s factory setting: 0 = OFF.		31
4.8.3	maximum time for minimum flow during the batch	setting range: 0 to 9999999 unit: s factory setting: 0 = OFF.		31
4.8.4	allowed under batching quantity	setting range: 0 to 9999999 The unit and the decimal point are		31

Overview install settings

Fct.	description	setting range	set value	P.
		shown factory setting: 0 = OFF.		
4.9.0	sub menu special function purge			31
4.9.1	Filter time for enabling contact	setting range: 0,0 to 999,9 unit: s factory setting: 0,0 = OFF.		31
4.9.2	waiting time before batching	setting range: 0,0 to 999,9 unit: s factory setting: 0,0 = OFF		31
4.9.3	waiting time within the enabling contact must switch	setting range: 0,0 to 999,9 unit: s factory setting: 0,0 = OFF, see description of function 4.9.0		31
4.9.4	delay after enable contact for batching	setting range: 0 to 99.9 unit: s factory setting: 0 = OFF		31
4.10	suppressing the flow metering	setting range: continual at batch at start continual factory setting: continual		32
4.11.0	sub menu printer settings			33
4.11.1			(no more available)	
4.11.2	printout delay	setting range: 0 to 999 unit: s factory setting: 0		33
4.11.3	stop conditions at printer error	setting range: no stop no new start no stop factory setting: no stop		33
4.12	reset totaliser	setting range: do not delete, delete factory setting: delete		33
4.13	confirm end of batch	setting range: no, yes factory setting: no		33
4.14.0	sub menu pipeline measuring			33
4.14.1	Function	setting range: Batch controller, Conti-Pipeline factory setting: Batch controller		33
4.14.2	Counter 1	setting range: active, not active factory setting: not active		33
4.14.3	Counter 2	setting range: active, not active		33

Fct.	description	setting range		set value	P.
		factory setting:	not active		
4.14.4	Counter 3	setting range: factory setting:	active, not active not active		33
4.14.5	Mass flow	setting range: factory setting:	active, not active not active		33
4.14.6	Volume flow	setting range: factory setting:	active, not active not active		33
4.14.7	Standard volume flow	setting range: factory setting:	active, not active not active		33
4.14.8	Temperature	setting range: factory setting:	active, not active not active		33
4.14.9	Density	setting range: factory setting:	active, not active not active		33
4.14.10	Standard Density	setting range: factory setting:	active, not active not active		33
4.14.11	Pressure	setting range: factory setting:	active, not active not active		33
4.14.12	Printout	setting range: factory setting:	1 x every month 1 x every week at 0 a.m. at 0 p.m. every 12 hours every 8 hours every 4 hours every 2 hours every hour only keyboard only digital input every hour		33
4.15.0	Additive Batching				33
4.15.1	T-Pulse (pulse time)	setting range: factory setting:	0,0 s to 99,9 s 0,0 s		33
4.15.2	Batched Quantity	setting range: factory setting:	0 to 9999999 x 0		33

