User's manual

Dosing- Controller

DC155

Manual DC155 Rev. C05

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Zertifiziertes Qualitäts-Managementsystem nach DIN EN ISO 9001

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1 Operation instruction for Explosion protected control panels

1.1 Application and Standards

This instruction manual applies to explosion protected control panels of type of protection types below. This apparatus is only to be used as defined and meets requirements of EN 60 079 particularly EN60 079-14 "electrical apparatus for potentiality explosive atmospheres". It can be used in hazardous locations which are hazardous due to gases and vapours according to the explosion group and temperature class as stipulated on the type label. When installing and operating the explosion protected distribution and control panels the respective nationally valid regulations and requirements are to be observed.

1.2 General Instructions

The control panel has to have a back-up fuse as stipulated. The mains connection must have a sufficient short circuit current to ensure safe breaking of the fuse. To achieve an impeccable and safety device operation, please take care for adept transportation, storage and mounting, as well as accurate service and maintenance. Operation of this device should only be implemented by authorised persons and in strict accordance with local safety standards. The electrical data on the type label and if applicable, the "special conditions" of the test certificate PTB 98 ATEX 2071 are to be observed.

For outdoor installation it is recommended to protect the explosion protected distribution and control panel against direct climatic influence, e.g. with a protective roof. The maximum ambient temperature is 40°C, if not stipulated otherwise.

1.3 Before using the device

All connections and connection points must be checked for correct cabling. Operation with damaged cables is not permitted.

1.4 Intrinsically Safe Circuits

Erection instructions in the testing certificates of intrinsically safe apparatus are to be observed. The electrical safety values stipulated on the type label must not be exceeded in the intrinsically safe circuit. When interconnecting intrinsically safe circuits it is to be tested, whether a voltage and/or current addition occurs. The intrinsic safety of interconnected circuits is to be ensured. (EN 60079-14, section 12)

Safety Measures: to read and to comply

Work on electrical installations and apparatus in operation is generally forbidden in hazardous locations, with the exception of intrinsically safe circuits. In special cases work can be done on non-intrinsically safe circuits, on the condition that during the duration of such work no explosive atmosphere exists. Only explosion protected certified measuring instruments may be used to ensure that the apparatus is voltage-free. Grounding and short circuiting may only be carried out, if there is no explosion hazard at the grounding or short circuit connection.

Safety aspects

A batch control system built exclusively with the DC155 represents a control system in category 1 according EN954-1. If a higher safety is required, it is necessary to install independent working safety facilities.

2 Dosing controller DC155

2.1 Short description

The dosing controller DC155 is an all-purpose dosing control device to manage batch controlling of any arbitrary liquids or solid products inside the hazardous area. Advantages of this device are:

- simply handling, an orderly key pad containing big (22 x 22 mm) keys,
- a large graphic display and a
- flexible wide functionality.

The DC155 can manage simple as well as complex dosing applications inside hazardous areas, without an extensive wiring to a distributed control system. See advantages below:

Several Input sources	It is possible to connect any common transmitter: NAMUR or 24V digital inputs are the standard input terminals, 4 up to 20 mA input as an option.
Temperature compensation	The additional Pt100- input terminal allows a temperature compensation, if the space expansion factor γ of the dosing product is known and not negligible.
Intelligent dosing features	The intelligent dosing program of the DC155 prevents shocks on the pipe system using a continuous raise and fall ramp by the 4 up to 20 mA – proportional valve output, as well as using a pair of fine and coarse valve.
Intelligent batch monitoring	Furthermore, the DC155 includes a trouble alarm system to report flow disturbances or sensor failures. The flow monitoring can be delayed to prevent wrong alarm during the start and finish period of the batch.
Simply remote control	The DC155 has several digital control inputs to realise a simple remote control with the basic functions like “START, STOP and RESET”.
Powerful analog output	The analog output can manage a load of 600 Ω directly.
PID-controlled Dosing process	Some applications need a regulation of the flow during the batch process. The option “regulated analog output” can manage these applications with an internal PID- controller.
Data safety	The data is stored on an onboard non-volatile memory, if the power supply fails. The DC155 continues at the restored state, when the mains is back.

2.2 Basics

2.2.1 Units for preset, sum counter and flow

The first step to configure the DC155 is to define the physical unit for preset, sum counter and flow. Therefore, sufficient unit symbols are implemented into the DC155 (e.g. gram (g), kilogram (kg), tons (t), liter (l) etc.) To define the flow several time units are available.

2.2.2 Impulse value, analog input scaling

The DC155 gets its information about the present flow via impulse or an analog signal from a flow sensor. If it is an impulse signal, you have to define the value of one impulse to get the right amount of flow. If the sensor signal is an analog signal, you have to define the maximum flow (e.g. 1000 kg/min) for 20 mA. The Impulse value and analog input scaling are located in the structure menu in the input category.

2.3 Dosing applications

Generally, a batch control system content a flow measuring, one or two valves and the batch controller.

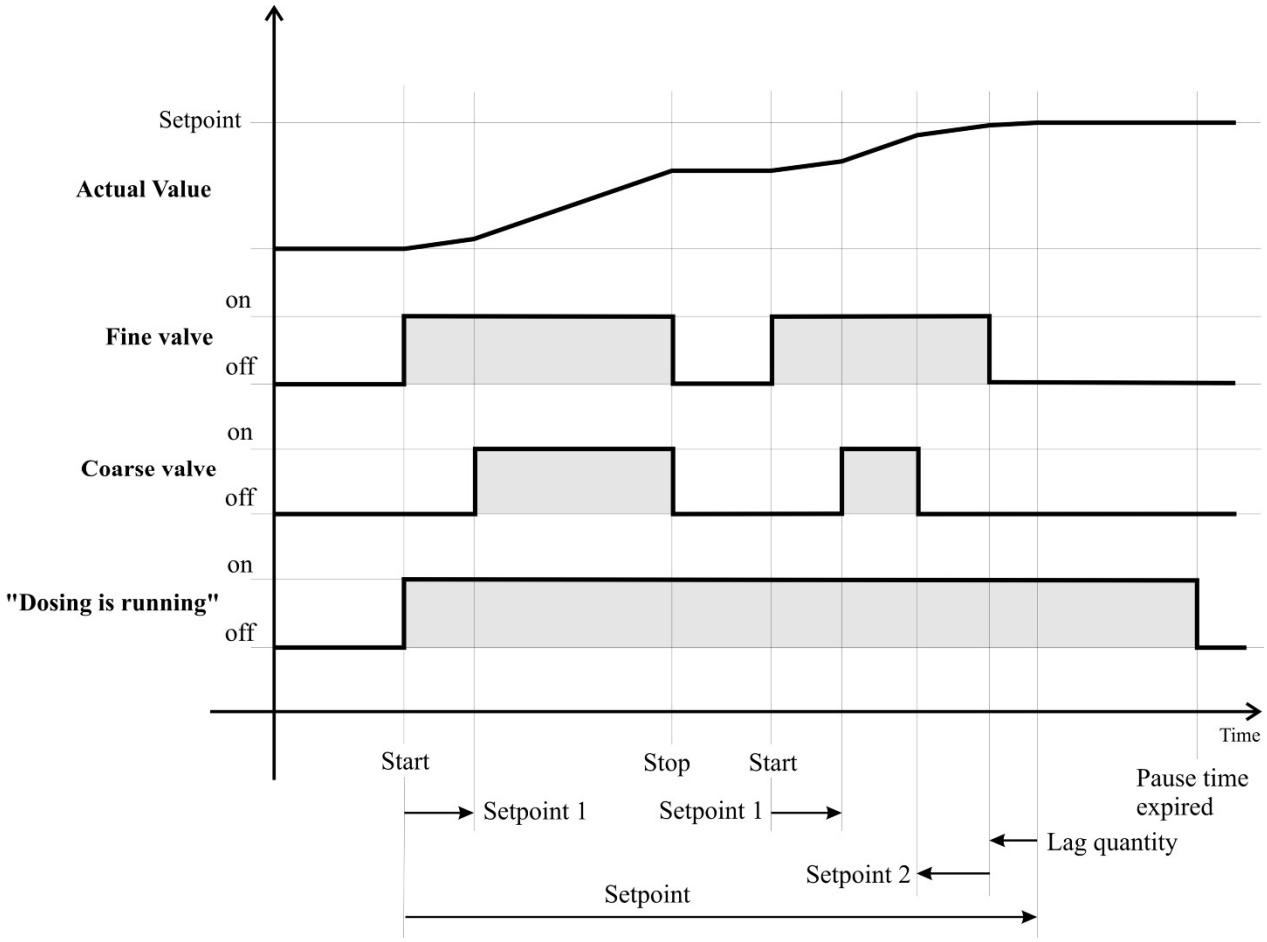
The flow sensor measures the quantity of the product per time, which flows into the target bowl and sends this information to the batch controller. The controller receives the flow information, integrates the flow signal to a sum, compares the sum continuously with the preset value and controls the connected actors, which themselves control the flow into the target bowl.

The DC155 **supports many sensor signals**: 24V active/passive, NAMUR, 4...20 mA (analog current signal) and several actors. The following chapters show application examples sorted by the kind of actors.

2.3.1 Dosing control using digital solenoid valves

The most common dosing application is by using coarse and fine valves. After starting the batch process, the fine valve opens first. When the quantity given by setpoint 1 has been reached, the coarse valve opens and a big flow starts. Before the setpoint is reached (at setpoint value minus setpoint 2 value) the coarse valve shuts and the remaining quantity will be added very exactly.

Additionally, it is possible to configure a lag quantity. This is the run-on quantity after both valves have been closed.



Besides it is possible to define a **maximum setpoint value**, to allow only equal or smaller setpoints to be set.

The DC155 has **three free programmable digital outputs**. In the example above two of them must be reserved for valve control.

The polarity of each output can be configured as "normally open" or "normally closed".

The following figure shows any possible function of a digital output.

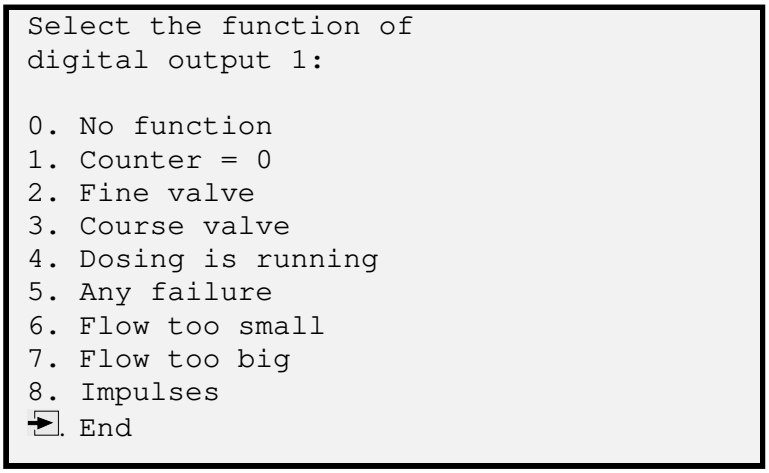


Figure 1 Digital output functions

Function	Description
1. Counter = 0	The digital output is active, if the actual value is equal to zero. Otherwise the digital output is inactive.
2. Fine valve	Control output for a valve with a fine cross section. Also, the control output for a single valve.
3. Coarse valve	Control output for a valve with a wide cross section.
4. Dosing is running	The output is active as long as the dosing is running and the pause time is not expired. Otherwise the digital output is inactive. See also the time diagram above.
5. Any failure	The output is active as long as any failure (broken wire, flow to big, etc) is occurring. The output remains active until the failure has been fixed and has been acknowledged by pressing the reset key. Otherwise the digital output is inactive.
6. Flow to small	The output is active as long as the flow rate is too small and the failure is not acknowledged. Otherwise the digital output is inactive.
7. Flow too big	The output is active as long as the flow rate is too big and the failure is not acknowledged. Otherwise the digital output is inactive.
8. Impulses (max. 125 Hz)	When the actual value is incremented during the dosing process, a pulse is output for each increment of the smallest displayed decimal place.

