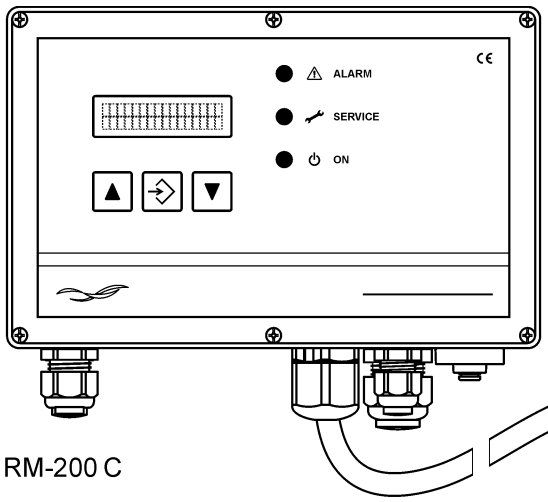
Operating and Installation Instructions

Filter control system

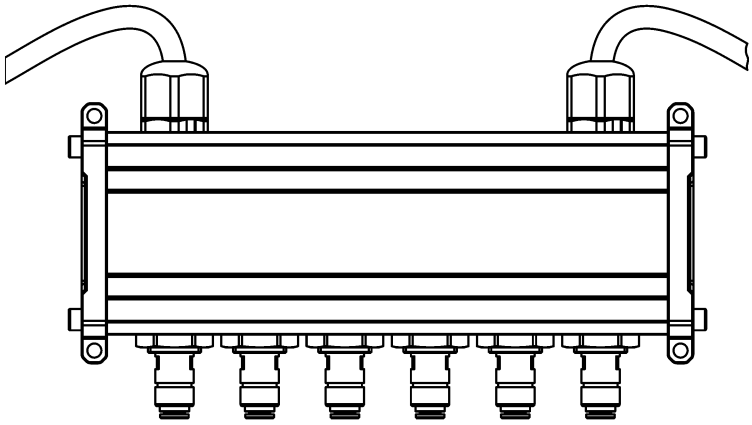
RM-200 C (Master)

Valve module

RM-LV 6/X (Slave)



RM-200 C



RM-LV 6/6

Table of Contents

Regulations

2014/30/EU
2014/35/EU

Legend

Warning against physical and health hazards or damages to the product and other properties.

Important note

1 Safety instructions

The filter control system RM-200 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 in respect of 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-200 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

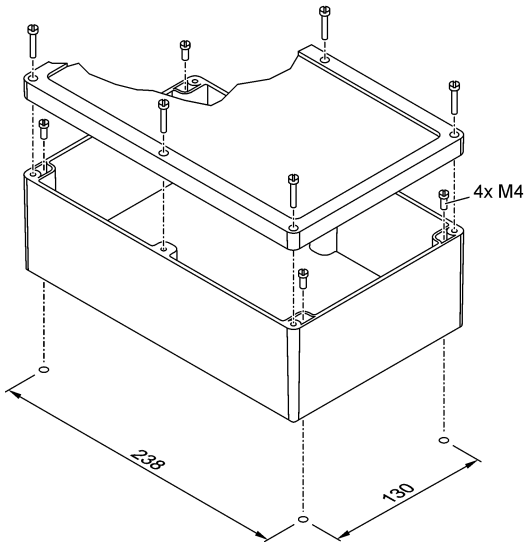
The RM-200 C (master), together with 1-15 RM-LV 6/X valve modules (slave), is used to control 24 V DC solenoid valves on filtering separators with compressed air pulse cleaning. After connecting the supply voltage, the filter control system operates automatically according to the set program sequence. With Δp mode switched on, the current differential pressure of the filter system is displayed on the text display. The cleaning is carried out depending on time or the differential pressure . The filter is monitored via an adjustable Δp alarm switch point (Δp alarm).

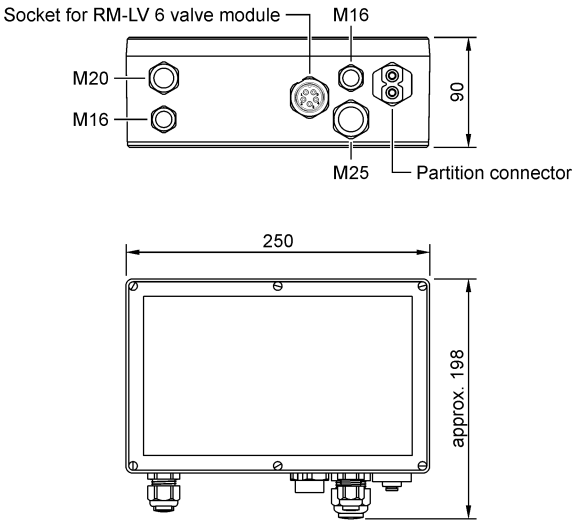
The measuring range of the differential pressure sensor can be set by the parameter 15 "`dP range`". The anlog output signal is automatically adjusted.

