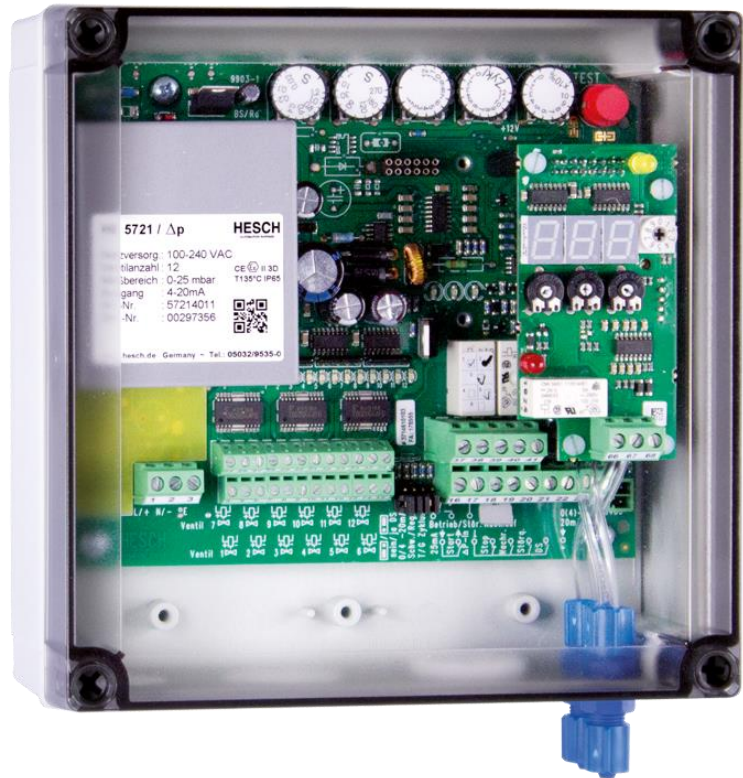


HE 5721

Δp -solenoid valve controller



Operating Instructions

(English)

HESCH

AUTOMATION



Imprint

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Versions

Date / Version	Description
17.06.2014 / 2.0	Layout modifications, frontpage: Image updated. Added Documenthistory. Chapter 2.2 and 7 (Technical Data): Power supply changed to 100 – 240 VAC (wide range power supply). Chapter 1 and 7 (Technical Data): Updated device designation; max. temperature at surface: 135 °C. Added Declaration of conformity.
13.02.2023 / 2.1	Operating instructions valid for ATEX devices and Non-ATEX devices

1. General Safety Instructions

1.1. Device Safety

This device was built and tested according to production-specifications and was shipped in safe condition. The protection class mentioned in the operating instructions is applicable.

In order to maintain this condition and to ensure a safe operation, the applicant must follow the hints and warnings given in these safety notes.

The device must be operated only by trained personnel. Maintenance and repair should be carried out only by trained, qualified personnel familiar with the relevant hazards.

The device may be operated within the specified environmental conditions (see data sheet) without impairing its safety.

The device is intended for mounting in an enclosure. Its contact safety is ensured by installation in a housing (switch cabinet, panel etc.).



ATEX!

The device is available as ATEX-approved device for use in EX zone 22 as well as without ATEX approval. **If you have ordered an ATEX-approved device, you must necessarily observe the safety instructions for explosion protection in this operating instruction.**

Unpacking the device

Remove device and accessories from the packing. Enclosed standard accessories: Operating notes or operating instructions for the instrument (if necessary, fixing elements). Check, if the shipment is o.k. and complete and if the instrument was damaged by improper handling during transport and storage. One operating instruction will be attached to each shipment.



Warning!

The device must never be put into operation despite visible damage.



Warning of material damage caused by electrostatic charge!

Observe the safety measures according to BS EN 61340-51/-3 to avoid electrostatic discharge!

1.2. Mounting

In order to have a proper function each instrument has to be placed in dust-free and dry rooms, either in a panel or in the relevant socket of a 19-inch instrument carrier.

The ambient temperature at the place of installation should not exceed the permissible nominal operational temperature specified in the data sheet.

When mounting several instruments at high packing density, sufficient ventilation must be provided to ensure a correct function.

The sealing devices (e.g. sealing ring) required for the relevant protection type must be applied.

Two captive screws are provided at the instrument front for fixing the 19-inch module in the instrument carrier. Generally, the fixing elements delivered with the instrument must be applied.

In the control cabinet existing contactors are to be suppressed by RC combinations.



Attention!

During installation, commissioning, maintenance and troubleshooting, observe the accident prevention regulations applicable to your system, e.g. DGUV Regulation 3 "Electrical installations and equipment".

1.3. Electrical Connections



Danger due to electrocution!

All electrical wiring must be conform to local Electrical Standards (e.g. VDE 0100 in Germany). The input leads must be kept separate from signal and mains leads.

The protective earth must be connected to the relevant terminal (in the instrument carrier).

In order to prevent electrical interferences, we recommend using twisted and screened cables. The electrical connections must be made according to the relevant connecting diagrams.

Commissioning

Before instrument switch-on, ensure that the advices and specifications given below are followed:

Ensure that the supply voltage corresponds to the specification on the instrument label. All covers required for contact safety must be applied.

Before instrument switch-on, check if other equipment and / or facilities connected in the same signal loop is / are not affected. If necessary, appropriate measures must be taken.

For instruments with protection class I, the protective earth must be connected with the relevant terminal in the instrument carrier.

The instrument may be operated only when mounted in its enclosure.

Operation

Switch on the supply voltage. The instrument is now ready for operation.

If necessary, a warm-up time of approx. 15 min. should be taken into account.



Warning!

