

Batch controller

## Batch Counter BC 20



### Programming and installation manual

Software Version 1

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Construction year see type plate

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## Safety information



Warning!

The Batch Counter 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 Batch Counter 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 Batch Counter BC 20 models.
- 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.

### Operating safety

- The instruments are manufactured in our ISO 9001 certified factory. They comply with the requirements laid down in this standard.
- The Batch Counter BC 20 satisfies the requirements of protection class IP65.
- Danger may occur if the instrument is used incorrectly or in an unauthorised manner. All the information in this manual must be rigorously observed.

### Technical developments

The manufacturer reserves the right to modify technical data without notice.

### Repairs, dangerous chemicals

Only the **IBS BatchControl GmbH** is allowed to repair the instruments. Instruments sent to **IBS BatchControl GmbH** for repair must always be accompanied by a note describing the fault.

### Warning!



Warning!

The following procedures must be carried out before an instrument is sent in for repair:

- Remove all residues and deposits that may be present. Pay special attention to the gasket grooves and crevices where residue may collect.
- If materials injurious to health are not completely removed to the highest levels of safety, we cannot accept an instrument for repair.
- Costs of disposal of materials or of injury to personnel (acid burns, etc.) arising because of defective cleaning of the equipment will be charged to the owner of the equipment.

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# 1 System description

The microprocessor-controlled Batch Counter BC 20 is a simple to use multi-function batcher used for the recording and controlling of flow quantities in batching and filling processes in production areas.

## 1.1 Type codes

The following types can be supplied:

Batch Counter BC 20	24V DC	24V DC version
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## 1.2 Areas of application

- **The maximum permissible ambient temperature is +60°C.**
- **The minimum permissible ambient temperature is -20°C.**

The Batch Counter BC 20 controls the batch process. A 4-20mA signal and several digital contacts are available for controlling the batch. Up to three control signals can be fed to the Batch Counter BC 20. For controlling the flow rate or another physical quantity an internal controller is available as option.

As input for the flow a current input (4-20mA) or a contact input can be selected. The contact input permits the connection of passive contacts or optical couplers. The choice of the input variant is done by the software.

The (active) digital inputs can be assigned various functions (e.g. preselection, start, stop, etc.).

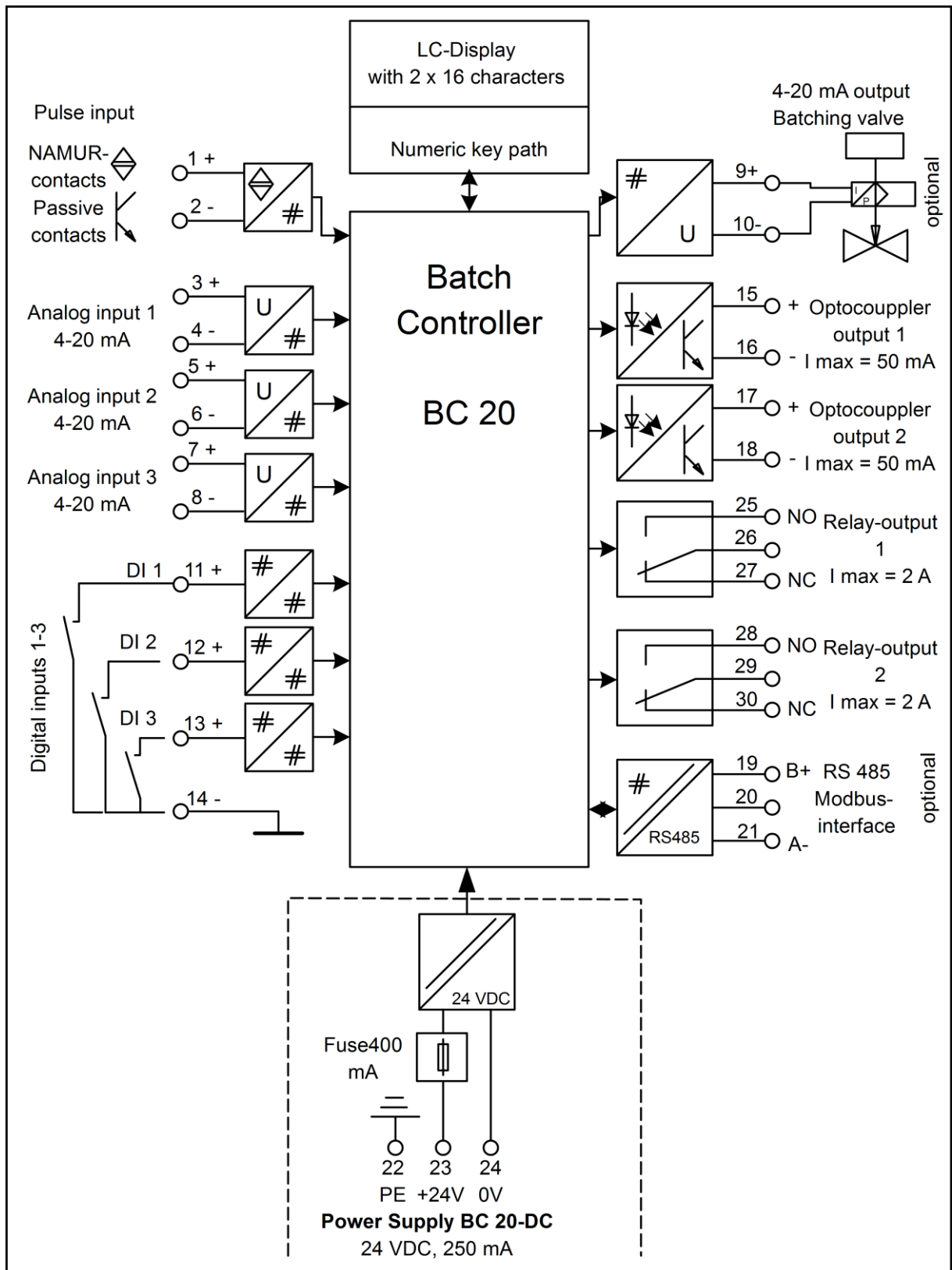
The digital outputs (optocouplers, relays) can be programmed to provide status signalling.

The Batch Counter BC 20 can be configured and controlled via a serial RS485 interface (MODBUS).

Access to the various program levels can be protected by a numerical code.

The Batch Counter BC 20 is supplied in a panel mount housing (IP20) with external dimensions of 96mm x 96mm.

**1.3 Block diagram**





## **2 Fitting and installation**

This information in this section is important and must be observed during fitting and installation.

### **2.1 Fitting the batch counter BC 20**

The batch counter BC 20 has external dimensions of 96mm x 96mm. You need a cut off in the panel mount with the dimensions of 92+0,8mm x 92+0,8mm (DIN43700). The depth is 110mm.

Release the two mounting profile screws. Shift the mounting profiles backwards from the panel mounting housing. Move the batch counter BC 20 from the front side through the cut off in the panel mount. If the IP65 front is ordered, put the gasket to the batch counter BC 20 before setting in the cut off.

### **2.2 Protection class IP20**

The batch counter BC 20 conforms to protection class IP20. The front is IP65.

### **2.3 Temperature range**

The batch counter BC 20 can be operated in the range  $-20^{\circ}\text{C}$  to  $+60^{\circ}\text{C}$ .

### **2.4 Cable glands and PE**

Only shielded cable may be used. The shield must be connected in the casing or the EMC clamps. The PE must be connected to the PE terminal and the PE screw at the batch counter BC20 housing.

Conformance with the EMC regulations can only be guaranteed if these measures are observed.

## 2.5 Terminal connection

The technical data must be observed at all times.

### 2.5.1 Potential equalisation

The PE must be connected to the PE terminal on the side of the housing and terminal 22.

### 2.5.2 Power supply 24V

The power supply provides power for all the electronics, the analogue output and the digital inputs and outputs. Don't connect line voltage to these terminals.

Terminal 22 (PE), Terminal 23 (+), Terminal 24 (-)	
Voltage U	DC 18-28,8V
Current $I_{max}$	250mA
Fuse	T 400mA

### 2.5.3 Pulse inputs

The batch counter BC 20 has connections for one pulse input. NAMUR contacts or passive electrically isolated contacts (optocoupler, relay contact) may be connected.

