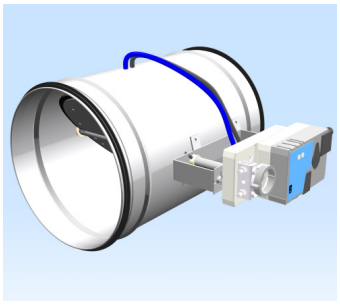
AIR TECH
SYSTEMS

Translation of Original Installation/Operating/Maintenance Instructions

LTG Air Distribution

Variable flow rate controllers
VR.*active*

active control



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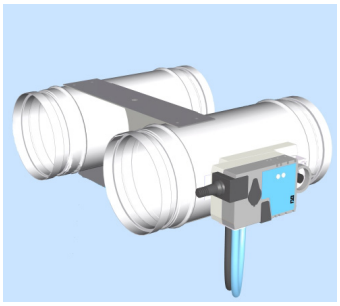

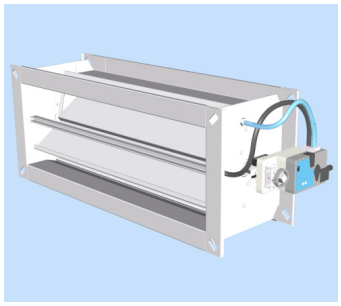

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Translation of original installation/operating/maintenance instructions

Variable flow rate controllers VR.*active*

LTG Comfort Air Technology

- Air-Water Systems
- Air Diffusers
- **Air Distribution**

Contents

Notes

Dimensions stated in this brochure are in mm.

Dimensions stated in this brochure are subject to General Tolerances according to DIN ISO 2768-vL.

0. EC Declaration of conformity

AIR TECH SYSTEMS

EC declaration of conformity

As defined by the EC Council Directive on Machinery 2006/42/EG, Annex II, Nr. 1A

We herewith declare that the machine described in the following conforms to all relevant provisions of the EC Machinery Directive 2006/42/EC.

Manufacturer:	**LTG Aktiengesellschaft, Grenzstr. 7, D-70435 Stuttgart**
Designation of machinery:	**Flow Rate Controller**
Machinery type:	**VRE*active* / VRF*active* / VRD*active*** all sizes
Relevant EC Council Directives:	Machinery Directive (2006/42/EC), Low voltage directive 2006/95/EC
Applied harmonized standards, in particular:	DIN EN ISO 12100, EN/IEC 60730-1, EN/IEC 60730-2-14, EN 61000-6-2, EN 61000-6-3
Other standards:	

Stuttgart, 16.06.2015

Signature of manufacturer

Position of signatory: Wagner ppa. Dehlwes

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Konformitätserklärung-GB.docx/page 1 of 1

1. Safety instructions

Assembly, dismantling, commissioning and maintenance must be performed by trained personnel in order to achieve reliability, safety and best results. The generally recognised rules of engineering must be adhered to, as well as relevant regulations (in particular those pertaining to safety and accident prevention).

1.1 Explanation of symbols and hints

Operating safety symbol

This symbol is placed alongside every operating safety instruction in these operating instructions, wherever there is a danger to life and limb. Observe these instructions and in such cases proceed with extreme caution. Pass on all the operating safety instructions to other users. In addition to the instructions contained in these operating instructions, the generally applicable safety and accident prevention regulations must be observed; as shown here, for example: Warning of hazard point.

Information symbol

This information symbol is placed alongside those points in the manual which must be specifically observed in order to ensure that the guidelines, regulations, instructions and correct operating sequences are observed and to prevent damage to or destruction of the unit and/or other components in the system.

These mandatory symbols are linked to the operating safety instructions and show which protective measures must be complied with at the appropriate workstations and therefore specifically mandate a certain action, as shown here as an example: Wear protective gloves.

These prohibition symbols are linked to the operating safety instructions banning a dangerous or risky action, as shown here as an example: Do not touch.

1.2 Operating safety instructions

Carefully read the safety instructions before using any LTG flow rate controllers. Always follow the safety instructions!

The units meet any pertinent safety standards.

The installation and maintenance of flow rate controllers may be dangerous because of high pressures and electrical components being alive. Therefore, the installation, maintenance, and repair must be performed by qualified and trained staff only.

In particular electrical connections are to be provided, removed, or modified by authorized persons only observing all relevant safety instructions.

Safety instructions in the technical documentation and on unit labels must be followed at all times.

Do not open the unit for cleaning, maintenance, or repair and do not remove covers and casings (air diffuser) unless all conducting lines have been completely disconnected. Do not connect or remove the plug-in connector when under tension.

Any work regarding the electrical equipment is to be performed by skilled and trained staff only. Connections to the main power supply and the safety earth terminal must be executed exactly as described in the wiring diagram.

Electrical operation of the unit in a partly disassembled condition or of individual components is not permitted since earth terminals might be interrupted.

Be careful when performing work on the flow rate controllers. Sheet metal parts may be sharp-edged. Wear gloves during work and handling.

Be careful when working overhead and provide protection against parts falling from above.

Avoid any additional load to the unit or the suspensions since stability might be insufficient.

The unit must be checked by an expert immediately. If

- it has been mechanically damaged
- it is suffering from a water damage,
- the suspension or the casing show clear signs of corrosion or ageing,

do not put the unit back into operation before all necessary maintenance and repair has been performed by an expert !

Take the unit entirely off the main power supply until all repairs have been completed by an expert even if this might result in not being able to operate undamaged units.

It is in any case imperative to take a damaged unit completely off the main power supply!

1.3 Intended use

The flow rate controllers are designed for controlling the flow rate in the air duct network of air-conditioning systems.

They may be used only for air without solids and without aggressive or toxic additives.

The flow rate controllers may be used only for the purpose described. Any use not expressly described in these operating and maintenance instructions is deemed non-authorised.