Table 1: Function list of the digital outputs

The total quantity of all batch processes is added and stored by a **sum counter**. The sum counter is shown permanently at the bottom of the display. The sum counter can be reset by the user manually. It provides information about the dosed product over several batches or over a longer period of time.

Furthermore, it is possible to realise a **very simple batch control using only one digital solenoid valve.** In this case you have to configure the single valve as a **fine valve**. Consider, the parameters like setpoint 1 and setpoint 2 (but not the lag quantity!) lose their functions.

2.3.2 Dosing control with a proportional (analog) valve

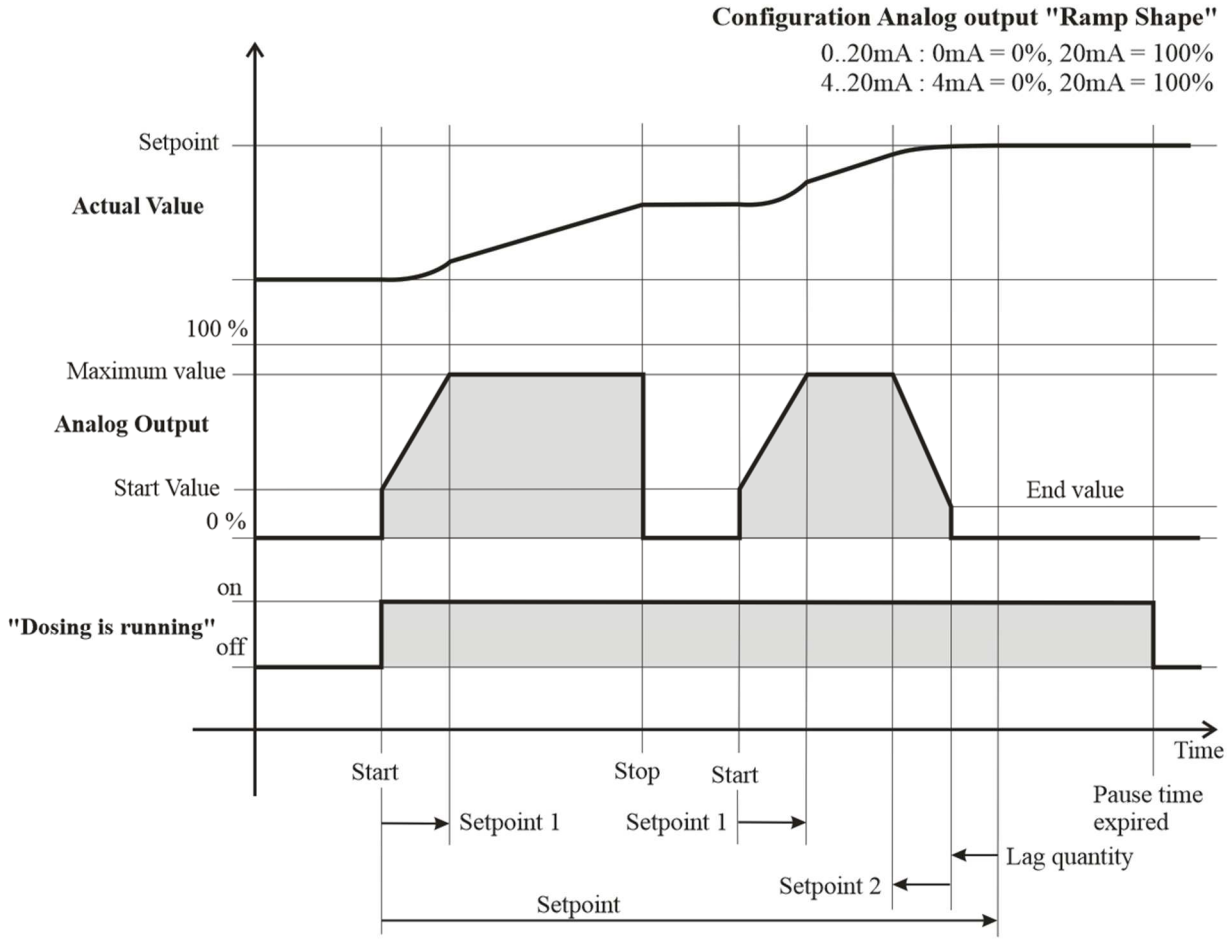
The DC155 can optionally get supplied with a **4...20 mA analog output** to control a proportional solenoid valve. In this case, the analog output has to be configured as **"Ramp shape"**.

It is possible to set the maximum value of the analog output, the starting value and the ending value by using the following three parameters (percentage values): **"Limit for analog output", "Start value of the rising ramp"** and **"End value of the falling ramp".**

The analog output can get configured as:
0...20 mA : 0% = 0mA, 100% = 20mA
4...20 mA : 0% = 4mA, 100% = 20mA

The dosing quantity is set with the parameter "setpoint". The rising ramp is determined by the parameter "setpoint 1", the falling ramp by "setpoint 2". The ramp is determined by the filling quantity, not by the time. This means that the analog output is at its maximum after the quantity "Setpoint 1" has been filled and not after a given time.

The meaning of all these parameters is demonstrated with the following diagram.



Any **alternative functions for the analog output** are shown below:

```
Settings for analog output:

0. No function
1. Flow prop. signal
2. Ramp shape
3. Flow feedback control
4. Counter prop. signal
5. Counter (max) prop. signal
6. Setpoint prop. signal
↵. End
```

Figure 2 Functions of the analog output

Function	Description (definition: output in normal open connection)
1. Flow prop. signal	Ratio: "actual flow / max. flow" The value of "max flow" is set in the input menu.
2. Ramp shape	Control of a proportional (analog) solenoid valve, see working diagram above
3. Flow feedback control	Output of PID flow controller (generate a configurable flow rate)
4. Counter prop. signal	Ratio "actual counter value" to "setpoint"
5. Counter (max) prop. signal	Ratio "actual counter value" to "max. setpoint" The value "max. setpoint" is set in the setpoints-menu.
6. Setpoint prop. signal	Ratio "setpoint" to "max. setpoint"

2.3.3 Flow controlled Dosing (Option PID)

Optionally, the DC155 can have an internal PID flow controller, so that the dosing can be carried out with an adjustable flow rate. The PID parameters Kp, Ki, Kd and the flow setpoint can be configured in the parameter menu.

In the mode "Flow Feedback Control", it is possible to define a ramp similar to the uncontrolled output when using the function "Ramp shape". There is one important difference: The ramp defined in the mode "Ramp shape" represents the analog output value directly (100% = 20mA). The ramp in the mode "Flow Feedback Control" refers to the PID flow setpoint. The flow setpoint represents 100%. For example, it is possible to start the PID controller with 20% of the flow setpoint and ramp up to 100% slowly.

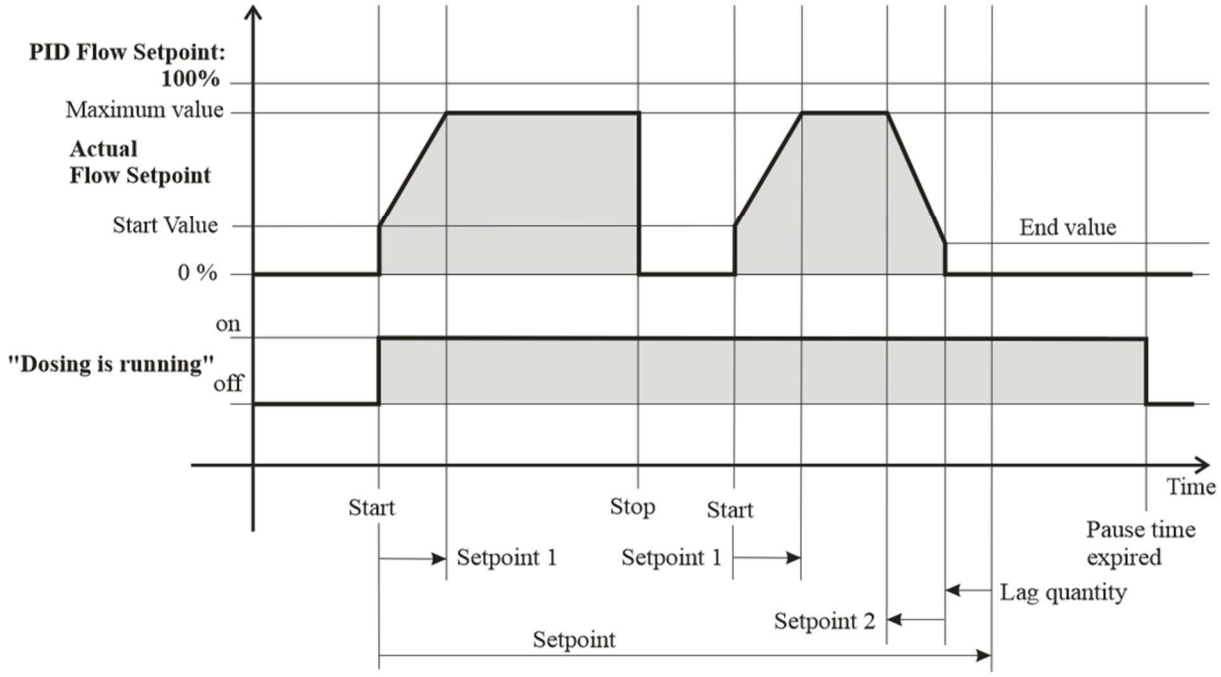
$Q_{setpoint}$ = Flow Setpoint
Q_{actual} = Actual Flow at the time k

The sampling rate of the digital PID controller is 20ms.

Normalized error value: $e_k = \frac{Q_{setpoint} - Q_{actual}}{Q_{setpoint}}$

Control Signal: $y_k = K_p \times e_k + K_i \times \sum_{m=0}^{m=k} e_m + K_d \times (e_k - e_{k-1})$

The PID parameters Kp, Ki and Kd are percentage values.
The control signal y is a percentage value, too. The value 100% corresponds to 20mA. If the analog output range was configured to 4...20mA, 0% corresponds to the value 4mA. With an analog output range of 0...20mA, 0% corresponds to the value 0mA.



