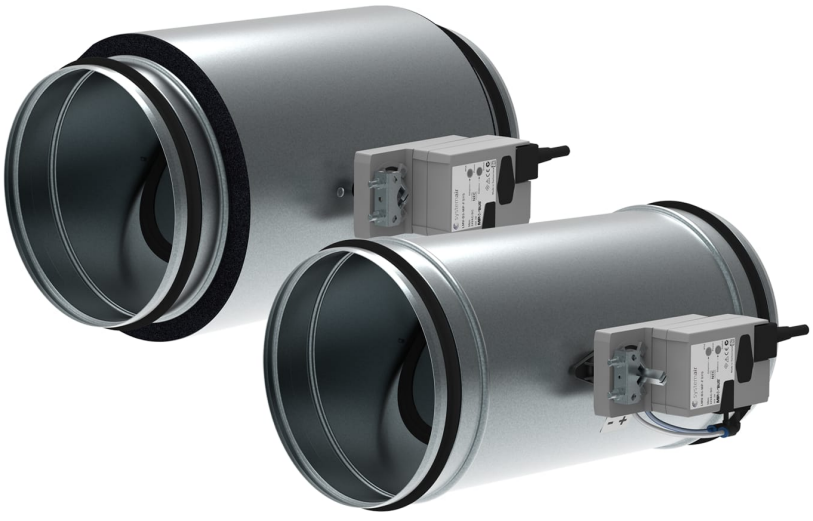
systemair

Handbook

OPTIMA-R-LV

Low Velocity VAV Controller



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Description

OPTIMA-R-LV is a variable air volume (VAV) controller with or without insulation. The product is intended for precise flow control at low airflow velocities. The product is installed into circular ducts of 100 mm up to 400 mm in diameter. Field of application is e.g. offices, hotel rooms, meeting rooms, or larger public or industrial halls where the required cooling and heating load will vary on demand.

Highlights

- Damper tightness class 4 according to EN 1751
- Casing tightness class C according to EN 1751
- Extends the range of VAV controllers in low airflow velocity part – down to 0,2 m/s
- Adaptive measurement probe for highly efficient dynamic pressure readings on the whole velocity range
- Advanced algorithm for appropriate control at subliminal duct static pressure
- Operable at Δp range 2 Pa ... 600 Pa
- Unprecedented control ratio V_{max}/V_{min} = 30/1 (0,2 m/s ... 6 m/s)
- High measurement/control accuracy of 5 % *
- Lowest possible cross-section restriction for given pressure - /flow parameters >> low pressure loss, low noise
- No straight duct in front or behind the VAV controller required. Installation immediately behind or in front of the elbow or tee duct piece is possible.
- OPTIMA-RI-LV version with external insulation for radiated sound reduction

NOTE: * The airflow controller OPTIMA-R-LV (RI) utilizes a special control algorithm to protect the actuator from mechanical damage in low-velocity flow.

Types of Product

- **OPTIMA-R-LV:** Non-insulated VAV controller
- **OPTIMA-RI-LV:** Insulated VAV controller

List of Accessories

- **ZTH-EU** Handheld Tool
- **Belimo Assistant** Configuration and setup NFC app. for Android smartphones for OPTIMA-R-LV...BP
- **ZIP BT NFC** Communication Port Bluetooth/NFC

Design

OPTIMA-R-LV consists of a casing, a damper blade, and a measurement probe. The casing is manufactured from galvanized sheet steel. The casing contains a duct connection with a rubber gasket. The damper blade is manufactured from extruded aluminium. The blade is equipped with a rubber gasket. The gasket eliminates leakage in the closed position. The metallic measurement probe is connected to the tubing from polymere. There is no airflow through the impulse tubing. OPTIMA-RI-LV is equipped by an insulation for sound reduction. The insulation is a 19 mm thick closed-cell foam mat, protected by a galvanized steel sheet.

Noise and thermal insulation material for OPTIMA-RI-LV

Base	NBR/PVC
Cellular Structure	Closed
Colour	Black
Density	80 kg/m^3
Water Absorption	2 % < 5 %
Resistence	Air+ U.V.-Good
Thermal Conductivity (t. + 40 °C)	< 0,039 W/m K
	Class 1 (DM 26/06/84)
	UL 94-HF1
Fire Resistance	Class 0 - BS 476 part6-7 UK
	NF certificate n.38 (until mm.32) France
	B-s3,d0 (EN 13501-1) Euroclass
Marine and Shipbuilding	MED B - MED D - DNV type approval
Steam Diffusion	MU > 7.000
Noise Reduction (DIN 4109)	Up to 30 dB
Ecological Compatibility	NO CFC - HCFC, asbest free

Controls

The OPTIMA-R-LV (RI) is equipped by a compact controller/actuator units.

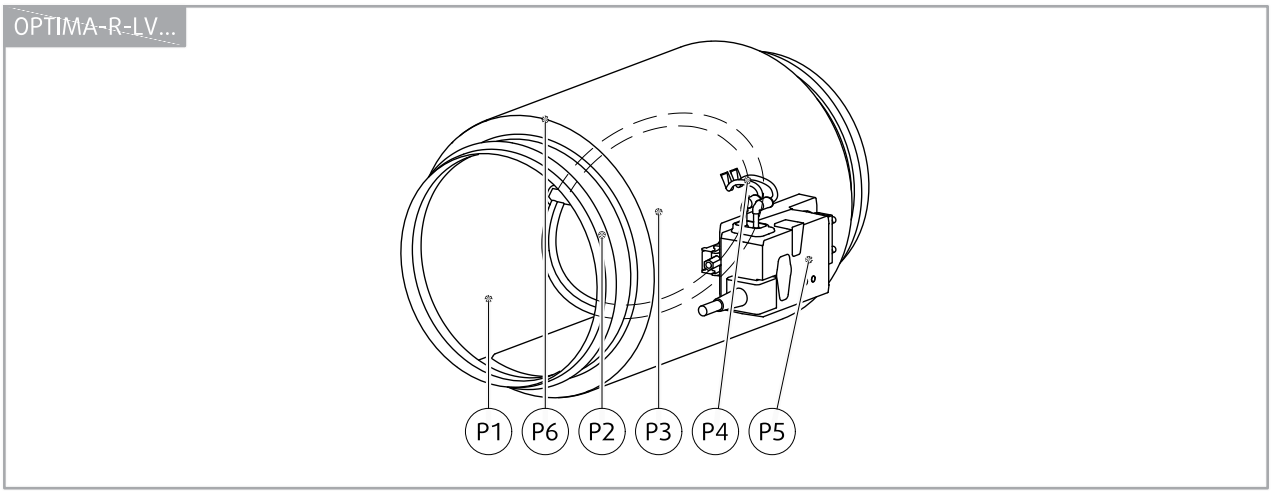
It can operate with analog DC 2 V (optionally 0 V) ... 10 V setpoint and feedback signals or via MP-Bus (Belimo-native) communication capability. It can be used stand-alone or in master and slave configuration of multiple devices. Gateway communication units can be provided for integration into building management systems on bus protocols like Modbus, BACnet, KNX.