3 Assembly

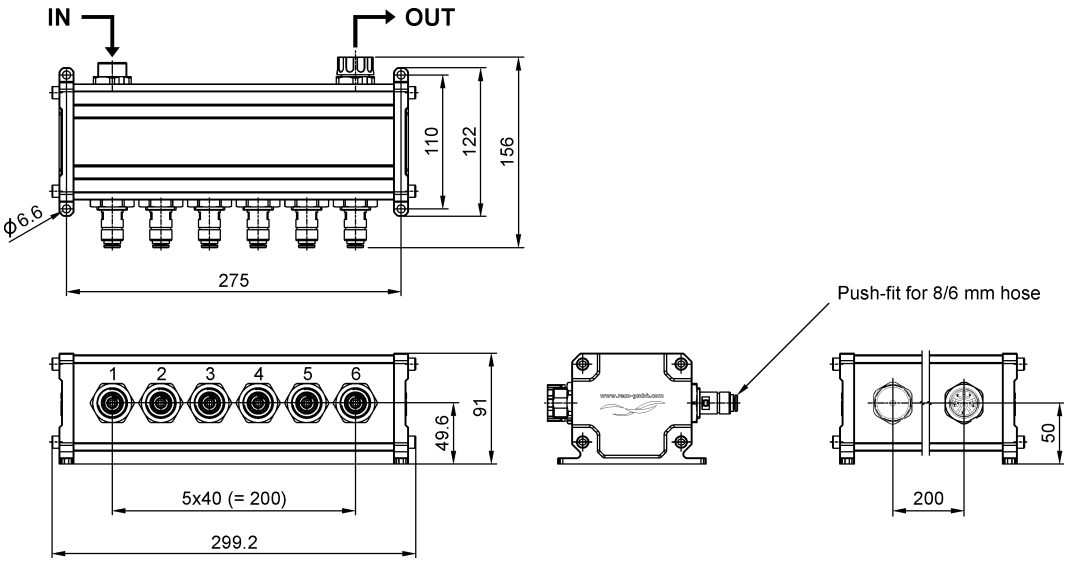
RM-200 C

Casing assembly



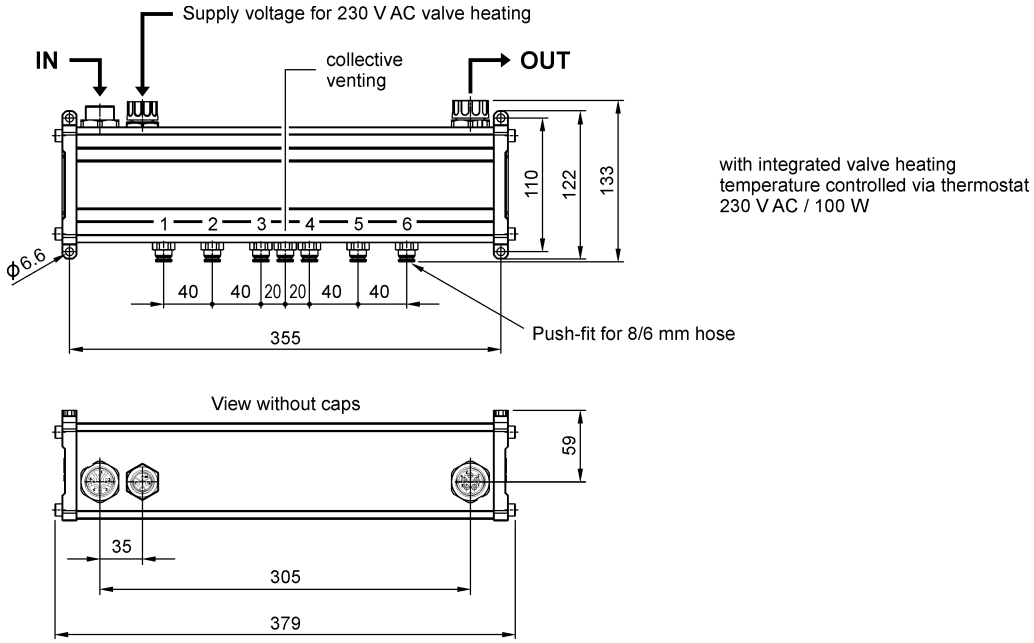


RM-LV 6/6 valve module <u>without</u> valve heating



Versions with 3 / 4 / 5 / 6 solenoid valves

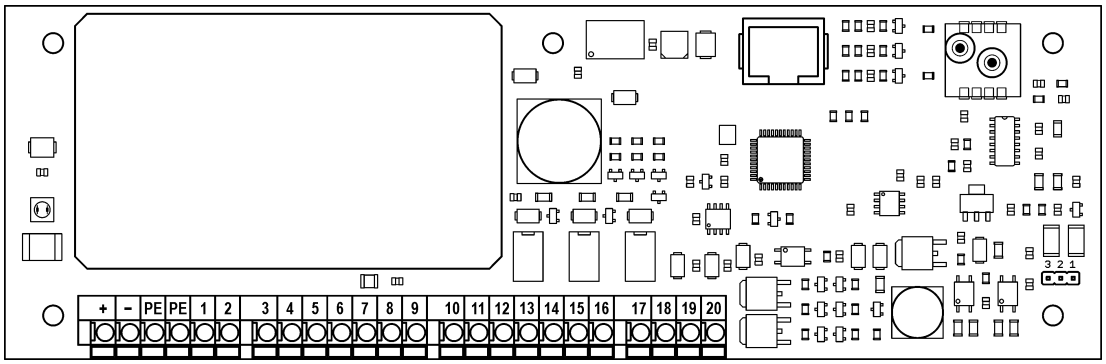
RM-LV 6/6 valve module <u>with</u> valve heating