Any interruption of the protective earth in the instrument carrier can impair the instrument safety. Intentionally interruptions are not permitted.

If the instrument is damaged to an extent that safe operation seems impossible, shut it down and protect it against accidental operation.

Trouble shooting

Before checking the instrument, all possibilities of error in other equipment and connections (input leads, wiring, equipment connected in the output circuit) should be checked. If the trouble cannot be located by checking these points, we recommend returning the instrument to the manufacturer.



Note!

Note that primary elements (especially thermocouples) connected to the energized transmitter are grounded in many cases, i.e. that the insulation resistance during operation can be reduced considerably. In these cases, additional connection to earth is not permissible

Shut-Down

For permanent shut-down, disconnect the instrument from all voltage sources and protect it against accidental operation.

Before instrument switch-off, check that other equipment and / or facilities connected in the same signal loop is / are not affected. If necessary, appropriate measures must be taken.

Maintenance, Repair and Modification

The instrument needs no particular maintenance. Any instrument with electro-mechanical relays has a limited durability (ask for data-sheet).



Danger due to electrocution!

When opening the instruments, or when removing covers or components, live parts or terminals can be exposed.

Before carrying out such work, the instrument must be disconnected from all voltage sources. After completing such work, re-shut the instrument and re-fit all covers and components. Check, if the specifications on the instrument label are correct!



Warning of material damage caused by electrostatic charge!

Observe the safety measures according to BS EN 61340-51/-3 to avoid electrostatic discharge!

Modifications, maintenance and repair may be carried out only by trained, authorized persons. Any repair or trouble-shooting by the applicant during the guarantee-period will result in losing the claim of guarantee. It is not permitted to operate or apply the instrument if the recommended specifications, warnings or conditions are not observed.

If a default was found due to a blown fuse, the cause must be determined and removed. For replacement, only fuses of the same type and current rating as the original fuse must be used. Using repaired fuses, or short-circuiting the fuse socket is inadmissible!

Explosion Protection (for ATEX-approved devices only!)

This instrument may be operated, due to its dust-proof housing, in areas of explosion zone 22 classification (occurrence of clouds of flammable air-borne dust for short periods). The special regulations for this device in EX zone have to be observed.

Storage

The storage-room for the instrument must be dry, dustfree and free of vibrations. The range of the storage-temperature is -20 °C...+70 °C. Any direct UV-radiation to the instrument must be avoided.

Transport

If no other recommendations are mentioned in the operating instruction the packing material used should have the quality that no damage to the instrument will occur even if it drops from a height of 80 cm. The transport temperature of -40 °C...+85 °C must be maintained.

Right of modifications reserved !

General Safety Instructions



Use appropriate cable glands for the installation of cables and mount them professional. Don't damage the protection class.



Not used holes in the housing have to be closed dust tight with appropriate sealing screws.



Operation with opened cover is not admissible.



The tightness of hose fittings e.g. for Δp - measurement or hose cleaning has to be checked.



Only wet or moistured cleaning tools are allowed for the plastic housing, to prevent electrostatic charges.

2. General Description

2.1 General

The HE 5721 solenoid valve control system is used for pulse activation of solenoid valves in air pollution control systems.

The HE 5721 permits numerous controlling and monitoring functions and can be extended by a differential pressure measuring and control system.

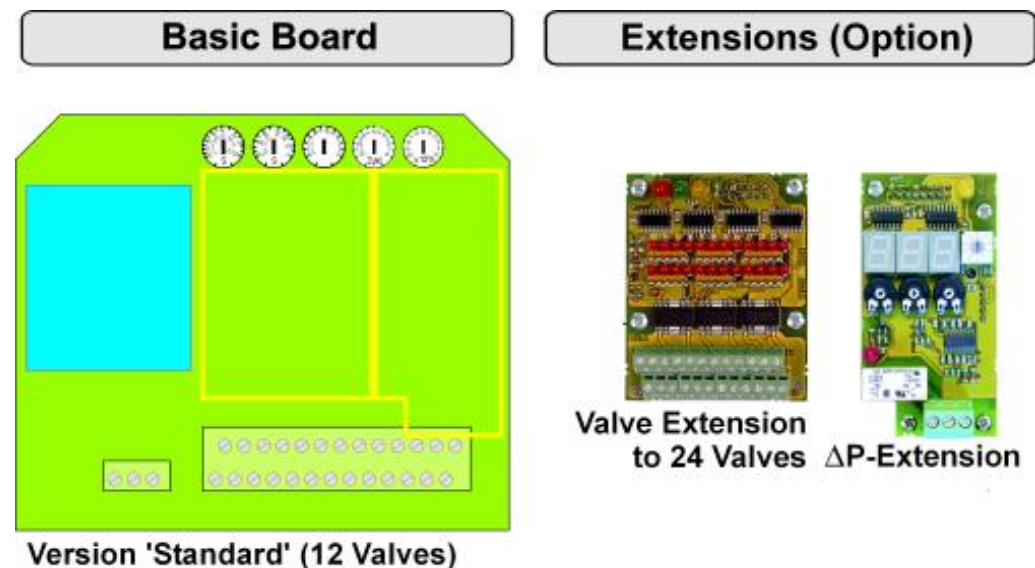
Cleaning can be effected on either a time-controlled or differential pressure basis with switching thresholds or pause time control.

The valves are monitored to detect open or short-circuits. Optionally, the valve function can be checked mechanically by means of a pressure switch.

The Δp extension unit can be used to check a maximum differential pressure.