With the type OPTIMA-R-LV (RI)...BM the Bus communication interface is on-board. It can be configured for the communication protocol Modbus or BACnet upon order request from the factory or on site with the ZTH-EU configuration tool. VAV controllers are factory calibrated as default standard to the air volume indicated in the table or upon request adjusted to site required settings before dispatch on Vmin and Vmax range. The air volumes can also be readjusted on site with ZTH-EU handheld service tool or by an NFC communicating Android smartphone in the app (not for types OPTIMA-R-LV (RI)...BM) Belimo Assistant. If specific air volumes for Vmin and Vmax would be required, this must be indicated before the order of the units for adequate calibration in the factory. During operation, the standard airflow control procedure runs: The measurement probe enables continuous reading of dynamic pressure dependent on the airflow velocity. The actual airflow is calculated and compared with the setpoint. If there is a difference, the actuator changes the damper position to adjust the airflow exactly to the setpoint value.

OPTIMA-R-LV (RI) can operate properly and accurately at very low airflow velocities (0,2 m/s) and low duct pressures (≥ 2 Pa). Though to avoid some undesirable behaviour and destructive effects on the actuator, at subliminal pressures and velocities the controller runs special procedures. If the actual setpoint corresponds to a velocity lower than 1 m/s, measured Δp (dynamic pressure on flow measurement probe) on the probe drops lower than 2 Pa (then also duct pressure is lower than 2 Pa and the velocity is lower than 0,2 m/s) the controller stops operation and the damper parks in a special waiting position (slightly open).

This damper position enables a proper probe Δp reading at the lowest possible duct pressure. The actuator does not move, avoiding so mechanically destructive small oscillations. The Δp measurement on the probe continues. As soon as the Δp value rises to 6 Pa the controller re-starts the normal control operation.

Product Parts

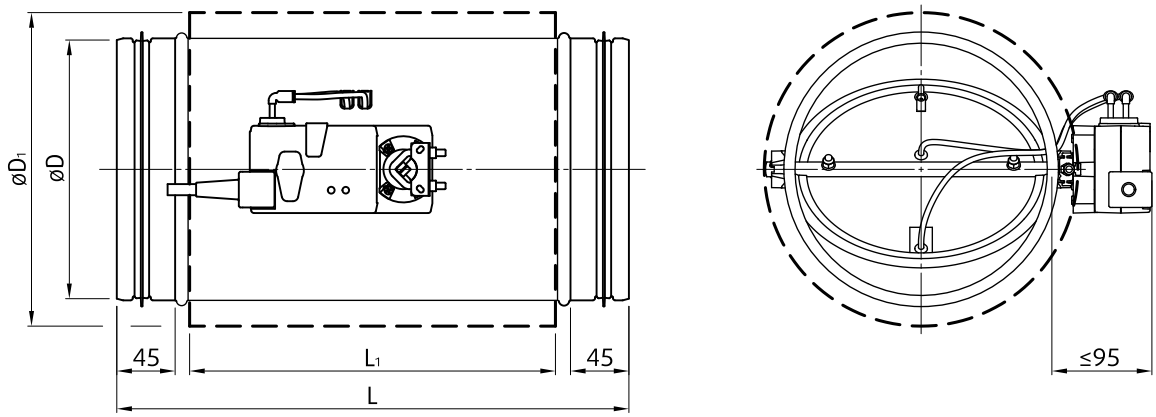


Legend:

P1 Casing
P2 Duct connection with gasket
P3 Damper blade with a measurement probe
P4 Measurement impulse tubes
P5 Compact control/actuator unit
P6 Insulation with a protection sheet (OPTIMA-RI-LV)

Dimensions & Weights

OPTIMA-R-LV... (mm)



øD	V_{min} @ 0,2 m/s *		V_{max} @ 6 m/s *		V_{nom} @ 6 m/s *		$øD_1$	L	L_1	OPTIMA-R-LV	OPTIMA-RI-LV
										m	
mm	m^3/h	l/s	m^3/h	l/s	m^3/h	l/s	mm			kg	
100	6	2	170	47	170	47	137	287	181	1,4	1,8
125	9	2	265	74	265	74	162	288	181	1,6	2,4
140	11	3	332	92	332	92	177	289	181	1,8	2,7
160	14	4	434	121	434	121	197	327	221	2	3
180	18	5	549	153	549	153	217	327	221	2,2	3,3
200	23	6	678	188	678	188	237	387	281	2,8	4,4
250	35	10	1060	294	1060	294	287	387	281	4,2	6,2
315	56	16	1682	467	1682	467	352	487	381	5,6	8,6
400	90	25	2713	754	2713	754	437	487	381	8	11,7

Ordering Codes

Non-insulated VAV controller

OPTIMA-R-LV-

Nominal size DN

100

125

140

160

180

200

250

315

400

Controller type

BP

BM

Minimum air flow volume factory setup [1)]

V_{min} (m^3/h)

Maximum air flow volume factory setup [1)]

V_{max} (m^3/h)

Setpoint analog input/output mode [2)]

0 DC 0 V ... 10 V

2 DC 2 V ... 10 V

Feedback analog output mode [3)]

F Air flow volume feedback

D Damper position feedback

NOTES:

1. If the V_{min} and V_{max} is not stated in the ordering code, the controller will be adjusted to the basic factory pre-set values. Corresponding to 0,2 m/s (V_{min}) and 6 m/s (V_{max}).
2. Default flow setpoint analog input mode is „2" (DC 2 V ... 10 V)
3. Default feedback analog output mode is „F" (actual air flow volume). The mode „D" is required for integration in optimizing system AIAS.

Example of the Ordering Code

OPTIMA-R-LV-160-BP-14-289-2-F

The non-insulated VAV controller, diameter size 160 mm, control range 14 m^3/h ... 289 m^3/h, analog signals 2 V ... 10 V, feedback air flow.

Insulated VAV controller

OPTIMA-RI-LV-

Nominal size DN

100

125

140

160

180

200

250

315

400

Controller type

BP

BM

Minimum air flow volume factory setup [1)]

V_{min} (m^3/h)

Maximum air flow volume factory setup [1)]

V_{max} (m^3/h)

Setpoint analog input/output mode [2)]

0 DC 0 V ... 10 V

2 DC 2 V ... 10 V

Feedback analog output mode [3)]

F Air flow volume feedback

D Damper position feedback

NOTES:

1. If the V_{min} and V_{max} is not stated in the ordering code, the controller will be adjusted to the basic factory pre-set values. Corresponding to 0,2 m/s (V_{min}) and 6 m/s (V_{max}).
2. Default flow setpoint analog input mode is „2" (DC 2 V ... 10 V)
3. Default feedback analog output mode is „F" (actual air flow volume). The mode „D" is required for integration in optimizing system AIAS.

