

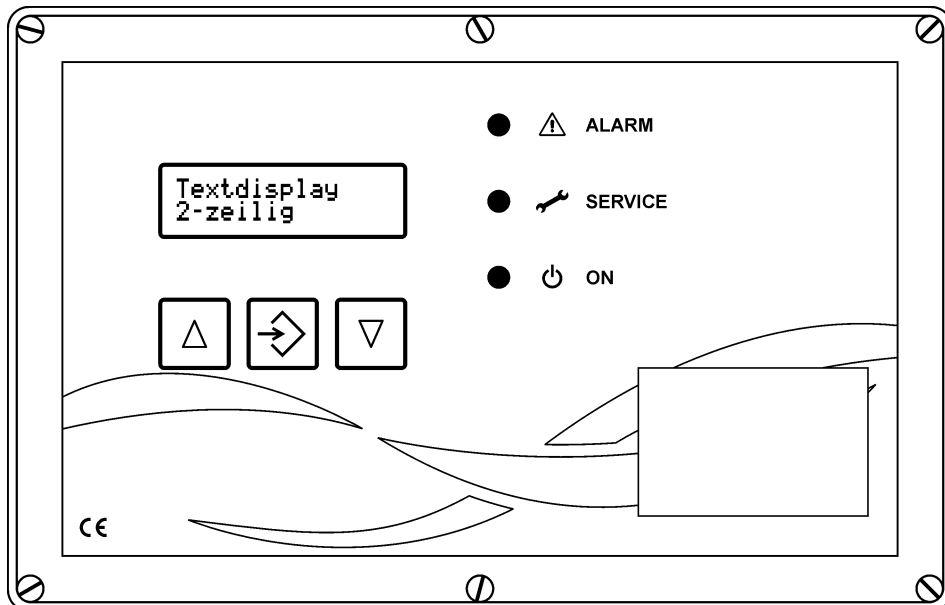
# Operating and Installation Instructions

Filter control system

## RM-216 C

### EasyLine

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## Regulations

VDE 0160

EN 60.439 Part 500

EN 50178

2004/108 EC

## Legend



Important note



Important warning

## 1 Safety instructions

The filter control system RM-216 C when connected to the mains poses an electrical hazard. Device failure, serious or even fatal injuries may occur as a result of improper installation of the connected equipment. Consequently, follow in particular the points set out below in addition to the general safety regulations for equipment in industrial electrical installations:

- Installation of the device may be carried out only by qualified experts, in accordance with the provisions of IEC 364, DIN VDE 0105 for electrical equipment.
- All applicable laws, conditions, orders and regulations governing the setting up of electrical equipment must be observed with respect to the installation site.
- Setting of equipment with degree of protection IP00 without covers, may only be performed by authorized expert staff, when disconnected, and whilst observing the local safety and accident prevention regulations.

The RM-216 C may only be operated in the permitted operating area.



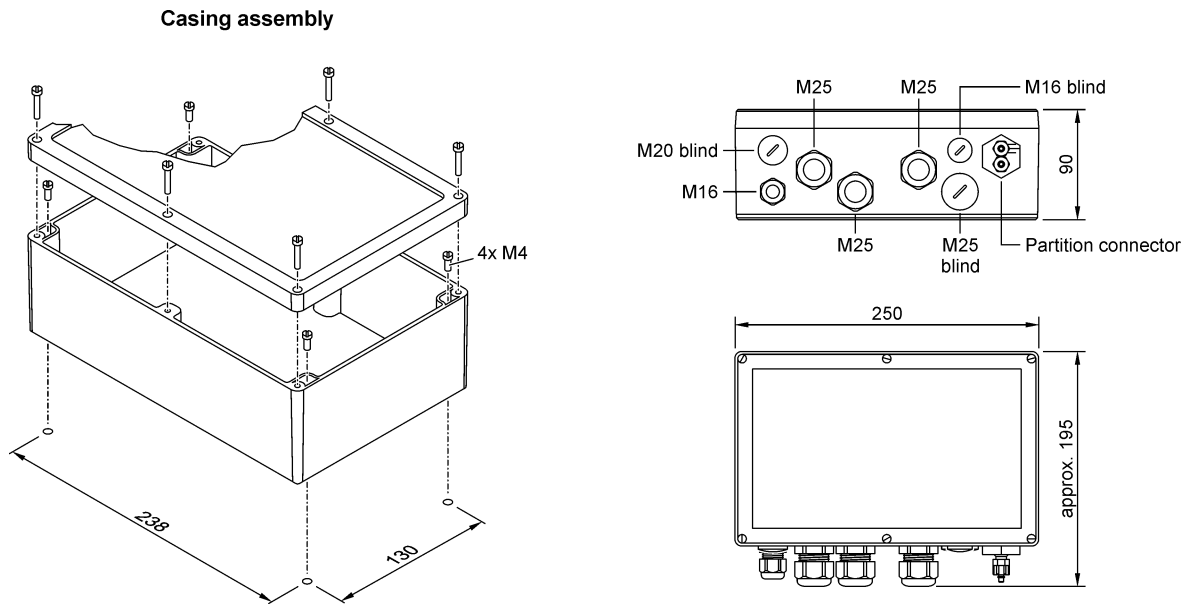
Switch off the mains supply before replacing the filter control or any components connected to it. Otherwise the equipment may be damaged.

## 2 Equipment specification

The RM-216 C is used to control 24 V DC solenoid valves on filtering separators with compressed air pulse cleaning. After connecting the supply voltage, the filter control system functions fully automatically without further activation. With  $\Delta p$  mode switched on, the current differential pressure of the filter system is displayed on the text display. The cleaning is carried out depending on the differential pressure. The filter can be monitored via a  $\Delta p$  alarm switch point ( $\Delta p$  alarm).