2. Transport, Delivery, Storage

The unit requires dry and dust-free conditions during transport, storage, installation, and operation.

Units are stacked on Euro-pallets or disposable pallets and secured with shrink film or packed in boxes. Pallets may be moved using suitable transportation vehicles and lifting gear.

Do not remove the packaging unless immediately prior to installation on site to protect the unit from pollution and damages.

LTG Aktiengesellschaft will not take responsibility for any pollution of or damages to the unit.

2.1 Transport instructions

For transporting the flow rate controllers, only use suitable transportation vehicles, lifting gear and load-carrying equipment of sufficient capacity.

The units are heavy (Sections 4.1 /4.2 / 4.3).

The load must be reliably safeguarded against damage of whatever type – being dropped, tilted or knocked etc.

Parts or tools falling from above when working overhead.

Sharp edges and flashes.

When transporting the units at the construction site, do not lift them at control components such as the actuator, measuring probes, hoses or damper blade. Lift them only at the edges of the housing.

The aluminium measuring probes of the VRF*active* are extremely important for the function of the controller and must therefore be treated with care. Do not pull or push on them.

2.2 Delivery

Check the flow rate controllers immediately for completeness and damage incurred in transit. If parts are missing or if you notice damage, inform LTG Aktiengesellschaft immediately.

Separate the packaging material in an environmentally friendly manner and recycle it.

2.3 Storage

When storing the flow rate controllers, protect them from excessive humidity (max. 95 % rh, non-condensing), moisture and contamination by sand, mortar, sticky dust, etc.

Maintain an ambient temperature of 0...50 °C to protect the electronic components.

3. Function

3.1 Mode of operation

The flow rate controllers VRE*active*, VRD*active* and VRF*active* have been designed for use in rectangular air ducts of air-conditioning plants, to control flow rates based on constant or variable set values, independent of the pressure in the air duct.

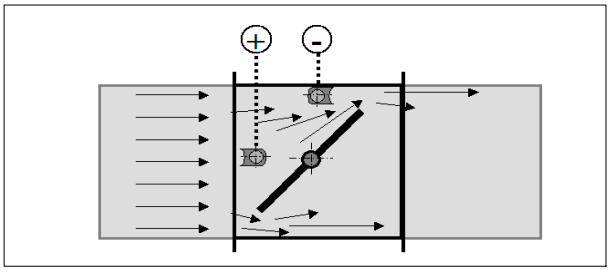
The flow rate is determined using two pressure-integrating measuring probes inside the duct casing.

The measuring front probe determines the total pressure and the rear probe measures static pressure inside the jet-like damper-accelerated air flow. Thus, the resulting differential pressure is hydraulically amplified.

The controller compares the actual flow rate signal with the set value and sends an output signal to the electrical actuating drive. The deviation is then corrected by changing the position of the damper.

Flow rates for the different model sizes are listed in the technical brochure. If the controllers are operated at flow rates below the minimum values shown, correct operation cannot be assured.

Depending on the reference signal and the programmed operating range, the controller sets the flow rate linearly between the minimum and maximum set values.



Flow pattern inside the housing

3.2 Application ranges and limits

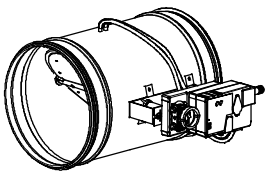
The intended application ranges and limits are as follows:

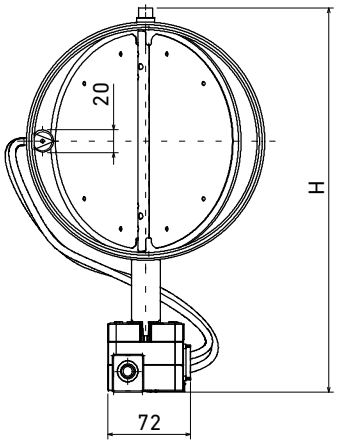
- Minimum air speed 1 m/s
- Nominal air speed 10 m/s
- Maximum air speed in the free case section 12 m/s with specific factory-set adjustment
- Static over-pressure in the air duct up to 1000 Pa
- Static under-pressure in the air duct based on ambient pressure -750 Pa max.
- Media temperature range 0...+50 °C, 5...95 % rH (non condensing)
- Suitable for low-pollution air flows (e.g. ETA1, ETA2 acc. to DIN EN 13779), non-corrosive, aggressive air, without solvents that may affect the EPDM damper sealing
- Installation with horizontal damper axle only
- Free suction with upstream air duct or via fitting only