Versions with 3 / 4 / 5 / 6 solenoid valves

4 Installation

RM-200 C



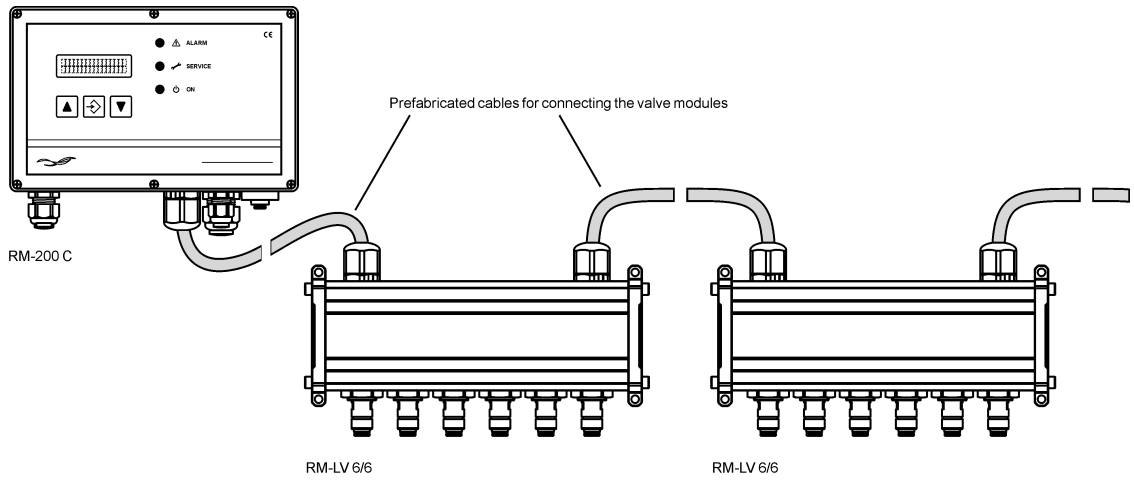
❶ Supply voltage

100 V ... 240 V AC or **24 V DC**

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

24 V DC	1 to 4 RM-LV 6/X valve modules
26 V DC … 28 V DC	1 to 15 RM-LV 6/X valve modules

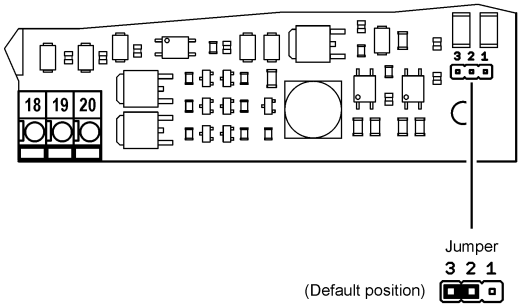
❷ RM-LV 6/X valve module

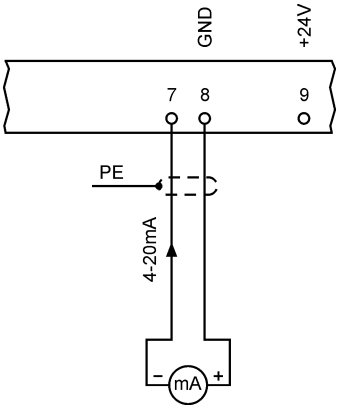


❸ 4-20 mA output / 4-20 mA input

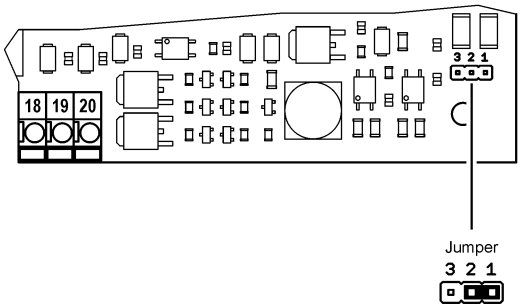
The function depends on the position of the jumper on the board

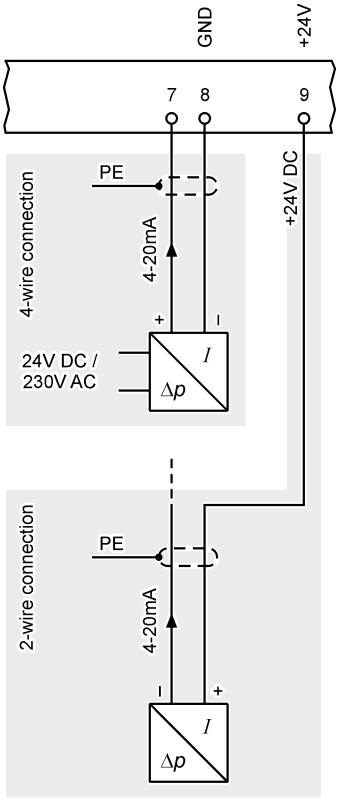
- 4-20 mA output (e.g. for connecting a remote display)



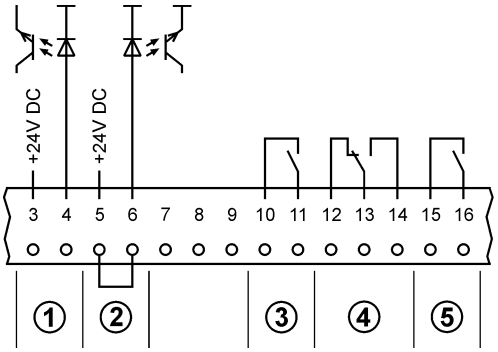


- 4-20 mA input for connecting an external differential pressure transmitter (e.g. the transmitter RM-DPT 5002 of the company RECO)