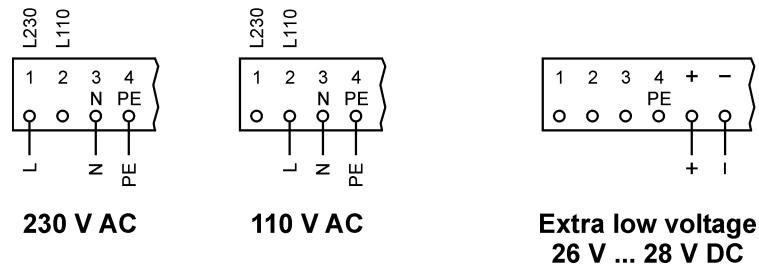
The full scale output for the measured differential pressure can be set by the parameter 15 "dP range". The analog output signal is automatically adjusted to the set full scale output.

### 3 Assembly



### 4 "Step by step" installation

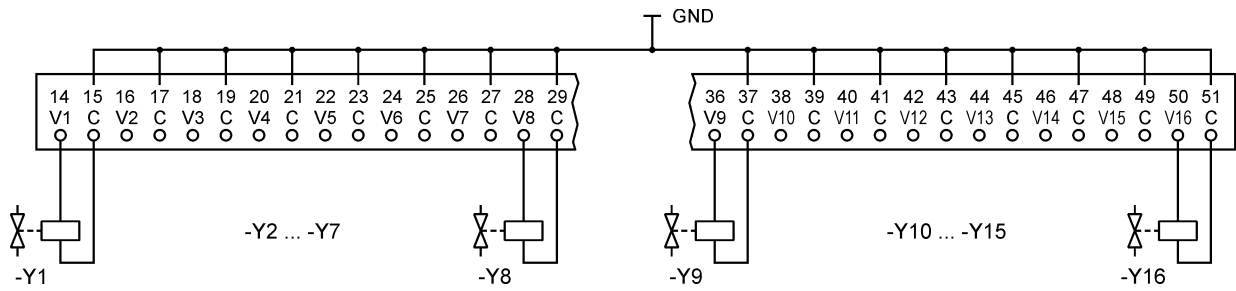
#### 1 Supply voltage connection



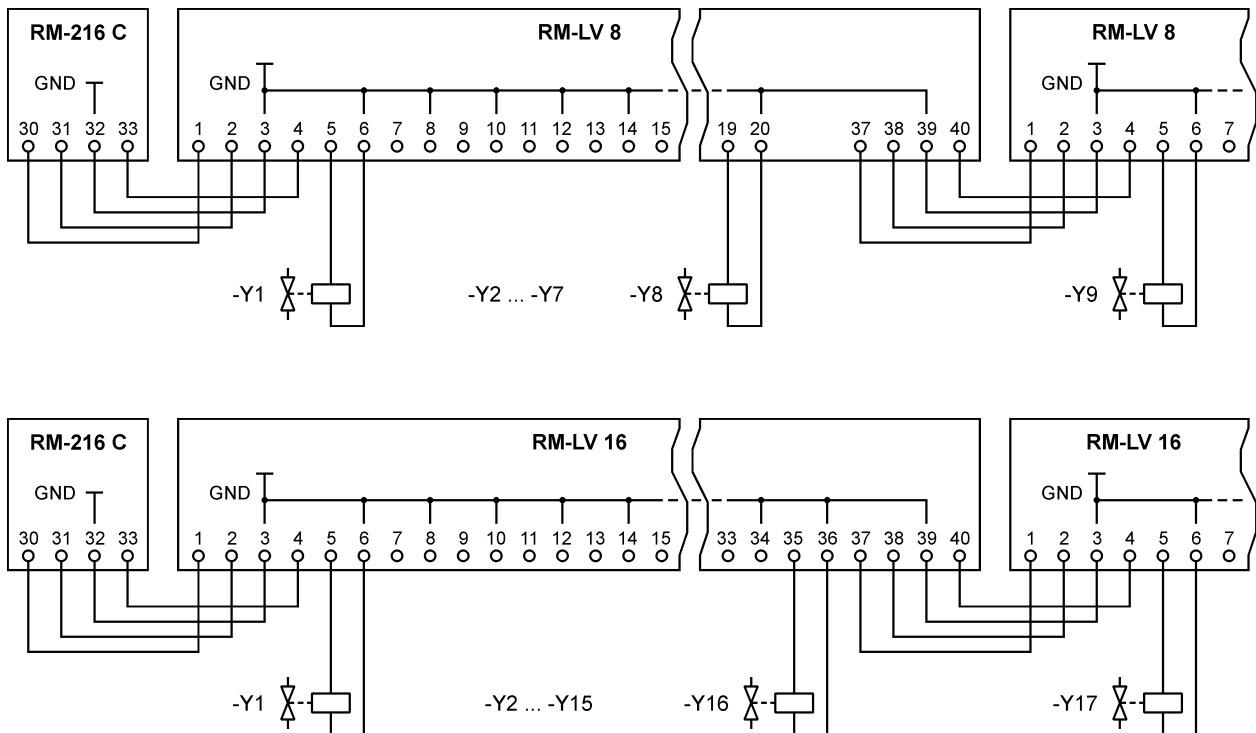
**i** A separate power supply unit is recommended for the operation of the filter controller with extra low voltage.

The unit can be operated with a supply voltage of 24 V DC, if no expansion modules are connected and if the electric cables (minimum cross-section: 0.75 mm<sup>2</sup>) to the solenoid valves are shorter than 10 meters long.

