Batch controller

Batch Counter BC 20

Programming- and installation manual

Software Version 1

Revision 1.01
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Construction year see type plate

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Safety information

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!

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.

Contents

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	24 V DC	24 V DC version
Batch Counter BC 20	230 V AC	100 – 240 V AC version

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 batching and terminates this when the preselected quantity is reached. A positioner (4 – 20 mA) and several contacts are controlled depending on the batching. Up to four control signals can be fed to the Batch Counter BC 20. A controller is available to control the flow rate or another physical quantity (option).

There is a choice of current (4 - 20 mA) or contact input. The contact input permits the connection of passive contacts or optical couplers. Selection of the input option is carried out via the software.

The input can be linearised by the software.

The Batch Counter BC 20 can be easily set to the different measuring ranges.

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

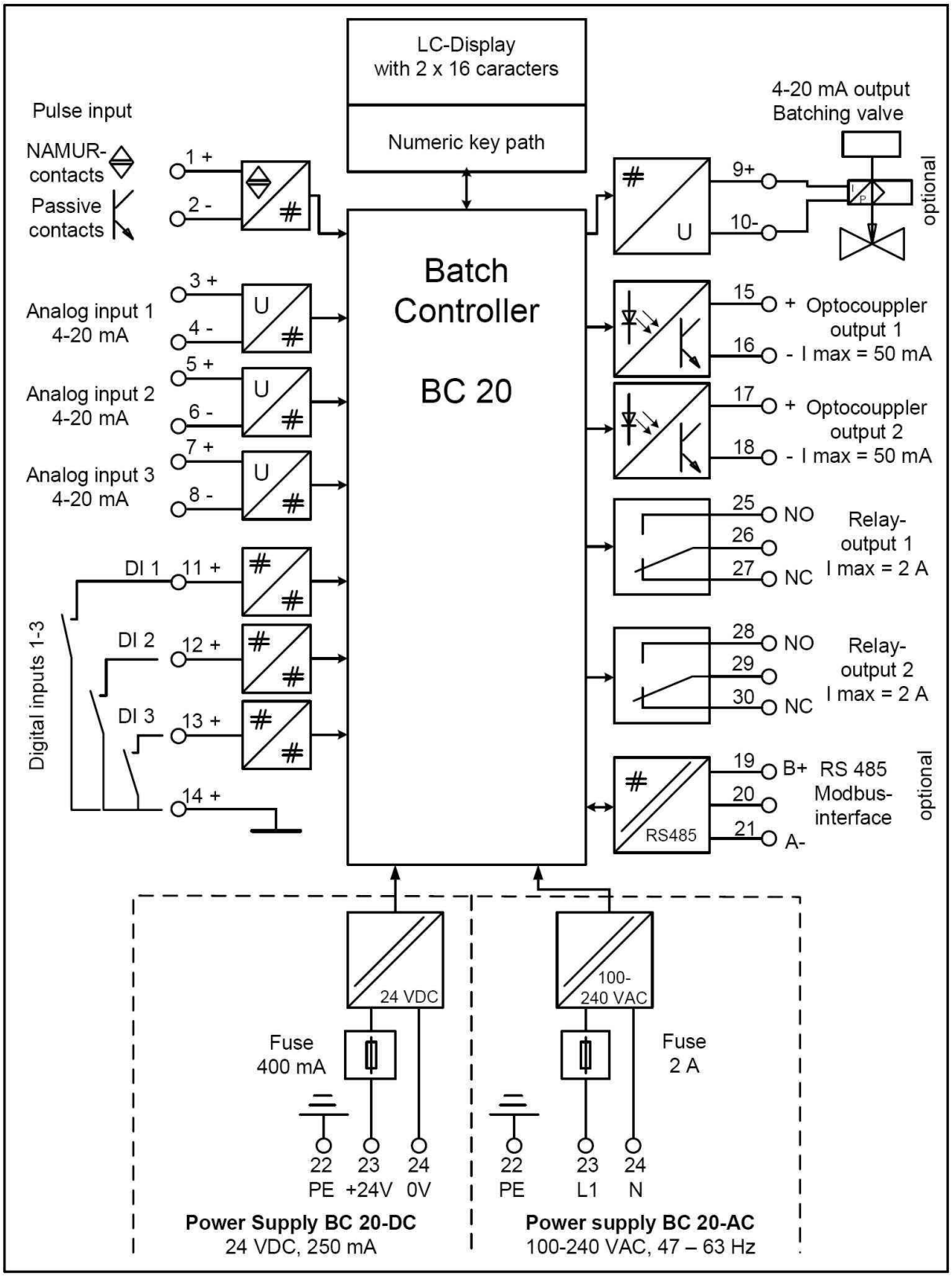
The (passive) digital outputs can be programmed to provide status signalling.

