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Volume flow controller VKup | VKpro



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Overview

VKup | VKpro volume flow controller

1 Product overview

VKup
Electronic volume flow controller
See ► [page 3](#)



VKpro
Electronic volume flow controller
See information starting on ► [page 20](#)



Product features		VKup	VKpro
Actuators	Standard speed (150 s)	■	■
	High speed (4 s / 7 s)		■
	Spring return actuator (150 s, 20 s spring)		■
Communication	Analogue	■	■
	MP-Bus*	■	■
	KNX*	■	
	Modbus* RTU	■	■
	BACnet* MS/TP	■	■
Sensors	Dynamic (thermal measuring method) • Comfort ventilation • Air with low dust content	■	■
	Static (diaphragm measuring method) • Comfort ventilation • Air with low dust content • Air with high dust content		■
Installation flexibility	Consoles: • For manual chamfering • Repositionable		■
Options	Factory-installed acoustic insulation	■	■
	Factory presets	■	■
	SKE-V sound attenuator	■	■

* Trademark of a third party

VKup volume flow controller

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2 VKup volume flow controller

VKup volume flow controllers are maintenance-free electronic controllers for constant and variable volume flows in ventilation and air conditioning systems. They can be installed and operated in any installation position in ventilation ducts for supply and exhaust air.

The casing and control mechanism are made of galvanised sheet steel. The blades for volumetric flow rate control are centrally supported and equipped with a seal. The bearing axles are made of stainless steel and are guided in special plastic bearing bushes. The measuring cross is made of aluminium.

There are four 24 V AC/DC actuators available for selection:

- The AN actuator works exclusively with analogue control.
- The MP actuator is suitable for analogue control using MP-Bus, and can be set using a smartphone via the NFC interface.
- The KNX actuator works exclusively in KNX bus mode
- The MOD actuator can be activated by BACnet, Modbus, MP-Bus or is suitable for analogue control.

Actuators which are suitable for analogue control can be used for the operating modes "constant", "variably adjustable 0 ... 10 V, 2 ... 10 V" and "3-level". Overrides, parallel operation and sequential circuits are possible.

Factory settings can be ordered. Modifications by the user can be made using a setting device, including in conjunction with a PC.

The volume flow controllers allow for a high accuracy with an approximate fluctuation of only ± 5 to 20 % of the actual volumetric flow rate. Accordingly, the volumetric flow rates are held constant in the overall pressure range of 5 Pa to 1000 Pa.



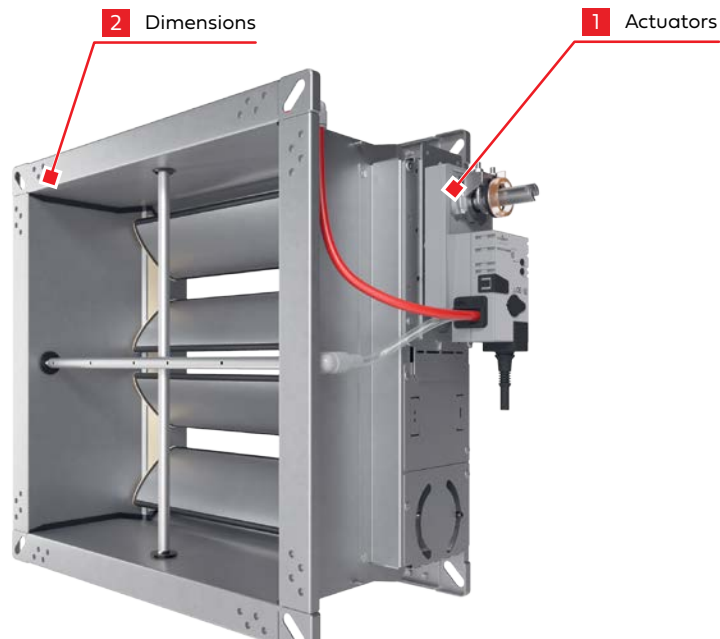
- Can be set on site
 - Position-independent installation
 - Maintenance-free design
 - Sizes W x H:
Lengths L:
 - Leak tightness class:
 - Maximum differential pressure:
 - Differential pressure control range:
 - Volumetric flow rate control range:
 - Flow velocities:
 - Voltage supply:
 - Communication:
 - Actuators:
 - Operating temperature:
 - Protection rating:
 - Hygiene certificate:
 - Environment Product Declaration:
 - Operation modes: constant, variable (0 ... 10 V, 2 ... 10 V, adjustable) and 3-level, overrides, parallel operation and sequential circuits possible.
 - Options
 - Factory presets
 - Acoustic insulation with sheet metal jacket
 - SKE-V sound attenuator
- 200 x 100 mm to 1000 x 1000 mm
250 mm
- Casing: ATC 3 (formerly C) in accordance with DIN EN 1751
Damper blade: Class 4 in accordance with DIN EN 1751
- 1000 Pa
5 ... 1000 Pa
144 ... 36000 m³/h**
2 ... 12 m/s**
24 V AC/DC, -10 % +20 %
Analogue, bus-compatible (MP-Bus, Modbus, BACnet, KNX)
Standard speed
0 ... +50 °C
IP54 in accordance with
DIN EN 60529
- W-408912-25-JRoll, issued by:
Ruhr District Institute of Hygiene
EPD-WIL-20230373-ICAI-DE, issued by:
Institut Bauen und Umwelt e. V.

** Specifications depending on size

VKup volume flow controller

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2.1 Product features



1 Actuators



Example illustration

Various standard actuators (150 s), differentiated by communication type:

Actuator AN

- Analogue control

Actuator MP

- MP-Bus control
- Analogue control

Actuator KNX

- KNX-Bus control

Actuator MOD

- Modbus bus control
- BACnet bus control
- MP-Bus control
- Analogue control

All actuators feature a dynamic sensor with a thermal measurement method.

VKup volume flow controller

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2 Dimensions

Width W [mm]	Height H [mm]	Inflow cross section A_A [m ²]	Volumetric flow rate \dot{V} [m ³ /h]		
			\dot{V}_{limit}	\dot{V}_{start}	\dot{V}_{nom}
200	100	0.020	88	144	864
	200	0.040	171	288	1728
300	100	0.030	129	216	1296
	200	0.060	275	432	2592
	300	0.090	402	648	3888
400	100	0.040	183	288	1728
	200	0.080	3371	576	3456
	300	0.120	549	864	5184
	400	0.160	723	1152	6912
500	100	0.050	235	360	2160
	200	0.100	458	720	4320
	300	0.150	698	1080	6480
	400	0.200	950	1440	8640
	500	0.250	1153	1800	10800
600	100	0.060	280	432	2592
	200	0.120	549	864	5184
	300	0.180	891	1296	7776
	400	0.240	1145	1728	10368
	500	0.300	1356	2160	12960
	600	0.360	1635	2592	15552
700	200	0.140	658	1008	6048
	300	0.210	1020	1512	9072
	400	0.280	1349	2016	12096
	500	0.350	1603	2520	15120
800	200	0.160	744	1152	5760
	300	0.240	1182	1728	8640
	400	0.320	1540	2304	11520
	500	0.400	1787	2880	14400
	600	0.480	2213	3456	17280
	800	0.640	2938	4608	23040
	900	0.810	3657	5832	29160
900	300	0.270	1323	1944	9720
	400	0.360	1725	2592	12960
	500	0.450	2033	3240	16200
1000	300	0.300	1419	2160	10800
	400	0.400	1951	2880	14400
	500	0.500	2344	3600	18000
	600	0.600	2766	4320	21600
	800	0.800	3673	5760	28800
	1000	1.000	4855	7200	36000

3 Accessories



Acoustic insulation with sheet metal casing to reduce the external sound radiation (radiated noise).
Optional accessories, pre-assembled in the factory



Link.10 setting and diagnostics tool for convenient configuration, commissioning and fault diagnosis.
Optional accessories



SKE-V sound attenuator for reducing flow noise in the connected ventilation duct.
Optional accessories for on-site installation



BS2-VR-01 volumetric flow rate and pressure controller module for functional upgrade as a result of integration into the Wildeboer-Net communication system.
Optional accessories

Accessories details see [▶ page 12](#)



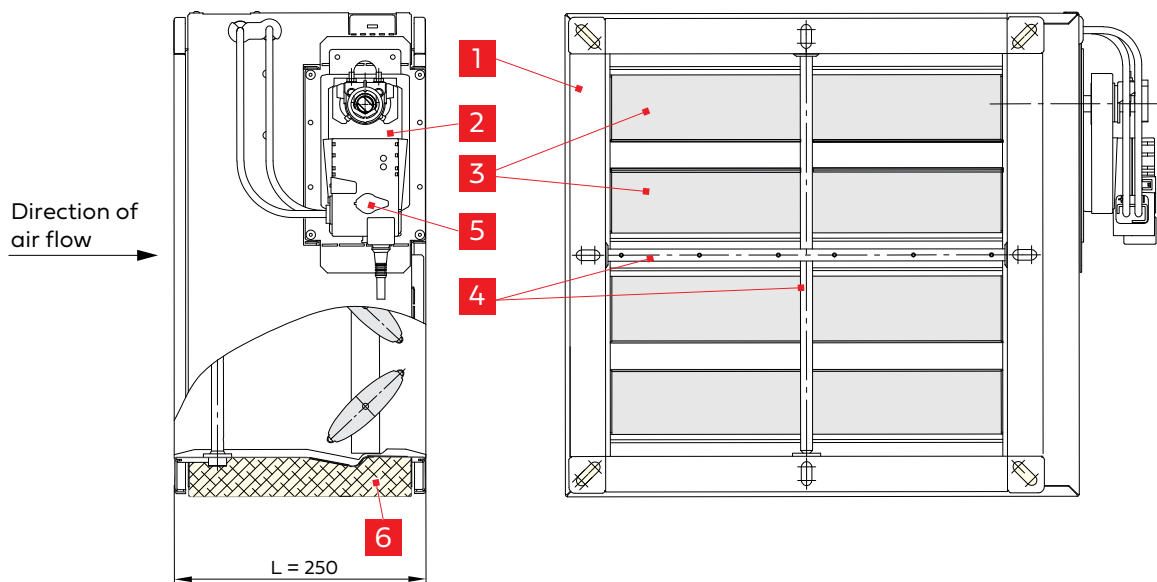
Some of the accessories depend on the size. For reliable selection and to determine the appropriate order data, the web application Wildeboer Connect is recommended [▶ Wildeboer Connect](#).

VKup volume flow controller

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2.2 Product description

VKup volume flow controllers regulate the volumetric flow rate using the differential pressure at the measuring cross using a compact actuator which integrates a sensor and the control technology alongside the actuator. Each actuator has LED status indicators, a release for manual adjustment and a service connection. The sensor works with a dynamic measurement principle. Depending on the differential pressure gradient at the measuring cross, a small air volumetric flow rate passes through the sensor. This flow is proportionate to the differential pressure. This is thermally detected and serves as a measure for the volumetric flow rate.

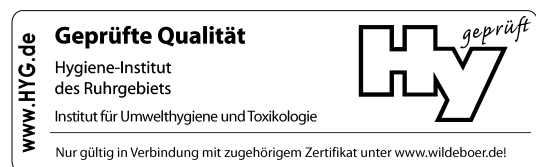


Item	Description
1	Duct casing
2	Motorised actuator
3	Blades
4	Measuring cross
5	Service socket for setting device
6	Acoustic insulation with sheet metal jacket (optional)

Hygiene

VKup volume flow controller

- meet the hygiene requirements according to VDI 6022-1, VDI 3803-1, DIN 1946-4, DIN EN 16798-3, SWKI VA104-01, SWKI VA105-01, ÖNORM H6020, ÖNORM H6021,
- are resistant to microbes, so they do not promote the growth of micro-organisms (fungi, bacteria),
- are resistant to cleaning agents and disinfectants,
- are suitable for cleaning and satisfy the requirements for surface and geometric design



For further information and instructions ⇒ see hygiene certificate and operating instructions

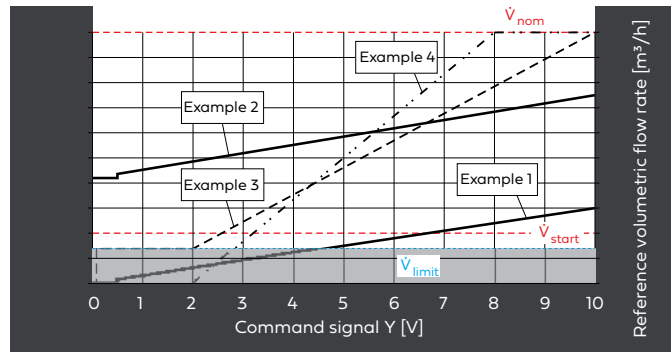
VKup volume flow controller

VKup | VKpro volume flow controller

2.2.1 Function of operating modes

The use of the operating modes requires the necessary electrical connections and the setting of the corresponding parameters. The volumetric flow rate control starts as soon as the sensor in the actuator detects a differential pressure.

A specification of the reference volumetric flow rate from \dot{V}_{limit} prevents uncontrolled control states, e.g. unintentional closing. The specified control accuracy is achieved in the volumetric flow rate range from \dot{V}_{start} to \dot{V}_{nom} . This must be taken into account for serviceable control by setting \dot{V}_{min} .



Constant

For $\dot{V}_{\text{min}} < \dot{V}_{\text{nom}}$, a reference volumetric flow rate is established which the controller has to keep constant.

Variable

A reference volumetric flow rate range is established with $\dot{V}_{\text{min}} < \dot{V}_{\text{max}}$ or $\dot{V}_{\text{min}} = 0$ [m³/h] and $\dot{V}_{\text{max}} \geq 20\% \dot{V}_{\text{nom}}$.

Within this range, volumetric flow rates \dot{V}_{ref} which have to be kept constant, can be specified by a command signal Y [V].

On analogue actuators AN and MP, it is applied to duct 3.

Actuators MP, KNX, MOD ▶ [page 18](#)

The following command signals Y are possible:

• 0 ... 10 V

- If $\dot{V}_{\text{min}} = 0$ [m³/h] is set, the blades close completely when Y = 0 to 0.5 V. The control function begins from Y ≥ 0.5 V. Illustration using the example 1.
- If $\dot{V}_{\text{min}} > 0$ m³/h is set, the control function starts at this value from Y = 0 V – without closing. In the process, the switching threshold at 0.5 V must be observed! Illustration using the example 2.
- Calculate the reference volumetric flow rate \dot{V}_{ref} for the command signal Y^{***}:
$$\dot{V}_{\text{ref}} \text{ [m}^3\text{/h]} = \dot{V}_{\text{min}} \text{ [m}^3\text{/h]} + (\dot{V}_{\text{max}} \text{ [m}^3\text{/h]} - \dot{V}_{\text{min}} \text{ [m}^3\text{/h]}) \cdot Y \text{ [V]} : 10 \text{ V} \quad [1]$$

• 2 ... 10 V

- If $0 \text{ V} \leq Y \leq 0.1 \text{ V}$, the blades close completely. If $0.1 \text{ V} \leq Y \leq 2 \text{ V}$, the control function begins with \dot{V}_{min} . Illustration using the example 3.
- If $\dot{V}_{\text{min}} = 0$ m³/h is set, the blades close at Y = 0 ... 2 V. The control function begins from Y ≥ 2 V.
- Calculate the reference volumetric flow rate \dot{V}_{ref} for the command signal Y^{***}:
$$\dot{V}_{\text{ref}} \text{ [m}^3\text{/h]} = \dot{V}_{\text{min}} \text{ [m}^3\text{/h]} + (\dot{V}_{\text{max}} \text{ [m}^3\text{/h]} - \dot{V}_{\text{min}} \text{ [m}^3\text{/h]}) \cdot (Y \text{ [V]} - 2 \text{ V}) : 8 \text{ V} \quad [2]$$

• Adjustable

- Adjustable (Y from LL = 0 ... 30 V DC to UL = 2 ... 32 V DC) LL and UL can be set as integers, where UL must always be at least 2 V greater than LL.
- If LL = 0 V, the functions correspond to 0 to 10 V, but in combination with UL instead of 10 V.
- If LL > 0 V and $0 \text{ V} \leq Y \leq 0.1 \text{ V}$, the blades close completely. If $0.1 \text{ V} \leq Y \leq \text{LL}$, the control function begins with \dot{V}_{min} .
- If $\dot{V}_{\text{min}} = 0$ m³/h is set, the blades close completely at Y = 0 to LL. The control function begins from Y ≥ LL. Illustration using the example 4 with 2 ... 8 V.
- Calculate the reference volumetric flow rate \dot{V}_{ref} for the command signal Y^{***}:
$$\dot{V}_{\text{ref}} \text{ [m}^3\text{/h]} = \dot{V}_{\text{min}} \text{ [m}^3\text{/h]} + (\dot{V}_{\text{max}} \text{ [m}^3\text{/h]} - \dot{V}_{\text{min}} \text{ [m}^3\text{/h]}) \cdot (Y \text{ [V]} - \text{LL [V]}) / (\text{UL [V]} - \text{LL [V]}) \quad [3]$$

3-level

3-level mode is a simple alternative to constant or variable operation, particularly for volume flow controllers with analogue control. With \dot{V}_{min} , \dot{V}_{mid} and \dot{V}_{max} three volumetric flow rates can be set and kept constant. The value for \dot{V}_{min} can also be set to 0 m³/h for complete closing.

This mode requires the actuators to be set appropriately and requires special 24 V AC connections. ⇒ See ▶ [page 16](#)

*** The volumetric flow rates can also be used in [% \dot{V}_{nom}] instead of in [m³/h]. ⇒ see examples ▶ [page 26](#) and ▶ [page 27](#)
Equation results apply for $\dot{V}_{\text{ref}} > \dot{V}_{\text{limit}}$.

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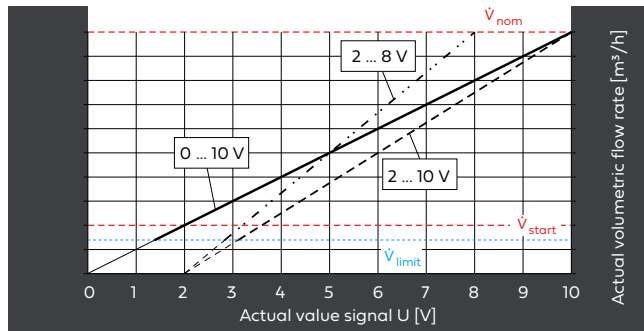
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Override

Overrides require the appropriate settings for the actuators and electrical connection of the 24 V AC/DC voltage signals. Analogue and bus controls can be used.