Pulse input: Terminal 1 (+) Terminal 2 (-)	
Voltage $U_{max}$	DC 8.5V
Current $I_{max}$	9mA

The pulse input supplies a current of approximately 3mA if a NAMUR contact is connected. The maximum voltage that can be measured is approximately 8.2V. Please note that terminals 2 must not be connected to ground.

### 2.5.4 Analogue inputs

The batch counter BC 20 has 3 analogue inputs (4-20mA).

The analogue inputs are not voltage-free, that means the minus is at instrument ground potential. The equipment connected must be able to drive a load of approx. 100Ω. As option a voltage input (2-10 V) is available.

Current input 1: Terminal 3 (+) Terminal 4 (-)	
Current input 2: Terminal 5 (+) Terminal 6 (-)	
Current input 3: Terminal 7 (+) Terminal 8 (-)	
Current $I_{max}$	25mA

### 2.5.5 Analogue output (option)

The Batch Counter BC 20 has an analogue output (4-20mA) for the controlling of a valve.

The analogue output is not electrically isolated. The minus is at ground potential. The maximum load is up to 900  $\Omega$ .

Analogue output: Terminal 9 (+) Terminal 10 (GND)	
Voltage $U_{\max}$	21V
Current $I_{\max}$	25mA

### 2.5.6 Digital inputs

The Batching Master has four digital inputs. The digital inputs can be assigned a wide range of functions via the software.

The digital inputs are active (approx. 100 $\mu$ A / 5V). Passive switches or optical couplers can be connected.

Digital input 1: Terminal 11 (+) Terminal 14 (GND) Digital input 2: Terminal 12 (+) Terminal 14 (GND) Digital input 3: Terminal 13 (+) Terminal 14 (GND)	
Voltage $U_{\max}$	DC 6V
Current $I_{\max}$	0.2mA

### 2.5.7 Digital optocoupler outputs

The Batch Counter BC 20 has two digital optocoupler outputs. The digital outputs can be assigned a wide range of functions via the software.

Optocoupler 1: Terminal 15 (+) Terminal 16 (-) Optocoupler 2: Terminal 17 (+) Terminal 18 (-)	
Supply circuits with the following maximum values can be connected to each circuit:	
Voltage $U_{\max}$	DC 30V
Current $I_{\max}$	550mA

### 2.5.8 Digital relay outputs

The Batch Counter BC 20 has two digital relay outputs. The digital outputs can be assigned a wide range of functions via the software.

Relay 1: Terminal 25 (N. O.) Terminal 26 (COM) Terminal 27 (N. C.) Relay 2: Terminal 28 (N. O.) Terminal 29 (COM) Terminal 30 (N. C.)	
Supply circuits with the following maximum values can be connected to each circuit:	
Voltage $U_{\max}$	30V
Current $I_{\max}$	2A

### **2.5.9 RS485 interface**

A higher level system can be connected to the interface. The protocol is Modbus RTU or ASCII

Interface: Terminal 19 (B+) Terminal 20 (GND) Terminal 21 (A-)

### 3 Operating and display elements



#### 3.1 Display

The LCD has two lines of 16 characters each. The character height is about 6mm. The upper LCD indicates the preselected quantity. The lower LCD indicates the current quantity batched. The display can be changed to flow, totalizer or flow controller (only if this is active) using the [#] key. The contrast can be adjusted by pressing the [◀] and [▶] keys.

#### 3.2 Keyboard

There are 24 short-stroke keys at the front of the batch counter BC 20.

In these operating instructions manual, keys are shown in square brackets. As example: If the number 15 is to be entered, this is shown as [15]. The Set key is shown as [Set].

## 4 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 totalizer by pressing the key again. The totalizer 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 set point 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 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.

### 4.1 Switching on the batch counter BC 20

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.

### 4.2 Batching with the batch counter BC 20

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 preselection value must be confirmed with [Set]. The last quantity batched is set to 0.

The batch counter BC 20 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 20mA. 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.

### 4.3 Fault messages

The batch counter BC 20 can detect various faults. Batching is interrupted immediately. The fault is reset by pressing the RESET key (see Holding Register 5 and 6).

<i>Lower Display</i>	<i>Upper Display</i>	<i>Fault No.</i>	<i>Fault Type</i>
FRAM	Error in	1	Memory error
<b>ERR S.-Break NK1</b> alternating with batched quantity (app. 1 sec intervals)	Preselected quantity	2	NAMUR contact 1 sensor break
<b>ERR S.-Break mA1</b> altern. with batched quantity	Preselected quantity	4	Analogue input 1 sensor break
<b>ERR S.-Break mA2</b> altern. with batched quantity	Preselected quantity	5	Analogue input 2 sensor break
<b>ERR S.-Break mA3</b> altern. with batched quantity	Preselected quantity	6	Analogue input 3 sensor break
<b>ERR M.-range mA1</b> altern. with batched quantity	Preselected quantity	7	Analogue input 1 measurement range violation
<b>ERR M.-range mA2</b> altern. with batched quantity	Preselected quantity	8	Analogue input 2 measurement range violation
<b>ERR M.-range mA3</b> altern. with batched quantity	Preselected quantity	9	Analogue input 3 measurement range violation
<b>ERR MIN. FLOW</b> altern. with batched quantity	Preselected quantity	10	Flow rate lower than permitted minimum
<b>ERR sensor</b> altern. with batched quantity	Preselected quantity	11	External fault message (e.g. mass measurement fault)
<b>not enabled 1</b> altern. with batched quantity	Preselected quantity	12	1 not enabled
<b>not enabled 2</b> altern. with batched quantity	Preselected quantity	13	2 not enabled
<b>ERR Over batched</b> altern. with batched quantity	Preselected quantity	14	Over-batching
<b>ERR OFF</b> altern. with batched quantity	Preselected quantity	15	OFF

Operation

<i>Lower Display</i>	<i>Upper Display</i>	<i>Fault No.</i>	<i>Fault Type</i>
<b>ERR Printer</b> altern. with batched quantity	Preselected quantity	16	Printer fault
		17	Preselection too small
		18	Preselection too large
		19	Pulse faulty (in case of double pulse)
		20	B confirmation not present
		21	Printer ERR. Communication error
		22	not used
		23	not used
<b>ERR product selection</b> altern. with batched quantity	Preselected quantity	24	no product selected
<b>extended area crc bad</b> altern. with batched quantity	Preselected quantity	25	checksum error
		26	not used
<b>External sensor Error</b> altern. with batched quantity	Preselected quantity	27	not used
<b>valve not open</b> altern. with batched quantity	Preselected quantity	28	valve open contact not active
<b>valve not closed</b> altern. with batched quantity	Preselected quantity	29	valve closed contact not active



## 4.4 Programming

To enter the programming level, press the Menu key. The batch counter BC 20 displays the current software version and the instrument number. A checksum has to be generated to check the certification data.

If a sub-menu is selected, you can access the next level using the  $\blacktriangleright$  key. A code is requested if one has been entered. 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  $\blacktriangleleft$  key to exit all levels. The “Save” prompt appears. You can change from “Yes” to “No” using the  $\blacktriangleup$ / $\blacktriangledown$  keys. The setting is then confirmed by pressing the  $\blacktriangleleft$  or Set key. All data are saved. The batch controller is now in batching mode again. Programming cannot take place during batching (except for the controller function).

## 4.5 Cold-Start

If the batch counter BC 20 detects invalid data in FRAM, a fault message is issued. A COLD-START can be initiated by pressing the RC key when switching on. A prompt appears asking whether all data is to be deleted (factory) or whether just the settings (basic settings) are to be reset (software options, characteristic and instrument number). The factory reset cannot be accessed by the user.

<b>Cold-Start</b>	<b>Upper Display</b>	<b>Lower Display</b>
The LCD indicates Cold Start after switching on. Entries are made using the $\blacktriangleright$ key. The upper display flashes. You can change between the levels with the $\blacktriangleup$ / $\blacktriangledown$ arrow keys and confirm with the $\blacktriangleleft$ or SET keys. When the setting has been confirmed, the associated code is requested. The setting is only deleted if the code is entered correctly. Settings:     Basic setting Factory setting Display basic setting at first	Cold-Start	Factory setting
Basic setting	Code Install code request	Each key pressed is shown as a field.
Factory	Code Factory code request	Each key pressed is shown as a field.

## 5 The parameter level

This chapter describes the setting options in the parameter level.