2.2 Options

- Relays: 1 operating / malfunction relay and 1 relay cleaning
- Pressure switch: Mechanical valve function monitoring by means of a pressure switch (The pressure switch is not part of the delivery but can be ordered separately)
- Valve extension: Attachable board for extension of 12 valve outputs
- Δp -extension: Attachable board for measuring and controlling the differential pressure
- *Frontpanel: The device is available as a version with frontpanel. The device is available as a version with frontpanel. The device described is not subsequently expandable with a frontpanel.
- Connecting-kit: Screw connections and cable connections depend on the number of valves. For details see technical data.
- Power supply: 24 VDC



3. Installation and housing

The instrument should be installed in such a way that it is not exposed to moisture/humidity and dirt. It must also be ensured that the permissible maximum ambient temperature (50° C) is not exceeded. The device has to be protected against direct solar radiation.

Electrical connections should be made in accordance with the relevant VDE (Verein Deutscher Elektrotechniker = Association of German Electrical Engineers) regulations and/or locally applicable regulations.

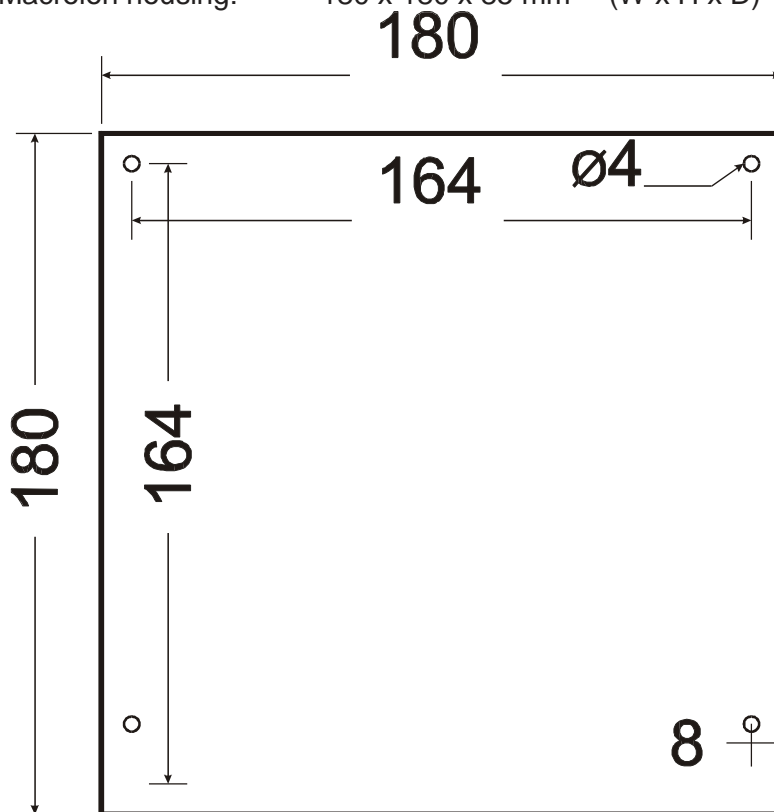
Power relays installed in the control cabinet should be interference-suppressed by means of RC-combinations.

The instrument features its own built-in mains filter. An additional external mains filter may be necessary if voltage transients occur.

3.1 Instrument dimensions

Dimensions of the solenoid valve controller HE 5721:

- Macrolon housing: 180 x 180 x 85 mm (W x H x D)



The housing is applied with threaded holes 1x M20 x1.5 and 2x M32 x 1.5 for metrical cable glands. Not used holes have to be closed dust-proof (IP65) with sealing caps.

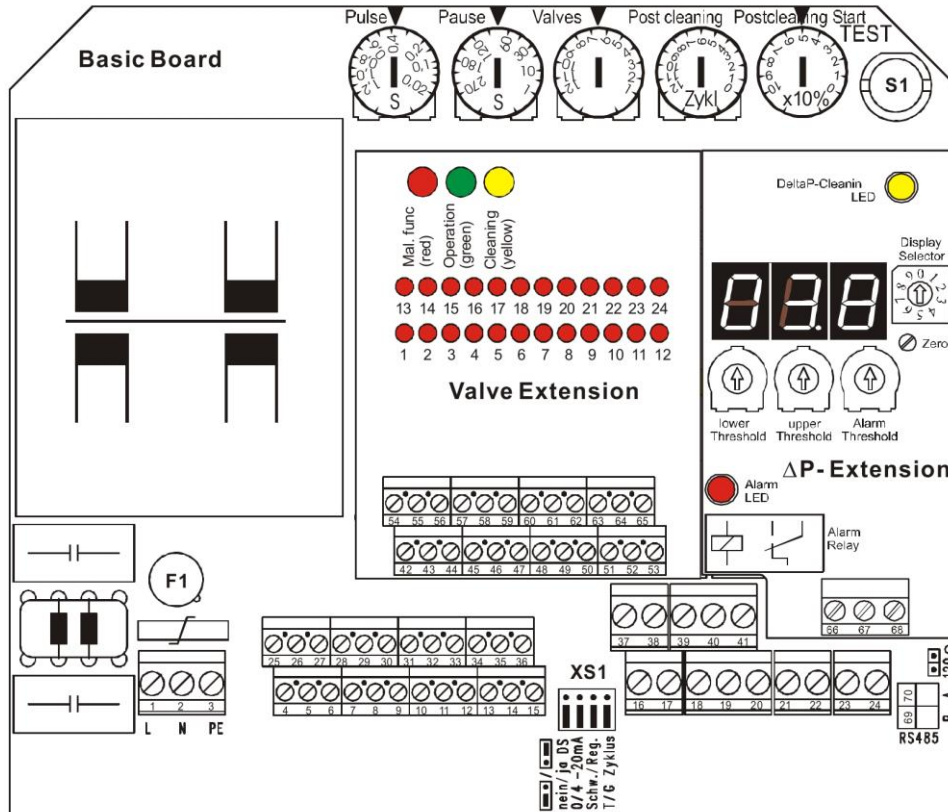
3.2 Power supply

The HE 5721 is designed for mains operation at 100 – 240 VAC, 50 - 60 Hz.