The signals override all operating modes and allow the blades to open or close fully. In constant mode, the operating level \dot{V}_{\max} can additionally be forced; in variable mode, the operating levels

\dot{V}_{\min} and \dot{V}_{\max} . ⇒ See [page 17](#)



Actual value signal U

In the case of analogue control of the actuators AN and MP,**** an actual value signal U proportional to the actual volumetric flow rate \dot{V}_{act} is available on duct 5 for a display of external volumetric flow rate and as a command signal for sequential circuits.

It is proportional to the maximum volumetric flow rate \dot{V}_{nom} and independent of the settings on the volume flow controller.

The voltage range can be set from LL = 0 ... 8 V DC to UL = 2 ... 10 V DC.

In general, the following applies:

$$\begin{aligned} \dot{V}_{\text{act}} [\text{m}^3/\text{h}] &= \dot{V}_{\text{nom}} [\text{m}^3/\text{h}] \cdot (U [\text{V}] - LL [\text{V}]) : (UL [\text{V}] - LL [\text{V}]) & [1a] \\ U [\text{V}] &= LL [\text{V}] + (UL [\text{V}] - LL [\text{V}]) \cdot \dot{V}_{\text{act}} [\text{m}^3/\text{h}] : \dot{V}_{\text{nom}} [\text{m}^3/\text{h}] & [1b] \end{aligned}$$

For volumetric flow rate control in the voltage ranges 0 – 10 V and 2 – 10 V, the following applies:

- For constant operation, the actual value signal U can be ordered in these two settings.
- For variable operation, the voltage range of the actual value signal U is matched to the command signal Y.

In both cases, formulas [1a] and [1b] are applied:

$$\begin{aligned} 0 \dots 10 \text{ V: } \dot{V}_{\text{act}} [\text{m}^3/\text{h}] &= \dot{V}_{\text{nom}} [\text{m}^3/\text{h}] \cdot U [\text{V}] : 10 \text{ V} & [2a] \\ U [\text{V}] &= 10 \text{ V} \cdot \dot{V}_{\text{act}} [\text{m}^3/\text{h}] : \dot{V}_{\text{nom}} [\text{m}^3/\text{h}] & [2b] \end{aligned}$$

$$\begin{aligned} 2 \dots 10 \text{ V: } \dot{V}_{\text{act}} [\text{m}^3/\text{h}] &= \dot{V}_{\text{nom}} [\text{m}^3/\text{h}] \cdot (U [\text{V}] - 2 \text{ V}) : 8 \text{ V} & [3a] \\ U [\text{V}] &= 2 \text{ V} + 8 \text{ V} \cdot \dot{V}_{\text{act}} [\text{m}^3/\text{h}] : \dot{V}_{\text{nom}} [\text{m}^3/\text{h}] & [3b] \end{aligned}$$

If the upper limit UL of the command signal Y is set higher than 10 V, the actual value signal U remains limited to 0 ... 10 V; formulas [2a] and [2b] apply.

In 3-level mode, the actual value signal U = 2 ... 10 V is set; formulas [3a] and [3b] apply.

**** In MP-Bus mode, duct 5 is required for data communication. [page 18](#)

2.2.1.1 Stand-alone operation, parallel operation and master-slave sequential operation

With **stand-alone operation**, the volume flow controller is set to one of the possible operating modes.

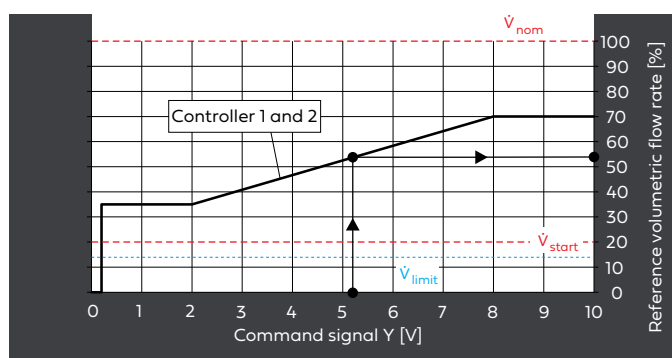
With **parallel operation**, this affects two or more. The command signals are always identical and are connected electrically individually or in parallel to duct 3. When connected in parallel, controllers operate independently of one another. Reference volumetric flow rates \dot{V}_{\min} , \dot{V}_{mid} , \dot{V}_{\max} can be set independently of each other and according to the size and operating modes of the controllers. Changes to one controller have no effect on the others.

With **master-slave sequential operation**, the actual volumetric flow rate \dot{V}_{act} of one controller controls the reference volumetric flow rate \dot{V}_{ref} of another.

In the case of analogue control, the actual value signal U from duct 5 of the master controller is fed as the command signal Y to the ducts 3 of the slave controllers.

If the master is set to "variable 0 ... 10 V", "variable 2 ... 10 V" or "variable adjustable", the same mode must be set on the slave. If a master operates in "constant" mode, the slave must be operated in "variable" mode and must be matched to the master's output signal (0 ... 10 V or 2 ... 10 V). If the master is set to "3-level" mode, the slave must be set to "variable 2 ... 10 V".

Example 1: Stand-alone operation of volume flow controller and parallel operation with identical volume flow rate.



If the "variable adjustable" operating mode is set to 2 ... 8 V, the control range is controlled with $Y = 2$ to 8 V as the command signal.

$\dot{V}_{\min} = 35\% \dot{V}_{\text{nom}}$ and $\dot{V}_{\max} = 70\% \dot{V}_{\text{nom}}$ are used to set a reference volumetric flow rate range.

As per [page 8](#), formula [3], with $Y = 2$ V as the "command signal", the result is:

$$\dot{V}_{\text{ref}} [\%] = 35\% + (70\% - 35\%) \cdot (2\text{ V} - 2\text{ V}) : (8\text{ V} - 2\text{ V}) = 35\% \dot{V}_{\text{nom}}$$

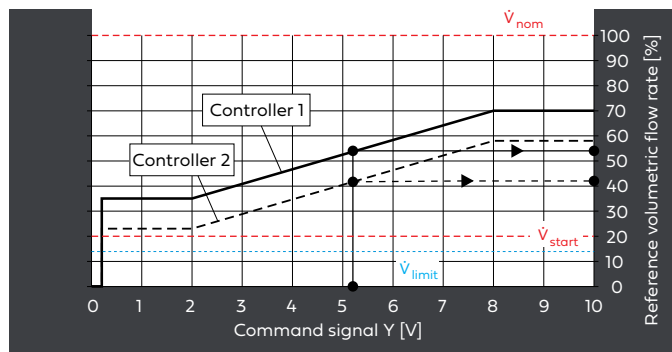
- When $Y = 5.2$ V is selected as command signal between 2 and 8 V:

$$\dot{V}_{\text{ref}} [\%] = 35\% + (70\% - 35\%) \cdot (5.2\text{ V} - 2\text{ V}) : (8\text{ V} - 2\text{ V}) = 54\% \dot{V}_{\text{nom}}$$

- With $Y = 8$ V as the greatest command signal:

$$\dot{V}_{\text{ref}} [\%] = 35\% + (70\% - 35\%) \cdot (8\text{ V} - 2\text{ V}) : (8\text{ V} - 2\text{ V}) = 70\% \dot{V}_{\text{nom}}$$

Example 2: Parallel operation of volume flow controllers with constant volume flow differential



If the "variable adjustable" operating mode is set to 2 ... 8 V, the control range is controlled with $Y = 2$... 8 V as the command signal.

$\dot{V}_{\min} = 35\% \dot{V}_{\text{nom}}$ and $\dot{V}_{\max} = 70\% \dot{V}_{\text{nom}}$ are used on controller 1 to set a reference volumetric flow rate range.

As per [page 8](#), formula [3], the result for e.g. $Y = 5.2$ V as a possible command signal between 2 and 8 V is:

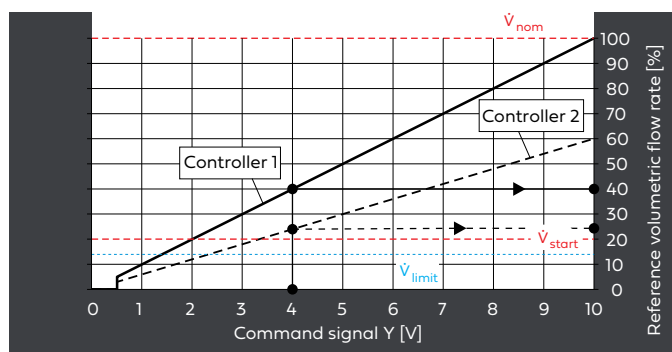
$$\dot{V}_{\text{ref}} [\%] = 35\% + (70\% - 35\%) \cdot (5.2\text{ V} - 2\text{ V}) : (8\text{ V} - 2\text{ V}) = 54\% \dot{V}_{\text{nom}}$$

If a constantly 12 % lower volumetric flow rate is to be set on controller 2, $\dot{V}_{\min} = 23\% \dot{V}_{\text{nom}}$ and $\dot{V}_{\max} = 58\% \dot{V}_{\text{nom}}$ must be set on it.

Then, with $Y = 5.2$ V,

$$\dot{V}_{\text{ref}} [\%] = 23\% + (58\% - 23\%) \cdot (5.2\text{ V} - 2\text{ V}) : (8\text{ V} - 2\text{ V}) = 42\% \dot{V}_{\text{nom}}$$

Example 3: Parallel operation of volume flow controllers with proportionally-equal volume flow differential



If "variable 0 ... 10 V" operating mode is set on the controllers, the control range is controlled with $Y = 0$... 10 V as the command signal. $\dot{V}_{\min} = 0\% \dot{V}_{\text{nom}}$ and $\dot{V}_{\max} = 100\% \dot{V}_{\text{nom}}$ are used on controller 1 to set a first reference volumetric flow rate range.

As per [page 8](#), formula [1], for e.g. $Y = 4$ V as a possible command signal between 0 and 10 V, the result is:

$$\dot{V}_{\text{ref}} [\%] = 0\% + (100\% - 0\%) \cdot 4\text{ V} : 10\text{ V} = 40\% \dot{V}_{\text{nom}}$$

If a 40 % lower volumetric flow rate is to be set on controller 2, $\dot{V}_{\min} = 0\% \dot{V}_{\text{nom}}$ and $\dot{V}_{\max} = 60\% \dot{V}_{\text{nom}}$ must be set on it.

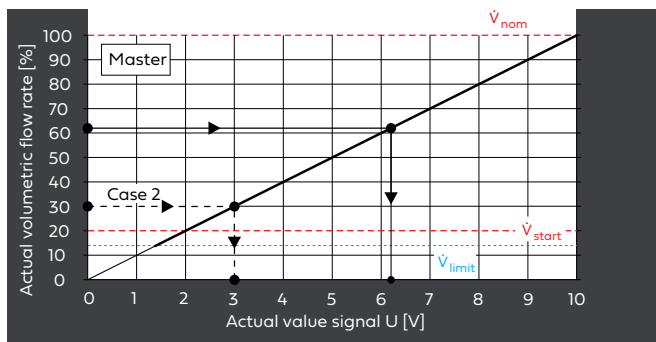
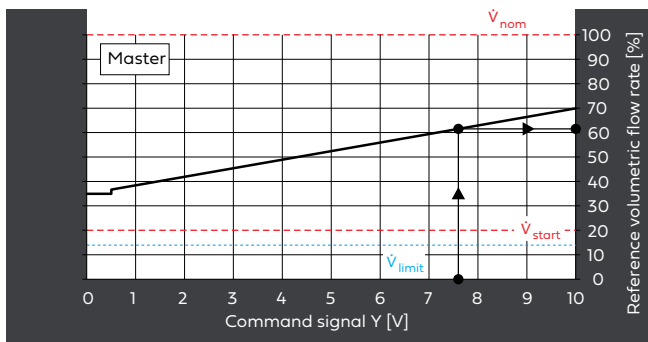
Then, with $Y = 4$ V on the other hand:

$$\dot{V}_{\text{ref}} [\%] = 0\% + (60\% - 0\%) \cdot 4\text{ V} : 10\text{ V} = 24\% \dot{V}_{\text{nom}}$$

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Example 4: Master-slave sequential operation to volume flow controller with identical volumetric flow rate



The operation modes "variable 0 ... 10 V" are set on the master and slave. The master is then controlled with $Y = 0 \dots 10 \text{ V}$.

For $\dot{V}_{\min} = 35\% \dot{V}_{\text{nom}}$ and $\dot{V}_{\max} = 70\% \dot{V}_{\text{nom}}$, and in the case of, for example,

$Y = 7.6 \text{ V}$, in accordance with [page 8](#), formula [1] the following applies:

$$\dot{V}_{\text{ref}} [\%] = 35\% + (70\% - 35\%) \cdot 7.6 \text{ V} : 10 \text{ V} = 62\% \dot{V}_{\text{nom}}$$

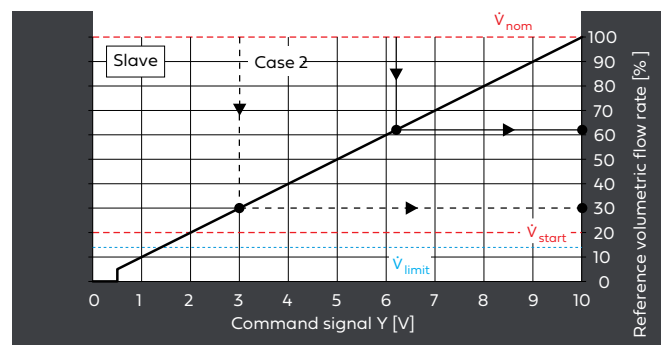
If $\dot{V}_{\text{act}} = \dot{V}_{\text{ref}}$, the actual value signal, in accordance with [page 8](#), formula [2b] is:

$$U [\text{V}] = 10 \text{ V} \cdot \dot{V}_{\text{act}} : \dot{V}_{\text{nom}} = 10 \text{ V} \cdot 62\% : 100\% = 6.2 \text{ V}$$

The voltage of 6.2 V is specified by the master as command signal Y for the slave. $\dot{V}_{\max} = 20\%$ bis $100\% \cdot \dot{V}_{\text{nom}}$ can be set variably on it.

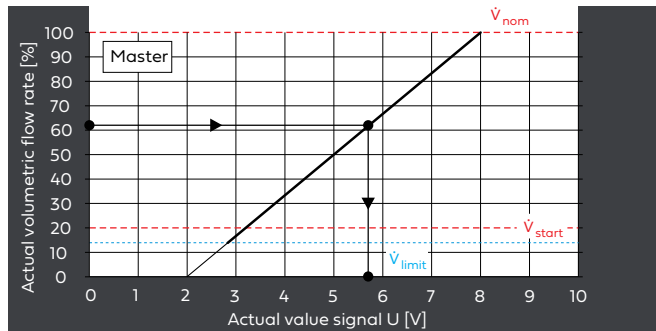
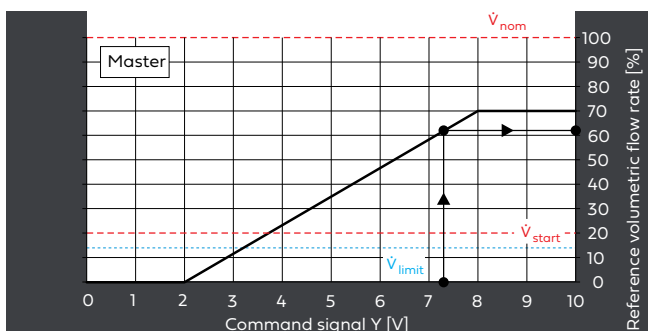
If $\dot{V}_{\max} = 100\% \dot{V}_{\text{nom}}$ is set on the slave, in accordance with [page 8](#), formula [1] the following applies:

$$\dot{V}_{\text{ref}} [\%] = 0\% + (100\% - 0\%) \cdot 6.2 \text{ V} : 10 \text{ V} = 62\% \dot{V}_{\text{nom}}$$



If the actual volumetric flow rate on the master does not reach the reference volumetric flow rate, the slave follows the actual volumetric flow rate! → see case 2!

Example 5: Master-slave sequential operation for volumetric flow rate controller with identical proportionally-equal volumetric flow rate



The master and slave are set in operating mode "variably adjustable" to 2 ... 8 V. The master is set to $\dot{V}_{\min} = 0\% \dot{V}_{\text{nom}}$ and $\dot{V}_{\max} = 70\% \dot{V}_{\text{nom}}$ and controlled with $Y = 2$ to 8 V.

If $Y = 7.3$, in accordance with [page 8](#), formula [3] the following applies:

$$\dot{V}_{\text{ref}} [\%] = 0\% + (70\% - 0\%) \cdot (7.3 \text{ V} - 2 \text{ V}) : (8 \text{ V} - 2 \text{ V}) = 62\% \dot{V}_{\text{nom}}$$

If $\dot{V}_{\text{act}} = \dot{V}_{\text{ref}}$, the corresponding actual value signal, in accordance with [page 8](#), formula [1b] is:

$$U [\text{V}] = 2 \text{ V} + (8 \text{ V} - 2 \text{ V}) \cdot 62\% : 100\% = 5.7 \text{ V}$$

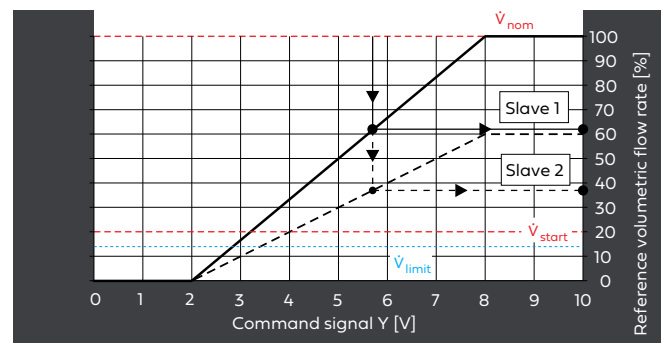
The voltage of 5.7 V is specified by the master as command signal Y for the slave. $\dot{V}_{\max} = 20\%$ to $100\% \cdot \dot{V}_{\text{nom}}$ can be set variably on them.