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

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 96 mm x 96 mm.

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

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°C to +60°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 24 V

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

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

2.5.3 Power supply 100 – 240 V AC

The power supply provides power for all the electronics, the analogue output and the digital inputs and outputs.

Terminal 22 (PE), Terminal 23 (AC), Terminal 24 (AC)	
Voltage U_N	AC 100 – 240 V / 47 – 63 Hz
Current I_{max}	250 mA
Fuse	T 2 A

2.5.4 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 8,5 V
Current I_{max}	3 mA

The pulse input supplies a current of approx. 3 mA. The maximum voltage that can be measured is approximately 8,2 V. Please note that terminals 2 must not be connected to ground.

2.5.5 Analogue inputs

The Batch Counter BC 20 has 3 analogue inputs (4 - 20 mA).

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}	25 mA

2.5.6 Analogue output (option)

The Batch Counter BC 20 has an analogue output (4 - 20 mA) 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 Ω.

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

2.5.7 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 µA / 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 6 V
Current I_{max}	0.2 mA

2.5.8 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 30 V
Current I_{max}	550 mA

2.5.9 Digital relais 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}	230 V
Current I_{max}	2 A

2.5.10 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 6 mm. The upper LCD indicates the preselected quantity. The lower LCD indicates the current quantity batched. The display can be changed to flow, totaliser or flow controller (only if this is active) using the [#] key. The contrast can be adjusted by pressing the [◅] and [▻] keys.

3.2 Keyboard

The Batch Counter BC 20 has 24 short-stroke keys.

In these Operating Instructions, keys are shown in square brackets. For instance, 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 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 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 20s

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 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.

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).

Lower Display	*Upper Display*	*Fault No.*	*Fault Type*
FRAM	Error in	1	Memory error
ERR S.-Break NK1 alternating with batched quantity (app. 1 sec intervals)	Preselected quantity	2	Namur contact 1 sensor break
ERR S.-Break mA1 altern. with batched quantity	Preselected quantity	4	Analogue input 1 sensor break
ERR S.-Break mA2 altern. with batched quantity	Preselected quantity	5	Analogue input 2 sensor break
ERR S.-Break mA3 altern. with batched quantity	Preselected quantity	6	Analogue input 3 sensor break
ERR M.-range mA1 altern. with batched quantity	Preselected quantity	7	Analogue input 1 measurement range violation
ERR M.-range mA2 altern. with batched quantity	Preselected quantity	8	Analogue input 2 measurement range violation
ERR M.-range mA3 altern. with batched quantity	Preselected quantity	9	Analogue input 3 measurement range violation
ERR MIN. FLOW altern. with batched quantity	Preselected quantity	10	Flowrate lower than permitted minimum
ERR sensor altern. with batched quantity	Preselected quantity	11	External fault message (e.g. mass measurement fault)
not enabled 1 altern. with batched quantity	Preselected quantity	12	1 not enabled

Lower Display	*Upper Display*	*Fault No.*	*Fault Type*
not enabled 2 altern. with batched quantity	Preselected quantity	13	2 not enabled
ERR Over batched altern. with batched quantity	Preselected quantity	14	Over-batching
ERR OFF altern. with batched quantity	Preselected quantity	15	OFF
ERR Printer 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
ERR product selection altern. with batched quantity	Preselected quantity	24	no product selected
extended area crc bad altern. with batched quantity	Preselected quantity	25	checksum error
		26	not used
External sensor Error altern. with batched quantity	Preselected quantity	27	not used
valve not open altern. with batched quantity	Preselected quantity	28	valve open contact not active
valve not closed 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 ➢ 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 ➢ key to exit all levels. The “Save” prompt appears. You can change from “Yes” to “No” using the ⮝⮟ keys. The setting is then confirmed by pressing the ➢ or Set key. All data are saved. The batch controller in 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.