(Options: 24 VDC).

4 Solenoid valve controller

4.1 Operating and display elements



- Potentiometer:** The time setting potentiometers have a logarithmical scale division.
 - Pulse time: 0.02 ... 1.2 s
 - Pause time: 1... 270 s
 - Number of valves: 1...12 valves,
12 + 1...12 valves if the valve extension board is used.
See the adjusting aids for integer parameters.
 - Post-cleaning start: 0... 100% of the measuring range of the Δp -value.

- Jumper XS1:**

	i	!	Legend
Pressure switch	No	yes	nein/ja DS
Analog input	0...20 mA	4-20 mA	0 / 4-20 mA
Type of cleaning	Threshold	Pause control	Schw. / Reg.
Cleaning cycle	Partial cycle	Total cycle	T / G Zyklus

Note: Changes of the jumper configuration become effective after a restart of the device!

Solenoid valve controller

• Function

	Jumper XS1 Cleaning mode	Terminal*	Note
Δp -Threshold control	Schw.		
Pause time control	Reg.		Characteristic selection with pause potentiometer
External- Δp -signal	Reg.	17,18 external signal	only pause time control
Timer mode	Schw.	16, 17 connected	Pulse- and pause poti

* Terminals 18, 19 connected = release

- **Push-button S1: ('Test')** Starts cleaning with the next valve, terminates the pause of the current valve. If 'total cycle' is selected, cleaning is carried out up to the last valve.
- **LED-indicators:** Operation (green) or malfunction (red)
Cleaning (yellow)
Pulse indication for each valve (red)
- **Valve error indication:** The valve LED flashes.
Cause: short-circuit, breakage or error at mechanically valve function monitoring with pressure switch

4.2 Inputs

- **Analog:** Start or Δp -Input 0(4)...20 mA
The analogue signal is measured between terminal 17 + and terminal 18 - (GND). Terminal 16 can be used as an auxiliary current source (25 mA)
Timer mode: Term. 16 and 17 connected
- **Digital:** Release (contact closed) / Stop (contact open)
Post-cleaning (signal from push-button)
Malfunction acknowledgement (signal from push-button)
Pressure switch for mechanical checking of the valve function.
The inputs are active if they are switched to ground (terminal 18 GND).

4.3 Outputs

- **Valves:** 1...12 with 24 VDC / 1A (extensible to 1...24 valves)
+ Outputs have common potential
- outputs are switched
- **Relays:** Contact rating 250 VAC / 5 A
1 change over contact for operating/malfunction message (fail-safe-circuit)
1 normally open contact for cleaning message



***The inputs and the analogue output are not galvanically separated!
Provide an external potential separation, if required!***

4.4 Functions

4.4.1 Release/Stop

The input releases activation of the valves. If the contact is open, cleaning is stopped immediately.

4.4.2 Start / Δp -IN

The control system can operate in 2 operating modes. They are selected with the jumper 'XS1 Type of cleaning'.

1. Switching threshold: Cleaning is effected as long as a switching contact is closed, e. g. between the upper and the lower threshold of a ΔP controller.
2. Control: Cleaning is effected permanently with variable pause times.
—> cf. pause control

Note: Changes of the jumper configuration become effective after a restart of the device!

The (analog) input signal for cleaning can be connected externally or signalled internally by the Δp extension board.

- internal signal: “Threshold” for type of cleaning (XS1) “Threshold”
“Control” for type of cleaning (XS1) “Pause control”
- external signal: A 0(4)-20 mA signal is required for controlling.
In order to serve as a 'switching threshold', the signal must be switched between 0(4) mA and > 20 mA. Terminal 16 can be used as source of current for a switching contact.
The current output of a PLC can be used as an external signal.
The current output must be connected to terminal 17 + and terminal 18 - (GND).

It is possible to work with an external and an internal signal simultaneously. The higher signal then has priority. This allows the cleaning to be started in special operating situations, even if the set thresholds have not been exceeded (e. g. for time-controlled forced cleaning).

4.4.3 Post-cleaning

1. Starts if differential pressure falls under threshold with is adjusted at the potentiometer 'Post-cleaning Start'. The number of complete cleaning cycles can be adjusted with the potentiometer 'Cycles'. (Jumper XS1=Schw). Pulse- and pause time as adjusted.
2. Impulse signal at the input 'Post-cleaning' (18,20) triggers the post-cleaning process. Pulse- and pause time as adjusted.
If the function 'pause control' (XS1 'Reg!') is selected, post-cleaning is effected with a fixed pause time of 30 sec.

Note: Changes of the jumper configuration become effective after a restart of the device!

4.4.4 Malfunction acknowledgement

A signal at the input 'malfunction acknowledgement' resets a valve error message (LED and malfunction relay). When the cause of error has been eliminated, the error message is automatically removed. (The condition of a valve is recognized with the next excitation).

4.4.5 Pressure Switch

The input 'pressure switch' serves for the mechanical check the valve function. The contact must be closed before activating a valve (message: pressure exists). During the pause time, the contact has to open (message: pressure drop = valve is open) and close again (pressure rise = valve is closed). The jumper XS1 has to be changed in the position 'with pressure switch'.

4.4.6 Cleaning Cycle

The cleaning cycle can be selected with the jumper XS1 (Cleaning cycle):

- 'Partial cycle' = Cleaning is effected as long as the start signal is active
- 'Total cycle' = Cleaning is always executed up to the last valve.

Note: Changes of the jumper configuration become effective after a restart of the device!