Example of the Ordering Code

OPTIMA-RI-LV-160-BM-20-250

The insuted VAV-controller, diameter size 160 mm, with customized pre-adjustment of V_{min} to 20 m^3/h and V_{max} to 250 m^3/h.

Accessories

ZTH-EU

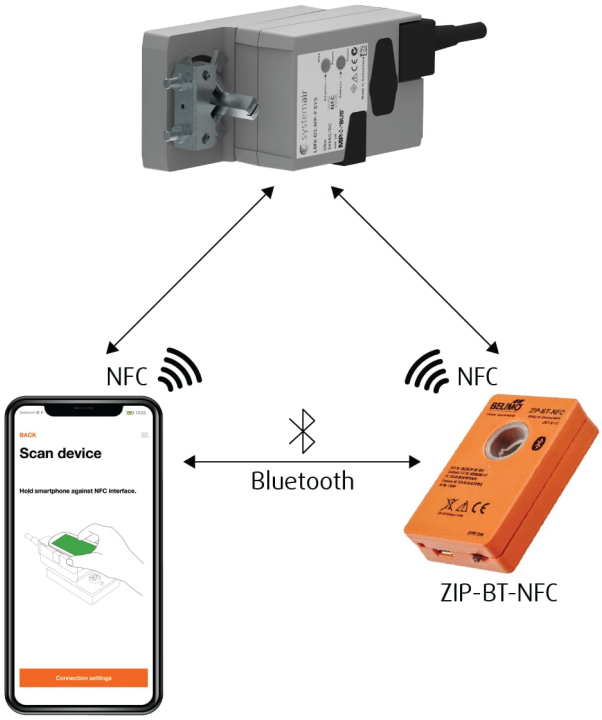
Handheld Tool

ZTH-EU is a handheld tool for VAV controllers and communicative actuators. The product enables the customer to change the configuration of the VAV controllers.

ZIP-BT-NFC

Communication Port Bluetooth/NFC

ZIP-BT-NFC is a wireless interface connecting the smartphone with configuration app Belimo Assistant via Bluetooth to the VAV controller VRU... with NFC communication protocol.



			Tool		Authorisation
Parameter/Function	Unit/Value	Function/Description/ (Area)	Assistant App	ZTH-EU	Expert/OEM
VAV Unit/Air Duct Pressure Control Butterly Valve - Manufacturer Parameters (OEM Values - Not Variable)					
OSN Actuator	xxxxx-xxxxx-xxx-xxx	Actuator series number	r	r	
Rotation Direction	CCW/CW	Actuator direction of rotation setting	r/w	r/w	E
Range of rotation	Adapted/programmed	Actuator adapted/ programmed 30°...95°	r/w	–	E
Power on behaviour	No action/synch. / adaption	Actuator power on behaviour	r/w	–	E
Parametrisation - Project-specific Settings					
Position	Text string	Plant designation (16 Z./ ZTH 16 Z.)	r/w	r	
Max	m^3/h | l/s | cfm (PC-tool/ ZTH %) % (position)	Operating volumetric flow 0% ... 100% V_{nom} Damper position (pos. ctrl.) 0% ... 100%	r/w	r/w	
Min	m^3/h | l/s | cfm (PC-tool/ ZTH %) % (position)	Operating volumetric flow 0% ... 100% V_{nom} Damper position (pos. ctrl.) 0% ... 100%	r/w	r/w	
Altitude compensation	ON/OFF	Switch function ON/OFF	r/w	r/w	E
Altitude of installation	0 m	Compensated Δp and volumetric flow values to set the altitude of installation (above sea level)	r/w	r/w	E
Function	VAV-CAV/position control	Control function	r/w	–	E
Setpoint	Analogue/bus	Analogue and hybrid mode/bus	r/w	r/w	E
Setpoint offset	0	VAV: ±5% compensation ABL unit	r/w	–	E
Reference signal Y	2 V ... 10 V/0 V ... 10 V/ adjustable	Setting for VAV control	r/w	r/w	E
Feedback type	Volumetric flow/Δp/ position	VAV: volume/Δp/damper position Pressure: Δp/damper position	r/w	r/w	E
Feedback U	2 V ... 10 V/0 V ... 10 V/ adjustable	Setting U signal	r/w	r/w	E

Bus parameter

			Tool		Authorisation
Parameter/Function	Unit/Value	Function/Description/ (Area)	Assistant App	ZTH-EU	Expert/OEM
Parametrisation – Communication					
Bus protocol	BACnet MS/TP / Modbus / MP		r/w	r/w	E
Bus protocol	BACnet MS/TP				
MAC address	0…127		r/w	r/w	E
Baudrate	9600 / … / 115200		r/w	r/w	E
Terminating resistor	OFF/ON		r/w	–	E
Instance number	1…4194304		r/w	–	E
Device name	{VAV Compact}	(16 Z.)	r/w	–	E
Max master	1…127		r/w	–	E
Bus protocol	Modbus RTU				
Address	1…247		r/w	r/w	E
Baudrate	9600 / … / 115200		r/w	r/w	E
Terminating resistor	OFF/ON		r/w	–	E
Parity	1-8-N-2/…E-1/…-O-1/…-N-1		r/w	r/w	E
Bus protocol	MP-Bus				
MP address	PP/MP1…8	PP (MP off)/MP1…8	r/w	r/w	E
Bus fail position	0	0% … 100% (min…max)	r/w	–	E

Legend

X Application supports function

r Tool: read

w Tool: write

– Tool: Does not support parameter

E Only visible in Expert Mode Authorisations - functionally relevant settings are only accessible via the Expert Level of the Belimo Assistant App