Cold-Start	***Upper Display***	***Lower Display***
The LCD indicates Cold Start after switching on. Entries are made using the ➢ key. The upper display flashes. You can change between the levels with the ⮝⮟ arrow keys and confirm with the ➢ 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.

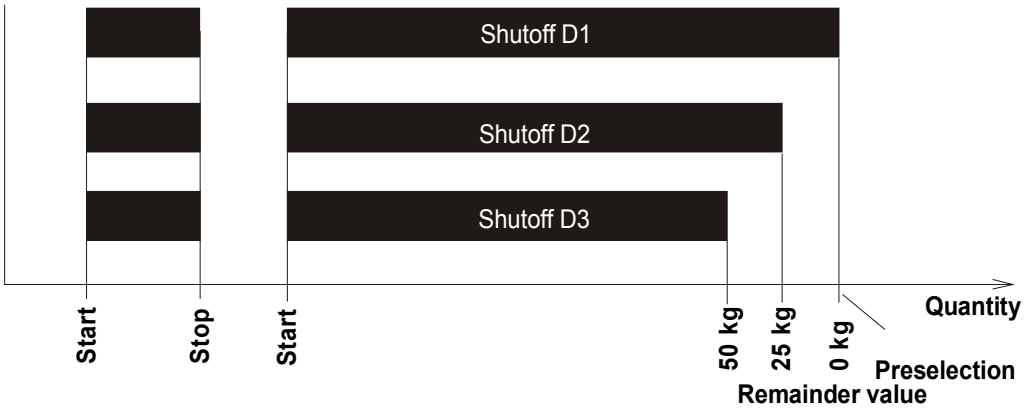
5.1 Setting the digital shut-off steps

There are three digital outputs for switching a 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 shutoff steps is carried out in function 1.1.x of the Parameter Level.

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



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

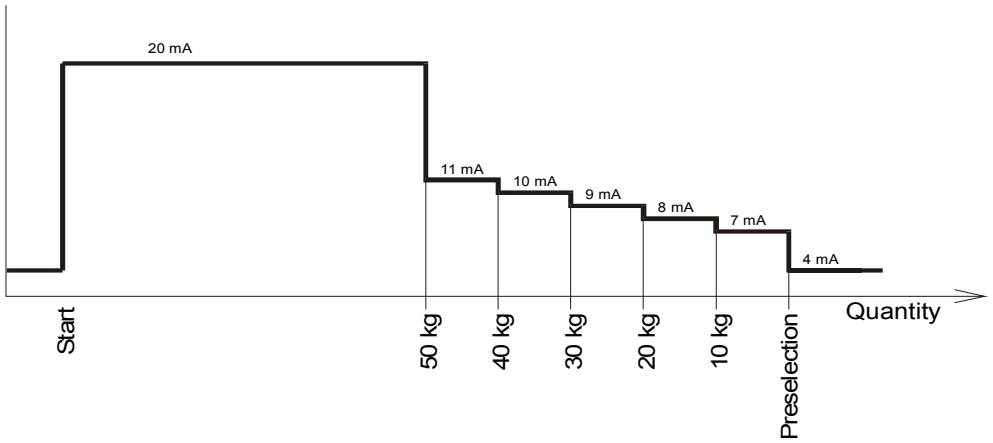
The digital shutoff steps are assigned to the digital outputs in function 2.3.x of the Structure Level.

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

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 4 mA 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 setpoint 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.