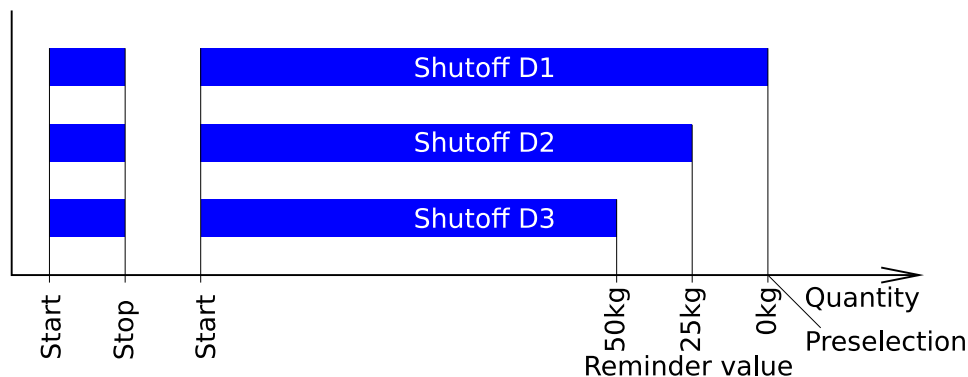
### 5.1 Setting the digital shut-off steps

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

These digital outputs switch on when batching is started. They switch off when the preselected quantity is reached. The digital outputs are also switched off if batching is interrupted through a stop or OFF.

Remainder values can be set to prevent over-batching. The digital outputs then switch off before the end of batching. Setting the remainder values for the shut-off steps is carried out in function 1.1.x of the Parameter Level.

If, for instance, you set the D3 shut-off to 50kg, D2 to 25kg and D1 to 0kg, the digital outputs switch as shown in the drawing.



All three digital outputs switch on when batching is started. Shut-off step D3 switches off 50kg before the end of batching. Shut-off step D2 switches off 25kg before the end of batching. When the preselected quantity is reached (remainder value = 0), shut-off step D1 switches off.

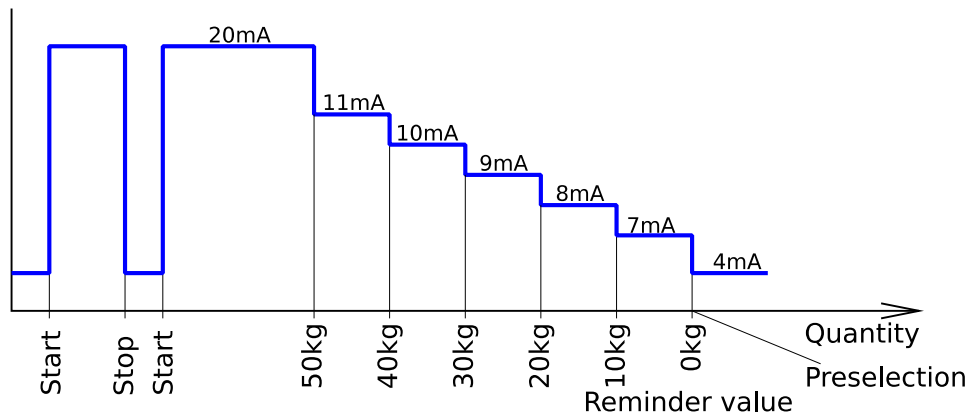
The digital shut-off steps are assigned to the digital outputs in function 2.3.x of the Structure Level.

The direction of action of the digital outputs can be set in function 2.3.x.

## 5.2 Setting the analogue shut-off steps

To achieve a more accurate shut-off at the end of batching; the analogue output can be ramped down to 4mA in six steps. The point at which a step should be activated before the end of batching 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 set-point can be entered. To do this, shut-off by flow must be set in function 1.2.1.

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

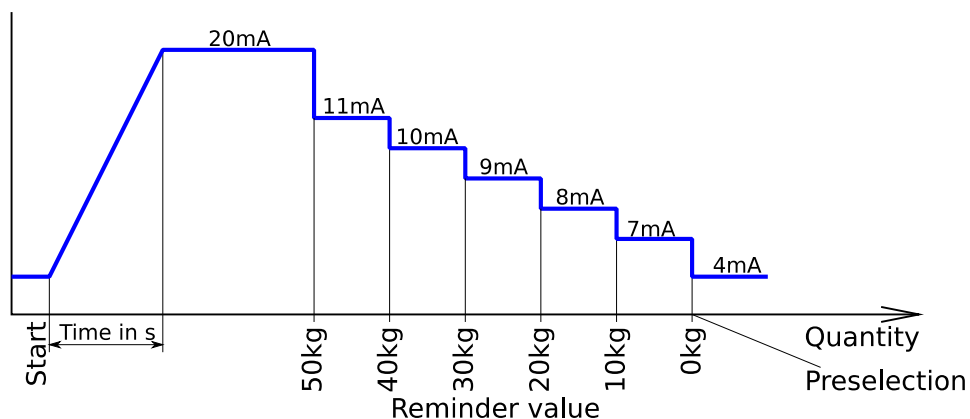


If batching is stopped using Stop, the output supplies 4mA immediately. If OFF is operated, the output supplies no current.

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

## 5.3 Setting a start-up ramp of the analogue output

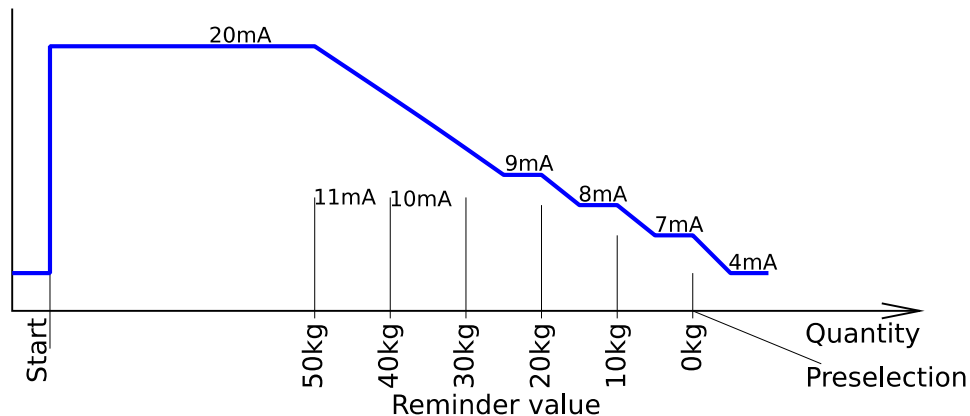
To prevent pressure hammers in the pipework, the current output to the valve is ramped up at the batch start from 4 to 20mA. The time for the ramp can be programmed in function 1.3. A value up to 9999 seconds can be specified.



## 5.4 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 4mA 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 when the OFF is activated.

The time for the ramp can be programmed in function 1.4. A value up to 9999 seconds can be specified. The time must be specified so short that there is no over dosage.



## 5.5 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). This digital output switches when the specified flow is exceeded. Entering a value of 0 will disable flow monitoring.

## 5.6 Batching indication

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

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

In the first type, the digital output is switched from the start to the end of batching. Batching must be fully terminated. If batching is interrupted with [Stop] (preselected quantity not reached), the batching indication remains on. The batching 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 output at the end of batching. The pulse length is written in seconds to menu 1.6.2.

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## 5.7 Monitoring the overflow quantity

A value for the maximum permissible overflow 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, a time indicating how long the overflow quantity is to be monitored after batching is terminated can be entered. This is necessary if, for example, the mass measuring device runs empty after a time and issues pulses even though no medium is flowing.

## 5.8 Monitoring of sensor break contact inputs

If a batch counter BC 20 has been configured for pulse or double pulse input, the NAMUR contact sensor break can be monitored. The contact inputs used are monitored for open circuit or short-circuit when sensor break is switched on in function 1.8.1 or 1.8.2. If a fault occurs, an active batching process is stopped and the fault message is issued.

## 5.9 Monitoring of sensor break current inputs

If the batch counter BC 20 has been configured as a current input or a limiting or tracking controller, the current sensor break can be monitored. The current inputs used are monitored for currents less than 3.2mA when sensor break is activated in functions 1.8.3 to 1.8.5. If a fault occurs, an active batching process is stopped and the fault message is output.

