RLP 100: Pneumatic air-volume controller

How energy efficiency is improved

Enables the demand-led volume flow control of fume cupboards, laboratory rooms and clean rooms.

Areas of application

Specially designed for volume flow control equipment in VAV installations. In combination with a highly accurate, static differential pressure transmitter and a pneumatic damper drive, it is possible to control laboratory fume cupboards, laboratory rooms and room pressures.

Features

- ATEX certification for use in Zone 1 potentially explosive areas .
- Conformity tested as per EN 13463-1 and EN 1127-1 (Ex II 2 G T6) .
- Control of constant, switchable or variable air volumes •
- Highly accurate, static differential pressure sensor with large measuring range (1 to 160 Pa) •
- Controller front panel is printed with circuit diagram for rapid identification of function .
- Glass-fibre-reinforced thermoplastic housing suitable for wall or top-hat rail mounting • (rail EN 60715)
- Compressed-air connections with Rp 1/8" female thread
- Special measuring connection for recording the volume flow with M4 connector
- Low-pressure connections in form of stepped nipples for flexible plastic hose (internal Ø 4 and . 6 mm)
- Complies with directive 97/23/EC Art. 3.3 on pressure equipment

Technical description

- Supply pressure 1.3 bar \pm 0.1 ٠
- Response sensitivity of sensor 0.1 Pa
- Linearity, square root extraction accuracy 2% •
- Two inputs for:
 - command variable •
 - setpoint adjustment $\Delta \mathbf{\dot{V}}$
- Two outputs for:
- actual value •
 - activation of damper drive
- One adjuster for adjustment of the sensor measuring range
- Three setpoint adjusters for maximum and minimum limiting of volume flow, plus limiting setpoint adjustment ΔV to max. ± 20%

Туре	Control action	Setpoint- shift ∆ Vໍ	Sequence relay	Air capacity ¹	Weight
		% V		In/h	kg
For supply air and ret	urn air (roo	om-air control, in	tegral)		
RLP 100 F003	B/A	320	_	330	0,6
For return air in aggre	essive gase	es (fume-cupboa	rd control, PI)		
RLP 100 F123	A	-	-	900	0,6
For return air in aggre	essive gase	es (room-air cont	trol, integral)		
RLP 100 F914	A	320	-	330	0,6
For supply air and ret	urn air, wit	h interface relay	(room-air control, in	tegral)	
RLP 100 F919	A	—	—	330	0,6
Output pressure		0,21,0 bar	Reset time, F123		1 s
Setpoint range for air vo	lume	20100% V	Input: setpoint shift w	1	
Measuring range ∆p (fact	ory setting)	6,4160 Pa	20100% V		0,21,0 bar
reducible to		125 Pa	Usable range p _{stat}		03000 Pa
Response sensitivity	2)	0,1 Pa	Permissible pressure	<i></i> 、	0000 D
Linearity; root extraction	2)	2%	(low-pressure conn	iections)	3000 Pa
Supply pressure ³⁾		1,3 bar ± 0,1	Connection diagram		
Air consumption		44 l _n /h	F003		A02878
F123		90 l _n /h	F914, F123		A02879; A07495
with setpoint shift ΔV		60 l _n /h	F919		A08621
Permissible ambient ten	۱p.	055 °C	Dimension drawing		M297570
I ype of protection		IP 30	Fitting instructions		MV 505804
			F123		MV 505546
			F914; F919		IVIV 505337; IVIV 505263



Influence AV B03240



The percentage refers to 100% air volume

2) 3) See Section 60 on regulations concerning the quality of supply air, especially at low ambient temperatures







67.400/1



Accessories			
0297354 000*	Short screw-type connector R ¹ / ₈ for soft plastic tubing, internal Ø 4 mm;		
	F003, F919: 4 pcs required, F123, F914: 5 pcs required		
0297653 000	Resistor 10 Ω f, for air capacity of 180 I _n /h (not for F123)		
0297762 001	Restrictor Ø 0,8 mm for attenuating turbulent low-pressure signals; 2 pcs required		
0274571 000	Restrictor Ø 0,5 mm for attenuating turbulent low-pressure signals; 2 pcs required		
0297800 001*	Manual switch, Open-Closed (min. air volume), for panel mounting; A07667,		
	MV505784 ¹⁾		
0297772 001*	Screw-in push-on adaptor M4 with seal for soft plastic tubing of Ø 4 mm internal		
0297838 001*	Bracket for two XMP pressure gauges (see PDS, Section 68) ¹⁾		
0297091 000*	Blanking piece for unused pressure-gauge aperture		
0297680 001	Setpoint V in., V max. set and marked (not for F123)		
0297680 002	Influence E set and marked		
0297870 001*	Fixing bracket for fitting the controller to ceilings, floors or panels 1)		
*) Dimension drawing or wiring diagram are available under the same number			
1) The accessories were tested for protection against explosion when fitted to the standard version of this product			

Operation

RLP 100 F003

The pressure difference created at the orifice plate or dynamic pressure sensor is converted by the root-extracting transducer into a fluidic-linear standard signal (0.2...1.0 bar). The command variable *w* at connector 6 (e.g. TSP 80 temperature controller) is limited by the min. and max. adjuster, and is compared with the actual value. For fixed-value control, no command variable *w* is connected, since the 'min.' adjuster serves as the setpoint adjuster. The integral controller compensates without lasting error for the control deviation. The measuring range (as the pressure difference) is set via adjuster E (E = 0,7...1,8).