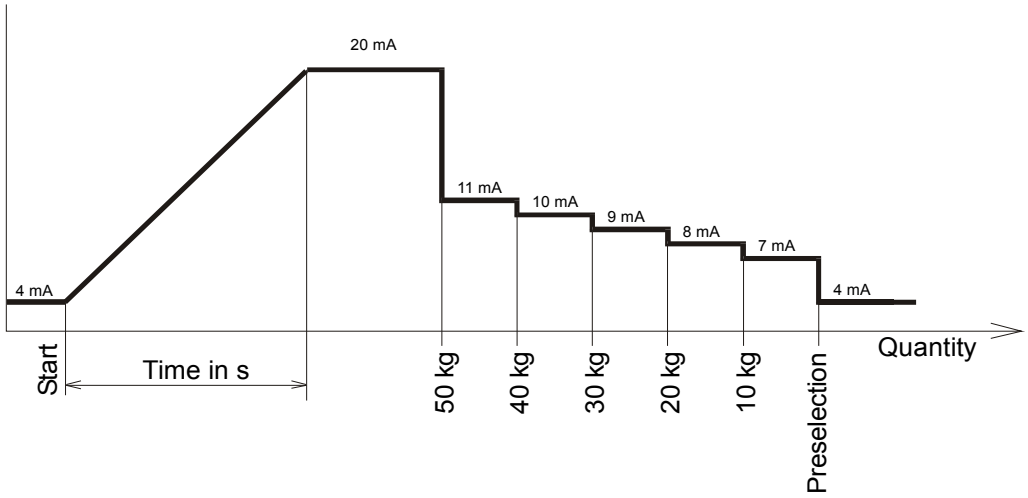


If batching is stopped using Stop, the output supplies 4 mA immediately. If OFF is operated, the output supplies no current.

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

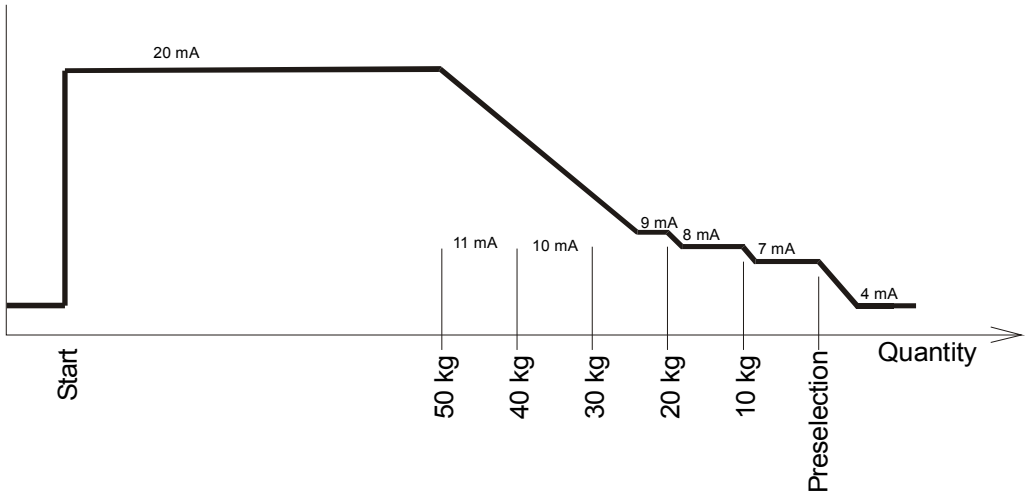
To prevent pressure hammers in the pipework, the current output to the valve is ramped up at the batch start from 4 to 20 mA. The time for the ramp can be programmed in function 1.3. A value up to 9999 seconds can be specified.



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 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 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 overdosage.



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

5.7 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, a time indicating how long the overfill 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 mA sensor break can be monitored. The current inputs used are monitored for currents less than 3.2 mA 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, mA measuring range violation can be monitored. The current inputs used 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 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 setpoints. 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 the overrun value changes because the product properties or facility conditions changes (e. g. pump pressure), you can activate the self optimising overrun compensation in function 1.10.0. Only batches, which are done without stops 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 underbatch must be set.