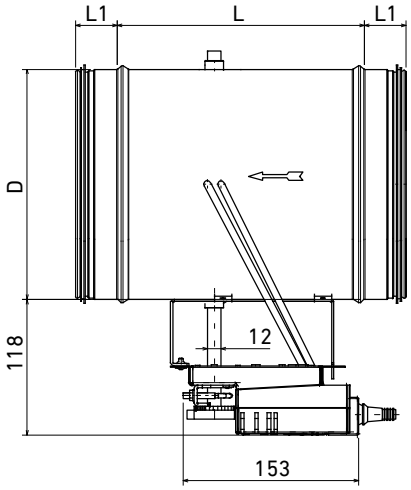
4. Technical data

4.1 Dimensions, weight VRE*active*

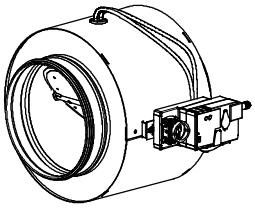
Without insulating case

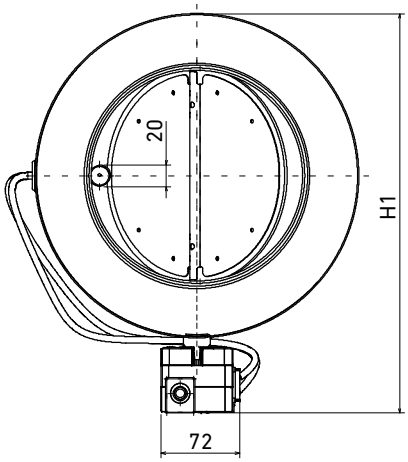


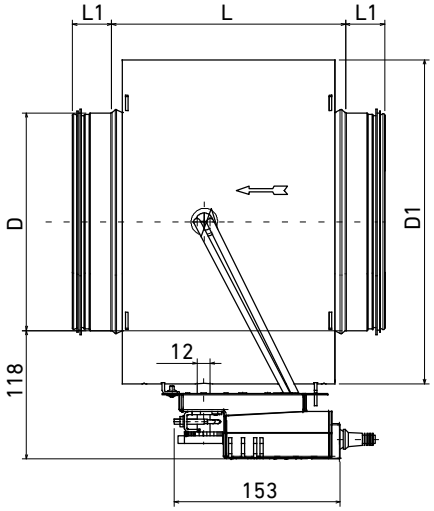




With insulating case
(retrofit)



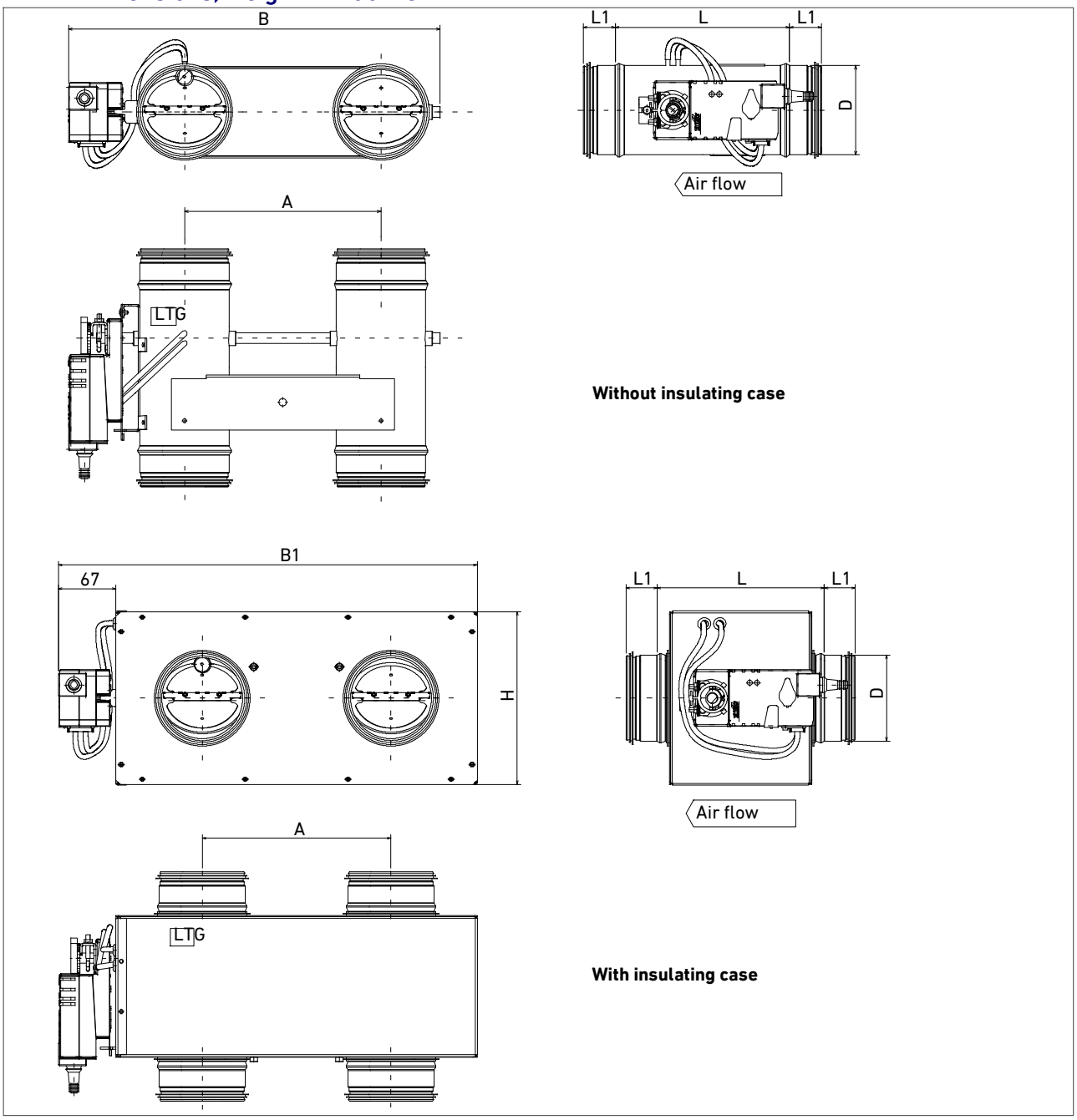




Version with plug-in ends and lip seal gasket.
Total length of the housing of the version with flange L + 2 x L1