## 5.10 Monitoring measuring range violation for current inputs

If your batch counter BC 20 has been configured as a current input or a limiting or tracking controller, current measuring range violation can be monitored. The current inputs used are monitored for currents exceeding 20.4mA when monitoring is switched on in functions 1.8.6 to 1.8.8. If a violation occurs, an active batching process is stopped and the fault message is output.

## 5.11 Specify fixed values

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

The three fixed pre-selection values can be specified in function 1.9.x or 3.1.11-13.

## 5.12 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 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 shut-off steps are not changed.

Note:

- Only batches, which are done without stops and error messages, are used for the compensation calculation. The third shut off 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-batching must be set. The minimum allowed flow (4.8.1) with the times (4.8.2 and 4.8.3) and an allowed under-batching (4.8.4) must be set.
- To detect an over-batching, 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.

### 5.12.1 End value for correction

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

In function 1.10.1 you set the factor for over-batching compensation. The input value is in percent. The function is off if 0% is set. You can see the actual shut-off values in the function 1.1.0.

Example:

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

### 5.12.2 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. The function is off if it is set to 0.



Note!

### **5.12.3 Flow rate addicted correction from the shut off steps**

You set in function 1.10.3 the flow rate addicted correction factor. At the third shut off the actual flow rate is compared with the flow rate from the last batch. If the actual 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.) 10kg is set. At the last batch the flow rate was 50000kg/h (measuring range 100000kg/h). At the actual batch the flow rate is 40000kg/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 10kg later as in the last batch.

### **5.13 Checksum for certification data**

In function 1.10, a checksum of all certification data is generated and is displayed on the LCD.

### **5.14 Checksum for parameter assignment data**

In function 1.11, a checksum of all data unrelated to certification is generated and displayed on the LCD.

## **6 The structure level**

### **6.1 Setting the language**

The language in which the menus are displayed is selected in function 2.1.

### **6.2 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.

#### **6.2.1 Set**

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

#### **6.2.2 Start**

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

#### **6.2.3 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.

#### **6.2.4 Stop**

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

#### **6.2.5 Reset**

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

#### **6.2.6 Failure of the flow sensor**

It is possible to connect a digital status output of a flow-meter to a digital input of the Batch Counter BC 20. The setting is “ext. error”. If the input switches during an active batch the batch will be stopped with the failure message “ERR Sensor”.

#### **6.2.7 Reset totalizer**

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



### 6.2.8 Two custom specific release signals

If a digital input is programmed to “Release 1” or “Release 2”, batching process can only be started 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. These two failure texts can be entered via the Modbus interface from Holding Register address 1151. The maximum length is 16 characters.

Example:



### 6.2.9 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.

### 6.2.10 Disabling keypad operating

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

### 6.2.11 Activate purge function

If the digital input is set to “purge”, the analogue valve output ramps up to 20mA 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 34.

### 6.2.12 Switching off controller function

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

### 6.2.13 Enabling input for special function

If the digital input is set to “SF enable”, function 4.9 is enabled when the input is activated (see special rinsing function page 34).

### 6.2.14 Selecting the fixed preselection values

Digital input 3 can be assigned “Preselection 2”. If the digital input is active, the second preselection is used.

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

## 6.3 Setting the direction of action of the digital inputs

Functions 2.2.2, 2.2.5 and 2.2.8 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.

## 6.4 Setting the type of activation of the digital inputs

Functions 2.2.3, 2.2.6 and 2.2.9 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”, batching cannot be started until the Stop is deactivated. If, however, the “Stop” function is set

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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).

## 6.5 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 (relay 1)	Digital shut-off point 1
Digital output 2 (relay 2)	Digital shut-off point 2
Digital output 3 (optocoupler 1)	Digital shut-off point 3
Digital output 4 (optocoupler 2)	Batching indication

### 6.5.1 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 via the hardware. In addition, switch off takes place via the micro-controller.

### 6.5.2 Setting a digital output to pulse output

The current flow rate can be output on the digital outputs in the form of pulses. The maximum frequency is 150 Hz. The relay outputs are not suitable for pulse output. Setting the pulse increment is carried out in function 4.4.

### 6.5.3 Setting a digital output as batching indication

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

### 6.5.4 Setting a digital output as a flow alarm

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

### 6.5.5 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.

### 6.5.6 Switch off 1 reverse

The contact *switch off 1* switched not before ending batch. It switched after starting the batch. Exceeding the quantity set in menu 1.1.1, the contact switch.

### 6.5.7 Setting a digital output as purge indication

The output switched if the purge function is active.

## 6.6 Setting the direction of action of the digital outputs

Functions 2.3.2, 2.3.4 and 2.3.8 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.

## 6.7 Interface settings

The Batch Counter BC 20 has one serial data interface. The settings are performed in the sub menu 2.4.0.

### 6.7.1 Setting the operating mode for interface

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 Batch Counter BC 20. At the setting “read/write” it is also allowed to write data in the Batch Counter BC 20.

### 6.7.2 Setting the protocol type of interface

In function 2.4.2, you can choose between Modbus RTU, Modbus ASCII and DIN 66348. At the setting DIN 66348 a MEW is emulated.

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

### 6.7.3 Specifying the unit address of interface

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

### 6.7.4 Specifying transmission speed of interface

The baud rate is specified in function 2.4.4. The maximum baud rate is 115200 bps.

## 6.8 Code entry

Access to all levels can be code protected. The code is entered in functions 2.5.1 to 2.5.6.

Function 2.5.3, set-point, prevents the controller set-point from being modified (only if the controller is active).

The codes set in functions 2.5.4 install, 2.5.5 cali/test and 2.5.6 characteristic only

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apply to calibrated custody transfer instruments. In the case of calibrated instruments (for custody transfer), the install level can only be enabled by the programming enable switch.

## 6.9 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.

## 6.10 Function key assignment

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

### 6.10.1 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.

### 6.10.2 Fixed select values

The fixed select values are assigned to function keys F1 to F3. When a function key is pressed, the assigned LED lights up. If the function preselect values is enable, the preselection appears in the display. Batching 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

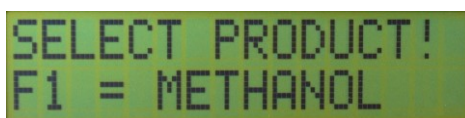
### 6.10.3 Purge via F1

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 key. By pressing the F1 key the output signal to the batching valve opens to 20mA. The LCD shows purge in the lower display.

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

### 6.10.4 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).



SELECT PRODUCT!  
F1 = METHANOL

After the confirmation of the pre-set input value with [Set], the first display line shows the question text. When 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. When batching is started, only the selected digital shut-off step switches and the 4- 20mA 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 in the factory via the Modbus interface.

### 6.11 Edit Text

Use function 2.8 to edit the text for releases, station name and so on. If no text is set, the standard text is used.

Menu	Description
2.8.1	Release 1
2.8.2	Release 2
2.8.3	Station Name
2.8.4	Product Selection
2.8.5	Product 1
2.8.6	Product 2
2.8.7	Product 3
2.8.8	Wait for release
2.8.9	Delay

### 6.12 Vale feedback signalisation

The Batch Counter BC 20 is able to control the valve position. After batch start the valve open indication within the time set in function 2.11.1 must be active. If not, the batch will be stopped and an error message appears at the display. In function 2.11.2 the time for valve closed indication is set. If all times are set to 0s, the valve monitoring is not active.

## 7 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 set-point can be set even during batching. Press the [#] key ([RC] key for limiting controller). The upper display shows the set-point, the lower display the actual value. The set-point can be changed by pressing [Reset], entering new set-point using keys [0] to [9] and then pressing [Set]. The controller display remains active for approx. four seconds. After this, the batching data (pre-set quantity, batched quantity) is displayed.

If the set-point was not changed, the batch counter BC 20 returns to the operating mode after 10 seconds if no key is pressed.

### 7.1 Flow controller

The flow is controlled during batching. In function 1.2.1 you can select between Flow values or mA values are set as shut-off steps. These are shown as a set-point when the controller is displayed. If batching is interrupted, the last manipulated variable is saved. If no start-up ramp is set, the set-point is reached quickly.

The flow controller set-point can also be specified externally on analogue input 3. To do this, function 3.1.1 must be switched to FLOW tracking controller.

### 7.2 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 set-point can also be specified externally on analogue input 3. To do this, function 3.2.1 must be switched to "Remote Control".