## 2 Solenoid valve connection



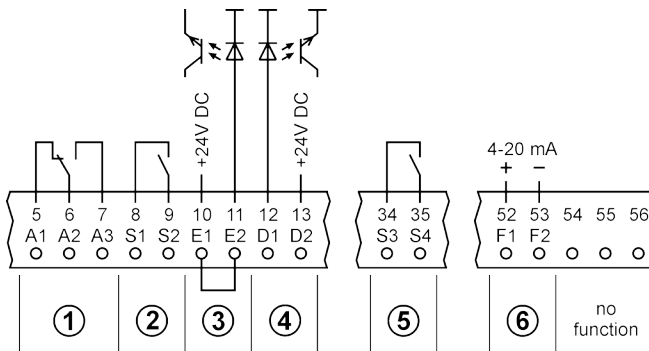
## 3 Connection of expansion modules RM-LV8 / RM-LV16



**i**

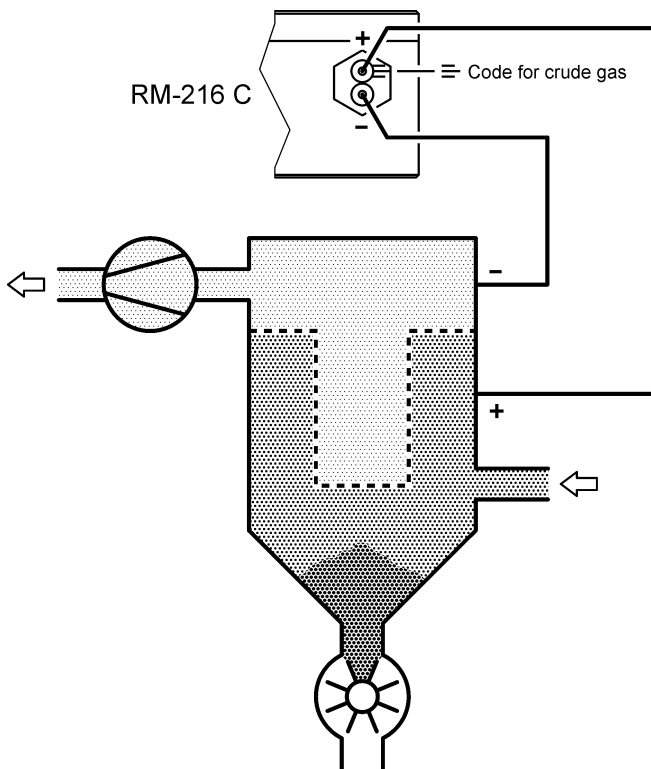
- Use shielded cable for all bus lines! The shielding must be connected unilaterally to the protective earthing (PE).
- Signal cables must not be laid parallel to power cables.
- Tighten all cable glands in use so the cables are properly enclosed and water cannot penetrate.
- Cable glands that are not in use must be closed or replaced by blind plugs.

## 4 Other connections



- ① "Common alarm" relay output
- ② Output to control an extractor element contactor
- ③ Down-time cleaning input (factory bridged)
- ④ Start/stop input (external  $\Delta p$ -switch)
- ⑤ Relay output " $\Delta p$  MAX-Alarm"
- ⑥ Connections for  $\Delta p$  remote display (4-20-mA signal)

## 5 Connecting differential pressure measurement cables



**i**

- Use hoses with 4 mm inner and 6 mm outer diameters.
- Connect the connection marked with 3 lines (black screw cap) to the crude gas side and the other connection (blue screw cap) to the pure gas side of the filter.

## 5 “Step by step” settings

### 5.1 Function when shipped

The down time cleaning input E1, E2 (terminals 10, 11) is bridged at the factory. The cleaning starts when the differential pressure  $\Delta p$  for the filter has reached the value  $\Delta p$ -MAX (factory setting: 1300 Pa). The solenoid valves are triggered in sequence. The RM-216 C automatically detects how many valves are connected. The cleaning process means that the differential pressure drops after a time. Cleaning stops when the differential pressure reaches the value  $\Delta p$ -MIN (factory setting: 700 Pa).

If another function is required or if additional functions are to be activated, the parameter setting of the RM-216 C must be changed. See also section 5.2.

### 5.2 Setting parameters

To set or check the parameters, proceed as follows:

- 1 Use the parameter list in section 5.3 to search for the parameters you want to change or check. On the RM-216 C, press buttons  $\blacktriangle$  and  $\blacktriangle$  simultaneously, for at least 3 seconds. The program then changes from operation mode to parameter selection mode. The parameter P00 “ $\Delta p$ -MIN” is displayed on the text display at its set value.
- 2 Press the  $\blacktriangle$  button to call up all following parameters P01 ... P20 in sequence. The parameters already displayed can be accessed by repeatedly pressing the  $\blacktriangledown$  button.
- 3 To change the value of a displayed parameter, press the ENTER button for at least one second. The program then changes from parameter selection mode to parameter setting mode.
- 4 Press the  $\blacktriangle$  button to increase the parameter value displayed in increments. Press the  $\blacktriangledown$  button to decrease the parameter value displayed.
- 5 Press the ENTER button for at least 3 seconds. The new parameter value is stored. The text display will briefly display the message “Store”. The program automatically returns to the parameter selection mode. You can now call up other parameters and check or change their values.
- 6 So that the program changes from parameter selection mode to operation mode, press buttons  $\blacktriangle$  and  $\blacktriangle$  simultaneously for at least 3 seconds.

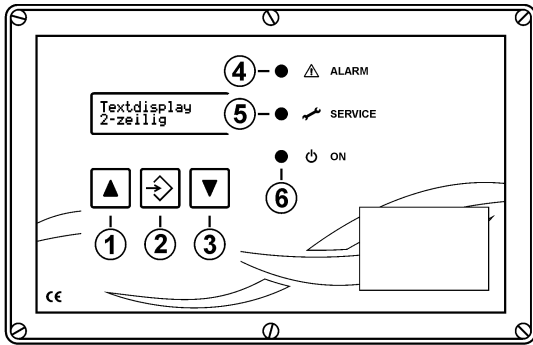
If the program is still in parameter setting mode, follow the instructions given under point 5.