4.5 Pause Control

The control system is able to carry out a ΔP -dependent pause control. This function is selected with the jumper XS1 'Regl'.

The operator selects an individual controller characteristic with the pause potentiometer. For controlling, the current differential pressure must be signalled to the control system as an analog signal. The signal can be made available either internally by the ΔP extension board or externally as a 0(4)-20 mA signal at the terminals 17 + and 18 - (cf. also 'Start input').

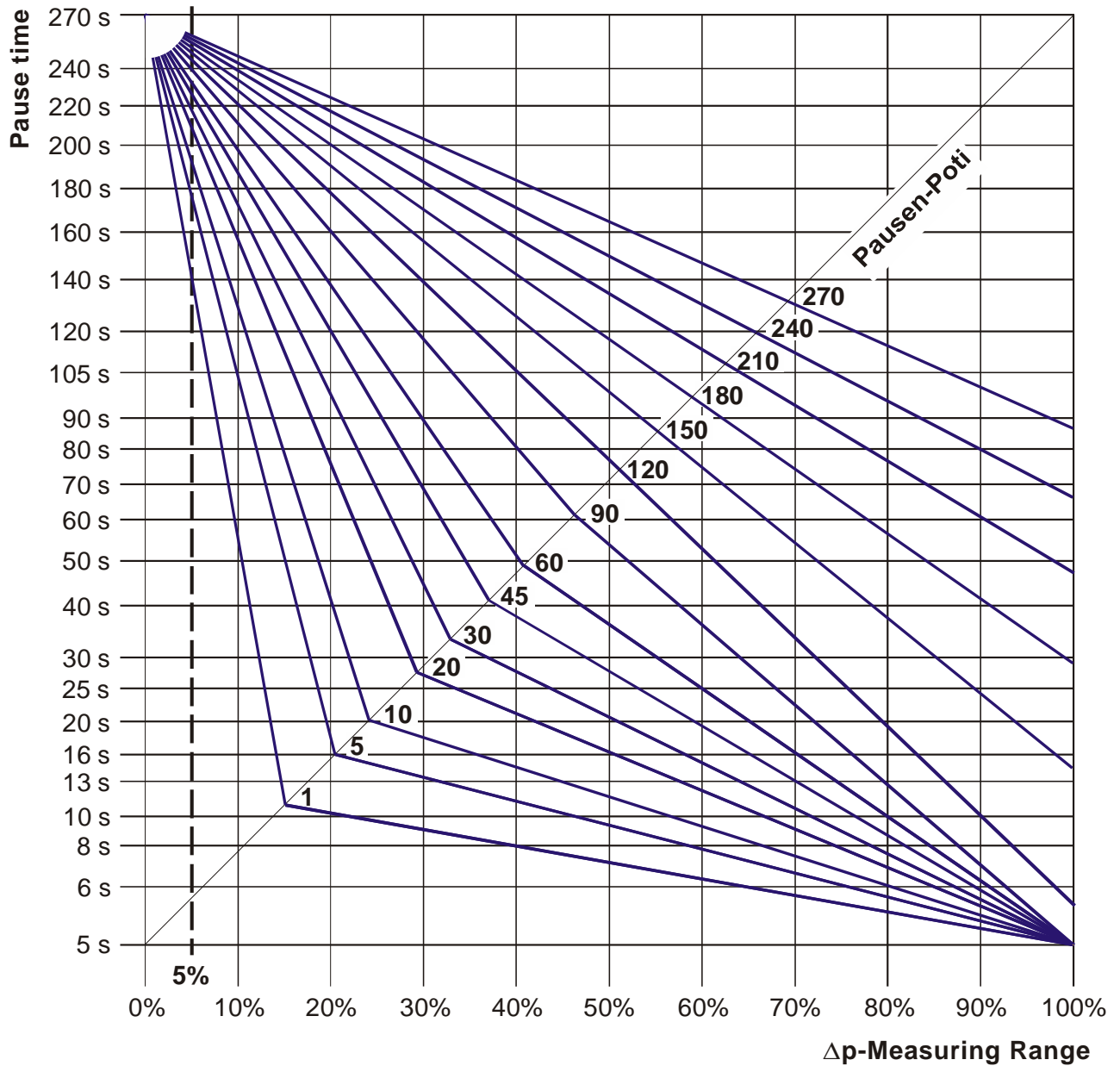
The control system determines the current pause time from the current differential pressure and the selected characteristic curve.

When the differential pressure increases, the pause time is shortened; when the differential pressure decreases, the pause time is prolonged.

The variation of the pause time is not linear.

Cleaning is terminated when the differential pressure falls below approx. 5% of the measuring range.

Controller Characteristics



Example: The filter is to be cleaned at a differential pressure of 60% of the ΔP measuring range with a pause time of approx. 25 sec.

Selection of the characteristic curve: The intersection of the curves '60% of the measuring range' and '25 sec.' is on characteristic curve 60. The pause potentiometer is set to 60 sec.

The control system controls the pause time along characteristic curve 60. The cleaning capacity is increased progressively due to the shape of the characteristic curve. Additionally, a larger amount of dust per impulse is cleaned if the differential pressure is higher (= higher resistance of filter).

For shorter pause times, the capacity of the pneumatic system must be considered.