#### 7.2.1 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.

Finally, the measuring range is specified. Function 3.2.4 sets the start of the measuring range i.e. the value corresponding to 4mA. Function 3.2.5 sets the end of the measuring range i.e. the value corresponding to 20mA. A value between -9999 and +9999 can be entered. The decimal point is shown in a fixed position.

### 7.3 Control parameter

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

### 7.3.1 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.

### 7.3.2 Working point setting OP

With a P controller, the working point  $Y_0$  is set in function 3.1.3 either 3.2.7. The factory setting is 0.0%.

### 7.3.3 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 to 1.00.

### 7.3.4 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.

### 7.3.5 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.

### 7.3.6 Set-point start SPS

Use function 3.1.7 either 3.2.11 to enter the lowest set-point that the user can set.

### 7.3.7 Set-point end SPE

Use function 3.1.8 either 3.2.12 to enter the highest set-point that the user can set.

### 7.3.8 Set set-point enable

Use function 3.1.9 or 3.1.13 to enable the changing of set-point.

### 7.3.9 Set-points

Use function 3.1.10 to 3.1.13 or 3.2.14 to 3.2.17 for setting the set-points. The first set-point is the actual set-point, which is active either selected. The following three set-points are fixed set-points, which can be set.

### 7.3.10 Ramp difference

During the start-up ramp from the batch the flow rate controller is inactive. The maximum flow rate is reached within the ramp time. After the ramp difference is less than set in parameter 3.1.4, the flow rate controller is set active and the start-up ramp is deactivated. In this way the controller reaches the set-point fast.

### 7.3.11 Valve set time

In function 3.1.15 the valve set time for the use of electro-hydraulic valves is set.

### 7.3.12 Minimum pulse time

Set the minimum pulse time for electro-hydraulic two step valves in function 3.1.16.

## **8 Settings in the install level**

All important settings that affect the sensor and measuring range are set in the install level (function 4.0). In certified custody transfer instruments, this level can only be enabled via the programming switch.

### **8.1 Specifying the type of sensor**

The type of sensor for flow rate, temperature, density and pressure to be connected is specified in function 4.1. There is a choice of current, pulse and double pulse input. The measured values can also be transmitted via the interface. You can use this for checking the quantity transformer function.

A sensor with current output must be connected to analogue input 1. A sensor with pulse output is connected to pulse input 1. In the case of certified custody transfer sensors that have a second pulse output, connect the second output to pulse input 2.

NAMUR Sensor break monitoring is switched on in function 1.8.x.

### **8.2 Setting the measuring range of the flow**

The measuring range is specified in function 4.2.x.

#### **8.2.1 Measuring range unit**

The measuring range unit is set in function 4.2.1. You can choose between kg, g, mg, l, ml, t, m<sup>3</sup> and "no unit".

#### **8.2.2 Decimal places**

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

#### **8.2.3 End of scale value**

The end of scale value is then set in function 4.2.3.

#### **8.2.4 Incoming pulses per unit**

For sensors 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:

You have set a measuring range of 10000kg/h. This is to be displayed to one decimal place. The sensor supplies 10pulses/kg. An increment per pulse of 1 pulse / 0.1kg must therefore be entered.

### **8.3 Linearization of an input signal**

You can linearize an input of the batch counter BC 20 in the case of a non-linear sensor. The input to be linearized is selected in function 4.3. The linearization takes place in the characteristic level described on page 39.



## **8.4 Pulse output, pulse rate or frequency**

You can select the pulse output between count pulses or frequency according to the flow rate.

### **8.4.1 Pulse output, pulse rate**

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

### **8.4.2 Pulse output, frequency**

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

## **8.5 Limit pre-selection value**

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

### **8.5.1 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.

### **8.5.2 Maximum pre-selection value**

The maximum permissible pre-selection can be set in function 4.6. This is necessary by custody transfer instruments.

## **8.6 Entering the overrun quantity**

If the batch counter BC 20 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 batch counter BC 20 and the actual quantity should then agree with the preselected quantity.

## **8.7 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.

How long the flow rate may remain below the value set in function 4.8.1 after starting is specified in function 4.8.2. If the flow rate has not reached the minimum permissible value within this time, batching is interrupted and a fault message is output.

How long the flow rate may remain below the value set in function 4.8.1 during the batch is specified in function 4.8.3.

### **8.7.1 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.

## **8.8 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 after 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. Batching can be re-started.

If batching has not been started, rinsing can be initiated via the digital input assigned to the rinsing function. The current output supplies 20mA for as long as the contact is operated. The digital shut-off points D1 to D3 do not switch.

The rinse function cannot be started during batching and batching cannot be started during rinsing.

### **8.8.1 Application 1**

Once the Start signal has been given, the digital output assigned to digital shut-off step D3 is active. A text, which is stored from holding register 1209, is shown. The configuration is done by the serial interface.

After enabling via the SF enable digital input, digital shut-off steps D2 and D1 switch. The valve output ramps up. Batching indication is active. The batch counter BC 20 meters the flow.

If digital shut-off step D3 has to drop out before D2 and D1 are activated, the delay must be set in function 4.9.4. Once enable is given, shut-off step 3 drops out. D2 and D1 switch after expiry of the time (4.9.4).

### **8.8.2 Application 2**

Once the Start signal has been given, the digital output assigned to digital shut-off step D3 is active. A text is shown (holding register 1209).

After the time in function 4.9.2 “t to batch” has expired, D2 and D1 are also active. The valve output ramps up. Batching indication is active. The batch counter BC 20 meters the flow.

### **8.8.3 Application 3**

Once the Start signal has been given, the digital output set to digital shut-off step D3 is active. A text is shown (holding register 1209).

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 valve output ramps up. Batching indication is active. The batch counter BC 20 meters the flow. If enable is not issued within this time, D3 drops out. An error message appears (from holding register address 1151). This procedure can be started again with Start.

#### **8.8.4 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 holding register 1217 is shown. The valve output ramps up. Batching indication is active. The batch counter BC 20 meters the flow.

### **8.9 Suppressing the flow counting**

When the input signal is to be evaluated is specified in function 4.10 'Metering'. The factory setting is for the input signal always to be evaluated.

With the rinsing function, it is logical to evaluate the input signal only during active batching (during DOS). The input signal is to be evaluated from start to end of the batch. 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 to be evaluated only if the batch is started. If temporary stopped, the input signal is not to be evaluated.

### **8.10 Printer settings**

In function 4.11.1, a print instruction can be sent to a higher-level system.

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

The stop conditions of a batch if no printer is connected or active are specified in function 4.11.3. If "no stop" is selected, batching can continue even though the printer is inactive. If "no restart" is set, a new batch can only be started if the printer is active.

### **8.11 Reset totalizer**

To reset the totalizer, set function 4.12 to reset.

### **8.12 Confirm end of batch**

Function 4.13 "conf. batch" specifies whether the end of a batch must be confirmed from a higher-level system.

The associated flag reg. no 18 is set after the end of batching. A new batch can only be started when this flag is reset by the higher level system.

In the case of certified custody transfer instruments, this function can only be

Settings in the install level

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changed by activating the programming enable switch.

## 9 Settings in the calibration and test level

This level can only be accessed with the programming switch in the case of certified custody transfer instruments. The seal must be broken to do this.

Please note that, in this level, all outputs may switch and up to 22mA 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.



Warning!

### 9.1 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 4mA. In function 5.1.3, enter the programming level with [➤] (display flashes). Returning by pressing [◀] or [Set] saves the present current as the 0% value.

Now apply a current of 20mA 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.

### 9.2 Calibrating current outputs

To calibrate the current outputs, connect an ammeter to the current output that is to be calibrated.

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 4mA is reached, exit the programming level using the [◀] key. Setting of the 100% value setting is performed in function 5.1.8.

### 9.3 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 input is shown on the LCD when activated.

Function 5.2.2 tests the digital outputs. Use number keys 1 to 5 to switch the associated digital output 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.

### Settings in the calibration and test level

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Functions 5.2.9 to 5.2.11 cause a test current of 4, 12 or 20mA 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 read the keypad. Each key pressed is shown on the display. This level is exited with the [◀] key.

Function 5.2.13 carries out an LCD test.

## 10 Linearization of an input signal

If the signal on an input is non-linear, it can be corrected using a characteristic. Assignment of the input is carried out in function 4.3. Only one input can be linearized.

There are 25 nodes available at 5% intervals from -10% to +110%. The nodes in functions 6.1 to 6.26 specify the actual value at a node. The upper display shows which node is currently being processed.