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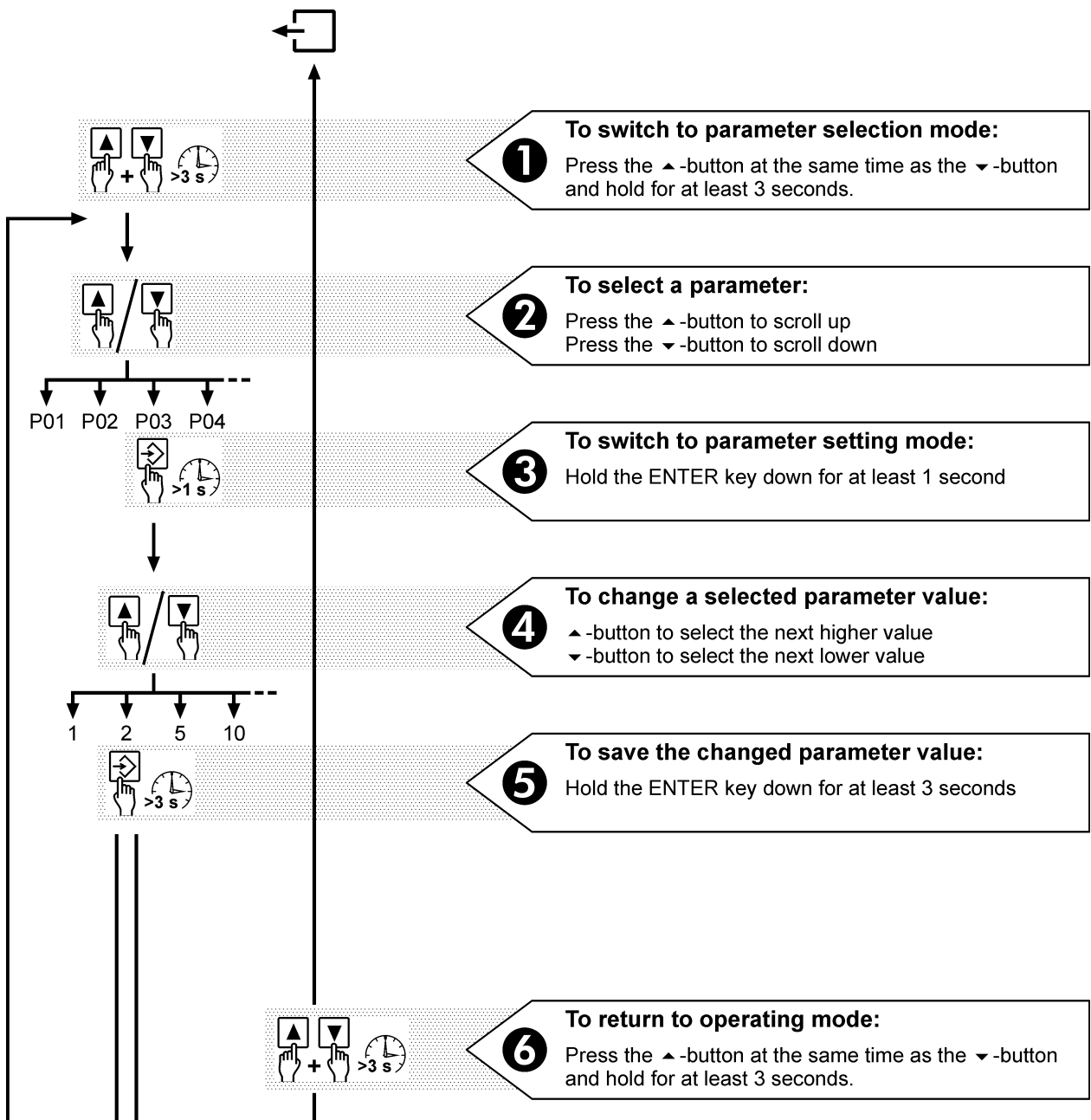
The symbols shown on the right will be shown in the lower left-hand corner of the text display. They indicate to the operator which mode the equipment is currently in.

+ - Operation mode  
 +^ - Parameter selection mode  
 +>- Parameter setting mode

If no buttons are pressed for 4 minutes, the RM-216 C automatically returns from parameter selection mode or parameter setting mode to operation mode with the last values stored.



- ① ▲-button for selecting parameters or values (ascending)
- ② ENTER button for entering selected values
- ③ ▼-button for selecting parameters or values (descending)
- ④ LED "ALARM" is on when there is an alarm message (alarm relay pressed)
- ⑤ LED "SERVICE" is on when filter maintenance work is due
- ⑥ LED "ON" is on when the machine is in operation