2.3.4 Batch control with absolute level signal (requires 4...20mA analog input option)

This kind of batch control does not work with a flow signal, but with an absolute level signal. You can either measure the level in the container that is being filled (level rises during dosing) or the level of the container from which the material to be dosed is removed (level falls during dosing). The valves are controlled as in the other operating modes. Flow monitoring or displaying is not possible in this mode.

2.3.5 Forward - backward Impulse counter (requires 2 Impulse inputs option)

Some kinds of flow sensors (e. g. windmill-type anemometer) recognises back flows. These have two sensor signals. The DC155 can determinate the flow direction using the phase relation of the two signals.

Configuration and handling of the DC155 with this option is equal to any standard application.

2.4 Creep suppression

In some applications, when using 4-20mA analog inputs, it is necessary to suppress adding up small flow quantities.

The figure on the right hand shows its function.

Adjust the creep suppression value in the structure menu.

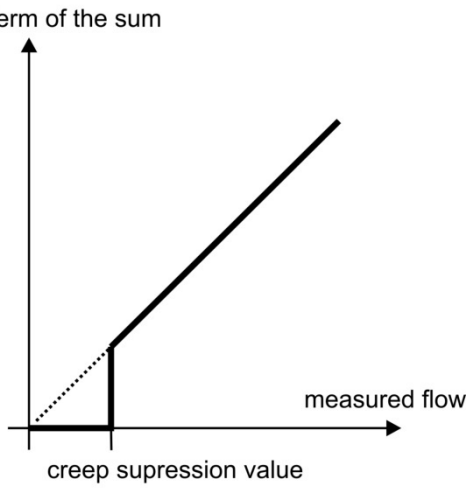


Figure 3: creep suppression

2.5 Temperature compensation (requires Pt100- option)

Any fluid has a specific **expansion coefficient γ**. The volume of the fluid increases with its temperature. Using a volume measurement sensor for a mass dosing application, introduces an inaccuracy into the dosing process, if the temperature is not taken into account.

The DC155 can compensate the thermal expansion of a fluid according to the following formula:

$$V(\vartheta) = V_0\left(1 + \gamma(\vartheta - \vartheta_0)\right)$$

$V(\vartheta)$	volume at actual temperature
V_0	volume at reference temperature
ϑ	actual fluid temperature
ϑ_0	reference temperature
γ	expansion coefficient

The DC155 measures the temperature of the fluid with a Pt100 temperature sensor. The user can set the values of the expansion coefficient and the reference temperature with the "Temperature compensation" menu.

```
Temperature Compensation

0. Temperature compensation: active
1. Reference temperature: 20°C
2. Coeff. of expansion: 0.100E-3 1/K

3. Temperature monitoring: Yes
4. Minimum value: -10°C
5. Maximum value:  50 °C
6. Default value:  20°C
7. Stop Dosing: Yes
8. Error signal: Yes
↵. End
```

The **signs of the temperature values** are entered by using the **arrow keys**. The left arrow sets a negative sign, the right arrow sets a positive sign.

The temperature measurement value can be monitored. This allows to recognise broken wires and short cuts of the Pt100 wiring. The DC155 uses a default value, if the Pt100 temperature is outside the configured temperature range, given by the parameters "Minimum Value" and "Maximum Value". The dosing process can either be stopped or continued in that case. Additionally, it is possible to activate any digital output whose functionality has been set to "Any failure".

You can see whether the temperature is within the permitted range in the lower right corner of the display:

Dosing process	**Pt100-temperature inside permitted range**	**Pt100-Temperatur outside permitted range**
not running	"**Temp:** Measured Value °C"	"**Err:** Measured Value °C "
running	"**Temp:** Measured Value °C"	"**Err:** Default value °C "

The marking "Err:" shows that the temperature is out of range. The marking "Temp:" shows that the temperature is OK. If the dosing process is running, the display shows always the temperature that is used for dosing. This can be the measured value or the default value, if the temperature is out of range. When no dosing process is running, the value that is displayed is always the measured value. In case of a temperature error, the user can see, if the temperature is just a few degrees out of the range or if there is a short cut or an open wire.
If the dosing has been stopped because of a temperature error, an error message appears on the display. The error state can only get exited if the temperature problem is resolved. The error must get acknowledged by pressing the **RESET- key**. A further push on the **RESET- key resets the DC155 batch counter to zero**. Alternatively, it is possible to **continue the batch process** by pressing the **START- key**.

2.6 Process monitoring

A dosing process can get interrupted due to various error causes. In these cases, it is possible to give an alarm by using one of the digital outputs. Please consider the dosing process flow chart in chapter 3.4.

2.6.1 Broken wire monitoring

Broken wires can get detected by using NAMUR- signals as digital input signals or 4...20 mA signals as analog input signals.

In case of a broken wire, the DC155 interrupts the dosing process and **indicates "Broken wire" on the display**. It is possible to report the "Broken wire" error using any digital output.

The DC155 remains in the error state until the "Broken wire" error is resolved. Afterwards, the user can leave the error state by pressing the **RESET- key**. A second push of the **RESET- key resets the DC155 batch counter to zero**. Alternatively, it is possible to **continue the batch process** by pressing the **START- key**.

2.6.2 Flow monitoring

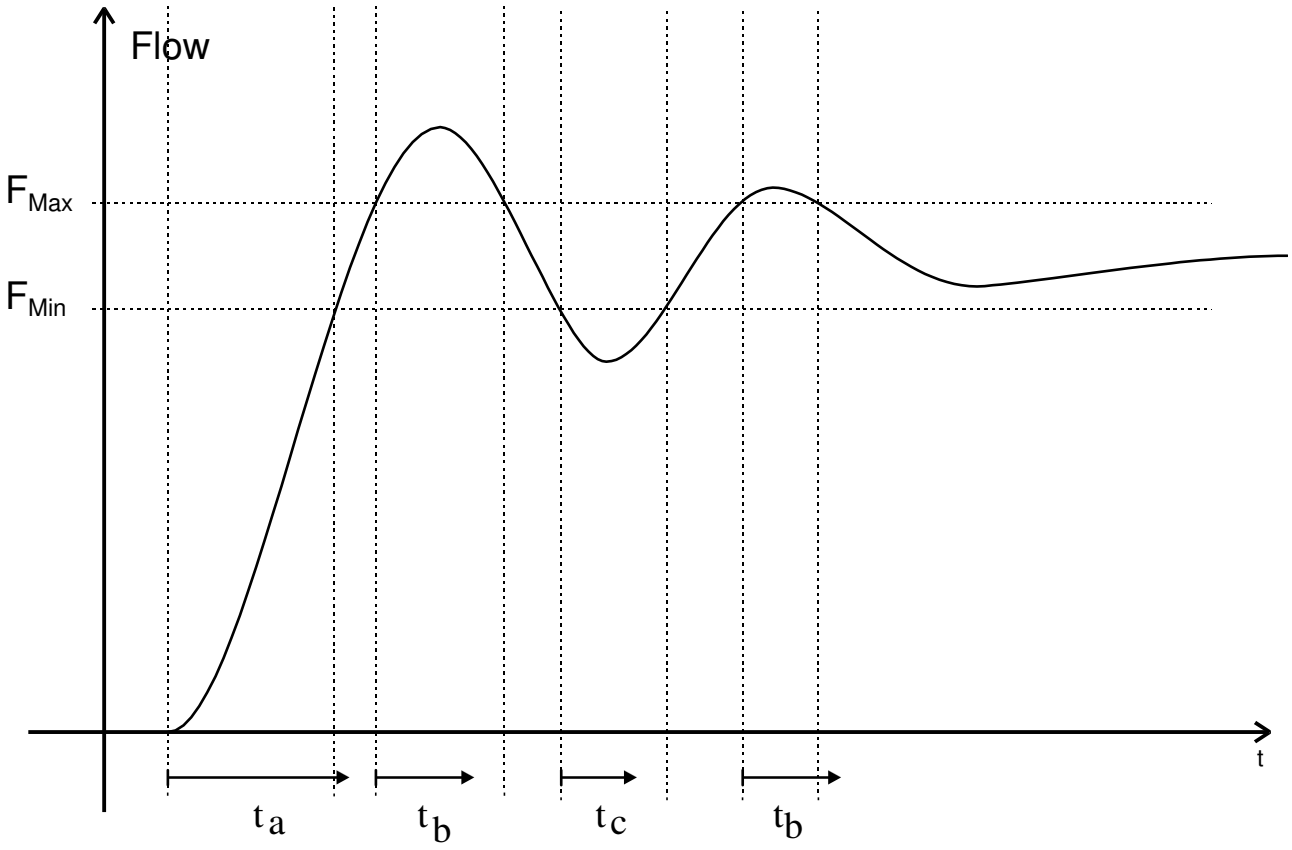
The DC155 can monitor minimum and maximum flow limits. If the flow exceeds these limits, the DC155 interrupts the dosing process after a programmable time delay and indicates the error on the display. It is possible to report the error by using any digital output.

Figure 4 shows an example for the flow at the beginning of a dosing process. The delay times are as follows:

t_a : General delay before the flow monitoring starts

t_b : Selective delay at F > F max

t_c : Selective delay at F < F min



The general delay t_a starts on the beginning of the dosing process. No Flow monitoring takes place during this time. Afterwards selective delays (t_b and t_c) start at the moment the flow exceeds its limits. If the flow doesn't return while the selective delay time is running, the DC155 interrupts the dosing and indicates the error on the display. It is possible to report the error by using any digital output.

The user can leave the error state by pressing the **RESET- key**. A second push of the **RESET- key resets the DC155 batch counter to zero**. Alternatively, it is possible to **continue the batch process** by pressing the **START- key**.

2.7 Safety

Thoughtlessness and carelessness of unauthorised people are often the cause of failures of automatic dosing systems. We took measures on the DC155 to prevent unintentional or incompetent interruptions to the dosing process.

2.7.1 Code words

The permission to enter or manipulate parameter settings is divided into 3 safety levels. Each safety level has its own programmable access code.

1. The **lowest level** is the permission **to change the quantity setpoint**. Authorised persons, who know the "setpoint" access code are only able to change the quantity setpoint and nothing else. **The factory setting of this access code "0001"**. A value of **"0000" disables the need of entering an access code** to change the quantity setpoint.
2. The **medium safety level** is the permission to change settings in the **parameter menu**. In this menu, it is possible to change parameters like "setpoint 1", "setpoint 2", "lag quantity", "pause time", "flow limits", PID-controller parameters, time and date as well as resetting the sum counter. **The factory setting of this access code "0002"**. Entering the parameter menu access code **cannot get disabled by setting the access code to "0000"**. The medium safety level is dedicated to maintenance personal.
3. The **highest safety** level is the permission to change the settings of the **structure menu**. In this menu, it is possible to change the entire structure (configuration) of the DC155 (e.g. dosing method, units, input signal definition, output signal definition, temperature compensation, flow monitoring, display

configuration, key blocking) as well as changing code words. **The factory setting of this access code "0003"**. Entering the structure menu access code **cannot get disabled by setting the access code to "0000"**. The highest safety level is dedicated to plant engineers.