Example:

You have determined that, at a current of 5.6mA (corresponding to 10%), the sensor does not have a flow-rate of 10000kg/h (10%) as expected but only 9000kg/h (9%). To correct this error, switch to function 6.5 (10% node). "Lin 10%" appears in the display. Switch to the programming level with [➤]. The upper display flashes. The lower display still shows 10.00%. Change this value to 9.00% with the [▼] (for -) and [0 to 9] keys. The new value is saved by pressing the [↵] key.

This change has the result that a current of 5.6mA (10%) is evaluated as a value of 9000kg/h (9%).

## **11 Factory menu**

Various software options can be ordered. These options can be enabled in the factory menu. The code is not accessible to users.

This software is only present if it was ordered as an option.

### **11.1 Specify fixed preselection values, set-points or products**

Three fixed preselection values, three set-points or three products can be specified. Which selection is active is selected using the digital inputs or the function keys F1 to F3.

### **11.2 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 controllers could be active simultaneously.

The controller set-point can also be specified externally (4-20mA).

### **11.3 Purge function and other special functions**

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

To make the function more flexible, several times have been added that can be used to specify how the digital outputs are to be switched.

One digital input can be used as an enable input.

You will find a complete description in Paragraph 8.8 ff.

### **11.4 Terminal mode**

You can switch the batching master to terminal mode by the interface. The terminal mode is only usable by stopped batching.

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

The function is described in Paragraph 12.1.

### **11.5 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.



## 12 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			18
1.1.0	sub menu digital shut off			18
1.1.1	digital shut off 1	unit: as measuring range 4.2.1, decimal point 4.2.2 setting range: 0 to 9999999 factory setting: 0		18
1.1.2	digital shut off 2	unit: as measuring range 4.2.1, decimal point 4.2.2 setting range: 0 to 9999999 factory setting: 0		18
1.1.3	digital shut off 3	unit: as measuring range 4.2.1, decimal point 4.2.2 setting range: 0 to 9999999 factory setting: 0		18
1.2.0	sub menu analogue shut off			19
1.2.1	shut off	setting range: current flow factory setting: current		19
1.2.2.	analogue shut off1	unit: as measuring range 4.2.1, decimal point 4.2.2 setting range: 0 to 9999999 factory setting: 50		19
1.2.3	analogue out 1	unit: mA setting range: 4.00-20,00mA factory setting: 11mA or: 0 to 9999999 unit as measuring range 4.2.1, decimal point 4.2.2 factory setting: 5000		19
1.2.4	analogue shut off 2	see 1.2.1 factory setting: 40		19
1.2.5	analogue out 2	see 1.2.2 factory setting: 10mA or 4000		19
1.2.6	analogue shut off 3	see 1.2.1 factory setting: 30		19
1.2.7	analogue out 3	see 1.2.2 factory setting: 9mA or 3000		19
1.2.8	analogue shut off 4	see 1.2.1 factory setting: 20		19
1.2.9	analogue out 4	see 1.2.2 factory setting: 8mA or 2000		19

## Overview parameter settings

1.2.10	analogue shut off 5	see 1.2.1 factory setting: 10		19
1.2.11	analogue out 5	see 1.2.2 factory setting: 7mA or 1000		19
1.3	Start up ramp	unit: s setting range: 0 to 9999 factory setting: 0		19
1.4	Shut down ramp	unit: s setting range: 0 to 9999 factory setting: 0		20
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		20
1.6.0	sub menu batch indication			21
1.6.1	batch-indication	unit: no setting range: on, pulses, (after ending batch a pulse about 2s is set) factory setting: ON		21
1.6.2	pulse length	unit: s setting range: 0 to 99.9s factory setting: 2s		21
1.7.0	sub menu overflow quantity			21
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		21
1.7.2	time overflow quantity	only displayed if 1.7.1 < 9999999 unit: s setting range: 0 to 9999, (0 displayed as continual) factory setting: continual		21
1.8.0	sub menu sensor break / measuring range overflow			21
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		21

Overview parameter settings

1.8.3	sensor break current input 1	unit: no setting range: sensor break OFF, sensor break ON factory setting: sensor break OFF		21
1.8.4	sensor break current input 2	unit: no setting range: sensor break OFF, sensor break ON factory setting: sensor break OFF		21
1.8.5	sensor break current input 3	unit: no setting range: sensor break OFF, sensor break ON factory setting: sensor break OFF		21
1.8.6	measuring range overflow current input 1	unit: no setting range: sensor break OFF, sensor break ON factory setting: sensor break OFF		21
1.8.7	measuring range overflow current input 2	unit: no setting range: sensor break OFF, sensor break ON factory setting: sensor break OFF		21
1.8.8	measuring range overflow current input 3	unit: no setting range: sensor break OFF, sensor break ON factory setting: sensor break OFF		21
1.9.0	sub menu fixed preselection	(not for controller set points see controller settings)		21
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		21
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		21
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		21

## Overview parameter settings

1.11	checksum part custody transfer			23
1.12	checksum part parameter settings			23

## 13 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			24
2.1	Select language	unit: no setting range: Deutsch, English, Französisch, Spanisch, Italienisch factory setting: Deutsch		24
2.2.0	sub menu settings digital inputs			24
2.2.1	function digital input 1	setting range: no function, SET, START, SET-START, STOP, RESET, external failure, totalizer reset, release 1, release 2, interface on, Keypad enable, purge, controller off, valve open, valve closed, special function release, factory setting: no function not with function two step valve		24
2.2.2	direction of action digital input 1	setting range: normally open, normally closed factory setting: normally open		24
2.2.3	type of action digital input 1	setting range: level, flank factory setting: level		24
2.2.4	function digital input 2	setting range: no function, SET, START, SET-START, STOP, RESET, external failure, totalizer reset, release 1, release 2, interface on, Keypad enable, purge, controller off, valve open, valve closed, special function release, factory setting: no function not with function two step valve		24
2.2.5	direction of action digital input 2	setting range: normally open, normally closed factory setting: normally open		24
2.2.6	type of action digital input 2	setting range: level, flank factory setting: level		24

Overview structure level

<b><i>Fct.</i></b>	<b><i>description</i></b>	<b><i>setting range</i></b>	<b><i>set value</i></b>	<b><i>P.</i></b>
2.2.7	function digital input 3	setting range: no function, SET, START, SET-START, STOP, RESET, external failure, totalizer 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		24
2.2.8	direction of action digital input 3	setting range: normally open, normally closed factory setting: normally open		24
2.2.9	type of action digital input 3	setting range: level, flank factory setting: level		24
2.3.0	sub menu settings digital outputs			26
2.3.1	function relay 1	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 factory setting: shut off 1		26
2.3.2	direction of action relay 1	setting range: normally open, normally closed factory setting: normally open		26
2.3.3	function relay 2	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 factory setting: shut off 2		26
2.3.4	direction of action relay 2	setting range: normally open, normally closed factory setting: normally open		26
2.3.5	function optocoupler 3	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 factory setting: shut off 3		26
2.3.6	direction of action optocoupler 3	setting range: normally open, normally closed factory setting: normally open		26

<b>Fct.</b>	<b>description</b>	<b>setting range</b>	<b>set value</b>	<b>P.</b>
2.3.7	function optocoupler 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 factory setting: batch indication		26
2.3.8	direction of action optocoupler 4	setting range: normally open, normally closed factory setting: normally open		26
2.4.0	sub menu interface settings			27
2.4.1	function	setting range: read / write, only read factory setting: read / write		27
2.4.2	Protocol 1	setting range: MODBUS RTU, MODBUS ASCII factory setting: RTU		27
2.4.3	Address 1	setting range: 1 to 255 factory setting: 1		27
2.4.4	Baud rate 1	setting range: 2400, 4800, 9600, 19200, 38400, 76800, 115200 factory setting: 9600		27
2.5.0	sub menu code input			27
2.5.1	Code parameter menu	setting range: 0 to 9999999 factory setting: 0		27
2.5.2	Code structure menu	setting range: 0 to 9999999 factory setting: 0		27
2.5.3	Code controller menu	setting range: 0 to 9999999 factory setting: 0		27
2.5.3	Code set-point setting controller	setting range: 0 to 9999999 factory setting: 0		27
2.5.4	Code install menu	setting range: 0 to 9999999 factory setting: 0		27
2.5.5	Code calibration and test menu	setting range: 0 to 9999999 factory setting: 0		27
2.5.6	Code linearisation	setting range: 0 to 9999999 factory setting: 0		27
2.6.0	sub menu key operation disable / enable			28
2.6.1	key operation disable / enable	setting range: enable, locked factory setting: enable		28