Technical Parameters

Legend

p_s (Pa) Pressure drop

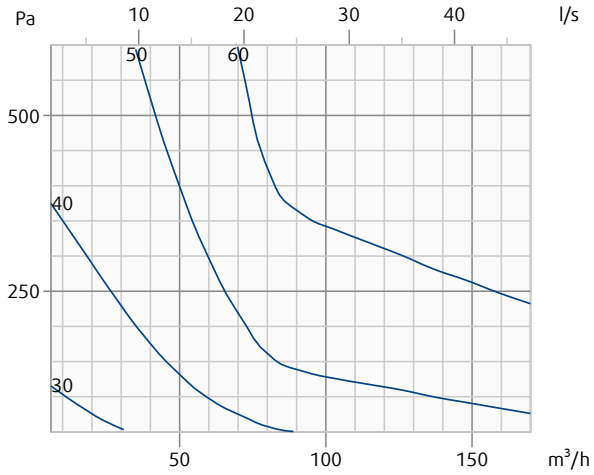
q_V (m^3/h or l/s) Air flow volume

L_{WA} (dB(A)) A-weighted total radiated sound power level

L_W (dB) Non-weighted total sound power level

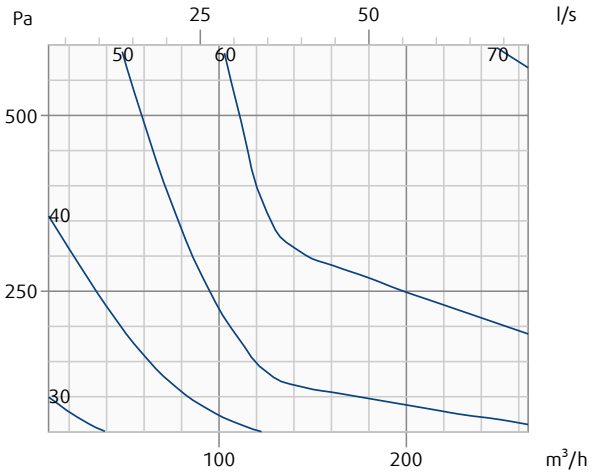
OPTIMA-R-LV-100-BP

Pressure drop & A-weighted sound power level in dB(A)



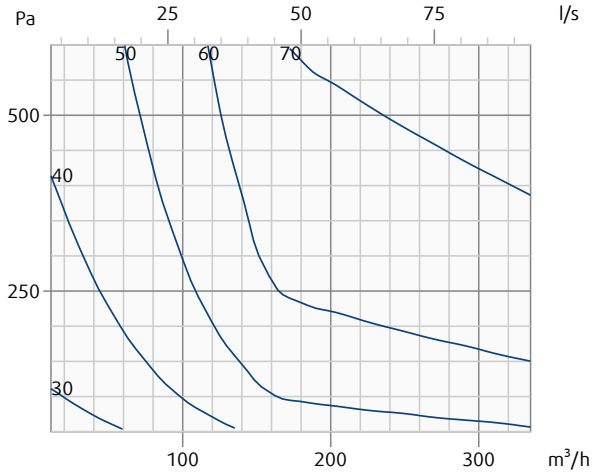
OPTIMA-R-LV-125-BP

Pressure drop & A-weighted sound power level in dB(A)



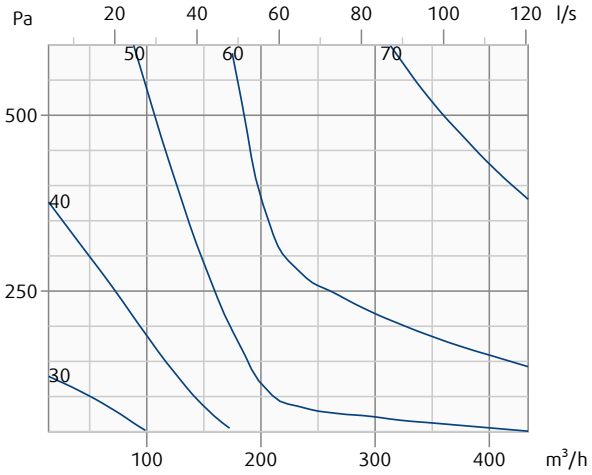
OPTIMA-R-LV-140-BP

Pressure drop & A-weighted sound power level in dB(A)



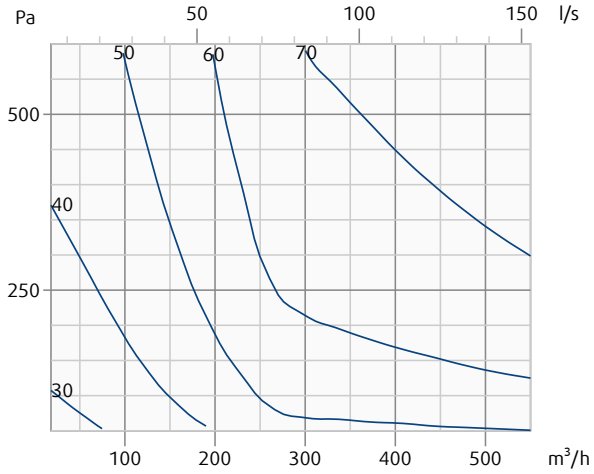
OPTIMA-R-LV-160-BP

Pressure drop & A-weighted sound power level in dB(A)



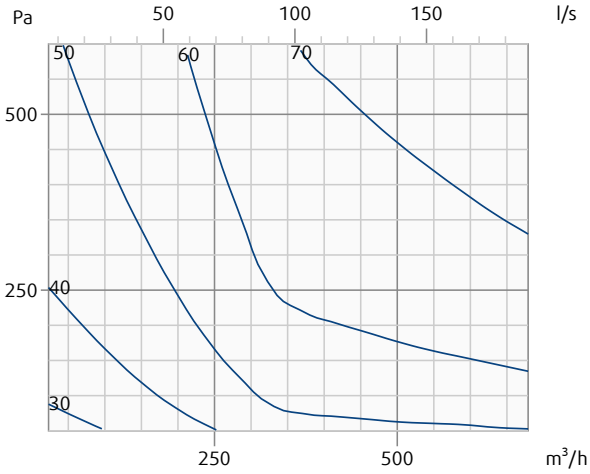
OPTIMA-R-LV-180-BP

Pressure drop & A-weighted sound power level in dB(A)



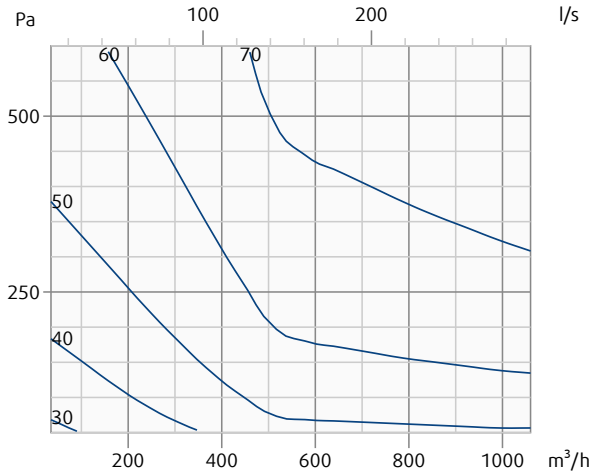
OPTIMA-R-LV-200-BP

Pressure drop & A-weighted sound power level in dB(A)