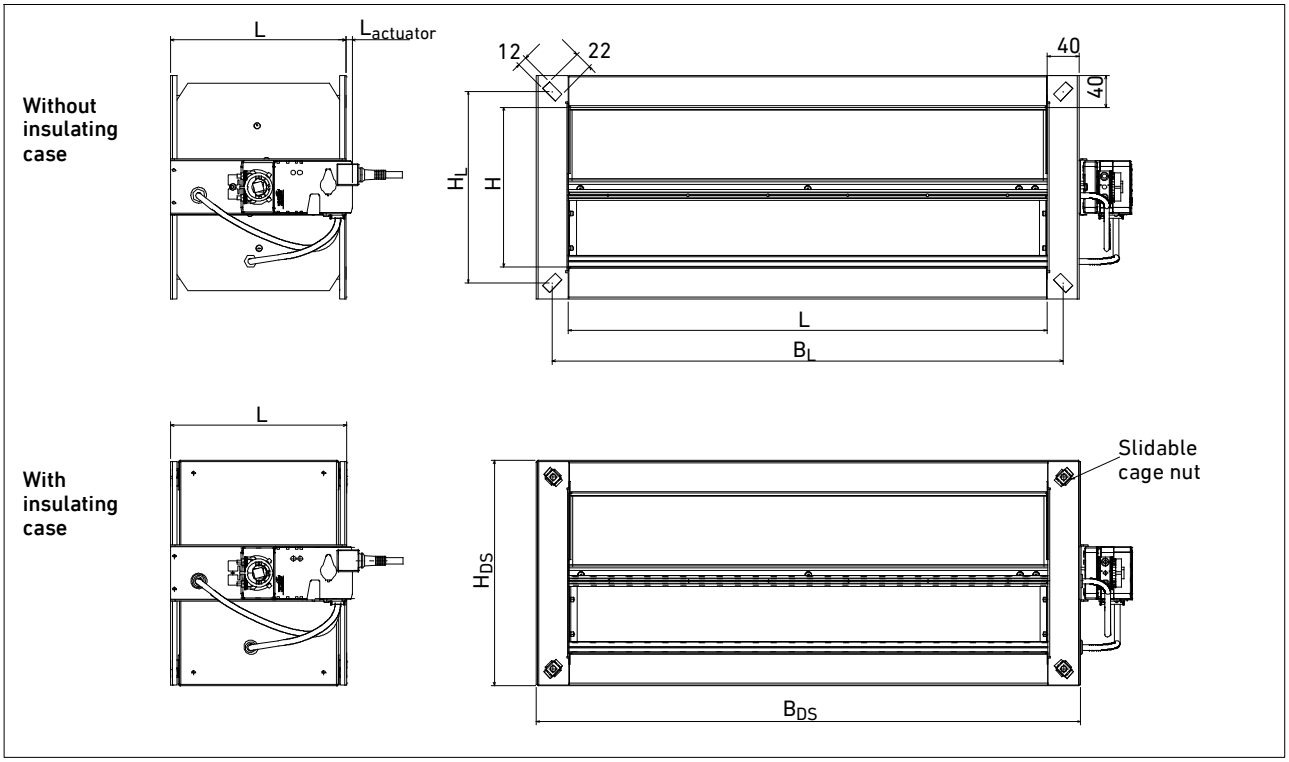
Nominal diam DN	L [mm]	L1 [mm]	D [mm]	D1 [mm]	H [mm]	H1 [mm]	Damper angle [°]	Weight [kg] without | with insulating case	
100	195	36	99	199	233	267	60	1.5	2.9
125	195	36	124	224	258	292	60	1.8	3.4
160	215	36	159	259	293	327	60	2.1	4.1
200	215	36	199	299	333	367	60	2.6	4.9
250	260	54	249	349	383	417	60	3.3	6.5
315	260	54	314	414	448	482	60	4.4	8.2
400	315	72	399	499	533	567	60	6.1	11.7

4.2 Dimensions, weight VRD*active*



Nominal diam. Ø DN	D [mm]	L [mm]	L1 [mm]	A [mm]	B [mm] w/o insulating case	L [mm] w/o insulating case	B [mm] with insulat. case	H [mm] with insulat. case	Damper angle [°]	Weight [kg] w/o i. c.	Weight [kg] with i. c.
100	99	195	36	220	420	195	420	199	60	3.2	7.5
125	124	195	36	245	475	195	470	224	60	4.0	10.0
160	159	215	36	280	550	215	540	259	60	4.6	11.5
200	199	215	36	320	630	215	620	298	60	5.8	14.5

4.3 Dimensions, weight VRF*active*



Width B [mm]	Height H [mm]	Length L [mm]	Distance between holes B_L [mm]	Distance between holes H_L [mm]	Excess length $L_{actuator}$ [mm]	Width with insulation B_{DS} [mm]	Height with insulation H_{DS} [mm]	Max. torque [Nm]	Weight w/o insulat. [kg]	Weight with insulat. [kg]
200	100	135	240	140	60	282	182	5	3.0	4.3
300			340	140		382			3.7	5.5
400			440	140		482			4.4	6.5
500			540	140		582			5.1	7.5
600			640	140		682			5.8	8.3
300	150	170	340	190	60	382	232	5	4.4	6.5
400			440	190		482			5.2	7.6
500			540	190		582			6.0	8.8
600			640	190		682			6.8	10.2
200	200	220	240	240	30	282	282	5	4.3	6.7
300			340	240		382			5.3	8.3
400			440	240		482			6.3	9.5
500			540	240		582			7.3	11.2
600			640	240		682			8.3	12.4
800			840	240		882			10.2	15.2
300	250	270	340	290	30	382	332	5	6.3	11.3
400			440	290		482			7.4	12.3
500			540	290		582			8.5	15.4
600			640	290		682			9.6	17.5
800			840	290		882			11.6	21.8
300	300	325	340	340	0	382	382	10	7.8	13.0
400			440	340		482			9.2	15.5
500			540	340		582			10.2	17.5
600			640	340		682			12.8	20.0
800			840	340		882			15.7	23.5
1000			1040	340		1082			18.7	27.5
400	400	430	440	440	0	482	482	10	12.7	20.0
500			540	440		582			14.5	22.5
600			640	440		682			16.3	26.0
800			840	440		882			19.9	30.5
1000			1040	440		1082			23.5	35.0
1200			1240	440		1282			27.1	40.0

4.4 Control components

Overview of standard control components

Type	Torque [Nm]	Power consumption [W]	Dimensioning [VA]	Weight [g]
LMV-D3W-MF-F LTG	5	2	4	ca. 500
LMV-D3W-E-MF LTG	5	2	4	ca. 500
NMV-D3W-E-MP LTG	10	3	5	ca. 700