Overview structure level

<b>Fct.</b>	<b>description</b>	<b>setting range</b>	<b>set value</b>	<b>P.</b>
2.6.2	key operation RESET enable	setting range: RESET enable, RESET disable factory setting: disable		28
2.6.3	key operation SET enable	setting range: SET enable, SET disable factory setting: disable		28
2.6.4	key operation START enable	setting range: START enable, START disable factory setting: disable		28
2.6.5	key operation STOP enable	setting range: STOP enable, STOP disable factory setting: disable		28
2.6.6	key operation function keys enable	setting range: F1-F3 enable, F1-F3 disable factory setting: disable		28
2.6.7	key operation numeric keys enable	setting range: 0...9 enable, 0...9 disable factory setting: 0...9 disable		28
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		28
2.8	sub menu text			
2.8.1	Release 1			
2.8.2	Release 2			
2.8.3	Station			
2.8.4	Product selection			
2.8.5	Product 1			
2.8.6	Product 2			
2.8.7	Product 3			
2.8.8	Wait for release			
2.8.9	Delay			
2.11	sub menu valve position feedback			
2.11.1	start time	setting range: 0 (OFF) to 9999s		
2.11.2	end time	setting range: 0 (OFF) to 9999s		



## 14 Overview controller settings

<b>Fct.</b>	<b>description</b>	<b>setting range</b>	<b>set value</b>	<b>P.</b>
3.0	Controller main menu			30
3.1.0	Flow controller			30
3.1.1	Controller type	Setting range: no function flow controller tracking flow controller Factory setting: no function		30
3.1.2	Proportional coefficient Kp	Setting range: -100.0 to 100.0 Unit: none Decimal point: 0,0 Factory setting: 1.0		31
3.1.3	P controller operating point OP	Setting range: -10% to 110% Unit: none Decimal point: 0.0 Factory setting: 0		31
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		31
3.1.5	Integral action time	Setting range: 1 to 4999 Unit: s Decimal point: 0 Factory setting: 5000 corresponding to off		31
3.1.6	Derivative action time Tv	Setting range: 0 to 1000 Unit: s Decimal point: 0 Factory setting: 0		31
3.1.7	Set-point start SPS	Setting range: -9999 to 9999999 Unit: from 3.2.1 or 4.2.0 Decimal point: see above Factory setting: 0		31
3.1.8	Set-point end SPE	Setting range: -9999 to 9999999 Unit: from 3.2.1 or 4.2.0 Decimal point: see above Factory setting: 100%		31
3.1.9	Set-point adjustment	Setting range: fixed, variable Factory setting: fixed		31
3.1.10	Set-point SP	Actual Set-point		31
3.1.11	Set-point SP1	Set-point 1		31
3.1.12	Set-point SP2	Set-point 2		31
3.1.13	Set-point SP3	Set-point 3		31
3.2.0	Limiting controller			30

## Overview controller settings

3.2.1	Controller type	Setting range: no function limiting controller tracking limiting controller Factory setting: No function		30
3.2.2	Physical unit controller	Setting range: no physical unit, %, °C, bar, pH Factory setting %		30
3.2.3	Decimal point (not applicable for flow controllers)	Setting range: 0000 000.0 00.00 0.000 Factory setting: 0000		30
3.2.4	Start of scale	Setting range: -9999 to 9999 Unit from 3.2.1 Decimal point from 3.2.2 Factory setting: 0%		30
3.2.5	End of scale	Setting range: -9999 to 9999 Unit from 3.2.1 Decimal point from 3.2.2 Factory setting: 100%		30
3.2.6	Proportional coefficient Kp	Setting range: -100.0 to 100.0 Unit: none Decimal point: 0,0 Factory setting: 1.0		31
3.2.7	P controller operating point OP	Setting range: -10% to 110% Unit: none Decimal point: 0.0 Factory setting: 0		31
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		31
3.2.9	Integral action time	Setting range: 1 to 4999 Unit: s Decimal point: 0 Factory setting: 5000 corresponding to off		31
3.2.10	Derivative action time Tv	Setting range: 0 to 1000 Unit: s Decimal point: 0 Factory setting: 0		31
3.2.11	Set-point start SPS	Setting range: -9999 to 9999999 Unit: from 3.2.1 or 4.2.0 Decimal point: see above Factory setting: 0		31
3.2.12	Set-point end SPE	Setting range: -9999 to 9999999 Unit: from 3.2.1 or 4.2.0 Decimal point: see above Factory setting: 100%		31

Overview controller settings

3.2.13	Set-point adjustment	Setting range: fixed, variable Factory setting: fixed		31
3.2.14	Set-point SP	Actual Set-point		31
3.2.15	Set-point SP1	Set-point 1		31
3.2.16	Set-point SP2	Set-point 2		31
3.2.17	Set-point SP3	Set-point 3		31

## 15 Overview install settings

<b>Fct.</b>	<b>description</b>	<b>setting range</b>	<b>set value</b>	<b>P.</b>
4.0	main menu install			32
4.1	Sub menu Selection of Measuring inputs			32
4.1.1	Flow	setting range: 4 – 20mA input 1 pulse input 1, Modbus interface factory setting: pulse input 1		32
4.1.2	Temperature	setting range: No input 4 – 20mA input 1 4 – 20mA input 2 4 – 20mA input 3 Modbus interface factory setting: No input		32
4.1.3	Density	setting range: No input 4 – 20mA input 1 4 – 20mA input 2 4 – 20mA input 3 Modbus interface Pulse input 2 factory setting: No input		32
4.1.4	Pressure	setting range: No input 4 – 20mA input 1 4 – 20mA input 2 4 – 20mA input 3 Modbus interface factory setting: No input		32
4.2.0	sub menu measuring range			32
4.2.1	flow unit	setting range: kg, g, mg, l, ml, t, m <sup>3</sup> , factory setting: kg/h		32
4.2.2	decimal point	setting range: 0000 000.0 00.00 0.000 factory setting: 0000		32
4.2.3	end of scale value	setting range: 1 to 9999999 unit: from 4.2.1 factory setting: 100000		32
4.2.4	increment per pulse	setting range: 1 to 9999,999 factory setting: 10,000 The setting range is for the last digit		32
4.3	select input to linearisation	setting range: pulse input current input 1 current input 2		32

Overview install settings

<b>Fct.</b>	<b>description</b>	<b>setting range</b>	<b>set value</b>	<b>P.</b>
		current input 3 OFF (no input) factory setting: OFF		
4.4	sup menu pulse ration or frequency of pulse output			33
4.4.1	count pulses or frequency	setting range: factory setting:	count pulse, frequency count pulse	
4.4.2	increment per pulse of pulse output	setting range: factory setting:	1, 10, 100, 1000 1	
4.4.3	frequency at maximum flow	setting range: factory setting:	1.00 to 100.00Hz 100 Hz	
4.5	minimum preselection	setting range: factory setting:	1 to 9999999 1	33
4.6	maximum preselection	setting range: factory setting:	1 to 9999999 9999999	33
4.7	overrun quantity	setting range: factory setting:	0 to 9999999 AUS (0)	33
4.8.0	sub menu monitoring the flow			33
4.8.1	minimum permissible flow	setting range: factory setting:	0 to 9999999 0	33
4.8.2	maximum time for minimum flow after start	setting range: unit: factory setting:	0 to 9999999 s 0 = OFF.	33
4.8.3	maximum time for minimum flow during the batch	setting range: unit: factory setting:	0 to 9999999 s 0 = OFF.	33
4.8.4	allowed under batching quantity	setting range: The unit and the decimal point are shown factory setting:	0 to 9999999 0 = OFF.	34
4.9.0	sub menu special function purge			34
4.9.1	Filter time for enabling contact	setting range: unit: factory setting:	0,0 to 999,9 s 0,0 = OFF.	34
4.9.2	waiting time before batching	setting range: unit: factory setting:	0,0 to 999,9 s 0,0 = OFF	34
4.9.3	waiting time within the enabling contact must switch	setting range: unit: factory setting:	0,0 to 999,9 s 0,0 = OFF,	34