### 5.3 Parameter list

Parameter no.	Text on the display	Explanation	Factory settings	Setting range
<b>P00</b>	Delta-P Min	$\Delta p$ -MIN	700 Pa	260 ... 4000 Pa
<b>P01</b>	Delta-P Max	$\Delta p$ -MAX	1300 Pa	280 ... 4400 Pa
<b>P02</b>	Delta-P Alarm	$\Delta p$ -Alarm	2300 Pa	300 ... 5000 Pa
<b>P03</b>	Pulse Time	Pulse time	60 ms	30 ... 300 ms
<b>P04</b>	Interval Time	Interval time	10 s	4 ... 500 s
<b>P05</b>	DTC.Interv.Time	Down time interval time	6 s	2 ... 100 s
<b>P06</b>	Total Valve no.	Total no. of valves <sup>1</sup>	0	0 ... 128
<b>P07</b>	DTC Down Time Cy	Down time cleaning cycles	6	0 ... 32
<b>P08</b>	Delta-P DTC Max	Parameter to activate down time (DTC modes 2 and 3)	1000 Pa	280 ... 4000 Pa
<b>P09</b>	Delta P DTC Min	Parameter to activate down time (DTC mode 3)	260 Pa	260 ... 2000 Pa
<b>P10</b>	Hours in operati	Operating hours	–	0 ... 250000 h
<b>P11</b>	Text Language	Language for the display text	D	D, GB, F, I, NL, DK, FIN, PL
<b>P12</b>	DP-Display Range	Unit of displayed $\Delta p$ values	Pa	Pa, mbar, Inch WC, mm WG
<b>P13</b>	DTC Cleaning Mod	Down time cleaning mode (DTC-mode)	2	1 ... 3
<b>P14</b>	Test Mode	0 = Test mode off 1 = Valve test 2 = Input test 3-7 = For manufacturer purposes only	Off (0)	0 ... 7
<b>P15</b>	dP range	$\Delta p$ range	0 ... 5000 Pa	0 ... 1000 Pa to 0 ... 5000 Pa <sup>2</sup>
<b>P16</b>	Servic.Run Hours	Service operating hours	–	–
<b>P17</b>	Ser.Run Hours AL	Service operating hours alarm	0 h <sup>3</sup>	0 ... 25000 h <sup>3</sup>
<b>P18</b>	Ser.Run Hou.Code	Service operating hours code	0	–
<b>P19</b>	DP-Mode	Differential pressure mode	On	On / Off
<b>P20</b>	Setting Lock	Parameter setting lock	On	On / Off

<sup>1</sup> Number of all valves connected to the RM-216 C and to the expansion modules. The parameter is used by the equipment for internal monitoring purposes and need only be set, if expansion modules are fitted. If the equipment detects that the total number of valves set is different from the actual number of valves controlled, an alarm message is issued.

<sup>2</sup> The  $\Delta p$  measuring range of the 4-20 mA signal output 52, 53 is configurable from 0 ... 1000 Pa to 0 ... 5000 Pa in 500 Pa increments.

<sup>3</sup> If the parameter is set to the value 0 h, the alarm is switched off.

**i** The parameters P03, P06, P07, P08, P09, P13 and P18 are protected by a setting lock at the factory. If the values need to be changed, the parameter P20 "Setting lock" Must be set to the value "Off".

The parameters P10, P16 and P17 are only displayed, if the service operating hours code (parameter P18) has been entered.

## 6 Operating modes

### 6.1 Test mode

In test mode, the most important functions in the control sequence are checked and shown on the text display. To start test mode, call up parameter no. P14 "Test mode" (see section 5.2 for more information) and select one of the following test modes:

#### Test mode 1 (Valve test)

Each connected valve is activated in sequence and shown in the text display.

#### Test mode 2 (Input test)

The signal statuses of the inputs are displayed on the text display.

#### Test modes 3-7

For manufacturer purposes only.

#### Test mode 0 (test mode off)

Test mode is switched off.

### 6.2 $\Delta p$ -Mode (differential pressure controlled cleaning)

There are two options for switching the differential pressure controlled cleaning on the RM-216 C on and off:

- By setting the parameter P19 "DP-Mode" to the value "On" or "Off"
- By pressing the ENTER button for around 3 seconds



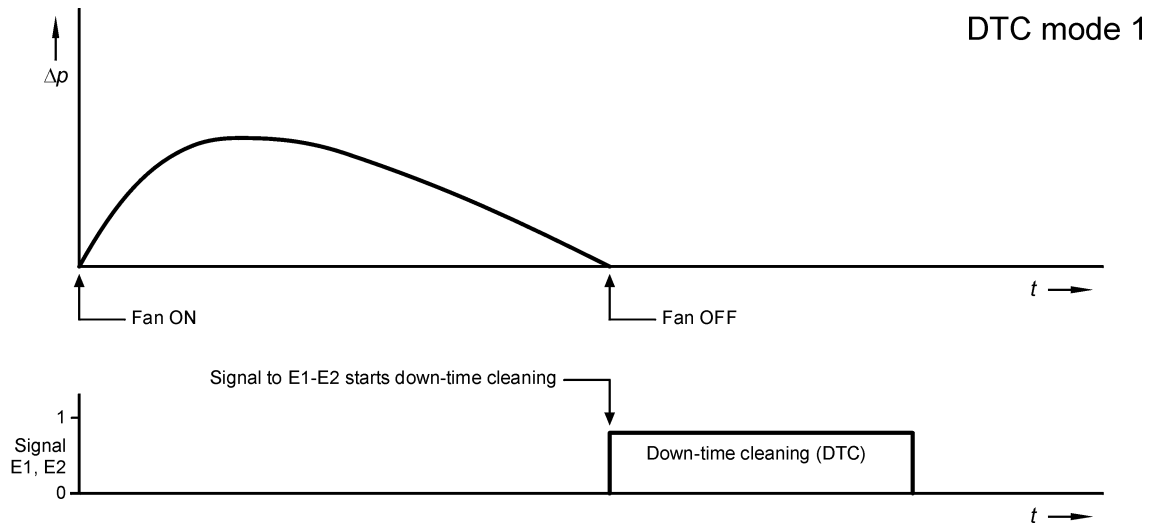
If differential pressure-controlled cleaning is switched off, the text "DP-Mode Off" is shown on the display.