2.7.2 Key locking

In some applications the DC155 is controlled using a decentralized control system (DCS) with no need for manual control. In these cases, it is possible to block some or all keys of the DC155 to prevent an unauthorised intervention.

The DC155 has three key locking levels:

1. Any key is enabled
2. Any key is locked, except the START, STOP and RESET keys
3. Any key is locked

The **key locking is only active**, if the **key lock signal input (terminal 15) is high.**

2.8 Remote control / bus coupling

The DC155 has several interfaces for remote control.

2.8.1 Remote control via digital inputs

The DC155 has five predefined digital inputs (**START, STOP, RESET, INHIBIT and KEY LOCK**) to realise a simple remote control with active or passive switches.

The polarity of these inputs, except the STOP input, is "normally open". There are two STOP inputs: one is "normally close", the other is "normally open".

2.8.2 TTY- interface and protocol print (Option)

The DC155 can also get controlled by using the serial TTY-interface and ESC -sequences, see the instruction codes in the following table:

Instruction code	**Function**
ESC 0	Reads the actual counter value
ESC S	START- instruction
ESC P	STOP- instruction
ESC Z	RESET- instruction
ESC K1	Enable keys (equals setting the keylock-input low)
ESC K0	Lock keys (equals setting the keylock-input high)
ESC B *SETPOINT*	Sets the quantity setpoint
ACK (hex. 06)	Answer to a known instruction
NAK (hex. 15)	Answer to an unknown instruction

Receiving a **"ESC Z" instruction** , the DC155 answers with a **complete batch protocol print** (date, time, quantity setpoint, filled quantity), if the feature "print protocol" has been enabled (Menu/structure/TTY interface).

a) Print out format

```
[info text]

[date]          [time]        [quantity setpoint]       [filled quantity]
```

b) Info text

It is possible to print out an info text. The text length is 20 characters at maximum. The text can be entered in menu “TTY- interface”, choosing “info text”. A list with all available characters is displayed. Select a character with an arrow buttons and put it into text with the enter button.

Delete wrong characters with "<" and confirm the info text with ↵.

```
Input the infotext:
ABCDEFGHIJKLMNOPQRSTUVWXYZ0123456789 . < ↵

Batch position 1
```

c) Central printer for several batch control stations

Use a “Auto data switcher” in the safe area to connect several batch controllers to one printer. The print outs can be distinguished by individual info text headers.

2.8.3 Modbus (Option)

The dosing controller DC155 supports Modbus RTU (Remote Terminal Unit). The modbus interface uses only "Holding Registers" to submit measurement values and commands. The registers are defined as below:

Register (Hex)	Access	Data format	Function
40001	 R/W R/W R/W R R R R R R R R	Bit field	Ctrl-Flags: Bit 0: Start Dosing process Bit 1: Stop Dosing process Bit 2: Reset Counter Info-Flags: Bit-6: Pt100 error Bit-7: reserved Bit 8: Dosing process is started Bit 9: Dosing process is stopped Bit 10: Counter is equal to zero Bit 11: Broken wire Sensor 1 Bit 12: Broken wire Sensor 2 Bit 13: minimum flow rate alarm Bit 14: maximum flow rate alarm Bit 15 Counter overflow
40002 40003	R/W	Floating point	Quantity setpoint
40004 40005	R	Floating point	Actual quantity value
40006 40007	R	Floating point	Flow rate

Remarks:

- The read only bits in the Register 40001 are ignored when writing to this register.
- A new quantity setpoint can be set by using the modbus function 16 "Preset Multiple Registers". The registers 40002 and 40003 must be written simultaneously.
- A running dosing process is ended when a new quantity setpoint is set.

The DC155 supports the following modbus functions:

Function number	Function
3	Read Holding Registers
6	Preset Single Register
16	Preset Multiple Registers

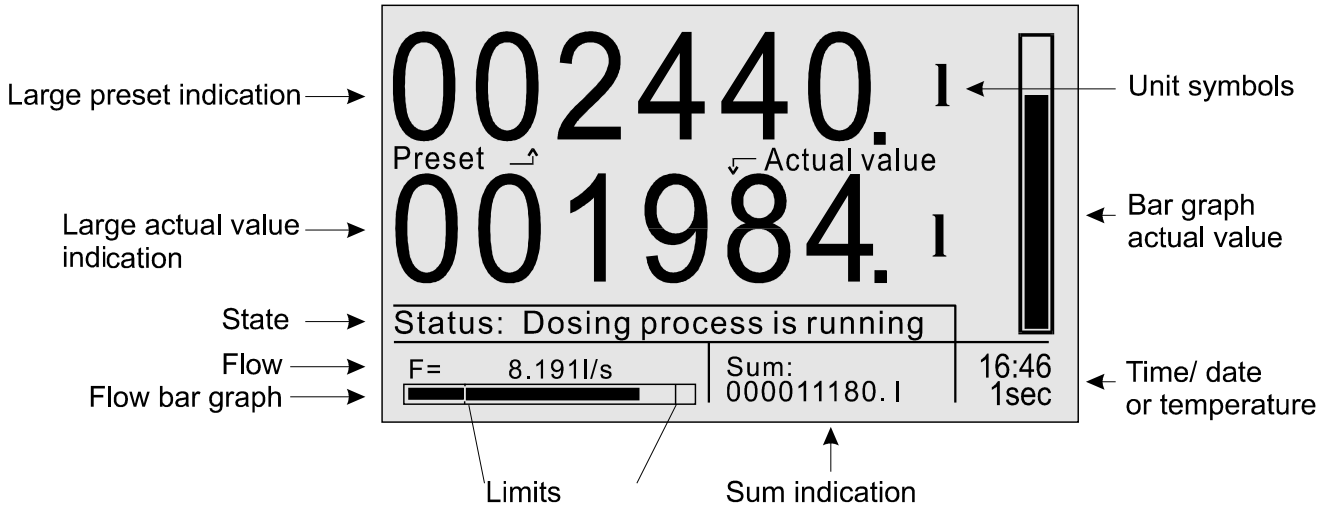
The baud rate is 9600 baud. The parity can be freely selected or deactivated. The VI156 supply and interface module is used to separate the intrinsically safe TTY interface of the DC155 from non-intrinsically safe TTY or RS232 interfaces.

3 Operation

The DC155 is controlled by the front keys and the display. A restricted control is possible by using the digital inputs or by using a serial interface.

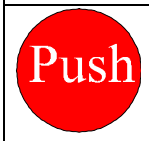
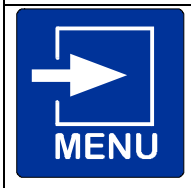
3.1 LC-Display

The graphical display of the DC155 consists of two big variable text fields and further text and graphic elements. Every important process data is visible.



3.2 Keyboard

The DC155 has 14 keys and a STOP- switch, for complete configuration, parameter changing and manual operation. The functions of these keys are listed below.

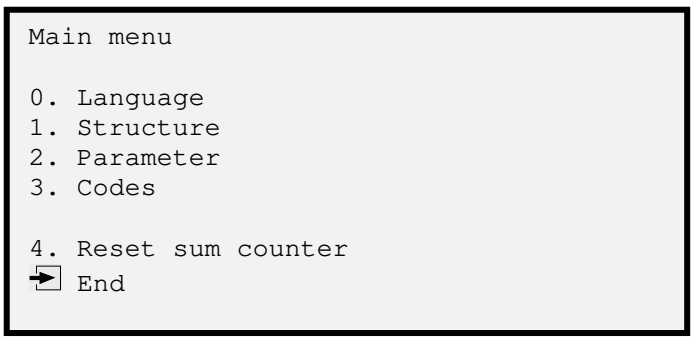
Key	Name	State	Function
	STOP- Switch	1. During dosing process 2. Else	Valves are closed immediately, dosing process is interrupted None
	START- key	1. Dosing process stopped / ready 2. While menu input	Dosing process continues / starts, valves are opened Cursor shift left
	RESET- key	1. Dosing process finished / stopped 2. During power on 3. While menu input	Resets actual value Activates parameter reset, parameters are reset to factory settings Cursor shift right
	SET- key	1. In operation 2. Else	Sets the quantity setpoint None
	INFO- key	1. In operation 2. While menu input	Toggles between status view of the dosing process and input/output view Digit "0"
	ENTER- key	1. In operation 2. While menu input	Starts structure and parameter menus (Code word is necessary) Confirms input / returns to upper menu
	Digit keys	1. In operation 2. While running menu 3. While digit input	No function Select menu item X Select the digit X

3.3 Parameter input and Configuration

It is not necessary to read the following section, if you want to go ahead quickly.

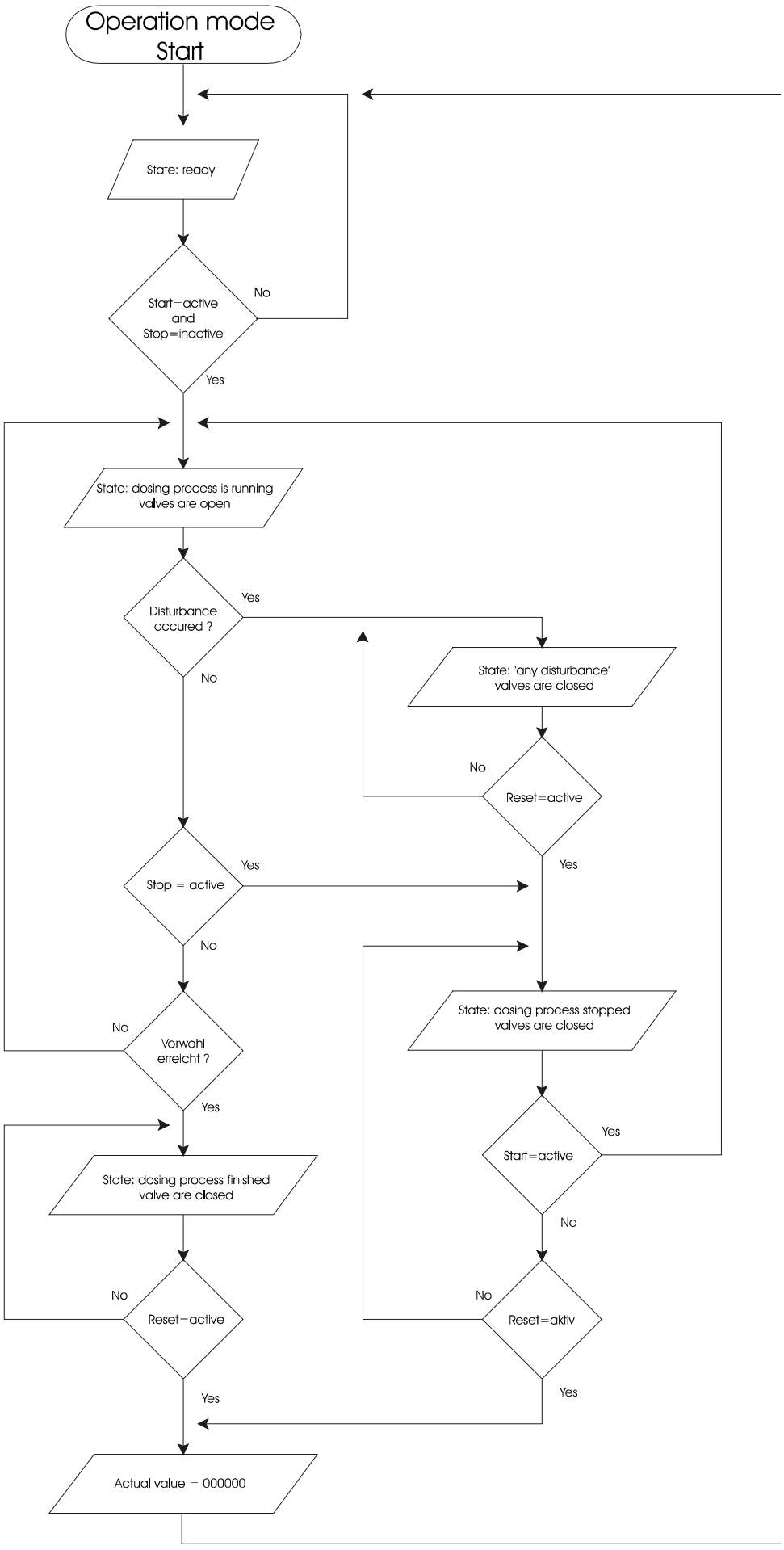
If you start the parameter or the structure menu while a dosing process is running, the dosing is stopped immediately: the valves close, the actual value is reset to "0".