If $\dot{V}_{\max} = 100\% \dot{V}_{\text{nom}}$ and $\dot{V}_{\min} = 0\% \dot{V}_{\text{nom}}$ is set on slave 1, in accordance with [page 8](#), formula [3] the following applies:

$$\dot{V}_{\text{ref}} [\%] = 0\% + (100\% - 0\%) \cdot (5.7 \text{ V} - 2 \text{ V}) : (8 \text{ V} - 2 \text{ V}) = 62\%$$

If $\dot{V}_{\max} = 60\% \dot{V}_{\text{nom}}$ and $\dot{V}_{\min} = 0\% \dot{V}_{\text{nom}}$ is set on slave 2, in accordance with [page 8](#), formula [3] the following applies:

$$\dot{V}_{\text{ref}} [\%] = 0\% + (60\% - 0\%) \cdot (5.7 \text{ V} - 2 \text{ V}) : (8 \text{ V} - 2 \text{ V}) = 37\% \dot{V}_{\text{nom}}$$



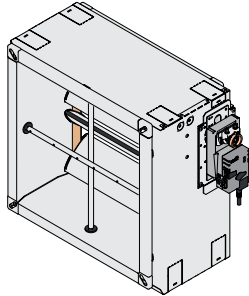
VKup volume flow controller

VKup | VKpro volume flow controller

2.3 Accessories

2.3.1 Acoustic insulation with sheet metal jacket

The acoustic insulation with sheet metal jacket for reducing radiated noise is supplied factory-mounted.



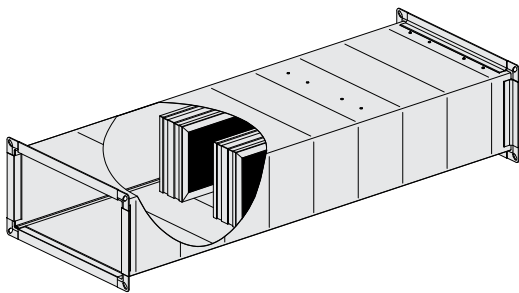
Reduction of radiated noise:

Reduction
-6 dB

For further technical data, see ► [WiDim](#).

2.3.2 SKE-V sound attenuator

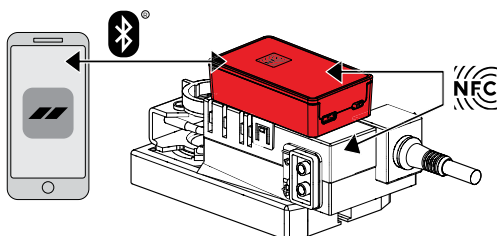
The SKE-V sound attenuator for reducing flow noise is supplied separately. Assembly is carried out on site along with the volume flow controller.



For further technical data, see ► [user manual for SKE](#) or ► [WiDim](#).

2.3.3 Link.10

Universal setting and diagnostics tool for actuators and controllers. It serves as a Bluetooth and USB-to-NFC and MP-Bus converter, enabling user-friendly configuration, commissioning and fault diagnosis.



VKup volume flow controller

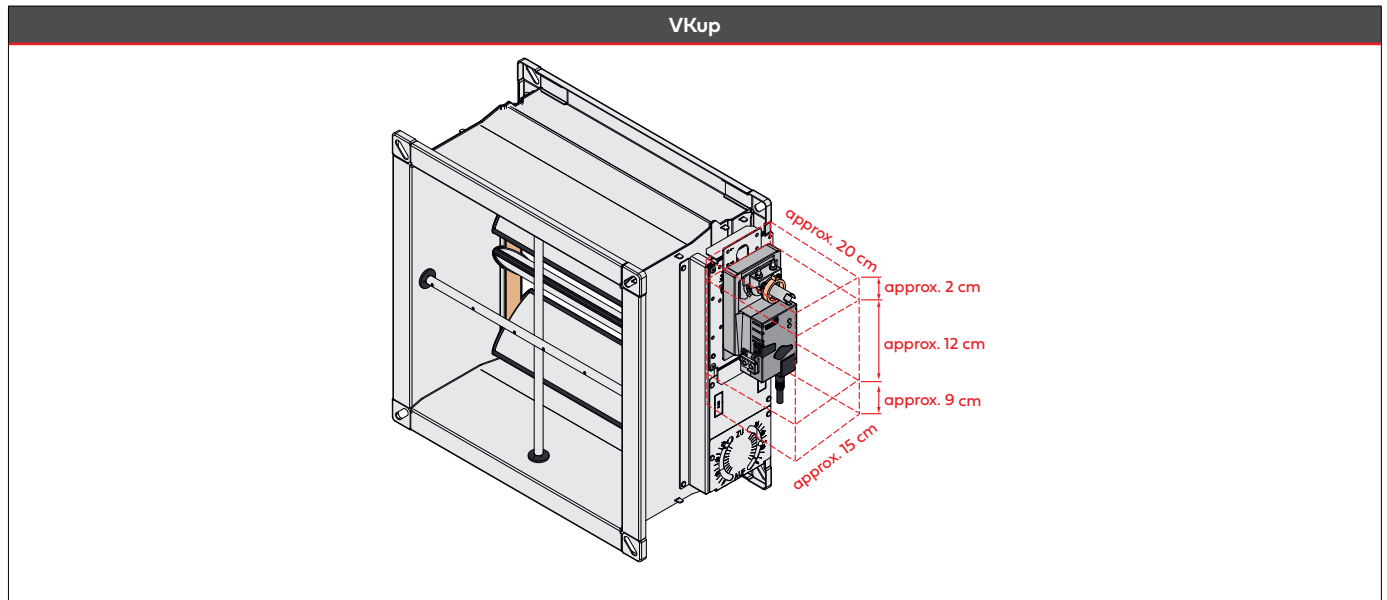
VKup | VKpro volume flow controller

2.4 Installation

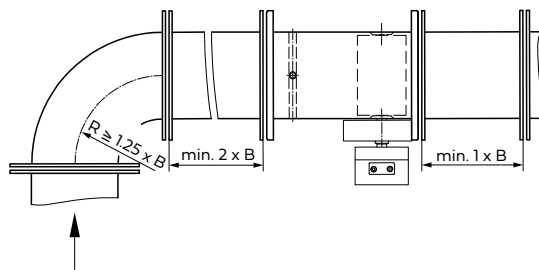
The VKup volume flow controller is installed position-independently and in the air direction indicated on the label. To ensure lasting function and leak tightness, tension-free installation in ventilation ducts is a prerequisite.

Space requirement

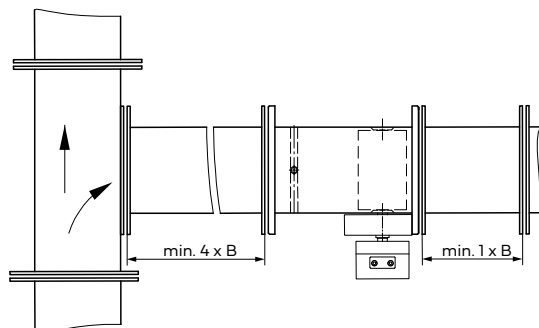
To enable the commissioning and servicing work to be carried out, sufficient space should be kept free in the area of any attachment parts. Inspection openings of sufficient size may required so that the attachments are easily accessible.



2.4.1 Installation information / clearances to obstructions



Installation downstream of a bend



Installation downstream of a T-connector

- VKup are designed for ventilation and air conditioning systems. Suitable air purity is a prerequisite for operation.
- VKup volume flow controllers are parametrised for the entire controllable volumetric flow rate range from \dot{V}_{start} to \dot{V}_{nom} and achieve the specified control accuracy in this range. Greater fluctuations can occur at low volumetric flow rates.
- For the VKup volume flow controller to work optimally, the flows must be largely free of disturbance. After flow disturbance points (e.g. bends or branches), the straight inlet and outlet sections shown as examples must be observed; longer inlet sections may be required where several disturbance points occur consecutively. Otherwise significant volumetric flow rate deviations must be expected.
- VKup volume flow controllers can be installed position-independently.
- VKup volume flow controllers are supplied from the factory with the blades open and with either the standard setting or a customer-specific presetting.
- If there is no system operating pressure, the blades are open. If the volumetric flow rate increases to the specified set point, the VKup volume flow controllers enter into operation.
⇒ For application limits, see [page 36](#) and [page 37](#)
- The actuators are overload-proof.
- On-site changes to the setting values can be made using the Link.10 setting device; additionally, with the appropriate communication software, this can also be performed on a PC or a smartphone.
- Settings changed on site can be reset back to the factory default settings for \dot{V}_{min} , \dot{V}_{mid} and \dot{V}_{max} on the VKup volume flow controller.

VKup volume flow controller

VKup | VKpro volume flow controller

2.5 Technical data

Technical data	
Sizes W x H	200 x 100 mm ... 1000 x 1000 mm
Control ranges	
Volumetric flow rate	144 ... 36000 m ³ /h****
Flow velocity	2 ... 12 m/s****
Minimum differential pressure	5 Pa
Maximum differential pressure	1000 Pa
Areas of application	
Differential pressure	0 ... 1000 Pa
Operating temperature	0 ... +50 °C
Storage temperature	
Relative humidity	≤ 95 %, non-condensing
Classifications	
Leak tightness class	Casing: ATC 3 (formerly C) in accordance with DIN EN 1751 Damper blade: Leak tightness class 4 in accordance with DIN EN 1751
Protection class	III safety extra-low voltage
Protection rating	IP54 in accordance with DIN EN 60529
Approvals / certificates	
Environmental Product Declaration in accordance with DIN EN 15804	EPD-WIL-20230373-ICAI-DE, issued by: Institut Bauen und Umwelt e. V., Berlin
Hygiene certificate in accordance with VDI 6022	W-408912-25-JRoll, issued by: Hygiene Institut des Ruhrgebiets, Gelsenkirchen
Conformities	
Electromagnetic compatibility	2014/30/EU
Machinery Directive	2006/42/EG
RoHS2	2011/65/EU
Actuators	
Voltage supply	24 V AC/DC, -10 %, +20 %
Power consumption of actuators	
• W x H: 200 x 100 ... 300 x 100, 400 x 100, 500 x 100, 600 x 100	2 W, 4 VA (max. 8 A @ 5 ms)
• W x H: 300 x 200, 300 x 300, 400 x 200 ... 400 x 400, 500 x 200 ... 500 x 500, 600 x 200 ... 600 x 400, 700 x 200 ... 700 x 400, 800 x 200 .. 800 x 400, 900 x 300, 1000 x 300	3 W, 5 VA (max. 8 A @ 5 ms)
• W x H: 600 x 500, 600 x 600, 700 x 500, 800 x 500 ... 800 x 800, 900 x 400, 900 x 500, 1000 x 400 ... 1000 x 1000	3 W, 5.5 VA (max. 8 A @ 5 ms)
Runtime for approx. 90°	120 ... 150 s
Control	
• Command signal, analogue	0 ... 10 V DC, 2 ... 10 V DC, adjustable (0 ... 32 V DC)
• Actual value signal, analogue	0 ... 10 V DC, 2 ... 10 V DC, adjustable (0 ... 10 V DC)
• Bus operation	MP-Bus, KNX, Modbus RTU, BACnet MS/TP

**** Specifications depending on size

VKup volume flow controller

VKup | VKpro volume flow controller

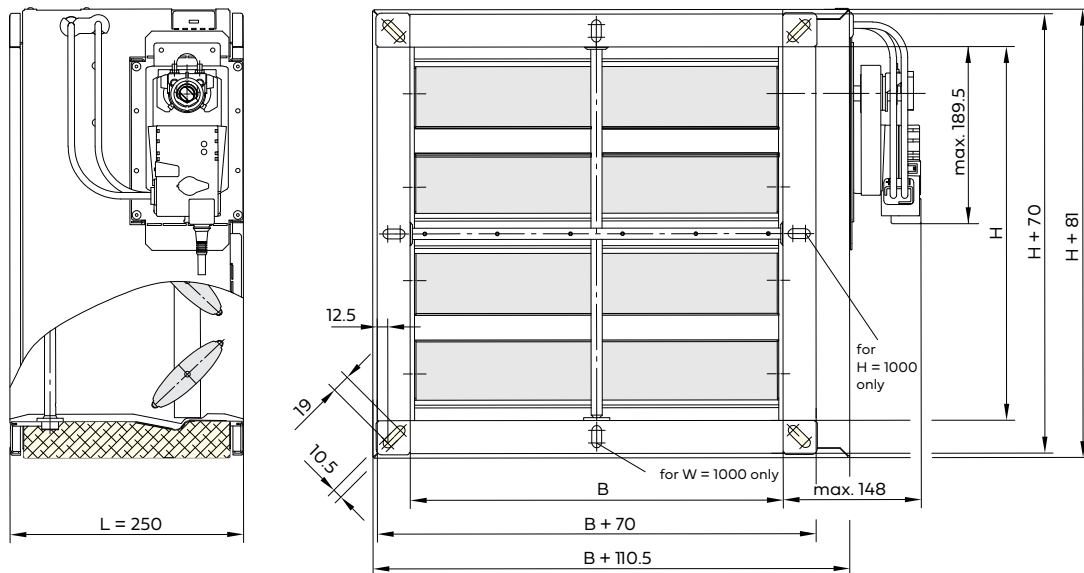
2.5.1 Weights

VKup volume flow controller [with acoustic insulation]

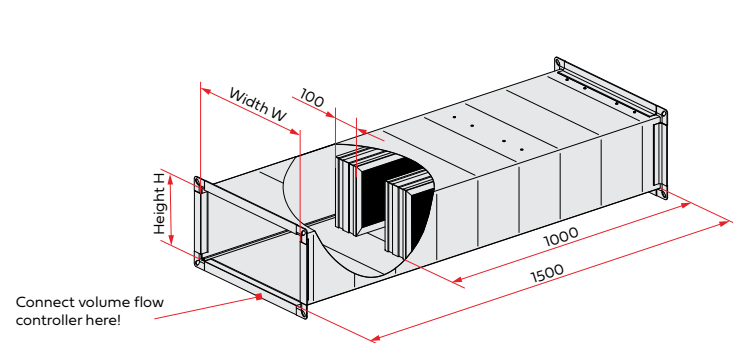
Weights in kg

Width [mm]	Height [mm]							
	100	200	300	400	500	600	800	1000
200	4.0 [5.9]	5.7 [8.2]	-	-	-	-	-	-
300	4.8 [7.0]	6.6 [9.5]	8.2 [11.4]	-	-	-	-	-
400	5.6 [8.1]	7.5 [10.7]	9.3 [12.8]	11.0 [14.8]	-	-	-	-
500	6.4 [9.3]	8.5 [12.0]	10.4 [14.3]	12.2 [16.4]	14.1 [18.7]	-	-	-
600	7.2 [10.5]	9.4 [13.4]	11.4 [15.8]	13.5 [18.1]	15.5 [20.5]	17.5 [23.0]	-	-
700	-	10.4 [14.7]	12.5 [17.3]	14.7 [19.7]	16.9 [22.3]	-	-	-
800	-	11.3 [16.0]	13.6 [18.7]	16.0 [21.4]	18.3 [24.1]	20.6 [26.9]	25.2 [32.3]	-
900	-	-	14.7 [20.2]	17.2 [23.0]	19.7 [25.9]	-	-	-
1000	-	-	15.8 [21.7]	18.4 [24.6]	21.1 [27.7]	23.7 [30.7]	28.9 [36.8]	34.2 [42.9]

2.5.2 Dimensions



2.5.2.1 SKE-V sound attenuator



Number of splitters

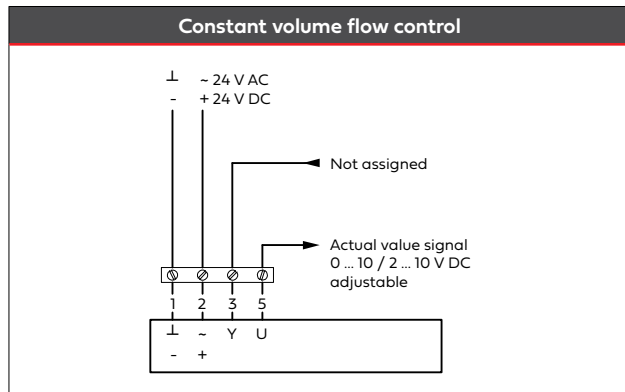
Width W [mm]	Height H [mm]							
	100	200	300	400	500	600	800	1000
200	-	-	-	-	1	-	-	-
300	-	-	-	-	1	-	-	-
400	-	-	-	-	2	-	-	-
500	-	-	-	-	2	-	-	-
600	-	-	-	-	3	-	-	-
700	-	-	-	-	3	-	-	-
800	-	-	-	-	4	-	-	-
900	-	-	-	-	4	-	-	-
1000	-	-	-	-	5	-	-	-

For further technical data, see ► [user manual for SKE](#) or ► [WiDim](#).