Technical data

Measurement range	[Pa]	0...600
Measuring air conditions	[°C]	0...+50, 5...95 % rH, non condensing
Storage temperature	[°C]	-20...+80
V_{max}	[m^3/h]	20...100 % of V_{nom}
V_{min}	[m^3/h]	0...100 % of V_{nom}
Sound power level	[dB(A)]	max. 35
Nominal voltage		AC 24 V, 50/60 Hz, DC 24 V
Nominal voltage range	[V]	AC 19,2...28,8; DC 21,6...28,8
Control function		VAV-CAV, open-loop operation
VAV and CAV application		- supply/return air in stand-alone mode (parallel connection) - master-slave control
Mode for reference value input Y (input resistance min. 100 kΩ)		- DC 2...10 V / (4...20 mA with 500 Ω); - DC 0...10 V / (0...20 mA with 500 Ω); - adjustable DC 0...10 V
Mode for actual flow rate U_5 (max. 0,5 mA)		- DC 2...10 V - DC 0...10 V - adjustable: flow rate, damper position or differential pressure
Sensor linking		Passive (Pt1000, Ni1000 etc.) and active sensors (0...10 V) e. g. temperature, humidity 2-point signal (contact rating 16 mA @ 24 V), e.g. switches, occupancy detector
Operation and service		PC tool (V3.6 and above) / ZTH-VAV manual control unit, connection via service socket or free wire ends
Connection		cable, 4 x 0,75 mm^2
Protection class		III extra low voltage
IP rating		IP54

Technical data on other control components can be supplied on request.

5. Installation

Dispose of all packaging material before assembling. Remove any cushioning material from the interior of the controller.

During assembly, ensure that the piping is free of dirt and loose objects such as rags, newspapers, chips and packing material. These can impair the functioning of the controller.

Install the controller in a location that ensures free access to all the control components

Flow direction, installation position

Install the flow rate controller in accordance with the air direction arrow on the housing. The valve shaft must be horizontal.

The flow rate controller can be mounted in vertical and horizontal air ducts.

The flow rate controller is virtually insensitive to entry duct conditions. Nevertheless, certain installation situations can adversely affect the fluid mechanics, control accuracy and acoustics, and should therefore be avoided. Examples are extreme constriction of the flow, deflection around sharp corners, asymmetric inflow, free suction without an intake fitting, installation in front of or behind obstructions, etc.

Free suction is permissible only with an upstream air duct or suitable fitting.

The air ducts and the flow rate controller must be securely mounted.

Before connecting the air ducts, check them for damage, contamination and loose parts. The connections between the air ducts must be sealed against leakage with standard sealing materials.

The above installation requirements also apply to the installation of sound absorbers.

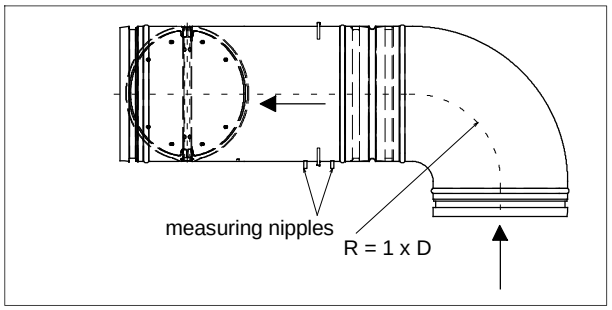
If the sound emission via air duct surfaces is critical, all ducts including the controller must be sound insulated up to the sound absorber.

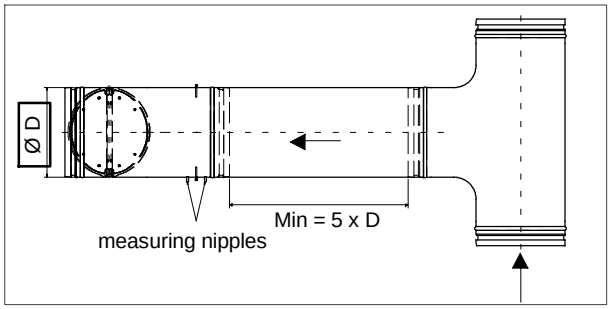
For sound absorbers, the flow noise downstream of the splitters and the noise created by the increased outflow air speed in the connected fittings must be considered.

Straight entry ducts are to be designed as follows:

Upstream of the flow rate controller, the minimum straight length ("Min") of the entry flow duct must be as shown in the illustrations below. A 90° bend can be connected to the flow rate controller without a straight entry duct. If a branch piece is connected, a straight entry duct of at least 5 x D is required. The measuring nipples must be correctly located in order to achieve the specified control accuracy.

There are no restrictions regarding the outflow side.





D - diameter

Min - min. inflow distance for a control accuracy ± 5 % of V_{nom}

If the fittings must be combined in a way that is unfavourable to the flow, the minimum straight length is several times the Min value specified.

Make sure that the connecting cables and measuring hoses are not damaged during installation.

Connect and suspend the air ducts and flow rate controllers using suitable fastening material of sufficient strength.

Make sure that there is no inner offset between the flow rate controller and air duct, especially with flange connections.

Seal all connection points against leakage.

For sound absorbers, the flow noise downstream of the splitters and the noise created by the increased outflow air speed in the connected fittings must be considered.

If the sound emission via air duct surfaces is critical, all ducts including the controller must be sound insulated up to the sound absorber.

Continuation 5. Installation

Parts or tools falling from above when working overhead.

Cordon off the danger area.

Sharp edges and flanges.

Between damper blade and housing.

Never stand underneath the suspended load!

5.1 Installation VRE*active*, VRD*active*

The plug-in end pieces are suitable for connection with air ducts according to DIN EN 1506 or EN 13180 and have insertion grooves.

Pipe ends with a rim are for connections with clamping rings.