5.12.1 End value for correction

In function 1.10.1 you set the factor for over-batch compensation. The input value is in percent.

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.

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.

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.

Example:

In function 1.10.4 (flow corr.) 10 kg is set. At the last batch the flow rate was 50000 kg/h (measuring range 100000 kg/h). At the actual 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.

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 flowmeter 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 totaliser

If the digital input is set to “Tot. reset”, the totaliser 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 2. 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 positioner 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 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 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 shutoff point 1
Digital output 2 (relay 2)	Digital shutoff point 2
Digital output 3 (optocoupler 1)	Digital shutoff point 3
Digital output 4 (optocoupler 2)	Batching indication

6.5.1 Assigning shutoff points to the digital outputs

The shutoff points entered in functions 1.1.1 to 1.1.3 can be assigned to the digital outputs. In the factory setting, the three shutoff 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 – Stop bits: 1 – Parity: Even	– Data bits: 7 – Stop bits: 1 – 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, setpoint, prevents the controller setpoint 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 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 associated LED lights. 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 preselections, the keypad must be locked. The Set, Start, Stop, Reset and function keys can then be enabled individually (see description in chapter 6.9).

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 20 mA. 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 shutoff 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. 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- 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 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 a error massage 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 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 actual 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 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 shutoff steps. These are shown as a setpoint when the controller is displayed. If batching is interrupted, the last manipulated variable is saved. If no startup ramp is set, the setpoint is reached quickly.

The flow controller setpoint 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 shutoff 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, 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 4 mA. Function 3.2.5 sets the end of the measuring range i.e. the value corresponding to 20 mA. 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 Setpoint start SPS

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

7.3.7 Setpoint end SPE

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

7.3.8 Set setpoint enable

Use function 3.1.9 or 3.1.13 to enable the changing of setpoint.

7.3.9 Setpoints

Use function 3.1.10 to 3.1.13 or 3.2.14 to 3.2.17 for setting the setpoints. The first setpoint is the actual setpoint, which is active either selected. The following three setpoints are fixed setpoints, 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 setpoint 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. Additional the measuring values could be transmit by 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 type sensor outputs are also connected to the pulse input. 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, m³ and “no unit”.

8.2.2 Decimal places

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

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

8.3 Linearisation of an input signal

You can linearise an input of the Batch Counter BC 20 in the case of a non-linear sensor. The input to be linearised is selected in function 4.3. The linearisation 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 150 Hz.

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 cutoff 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 flowmeter 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 empting the pipe system

A rinsing function is implemented in function 4.9. his 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 shutoff 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 20 mA for as long as the contact is operated. The digital shutoff 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 shutoff 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 shutoff steps D2 and D1 switch. The positioner output ramps up. Batching indication is active. The Batch Counter BC 20 meters the flow.

If digital shutoff 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, shutoff 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 shutoff 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 positioner 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 shutoff 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 positioner 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. A 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 shutoff 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 positioner 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 totaliser

To reset the totaliser, 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 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 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 .

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 4 mA. 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 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.

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 4 mA 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.

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 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 Linearisation 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 linearised.

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 5.6 mA (corresponding to 10%), the sensor does not have a flowrate of 10000 kg/h (10 %) as expected but only 9000 kg/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 5.6 mA (10%) is evaluated as a value of 9000 kg/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, setpoints or products

Three fixed preselection values, three setpoints 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 flowrate 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.

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

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 et sqq..