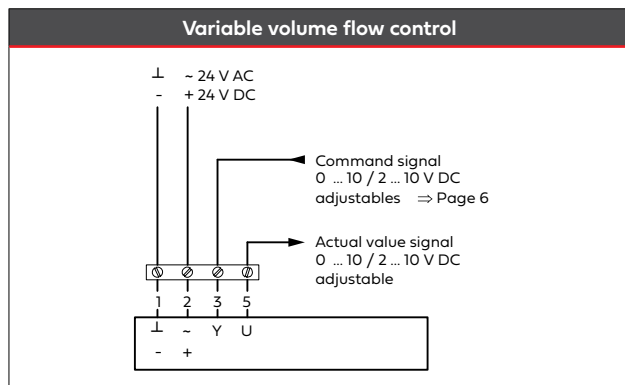
VKup volume flow controller

VKup | VKpro volume flow controller

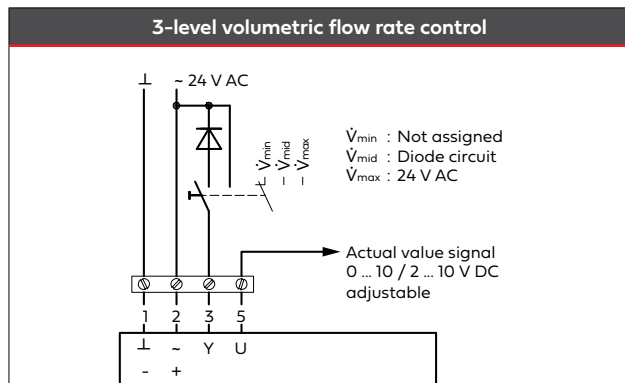
2.6 Electrical connection



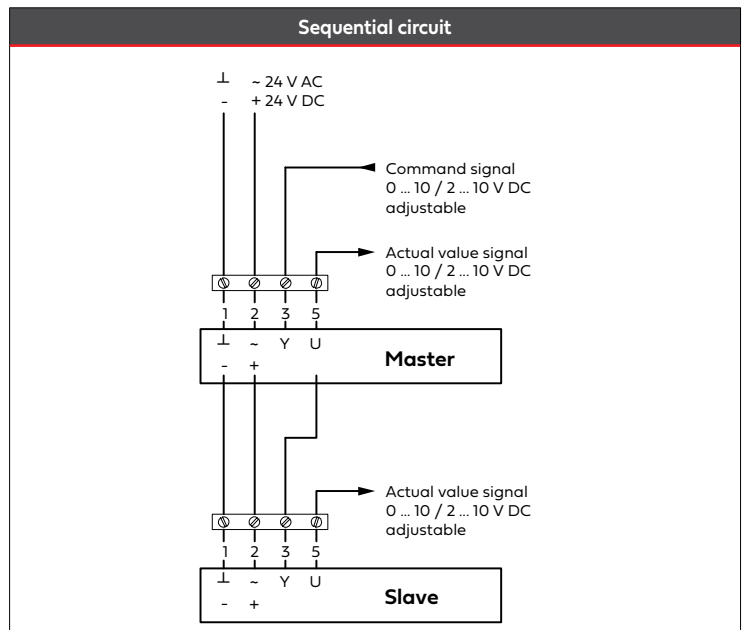
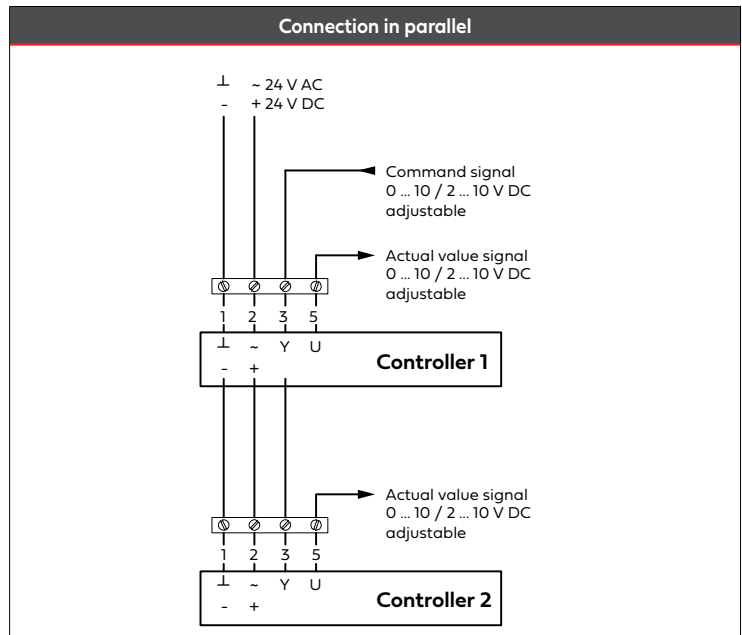
CAV function "standard" is preset



CAV function "standard" is preset



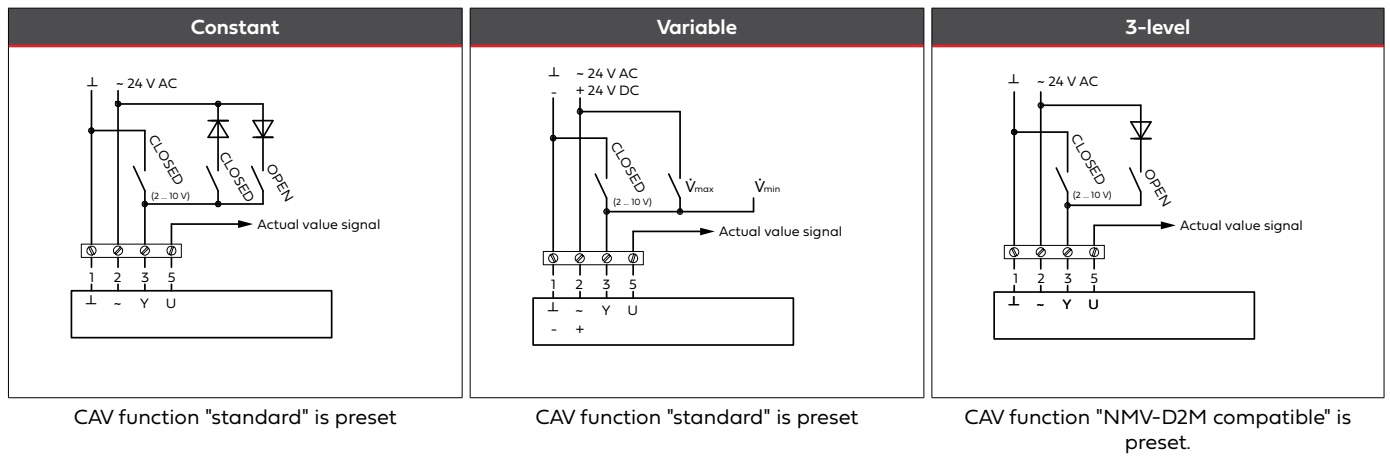
CAV function "NMV-D2M compatible" is preset.
Make sure that the contacts are mutually interlocked!



VKup volume flow controller

VKup | VKpro volume flow controller

2.6.1 Overrides

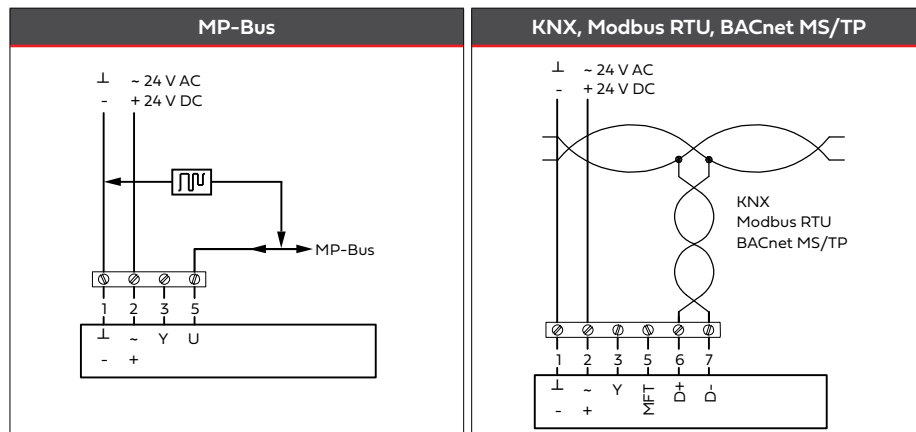


- Override circuits must be provided on site.
- Ensure mutual interlocking of the respective overrides (CLOSED, \dot{V}_{min} , \dot{V}_{max} , OPEN) to prevent a short circuit!
- The CAV function is factory-set according to the order data; changes using PC and software are possible.

VKup volume flow controller

VKup | VKpro volume flow controller

2.6.2 Bus operation



The VKup volume flow controller can be integrated into a higher-level building control system via MP-Bus. The bus connection at the MP actuator can be established using conventional 3-core installation cables. The supply voltage is transmitted via duct 1 (GND) and duct 2 (24 V), and the bus signal via duct 5.

Function:

After an address has been assigned, bus operation starts automatically. The MP actuator on the VKup volume flow controller represents one of a maximum of eight possible slaves (MP nodes) connected to an MP master. They receive their digital command signal from the MP master of the building control system (PLC or DDC controller with MP interface).

The bidirectional function of MP-Bus transmits the addressing, commands, set points, overrides and settings, such as \dot{V}_{\min} and \dot{V}_{\max} to each slave.

Each slave transmits its identification and settings, the actual volumetric flow rate, the blade position, status messages, and, if applicable, the value (Ω , %, 0/1) of a connected sensor.

The reference variable MP is specified in % in MP bus operation. It is $0\% = \dot{V}_{\min}$, $100\% = \dot{V}_{\max}$.

Thus, the MP operating mode is similar to the "variable 0 ... 10 V" operating mode, only working between 0 % and 100 % instead of between 0 V and 10 V. \Rightarrow see formula [1]

Parallel operation and sequential circuit with identical or differing volumetric flow rates can also be implemented via MP-Bus control. \Rightarrow see examples 1 to 5 [page 10](#)

$$\dot{V}_{\text{ref}} [\text{m}^3/\text{h}] = \dot{V}_{\text{min}} [\text{m}^3/\text{h}] + (\dot{V}_{\text{max}} [\text{m}^3/\text{h}] - \dot{V}_{\text{min}} [\text{m}^3/\text{h}]) \cdot \text{MP} (\%) : 100 \% \quad [1]$$

In MP-Bus operation, duct 3 can be used for additional functions:

- For the connection of analogue sensors or switches. In the process, the actuator MP serves as an A/D converter, providing the master with digitised sensor or switching signals.
- For local overrides for full opening and closing or for the \dot{V}_{\max} operating level. The reference variable of the MP-Bus is overridden in the process.

VKup volume flow controllers can also be supplied with actuators for KNX and MOD. They work exclusively in bus mode and have largely identical capabilities to those described for MP-Bus. The MOD actuator can be controlled using BACnet MS/TP, Modbus RTU, MP-Bus or with analogue control.

2.7 Specification text

Maintenance-free electronic volume flow controller for constant and variable volumetric flow rates. Rectangular design for position-independent installation in ventilation ducts for supply air and exhaust air in ventilation and air conditioning systems. Duct casing and blades made of galvanised sheet steel. Blades for volumetric flow rate control centrally supported, bearing shafts made of stainless steel in special plastic bearing bushings. With seals on the blades for shutting off the ventilation duct.

Aluminium measuring cross as differential pressure sensor. High volumetric flow rate accuracy across the entire volumetric flow rate range. The volumetric flow rate must remain constant at variable pressures from 5 to 1000 Pa.

Maintenance-free actuator 24 V AC/DC with LED status indicators, for analogue control / analogue control and MP-Bus / KNX-Bus / analogue control, Modbus, BACnet and MP-Bus. Operating modes constant / variable / 3-level, with 0 to 10 V, 2 to 10 V or adjustable.

Can be used for superimposed overrides for opening and closing the blades and for parallel and sequential operation of multiple volume flow controllers. With actual volumetric flow rate output signal, with acoustic insulation and sheet metal jacket. Leak tightness class ATC 3 (formerly C) for the casing, leak tightness class 4 for the blades, each in accordance with DIN EN 1751. Certificate as proof of compliance with the hygiene requirements in accordance with VDI 6022-1, VDI 3803-1, DIN 1946-4, DIN EN 16798-3, SWKI VA104-01, SWKI VA105-01, ÖNORM H6020 and ÖNORM H6021.

..... pcs.			
	Volumetric flow rate:	..... m ³ /h to	m ³ /h
	Maximum pressure drop:	..... Pa	
	Maximum sound power level		
	Flow noise	..... dB(A)	
	including SKE-V sound attenuator		
	Radiated noise	..... dB(A)	
	Manufacturer:	WILDEBOER	
	Type:	VKup	
	Width:	.....
	Height:	.....
	Complete with fixings		deliver:
			install:
..... pcs.	Sound attenuator SKE-V - L		supply:
			install:
..... pcs.	Link.10 setting device for setting and operation.		supply:

Select text not printed in bold as required!

This tender specification text can be found on the website www.ausschreiben.de ▶ ausschreiben.de.

Alternatively, you can use the tender specification text tailored to your product selection in the Wildeboer Connect web application ▶

[Wildeboer Connect](#).

VKpro volume flow controller

VKup | VKpro volume flow controller

3 VKpro volume flow controller

VKpro volume flow controllers are maintenance-free electronic controllers for constant and variable volumetric flow rates in ventilation and air conditioning systems. They can be installed and operated in any installation position in ventilation ducts for supply and exhaust air. The casing and control mechanism are made of galvanised sheet steel. The blades for volumetric flow rate control are centrally supported and equipped with a seal. The bearing axles are made of stainless steel and are guided in special plastic bearing bushes. The measuring cross is made of aluminium.

The control components comprise a controller with integrated static or dynamic sensor and an actuator with standard, quick or spring return. The controller with integrated sensor is mounted on an attachment console which can be tilted or offset manually in confined spaces.

Control and electrical connection of the VKpro are analogue, by MP-Bus, BACnet or Modbus.

All control components facilitate the operating modes "constant" and "variably adjustable 0 ... 10 V, 2 ... 10 V".

Overrides, parallel operation and sequential circuits are possible.

Factory settings can be ordered. Modifications by the user can be made using a setting device, including in conjunction with a PC or using the integrated NFC interface with a smartphone.

The volume flow controllers allow for a high accuracy with an approximate fluctuation of only $\pm 5\%$ to $\pm 20\%$ of the actual volumetric flow rate. Accordingly, the volumetric flow rates are held constant in the overall pressure range of 5 Pa to 1000 Pa.



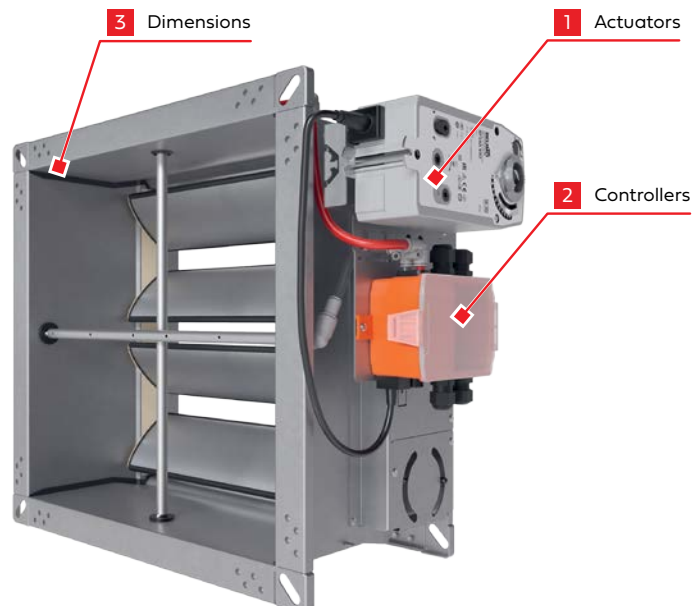
- Can be set on site
- Position-independent installation
- Maintenance-free design
- Sizes W x H: 200 x 100 mm to 1000 x 1000 mm
- Leak tightness class: Casing: ATC 3 (formerly C) in accordance with DIN EN 1751
Damper blade: Class 4 in accordance with DIN EN 1751
- Maximum differential pressure: 1000 Pa
- Differential pressure control range: 5 ... 1000 Pa
- Volumetric flow rate control range: 144 ... 36000 m³/h^{*****}
- Flow velocities: 2 ... 12 m/s^{*****}
- Voltage supply: 24 V AC/DC, -10 % +20 %
- Communication: Analogue, bus-compatible (MP-Bus, Modbus, BACnet)
- Actuators: Standard speed, high speed or with spring return for emergency operation
- Operating temperature: 0 ... +50 °C
0 ... +40 °C (drive NMQ24A-VST only)
- Protection rating: IP42 in accordance with DIN EN 60529
- Hygiene certificate: W-408912-25-JRoll, issued by: Ruhr District Institute of Hygiene
- Environment Product Declaration: EPD-WIL-20230373-ICAI-DE, issued by: Institut Bauen und Umwelt e. V.
- Operation modes: constant, variable (0 ... 10 V, 2 ... 10 V, adjustable) and 3-level, overrides, parallel operation and sequential circuits possible.
- Options
 - Factory presets
 - Acoustic insulation with sheet metal jacket
 - SKE-V sound attenuator

***** Specifications depending on size

VKpro volume flow controller

VKup | VKpro volume flow controller

3.1 Product features



1 Actuators



Example illustration

Various actuators, differentiated by run mode / runtime:

Standard speed

- 150 s

High speed

- 4 s / 7 s

Spring return

- 150 s, 20 s spring

2 Controller



Example illustration

Different controllers, differentiated by sensor and measuring method:

static

- Diaphragm measuring method

dynamic

- Thermal measurement method

VKpro volume flow controller

VKup | VKpro volume flow controller

3 Dimensions

Width W [mm]	Height H [mm]	Inflow cross section A_A [m ²]	Volumetric flow rate \dot{V} [m ³ /h]		
			\dot{V}_{limit}	\dot{V}_{start}	\dot{V}_{nom}
200	100	0.020	88	144	864
	200	0.040	171	288	1728
300	100	0.030	129	216	1296
	200	0.060	275	432	2592
400	300	0.090	402	648	3888
	100	0.040	183	288	1728
	200	0.080	371	576	3456
	300	0.120	549	864	5184
500	400	0.160	723	1152	6912
	100	0.050	235	360	2160
	200	0.100	458	720	4320
	300	0.150	698	1080	6480
600	400	0.200	950	1440	8640
	500	0.250	1153	1800	10800
	100	0.060	280	432	2592
	200	0.120	549	864	5184
700	300	0.180	891	1296	7776
	400	0.240	1145	1728	10368
	500	0.300	1356	2160	12960
	600	0.360	1635	2592	15552
800	700	0.420	1914	3024	18144
	200	0.140	658	1008	6048
	300	0.210	1020	1512	9072
	400	0.280	1349	2016	12096
900	500	0.350	1603	2520	15120
	200	0.160	744	1152	5760
	300	0.240	1182	1728	8640
	400	0.320	1540	2304	11520
1000	500	0.400	1787	2880	14400
	600	0.480	2213	3456	17280
	800	0.640	2938	4608	23040
	300	0.270	1323	1944	9720
1000	400	0.360	1725	2592	12960
	500	0.450	2033	3240	16200
	300	0.300	1419	2160	10800
	400	0.400	1951	2880	14400
1000	500	0.500	2344	3600	18000
	600	0.600	2766	4320	21600
	800	0.800	3673	5760	28800
	1000	1.000	4855	7200	36000

4 Accessories



Acoustic insulation with sheet metal casing to reduce the external sound radiation (radiated noise).
Optional accessories, pre-assembled in the factory



Link.10 setting and diagnostics tool for convenient configuration, commissioning and fault diagnosis.
Optional accessories



SKE-V sound attenuator for reducing flow noise in the connected ventilation duct.
Optional accessories for on-site installation



BS2-VR-01 volumetric flow rate and pressure controller module for functional upgrade as a result of integration into the Wildeboer-Net communication system.
Optional accessories

Accessories details see ▶ [Seite <ÜS>](#)



Some of the accessories depend on the size. For reliable selection and to determine the appropriate order data, the web application Wildeboer Connect is recommended ▶ [Wildeboer Connect](#).