They should be connected to an air duct as per DIN EN 1506 with the same rim height as on the controller side (standard approx. 6 mm). Clamping rings and ring seals suitable for the duct wall thickness should be used in order to ensure a tight connection.

Clamping rings and ring seals for 1 mm ducts are available as accessories.

For flange connections, use standardised mating flanges that fit the connection side (standard: DIN 24154 R1). Separate mating flanges are available as optional accessories.
Insert a suitable flat seal between the flanges. Connect the flanges at all holes with bolts and nuts of sufficient strength.

5.2 Installation VRF*active*

Straight entry ducts L_{Anstr} must be provided to prevent flow separation in the area of the measuring probes. These straight sections, installed upstream of the controllers, must have a length of L_{Anstr} > 2...3 H or > 2...3 B depending on whether the disruption is caused by the duct height H or width B.
If there is no space for installation of such entry ducts, guide plates must be installed where the flow is diverted.

The flanges have slots in the corners. They can be connected to air ducts with flat flanges (DIN 24192) as well as to Meinig or MEZ/SBM duct connections with a profile height of 30/40 mm. The housing cross-sections match the recommended edge lengths for rectangular air ducts as per DIN EN 1505.

6. First use

First use is only permitted after installation and testing have been completed.

Before starting the flow rate controller, install it permanently in the air duct and set up a power supply for the drive and control unit. Check all cables and measuring lines for possible damage and route them in such a way that they cannot be damaged during operation.

When the supply voltage of 24 V is first applied, the controller will adjust itself automatically. The damper will move to its two mechanical stops (open and closed), thus determining its turning range.

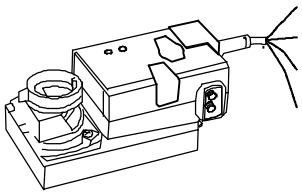
The factory-set sliding blocks of the actuator serve as end stops to limit the angular movement of the damper blade and must not be adjusted. If they are adjusted, this could pose a risk to correct operation within the tolerance range and possibly also impair the strength of the damper blade.

The running time and operating range are adjusted to the available turning angle, and the values are saved in the compact controller. This takes approx. 150 seconds. The process is indicated by the yellow status LED. If this adjustment does not take place automatically at the first start-up, it can be triggered manually by pressing the green Power LED button.

The damper closes all the way during the adaptation process. To prevent mechanical damage to the flow rate controller, the permissible pressure differences must not be exceeded (Section 3.2 Operating range). If necessary, the fan can be shut off or a fan control unit can be installed to regulate the pressure.

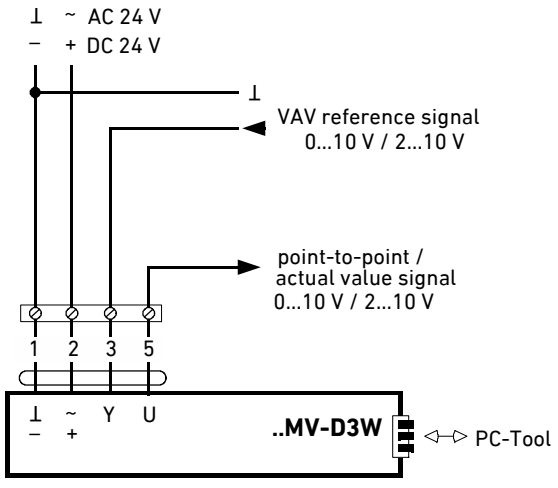
The mechanical function of the flow rate controllers has been checked by LTG Aktiengesellschaft. The unit can be put into operation after the unit has been mounted and the piping and other lines have been correctly connected by the customer.

6.1 Cable connection, wiring diagram

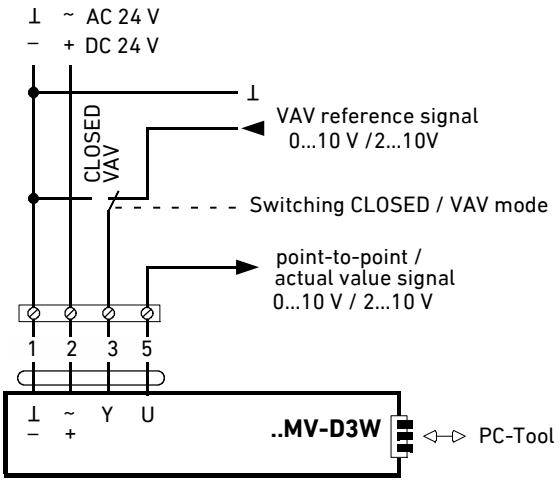


No.	Designation	Wire colour	Function
1	– ⊥	black	⊥ – } AC/DC 24V supply
2	+ ~	red	~ + }
3	Y	white	Reference signal VAV/CAV
5	U	orange	Point-to-point / Actual value signal

VAV (variable flow rate) with analogue reference signal



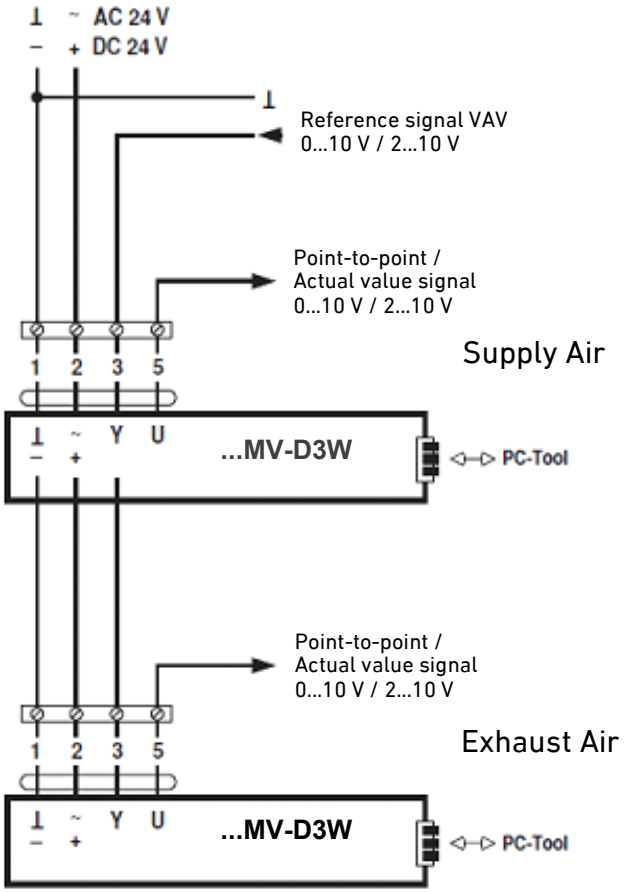
VAV (variable flow rate) with shut-off (CLOSE), 2...10 V mode