Press the ENTER- key to start the access code input. The factory setting of the access code for entering the main menu with access to the structure menu is "**0003"**. Confirm the access code with the ENTER- key.



3.4 Dosing control flow chart

The following flow chart depicts the dosing control process. Consider that pressing the "ENTER"- key and entering the right code word will terminate this procedure in any state. After returning to the dosing operation the procedure starts on the start position.


Operation mode Start
State: ready
Start=active and Stop=inactive
No
Yes
State: dosing process is running valves are open
Disturbance occured ?
Yes
No
State: 'any disturbance' valves are closed
No
Reset=active
Yes
Stop = active
Yes
No
State: dosing process stopped valves are closed
No
Vorwahl erreicht ?
Yes
Start=active
Yes
No
State: dosing process finished valve are closed
No
Reset=active
No
Reset=aktiv
Yes
Yes
Actual value = 000000

4 Parameter default settings

After the initial connection of the device, the following factory settings are preset if no special preconfiguration was agreed upon when ordering.

1. Level	2. Level	Parameter	Value	Comment
Language		German, English, French, Dutch	English	
Structure	Units	Type (mass, volume) Setpoint: Sum counter: Flow:	mass 000000 kg 000000000 kg 0000000 kg/s	
	Dosing method	Flow Level	Flow	 Devices with analog output
	Input (Flow)	Namur, 24V, 0/20mA, 4/20mA	24V input	Type of the input signal
		Impulse value Max. Flow	1.000000kg 0 kg/s	Digital flow sensor: Namur or 24V input
		Flow at 20mA Creeping suppression	0 kg/s 0 kg/s	Analog flow sensor: 0/20mA or 4/20mA
	Input (Level)	0/20mA or 4/20mA rising / falling Level at 20mA	4/20mA sinking 0 kg	Devices with analog output: Level rises or falls while dosing
	Output	Dig. output 1 Dig. output 2 Dig. output 3	No function No function No function	Function of the output
		Dig. output 1 Dig. output 2 Dig. output 3	Normally closed Normally closed Normally closed	Polarity of the output "normally closed" or "normally open"
		Type of Analog Output Function of Analog Output	4/20 mA No function	Devices with analog output
	Flow monitoring	Active / Inactive	Inactive	Not, if Dosing method = Level
	Temperature Compensation	Active / Inactive Reference Temperature Coeff. of expansion Temperature monitoring Minimum value Maximum value Default value Stop Dosing Error signal	Inactive 20°C 0.000E-3 1/K No -20°C 99°C 20°C No No	Devices with Pt100 input Parameters for temperature monitoring:
	Display	Upper display Lower display	Setpoint Actual value	
	Serial Interface	Baud rate Bits Parity Print protocol	9600 8 No No	Devices with TTY/RS485 - without modbus protocol
		Parity Swap High/Low byte Device address	No No 1	Devices with TTY/RS485 - with modbus protocol
	Key locking	Enable / Disable	Keys enabled	All keys are active

1. Level	2. Level	Parameter	Value	Comment
Parameter	Setpoints	Max. Setpoint Setpoint Setpoint 1 Setpoint 2 Lag quantity	999999 kg 0 kg 0 kg 0 kg 0 kg	
	Flow monitoring	Minimum Flow Maximum Flow General delay Selective delay F<Fmin Selective delay F>Fmax	0 kg/s 0 kg/s 1s 1s 1s	only visible, if Flow Control has been activated in the structure menu
	PID Flow Control	Flow setpoint Kp Ki Kd	0 kg/s 0 0 0	only visible, if the function of the analog output has been set to "Flow feedback control"
	Analog Output	Max. value of ramp Start value of rising ramp End value of falling ramp	100% 100% 100%	Analog Output = "Ramp shape": 100 % = 20mA Analog Output = "PID Flow control": 100% = PID Flow setpoint
	Pause time	Pause time	0 s	
	date time		- -	
Codes		Setpoint Parameter Structure	0001 0002 0003	

5 Reset

Reset **Reset the DC155 to the factory defaults as follows: press the "RESET" key while you're switching on the power supply to the DC155.**

After a reset the display shows:

```
The DC155 has been reset.
All parameters are cleared.
It is necessary to reconfigurate
the DC155 !!!

Press START key
```

6 Power supply of the DC155

6.1.1 Application inside hazardous area

The DC155 needs an **intrinsically safe** power supply with the maximal values of U_0 = 30 V, I_k = 160 mA.

The **power consumption** of the DC155 **depends on the kind and count of additional options**. The **basic power consumption** of the DC155 (Type code = DC155.x.0.0.x.0.0.x) is about **300 mW**.

The power consumption is increased by any energy consuming option. For the total power consumption of the DC155 see the table below.

Instead of using one powerful power supply, you can supply the DC155 with two less powerful power supplies. In that case you have to use a DC155 with "separate power supply" option. Please see table below for details.

Hardware- Configuration Of DC155		**Power request to power supply**		
		Standard	**separate feeding**	
		SG	SG 1 (terminal 1 and 5)	SG 2 (terminal 3 and 6)
Minimal configuration DC155.x.0.0.x.0.0.x		U ≥ 15 V, I ≥ 20 mA impedance ≥ 750 Ω	-	-
	+ analog output DC155.x.a.0.x.0.0.x a = {1, 2}	U ≥ 15 V, I ≥ 20 + 21 = 41 mA impedance ≥ 365 Ω	U ≥ 15 V, I ≥ 20 mA impedance ≥ 750 Ω	U ≥ 15 V, I ≥ 21 mA impedance ≥ 714 Ω
	+ TTY interface DC155.x.0.0.x.3.0.x	U ≥ 15 V, I ≥ 20 + 22 = 42 mA impedance ≥ 357 Ω	U ≥ 15 V, I ≥ 20 mA impedance ≥ 750 Ω	U ≥ 15 V, I ≥ 22 mA impedance ≥ 681 Ω
	+ RS485 interface DC155.x.0.0.x.5.0.x	U ≥ 15 V I ≥ 20 + 11 = 31 mA impedance ≥ 483 Ω	U ≥ 15 V I ≥ 20 mA impedance ≥ 750 Ω	U ≥ 15 V I ≥ 11 mA impedance ≥ 1363 Ω
	+ 2. NAMUR input DC155.x.0.1.x.0.0.x	U ≥ 15 V, I ≥ 20 + 6 = 26 mA impedance ≥ 477 Ω	-	-
Example- configuration: DC155 + 2. NAMUR input + TTY-interface DC155.0.0.1.0.3.0.x		U ≥ 15 V, I ≥ 20 + 6 +22 = 48 mA impedance ≥ 312 Ω	U ≥ 15 V, I ≥ 20 + 6 = 26 mA impedance ≥ 577 Ω	U ≥ 15 V, I ≥ 22 mA impedance ≥ 681 Ω

a) Intrinsically safe power supply SG160

The intrinsically safe power supply SG160 can be used as power supply for the DC155. The SG160 is suitable for the assembly within the Ex zone 1.

b) Supply- and interface module VI156

The Supply- and interface module VI156 can be used as power supply for the DC155. It is also an Ex-interface that provides 3 digital outputs, 2 digital inputs and a serial TTY interface.

6.1.2 DC155 for safe area application

If you use the DC155 for safe area applications and do not wire the DC155 into hazardous areas, then you can supply the DC155 directly by a 24VDC net. In that case, there is no separate power supply device necessary.

7 Installation and connection

7.1 Mounting

The DC155 is dedicated for mounting and working in hazardous area zone 1 and 2. Please use the 4 holes on the rear plate for mounting and use a solid base.

Warning **The local installation regulations must be observed.**

See hole distances below:

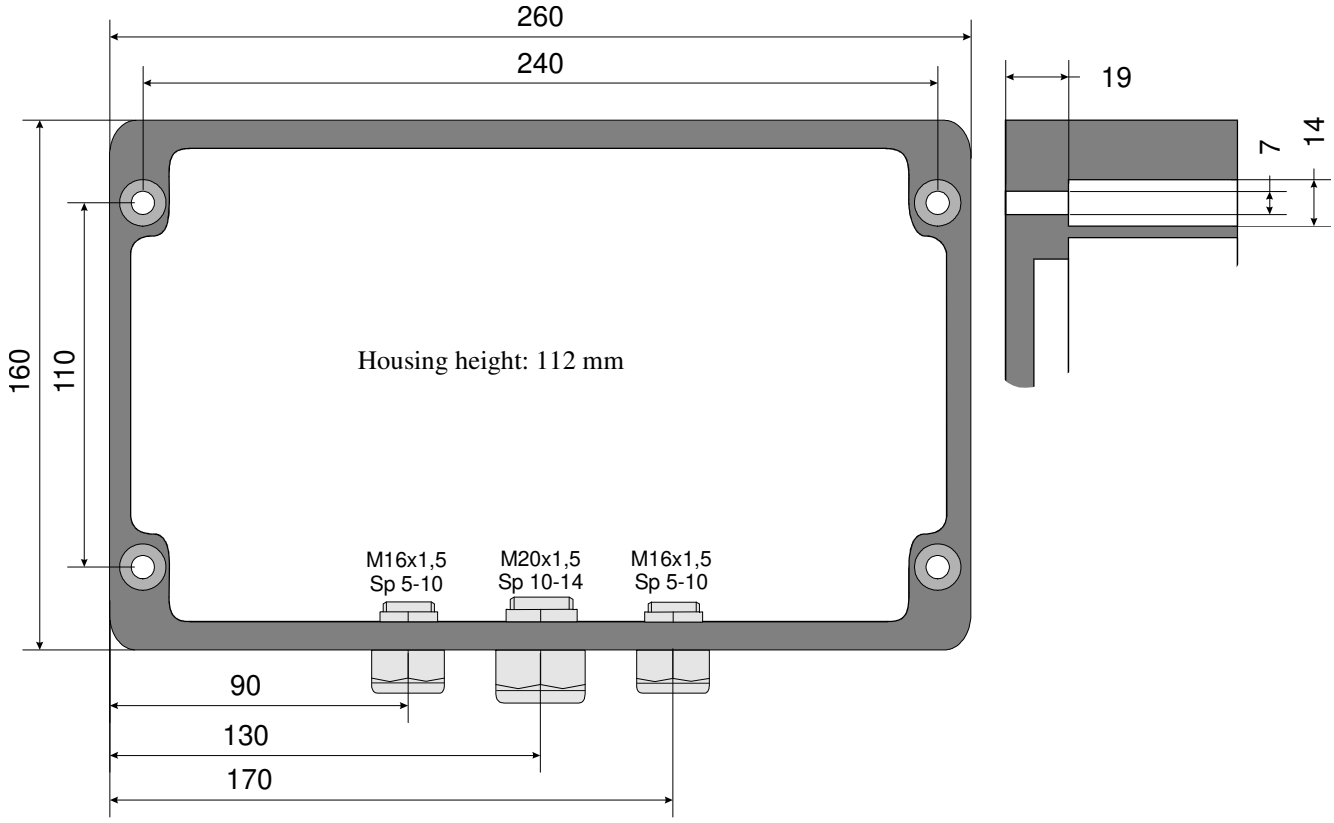


Figure 4: Dimensions

7.2 Electrical Wiring

Warning **The regulations of IEC/EN 60079-14 and the EU type examination certificate IECEx BVS 18.0031 / BVS 18 ATEX E 040 must be observed.**

Warning **The intrinsically safe terminal limits must be observed. The intrinsically safe terminal limits are included in the EU type examination certificate BVS 18 ATEX E 040 / IECEx BVS 18.0031 and in the appendix to this Manual.**

7.2.1 Terminal description DC155

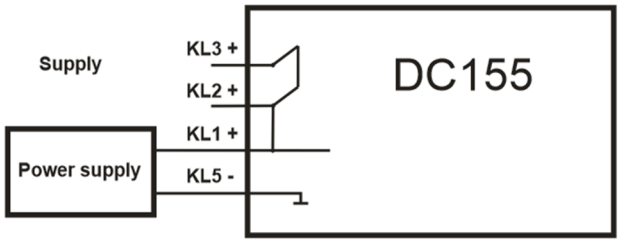
Terminal	Description
1,2 + 5,6 -	Power supply of DC155
3 +	Power supply of DC155 / Option: separate power supply for analog output and/or TTY/RS485 interface, respectively.
4 +	Supply output for NAMUR- Sensors
7 -	Connect only to a NAMUR sensor supplied by terminal 4
8 +	Input for 24V impulses
9 -	Connect only to a NAMUR sensor supplied by terminal 4
10 +	Input for 24V impulses
	Digital inputs (11-16)
11 +	START
12 +	STOP (normally closed)
13 +	RESET
14 +	INHIBIT
15 +	KEY LOCK
16 +	STOP (normally open)
17 + 19 + 21 + 18 - 20 - 22 -	Digital output
23+ 24-	Analog inputs
25,26,27,28	Reserved (do not connect anything)
29+ 30-	Analog output
31 +, 32 , 33 34-	Terminal for PT100, 2 wire or 4 wire connection
35+ 36-	TTY- receiver RS485: D+, D-
37+ 38 -	TTY- transmitter RS485: potential equalization

Note **The digital input "STOP" is a normal closed connection. For that reason, please put a shorting bridge on terminal 2 to terminal 12, If you don't use the external "STOP"**

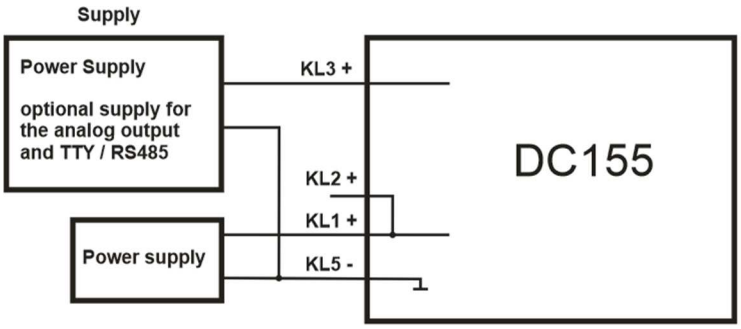
The block diagram of the DC155 and the electrical safety limits of the DC155 are given in the annex.

7.2.2 Power supply

a) Standard

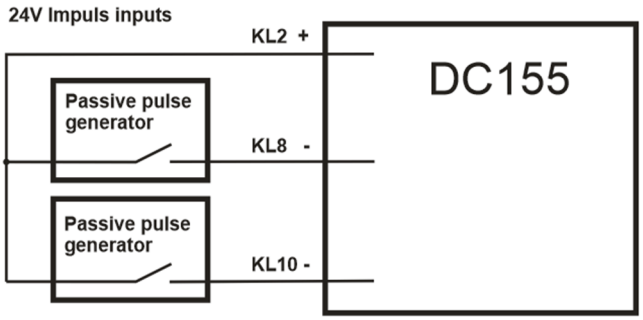


b) Separate power supply of analog output and TTY / RS485

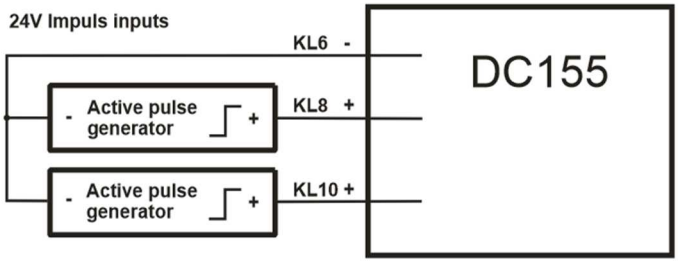


7.2.3 Sensor terminals

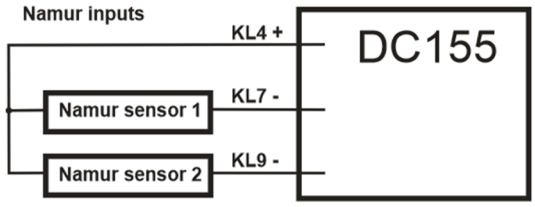
a) 24V Impulses passive



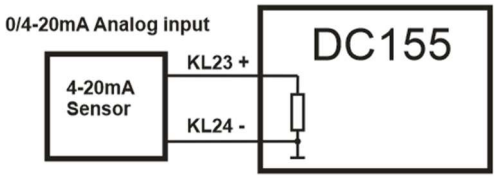
b) 24V Impulses active



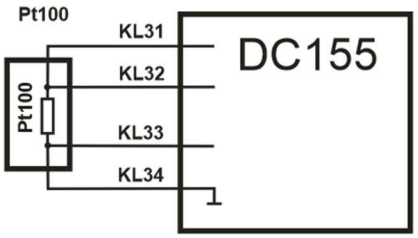
c) NAMUR- Signal

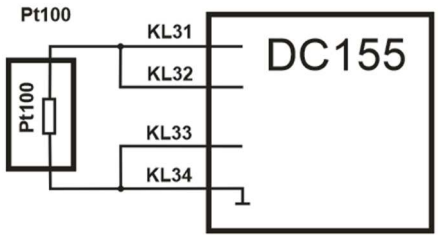


d) 4-20 mA Signal



e) Pt100 terminal (4-wire connection) *(2-wire connection)*

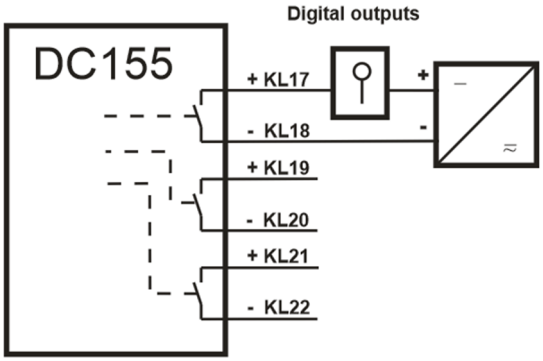




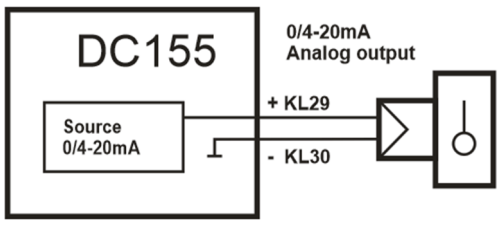
(NB: a Pt100 3-wire connection is not possible)