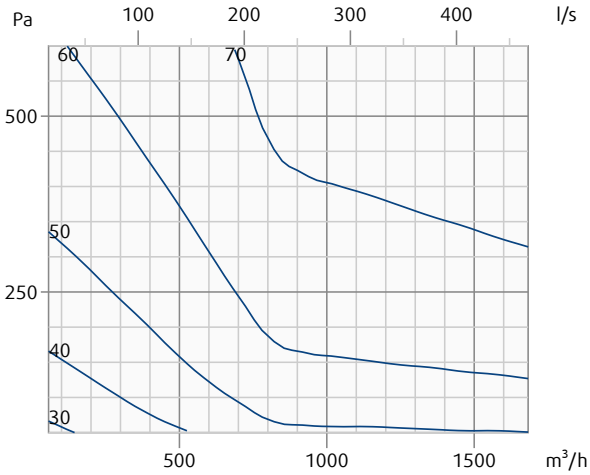
OPTIMA-R-LV-250-BP

Pressure drop & A-weighted sound power level in dB(A)



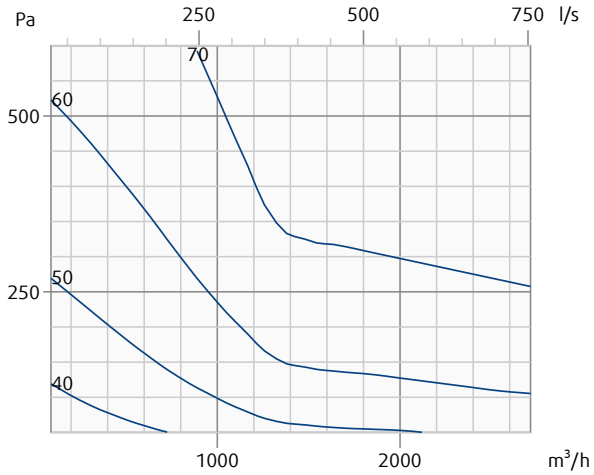
OPTIMA-R-LV-315-BP

Pressure drop & A-weighted sound power level in dB(A)

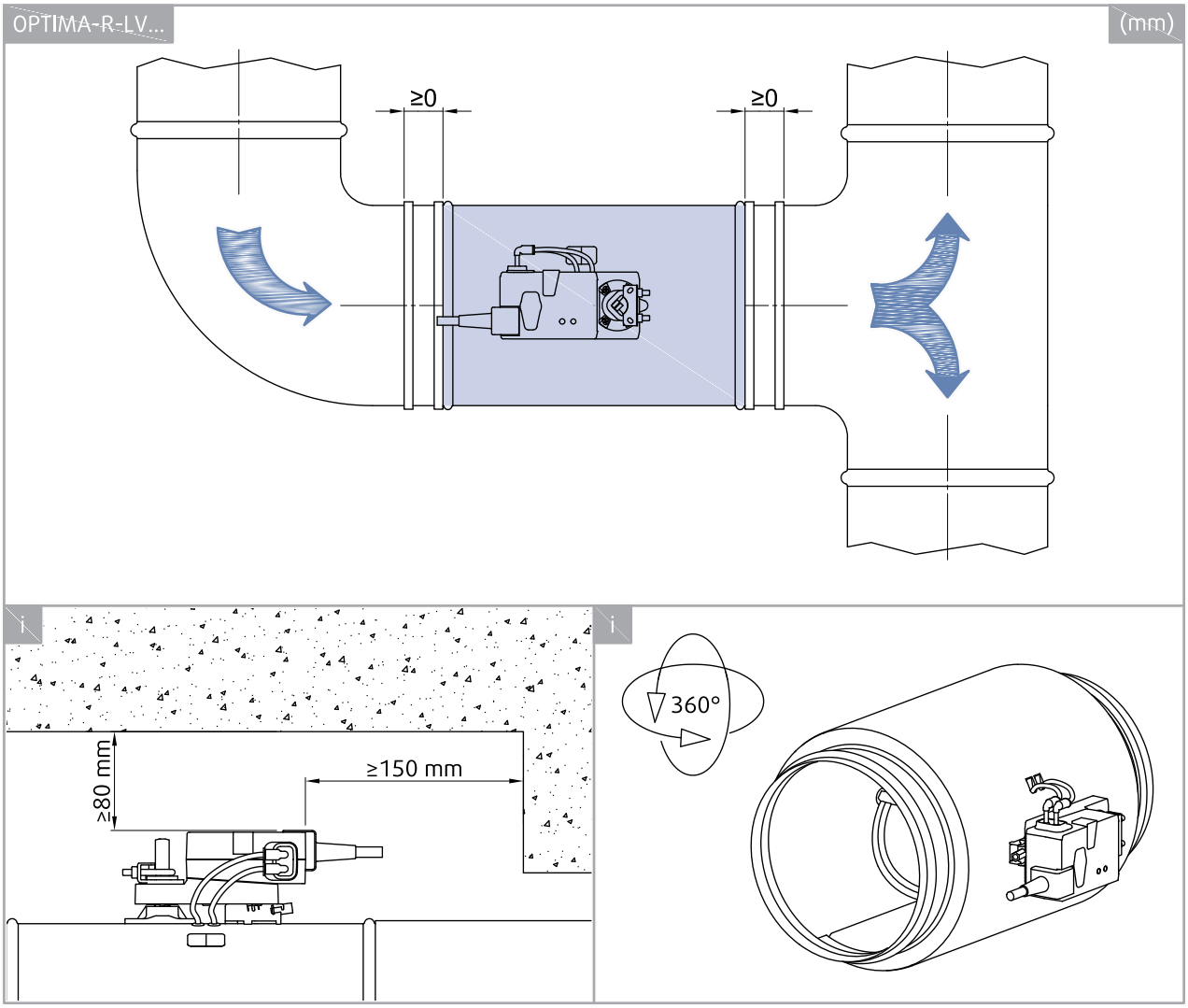


OPTIMA-R-LV-400-BP

Pressure drop & A-weighted sound power level in dB(A)

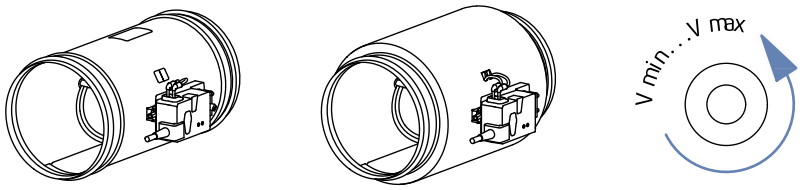


Installation



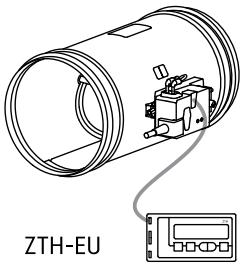
Setting

OPTIMA-R/RI-LV...