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 systems can be build 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

Fct.	*description*	*setting range*	*set value*	*P.*
1.0	parameter main menu			18
1.1.0	sub menu digital shutoff			18
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		18
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		18
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: 0		18
1.2.0	sub menu analogue shutoff			19
1.2.1	shutoff	setting range: current flow factory setting: current		19
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		19
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		19
1.2.4	analogue shutoff 2	see 1.2.1 factory setting: 40		19
1.2.5	analogue out 2	see 1.2.2 factory setting: 10 mA or 4000		19
1.2.6	analogue shutoff 3	see 1.2.1 factory setting: 30		19
1.2.7	analogue out 3	see 1.2.2 factory setting: 9 mA or 3000		19

Fct.	*description*	*setting range*	*set value*	*P.*
1.2.8	analogue shutoff 4	see 1.2.1 factory setting: 20		19
1.2.9	analogue out 4	see 1.2.2 factory setting: 8 mA or 2000		19
1.2.10	analogue shutoff 5	see 1.2.1 factory setting: 10		19
1.2.11	analogue out 5	see 1.2.2 factory setting: 7 mA 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			20
1.6.1	batch-indication	unit: no setting range: on, pulses, (after ending batch a pulse about 2s is set) factory setting: ON		20
1.6.2	pulse length	unit: s setting range: 0 to 99.9s factory setting: 2s		20
1.7.0	sub menu overfill quantity			21
1.7.1	Overfill 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 overfill quantity	only displayed if 1.7.1 < 9999999 unit:: s setting range: 0 to 9999, (0 displayed as continual) factory setting: continual		21

Fct.	*description*	*setting range*	*set value*	*P.*
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
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 setpoints see controller settings)		21

Fct.	*description*	*setting range*	*set value*	*P.*
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
1.11	checksum part custody transfer			22
1.12	checksum part parameter settings			22

13 Overview structure level

Fct.	*description*	*setting range*	*set value*	*P.*
2.0	structure main menu			23
2.1	Select language	unit: no setting range: Deutsch, English, Französisch, Spanisch, Italienisch factory setting: Deutsch		23
2.2.0	sub menu settings digital inputs			23
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 not with function two step valve		23
2.2.2	direction of action digital input 1	setting range: normally open, normally closed factory setting: normally open		23
2.2.3	type of action digital input 1	setting range: level, flank factory setting: level		23
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 not with function two step valve		23
2.2.5	direction of action digital input 2	setting range: normally open, normally closed factory setting: normally open		23
2.2.6	type of action digital input 2	setting range: level, flank factory setting: level		23

Fct.	*description*	*setting range*	*set value*	*P.*
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		23
2.2.8	direction of action digital input 3	setting range: normally open, normally closed factory setting: normally open		23
2.2.9	type of action digital input 3	setting range: level, flank factory setting: level		23
2.3.0	sub menu settings digital outputs			25
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		25
2.3.2	direction of action relay 1	setting range: normally open, normally closed factory setting: normally open		25
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		25
2.3.4	direction of action relay 2	setting range: normally open, normally closed factory setting: normally open		25
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		25
2.3.6	direction of action optocoupler 3	setting range: normally open, normally closed factory setting: normally open		25

Fct.	*description*	*setting range*	*set value*	*P.*
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		25
2.3.8	direction of action optocoupler 4	setting range: normally open, normally closed factory setting: normally open		25
2.4.0	sub menu interface settings			26
2.4.1	function	setting range: read / write, only read factory setting: read / write		26
2.4.2	Protocol 1	setting range: MODBUS RTU, MODBUS ASCII factory setting: RTU		26
2.4.3	Address 1	setting range: 1 to 255 factory setting: 1		26
2.4.4	Baud rate 1	setting range: 2400, 4800, 9600, 19200, 38400, 76800, 115,200 factory setting: 9600		26
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 setpoint 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			27
2.6.1	key operation disable / enable	setting range: enable, locked factory setting: enable		27

Fct.	*description*	*setting range*	*set value*	*P.*
2.6.2	key operation RESET enable	setting range: RESET enable, RESET disable factory setting: disable		27
2.6.3	key operation SET enable	setting range: SET enable, SET disable factory setting: disable		27
2.6.4	key operation START enable	setting range: START enable, START disable factory setting: disable		27
2.6.5	key operation STOP enable	setting range: STOP enable, STOP disable factory setting: disable		27
2.6.6	key operation function keys enable	setting range: F1-F3 enable, F1-F3 disable factory setting: disable		27
2.6.7	key operation numeric keys enable	setting range: 0 .. 9 enable, 0 .. 9 disable factory setting: 0 .. 9 disable		27
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		27
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