7.2.4 Actor terminals

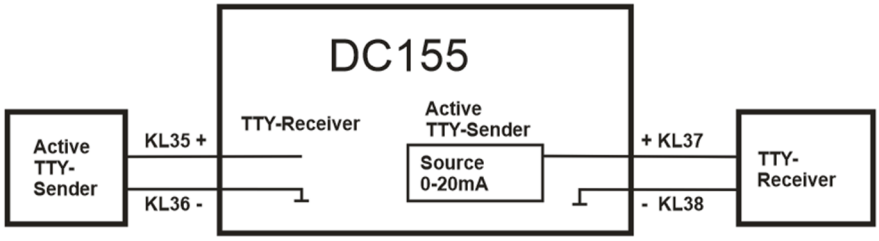
a) Digital outputs



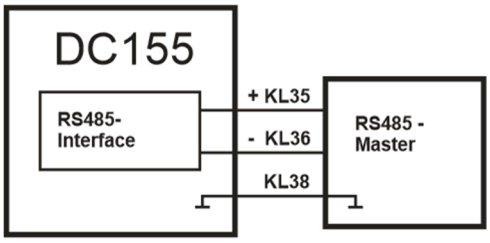
b) Analog 0/4-20 mA output



7.2.5 TTY interface



7.2.6 RS485 interface



8 Annex

8.1 Block diagram DC155

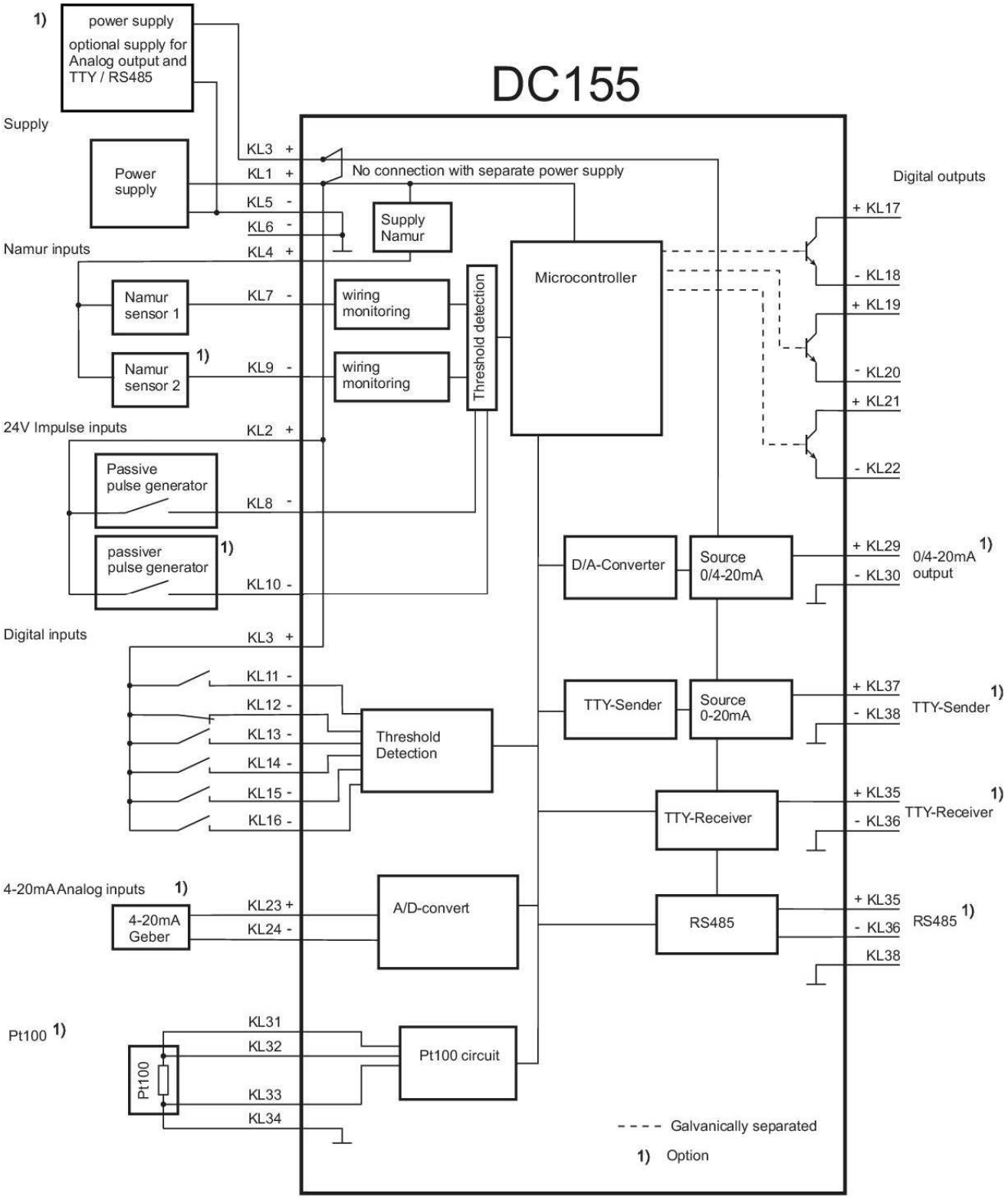


Figure 5 block diagram DC155

8.2 Technical Details

		Dosing controller DC155
General	Mounting	Inside hazardous area
	Ex-protection	2 II G Ex ib IIC T6 Gb
	EU type examination certificate	BVS 18 ATEX E 040 IECEx BVS 18.0031
	Housing protection class	IP65
Mounting	Ambient temperature	-10°C...+40°C at T6 -10°C...+70°C at T4
Housing	Dimensions	H x B x T: 160 mm x 260 mm x 112 mm
	Material	Aluminium lacquered / front foil: polyester
Electrical Specifications	Main voltage	Intrinsically safety Ex ib IIC
	Power consumption	min.20 mA at 15V = 300 mW (without analog output, TTY/RS485, 2.Namur)
Inputs	NAMUR	Max input frequency: 2 kHz
	24V- Digital input	Threshold : 0-Signal: U < 2 V, 1- Signal: U > 5 V
	Analog input	4-20 mA, load: 15 Ω
	Measuring error	< 0,2 %
	Temperature coefficient	< 0,01 % /K
Outputs	Digital output	3 intrinsically safe galvanically separated digital ouputs closed output remain voltage ≈ 2,5 V
	Analog output	4-20 mA, min 600 Ω, error < 0,2 % TK < 0,01 %/K
Power supply	Minimum Configuration DC155.x.0.0.x.0.0.x	U ≥ 15 V, I ≥ 20 mA, load ≥ 750 Ω
	Additional analog output	U ≥ 15 V, current delivery as above + 21 mA
	Add. TTY interface	U ≥ 15 V, current delivery as above + 22 mA
	Add. RS485 interface	U ≥ 15 V, current delivery as above + 11 mA
	Add. 2. NAMUR- input	U ≥ 15 V, current delivery as above + 6 mA
Ergonomy	Display	Graphical LC-Display
	Entering configuration	Menu guided languages: German, English, French, Dutch
	TTY/RS485 interface	Protocol print Remote control via ESC- sequences Modbus

8.3 Transport, storage, disposal and repairs

Transport	Shock-free in the original box, no turning over, handle carefully
Storage	Store dry in the original box
Disposal	When disposing the explosion-proof display devices, the applicable national waste disposal regulations must be observed.
Repairs	Defective parts must be replaced by the manufacturer or personnel specially trained and supervised by the manufacturer.

8.4 Type Code (Configuration example)

DC155	.x	.x	.x	.x	.x	.x	.x
Analog input:							
	No analog input	.0					
	One 4...20mA input	.1					
Analog output:							
	No analog output		.0				
	0/4...20mA output		.1				
	PID controlled analog output		.2				
NAMUR input:							
	NAMUR input			.0			
	Two NAMUR inputs			.1			
Pt100 input:							
	No Pt100 input				.0		
	One Pt100 input				.1		
Interface:							
	No interface					.0	
	TTY sender an receiver					.3	
	RS485					.5	
Protocol:							
	No Protocol						.0	
	Modbus						.2	
Separate power supply for analog output and TTY / RS485:							
	No separate power supply terminal							.0
	With separate power supply terminal							.1

8.5 Batteries and battery replacement

Only Gönnheimer EB350.1 batteries must be used. The exchange of the batteries is permitted in explosive areas of zone 1 and 2.
The positive pole (red) and the negative pole (blue) of the battery must be connected in accordance with the imprint on the back of the housing.

8.6 Ex-technical terminal limit values

The intrinsically safe terminal limit values are specified in the EU type examination certificate BVS 18 ATEX E 040 / IECEx BVS 18.0031.

8.7 Documentation table

This documentation table is complete, but not without contradictions. Not all parameters can be entered at the same time as they are listed next to each other in the table, since some parameters only appear in certain configurations. Simply ignore the unused parameters or cross them out.

1. Level	2. Level	Parameter	Value / Choice	Comment
Language		German	❑	
		English	❑	
		French	❑	
		Dutch	❑	
Structure	**Units** mg, g, kg, t, kt ml, l, dm³, m³	Type	❑ Mass ❑ Volume	
		Setpoint	Unit: Decimal places:	
		Sum counter	Unit: Decimal places:	
		Flow	Unit: Decimal places:	
	Dosing method		❑ Flow ❑ Level	
	Input **(method Flow)**	Signal	❑ NAMUR ❑ 24V ❑ 0-20 mA ❑ 4-20 mA	
		Impulse Value		
		Max. Flow		
		Flow at 20 mA		
		Creep suppression		
	Input **(method Level)**	Signal	❑ 0-20 mA ❑ 4-20 mA	
		Filling level	❑ rises ❑ falls	
		Filling level at 20 mA		
	Outputs **digital**	**0** No Function **1** Counter = 0 **2** Fine valve **3** Coarse valve **4** Dosing is running	**5** Any failure **6** Flow too small **7** Flow too big **8** Impulses	
		Dig. Output 1	Function No.:	
		Dig. Output 2	Function No.:	
		Dig. Output 3	Function No.:	
		Dig. Output 1	❑ Normally open ❑ Normally closed	
		Dig. Output 2	❑ Normally open ❑ Normally closed	
		Dig. Output 3	❑ Normally open ❑ Normally closed	

1. Level	2. Level	Parameter	Value / Choice	Comment
Structure	**Outputs analog**	**0** No Function **1** Flow prop. signal **2** Ramp shape **3** Flow feedback control **4** Counter prop. signal **5** Counter (max) prop. signal **6** Setpoint prop. signal		
		Analog function No.		
		Analog signal	❑ 0-20 mA ❑ 4-20 mA	
	Flow monitoring	Activation	❑ active | ❑ inactive	
	Temperature compensation	Activation	❑ active | ❑ inactive	
		Reference temperature	°C	
		Coeff. of expansion	/K	
		Temperature monitoring	❑ yes | ❑ no	
		Minimum value	°C	
		Maximum value	°C	
		Default value	°C	
		Stop dosing	❑ yes | ❑ no	
		Error signal	❑ yes | ❑ no	
	Display	**0** No item **1** Setpoint	**2** Actual value **3** Flow	
		Top display		
		Bottom display		
	Serial Interface	Baud rate		
		Bits		
		Parity	❑ no ❑ odd ❑ even	
		Print protocol	❑ yes | ❑ no	
		Swap float (Modbus)	❑ yes | ❑ no	
		Device ID (Modbus)		
	Key-lock		❑ all keys active ❑ partly locked ❑ totally locked	
Parameter	**Setpoints**	Max. Setpoint		
		Setpoint		
		Setpoint 1		
		Setpoint 2		
		Lag quantity		
	Flow monitoring	Minimum Flow		
		Maximum Flow		
		General delay	s	
		Selective delay F < Fmin	s	
		Selective delay F > Fmax	s	
	PID parameter	Flow setpoint		
		Kp		
		Ki		
		Kd		
	Analog output	Maximum value	%	
		Start value	%	
		End value	%	
	Pause time	Pause time	s	

1. Level	2. Level	Parameter	Value / Choice	Comment
Codes		Code for setpoint		
		Code for parameter menu		
		Code for structure menu		

Translation

1 # EU-Type Examination Certificate

2 **Equipment intended for use in potentially explosive atmospheres Directive 2014/34/EU**

3 EU-Type Examination Certificate Number: **BVS 18 ATEX E 040**

4 Product: **Dosing controller type DC155**

5 Manufacturer: **Gönnheimer Elektronic GmbH**

6 Address: **Dr.-Julius-Leber-Str. 2, 67433 Neustadt an der Weinstraße, Germany**

7 This product and any acceptable variations thereto are specified in the appendix to this certificate and the documents referred to therein.

8 DEKRA EXAM GmbH, Notified Body number 0158, in accordance with Article 17 of Directive 2014/34/EU of the European Parliament and of the Council, dated 26 February 2014, certifies that this product has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of products intended for use in potentially explosive atmospheres given in Annex II to the Directive.
The examination and test results are recorded in the confidential Report No. BVS PP 18.2171 EU.

9 Compliance with the Essential Health and Safety Requirements has been assured by compliance with:

EN 60079-0:2012 + A11:2013	**General requirements**
EN 60079-11:2012	**Intrinsic Safety "i"**

10 If the sign "X" is placed after the certificate number, it indicates that the product is subject to the Special Conditions for Use specified in the appendix to this certificate.

11 This EU-Type Examination Certificate relates only to the design and construction of the specified product. Further requirements of the Directive apply to the manufacturing process and supply of this product. These are not covered by this certificate.