4 Other connections

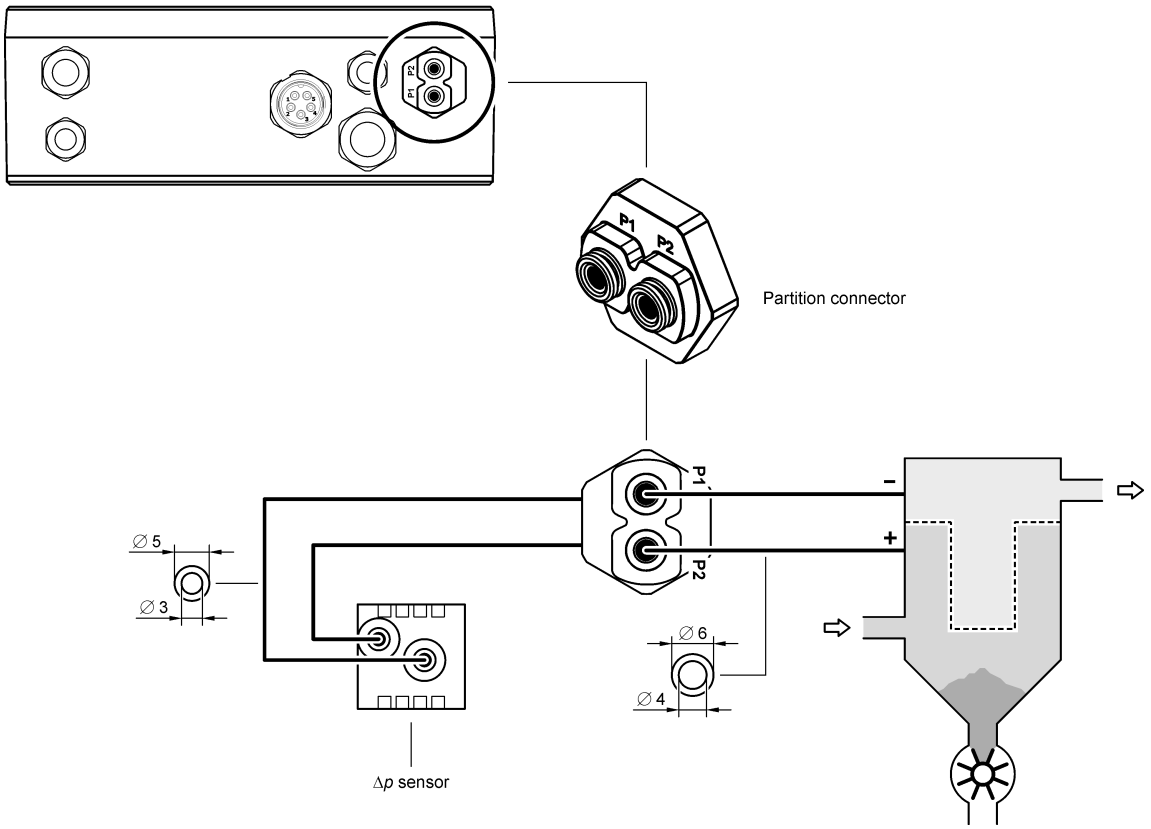


1. Start/stop input (external Δp-switch)
2. Down-time cleaning input (factory bridged)
3. Relay output "Δp MAX-alarm"
4. "Common alarm" relay output
5. Output to control an extractor element contactor

- 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.
- The RM-200 C controller with RM-LV 6/X is supplied with a cable set with plug contacts. It must be ensured that the plug contacts are correctly attached and screwed with the union nut. The plug connection of the last RM-LV 6/X must be closed with a protective cap.

5 Differential pressure measurement cables

RM-200 C



5 Settings

5.1 Function when shipped

The down time cleaning input 13, 14 is bridged at the factory. The cleaning starts when the differential pressure Δp for the filter has reached the value Δp-MAX (factory setting: 700 Pa). The solenoid valves of the connected RM-LV 6/X valve modules are triggered in sequence. The RM-200 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 Δp-MIN (factory setting: 300 Pa).

If another function is required or if additional functions are to be activated, the parameter setting of the RM-200 C must be changed. See also section 5.2.

5.2 Setting parameters

To set or check the parameters, proceed as follows:

❶ Use the parameter list in section 5.3 to search for the parameters you want to change or check. On the RM-200 C, press buttons ▲ and ▲ simultaneously, for at least 3 seconds. The program then changes from operation mode to parameter selection mode. The parameter P00 “DP-MIN” is displayed on the text display at its set value.

❷ Press the ▲ button to call up all following parameters P01 ... P20 in sequence. The parameters already displayed can be accessed by repeatedly pressing the ▼ button.

❸ 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.

❹ Press the ▲ button to increase the parameter value displayed in increments. Press the ▼ button to decrease the parameter value displayed.

❺ 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.

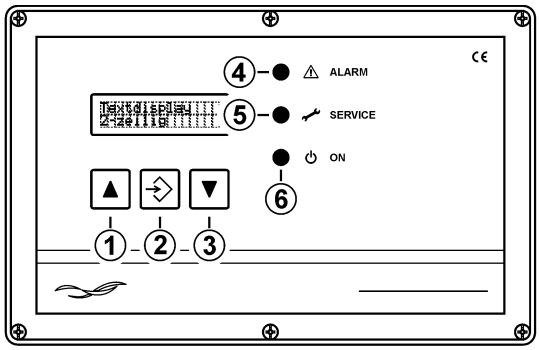
❻ So that the program changes from parameter selection mode to operation mode, press buttons ▲ and ▲ simultaneously for at least 3 seconds.