The use of temperature controllers without amplifier (TS.P 80 or TK.P 80) is recommended. The temperature controller is supplied by the internal restrictor (\emptyset 0,14 mm).

The value set at the $\Delta \dot{V}$ adjuster (3...20% \dot{V}) is added to the setpoint volume. It can be adjusted externally via terminal 8; the value set at the $\Delta \dot{V}$ adjuster becomes the minimum limitation.

The control action can be changed from B (factory setting) to A using the change-over switch.

Additional function for RLP 100 F914

In order to protect the measuring diaphragm from aggressive gases, a very small amount of air is fed constantly into the '+ and –' low-pressure line. For the command of, for example, a supply-air volume-flow controller by a return-air volume-flow controller (RLP 100 F914), an interface relay is fitted internally for de-coupling the pneumatic signal at terminal 7. If a passive element (e.g. a pressure gauge for showing the actual value) is connected to connector 7, it must be supplied with air by an external restrictor of 0,2 mm dia.

Additional function for RLP 100 F919

For controlling the room temperature (e.g. with a TSFP 80 F117) via a room supply- or return-air controller (RLP 100 F919), an interface relay is fitted in order to de-couple the pneumatic signal at terminal 7. If a passive element (e.g. a pressure gauge for showing the actual value) is connected to connector 7, it must be supplied with air by an external restrictor of \emptyset 0,2 mm.

RLP 100 F123

The pressure difference created at the orifice plate or dynamic pressure sensor is converted by a rootextracting transducer into a fluidic-linear standard signal (0,2...1,0 bar). The command variable (connector 6) from the sash sensor (TUP 224 F901, continuous), and the command variable (connector 8) from the sliding-door sensor (micro-switch, 2-point, EVM 131-F01-01S, manufactured by *SMC*) are limited by the min. and max. adjuster and compared with the actual value. The controller uses the larger of the two signals as the setpoint. The PI-controller compensates without lasting error for the control deviation. The measuring range (as the pressure difference) is set via adjuster E (E = 0,7...1,8). To prevent toxic gases from escaping from fume cupboards, the air volume must react within 1 to 2 seconds proportionate to the amount that the sash is opened, i.e. the damper's positioning time is short. When the sash is closed, the positioning time is about five seconds, so that no excess pressure arises in the room.

The sash sensor at terminal 6 is fed by the internal restrictor (Ø 0,2 mm) in the RLP. The sliding-door sensor at terminal 8 is fed by a different internal restrictor (Ø 0,14 mm). If connector 8 is closed, \dot{V}_{max} applies; if connector 8 is open, the controller uses the value provided by the sash sensor. If no sliding-door sensor is needed, connector 8 should not be closed off.

The output signal at terminal 7 (deviation from the command variable at connectors 6 and 8 to the actual value) amounts to 0.6 ± 0.4 bar and is fed to either a pressure gauge or the RXP 210 alarm unit. If the command variable (connector 6) from the sash sensor is higher than the max. limitation, the output signal at connector 7 amounts to 0.6 - 0.4 bar.

If, in order to monitor the fume-cupboard's air volume with the RXP 210 alarm unit, a low-flow function is also required (setting a minimum air volume regardless of the sliding door's opening), then a manual switch (accessory no 0297800 001) can be fitted at terminal 6 between the TUP 224 F901 sash sensor and the RLP 100 F123. If the function 'Min. or max. air volume ($\dot{V}_{100\%}$) regardless of the sliding door's opening' is required without an alarm unit, then a manual switch (accessory no 0297800 002) can be fitted at terminal 8 between the TUP 224 F901 sash sensor and the RLP 100 F123.

In order to protect the measuring diaphragm from aggressive gases, a very small amount of air is fed constantly into the '+ and -' low-pressure line.

Additional information on accessories

- **0297762 001** Restrictor (Ø 0,8 mm) for damping turbulent low-pressure signals; push-on connector for soft plastic tubing of 4 mm internal dia. If the damping is insufficient, a Ø 0,5 mm restrictor can be used instead (accessory no. 0274571; not suitable for RLP 100 F908, F914, F123).
- **0274571 000** Restrictor Ø 0,5 mm) for damping turbulent low-pressure signals; push-on connector for soft plastic tubing of Ø 4 mm internal. Used in extreme cases where the Ø 0.8 mm restrictor (accessory no. 0297762) has proved to be inadequate. Unsuitable for any volume-flow controllers (RLP 100 F914 and F123) and transducers (RLP 100 F908) that have a very small amount of air fed constantly into the '+ and -' low-pressure line, since the pressure signals in the lower part of the measuring range are falsified, and the positioning time of 1...2 seconds (RLP 100 F123) is not attained.
- **0297800...** Manual switch for switching over pneumatic lines. Housing of light-grey thermoplastic. Front plate of aluminium with rotary knob. Compressed air via push-on connector for soft plastic tubing of 4 mm internal diameter. Suitable for fitting in panels.