### 6.3 Down time cleaning modes

Down time cleaning is activated differently depending on the mode selected. Down time cleaning modes 1, 2 and 3 (abbreviated below as DTC modes 1, 2 and 3; Down-Time-Cleaning mode) are available:

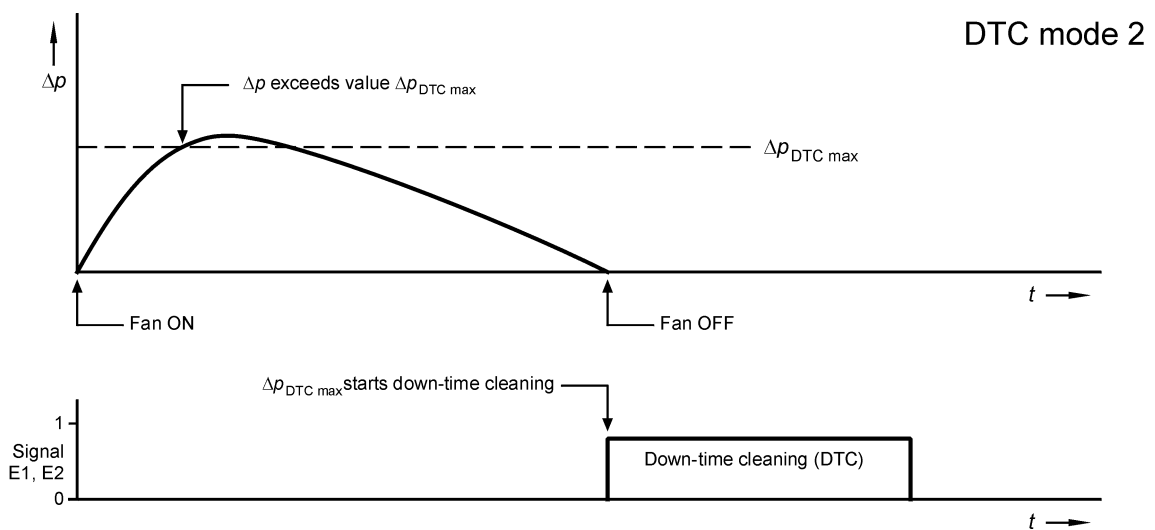
**DTC mode 1**

The down time cleaning is started via the contact connected on input E1 and E2. If the fan is switched off, the contact on E1, E2 must open.



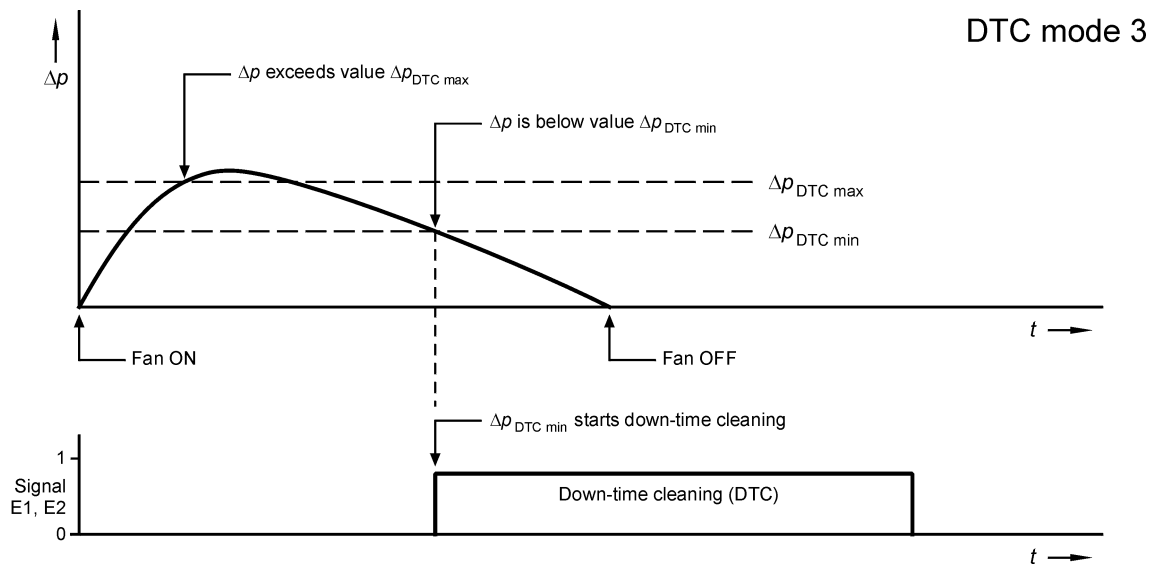
**DTC mode 2**

The down time cleaning is only started via the contact connected to input E1 and E2 if the differential pressure has exceeded the value  $\Delta p_{DTC\ max}$  during operation. If the fan is switched off, the contact on E1, E2 must open.



### DTC mode 3

The down time cleaning is started when the differential pressure falls below the value  $\Delta p$  DTC min, after the value  $\Delta p$  DTC max has first been exceeded. The signal on input E1, E2 is ignored.



#### 6.4 Cleaning via start/stop input (external $\Delta p$ switch)

If the cleaning is controlled via an external  $\Delta p$  switch, the isolated contact on the  $\Delta p$  switch must be connected to the start/stop input D1, D2 (terminals 12, 13). The function of the RM-216 C is given in the following table.

**If the setting is “ $\Delta p$  mode OFF”**

Contact (input D1, D2)	Cleaning
open	ON
closed	OFF

**If the setting is “ $\Delta p$  mode ON”**

Contact (input D1, D2)	Differential pressure $\Delta p$	Cleaning
open	$\Delta p > \Delta p\ MAX$	ON
closed	$\Delta p > \Delta p\ MAX$	OFF
open	$\Delta p < \Delta p\ MIN$	OFF
closed	$\Delta p < \Delta p\ MIN$	ON



During down-time cleaning, the start/stop input D1, D2 is inactive.