Fct.	*description*	*setting range*	*set value*	*P.*
3.0	Controller main menu			29
3.1.0	Flow controller			29
3.1.1	Controller type	Setting range: no function flow controller tracking flow controller Factory setting: No function		29
3.1.2	Proportional coefficient Kp	Setting range: -100.0 to 100.0 Unit: none Decimal point: 0,0 Factory setting: 1.0		30
3.1.3	P controller operating point OP	Setting range: -10% to 110% Unit: none Decimal point: 0.0 Factory setting: 0		30
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		30
3.1.5	Integral action time	Setting range: 1 to 4999 Unit: s Decimal point: 0 Factory setting: 5000 corresponding to off		30
3.1.6	Derivative action time Tv	Setting range: 0 to 1000 Unit: s Decimal point: 0 Factory setting: 0		30
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		30
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%		30
3.1.9	Setpoint adjustment	Setting range: fixed, variable Factory setting: fixed		30
3.1.10	Setpoint SP	Actual Setpoint		30
3.1.11	Setpoint SP1	Setpoint 1		30
3.1.12	Setpoint SP2	Setpoint 2		30
3.1.13	Setpoint SP3	Setpoint 3		30

Fct.	*description*	*setting range*	*set value*	*P.*
3.2.0	Limiting controller			29
3.2.1	Controller type	Setting range: no function limiting controller tracking limiting controller Factory setting: No function		29
3.2.2	Physical unit controller	Setting range: no physical unit, %, °C, bar, pH Factory setting %		29
3.2.3	Decimal point (not applicable for flow controllers)	Setting range: 0000 000.0 00.00 0.000 Factory setting: 0000		29
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%		29
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%		29
3.2.6	Proportional coefficient Kp	Setting range: -100.0 to 100.0 Unit: none Decimal point: 0,0 Factory setting: 1.0		30
3.2.7	P controller operating point OP	Setting range: -10% to 110% Unit: none Decimal point: 0.0 Factory setting: 0		30
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		30
3.2.9	Integral action time	Setting range: 1 to 4999 Unit: s Decimal point: 0 Factory setting: 5000 corresponding to off		30
3.2.10	Derivative action time Tv	Setting range: 0 to 1000 Unit: s Decimal point: 0 Factory setting: 0		30
3.2.11	Setpoint start SPS	Setting range: -9999 to 9999999 Unit: from 3.2.1 or 4.2.0 Decimal point: see above Factory setting: 0		30

Fct.	*description*	*setting range*	*set value*	*P.*
3.2.12	Setpoint end SPE	Setting range: -9999 to 9999999 Unit: from 3.2.1 or 4.2.0 Decimal point: see above Factory setting: 100%		30
3.2.13	Setpoint adjustment	Setting range: fixed, variable Factory setting: fixed		30
3.2.14	Setpoint SP	Actual Setpoint		30
3.2.15	Setpoint SP1	Setpoint 1		30
3.2.16	Setpoint SP2	Setpoint 2		30
3.2.17	Setpoint SP3	Setpoint 3		30

15 Overview install settings

Fct.	*description*	*setting range*	*set value*	*P.*
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, m³, no unit 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		32