Nominal flow Q _N 1 bar with respect to atmosphere	3,0 m ³ n/h
Max. leakage rate (2,5 bar \rightarrow 0)	1,2 l _n /h
Permissible pressure or differential pressure	2,5 bar
Ambient temperature	070 °C
Weight	0,05 kg
Connection diagrams	-
0297800 001	A07667
0297800 002	A03322
Dimension drawing	M04091

0297800 001

Scale	Function
$\dot{\bigcirc}$	continuity from 2 to 0; control mode
2 J	continuity from 3 to 0, V _{min}

0297800 002

Scale	Function
Aut.	continuity from 1 to 0
min	continuity from 2 to 0
Aut.	continuity from 3 to 0
max	no continuity to 0

Operation

Dial runs on O-rings, locking in either 2 or 4 positions.

Additional details on accessories

0297838 001 Bracket for two XMP pressure gauges. Includes:

1 adaptor (0297596) for tube (internal Ø 1,7 or 4,1);

1 Connector (0297112) with seal M4/push-on connector for tube (internal Ø 1,7);

1 m tube (internal Ø 1,7) and 2 screws.

Use the blanking piece (0297091) to cover the unused opening in the bracket. The pressure gauge for indicating the room pressure should be connected to the actual-value terminal M.

Technical information

Technical manual: VAV 7 000 621 003

Engineering and fitting notes

The unit should not be fitted laterally (as depicted below, right).



There should be no positioner connected between the integral controller and the actuator or valve drive.

The output pressure must go directly to the drive. In order to prevent turbulence which, in the form of oscillations, affects the low-pressure signal, there should be a smoothing sector in front of the measuring cross for the measurement of differential pressure.

Where the flow may be problematical – e.g. right-angles, bends or junctions directly in front of the measuring cross –, a restrictor should be fitted into the plastic tubing of the '+ and –' connection in order to attenuate turbulent low-pressure signals.

RLP 100 F914

1,3 bar

p1

 ΔP



Connection diagrams



Μ

1:1

V max

• V min

v

Е

1 E

Ø

16 I/h

6

5:1

Max Δ_V^{\bullet}

16 I/h

8

w = command variable

 Δp = pressure difference v = output pressure Controller

bar

0.2

NO

• v

A02879c

2





297800 001

297800 002





Dimension drawing



Accessories











Sauter Components

Examples of use

1. Control facility for variable air volume without re-heater, for 'open rooms'



2. Control facility for variable air volume without re-heater, for 'open rooms' with over-pressure



3. Control facility for variable air volume without re-heater, for 'open rooms' with under-pressure



4. Control facility for variable air volume with re-heater, for 'open rooms' with dead zone, normally closed re-heater, room-temperature controller with control action A and B



5. Control facility for variable air volume with re-heater, for 'open rooms', normally open re-heater, room-temperature controller with control action A



6. Control facility for variable air volume with re-heater, for 'open rooms', normally closed re-heater, room-temperature controller with control action B



7. Laboratory exhaust-air control.

Control facility for air-volume exhaust-air control (in relation to the amount that the sash is open) for fume cupboards; with sash sensor, alarm and operating unit, taking room temperature into account. Room-temperature controller is controlled by the data centre; room pressure is fed back to the data centre via an e/p-p/e trans ducer.

Engineering note: Laboratory exhaust-air control is also possible with Sauter's EY3600 *ecos* system. This allows more data points to be transmitted, but the damper drives and the sliding door's sensing system have a shorter serviceable life, while the control system has a longer positioning time (> 15 sec).



B08673

RXP 210

2

Variant: RLP 100 F123 with: manual switch, min. air volume



Variant: Fume cupboard with:

- sash detection, continuous _
- _ sliding-door detection for 3 windows, 2-point



Variant: RLP 100 F123 with: manual switch Aut-min-Aut-max (V 100 %) without: alarm and operating units



Variant: RLP 100 F123 with: operating unit without: alarm unit



Variant: RLP 100 F123 with: alarm unit without: operating unit



1 VAV controller 2 Damper drive, NO

3 Pressure-release unit

4 VAV exhaust-air contr. for fume cupboards

7 Operating unit

- 8 VAV exhaust-air contr. for aggressive gases
- 9 Pressure controller
- 10 Room temperature controller

5 Sash sensor 6 Alarm unit

- 11 Pressure gauge 0297797
- 12 Mute button, alarm reset

Micro-valve S0-3-PK-3-B Pressure switch AT-06-B (manufac'd by Festo)

- 13 Micro-switch, EVM 131-F01-01S (manuf'd by SMC)
- 14 Manual switch, 0297800 001 15 Manual switch, 0297800 002
- 16 e/p p/e converter
- NO normally open
- EY Data centre

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