VKpro volume flow controller

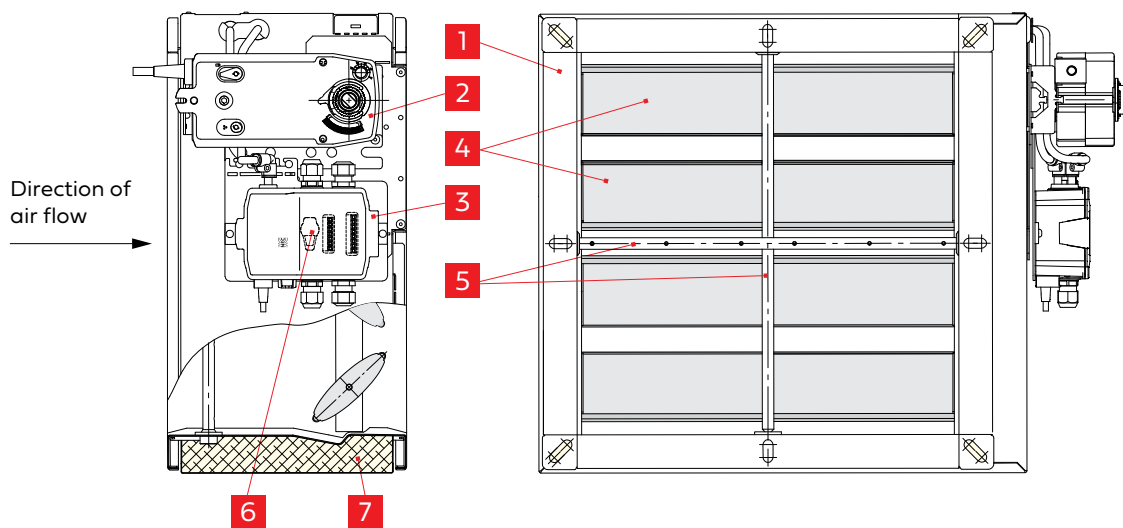
VKup | VKpro volume flow controller

3.2 Product description

VKpro volume flow controllers regulate the volumetric flow rate using the differential pressure at the measuring cross using a controller with an integrated sensor and actuator. The controllers have LED status indicators and a service port, while the actuators have a manual adjustment function.

In the case of the dynamic sensor, a small amount of the air volumetric flow rate passes through the sensor depending on the differential pressure at the measuring cross. It is proportional to the differential pressure and is detected thermally.

There is no flow through the static sensor. The differential pressures present at the measuring cross are directed into a measuring chamber of the sensor which is separated by a membrane. The membrane deflection, which is proportional to the differential pressure, is detected inductively. The sensor signals are a measure of the volumetric flow rate.

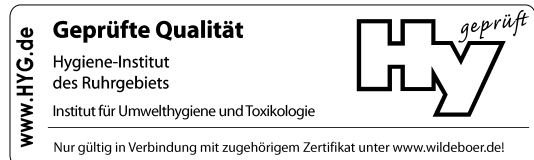


Item	Description
1	Duct casing
2	Motorised actuator
3	Sensor and controller with detachable attachment console
4	Blades
5	Measuring cross
6	Service socket for setting device
7	Acoustic insulation with sheet metal jacket (optional)

Hygiene

VKpro volume flow controller

- meet the hygiene requirements according to VDI 6022-1, VDI 3803-1, DIN 1946-4, DIN EN 16798-3, SWKI VA104-01, SWKI VA105-01, ÖNORM H6020, ÖNORM H6021,
- are resistant to microbes, so they do not promote the growth of micro-organisms (fungi, bacteria),
- are resistant to cleaning agents and disinfectants,
- are suitable for cleaning and satisfy the requirements for surface and geometric design

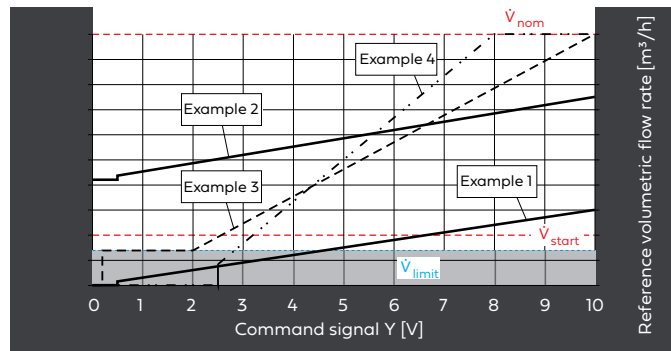


For further information and instructions ⇒ see hygiene certificate and operating instructions

3.2.1 Function of operating modes

The use of the operating modes requires the necessary electrical connections and the setting of the corresponding parameters. The volumetric flow rate control starts as soon as the sensor in the actuator detects a differential pressure.

A specification of the reference volumetric flow rate from \dot{V}_{limit} prevents uncontrolled control states, e.g. unintentional closing. The specified control accuracy is achieved in the volumetric flow rate range from \dot{V}_{start} to \dot{V}_{nom} . This must be taken into account for serviceable control by setting \dot{V}_{min} .



Constant

For $\dot{V}_{\text{min}} < \dot{V}_{\text{nom}}$, a reference volumetric flow rate is established which the controller has to keep constant.

Variable

A reference volumetric flow rate range is established with $\dot{V}_{\text{min}} < \dot{V}_{\text{max}}$ or $\dot{V}_{\text{min}} = 0$ [m³/h] and $\dot{V}_{\text{max}} \geq 20\% \dot{V}_{\text{nom}}$.

Within this range, volumetric flow rates \dot{V}_{ref} which have to be kept constant, can be specified by a command signal Y [V].

It is applied to terminal 3.

For information on bus operation see [page 34](#)

The following command signals Y are possible:

• 0 ... 10 V

- If $\dot{V}_{\text{min}} = 0$ [m³/h] is set, the blades close completely when $Y = 0$ to 0.5 V. The control function begins from $Y \geq 0.5$ V. Illustration using the example 1.
- If $\dot{V}_{\text{min}} > 0$ m³/h is set, the control function starts at this value from $Y = 0$ V – without closing. In the process, the switching threshold at 0.5 V must be observed! Illustration using the example 2.

• Calculate the reference volumetric flow rate \dot{V}_{ref} for the command signal Y*****:

$$\dot{V}_{\text{ref}} [\text{m}^3/\text{h}] = \dot{V}_{\text{min}} [\text{m}^3/\text{h}] + (\dot{V}_{\text{max}} [\text{m}^3/\text{h}] - \dot{V}_{\text{min}} [\text{m}^3/\text{h}]) \cdot Y [\text{V}] : 10 \text{ V} \quad [1]$$

• 2 ... 10 V

- If $0 \text{ V} \leq Y \leq 0.2 \text{ V}$, the blades close completely. If $0.2 \text{ V} \leq Y \leq 2 \text{ V}$, the control function begins with \dot{V}_{min} . Illustration using the example 3.

- If $\dot{V}_{\text{min}} = 0$ m³/h is set, the blades close at $Y = 0 \dots 2.5$ V. The control function begins from $Y \geq 2.5$ V.

• Calculate the reference volumetric flow rate \dot{V}_{ref} for the command signal Y*****:

$$\dot{V}_{\text{ref}} [\text{m}^3/\text{h}] = \dot{V}_{\text{min}} [\text{m}^3/\text{h}] + (\dot{V}_{\text{max}} [\text{m}^3/\text{h}] - \dot{V}_{\text{min}} [\text{m}^3/\text{h}]) \cdot (Y [\text{V}] - 2 \text{ V}) : 8 \text{ V} \quad [2]$$

• Adjustable

- Adjustable (Y from LL = 0 ... 8 V DC to UL = 2 ... 10 V DC) LL and UL can be set as integers, where UL must always be at least 2 V greater than LL.

- If LL = 0 V, the functions correspond to 0 to 10 V, but in combination with UL instead of 10 V.

- If LL > 0 V and $0 \text{ V} \leq Y \leq 0.2 \text{ V}$, the blades close completely.

If $0.2 \text{ V} \leq Y \leq \text{LL}$, the control function begins with \dot{V}_{min} .

- If $\dot{V}_{\text{min}} = 0$ m³/h is set, the blades close completely at $Y = 0$ to $+0.5$ V.

The control function begins from $Y \geq \text{LL} + 0.5$ V. Illustration using the example 4 with 2 ... 8 V.

• Calculate the reference volumetric flow rate \dot{V}_{ref} for the command signal Y****):

$$\dot{V}_{\text{ref}} [\text{m}^3/\text{h}] = \dot{V}_{\text{min}} [\text{m}^3/\text{h}] + (\dot{V}_{\text{max}} [\text{m}^3/\text{h}] - \dot{V}_{\text{min}} [\text{m}^3/\text{h}]) \cdot (Y [\text{V}] - \text{LL} [\text{V}]) / (\text{UL} [\text{V}] - \text{LL} [\text{V}]) \quad [3]$$

***** The volumetric flow rates can also be used in [% \dot{V}_{nom}] instead of in [m³/h]. \Rightarrow see examples [page 26](#) and [page 27](#)
Equation results apply for $\dot{V}_{\text{ref}} > \dot{V}_{\text{limit}}$.

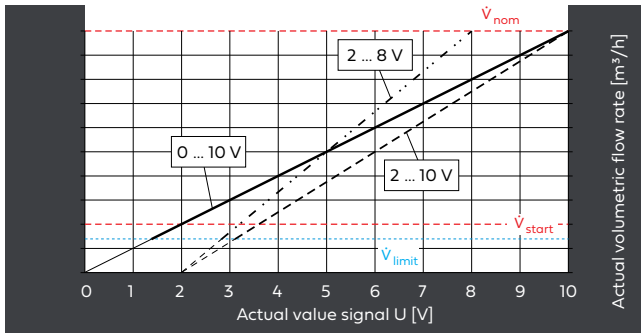
VKpro volume flow controller

VKup | VKpro volume flow controller

Override

Overrides require electrical connections with 24 VAC/DC voltage signals on the terminals 11 and 12. Analogue and bus controls can be used.

The signals override all operating modes and allow the blades to open or close fully. Additionally, the operating levels motor stop and \dot{V}_{max} can be forced. ⇒ See [page 33](#)



Actual value signal U

For analogue or BACnet / Modbus operation of the volume flow controllers, an actual value signal U proportional to the actual volumetric flow rate is available on duct 5 for the external volumetric flow rate display and as a command signal for sequential circuits.

It is proportional to the maximum volumetric flow rate \dot{V}_{nom} and independent of the settings on the volume flow controller.

The voltage range can be set from LL = 0 ... 8 V DC to UL = 2 ... 10 V DC.

In general, the following applies:

$$\begin{aligned} \dot{V}_{act} [m^3/h] &= \dot{V}_{nom} [m^3/h] \cdot (U [V] - LL [V]) : (UL [V] - LL [V]) & [1a] \\ U [V] &= LL [V] + (UL [V] - LL [V]) \cdot \dot{V}_{act} [m^3/h] : \dot{V}_{nom} [m^3/h] & [1b] \end{aligned}$$

For volumetric flow rate control in the voltage ranges 0 ... 10 V and 2 ... 10 V, the following applies:

- For constant operation, the actual value signal U can be ordered in these two settings.
- For variable operation, the voltage range of the actual value signal U is matched to the command signal Y.

In both cases, formulas [1a] and [1b] are applied:

$$\begin{aligned} 0 \dots 10 \text{ V: } \dot{V}_{act} [m^3/h] &= \dot{V}_{nom} [m^3/h] \cdot U [V] : 10 \text{ V} & [2a] \\ U [V] &= 10 \text{ V} \cdot \dot{V}_{act} [m^3/h] : \dot{V}_{nom} [m^3/h] & [2b] \end{aligned}$$

$$\begin{aligned} 2 \dots 10 \text{ V: } \dot{V}_{act} [m^3/h] &= \dot{V}_{nom} [m^3/h] \cdot (U [V] - 2 \text{ V}) : 8 \text{ V} & [3a] \\ U [V] &= 2 \text{ V} + 8 \text{ V} \cdot \dot{V}_{act} [m^3/h] : \dot{V}_{nom} [m^3/h] & [3b] \end{aligned}$$

3.2.1.1 Stand-alone operation, parallel operation and master-slave sequential operation

With **stand-alone operation**, the volume flow controller is set to one of the possible operating modes.

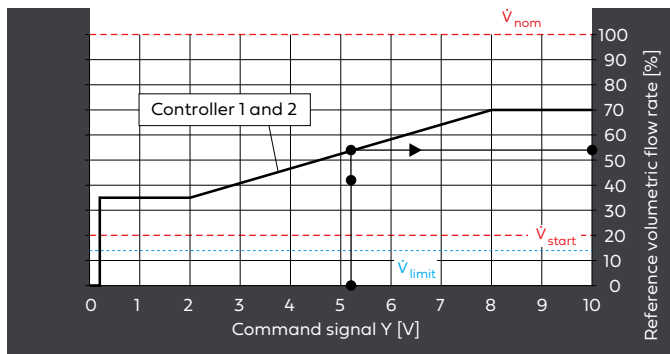
With **parallel operation**, this affects two or more. The command signals are always identical and are connected electrically individually or in parallel to duct 3 (command signal Y). When connected in parallel, controllers operate independently of one another. Reference volumetric flow rates \dot{V}_{min} , \dot{V}_{max} can be set independently of each other and according to the size and operating modes of the controllers. Changes to one controller have no effect on the others.

With **master-slave sequential operation**, the actual volumetric flow rate \dot{V}_{act} of one controller controls the reference volumetric flow rate \dot{V}_{ref} of another.

In the case of analogue control, the actual value signal U from duct 5 of the master controller is fed as the command signal Y to the ducts 3 of the slave controllers.

If the master is set to "variable 0 ... 10 V", "variable 2 ... 10 V" or "variable adjustable", the same mode must be set on the slave. If a master operates in "constant" mode, the slave must be operated in "variable" mode and must be matched to the master's output signal (0 ... 10 V or 2 ... 10 V).

Example 1: Stand-alone operation of volume flow controller and parallel operation with identical volumetric flow rate.



If the "variable adjustable" operating mode is set to 2 ... 8 V, the control range is controlled with $Y = 2$ to 8 V as the command signal.

$\dot{V}_{min} = 35\% \dot{V}_{nom}$ and $\dot{V}_{max} = 70\% \dot{V}_{nom}$ are used to set a reference volumetric flow rate range.

As per [page 24](#), formula [3], with $Y = 2$ V as the "command signal", the result is:

$$\dot{V}_{ref} [\%] = 35\% + (70\% - 35\%) \cdot (2\text{ V} - 2\text{ V}) : (8\text{ V} - 2\text{ V}) = 35\% \dot{V}_{nom}$$

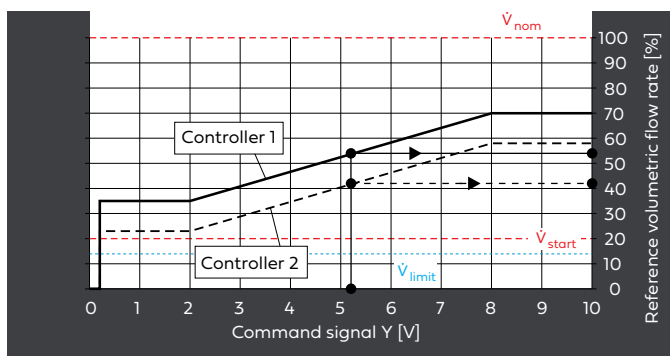
- When $Y = 5.2$ V is selected as command signal between 2 and 8 V:

$$\dot{V}_{ref} [\%] = 35\% + (70\% - 35\%) \cdot (5.2\text{ V} - 2\text{ V}) : (8\text{ V} - 2\text{ V}) = 54\% \dot{V}_{nom}$$

- With $Y = 8$ V as the greatest command signal:

$$\dot{V}_{ref} [\%] = 35\% + (70\% - 35\%) \cdot (8\text{ V} - 2\text{ V}) : (8\text{ V} - 2\text{ V}) = 70\% \dot{V}_{nom}$$

Example 2: Parallel operation of volume flow controllers with constant volume flow differential



If the "variable adjustable" operating mode is set to 2 ... 8 V, the control range is controlled with $Y = 2$... 8 V as the command signal.

$\dot{V}_{min} = 35\% \dot{V}_{nom}$ and $\dot{V}_{max} = 70\% \dot{V}_{nom}$ are used on controller 1 to set a reference volumetric flow rate range.