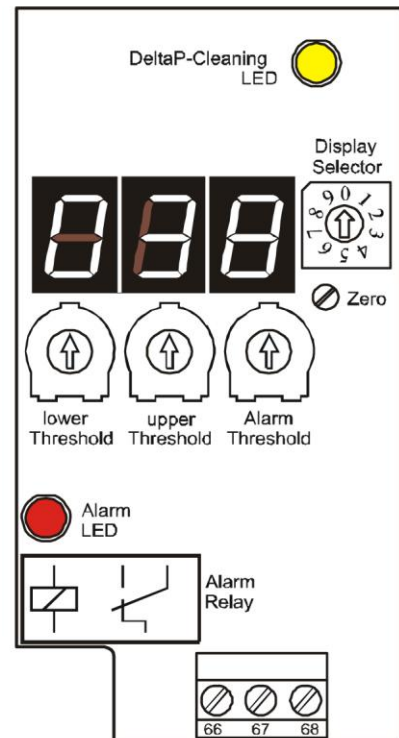
5 Δp-Extension (Option)

5.1 Operating and Display Elements

- LED-displays: 3-digit seven-segment display for current differential pressure or switching thresholds
1 LED for ΔP-Alarm (red),
1 LED for cleaning (yellow)
- Display selection: Rotary switch
 - 0 = Δp-actual value [mbar]
 - 1 = Cleaning Stop (Lower threshold) [mbar]
 - 2 = Cleaning Start (Upper threshold) [mbar]
 - 3 = Alarm (Alarm threshold) [mbar]
 - 4* = Post cleaning Start [mbar]
 - 5 = Actual valve or number of the defective valve
flashing at the 1. position :
upper segment = interruption
lower segment = over current
 - 6* = Post cleaning cycles
 - 7* = Amount of valves
 - 8* = Pause time [s]
 - 9* = Pulse time [s].xx
 - (* = Potentiometer in the base board)
- Potentiometer: Lower threshold (cleaning stop)
If the pressure drops under threshold, cleaning stops.
(Cleaning relay inactiv)

Upper threshold (cleaning start)
If the pressure exceeds threshold, cleaning begins.
(Cleaning relay activ)
Alarm threshold
If the pressure exceeds threshold, an alarm is generated.
(Alarm hysteresis ≤1% of measuring range)

ΔP- zero (Potentiometer below the board)
With this potentiometer the zero value of the ΔP- sensor can be adjusted.



Do not adjust the potentiometer without switching the display selector to that value!

- Differential pressure Connection: The differential pressure sensor is located below the board (see Page 11). The connections are suited for hoses with 4 mm inner diameter.
Left connection (+) :for higher pressure (= pressure before the filter).
Right connection (-) :for lower pressure (= pressure behind the filter).
The pressure inputs are connected to screw fittings (4 mm) at the housing.

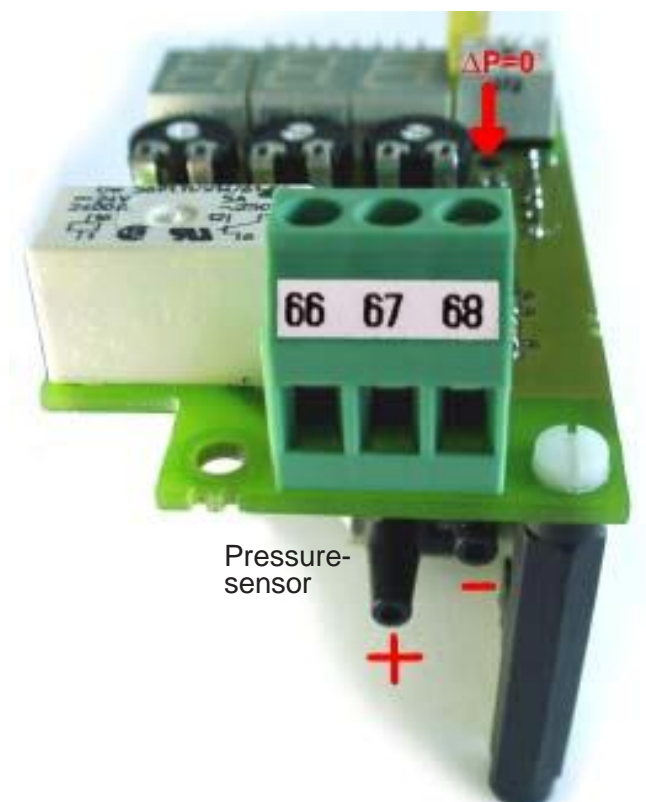
5.2 Outputs

- Relay: Contact rating: 250 V AC / 5 A
1 Change-over-contact for ΔP -alarm
Terminal 66 = NC- contact
Terminal 67 = NO- contact
Terminal 68 = Change-over-contact

5.3 Δp -Adjustment

In case of a zero drift, the display can be set to zero with the 0-point potentiometer (below the board). Adjustment should be carried out only when no differential pressure is present, i. e. if no measuring hoses are connected. For a better accuracy of the adjustment, check the current output 0(4) to 20 mA at terminals 23+ and 24-.

Adjustment should be carried out at operational temperature as the sensor can present a temperature drift of up to ± 1 mbar.



6 System Parameters

6.1 Adjustment of System Parameters



Attention!