14 Overview calibration and test settings

<i>Fct.</i>	<i>description</i>	<i>setting range</i>	<i>set value</i>	<i>P.</i>
5.0	main menu calibr. / test	Main menu calibration / test After pressing ➤ for entering this menu, there is displayed a warning about 2 seconds in the display. After this you can enter with ➤ the next level. For custody transfer units, changes are only possible with the custody transfer switch.		34
5.1.0	sub menu calibration current inputs and outputs	Sub menu calibration current inputs and output		34
5.1.1	calibration current input 1 4 mA	Connect 4 mA to current input 1. Enter the programming level by pressing ➤. The display flashed. To confirm the current press ◀ or [Set]. To calibrate the next selection press ▲ or ▼.		34
5.1.2	calibration current input 1 20 mA	Connect 20 mA to current input 1. Enter the programming level by pressing ➤. The display flashed. To confirm the current press ◀ or [Set]. To calibrate the next selection press ▲ or ▼.		34
5.1.3	calibration current input 2 4 mA	Connect 4 mA to current input 2. Enter the programming level by pressing ➤. The display flashed. To confirm the current press ◀ or [Set]. To calibrate the next selection press ▲ or ▼.		34
5.1.4	calibration current input 2 20 mA	Connect 20 mA to current input 2. Enter the programming level by pressing ➤. The display flashed. To confirm the current press ◀ or [Set]. To calibrate the next selection press ▲ or ▼.		34
5.1.5	calibration current input 3 4 mA	Connect 4 mA to current input 3. Enter the programming level by pressing ➤. The display flashed. To confirm the current press ◀ or [Set]. To calibrate the next selection press ▲ or ▼.		34
5.1.6	Calibration current input 3 20 mA	Connect 20 mA to current input 3. Enter the programming level by pressing ➤. The display flashed. To confirm the current press ◀ or [Set]. To calibrate the next selection press ▲ or ▼.		34
5.1.7	calibration current output 4 mA	A multimeter is connect to the analog output. Enter the programming level by pressing ➤. The display flashed. Set the current with ▲ ▼ to 4 mA. To confirm the current press ◀ or [Set]. To calibrate the next selection press ▲ or ▼.		34

Fct.	description	setting range	set value	P.
5.1.8	calibration current output 20 mA	A multimeter is connect to the anlog output. Enter the programming level by pressing ➤. The display flashed. Set the current with ▲▼ to 20 mA. To confirm the current press ◀ or [Set]. To choose the next selection press ▲ or ▼.		34
5.2.0	sub menu test	sub menu 5.2.0 test		34
5.2.1	digital inputs	Every digital input is shown in the upper display as value.		34
5.2.2	digital outputs	By pressing the keys 1 to 5 the digital outputs 1 to 5 switches and the LED's are illuminated.		34
5.2.3	pulse input 1	The current input frequency at pulse input 1 is shown.		34
5.2.4	Pulse input 2	The current input frequency at pulse input 1 is shown.		34
5.2.5	Sensor break	A sensor break at pulse input 1 or 2 is shown.		34
5.2.6	current input 1	The current input current at analogue input 1 is shown.		34
5.2.7	current input 2	The current input current at analogue input 2 is shown.		34
5.2.8	current input 3	The current input current at analogue input 3 is shown.		34
5.2.9	current 4 mA	There are 4 mA at the current output.		34
5.2.10	current 12 mA	There are 12 mA at the current output.		34
5.2.11	current 20 mA	There are 20 mA at the current output.		34
5.2.12	keyboard test	To enter the test level press ➤. Every pressed key is shown in the display. To quit this level press ◀. Select the next level by pressing ▲ or ▼.		34
5.2.12	LCD test	To enter the test level press ➤. To quit this level press ◀.		34

15 Overview linearisation

Fct.	description	setting range	set value	P.
6.0	main menu linearisation			36
6.1	support point –10%	setting range: 0,0000 to 2,0000 factory setting: 1,0000		36
6.2	support point –5%	as 6.1		36
6.3	support point 0%	as 6.1		36
6.4	support point 5%	as 6.1		36
6.5	support point 10%	as 6.1		36
6.6	support point 15%	as 6.1		36
6.7	support point 20%	as 6.1		36
6.8	support point 25%	as 6.1		36
6.9	support point 30%	as 6.1		36
6.10	support point 35%	as 6.1		36
6.11	support point 40%	as 6.1		36
6.12	support point 45%	as 6.1		36
6.13	support point 50%	as 6.1		36
6.14	support point 55%	as 6.1		36
6.15	support point 60%	as 6.1		36
6.16	support point 65%	as 6.1		36
6.17	support point 70%	as 6.1		36
6.18	support point 75%	as 6.1		36
6.19	support point 80%	as 6.1		36
6.20	support point 85%	as 6.1		36
6.21	support point 90%	as 6.1		36
6.22	support point 95%	as 6.1		36
6.23	support point 100%	as 6.1		36
6.24	support point 105%	as 6.1		36
6.25	support point 110%	as 6.1		36

