Maintenance-free, electronic

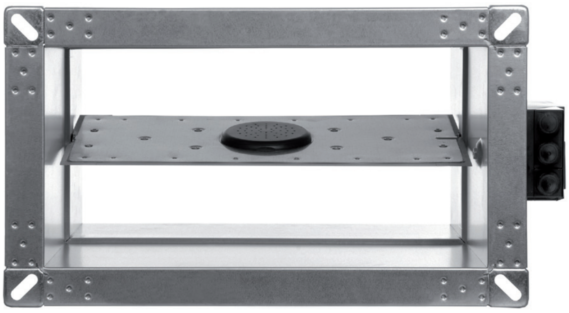
VKE1 volume flow controller

for ventilation and air conditioning systems. Versatile.

- Sizes: B x H from 200 mm x 200 mm to 800 mm x 400 mm.
- Operating voltage: 24 V AC/DC.
- Operation modes: Constant, 4-point, Variable (0 – 10 V, 2 – 10 V, 2 – 8 V).
- Leak tightness classes according to DIN EN 1751: Casing C, shut-off damper 3 and 4.
- Measuring device integrated into the damper blade. Outstanding control accuracy.
- Displays and settings are carried out digitally, also using a PC.
- Efficiency signal for optimising the fan output during operation.
- Overrides for complete opening and closing.

VKE1 volume flow controller

Properties



VKE1 volume flow controllers measure the volume flow directly at the damper blade.

The duct casing is free of disrupting measuring leads and other inbuilt parts which results in large unobstructed cross-sections. The flow does not pass through the measuring device! It is therefore immune to noise.

The **motorised actuator M1** is equipped with plain text displays, an illuminated display and adjustment buttons. LED status displays provide information on the current operating status of the volume flow controller at all times using different colours and signal types.

In addition, all settings and displays can be transferred to a PC via the RS232 interface located on the front, where they can be viewed and executed.

The **motorised actuator M2** is not equipped with plain text displays, display, adjustment buttons and LED status displays. The settings and displays are carried out using a PC via the RS232 interface.

Settings can also be made and ordered **at the factory**. Changes can be made on site via the adjustment buttons or using a PC.

Strain-relieved, assembly-optimised connection plug.

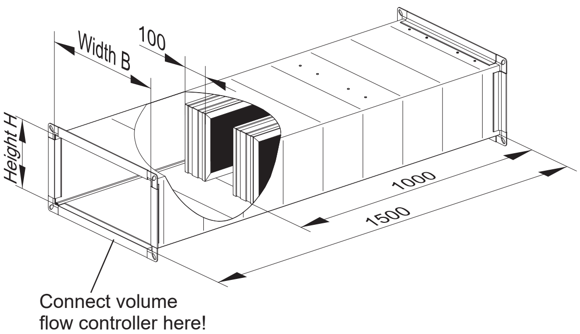
Option

VKE1 volume flow controller with acoustic insulation for thermal insulation and reduction of sound radiation to the outside.

All illustrations show the VKE1 volume flow controller with motorised actuator M1.

Option

SKB-V sound attenuator for volume flow controller for reduction of internal flow noise. Sound attenuator length 1500 mm.