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

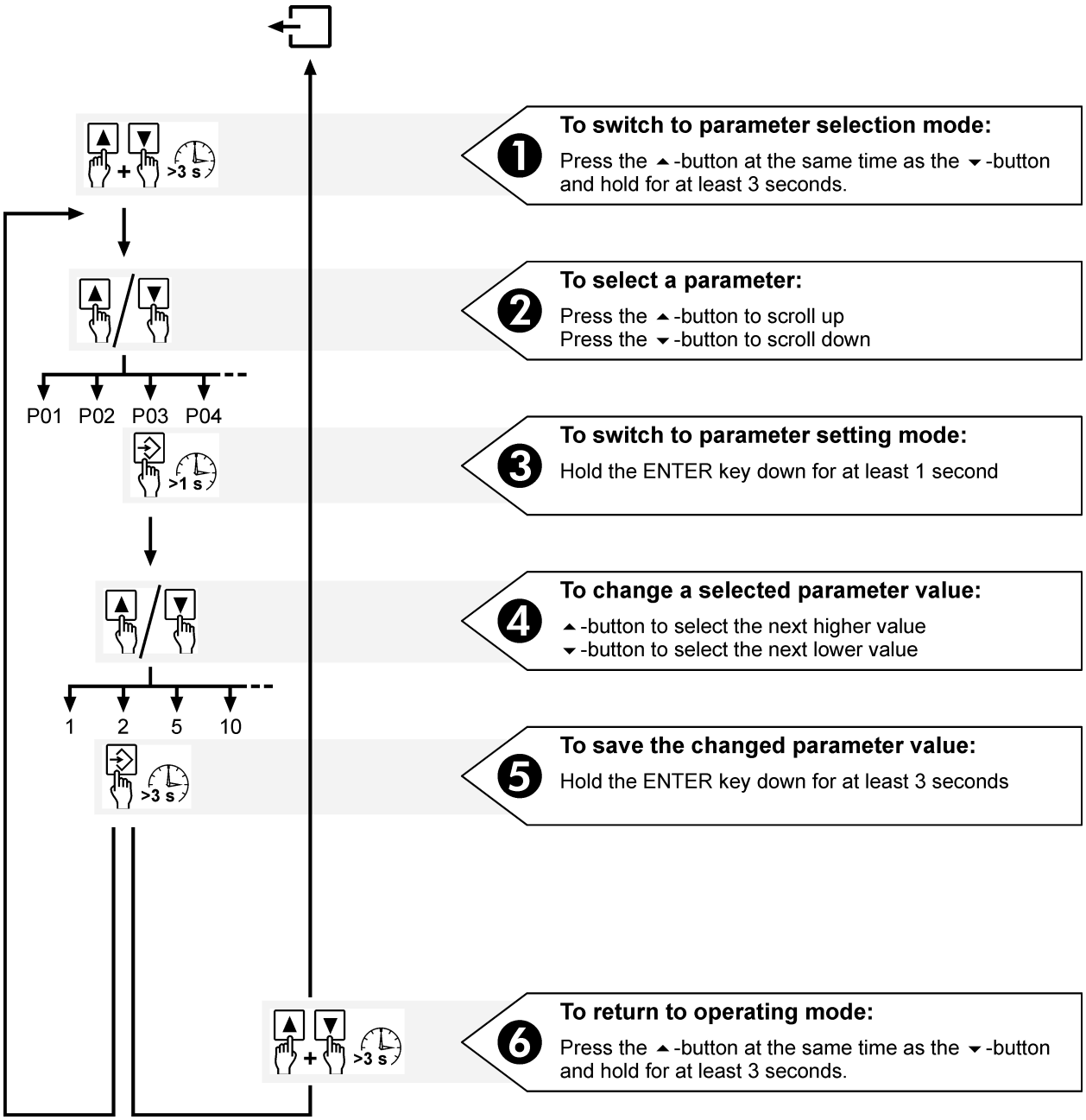
ℹ The symbols shown on the right will be shown in the lower left-hand corner of the text display. They indicate to the operator which mode the equipment is currently in.

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

If no buttons are pressed for 4 minutes, the RM-200 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



1 To switch to parameter selection mode:

Press the ▲-button at the same time as the ▼-button and hold for at least 3 seconds.

2 To select a parameter:

Press the ▲-button to scroll up
Press the ▼-button to scroll down

3 To switch to parameter setting mode:

Hold the ENTER key down for at least 1 second

4 To change a selected parameter value:

▲-button to select the next higher value
▼-button to select the next lower value

5 To save the changed parameter value:

Hold the ENTER key down for at least 3 seconds

6 To return to operating mode:

Press the ▲-button at the same time as the ▼-button and hold for at least 3 seconds.