12 The marking of the product shall include the following:

II 2G Ex ib IIC T6 Gb
II 2G Ex ib IIC T4 Gb

DEKRA EXAM GmbH
Bochum, 2018-11-09

Signed: Dr Franz Eickhoff
Certifier

Signed: Deniz Pezzutto
Approver

DEKRA EXAM GmbH, Dinnendahlstrasse 9, 44809 Bochum, Germany,
telephone +49.234.3696-105, Fax +49.234.3696-110, zs-exam@dekra.com

13 **Appendix**

14 **EU-Type Examination Certificate**

BVS 18 ATEX E 040

15 **Product description**

15.1 **Subject and type**

Dosing controller type DC155

Type DC155.x.x.x.x.x.x.x

a b c d e f g

a Analog input
0 Without
1 One 4...20 mA input
2 Two 4...20 mA inputs
3 Three 4...20 mA inputs
4 Weighing amplifier interface

b Analog output
0 Without
1 4...20 mA output
2 4...20 mA output with flow control

c Namur input
0 One Namur input
1 Two Namur inputs

d Pt100 input
0 Without
1 One Pt100 input

e Interface
0 Without
1 TTY transmitter
2 TTY receiver
3 TTY transmitter and receiver
5 RS485

f Protocol
0 Without
2 Modbus

g Separate power supply for analog output
0 Without separate terminal
1 With separate terminal

Depending on the configuration, circuit parts that are not required are not fitted.

15.2 **Description**

The dosing controller type DC155 evaluates signals from a flow meter as part of a dosing device for dosing off liquids and controls the dosing valves accordingly. The DC155 consists of an aluminium housing with polyester front foil into which the intrinsically safe electronics are mounted.

The electronics and all inputs and outputs of the DC155 are intrinsically safe.

The dosing controller is suitable for use in the following ambient temperature range:

Temperature class T6:	-20 °C up to +40 °C
Temperature class T4:	-20 °C up to +70 °C

DAkkS Deutsche Akkreditierungsstelle D-ZE-12069-03-00

DEKRA EXAM GmbH, Dinnendahlstrasse 9, 44809 Bochum, Germany,
telephone +49.234.3696-105, Fax +49.234.3696-110, zs-exam@dekra.com

15.3 Parameters

15.3.1 Supply circuit (Terminals 1/2, 5/6 resp. 3, 5/6)

Maximum input voltage	U_i	30	V
Maximum input current	I_i	160	mA
Maximum input power	P_i	2.5	W
Maximum internal capacitance	C_i	2	nF
Maximum internal inductance	L_i	12	µH

15.3.2 Sensor circuit (NAMUR)

Namur input 1 (Terminals 4, 7)

Maximum output voltage	U_o	9.4	V
Maximum output current	I_o	10	mA
Maximum output power	P_o	23	mW
Maximum external capacitance	C_o	3.9	µF
Maximum external inductance	L_o	30	mH

The maximum total current (2 sensors) via Terminal 4 is corresponding to 20 mA.

Namur input 2 (Terminals 4, 9)

Maximum output voltage	U_o	9.4	V
Maximum output current	I_o	10	mA
Maximum output power	P_o	23	mW
Maximum external capacitance	C_o	3.9	µF
Maximum external inductance	L_o	30	mH

The maximum total current (2 sensors) via Terminal 4 is corresponding to 20 mA.

15.3.3 Pulse input (Terminals 8/10, 5/6 active; 8/10, 1/2/3 passive)

For connection to active circuits:

Maximum input voltage	U_i	60	V
Maximum input current	I_i	160	mA
Maximum input power	P_i	not relevant	
Maximum internal capacitance	C_i	negligible	
Maximum internal inductance	L_i	12	µH

For connection to passive circuits: the maximum values correspond to the values of the supply circuit.

15.3.4 Digital input (Terminals 11 to 16, 5/6 active; 11 to 16, 1/2/3 passive)

For connection to active circuits:

Maximum input voltage	U_i	60	V
Maximum input current	I_i	160	mA
Maximum input power	P_i	not relevant	
Maximum internal capacitance	C_i	negligible	
Maximum internal inductance	L_i	12	µH

For connection to passive circuits: the maximum values correspond to the values of the supply circuit.

15.3.5 Digital output (Terminals 17-18, 19-20, 21-22)

Maximum input voltage	U_i	30	V
Maximum input current	I_i	160	mA
Maximum input power	P_i	1.5	W
Maximum internal capacitance	C_i	negligible	
Maximum internal inductance	L_i	12	µH

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15.3.6 Analog input (Terminals 23-24, 25-26, 27-28)

Maximum input voltage	U_i	30	V
Maximum input current	I_i	160	mA
Maximum input power	P_i	not relevant	
Maximum internal capacitance	C_i	negligible	
Maximum internal inductance	L_i	12	µH

15.3.7 Serial interface Weighing Amplifier (Terminals 25-26, 27-28)

Maximum input voltage	U_i	30	V
Maximum input current	I_i	60	mA
Maximum input power	P_i	19	mW
Maximum internal capacitance	C_i	negligible	
Maximum internal inductance	L_i	12	µH

15.3.8 Analog output (Terminals 29, 30)

Maximum output voltage	U_o	30	V
Maximum output current	I_o	23	mA
Maximum output power	P_o	690	mW
Maximum external capacitance	C_o	54	nF
Maximum external inductance	L_o	50	mH

15.3.9 Pt100 circuit (Terminals 31 to 34)

Maximum output voltage	U_o	5.4	V
Maximum output current	I_o	11	mA
Maximum output power	P_o	15	mW
Maximum external capacitance	C_o	65	µF
Maximum external inductance	L_o	100	mH

15.3.10 RS485 interface (Terminals 35, 36)

Maximum input voltage	U_i	5.4	V
Maximum input current	I_i	160	mA
Maximum input power	P_i	500	mW
Maximum internal capacitance	C_i	negligible	
Maximum internal inductance	L_i	12	µH
Maximum output voltage	U_o	3.8	V
Maximum output current	I_o	59	mA
Maximum output power	P_o	56	mW
Maximum external capacitance	C_o	100	µF
Maximum external inductance	L_o	9	mH

15.3.11 TTY input (Terminals 35, 36)

Maximum input voltage	U_i	60	V
Maximum input current	I_i	160	mA
Maximum input power	P_i	1.25	W
Maximum internal capacitance	C_i	negligible	
Maximum internal inductance	L_i	12	µH

15.3.12 TTY output (Terminals 37, 38)

Maximum output voltage	U_o	18.9	V
Maximum output current	I_o	23	mA
Maximum output power	P_o	435	mW
Maximum external capacitance	C_o	250	nF
Maximum external inductance	L_o	50	mH

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16 **Report Number**

BVS PP 18.2171 EU, as of 2018-11-09

17 **Special Conditions for Use**

None

18 **Essential Health and Safety Requirements**

The Essential Health and Safety Requirements are covered by the standards listed under item 9.

19 **Drawings and Documents**

Drawings and documents are listed in the confidential report.

We confirm the correctness of the translation from the German original.
In the case of arbitration only the German wording shall be valid and binding.

DEKRA EXAM GmbH
Bochum, dated 2018-11-09
BVS-Fro/Rip/Mu A 20170680

Certifier

Approver

DEKRA EXAM GmbH, Dinnendahlstrasse 9, 44809 Bochum, Germany,
telephone +49.234.3696-105, Fax +49.234.3696-110, zs-exam@dekra.com

IECEx Certificate of Conformity

INTERNATIONAL ELECTROTECHNICAL COMMISSION
IEC Certification Scheme for Explosive Atmospheres

for rules and details of the IECEx Scheme visit www.iecex.com

Certificate No.: IECEx BVS 18.0031

Issue No: 0

Certificate history:
Issue No. 0 (2018-11-27)

Status: **Current**

Date of Issue: **2018-11-27**

Applicant: **Gönnheimer Elektronic GmbH**
Dr.-Julius-Leber-Str. 2
67433 Neustadt an der Weinstraße
Germany

Equipment: **Dosing controller type DC155**

Optional accessory:

Type of Protection: **Equipment protection by intrinsic safety "i"**

Marking:
Ex ib IIC T6 Gb
Ex ib IIC T4 Gb

Approved for issue on behalf of the IECEx Certification Body: Dr Franz Eickhoff

Position: Deputy Head of Certification Body

Signature:
(for printed version)

Date: 2018-11-27

1. This certificate and schedule may only be reproduced in full.
2. This certificate is not transferable and remains the property of the issuing body.
3. The Status and authenticity of this certificate may be verified by visiting the Official IECEx Website.

Certificate issued by:

DEKRA EXAM GmbH
Dinnendahlstrasse 9
44809 Bochum
Germany

DEKRA
On the safe side.

IECEx Certificate of Conformity

Certificate No: IECEx BVS 18.0031 Issue No: 0

Date of Issue: **2018-11-27** Page 2 of 3

Manufacturer: **Gönnheimer Elektronic GmbH**
Dr.-Julius-Leber-Str. 2
67433 Neustadt an der Weinstraße
Germany

Additional Manufacturing location(s):

This certificate is issued as verification that a sample(s), representative of production, was assessed and tested and found to comply with the IEC Standard list below and that the manufacturer's quality system, relating to the Ex products covered by this certificate, was assessed and found to comply with the IECEx Quality system requirements. This certificate is granted subject to the conditions as set out in IECEx Scheme Rules, IECEx 02 and Operational Documents as amended.

STANDARDS:

The apparatus and any acceptable variations to it specified in the schedule of this certificate and the identified documents, was found to comply with the following standards:

IEC 60079-0 : 2011 Explosive atmospheres - Part 0: General requirements
Edition:6.0

IEC 60079-11 : 2011 Explosive atmospheres - Part 11: Equipment protection by intrinsic safety "i"
Edition:6.0

*This Certificate **does not** indicate compliance with electrical safety and performance requirements other than those expressly included in the Standards listed above.*

TEST & ASSESSMENT REPORTS:

A sample(s) of the equipment listed has successfully met the examination and test requirements as recorded in

Test Report:

DE/BVS/ExTR18.0079/00

Quality Assessment Report:

DE/TUN/QAR10.0006/08

IECEx Certificate of Conformity

Certificate No: IECEx BVS 18.0031 Issue No: 0

Date of Issue: 2018-11-27

Schedule

EQUIPMENT:

Equipment and systems covered by this certificate are as follows:

General product information:

The dosing controller type DC155 evaluates signals from a flow meter as part of a dosing device for dosing off liquids and controls the dosing valves accordingly. The DC155 consists of an aluminium housing with polyester front foil into which the intrinsically safe electronics are mounted.
The electronics and all inputs and outputs of the DC155 are intrinsically safe.
The dosing controller is suitable for use in the following ambient temperature range:

Temperature class T6:	-20 °C up to +40 °C
Temperature class T4:	-20 °C up to +70 °C

Model type code
See Annex

Ratings
See Annex

SPECIFIC CONDITIONS OF USE: NO

Annex:

BVS_18_0031_Gönnheimer_Annex_1.pdf