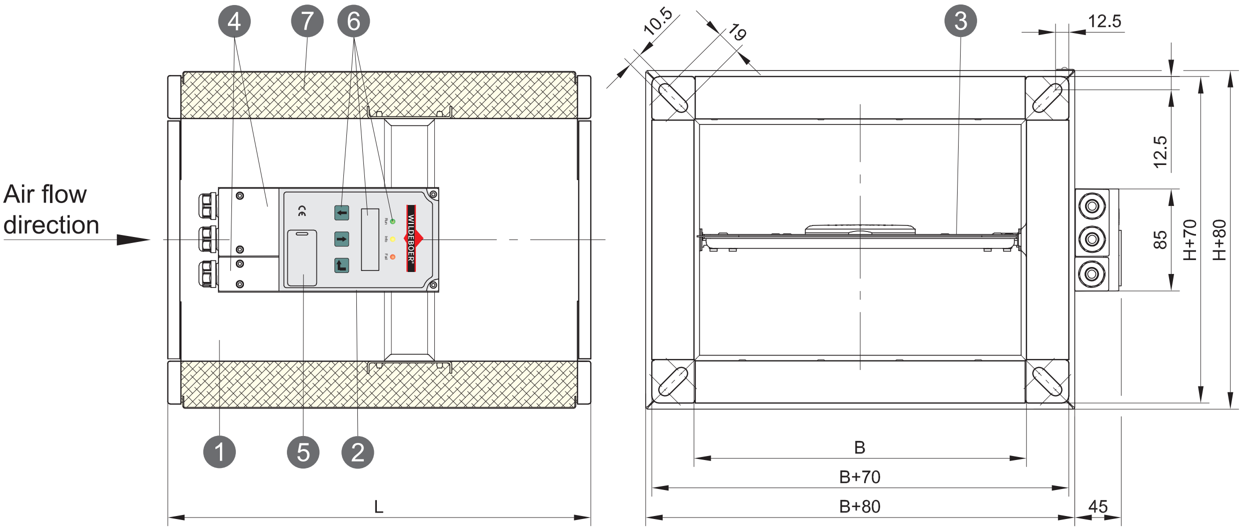


Maximum possible reduction of flow noise in [dB] with a

	Width B [mm]	200	300	400	500	600	700	800
	Number of splitters	1	1	2	2	3	3	4
Height H [mm]	100	-	-	-	-	-	-	-
	200	-15	-10	-16	-11	-16	-13	-16
	300	-	-9	-16	-11	-16	-13	-16
	400	-	-	-16	-11	-16	-13	-16

VKE1 volume flow controller

Description / technical data (1)



VKE1 volume flow controllers are maintenance-free, electronic controllers that produce constant and variable volume flows in ventilation and air conditioning systems.

They can be installed in supply and exhaust air ventilation ducts and are not position sensitive. The housing and control mechanism are made of galvanized sheet steel. Damper blade for volume flow control, positioned centrally with peripheral gasket. Stainless steel bearing shafts in special bearing bushes. Actuator M1 with display, adjustment buttons and LED status displays, M2 for adjustment only via PC.

Operation modes: “Constant”, “4-point 24 V AC/DC”, “Variable 0 – 10 V DC”, “Variable 2 – 10 V DC”, “Variable 2 – 8 V DC” and the overrides “Damper blade fully open” and “Damper blade closed”. Parallel operation and sequential circuits. Efficiency signal for optimising the fan output during operation.

The innovative measurement procedure ensures high control accuracy at all pressures in the minimum of 1:6 volume flow ranges V_{min} to V_{max} with only ±5% to ±15% deviation from the reference volume flow. Accordingly, the volume flows throughout the entire pressure range are kept constant.

- Sizes B x H x L: in accordance with adjacent table
- Total volume flow range: 130 – 13800 m³/h
- Pressure control range: 20 – 1000 Pa
- Operating voltage 24 V AC/DC
- *Options*
  - Acoustic insulation with sheet metal jacket on the outside
  - Factory presets. ⇒ see page 14
  - SKB-V sound attenuator for volume flow controller

1 Duct casing.
2 Motorised actuator M1.
3 Damper blade with integrated measuring cell.
4 Connection plug with integrated strain relief.
5 RS232 interface for PC.
6 Illuminated display with plain text displays, LED status displays and buttons for making adjustments (only actuator M1).
7 Acoustic insulation with sheet metal jacket *(optional)*.

Width B [mm]	Height H [mm]	Length L [mm]	Inflow cross-section A_A [m²]	Volume flow V_{min} [m³/h]	V_{max} [m³/h]
200	**100**	275	0.020	130	860
	200	350	0.020	260	1700
300	**100**	275	0.030	190	1300
	200	350	0.060	390	2600
	300	425	0.090	580	3900
400	**100**	275	0.040	260	1700
	200	350	0.080	520	3500
	300	425	0.120	780	5200
	400	525	0.160	1040	6900
500	**100**	275	0.050	320	2200
	200	350	0.100	650	4300
	300	425	0.150	970	6500
	400	525	0.200	1300	8600
600	**100**	275	0.060	390	2600
	200	350	0.120	780	5200
	300	425	0.180	1170	7800
	400	525	0.240	1560	10400
700	**200**	350	0.140	910	6000
	300	425	0.210	1360	9100
	400	525	0.280	1810	12100
800	**200**	350	0.160	1040	6900
	300	425	0.240	1560	10400
	400	525	0.320	2070	13800

VKE1 volume flow controllers

- satisfy the **hygiene requirements** in accordance with VDI 6022-1, VDI 3803-1, DIN 1946-4, DIN EN 13779, SWKI VA104-01, SWKI 99-3, ÖNORM H6020, ÖNORM H6021.
- are **resistant to microbes**, and therefore **do not promote the growth of micro-organisms (fungi, bacteria)**. This reduces the risk of infection for people and also expenditure for cleaning and disinfection!
- are **resistant to cleaning agents and disinfectants** and are suitable for use in hospitals and similar facilities!
- with **Environmental Product Declaration** as per ISO 14025 and EN 5804: EPD-WIL-20150037-ICA1-DE.