## 7 Troubleshooting

<b>Error</b>	<b>Possible causes</b>	<b>Recommended action</b>
The "ON" LED is not lit and input E1, E2 is bridged.	- No mains voltage	- Check power feed
	- Device fuse is defective	- Replace fuse
	- EMERGENCY STOP activated	- Check EMERGENCY STOP
No valve activity	- No control system release	- Bridge input E1, E2
	- Wiring to valves interrupted	- Check cables and electrical connections
	- Magnet coil faulty	- Replace coil
	- Cycle interrupted	- Check hose connections. Set different values for $\Delta p$ control
No down time cleaning	- Parameter P07 = 0 (down time cleaning cycles)	- Set parameter P07 "Down time cleaning cycles" to a different value
	- There is no signal from the valve controller (DTC modes 1-2)	- Activate signal to input I1, I2
Cleaning ineffective	- Interval time too long	- Set parameter P04 "Interval time" to a lower value
	- Pressure too low	- Set pressure to 6 ... 8 bar (min. 5 bar) - Set parameter P04 "Interval time" to a higher value
	- Valve faulty	- Check / replace valves
	- Pulse time too short	- Set parameter P03 "Pulse time" to a higher value
	- Cycle often interrupted	- Check differential pressure monitor and hose connections
Differential pressure display error	- Hose connection error	- Drain hoses. Clean joints between hose connections and the filter casing with compressed air (only towards the filter, never towards the sensor) - Fit the hoses so there are no kinks - Check the hose connections for water, kinks, etc.
"Alarm" LED on	- The number of valves is set incorrectly	- Set parameter P06 "Total no. of valves" correctly
	- $\Delta p$ -Alarm	- Observe the service instructions for the filter

## 8 Text messages on the display

Display	Explanation
<div style="border: 1px solid black; padding: 2px;">           Reset RM200VXX            + - XXXX Pa         </div>	Reset status, text version and differential pressure.  The text message is displayed for approx. 1 second after the voltage is switched on.
<div style="border: 1px solid black; padding: 2px;">           Stand By            + - XXXX Pa         </div>	Controller is not enabled through inputs I1 and I2.
<div style="border: 1px solid black; padding: 2px;">           Cleaning Off            + - XXXX Pa         </div>	Controller is enabled through inputs I1 and I2. The Max $\Delta p$ switching point has not yet been reached.
<div style="border: 1px solid black; padding: 2px;">           Cleaning On            + - XXXX Pa         </div>	Controller is enabled through inputs I1 and I2 and the Max $\Delta p$ switching point has been exceeded.
<div style="border: 1px solid black; padding: 2px;">           Cleaning On            + - XXXX Pa         </div> <p>alternating with</p> <div style="border: 1px solid black; padding: 2px;">           DP-Max Alarm            + - XXXX Pa         </div>	Controller is enabled through inputs I1 and I2 and the $\Delta p$ alarm switching point has been exceeded.
<div style="border: 1px solid black; padding: 2px;">           Extern Clean ON            + - XXXX Pa         </div>	Controller is enabled through inputs I1 and I2 and the Max $\Delta p$ switching point has not yet been reached with inputs D1 and D2 bridged.
<div style="border: 1px solid black; padding: 2px;">           Extern Clean OFF            + - XXXX Pa         </div>	Controller is enabled through inputs I1 and I2 and the Max $\Delta p$ switching point has been exceeded with inputs D1 and D2 bridged.
<div style="border: 1px solid black; padding: 2px;">           DP-Mode Off            + - XXXX Pa         </div>	$\Delta p$ mode switched off
<div style="border: 1px solid black; padding: 2px;">           DTC Cleaning ON            + - 000 Pcs         </div>	Down time cleaning active
<div style="border: 1px solid black; padding: 2px;">           Call Service            + - XXXX Pa         </div>	The alarm switching point for the service hours counter has been exceeded.
<div style="border: 1px solid black; padding: 2px;">           RM-LVX Alarm            + - XXXX Pa         </div>	A connected I/O module RM-LV8 or RM-LV16 is out of order or the total number of valves (parameter P06) is set incorrectly.
<div style="border: 1px solid black; padding: 2px;">           Lock         </div>	Locked parameter in parameter selection mode

XXXX The differential pressure value displayed depends on the parameter setting.

## 9 Details on the equipment function

### Differential pressure controlled cleaning

The cleaning is controlled by means of two  $\Delta p$  switch points which can be set independently of one another. It starts when the value  $\Delta p$ -MAX is reached. All connected solenoid valves are controlled using the preset values for the pulse time and the interval time, starting with the interval time. If the differential pressure reaches the value  $\Delta p$ -MIN, cleaning stops. To monitor the filter, a  $\Delta p$  alarm switch point ( $\Delta p$  alarm) can be set.

Cleaning starts at the first valve. If cleaning is interrupted using the  $\Delta p$  controller or the start/stop input D1, D2, the controller sequence is continued with the next cleaning process. The cleaning then starts at the valve following the last valve activated.

If the control is reactivated following a mains voltage failure, a restart is carried out.

### Input E1, E2 “Down time cleaning” (terminals 10, 11)

If the control is working in DTC mode 1 or DTC mode 2 (Down-Time-Cleaning mode. See also section 6.3), the control must be switched on and off via input E1, E2. The input should be operated in isolation. Ideally, the auxiliary contact of the fan contactor should be connected here.

- Closing the contact on input E1, E2 switches on the control unit.
- In DTC mode 1, opening the contact on input E1, E2 executes the down time cleaning cycles and then switches the device off. In DTC mode 2, the same function is only carried out if differential pressure exceeded the value  $\Delta p$  DTC max during the last operating period.
- In DTC mode 3, the down-time cleaning cycles are activated if differential pressure exceeded the value  $\Delta p$  DTC max during the last operating period and then fell below the value  $\Delta p$  DTC min.