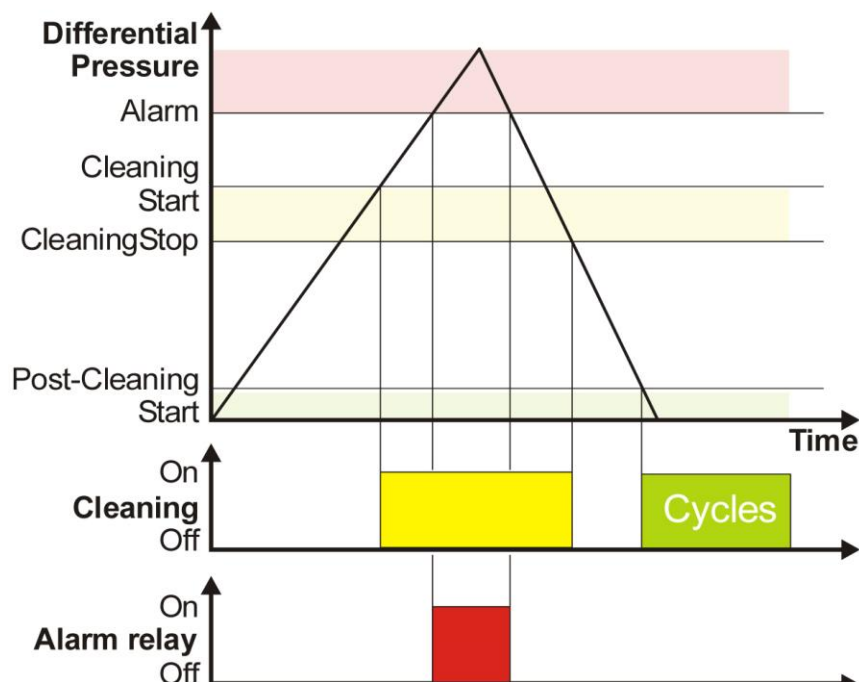
Adjustments are made during operation. If the thresholds for 'Cleaning Start' are set under the actual differential pressure, the cleaning begins. Remedial action: increase thresholds, disconnect device briefly from power.



Note!

Do not adjust the potentiometer without switching the display selector to that value!

1	Cleaning Stop	lower threshold
2	Cleaning Start	higher threshold
3	Alarm	Alarm threshold
4	Post-cleaning Start	lowest threshold, which starts the post-cleaning if ΔP value falls below.
5	Actual valve	Valve-No. is displayed. With malfunction: the erroneous valve.
6	Post-cleaning cycles	Number of cleaning-cycles. Adjust integer value accurately with the adjusting aids. See below.
7	Valves	Number of valves used in the system. Adjust integer value accurately with the adjusting aids
8	Pause	Pause time in seconds. Format xxx In the mode 'Pause Control': Selection of a characteristic curve.
9	Pulse	Pulse time in seconds. Format: x.xx
$\Delta p = 0$		Zero point calibration See details in chapter 5.3



6.2 Adjusting aids for Integer Parameters

With the potentiometers also integer values are set. To support this procedure the instrument offers two adjusting aids, which both work at the same time:

1. Display: -1 1 $\bar{1}$ -2 2 $\bar{2}$ -3 3 $\bar{3}$ -4 4 etc.
The value is correctly adjusted, if no dash is represented.
2. Valve LED row: Cycle adjustment: LED line flashes or lights up
Valve adjustment: max. 2 individual LEDs flash or light up

Cycle Adjustment

Display	LED-row	(Valves)
$\bar{2}$		flashing
$\bar{3}$		flashing
3		flashing 5 sec
$\bar{3}$		flashing
$\bar{4}$		flashing