OPTIMA...

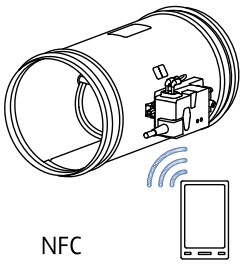
"R-LV-BP"
"RI-LV-BP"
"R-LV-BM (MODBUS)"
"RI-LV-BM (MODBUS)"



ZTH-EU

OPTIMA...

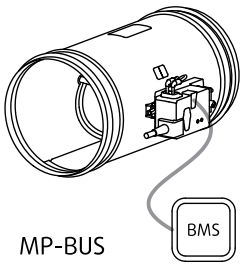
"R-LV-BP"
"RI-LV-BP"



NFC

OPTIMA...

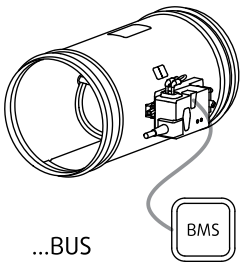
"R-LV-BP"
"RI-LV-BP"



MP-BUS

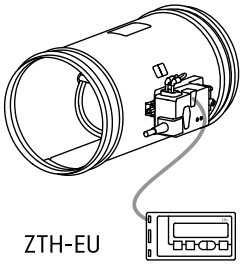
OPTIMA...

"R-LV-BM (MODBUS)"
"RI-LV-BM (MODBUS)"
"R-LV-BM (BACnet)"
"RI-LV-BM (BACnet)"