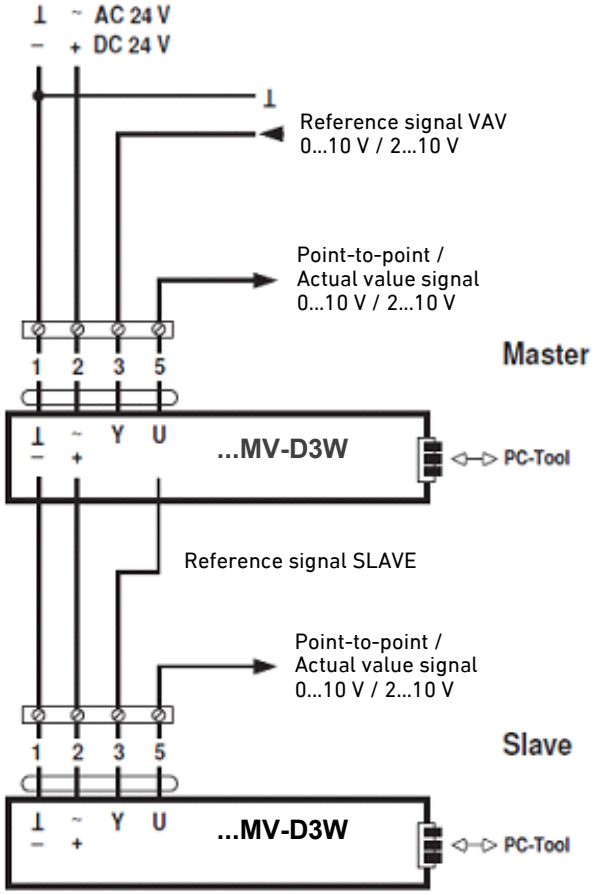
Translation of original installation/operating/maintenance instructions
Variable flow rate controllers VR.*active*

Continuation 6.1 Wiring diagrams

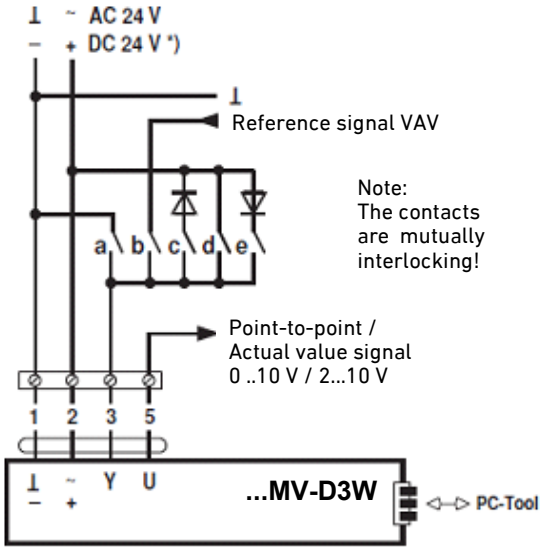
VAV (variable flow rate) with analogue reference signal
Supply/exhaust air in parallel connection



VAV (variable flow rate) with analogue reference signal
in Master/Slave connection



CAV mode (constant flow rate)



CAV standard function

Mode setting	–	0 … 10 V	0 … 10 V	0 … 10 V	0 … 10 V
	2 … 10 V	2 … 10 V	2 … 10 V	2 … 10 V	2 … 10 V
Signal	⊥ –	0 … 10 V 2 … 10 V	~	~ +	~
Function	3	3	3	3	3
Damper CLOSED	a) CLOSED		c) CLOSED *		
$\dot{V}_{min}$ … $\dot{V}_{max}$		b) VAV			
CAV – $\dot{V}_{min}$	All open – $\dot{V}_{min}$ active				
Damper OPEN					e) OPEN *
CAV – $\dot{V}_{max}$				d) $\dot{V}_{max}$	

Legend

- Contact closed, function active
- Contact closed, function active, only in 2 … 10 V mode
- Contact open

* Not available with DC 24 V supply

Wire diagrams for other control components on request.

7. Operation

The flow rate controllers must only be operated as described in Section 1.3.

To function correctly, they must remain within the following permissible operating conditions:

- Minimum length of entry flow (see Section 5)
- Installation position of box and sensor (Section 5)
- Power supply and controller (Section 4.2)
- Air velocity range (Section 3.2)
- Static overpressure or underpressure in the air duct as compared with the environment (Section 3.2)
- Minimum pressure loss (VRE*active*, VRD*active*, VRF*active* technical brochures)
- Media temperature, operating temperature, humidity (Section 3.2)
- Air quality (Section 3.2)

Data may be different for other makes of controllers

To prevent mechanical damage to the flow rate controller, the permissible pressure differences must not be exceeded when the damper is closed (Section 3.2 Operating range). If necessary, the fan can be shut off or a fan control unit can be installed to regulate the pressure