5.3 Parameter list

No.	Text on the display	Explanation	Factory settings	Setting range
P00	Delta-P Min	∆p-MIN	300 Pa	260 ... 4000 Pa
P01	Delta-P Max	∆p-MAX	700 Pa	280 ... 4400 Pa
P02	Delta-P Alarm	∆p-Alarm	1800 Pa	300 ... 5000 Pa
P03	Pulse Time	Pulse time	60 ms	30 ... 300 ms
P04	Interval Time	Interval time	10 s	4 ... 500 s
P05	DTC.Interv.Time	Down time interval time	6 s	2 ...100 s
P06	Total Valve no.	Total no. of valves*	0	0 ... 90
P07	DTC Down Time Cy	Down time cleaning cycles	6	0 ... 32
P08	Delta-P DTC Max	Parameter to activate down time (DTC modes 2 and 3)	1000 Pa	280 ... 4000 Pa
P09	Delta P DTC Min	Parameter to activate down time (DTC mode 3)	260 Pa	260 ... 2000 Pa
P10	Hours in operati	Operating hours	–	0 ... 250000 h
P11	Text Language	Language for the display text	DE	DE, EN, FR, IT, NL, PL, ES, RU, CS
P12	DP-Display Range	Unit of displayed ∆p values	Pa	Pa, mbar, Inch WC, mm WG
P13	DTC Cleaning Mod	Down time cleaning mode (DTC- mode)	2	1 ... 3
P14	Test Mode	0 = Test mode off 1 = Valve test 2 = Input test 3-7 = For manufacturer only	Off (0)	0 ... 7
P15	dP range	∆p range	0 ... 3000 Pa	0 ... 1000 Pa 0 … 1500 Pa 0 … 2000 Pa 0 … 2500 Pa 0 … 3000 Pa 0 … 3500 Pa 0 … 4000 Pa 0 … 4500 Pa 0 … 5000 Pa
P16	Servic.Run Hours	Service operating hours	–	–
P17	Ser.Run Hours AL	Service operating hours alarm	0 h**	0 ... 25000 h**
P18	Ser.Run Hou.Code	Service operating hours code	0	–
P19	DP-Mode	Differential pressure mode	On	On / Off
P20	Setting Lock	Parameter setting lock	On	On / Off

* Number of all valves connected to the valve modules. The parameter is used by the equipment for internal monitoring purposes. If the equipment detects that the total number of valves set is different from the actual number of valves controlled, an alarm message is prompted.

** If the parameter is set to the value 0 h, the alarm is switched off.

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 valve connected to the valve modules 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 Δp-Mode (differential pressure controlled cleaning)

There are two options for switching the differential pressure controlled cleaning on the RM-200 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

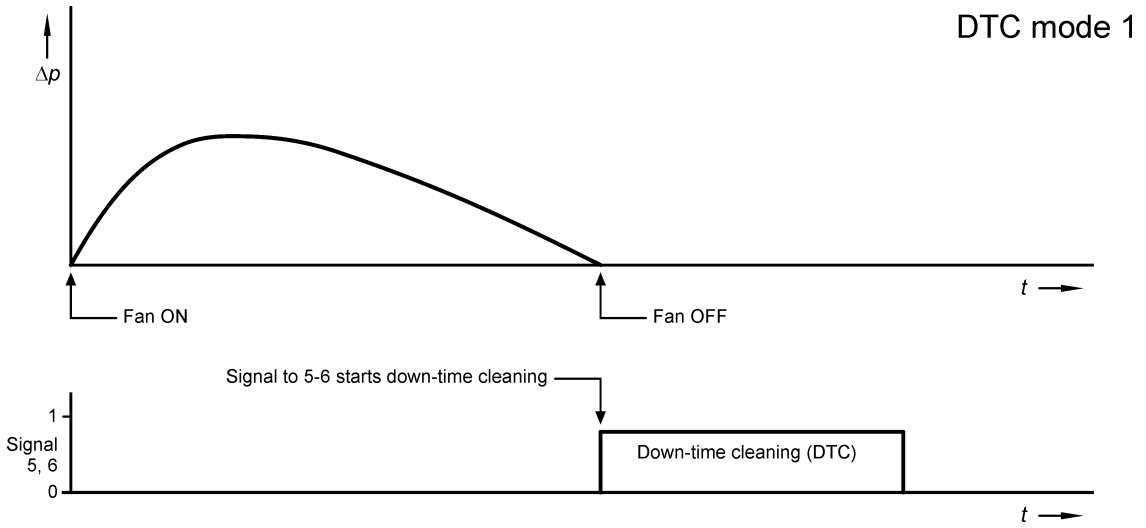
If differential pressure-controlled cleaning is switched off, the text “`DP-Mode Off`” is shown on the display.

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:

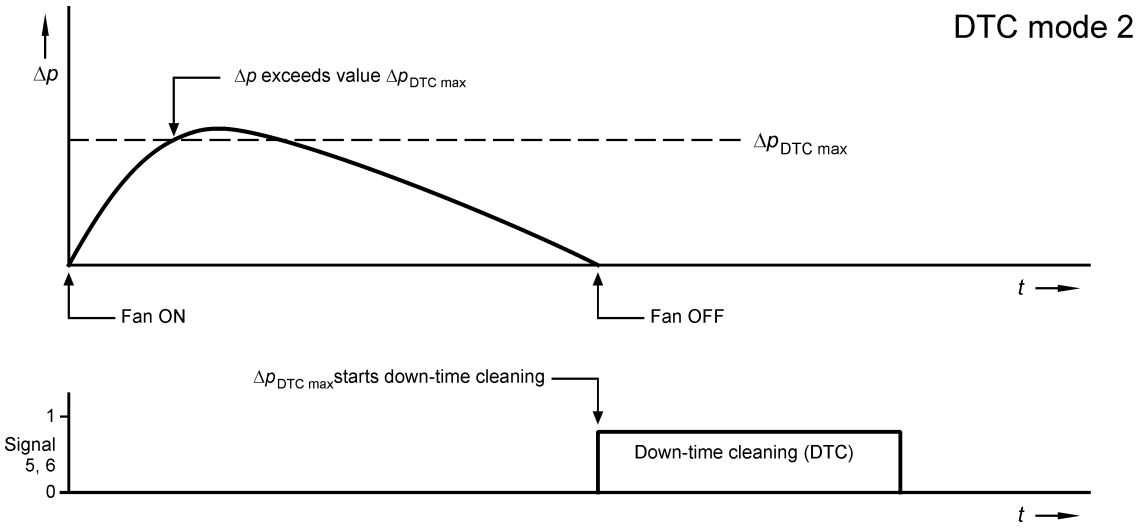
DTC mode 1

The down time cleaning is started via the contact connected on input 5, 6. If the fan is switched off, the contact on 5, 6 must open.