## Overview install settings

<b>Fct.</b>	<b>description</b>	<b>setting range</b>	<b>set value</b>	<b>P.</b>
		see description of function 4.9.0		
4.9.4	delay after enable contact for batching	setting range: 0 to 99.9 unit: s factory setting: 0 = OFF		34
4.10	suppressing the flow metering	setting range: continual at batch at start factory setting: continual		35
4.11.0	sub menu printer settings			35
4.11.1	printout	setting range: yes, no factory setting: no		35
4.11.2	printout delay	setting range: 0 to 999 unit: s factory setting: 0		35
4.11.3	stop conditions at printer error	setting range: no stop no new start factory setting: no stop		35
4.12	reset totaliser	setting range: do not delete, delete factory setting: delete		35
4.13	confirm end of batch	setting range: no, yes factory setting: no		35

## 16 Overview calibration and test settings

<b>Fct.</b>	<b>description</b>	<b>setting range</b>	<b>set value</b>	<b>P.</b>
5.0	main menu calibr. / test	Main menu calibration / test After pressing $\blacktriangleright$ for entering this menu, there is displayed a warning about 2 seconds in the display. After this you can enter with $\blacktriangleright$ the next level. For custody transfer units, changes are only possible with the custody transfer switch.		37
5.1.0	sub menu calibration current inputs and outputs	Sub menu calibration current inputs and output		37
5.1.1	calibration current input 1 4mA	Connect 4mA to current input 1. Enter the programming level by pressing $\blacktriangleright$ . The display flashed. To confirm the current press $\blacktriangleleft$ or [Set]. To calibrate the next selection press $\blacktriangleup$ or $\blacktriangledown$ .		37
5.1.2	calibration current input 1 20mA	Connect 20mA to current input 1. Enter the programming level by pressing $\blacktriangleright$ . The display flashed. To confirm the current press $\blacktriangleleft$ or [Set]. To calibrate the next selection press $\blacktriangleup$ or $\blacktriangledown$ .		37
5.1.3	calibration current input 2 4mA	Connect 4mA to current input 2. Enter the programming level by pressing $\blacktriangleright$ . The display flashed. To confirm the current press $\blacktriangleleft$ or [Set]. To calibrate the next selection press $\blacktriangleup$ or $\blacktriangledown$ .		37
5.1.4	calibration current input 2 20mA	Connect 20mA to current input 2. Enter the programming level by pressing $\blacktriangleright$ . The display flashed. To confirm the current press $\blacktriangleleft$ or [Set]. To calibrate the next selection press $\blacktriangleup$ or $\blacktriangledown$ .		37
5.1.5	calibration current input 3 4mA	Connect 4mA to current input 3. Enter the programming level by pressing $\blacktriangleright$ . The display flashed. To confirm the current press $\blacktriangleleft$ or [Set]. To calibrate the next selection press $\blacktriangleup$ or $\blacktriangledown$ .		37
5.1.6	Calibration current input 3 20mA	Connect 20mA to current input 3. Enter the programming level by pressing $\blacktriangleright$ . The display flashed. To confirm the current press $\blacktriangleleft$ or [Set]. To calibrate the next selection press $\blacktriangleup$ or $\blacktriangledown$ .		37
5.1.7	calibration current output 4mA	A multimeter is connect to the analogue output. Enter the programming level by pressing $\blacktriangleright$ . The display flashed. Set the current with $\blacktriangleup$ / $\blacktriangledown$ to 4mA. To confirm the current press $\blacktriangleleft$ or [Set]. To calibrate the next selection press $\blacktriangleup$ or $\blacktriangledown$ .		37
5.1.8	calibration current output 20mA	A multimeter is connect to the analogue output. Enter the programming level by pressing $\blacktriangleright$ . The display flashed. Set the current with $\blacktriangleup$ / $\blacktriangledown$ to 20mA. To confirm the current press $\blacktriangleleft$ or [Set]. To choose the next selection press $\blacktriangleup$ or $\blacktriangledown$ .		37

## Overview calibration and test settings

<b><i>Fct.</i></b>	<b><i>description</i></b>	<b><i>setting range</i></b>	<b><i>set value</i></b>	<b><i>P.</i></b>
5.2.0	sub menu test	sub menu 5.2.0 test		37
5.2.1	digital inputs	Every digital input is shown in the upper display as value.		37
5.2.2	digital outputs	By pressing the keys 1 to 5 the digital outputs 1 to 5 switches.		37
5.2.3	pulse input 1	The actual input frequency at pulse input 1 is shown.		37
5.2.4	Pulse input 2	The actual input frequency at pulse input 1 is shown.		37
5.2.5	Sensor break	A sensor break at pulse input 1 or 2 is shown.		37
5.2.6	current input 1	The actual current at analogue input 1 is shown.		37
5.2.7	current input 2	The actual current at analogue input 2 is shown.		37
5.2.8	current input 3	The actual current at analogue input 3 is shown.		37
5.2.9	current 4mA	There are 4mA at the current output.		37
5.2.10	current 12mA	There are 12mA at the current output.		37
5.2.11	current 20mA	There are 20mA at the current output.		37
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 ▼.		37
5.2.12	LCD test	To enter the test level press ➤. To quit this level press ◀.		37



## 17 Overview linearization

<b>Fct.</b>	<b>description</b>	<b>setting range</b>	<b>set value</b>	<b>P.</b>
6.0	main menu linearization			39
6.1	support point – 10%	setting range: -10% to +110% decimal point: 0.00 factory setting: -10%		39
6.2	support point – 5%	as 6.1 factory setting: -5%		39
6.3	support point 0%	as 6.1 factory setting: 0%		39
6.4	support point 5%	as 6.1 factory setting: 5%		39
6.5	support point 10%	as 6.1 factory setting: 10%		39
6.6	support point 15%	as 6.1 factory setting: 15%		39
6.7	support point 20%	as 6.1 factory setting: 20%		39
6.8	support point 25%	as 6.1 factory setting: 25%		39
6.9	support point 30%	as 6.1 factory setting: 30%		39
6.10	support point 35%	as 6.1 factory setting: 35%		39
6.11	support point 40%	as 6.1 factory setting: 40%		39
6.12	support point 45%	as 6.1 factory setting: 45%		39
6.13	support point 50%	as 6.1 factory setting: 50%		39
6.14	support point 55%	as 6.1 factory setting: 55%		39
6.15	support point 60%	as 6.1 factory setting: 60%		39
6.16	support point 65%	as 6.1 factory setting: 65%		39
6.17	support point 70%	as 6.1 factory setting: 70%		39
6.18	support point 75%	as 6.1 factory setting: 75%		39
6.19	support point 80%	as 6.1 factory setting: 80%		39

## Overview linearization

<b>Fct.</b>	<b>description</b>	<b>setting range</b>	<b>set value</b>	<b>P.</b>
6.20	support point 85%	as 6.1 factory setting: 85%		39
6.21	support point 90%	as 6.1 factory setting: 90%		39
6.22	support point 95%	as 6.1 factory setting: 95%		39
6.23	support point 100%	as 6.1 factory setting: 100%		39
6.24	support point 105%	as 6.1 factory setting: 105%		39
6.25	support point 110%	as 6.1 factory setting: 110%		39

## 18 Terminal assignment

<b>Terminal</b>	<b>Function</b>	<b>Remark</b>	<b>Page</b>
1	Pulse input 1 +		10
2	Pulse input 1 -		
3	4-20mA analogue input 1+		10
4	4-20mA analogue input 1-		
5	4-20mA analogue input 2+		10
6	4-20mA analogue input 2-		
7	4-20mA analogue input 3+		10
8	4-20mA analogue input 3-		
9	4-20mA analogue output +		11
10	4-20mA analogue output +		
11	Digital input 1 +		11
12	Digital input 2 +		11
13	Digital input 3 +		11
14	Digital input 1 – 3 -		
15	Optocoupler 1 +		11
16	Optocoupler 1 -		
17	Optocoupler 2 +		11
18	Optocoupler 2 -		
19	Interface RS485 1 B +		12
20	Interface RS485 1 GND		
21	Interface RS485 1 A -		
22	PE		
23	Power supply +		10
24	Power supply –		
25	Relay 1 N. O.		12
26	Relay 1 COM		
27	Relay 1 N. C.		
28	Relay 2 N. O.		12
29	Relay 2 COM		
30	Relay 2 N. C.		