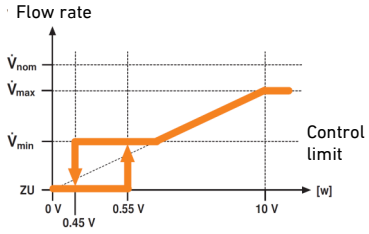
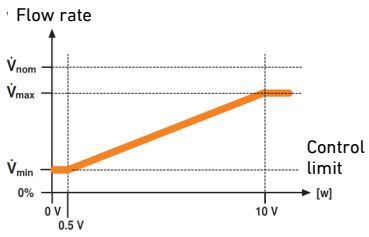
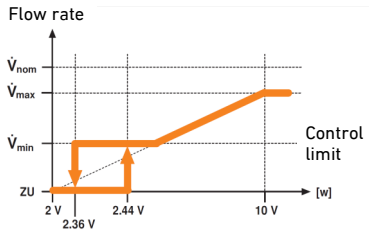
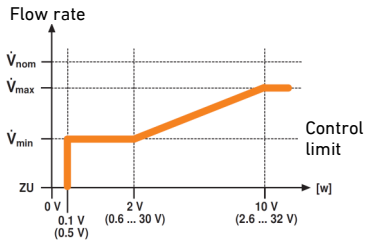
The following description of operating modes and functions applies to the Sauter ASV115 compact controller.

7.1 Shut-off (ZU)

If a shut-off is necessary in VAV mode, this can be achieved by means of the setting V_{min} = 0 % or operating range 2...10 V (see table in Section 7.2).

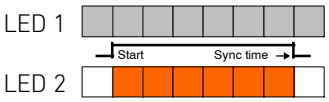
7.2 VAV (variable flow rate) mode

The desired flow rate is specified on a linear scale within the range V_{min}...V_{max} by means of an analogue reference signal at terminal 3.

Settings: Operating range [V]	Settings: V_{min}	Diagram	Reference signal Y [V]	Function	Calculation of reference signal [V]
0...10	0 %		0...0,55	Closed (ZU)	
			>0,55...10	V_{min}*...V_{max}	$w = 10 \times \frac{Vset}{Vmax}$
			10...0,45	V_{max} ...V_{min}*	
			<0,45...0	Closed (ZU)	
	> 0 %		0...0,5	V_{min}*	
			0,5...10	V_{min}*...V_{max}	$w = 9,5 \times \frac{Vset - Vmin}{Vmax - Vmin} + 0,5$
2...10	0 %		0...2,44	Closed (ZU)	
			>2,44...10	V_{min}*...V_{max}	$w = 8 \times \frac{Vset}{Vmax} + 2$
			10...2,36	V_{max} ...V_{min}*	
			<2,36...0	Closed (ZU)	
	> 0 %		0...0,1	Closed (ZU)	
			>0,1...<2	V_{min}*	
			2...10	V_{min}*...V_{max}	$w = 8 \times \frac{Vset - Vmin}{Vmax - Vmin} + 2$

* If V_{min} is set below the lower control limit, the controller sets the smallest differential pressure (flow rate).
For the lower control limit see the VRE*active*, VRD*active* and VRF*active* technical brochures.

7.3 LED function table

Application	Function	Description/Action	LED pattern: Adaption ⊕ LED 1 Power; Address ⊕ LED 2 Status
N1 Operation	Status information	- 24 V power supply OK - VAV-Compact ready for operation	
S1 Service function	Synchronisation	Synchronisation started by: a) Operating / service device b) Manual disengagement on the VAV-Compact c) Power On behaviour	
S2 Service function	Adaption	Adaption started by: a) Operating / service device b) Button on VAV-Compact	

Legend

Green LED (power) lit

Yellow LED (status) lit

LED function tables for other (non-standard) control components on request (standard components see page 11).

8. Maintenance, repair

All components are maintenance-free, aging-resistant and corrosion-resistant under normal conditions. However, to ensure proper performance, the flow rate controllers should be checked in the course of general system maintenance. This should include the following:

- Functioning of the flow rate controller
- Functioning of the actuating drive
- Functioning of the forced control
- Tightness of the connections and measuring hoses

According to the general rules for air-processing systems set forth in DIN 1946 Part 2 (VDI Ventilation Code of Practice), the duct system and flow rate controllers must be kept accessible for necessary adjustment and maintenance work. For flow rate controllers with electric drives and control components the corresponding manufacturer's specifications apply as well.

The factory-set sliding blocks of the actuator serve as end stops to limit the angular movement of the damper blade and must not be adjusted. If they are adjusted, this could pose a risk to correct operation within the tolerance range and possibly also impair the strength of the damper blade.

When replacing defective control components, proceed as follows:

- Use only original spare parts
- Turn off the supply of electric power supply and air
- Clearly label the wiring and hose attachments before removing them
- Replace the component and restore all connections

Any maintenance and repair work must be performed by skilled and trained staff only.

Secure the area against unauthorised entry when working on the system. Do not allow people to be present directly below the unit.

Perform all work with suitable tools and protective clothing, and allow work to be performed only by skilled personnel.

Before starting any maintenance or repair work the unit is to be completely disconnected from the main power supply!

9. Spare parts

The following spare parts (standard control components) are available and may be ordered from LTG Aktiengesellschaft stating unit type and description:

Description	For type
LMV-D3W-MF-F LTG	VRE*active,* VRD*active*
LMV-D3W-E-MF LTG	VRF*active*
NMV-D3W-E-MP LTG	VRF*active*

The control components are pre-set at the factory. Information on ordering can be obtained from the technical brochure or the rating plate.

10. Decommissioning, disposal

If the flow rate controller is taken out of service, all components must be properly recycled according to the type of material..

When the unit is taken out of service, is no longer used and is disposed of as waste, the following must be complied with:

- all steel parts are waste for recycling
- all plastic parts are waste for recycling
- all secondary substances and lubricants must be disposed of in accordance with the provisions of the EWC (European Waste Catalogue) classification.

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