As per [page 24](#), formula [3], the result for e.g. $Y = 5.2$ V as a possible command signal between 2 and 8 V is:

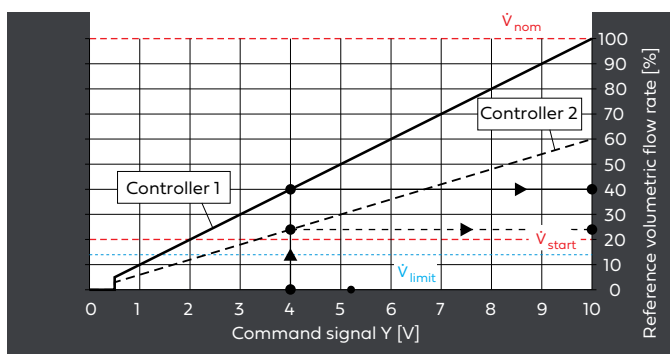
$$\dot{V}_{ref} [\%] = 35\% + (70\% - 35\%) \cdot (5.2\text{ V} - 2\text{ V}) : (8\text{ V} - 2\text{ V}) = 54\% \dot{V}_{nom}$$

If a constantly 12 % lower volumetric flow rate is to be set on controller 2, $\dot{V}_{min} = 23\% \dot{V}_{nom}$ and $\dot{V}_{max} = 58\% \dot{V}_{nom}$ must be set on it.

Then, with $Y = 5.2$ V,

$$\dot{V}_{ref} [\%] = 23\% + (58\% - 23\%) \cdot (5.2\text{ V} - 2\text{ V}) : (8\text{ V} - 2\text{ V}) = 42\% \dot{V}_{nom}$$

Example 3: Parallel operation of volume flow controllers with proportionally-equal volume flow differential



If "variable 0 ... 10 V" operating mode is set on the controllers, the control range is controlled with $Y = 0$... 10 V as the command signal. $\dot{V}_{min} = 0\% \dot{V}_{nom}$ and $\dot{V}_{max} = 100\% \dot{V}_{nom}$ are used on controller 1 to set a first reference volumetric flow rate range.

As per [page 24](#), formula [1], for e.g. $Y = 4$ V as a possible command signal between 0 and 10 V, the result is:

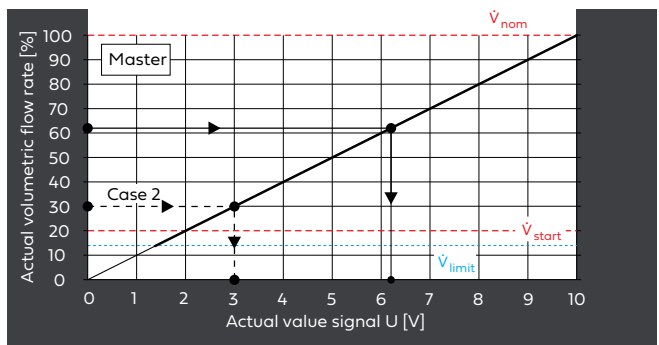
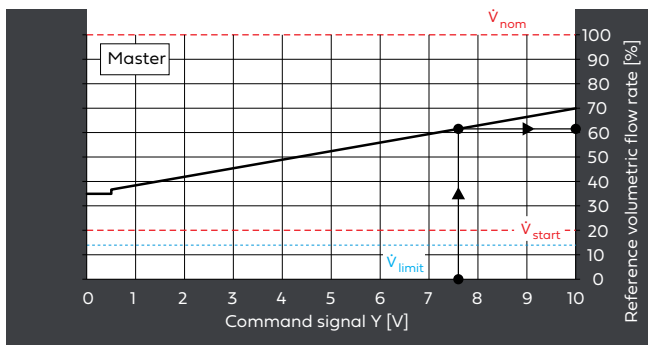
$$\dot{V}_{ref} [\%] = 0\% + (100\% - 0\%) \cdot 4\text{ V} : 10\text{ V} = 40\% \dot{V}_{nom}$$

If a 40 % lower volumetric flow rate is to be set on controller 2, $\dot{V}_{min} = 0\% \dot{V}_{nom}$ and $\dot{V}_{max} = 60\% \dot{V}_{nom}$ must be set on it.

Then, with $Y = 4$ V on the other hand:

$$\dot{V}_{ref} [\%] = 0\% + (60\% - 0\%) \cdot 4\text{ V} : 10\text{ V} = 24\% \dot{V}_{nom}$$

Example 4: Master-slave sequential operation to volume flow controller with identical volumetric flow rate



The operation modes "variable 0 ... 10 V" are set on the master and slave. The master is then controlled with $Y = 0 \dots 10 \text{ V}$.

For $\dot{V}_{\min} = 35\% \dot{V}_{\text{nom}}$ and $\dot{V}_{\max} = 70\% \dot{V}_{\text{nom}}$, and in the case of, for example,

$Y = 7.6 \text{ V}$, in accordance with [page 24](#), formula [\[1\]](#) the following applies:

$$\dot{V}_{\text{ref}} [\%] = 35\% + (70\% - 35\%) \cdot 7.6 \text{ V} : 10 \text{ V} = 62\% \dot{V}_{\text{nom}}$$

If $\dot{V}_{\text{act}} = \dot{V}_{\text{ref}}$ the actual value signal, in accordance with [page 25](#),

formula [\[2b\]](#) is:

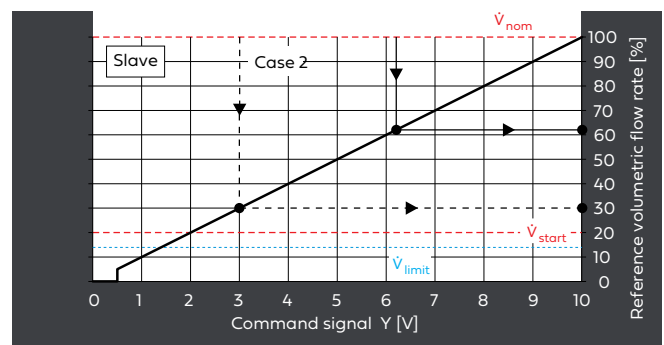
$$U [\text{V}] = 10 \text{ V} \cdot \dot{V}_{\text{act}} : \dot{V}_{\text{nom}} = 10 \text{ V} \cdot 62\% : 100\% = 6.2 \text{ V}$$

The voltage of 6.2 V is specified by the master as command signal Y for the slave. $\dot{V}_{\max} = 20\%$ bis $100\% \cdot \dot{V}_{\text{nom}}$ can be set variably on it.

If $\dot{V}_{\max} = 100\% \dot{V}_{\text{nom}}$ is set on the slave, in accordance with [page 24](#),

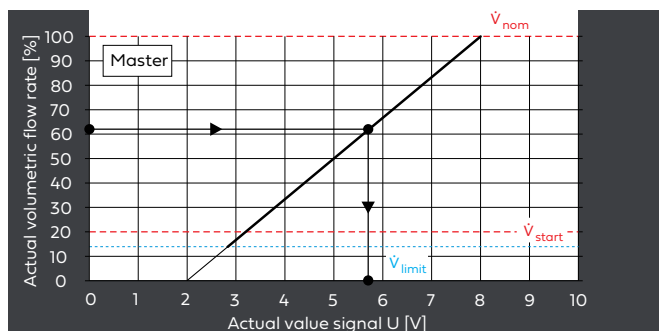
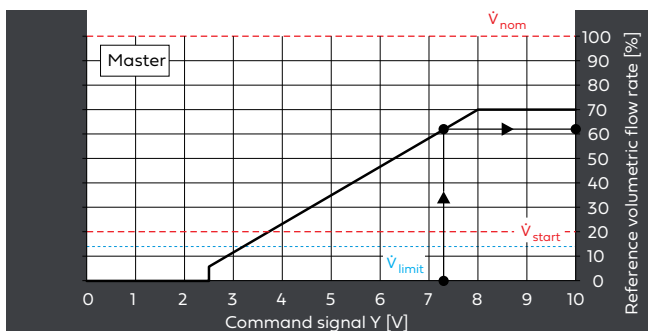
formula [\[1\]](#) the following applies:

$$\dot{V}_{\text{ref}} [\%] = 0\% + (100\% - 0\%) \cdot 6.2 \text{ V} : 10 \text{ V} = 62\% \dot{V}_{\text{nom}}$$



If the actual volumetric flow rate on the master does not reach the reference volumetric flow rate, the slave follows the actual volumetric flow rate! → see example 2!

Example 5: Master-slave sequential operation for volumetric flow rate controller with identical proportionally-equal volumetric flow rate



The master and slave are set in operating mode "variably adjustable" to 2 ... 8 V. The master is set to $\dot{V}_{\min} = 0\% \dot{V}_{\text{nom}}$ and $\dot{V}_{\max} = 70\% \dot{V}_{\text{nom}}$ and controlled with $Y = 2$ to 8 V.

If $Y = 7.3$, in accordance with [page 24](#), formula [\[3\]](#) the following applies:

$$\dot{V}_{\text{ref}} [\%] = 0\% + (70\% - 0\%) \cdot (7.3 \text{ V} - 2 \text{ V}) : (8 \text{ V} - 2 \text{ V}) = 62\% \dot{V}_{\text{nom}}$$

If $\dot{V}_{\text{act}} = \dot{V}_{\text{ref}}$ the corresponding actual value signal, in accordance with [page 25](#), formula [\[1b\]](#) is:

$$U [\text{V}] = 2 \text{ V} + (8 \text{ V} - 2 \text{ V}) \cdot 62\% : 100\% = 5.7 \text{ V}$$

The voltage of 5.7 V is specified by the master as command signal Y for the slave. $\dot{V}_{\max} = 20\%$ to $100\% \cdot \dot{V}_{\text{nom}}$ can be set variably on them.

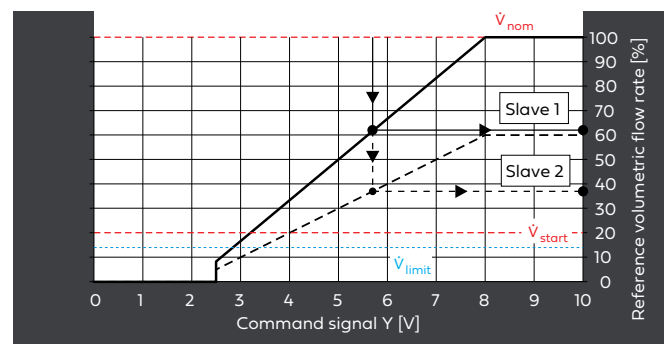
If $\dot{V}_{\max} = 100\% \dot{V}_{\text{nom}}$ and $\dot{V}_{\min} = 0\% \dot{V}_{\text{nom}}$ is set on slave 1, in accordance with [page 24](#), formula [\[3\]](#) the following applies:

$$\dot{V}_{\text{ref}} [\%] = 0\% + (100\% - 0\%) \cdot (5.7 \text{ V} - 2 \text{ V}) : (8 \text{ V} - 2 \text{ V}) = 62\% \dot{V}_{\text{nom}}$$

If $\dot{V}_{\max} = 60\% \dot{V}_{\text{nom}}$ and $\dot{V}_{\min} = 0\% \dot{V}_{\text{nom}}$ is set on slave 2, in

accordance with [page 24](#), formula [\[3\]](#) the following applies:

$$\dot{V}_{\text{ref}} [\%] = 0\% + (60\% - 0\%) \cdot (5.7 \text{ V} - 2 \text{ V}) : (8 \text{ V} - 2 \text{ V}) = 37\% \dot{V}_{\text{nom}}$$



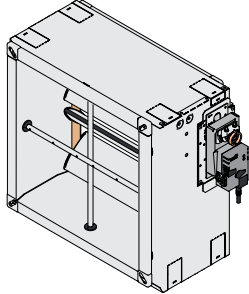
VKpro volume flow controller

VKup | VKpro volume flow controller

3.3 Accessories

3.3.1 Acoustic insulation with sheet metal jacket

The acoustic insulation with sheet metal jacket for reducing radiated noise is supplied factory-mounted.



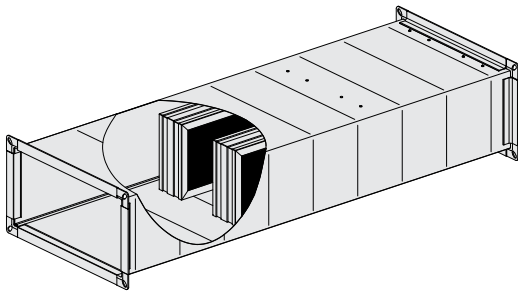
Reduction of radiated noise:

Reduction
-6 dB

For further technical data, see ► [WiDim](#).

3.3.2 SKE-V sound attenuator

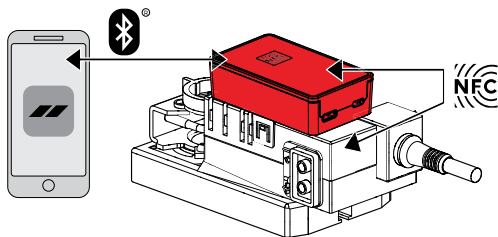
The SKE-V sound attenuator for reducing flow noise is supplied separately. Assembly is carried out on site along with the volume flow controller.



For further technical data, see ► [user manual for SKE](#) or ► [WiDim](#).

3.3.3 Link.10

Universal setting and diagnostics tool for actuators and controllers. It serves as a Bluetooth and USB-to-NFC and MP-Bus converter, enabling user-friendly configuration, commissioning and fault diagnosis.



VKpro volume flow controller

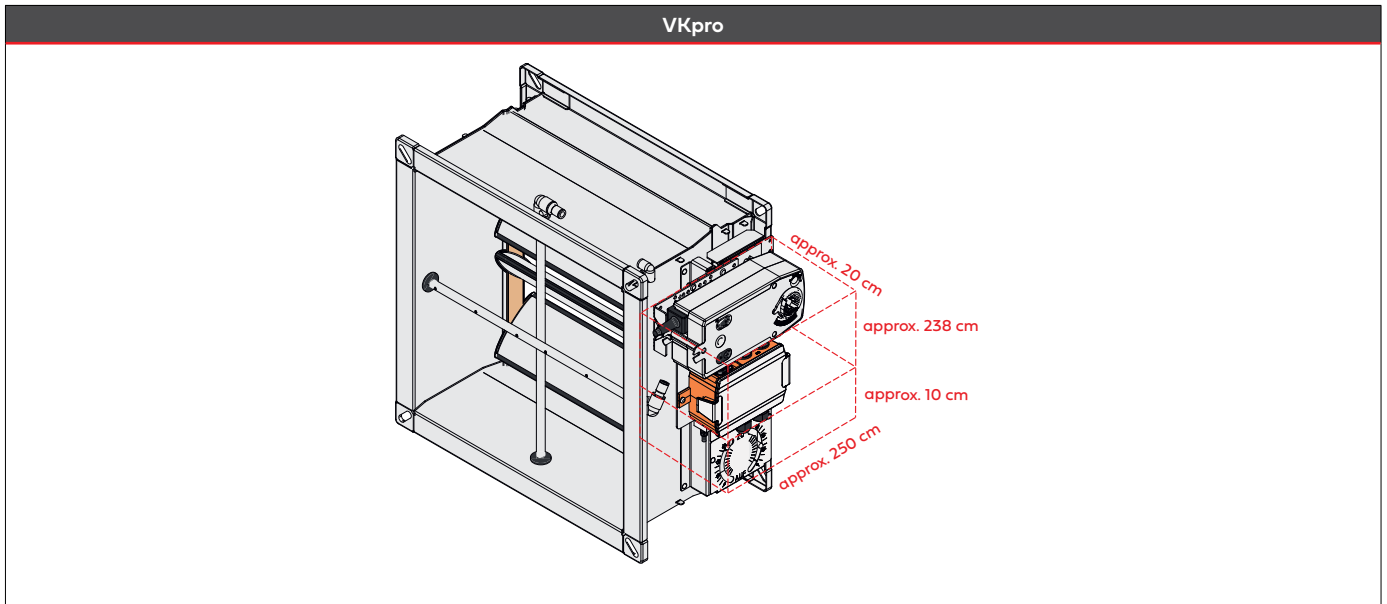
VKup | VKpro volume flow controller

3.4 Installation

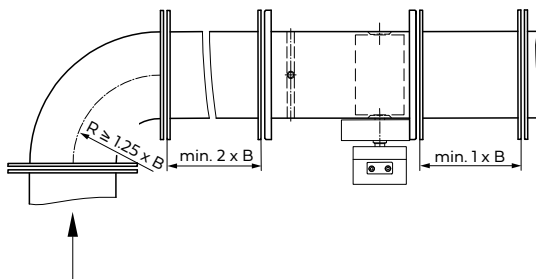
The VKup volume flow controller is installed position-independently and in the air direction indicated on the label. To ensure lasting function and leak tightness, tension-free installation in ventilation ducts is a prerequisite.

Space requirement

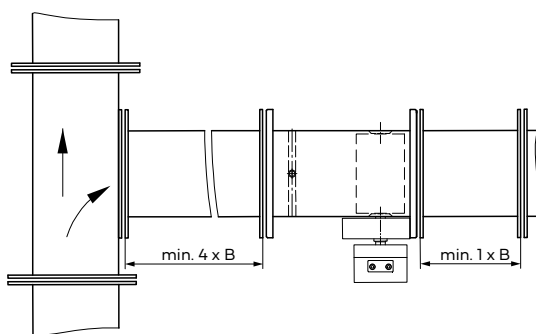
To enable the scale to be read and the commissioning and servicing work to be carried out, sufficient space should be kept free in the area of any attachments. Inspection openings of sufficient size may required so that the attachments are easily accessible.



3.4.1 Installation information / clearances to obstructions



Installation downstream of a bend



Installation downstream of a T-connector

- VKpro are designed for ventilation and air conditioning systems. Suitable air purity is a prerequisite for operation.
- VKpro volume flow controllers are parametrised for the entire controllable volumetric flow rate range from \dot{V}_{start} to \dot{V}_{nom} and achieve the specified control accuracy in this range. Greater fluctuations can occur at low volumetric flow rates.
- For the VKpro volume flow controller to work optimally, the flows must be largely free of disturbance. After flow disturbance points (e.g. bends or branches), the straight inlet and outlet sections shown as examples must be observed; longer inlet sections may be required where several disturbance points occur consecutively. Otherwise significant volumetric flow rate deviations must be expected.
- VKpro volume flow controllers can be installed position-independently.
- VKpro volume flow controllers are supplied from the factory with the blades open and with either the standard setting or a customer-specific presetting.
- If there is no system operating pressure, the blades are open. If the volumetric flow rate increases to the specified set point, the VKpro volume flow controllers enter into operation.
⇒ For application limits, see [page 36](#) and [page 37](#)
- The actuators are overload-proof. Standard and high-speed actuators remain in their current position in the event of a power failure. Spring return actuators perform the emergency positioning movement (closing or opening) using a spring. In the process, all settings remain in place.
- On-site changes to the setting values can be made using the Link.10 setting device; additionally, with the appropriate communication software, this can also be performed on a PC or a smartphone.
- Settings changed on site can be reset back to the factory default settings for \dot{V}_{min} , \dot{V}_{mid} and \dot{V}_{max} on the VKpro volume flow controller.