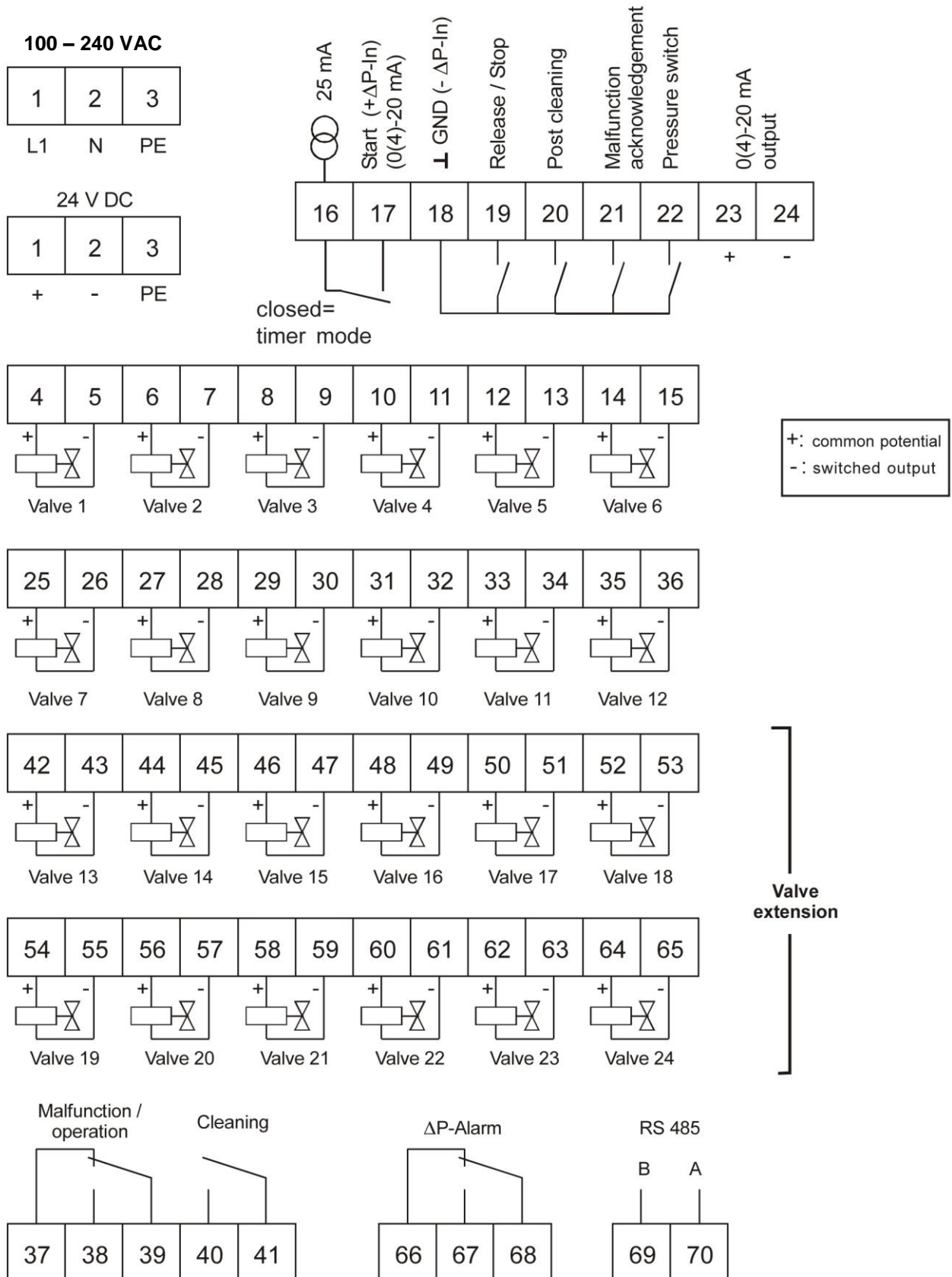
Valve Adjustment

Display	LED-row	(Valves)
$\bar{2}$		flashing
$\bar{3}$		flashing
3		flashing 5 sec
$\bar{3}$		flashing
$\bar{4}$		flashing

During the adjustment the cleaning process is not interrupted: the cleaning pulse is also displayed. The representation of a valve error is suppressed however during the adjustment.

Connecting Diagramm

7 Connecting Diagramm



8 Technical Data

Valve Controller

	<ul style="list-style-type: none"> • Start- / Δp-input 0(4)-20 mA • Release (contact closed) / stop (contact open) • Post-cleaning (impulse signal) • Malfunction acknowledgement (impulse signal) • Pressure switch for mechanical valve function monitoring
Valve outputs:	Max. 12, with extension 24 (option)
Valve voltage:	24 VDC \pm 10 %
Valve current:	1 A (at pulse time \leq 1 s and pause time \leq pulse time), otherwise 0.5 A
Nominal rating valve output:	Max. 24 watt
Display:	<ul style="list-style-type: none"> • 12 (24) LEDs for valve activation • 1 LED "operation" (green) • 1 LED "malfunction" (red) • 1 LED "cleaning" (yellow)
Functions:	<ul style="list-style-type: none"> • Partial / complete cycle • Δp-dependent control • Valve current monitoring (short-circuit / open circuit) • mechanical valve function monitoring (Option)
Test functions	1 button for valve function test
Relay outputs (Option):	Contact rating 250 VAC / 5 A: <ul style="list-style-type: none"> • 1 change over contact for operation-/ malfunction-indication (fail-safe-circuit) • 1 NO-contact for cleaning indication
Settings	<ul style="list-style-type: none"> • Number of valves 1...12 (24) • Pulse time 0.02...1.2 s • Pause time 1...270 s • Post-cleaning 1...12 cycles • Post-cleaning start threshold 0 .. 100 % of measuring range

Δp -Controller (Option)


Measuring ranges:	0 ... 25 / 0 .. 500 mbar
Δp-Sensor	Max. static pressure: 1000 mbar Linearity: \pm 1% Hysteresis: \pm 0.1 % Temperature hysteresis: \pm 0.5 % Temp.drift / zero point: \pm 0.025 %/K Temp.drift / full-span value: \pm 0.01 %/K
Settings:	<ul style="list-style-type: none"> • threshold 'cleanig stop' • threshold 'cleaning start' • threshold 'Δp-alarm' • Δp-zero-point

Subject to technical alterations !

Δp-Controller (Option)

Display:	3-digit 7-segment display <ul style="list-style-type: none"> • 1 LED "P-alarm" (red) • 1 LED "cleaning" (yellow)
Measuring range:	Between 0...25 and 0...500 mbar
Δp-sensor:	Max. static pressure: 1000 mbar Linearity: ±1% Hysteresis: ±0.1% Temperature hysteresis: ±0.5% Temperature drift / Zero: ±0.025% / K Temperature drift / terminal value: ±0.01% / K
Analog output	0(4)...20 mA Terminals 23, 24 on the base plane
Relay output:	1 switched output (change over) for Δp-alarm contact rating 250 VAC, 5A
Pressure connections	Tube screw fitting type: DN 4

General Technical Data

Mains supply:	100 – 240 VAC ± 10 %, 50 – 60 Hz (option: 24 VDC)
Mains fuse:	0.315 A slow action, type 'TR5' (0.63 A, 3.15 A)
Power consumption:	30 VA (30 VA, 42 W)
Electr. Connections:	Screw terminal strips: 2.5 mm ² Valve connections: 1.0 mm ²
Operating temperature:	-20 °C...+50 °C (in EX zone 22: -20 °C...+40 °C)
Interference resistance:	<ul style="list-style-type: none"> • DIN EN 50081 part 1 • DIN EN 50082 part 2
Explosion protection:	 II 3D Ex tc IIIC T135°C Dc IP65, zone 22
Class of protection:	IP 65
Dimensions:	180 x 180 x 85 mm (w x h x d)
Housing:	Dust tight Makrolon housing (IP65) with metrical threads M20 x 1,5 and 2x M32 x 1,5 for metrical cable glands. Holes are to be sealed with dust tight caps (IP65), 1 sealing cap M32 included
Connecting Kit (Option) 12 valves:	1 cable gland M20, 2 cable gland M32 with multi core insert and sealing bolts
Cable Connection (Option) 12 valves:	1 cable gland M20, 1 cable gland M32 with wire designation and wire end sleeves
Cable Connection (Option) 24 valves:	1 cable gland M20, 1 cable gland M32 with wire designation and wire end sleeves

Subject to technical alterations !