Geprüfte Qualität
Hygiene-Institut
des Ruhrgebiets
Institut für Umwelthygiene und Toxikologie
geprüft
www.HYG.de
Nur gültig in Verbindung mit zugehörigem Zertifikat unter www.wildeboer.de!

VKE1 volume flow controller

Technical data (2) / operation modes

Other technical data

- Flow velocity in A_A
  v_A = 1.8 – 12 m/s
- Maximum differential pressure: 1000 Pa
- Leak tightness according to DIN EN 1751:
  - Casing: Class C
  - Damper blade:

H / B [mm]	200	300	400	500	600	700	800
100	3	3	3	3	3	-	-
200	3	3	3	3	3	3	3
300	-	3	4	4	4	4	4
400	-	-	4	4	4	4	3

- Temperature ranges
  - Inside +5 – +60°C
  - Outside +5 – +50°C
- Maximum humidity 80%, non-condensing.
- Operating voltage: 24 V AC/DC ±20%
- Power consumption:
  - holding: 1.2 VA, 0.5 W
  - running: 3.5 VA, 1.5 W
- Degree of protection IP 54
- Runtime for 90° approx. 90 s
- EMC CE in accordance with 2004/108/EC

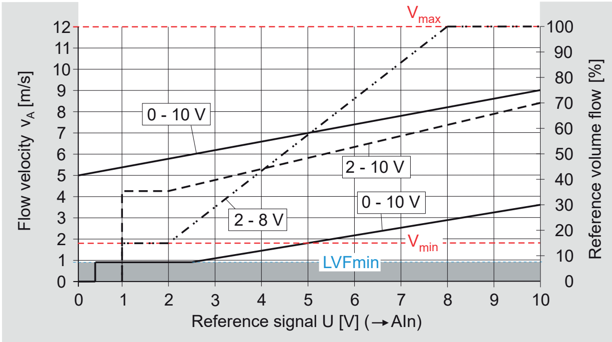
Nomenclature

V	[m³/h]	Volume flow
V_{min}	[m³/h]	Minimum adjustable volume flow
V_{max}	[m³/h]	Maximum adjustable volume flow
V_{min} to V_{max}		Operating range of volume flow controller
V_{ref}, **OVFconst**, **OVFmin**, **OVFmax**, **OVFmid1**, **OVFmid2** [m³/h]		Reference volume flows
LVFmin	[m³/h]	Minimum adjustable reference volume flow
v_A	[m/s]	Flow velocity in A_A
A_A	[m²]	Inflow cross-section $A_A = B \times H$
Δp_S	[Pa]	Static pressure drop
L_{WA}	[dB(A)]	A-weighted sound power level
$L_{W\text{-}Oct}$	[dB]	Octave sound power level $L_{W\text{-}Oct} = L_{WA} + \Delta L$
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]	Reference signal (variable set point input)

*) Volume flows in % V_{max} can also be used instead of in m³/h.
⇒ see examples on pages 6 and 7

Function of operation modes

- **Constant:** With V_{min} ≤ **OVFconst** ≤ V_{max}, a reference volume flow is set. The purpose of this is to keep the controller constant.
- **Variable:** With **OVFmin** ≥ **LVFmin** = 0.5 • V_{min} or **OVFmin** = 0 m³/h and **OVFmax** ≥ 30% V_{max}, a reference volume flow range is set. Volume flows V_{ref} can be specified within this range via reference signals U that can be kept constant by the controller from V_{min}.



The following reference signals are possible:

0 – 10 V

- If **OVFmin** = 0 m³/h is set, the damper blade closes completely with U = 0 to 0.4 V. The control function starts from U ≥ 0.4 V at a volume flow **LVFmin** = 0.5 • V_{min}.
- If **OVFmin** > 0 m³/h is set, the control function starts from U = 0 V at this value – without closing.