VKpro volume flow controller

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3.5 Technical data

Technical data	
Sizes W x H	200 x 100 mm ... 1000 x 1000 mm
Control ranges	
Volumetric flow rate	144 ... 36000 m ³ /h*****
Flow velocity	2 ... 12 m/s*
Minimum differential pressure	5 Pa
Maximum differential pressure	1000 Pa
Areas of application	
Differential pressure	0 ... 1000 Pa
Operating temperature	• 0 ... +50 °C
Storage temperature	• 0 ... +40 °C (drive NMQ24A-VST only)
Relative humidity	≤ 95 %, non-condensing
Classifications	
Leak tightness class	Casing: ATC 3 (formerly C) in accordance with DIN EN 1751 Damper blade: Leak tightness class 4 in accordance with DIN EN 1751
Protection class	III safety extra-low voltage
Protection rating	IP42 in accordance with DIN EN 60529
Approvals / certificates	
Environmental Product Declaration in accordance with DIN EN 15804	EPD-WIL-20230373-ICA1-DE, issued by: Institut Bauen und Umwelt e. V., Berlin
Hygiene certificate in accordance with VDI 6022	W-408912-25-JRoll, issued by: Hygiene Institut des Ruhrgebiets, Gelsenkirchen
Conformities	
Electromagnetic compatibility	2014/30/EU
Machinery Directive	2006/42/EG
RoHS2	2011/65/EU
Actuators	
Voltage supply	24 V AC/DC, -10 %, +20 %
Power consumption of actuators with controller [runtime for approx. 90°].	
Standard speed	
LM24A-VST	• W x H: 200 x 100 ... 300 x 100, 400 x 100, 500 x 100, 600 x 100 2.5 W, 4 VA [approx. 120 s]
NM24A-VST	• W x H: 300 x 200, 300 x 300, 400 x 200 ... 400 x 400, 500 x 200 ... 500 x 500, 600 x 200 ... 600 x 400, 700 x 200 ... 700 x 400, 800 x 200 ... 800 x 400, 900 x 300, 1000 x 300 3.5 W, 6 VA [approx. 120 s]
SM24A-VST	• W x H: 600 x 500, 600 x 600, 700 x 500, 800 x 500 ... 800 x 800, 900 x 300, 900 x 400, 1000 x 400 ... 1000 x 1000
High speed	
NMQ24A-VST	• W x H: 200 x 100 ... 500 x 300, 600 x 100 ... 600 x 300, 700 x 200, 800 x 200 14.5 W, 25 VA [approx. 4 s]
SMQ24A-VST	• W x H: 500 x 400, 500 x 500, 600 x 400 ... 600 x 600, 700 x 300 ... 700 x 500, 800 x 300 ... 1000 x 1000 16.5 W, 28 VA [approx. 7 s]
Spring return	
NF24A-VST	• W x H: 200 x 100 ... 600 x 400, 700 x 200 ... 700 x 400, 800 x 200 ... 800 x 400, 900 x 300, 1000 x 300 6.5 W, 10 VA [approx. 120 s | emergency positioning approx. 20 s]
SF24A-VST	• W x H: 600 x 500, 600 x 600, 700 x 500, 800 x 500, 800 x 600, 800 x 800, 900 x 400, 900 x 500, 1000 x 400 ... 1000 x 1000 10 W, 13 VA [approx. 120 s | emergency positioning approx. 20 s]
Control	
• Command signal, analogue	0 ... 10 V DC, 2 ... 10 V DC, adjustable (0 ... 10 V DC)
• Actual value signal, analogue	0 ... 10 V DC, 2 ... 10 V DC, adjustable (0 ... 10 V DC)
• Bus operation	MP-Bus, Modbus RTU, BACnet MS/TP

***** Specifications depending on size

VKpro volume flow controller

VKup | VKpro volume flow controller

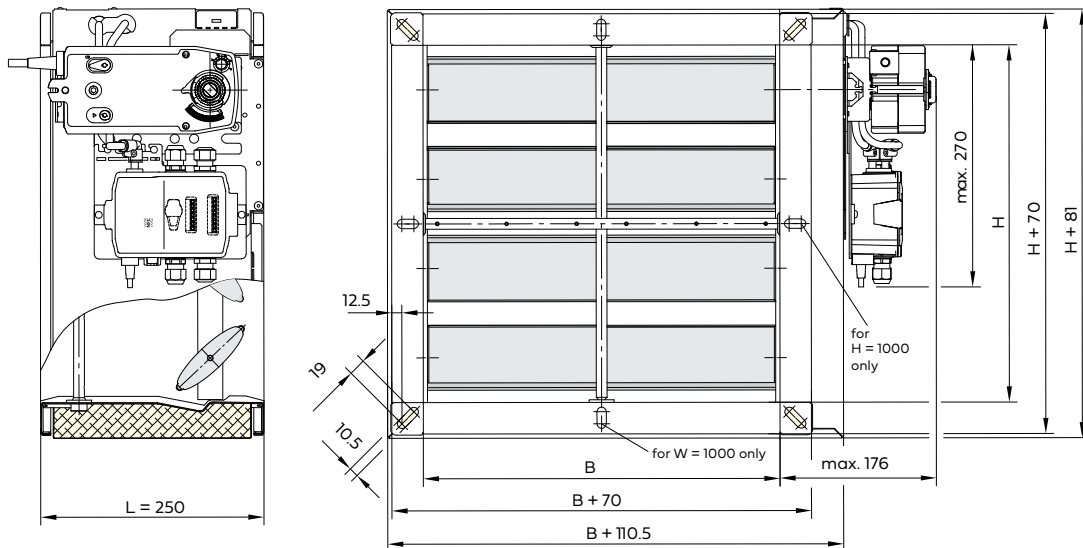
3.5.1 Weights

VKup volume flow controller [with acoustic insulation]

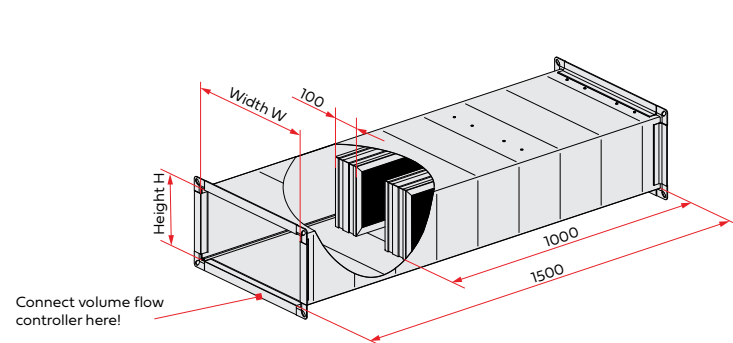
Weights in kg

Width [mm]	Height [mm]							
	100	200	300	400	500	600	800	1000
200	4.0 [5.9]	5.7 [8.2]	-	-	-	-	-	-
300	4.8 [7.0]	6.6 [9.5]	8.2 [11.4]	-	-	-	-	-
400	5.6 [8.1]	7.5 [10.7]	9.3 [12.8]	11.0 [14.8]	-	-	-	-
500	6.4 [9.3]	8.5 [12.0]	10.4 [14.3]	12.2 [16.4]	14.1 [18.7]	-	-	-
600	7.2 [10.5]	9.4 [13.4]	11.4 [15.8]	13.5 [18.1]	15.5 [20.5]	17.5 [23.0]	-	-
700	-	10.4 [14.7]	12.5 [17.3]	14.7 [19.7]	16.9 [22.3]	-	-	-
800	-	11.3 [16.0]	13.6 [18.7]	16.0 [21.4]	18.3 [24.1]	20.6 [26.9]	25.2 [32.3]	-
900	-	-	14.7 [20.2]	17.2 [23.0]	19.7 [25.9]	-	-	-
1000	-	-	15.8 [21.7]	18.4 [24.6]	21.1 [27.7]	23.7 [30.7]	28.9 [36.8]	34.2 [42.9]

3.5.2 Dimensions



3.5.2.1 SKE-V sound attenuator



Number of splitters

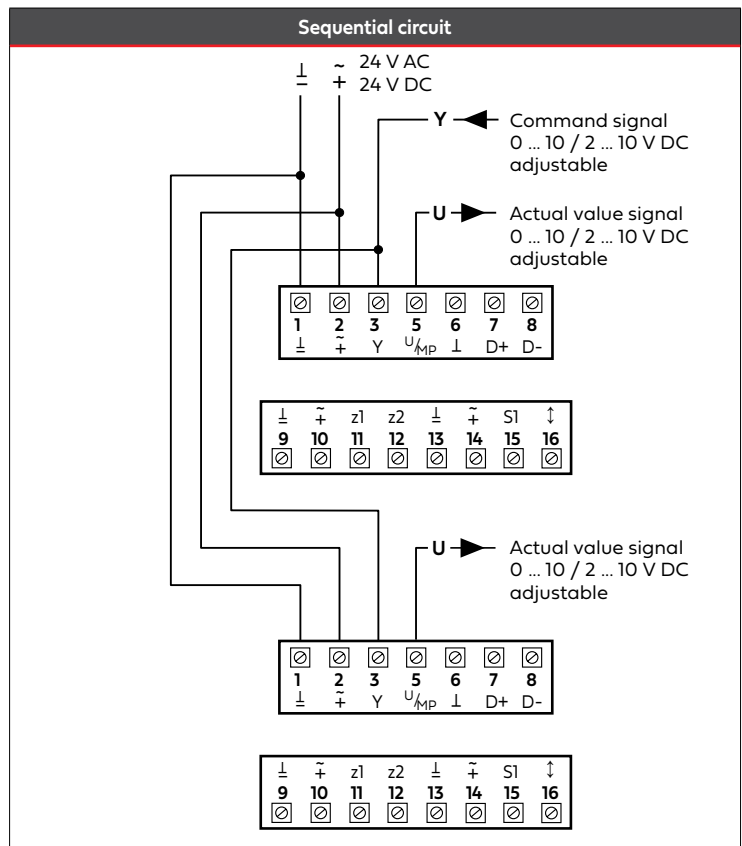
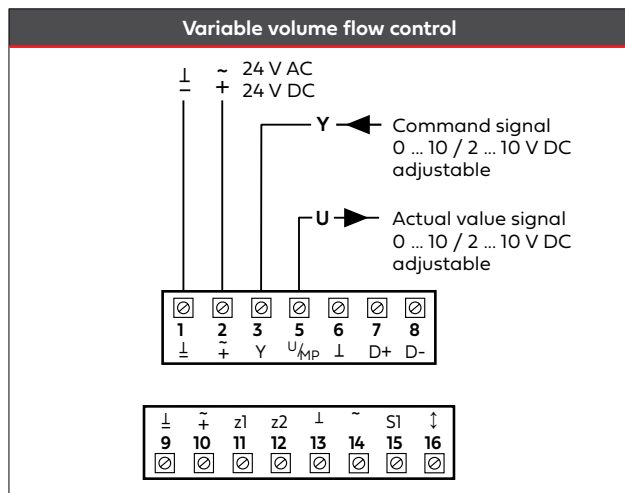
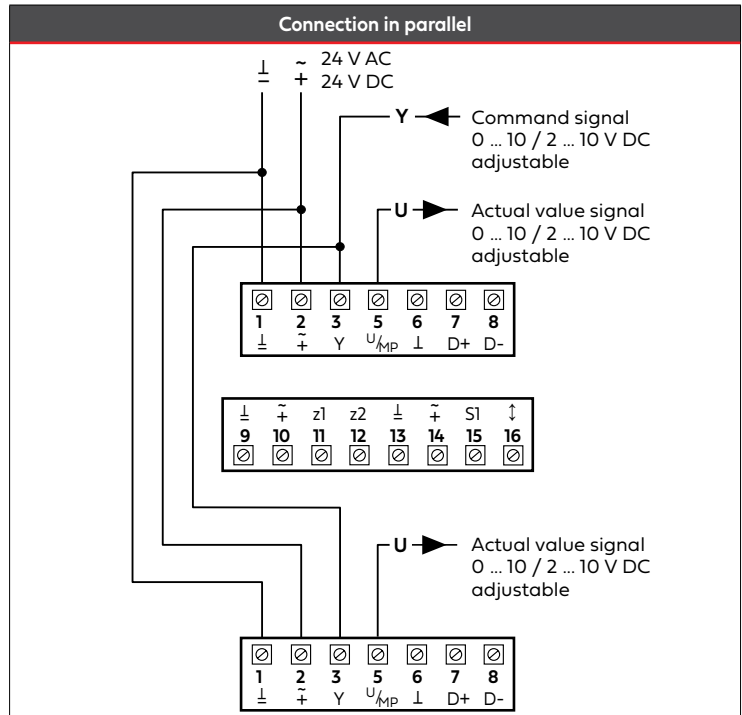
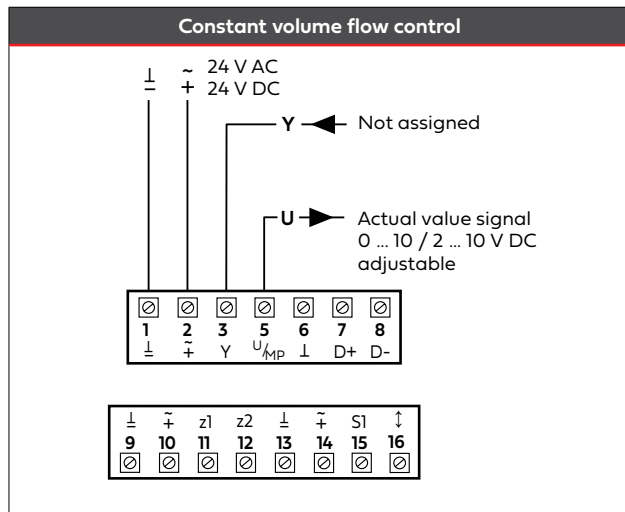
Width W [mm]	Height H [mm]							
	100	200	300	400	500	600	800	1000
200	-	-	-	-	1	-	-	-
300	-	-	-	-	1	-	-	-
400	-	-	-	-	2	-	-	-
500	-	-	-	-	2	-	-	-
600	-	-	-	-	3	-	-	-
700	-	-	-	-	3	-	-	-
800	-	-	-	-	4	-	-	-
900	-	-	-	-	4	-	-	-
1000	-	-	-	-	5	-	-	-

For further technical data, see ► [user manual for SKE](#) or ► [WiDim](#).

VKpro volume flow controller

VKup | VKpro volume flow controller

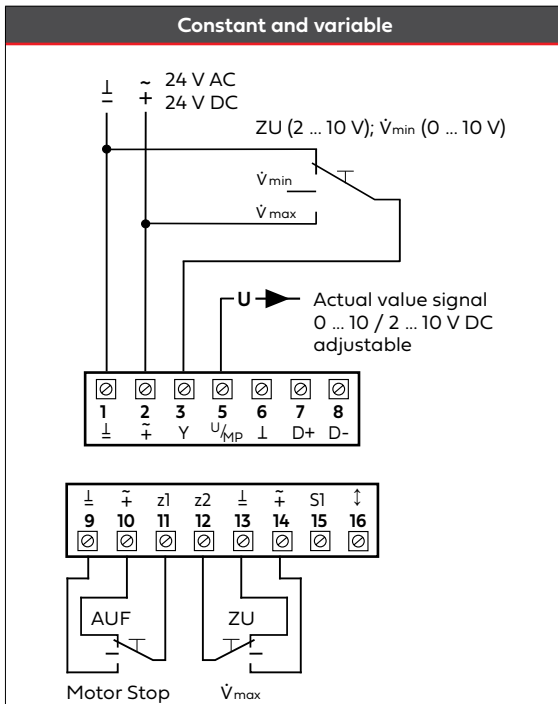
3.6 Electrical connection



VKpro volume flow controller

VKup | VKpro volume flow controller

3.6.1 Overrides



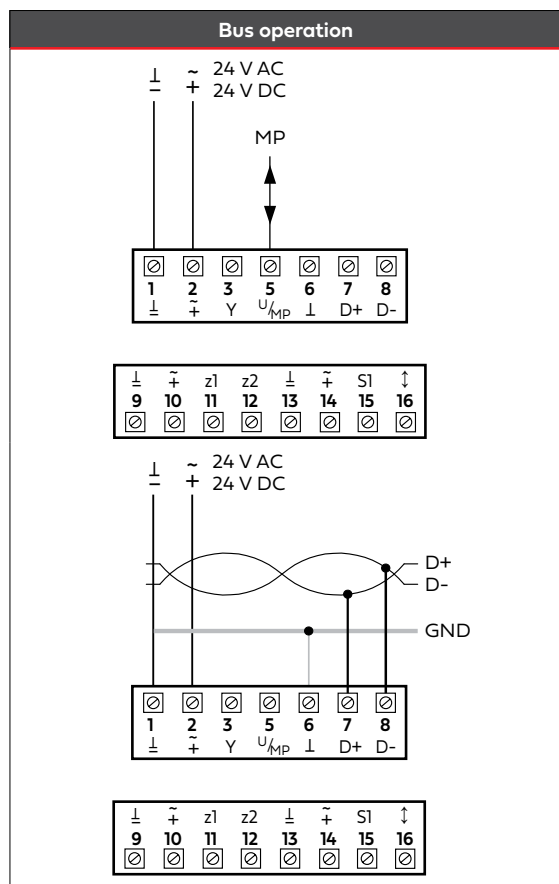
- Override circuits must be provided on site.
- Make sure that the respective overrides (CLOSED, OPEN, motor stop, \dot{V}_{min} , \dot{V}_{max}) are interlocked to prevent a short circuit!
- If there are signals on ducts 3, 11 and 12 simultaneously, the input on duct 11 has the highest priority, followed by duct 12. The input on duct 3 has the lowest priority.