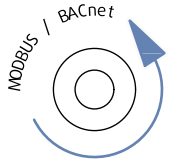


...BUS

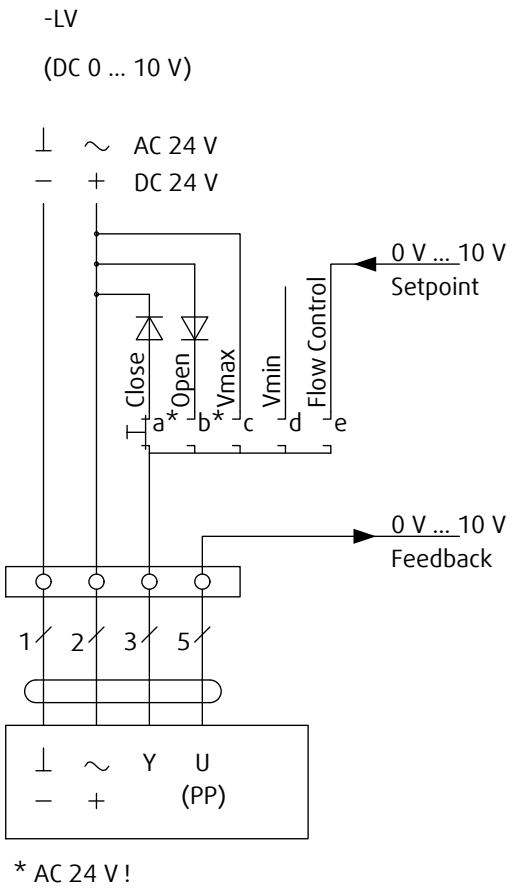
OPTIMA-R/RI-LV...BM

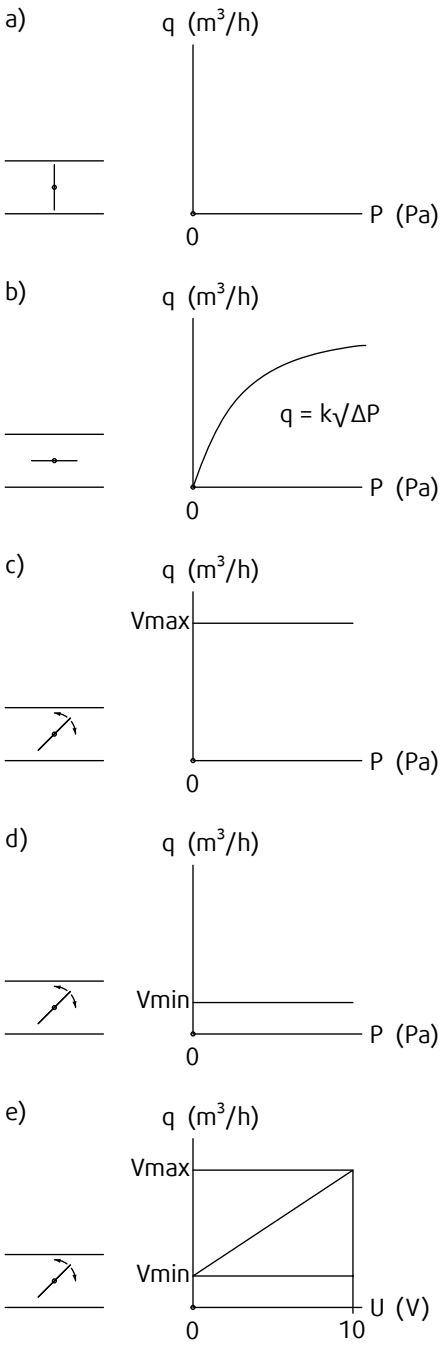


ZTH-EU



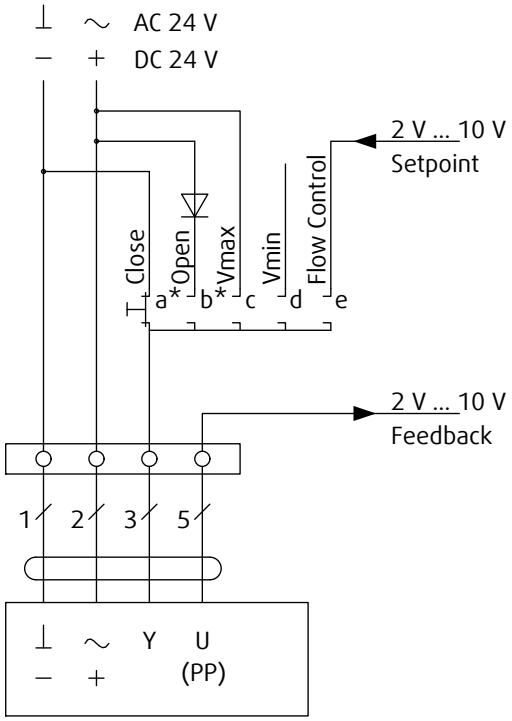
Electrical Connections



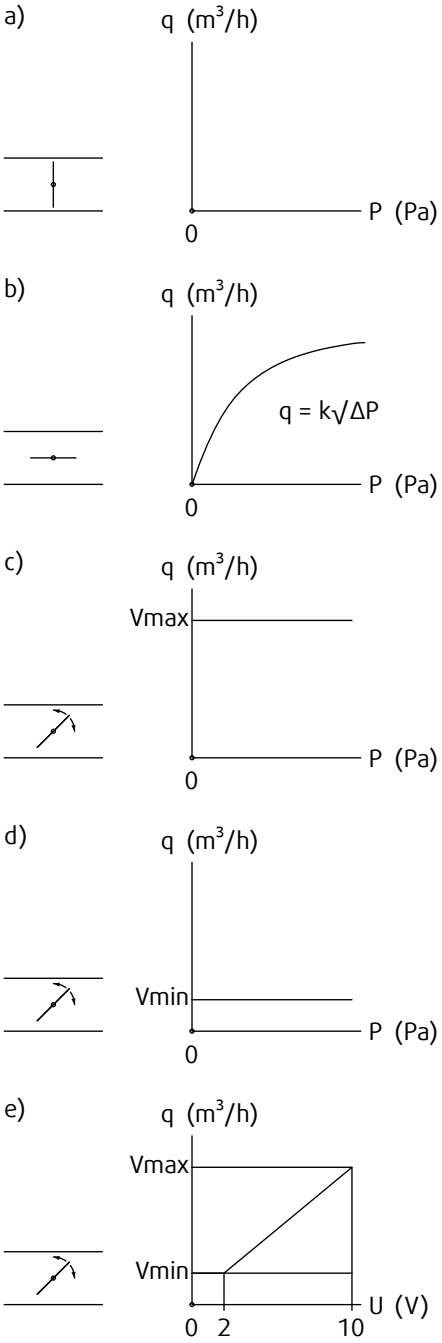


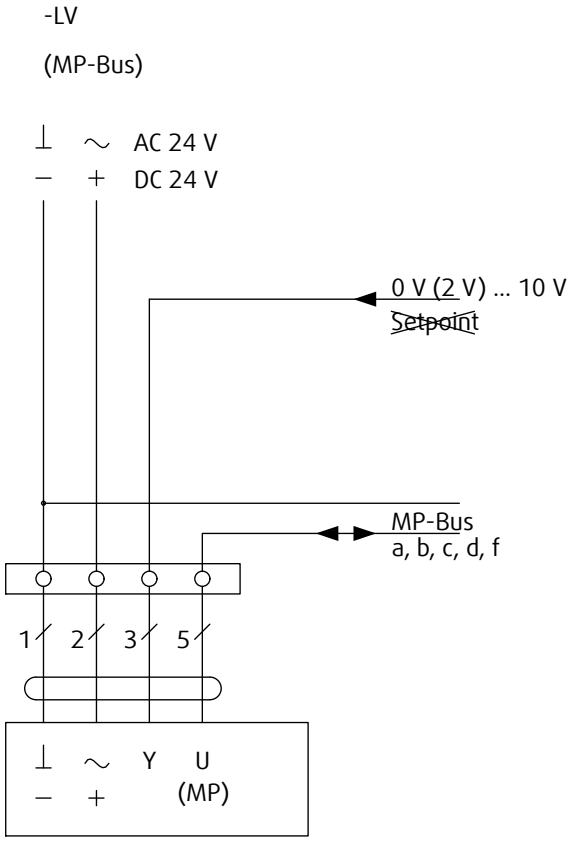
-LV

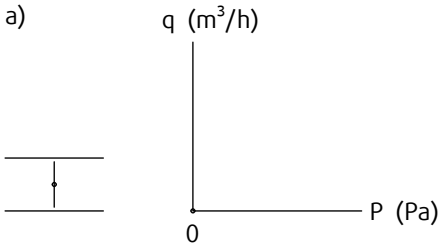
(DC 2 ... 10 V)

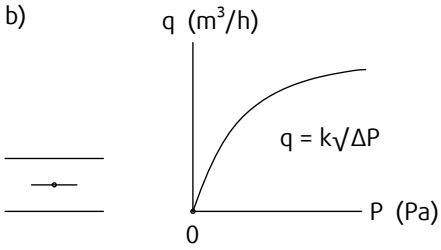


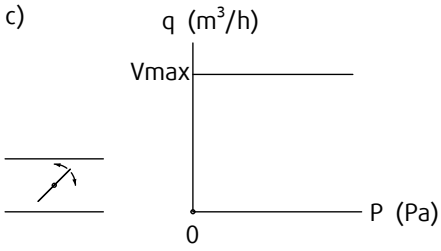
* AC 24 V !

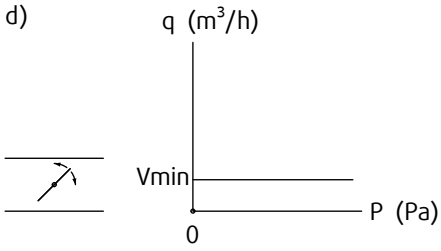



-LV
(MP-Bus)
AC 24 V
DC 24 V
0 V (2 V) ... 10 V
Setpoint
MP-Bus
a, b, c, d, f
1
2
3
5
Y
U
(MP)


a)
q (m³/h)
P (Pa)
0

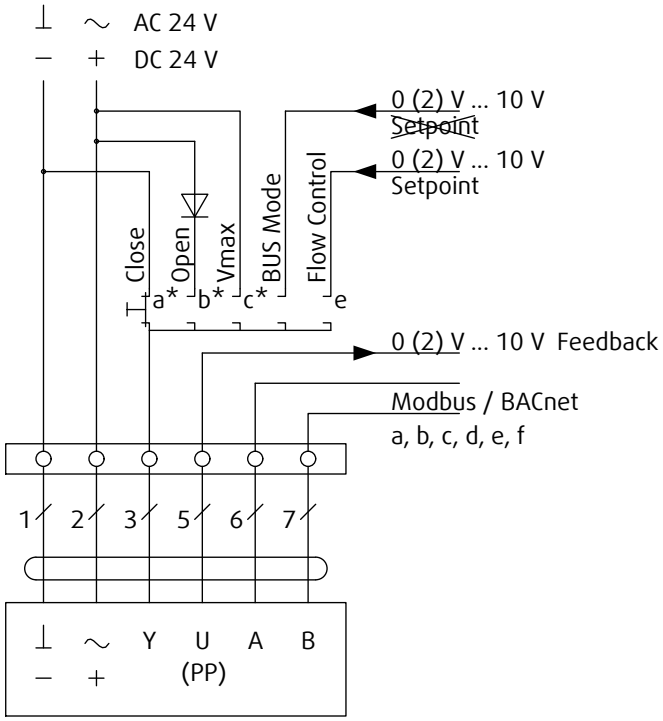

b)
q (m³/h)
q = k√ΔP
P (Pa)
0


c)
q (m³/h)
Vmax
P (Pa)
0


d)
q (m³/h)
Vmin
P (Pa)
0

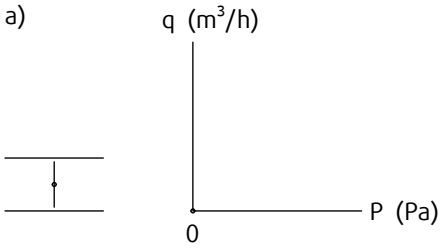
-LV-...-MOD

(Modbus / BACnet)

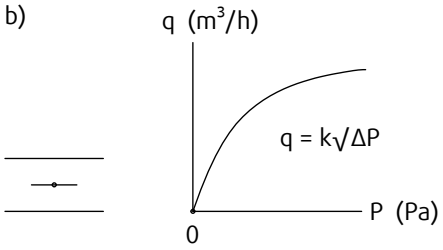


* AC 24 V !