### Relay output S1, S2 to control extractor elements (terminals 8, 9)

If automatic components for dust removal (extractor elements) are fitted, these need to be in operation during cleaning and during down time cleaning. Connect the cut-out for controlling these drive units to the isolated output S1, S2.

### “Alarm” relay output A1, A2, A3 (terminals 5, 6, 7)

As soon as the supply voltage is present on the RM-216 C, relay contact A1, A2 closes (terminals 5, 6) and contact A2, A3 opens (terminals 6, 7). In the following situations, relay contact A1, A2 opens and contact A2, A3 closes:

- Supply voltage failure
- Failure of a voltage internal to the equipment
- Fault in a connected I/O module
- Total number of valves is set incorrectly (parameter P06)
- The  $\Delta p$  alarm switching point has been exceeded.

## 10 Glossary

Term	Explanation
Bulkhead connector	Connections for fitting the differential pressure measurement hoses.
Cleaning	Cleaning the filter elements using compressed air pulses.
Compressed air pulse cleaning	Cleaning of the filter elements using compressed air pulses.
Differential pressure	Difference between the air pressures $\Delta p$ on the pure gas side (behind the filter element) and the crude gas side (in front of the filter element) of the filter.
Down time cleaning	Cleaning the filter elements after the system is shut down for a set duration or number of cycles.
Down time cleaning cycles	The number of cleaning cycles performed in the down time cleaning.
Down time cleaning input	Input on the RM-216 C for starting the down time cleaning.
Down time interval time	Pause time during the down time cleaning.
DTC mode	<u>D</u> own <u>T</u> ime <u>C</u> leaning mode The way in which the down time cleaning is started.
Expansion module	If the filter has more than 16 valves, expansion modules of type RM-LV8 (for 8 valves) or RM-LV16 (for 16 valves) are required. A maximum of 7 type RM-LV16 expansion modules can be connected to the main RM-216 C equipment. With the outputs on the main equipment, this makes a maximum of 128 valve outputs available.
Extractor element	Device for extracting the filter casing from the dust deposited. E.g. cellular wheel sluice, through conveyor worm.
Extractor element contactor	Contactors which switch an extractor element drive unit on and off.
I/O module	Input/output module (module for the input and output of control signals)
Operation mode	Status of the RM-216 C in which the equipment is ready for operation.
Parameter selection mode	Status of the RM-216 C in which the equipment operator can select a parameter.
Parameter setting lock	The parameters P03, P06, P07, P08, P09, P13 and P18 are protected by a setting lock at the factory. If the values need to be changed, the parameter P20 "Setting lock" Must be set to the value "Off".
Parameter setting mode	Status of the RM-216 C in which the equipment operator can set a parameter.
Pause time (also Interval time)	Time period between two consecutive control pulses from the valve outputs when the cleaning is running.
Pulse time	Duration of a control pulse on the valve outputs.
Service operating hours alarm	Alarm issued when the operating hours set for the maintenance interval has elapsed.
Service operating hours code	Code which needs to be entered to change the set value for the service operating hours.
Setting lock	See Parameter setting lock



<b>Term</b>	<b>Explanation</b>
Solenoid valve	(also relay valve) electromagnetically operated valve for the pneumatic triggering of the filter membrane valves. The membrane valves in turn release the compressed air strokes for filter cleaning.
Start/stop input	Input on the RM-216 C for starting and stopping the cleaning via an external $\Delta p$ switch.
Total no. of valves	Number of all valves connected to the RM-216 C and to the expansion modules.
$\Delta p$ alarm	Differential pressure value at which an alarm is issued.
$\Delta p$ -MAX	Differential pressure value at which the cleaning is started.
$\Delta p$ -MIN	Differential pressure value at which the cleaning is stopped.
$\Delta p$ mode	Operating mode of the filter control in which the cleaning of the filter elements depends on the differential pressure $\Delta p$ .
$\Delta p$ remote display	Display showing the differential pressure of the filter in a control room.
$\Delta p$ switch	Switch which is triggered by a differential pressure value set and which activates the filter cleaning.

## 11 Technical specifications

Application	Data
Supply voltages	230 V AC $\pm 10\%$ 110 V ... 120 V AC $\pm 10\%$ 26 V ... 28 V DC*
Signal inputs	24 V DC, operate ensuring isolation
Signal output	Relay outputs, max. 2 A, 250 V or 1 A, 30 V DC
Control outputs for valves	For valves with a rated voltage of 24 V DC, can be expanded to 128 outputs, Output power in pulse mode 42 Watt
Outputs for expansion modules	Supply voltage and pulse wires to the expansion modules
Signal output F1, F2	4-20 mA $\hat{=}$ 0 ... x Pa**; resistance 500 $\Omega$
$\Delta p$ measuring range	configurable from 0 ... 1000 Pa to 0 ... 5000 Pa in 500 Pa increments
Measurement sensor	piezoresistant, excessive pressure-safe up to 120 kPa
Fuses	230 V: T 0.4 A, 250 V, 5 x 20 mm 110 V: T 0.8 A, 250 V, 5 x 20 mm Extra low voltage: Fusing via PTC resistor
Temperature range	-20°C to +60°C
Degree of protection	Casing IP-66 / NEMA 4
Dimensions	See chapter 3 "Assembly"
Weight	approx. 0.8 kg
Installation height	max. 3000 m above M.S.L.

\* The unit can be operated with a supply voltage of 24 V DC, if no expansion modules are connected and if the electric cables (minimum cross-section: 0.75 mm<sup>2</sup>) to the solenoid valves are shorter than 10 meters long.

\*\* configured  $\Delta p$  measuring range

### Disclaimer

The contents of this documentation has been verified for correctness and completeness. Nevertheless, errors can not be excluded so that we cannot guarantee the correctness of this information. Subject to alterations at any time.