Calculating the reference volume flow V_{ref} for the reference signal U*):

V_{ref} [m³/h] = OVF_{min} [m³/h] + (OVF_{max} [m³/h] - OVF_{min} [m³/h]) • U [V] **:** 10 V [1]

2 – 10 V

- If 0 V ≤ U < 1 V, the damper blade closes completely. If 1 V ≤ U ≤ 2 V, the control function starts with **OVFmin**.
- If **OVFmin** = 0 m³/h is set and U ≥ 1 V, the control function starts at the volume flow **LVFmin** = 0.5 • V_{min}.

Calculating the reference volume flow V_{ref} for the reference signal U*):

V_{ref} [m³/h] = OVF_{min} [m³/h] + (OVF_{max} [m³/h] - OVF_{min} [m³/h]) • (U [V] - 2 V) **:** 8 V [2]

2 – 8 V

- If 9 V < U ≤ 10 V, the damper blade opens completely. If 8 V ≤ U ≤ 9 V, the control function operates with **OVFmax**. The functions for 0 V ≤ U ≤ 2 V are the same as those described for U = 2 to 10 V.

Calculating the reference volume flow V_{ref} for the reference signal U*):

V_{ref} [m³/h] = OVF_{min} [m³/h] + (OVF_{max} [m³/h] - OVF_{min} [m³/h]) • (U [V] - 2 V) **:** 6 V [3]

- **4-point** With **OVFmin** and **OVFmax** and the intermediate values **OVFmid1**, **OVFmid2**, four volume flows between V_{min} and V_{max} can be set and kept constant. The selection is made with LOW and HIGH signals (0 V and 24 V AC/DC).

Control	DigIn1 Terminal 6	DigIn2 Terminal 7	DigIn3 Terminal 8
OVF_{min}	LOW	LOW	LOW
OVF_{mid1}		LOW	HIGH
OVF_{mid2}		HIGH	LOW
OVF_{max}		HIGH	HIGH
open	HIGH	LOW	uninfluential
close		HIGH	

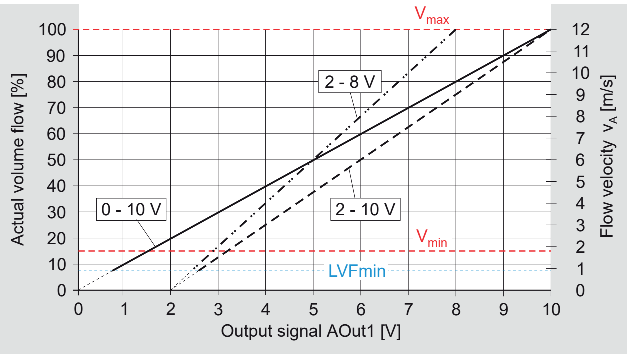
For terminal assignment ⇒ see page 12

Open/close **override**: The damper blade can be fully opened and closed with LOW and HIGH signals. All operation modes are overridden during this process.

VKE1 volume flow controller

Actual volume flow / efficiency signal for optimising the fan output during operation

Output signal AOut1: Actual volume flow V_{act}



If the pressure upstream of the volume flow controller is insufficient, because the fan output is not high enough for example, **nDef** appears on the display. **AOut1** then remains at the previous value.

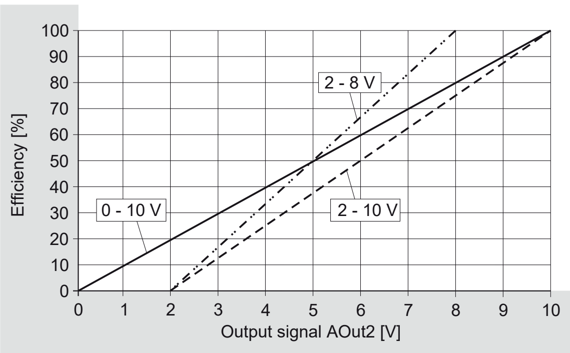
For **external volume flow display** and as reference signal for **sequential circuits**, the output signal **AOut1** which is proportional to the actual volume flow V_{act} is available at output 1, terminal 3.