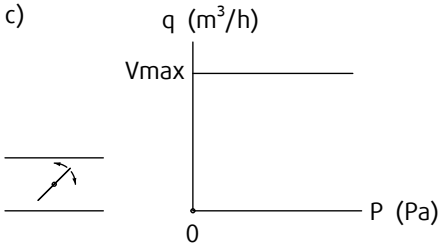
a)



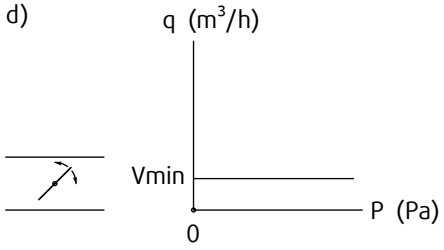
b)



c)



d)



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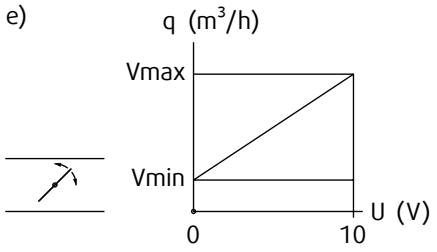
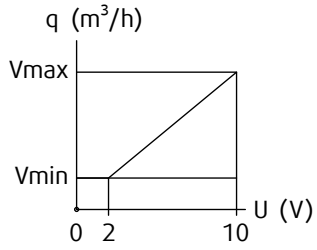
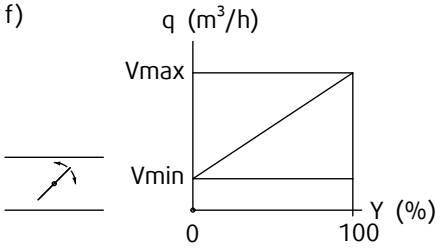


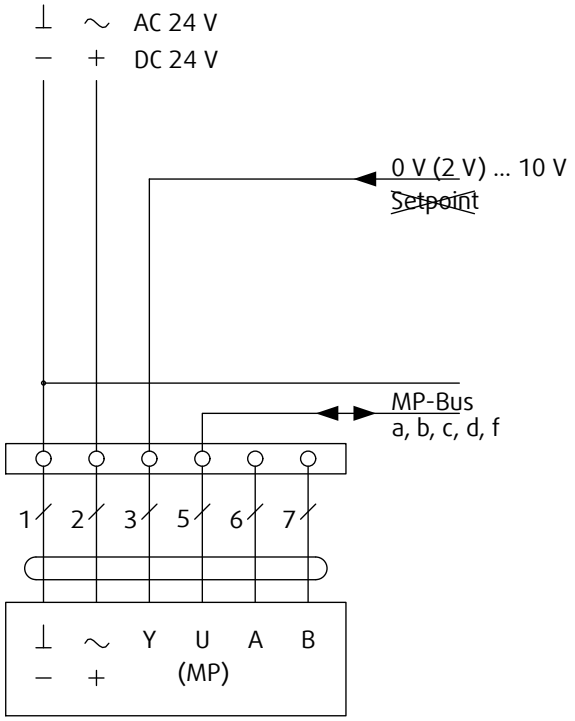


f)



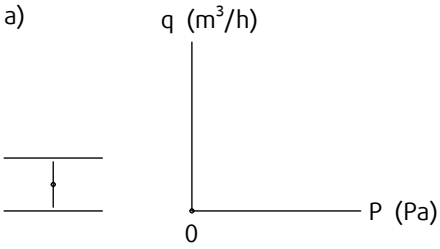
-LV-...-MOD

(MP-Bus)

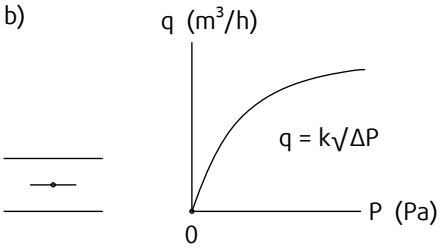


* AC 24 V !

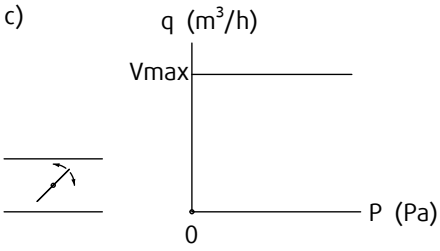
a)



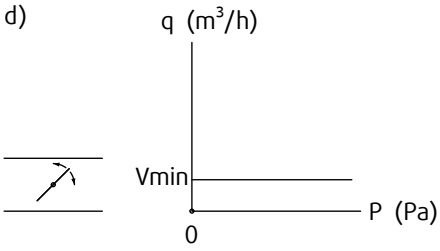
b)



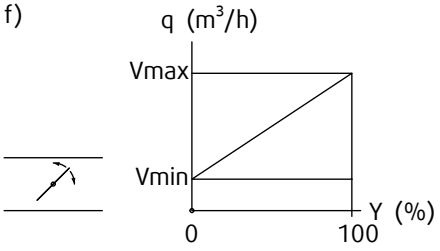
c)



d)



f)



Transport, Storage and Operation

Transport and storage temperature range: -20 °C to +40 °C, dry indoor conditions.
Operation temperature range: -20 °C ... +70 °C in the duct, -20 °C ... +50 °C on the actuator.

Supplement

Any deviations from the technical specifications contained herein and the terms should be discussed with the manufacturer. We reserve the right to make any changes to the product without prior notice, provided that these changes do not affect the quality of the product and the required parameters. Current information on all products is available on design.systemair.com.

Handbook_OPTIMA_LV_R_en-GB
design.systemair.com
www.systemair.com

Original instructions

2024-09-13

DOCUMENT VERSION 2