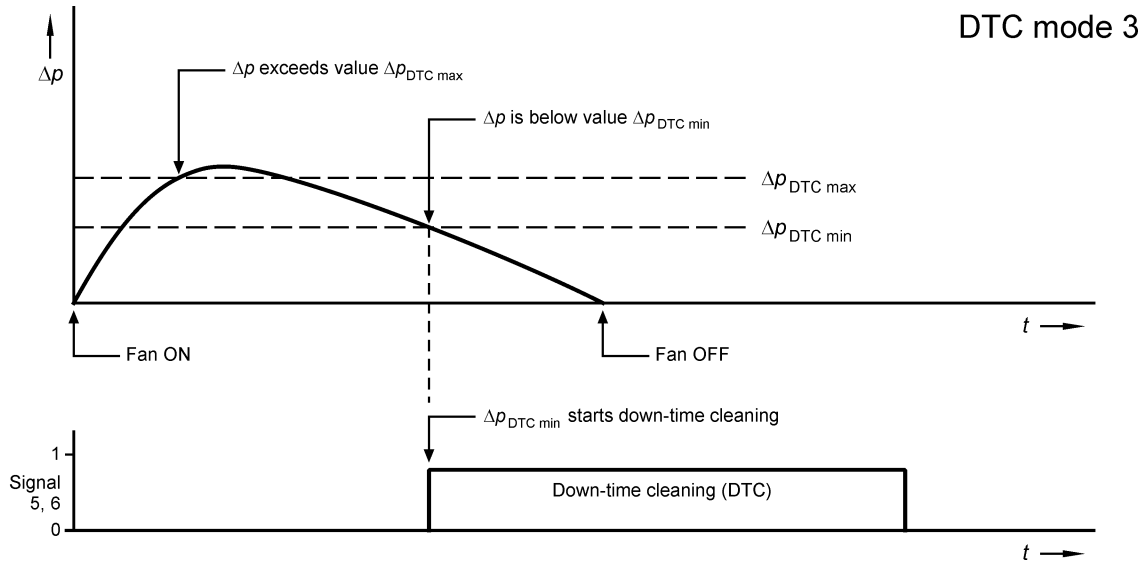
DTC mode 2

The down time cleaning is only started via the contact connected to input 5, 6, if the differential pressure has exceeded the value Δp DTC max during operation. If the fan is switched off, the contact on 5, 6 must open.



DTC mode 3

The down time cleaning is started when the differential pressure falls below the value ∆p DTC min, after the value ∆p DTC max has first been exceeded. The signal on input 5, 6 is ignored.



6.4 Cleaning via start / stop input (external ∆p switch)

If the cleaning is controlled via an external ∆p switch, the isolated contact on the ∆p switch must be connected to the start / stop input 3, 4. The function of the RM-200 C is given in the following table.

If the setting is "∆p mode OFF"

Contact (input 3, 4)	Cleaning
open	ON
closed	OFF

If the setting is "∆p mode ON"

Contact (input 3, 4)	Differential pressure ∆p	Cleaning
open	∆p > ∆p MAX	ON
closed	∆p > ∆p MAX	OFF
open	∆p < ∆p MIN	OFF
closed	∆p < ∆p MIN	ON

During down time cleaning, the start / stop input 3, 4 is inactive.

7 Troubleshooting

Error	Possible causes	Recommended action
The “ON” LED is not lit and input 5, 6 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 5, 6
	Wiring to valves interrupted	Check cables and electrical connections
	Magnet coil faulty	Replace coil
	Cycle interrupted	Check hose connections. Set different values for ∆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 5, 6
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
	∆p-Alarm	Observe the service instructions for the filter

8 Textmeldungen im Display

Display	Explanation
Reset RM200VXX + - XXXX Pa	Reset status, text version and differential pressure The text message is displayed for approx. 1 second after the voltage is switched on.
Stand By + - XXXX Pa	Controller is not enabled through input 5, 6.
Cleaning Off + - XXXX Pa	Controller is enabled through input 5, 6. The Max Δp switching point has not yet been reached.
Cleaning On + - XXXX Pa	Controller is enabled through input 5, 6 and the Max Δp switching point has been exceeded.
Cleaning On + - XXXX Pa alternating with DP-Max Alarm + - XXXX Pa	Controller is enabled through input 5, 6 and the Δp alarm switching point has been exceeded.
Extern Clean ON + - XXXX Pa	Controller is enabled through input 5, 6 and the Max Δp switching point has not yet been reached with input 3, 4 bridged.
Extern Clean OFF + - XXXX Pa	Controller is enabled through input 5, 6 and the Max Δp switching point has been exceeded with input 3, 4 bridged.
DP-Mode Off + - XXXX Pa	Δp mode switched off
DTC Cleaning ON + - 000 Pcs	Down time cleaning active
Call Service + - XXXX Pa	The alarm switching point for the service hours counter has been exceeded.
RM-LVX Alarm + - XXXX Pa	A connected RM-LV 6/X valve module is out of order or the total number of valves (parameter P06) is set incorrectly. or on a connected RM-LV 6/X valve module, the valve outputs are not assigned sequentially.
Lock	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 ∆p switch points which can be set independently of one another. It starts when the value ∆p-MAX is reached. All solenoid valves of the connected RM-LV 6/X valve modules 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 ∆p-MIN, cleaning stops. To monitor the filter, a ∆p alarm switch point (∆p alarm) can be set.