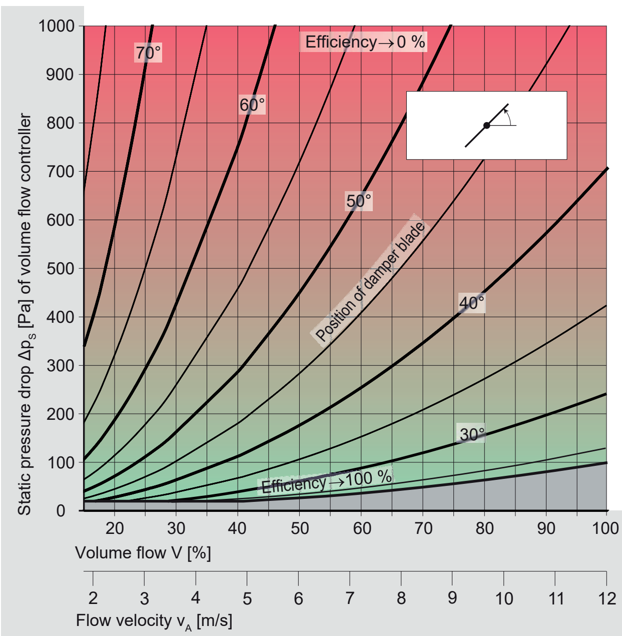
Irrespective of the settings at the volume flow controller, the signal produced is proportional to the maximum volume flow V_{max} and reference signal U at:

0 – 10 V:	V_{act} [m³/h]	=	V_{max} [m³/h] • AOut1 [V] : 10 V	[1a]
	AOut1 [V]	=	10 V • V_{act} [m³/h] : V_{max} [m³/h]	[1b]
2 – 10 V:	V_{act} [m³/h]	=	V_{max} [m³/h] • (AOut1 [V] - 2 V) : 8 V	[2a]
	AOut1 [V]	=	2 V + 8 V • V_{act} [m³/h] : V_{max} [m³/h]	[2b]
2 – 8 V:	V_{act} [m³/h]	=	V_{max} [m³/h] • (AOut1 [V] - 2 V) : 6 V	[3a]
	AOut1 [V]	=	2 V + 6 V • V_{act} [m³/h] : V_{max} [m³/h]	[3b]

Volume flows in [% V_{max}] can also be used instead of in [m³/h].

Output signal AOut2: Efficiency signal





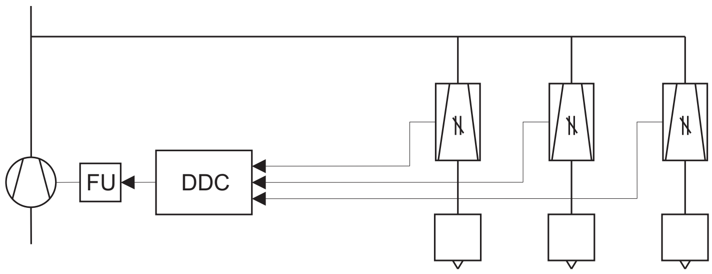
The analogue voltage signal **AOut2** is available at output 2, terminal 4, **for improving the energy efficiency of the fan output**. Depending on the setting of the reference signal U, the efficiency is as follows:

0 – 10 V:	Efficiency [%] =	100% • AOut2 [V] : 10 V	[4]
2 – 10 V:	Efficiency [%] =	100% • (AOut2 [V] - 2 V) : 8 V	[5]
2 – 8 V:	Efficiency [%] =	100% • (AOut2 [V] - 2 V) : 6 V	[6]

Volume flow controllers should be operated so that they **reduce the volume flow slightly**. They should be opened as wide as possible. The smaller the resulting pressure drops are, the more energy efficient the ventilation and air conditioning system will be when in operation.

A low efficiency signal – efficiency → 0% – means that the volume flow controller is operating with a high pressure drop and is restricting the flow considerably. The system operating pressure could be less and the fan could be operating at a lower speed. The efficiency signal should ideally be high, **efficiency → 90%**.

The volume flow controller will then have an optimum operating pressure in terms of energy efficiency. However, up to 95% is advisable in order to ensure that sufficient air distribution and pressure stability is maintained in the system.



Fan control with efficiency optimisation

Example: In a DDC control system, the efficiency signals of all volume flow controllers are analysed and the speed of the fan adjusted accordingly until a controller shows a higher efficiency signal.

The **efficiency signal** takes the volume flow, pressure drop and damper blade position into account.