VKpro volume flow controller

VKup | VKpro volume flow controller

3.6.2 Bus operation

The VKpro volume flow controller can be integrated into a higher-level building control system via MP-Bus. The bus connection on the controller can be established using conventional 3-core installation cables. The supply voltage is transmitted via duct 1 (GND) and duct 2 (24 V), and the bus signal via duct 5.



Function:

After an address has been assigned, bus operation starts automatically. The controller on the VKpro volume flow controller represents one of a maximum of eight possible slaves (MP nodes) connected to an MP master. They receive their digital command signal from the MP master of the building control system (PLC or DDC controller with MP interface). The bidirectional function of MP-Bus transmits the addressing, commands, set points, overrides and settings, such as \dot{V}_{\min} and \dot{V}_{\max} to the slave.

Each slave transmits its identification and settings, the actual volumetric flow rate, the damper position, status messages, and, if applicable, the value (Ω , %, 0/1) of a connected sensor.

The reference variable MP is specified in % in MP bus operation. It is $0\% = \dot{V}_{\min}$, $100\% = \dot{V}_{\max}$.

Thus, the MP operating mode is similar to the "variable 0 ... 10 V" operating mode, only working between 0 % and 100 % instead of between 0 V and 10 V.

⇒ see formula [1]

Parallel operation and sequential circuit with identical or differing volumetric flow rates can also be implemented via MP-Bus control.

⇒ see examples 1 to 5, ► [page 24](#)

In MP-Bus operation, duct 3 can be used for additional functions:

- For the connection of analogue sensors or switches. In the process, the controller serves as an A/D converter, providing the master with digitised sensor or switching signals.
- For local overrides for full opening and closing or for the \dot{V}_{\max} operating level. The reference variable of the MP-Bus is overridden in the process.

The controller can also be controlled using BACnet MS/TP and Modbus RTU.

3.7 Specification text

Maintenance-free, electronic volume flow controller for constant and variable volumetric flow rates. Rectangular design for position-independent installation in ventilation ducts for supply air and exhaust air in ventilation and air conditioning systems. Duct casing and blades made of galvanised sheet steel. Blades for volumetric flow rate control centrally supported, bearing shafts made of stainless steel in special plastic bearing bushings. With seals on the blades for shutting off the ventilation duct.

Aluminium measuring cross as differential pressure sensor. High volumetric flow rate accuracy across the entire volumetric flow rate range. The volumetric flow rate must remain constant at variable pressures from 5 to 1000 Pa.

Maintenance-free standard actuator / spring return actuator / high-speed actuator 24 V AC/DC with LED status indicators, controller with integrated static / dynamic sensor for analogue and digital communication via MP-Bus, BACnet and Modbus. Operating modes constant or variable, with 0 to 10 V, 2 to 10 V or adjustable.

Can be used for superimposed overrides for opening and closing the blades and for parallel and sequential operation of multiple volume flow controllers. With actual volumetric flow rate output signal, with acoustic insulation and sheet metal jacket. Leak tightness class ATC 3 (formerly C) for the casing, leak tightness class 4 for the blades, each in accordance with DIN EN 1751. Certificate as proof of compliance with the hygiene requirements in accordance with VDI 6022-1, VDI 3803-1, DIN 1946-4, DIN EN 16798-3, SWKI VA104-01, SWKI VA105-01, ÖNORM H6020 and ÖNORM H6021.

.....	pcs.			
	Volumetric flow rate:	..... m ³ /h to	m ³ /h	
	Maximum pressure drop:	..... Pa		
	Maximum sound power level			
	Flow noise	..... dB(A)		
	including SKE-V sound attenuator			
	Radiated noise	..... dB(A)		
	Manufacturer:	WILDEBOER		
	Type:	VKpro		
	Width:	.....	
	Height:	.....	
	Complete with fixings		deliver:	
			install: .....	.....
.....	pcs. Sound attenuator SKE-V - L		supply:	
			install: .....	.....
.....	pcs. Link.10 setting device for setting and operation.		supply:	
			install: .....	.....

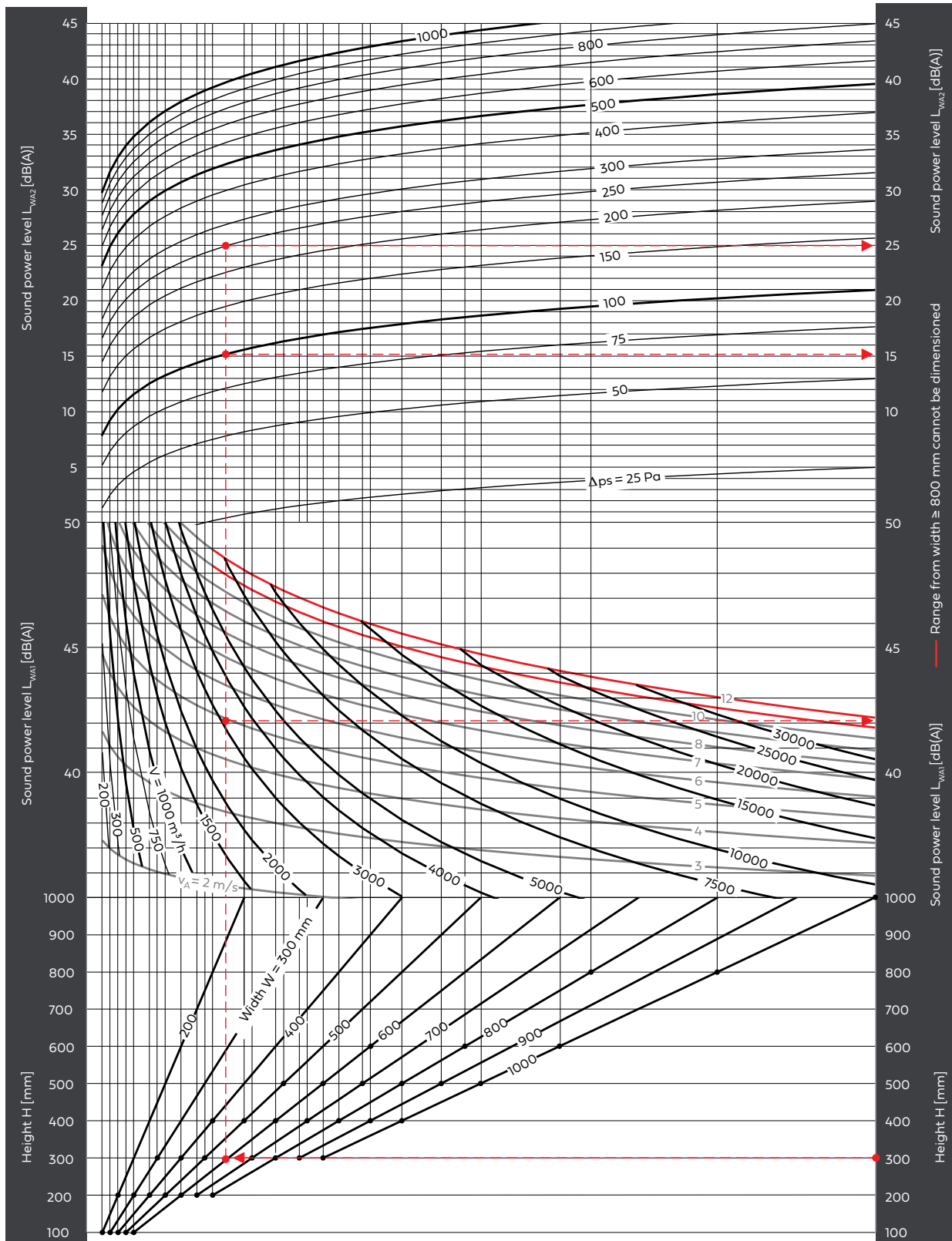
Select text not printed in bold as required!

This tender specification text can be found on the website www.ausschreiben.de ► ausschreiben.de.

Alternatively, you can use the tender specification text tailored to your product selection in the [Wildeboer Connect](#) web application ► [Wildeboer Connect](#).

4 VKup | VKpro sound power level

4.1 Flow noise



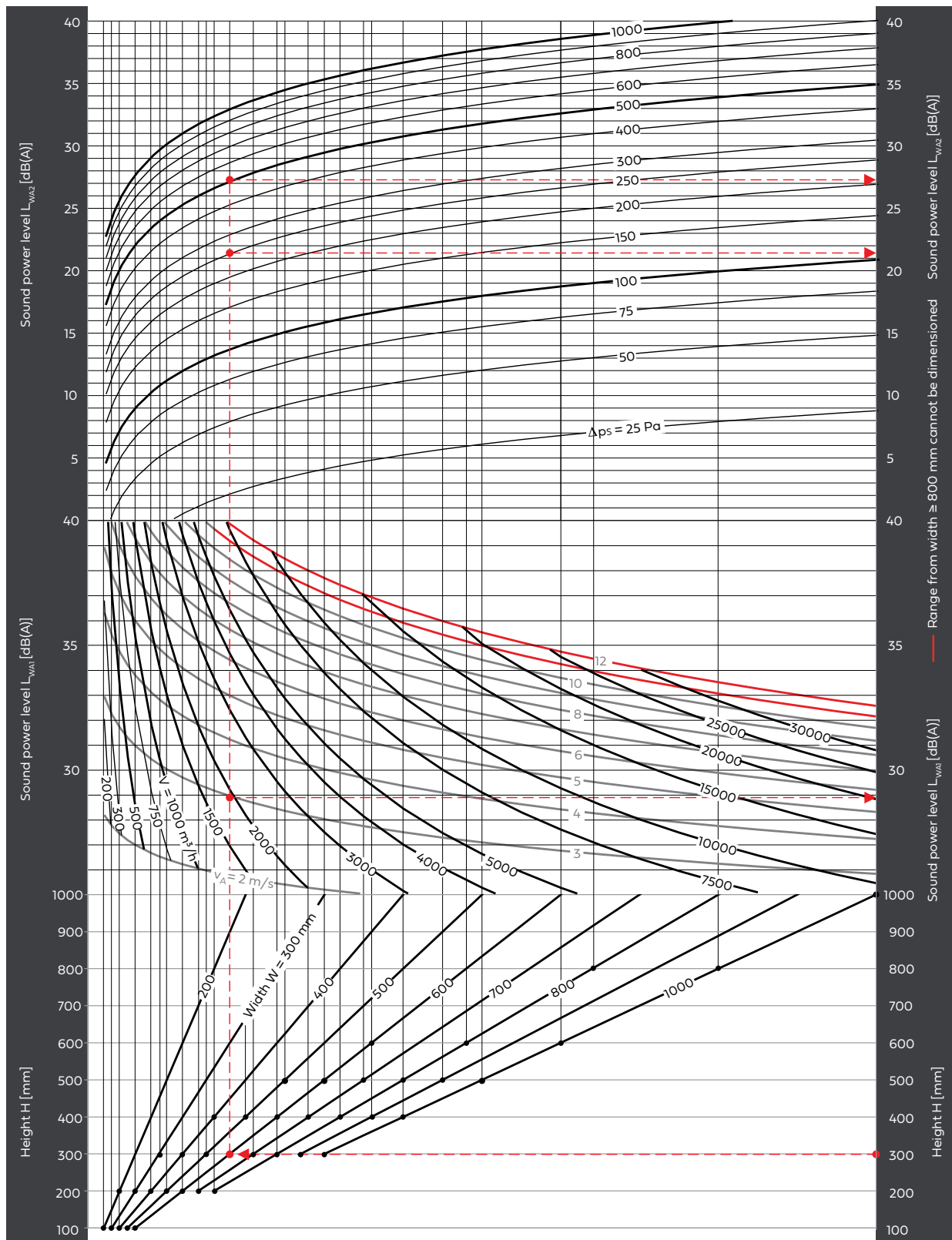
For nomenclature, see [page 38](#)

For examples, see [page 38](#)

In the above nomogram, the sound power level inside the ventilation duct is dimensioned as an overall level $L_{w,WA}$. Octave sound power levels $L_{w,WA,Oct}$ for every size and any required operating point are obtained from the WILDEBOER dimensioning software.

See download at www.wildeboer.de

4.2 Radiated noise



For nomenclature, see [page 38](#)
For examples, see [page 38](#)

In the above nomogram, the sound power level inside the ventilation duct is dimensioned as an overall level L_{wA} . Octave sound power levels L_{w-Oct} for every size and any required operating point are obtained from the WILDEBOER dimensioning software.

See download at www.wildeboer.de

4.3 Examples

For example, see [▶ page 40](#)

Specified:	Width	W	=	600	mm
	Height	H	=	300	mm
	Volumetric flow rate	\dot{V}	=	3240	m ³ /h
	Velocity v_A		=	5.0	m/s
	Static pressure drop	Δp_s	=	100	Pa

Result:	Sound power level	L_{WA1}	=	42.1	dB(A)
		L_{WA2}	=	15.2	dB(A)
		$L_{WA} = L_{WA1} + L_{WA2}$	=	57.3	dB(A)

For example, see [▶ page 40](#)

Specified:	Width	W	=	600	mm
	Height	H	=	300	mm
	Volumetric flow rate	\dot{V}	=	3240	m ³ /h
	Velocity v_A		=	5.0	m/s
	Static pressure drop	Δp_s	=	250	Pa

Result:	Sound power level	L_{WA1}	=	42.1	dB(A)
		L_{WA2}	=	25	dB(A)
		$L_{WA} = L_{WA1} + L_{WA2}$	=	67.1	dB(A)

- The sound power levels inside the ventilation duct are calculated in the nomograms as A-weighted overall levels L_{WA} . Corresponding octave sound power levels L_{W-Oct} can be calculated for every size and all operating points using the Wildeboer dimensioning software; also for designs with additional SKE-V sound attenuator.
- With SKE-V sound attenuators, the sound power levels L_{WA} can be reduced by up to 16 dB.

Important:

The sound levels indicated in the nomograms are stated as sound power levels! They represent the sound energy introduced into the duct system. They are used for acoustic calculations, e.g. when adding sound attenuators.

In other documents, sound pressure levels L_p or L_{pA} are frequently specified instead of sound power levels. They include general attenuations of up to 21 dB. This distinction must be taken into account when comparing numeric values.

Furthermore, the extent of these attenuations only becomes clear once the ducts, baffles, branches and spaces have actually been connected.

For example, see [▶ page 40](#)

Specified:	Width	W	=	600	mm
	Height	H	=	300	mm
	Volumetric flow rate	\dot{V}	=	2592	m ³ /h
	Velocity v_A		=	4.0	m/s
	Static pressure drop	Δp_s	=	250	Pa

Result:	Sound power level	L_{WA1}	=	28.9	dB(A)
		L_{WA2}	=	21.3	dB(A)
		$L_{WA} = L_{WA1} + L_{WA2}$	=	50.2	dB(A)

For example, see [▶ page 40](#)

Specified:	Width	W	=	600	mm
	Height	H	=	300	mm
	Volumetric flow rate	\dot{V}	=	2592	m ³ /h
	Velocity v_A		=	4.0	m/s
	Static pressure drop	Δp_s	=	500	Pa

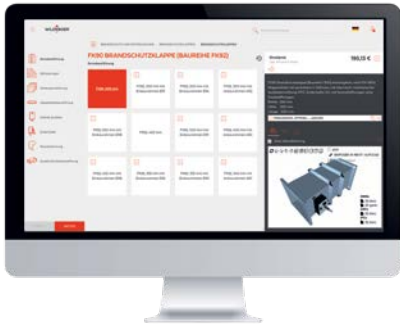
Result:	Sound power level	L_{WA1}	=	28.9	dB(A)
		L_{WA2}	=	27.2	dB(A)
		$L_{WA} = L_{WA1} + L_{WA2}$	=	56.1	dB(A)

Nomenclature

\dot{V}	[m ³ /h]	Volumetric flow rate
\dot{V}_{min}	[m ³ /h]	Minimum controllable reference volumetric flow rate
\dot{V}_{max}	[m ³ /h]	Maximum controllable reference volumetric flow rate
$\dot{V}_{min} - \dot{V}_{max}$	[m ³ /h]	Operating range of the volume flow controller
A_A	[m ²]	Inflow cross section
v_A	[m/s]	Flow velocity in A_A
Δp_s	[Pa]	Static pressure drop
Δp	[Pa]	Differential pressure
L_{WA}	[dB(A)]	A-weighted sound power level
L_{W-Oct}	[dB]	Octave sound power level $L_{W-Oct} = L_{WA} + \Delta L$
ΔL	[dB]	Relative sound power level to L_{WA}
f	[Hz]	Octave mid-frequency
L_p	[dB]	Sound pressure level
L_{pA}	[dB(A)]	A-weighted sound pressure level
U	[V]	Command signal (variable set point setting)
\dot{V}_{ref}	[m ³ /h]	Reference volumetric flow rate
LL	[V]	Lower limit for Y and U
UL	[V]	Upper limit for Y and U

5 Wildeboer makes it easy

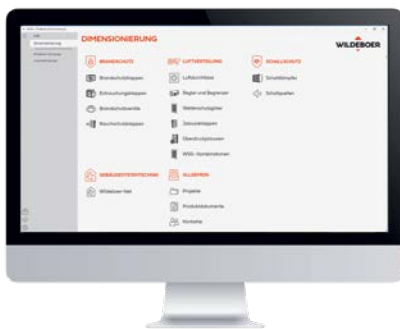
5.1 Wildeboer Connect



- High-performance configurator with customer-specific net prices
- Quick, intuitive product configuration of Wildeboer products
- Access to prices and unique version keys for ordering products
- Easy calculation of operating point data for configured products
- Interface to Autodesk Revit and AutoCAD for transferring CAD geometries
- Download of CAD data, data sheets, specification texts and further product documents in common data formats
- Transparent real-time order tracking
 - Detailed order information
 - Access to order documents
 - Access to shipment tracking



5.2 WiDim dimensioning software



- Functional, modern and intuitive dimensioning of Wildeboer products
- Conveniently collect operating point data, 3D product views, suitable accessories and current revision documents in a single project
- Project can be output in various formats
- A GAEB interface and an interface based on VDI 3805 facilitate a continuous planning process



5.3 Documents online



- Paperless and environmentally friendly online access to Wildeboer documents
- All documents in one central location and always up to date
- Supporting interactive formats and content



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