Cleaning starts at the first valve. If cleaning is interrupted using the ∆p controller or the start / stop input 3, 4, 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 5, 6 “Down time cleaning”

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 5, 6. The input should be operated in isolation. Ideally, the auxiliary contact of the fan contactor should be connected here.

- Closing the contact on input 5, 6 switches on the control unit.
- In DTC mode 1, opening the contact on input 5, 6 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 ∆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 ∆p DTC max during the last operating period and then fell below the value ∆p DTC min.

Relay output 15, 16 to control extractor elements

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 15, 16.

“Alarm” relay output 12, 13, 14

As soon as the supply voltage is present on the RM-200 C, relay contact 12, 13 closes and contact 13, 14 opens. In the following situations, relay contact 12, 13 opens and contact 13, 14 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 ∆p alarm switching point has been exceeded.

10 Glossary

Term	Explanation
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 Δp 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-200 C for starting the down time cleaning.
Down time interval time	Pause time during the down time cleaning.
DTC mode	Down Time Cleaning mode The way in which the down time cleaning is started.
Extractor element	Device for extracting the filter casing from the dust deposited. E.g. cellular wheel sluice, trough conveyor worm.
Extractor element contactor	Contactor which switches an extractor element drive unit on and off.
Operation mode	Status of the RM-200 C in which the equipment is ready for operation.
Parameter selection mode	Status of the RM-200 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-200 C in which the equipment operator can set a parameter.
Partition connector	Connections for fitting the differential pressure measurement hoses.
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
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-200 C for starting and stopping the cleaning via an external Δp switch.

Term	Explanation
Total no. of valves	Number of all valves of the connected RM-LV 6/X valve modules.
Valve modul	Module for controlling the solenoid valves. A maximum of 15 valve modules of the type RM-LV 6/X can be connected to the main unit RM-200 C. This makes a maximum of 90 solenoid valves available.
∆p alarm	Differential pressure value at which an alarm is issued.
∆p-MAX	Differential pressure value at which the cleaning is started.
∆p-MIN	Differential pressure value at which the cleaning is stopped.
∆p mode	Operating mode of the filter control in which the cleaning of the filter elements depends on the differential pressure ∆*p*.
∆p switch	Switch which is triggered by a differential pressure value set and which activates the filter cleaning.

11 Technical specifications

Application	Data
Supply voltage	100 V … 240 V AC 50/60 Hz 1 to 15 RM-LV 6/X valve modules 24 V DC 1 to 4 RM-LV 6/X valve modules 26 V DC … 28 V DC 1 to 15 RM-LV 6/X valve modules
Connected load	100 V … 240 V AC: max. 60 VA 24 V … 28 V DC: max. 40 W
Fuse	100 V … 240 V AC: Power supply fused internally 24 V … 28 V DC: PTC fuse, 1.85 A
Signal inputs, digital	2 optocoupler inputs, 24 V DC, to be served potential-free High >15 V Low < 5 V
Signal outputs, relays	3 relay outputs, potential-free max. 0.25 A, 250 V AC 50/60 Hz or max. 1 A, 30 V DC
Signal inputs, analog	4-20 mA input, 4-20 mA ≙ 0 ... 5000 Pa, burden 250 Ω
Outputs for Loop Bus	Number of RM-LV 6/X modules: max. 15 modules Cable cross section: 1,5 mm² Cable length max.: 50 m from the filter control to the last module
Measuring sensor Δp measurement	piezoresistive, overpressure-proof up to 120 kPa Pressure range: 0 … 5000 Pa (standard range) alternative: 0 … 500 Pa / 0 … 1000 Pa Total error band: ± 1.5% FSO Operating temperature range: -25°C up to 85°C: Long-term stability: < 0.5% FSO/a
Display	LCD 2 x 16 characters
Terminals	Spring-loaded terminals Admissible cross section Single-wire: 24 ... 14 AWG / 0.75 ... 1.5 mm² Stranded: 24 ... 14 AWG / 0.75 ... 1.5 mm² Stripping length: 9 … 10 mm ⚠ To open the spring-cage terminals, use a screwdriver with a blade width of max. 3 mm. The use of larger screwdrivers may damage the terminals.
Temperature range / humidity	Operation: -20°C to +60°C Transport: -20°C to +60°C Storage: -20°C to +60°C 75% relative humidity, no condensation

Application	Data
Protection class	Housing: IP-66 / NEMA 4 Cable gands: IP-67 Δp-connection: IP-66
Air gaps and creepage distances EN 61010	Pollution degree 2, overvoltage category II
Dimensions / weight	RM-200 C width x height x depth 250 x 195 x 90 mm / approx. 0.8 kg without heating RM-LV 6/6 width x height x depth 300 x 156 x 91 mm / approx. 1.7 kg RM-LV 6/5 width x height x depth 300 x 156 x 91 mm / approx. 1.6 kg RM-LV 6/4 width x height x depth 300 x 156 x 91 mm / approx. 1.5 kg with heating RM-LV 6/6 width x height x depth 379 x 133 x 91 mm / approx. 2.7 kg RM-LV 6/5 width x height x depth 379 x 133 x 91 mm / approx. 2.6 kg RM-LV 6/4 width x height x depth 379 x 133 x 91 mm / approx. 2.5 kg
Altitude	Max. 3000 m above sea level