- 0 – 10 V output signals and the above formulas [1a], [1b] and [4] are used in constant mode and 4-point mode.
- If a controller receives a close/open signal in variable mode via the reference signal U or via an override, the output signals for the actual volume flow **AOut1** and for efficiency **AOut2** are 0 V or 10 V respectively; **close/open** appears on the display.

VKE1 volume flow controller

Stand-alone operation, Parallel operation and Master/Slave sequential operation, examples (1)

With **Stand-alone operation**, the volume flow controller is set to one of the possible operation modes. With **Parallel operation**, this affects two or more. The reference signals are always identical and applied electrically either individually or in parallel to terminal 5 or terminals 6 to 8. When connected in parallel, controllers operate independently of one another.

Reference volume flows **OVFmin**, **OVFmax**, **OVFmid1, OVFmid2** can be adjusted independently of one another, and according to the size and operation modes of the controller. If changes are made to one controller this does not affect the others.

With **Master/Slave sequential operation**, the actual volume flow V_{act} of one controller controls the reference volume flow V_{ref} of another. The output signal **AOut1** at terminal 3 of the controlling controller (Master) is fed as reference signal **AIn** to terminal 5 of the controller being controlled (Slave). If "Variable 0 – 10 V", "Variable 2 – 10 V" or "Variable 2 – 8 V" is set at the Master, the same modes must be set at the Slave. If "Constant" or "4-point" is set at the Master, "Variable 0 –10 V" must be set at the Slave. In this case it is advisable to set **OVFmin** = 0% V_{max} and **OVFmax** = 100% V_{max} at the Slave; However, **OVFmax** ≥ 30% V_{max} can also be set.

Example 1:

Stand-alone operation of volume flow controller and Parallel operation with identical volume flow.

If the operation mode 2 – 8 V is set at the controllers, the control range is controlled with U = 2 to 8 V as reference signal at **AIn**. With **OVF**$_{min}$ = 35% V_{max} and **OVF**$_{max}$ = 70% V_{max}, a reference volume flow is specified according to page 4, formula [3]. With U = 2 V as reference signal at **AIn**, it is

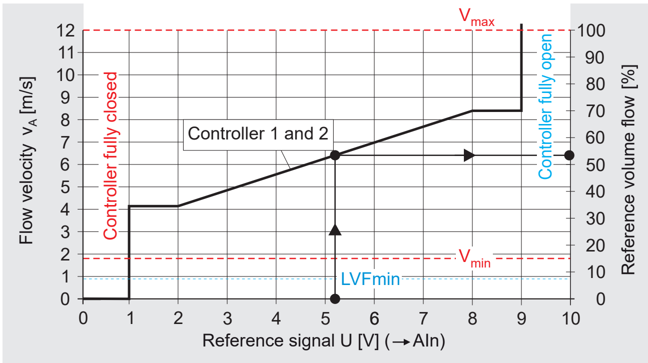
V_{ref} = 35% + (70% - 35%) • (2 V - 2 V) : 6 V = 35% V_{max}.

When U = 5.2 V is selected as reference signal between 2 and 8 V:

V_{ref} = 35% + (70% - 35%) • (5.2 V - 2 V) : 6 V = 54% V_{max}

With U = 8 V as the largest reference signal:

V_{ref} = 35% + (70% - 35%) • (8 V - 2 V) : 6 V = 70% V_{max}



Example 2:

Parallel operation of volume flow controllers with constant volume flow differential

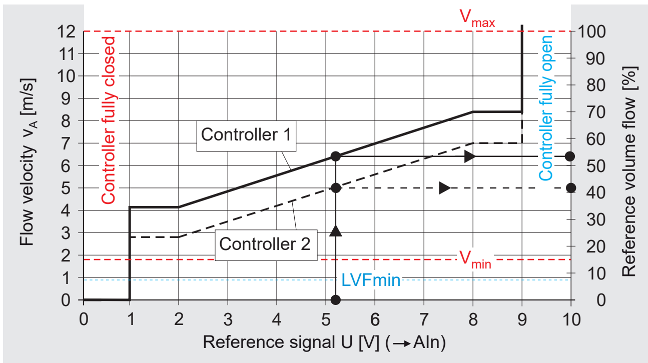
If the operation mode 2 – 8 V is set at the controllers, the control range is controlled with U = 2 to 8 V as reference signal at **AIn**.