Fct.	*description*	*setting range*	*set value*	*P.*
		The setting range is for the last digit		
4.3	select input to linearisation	setting range: pulse input current input 1 current input 2 current input 3 OFF (no input) factory setting: OFF		33
4.4	sup menu pulse ration or frequency of pulse output			33
4.4.1	count pulses or frequncy	setting range: count pulse, frequency factory setting: count pulse		
4.4.2	increment per pulse of pulse output	setting range: 1, 10, 100, 1000 factory setting: 1		
4.4.3	frequency at maximum flow	setting range: 1.00 to 100.00Hz factory setting: 100 Hz		
4.5	minimum preselection	setting range: 1 to 9999999 factory setting: 1		33
4.6	maximum preselection	setting range: 1 to 9999999 factory setting: 9999999		33
4.7	overrun quantity	setting range: 0 to 9999999 factory setting: AUS (0)		33
4.8.0	sub menu monitoring the flow			34
4.8.1	minimum permissible flow	setting range: 0 to 9999999 factory setting: 0		34
4.8.2	maximum time for minimum flow after start	setting range: 0 to 9999999 unit: s factory setting: 0 = OFF.		34
4.8.3	maximum time for minimum flow during the batch	setting range: 0 to 9999999 unit: s factory setting: 0 = OFF.		34
4.8.4	allowed under batching quantity	setting range: 0 to 9999999 The unit and the decimal point are shown factory setting: 0 = OFF.		34
4.9.0	sub menu special function purge			34
4.9.1	Filter time for enabling contact	setting range: 0,0 to 999,9 unit: s factory setting: 0,0 = OFF.		34

Fct.	*description*	*setting range*	*set value*	*P.*
4.9.2	waiting time before batching	setting range: 0,0 to 999,9 unit: s factory setting: 0,0 = OFF		34
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		34
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		36
4.11.0	sub menu printer settings			36
4.11.1	printout	setting range: yes, no factory setting: no		36
4.11.2	printout delay	setting range: 0 to 999 unit: s factory setting: 0		36
4.11.3	stop conditions at printer error	setting range: no stop no new start factory setting: no stop		36
4.12	reset totaliser	setting range: do not delete, delete factory setting: delete		36
4.13	confirm end of batch	setting range: no, yes factory setting: no		36

16 Overview calibration and test settings

Fct.	*description*	*setting range*	*set value*	*P.*
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.		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 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⮟.		37
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⮟.		37
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⮟.		37
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⮟.		37
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⮟.		37
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⮟.		37
5.1.7	calibration current output 4 mA	A multimeter is connect to the anlog 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⮟.		37

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⮟.		37
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 4 mA	There are 4 mA at the current output.		37
5.2.10	current 12 mA	There are 12 mA at the current output.		37
5.2.11	current 20 mA	There are 20 mA 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 linearisation

Fct.	*description*	*setting range*	*set value*	*P.*
6.0	main menu linearisation			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

Fct.	*description*	*setting range*	*set value*	*P.*
6.19	support point 80%	as 6.1 factory setting: 80%		39
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

Terminal	*Function*	*Remark*	*Page*
1	Pulse input 1 +		10
2	Pulse input 1 -		
3	4/20 mA analoge input 1+		11
4	4/20 mA analoge input 1-		
5	4/20 mA analoge input 2+		11
6	4/20 mA analoge input 2-		
7	4/20 mA analoge input 3+		11
8	4/20 mA analoge input 3-		
9	4/20 mA analoge output +		11
10	4/20 mA analoge 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 + or AC	see backplane description	10
24	Power supply – or AC	see backplane description	
25	Relay 1 N. O.		12
26	Relay 1 COM		
27	Relay 1 N. C.		
28	Relay 1 N. O.		12
29	Relay 1 COM		
30	Relay 1 N. C.		

19 Declaration of Conformity

Konformitätserklärung
Declaration of Conformity

IBS BatchControl GmbH
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erklärt in alleiniger Verantwortung, dass das Produkt
assumes sole responsibiliy in stating that the product

Batch Counter BC 20

mit den Vorschriften folgender europäischer Richtlinie übereinstimmt:
conform with the prescription of following european directives:

EMV-Richtlinie / *EMC-Directive* 2004/108/EG

Die Übereinstimmung wird nachgewiesen durch die Einhaltung
folgender Normen oder normativer Dokumente:
The conformity are verified under observance
of following standards or standard documents:

IEC 61000-4-2:1995 + A1:1998 + A2:2001
IEC 61000-4-3:2002 + A1:2002
IEC 61000-4-4:2004
IEC 61000-4-5:1995 + A1:2000
IEC 61000-4-6:1996 + A1:2000

EN 55011:1998 + A1:1999 + A2:2002

Kerpen, 17.02.2010

Entwicklung / Development
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