16 Overview Flow Conversion

Fct.	description	setting range	set value	P.
7.0	main menu Flow Conversion			37
7.1.0	Batch Dimension			
7.1.1	Batch Dimension	setting range: Mass, Volume, Standard Volume, manual selection factory setting: Mass		
7.1.2	Deactivated dimension	setting range: Mass, Volume, Standard Volume, No factory setting: No		
7.1.3	Totaliser dimension	setting range: Mass, Volume, Standard Volume, No factory setting: Mass		
7.2.0	Sub menu Temperature			
7.2.1	Calculation	setting range: Linear Correction API Correction DIN EN 14214 factory setting: Linear Correction		
7.2.2	Temperature 0 %	setting range: -200,0 °C – 600,0 °C factory setting: 0,0 °C		
7.2.3	Temperature 100 %	setting range: -200,0 °C – 600,0 °C factory setting: 100,0 °C		
7.2.4	Average correction factor	setting range: 0,000 – 2,000 factory setting: 0,723		
7.2.5	Sensor break	setting range: no new start start with fixed value start value input		
7.2.6	Error value	setting range: -200,0 °C – 600,0 °C factory setting: 0,0 °C		
7.3	Sub menu Density			
7.3.1	Calculation	setting range: Fixed density value from analogue input calculate density factory setting: from analogue input		
7.3.2	Density 0 %	setting range: 0,00 – 2000,00 kg/m3 factory setting: 1000,00 kg/m3		
7.3.3	Density 100 %	setting range: 0,00 – 2000,00 kg/m3 factory setting: 1000,00 kg/m3		

Fct.	description	setting range	set value	P.
7.3.4	Standard Density	setting range: 0,00 – 2000,00 kg/m3 factory setting: 1000,00 kg/m3		
7.3.5	Standard Temperature	setting range: 0,0 °C – 100,0 °C factory setting: 15 °C		
7.3.6	α_0	0.00000 * 10 ⁻³ /K if 0 then K ₀ , K ₁ and K ₂ is needed for the calculation		
7.3.7	K ₀	0000,0000		
7.3.8	K ₁	0,0000		
7.3.9	K ₂	-0,00000000		
7.3.10	Fixed density	Setting range: 0,00 – 2000,00 kg/m3 factory setting: 1000,00 kg/m3		
7.3.11	Sensor break	setting range: no new start start with fixed value start value input		
7.3.12	Error value	setting range: 0,00 – 2000,00 kg/m3 factory setting: 1000,00 kg/m3		
7.4	Sub menu Pressure	(Only for indication, not used for the flow conversion)		
7.4.1	Calculation	Setting range: OFF, manual compensation, method 1 linear, method 2 API, method 2 API special factory setting: OFF		
7.4.2	Pressure 0%	Setting range: -1,00 to + 100,00 bar factory setting: 0,00 bar		
7.4.3	Pressure 100%	Setting range: -1,00 to + 100,00 bar factory setting: 100,00 bar		
7.4.4	Cplm man.	Setting range: 0,000001 to 2,000000 factory setting: 1,000000		
7.4.5	Compress. b	Setting range: 0,000001 to 2,000000 factory setting: 1,000000		
7.4.6	Base pressure	factory setting: 1,01325 bar		
7.4.7	Sensor break	setting range: no new start start with fixed value start value input		
7.4.8	Error value	Setting range: -1,00 to + 100,00 bar factory setting: 0,00 bar		

17 Factory Settings

<i>Fct.</i>	<i>description</i>	<i>setting range</i>	<i>set value</i>	<i>P.</i>
8.0	main menu factory setting			
8.1	Selection function key	setting range: off, preselection, setpoint flow, setpoint override, product factory setting: as ordered		
8.2	Controller	setting range: active, not active factory setting: as ordered		
8.3	Purge function	setting range: active, not active factory setting: as ordered		
8.4	Custody transfer	setting range: no, yes factory setting: as ordered		
8.5	Terminal mode	setting range: active, not active factory setting: as ordered		
8.6	Instrument number	set in the factory		
8.7	Flow conversion	setting range: active, not active factory setting: as ordered		
8.9	Pipelinemaster	setting range: active, not active factory setting: as ordered		