With **OVF**$_{min}$ = 35% V_{max} and **OVF**$_{max}$ = 70% V_{max} at the first controller, a reference volume flow is then specified according to page 4, formula [3]. With U = 5.2 V, for example, this is a possible reference signal between 2 and 8 V:

V_{ref} = 35% + (70% - 35%) • (5.2 V - 2 V) : 6 V = 54% V_{max}

If a constant volume flow which is always 12% lower is to be achieved at the second controller, the settings **OVF**$_{min}$ = 23% V_{max} and **OVF**$_{max}$ = 58% V_{max} must be specified at this one. With U = 5.2 V,

V_{ref} = 23% + (58% - 23%) • (5.2 V - 2 V) : 6 V = 42% V_{max}



Example 3:

Parallel operation of volume flow controllers with proportionally-equal volume flow differential

If the operation mode 0 – 10 V is set at the controllers, the control range is controlled with U = 0 to 10 V as reference signal at **AIn**.

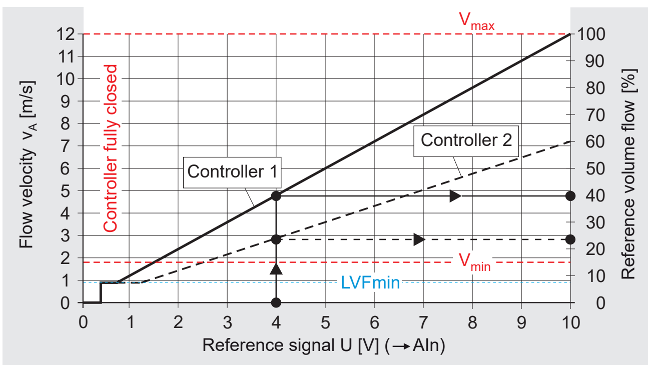
With **OVF**$_{min}$ = 0% V_{max} and **OVF**$_{max}$ = 100% V_{max} at the first controller, a reference volume flow is then specified according to page 4, formula [1]. With U = 4 V, for example, this is a possible reference signal between 0 and 10 V:

V_{ref} = 0% + (100% - 0%) • 4 V : 10 V = 40% V_{max}

If a constant volume flow which is always 40% lower is to be achieved at the second controller, the settings **OVF**$_{min}$ = 0% V_{max} and **OVF**$_{max}$ = 60% V_{max} must be specified at this one.

When U = 4 V on the other hand

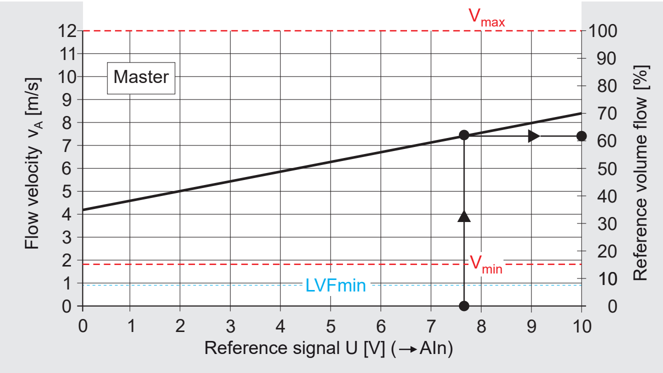
V_{ref} = 0% + (60% - 0%) • 4 V : 10 V = 24% V_{max}

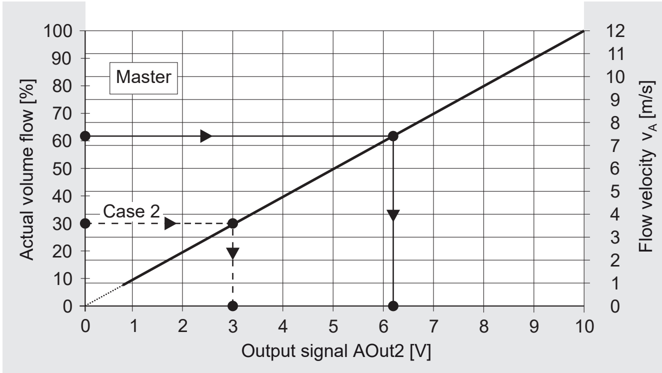


VKE1 volume flow controller

Stand-alone operation, Parallel operation and Master/Slave sequential operation, examples (2)

Example 4: Master/Slave sequential operation to volume flow controller with identical volume flow





The operation modes 0 – 10 V are set at the **Master** and **Slave**. The Master is then controlled with U = 0 to 10 V. For **OVF_{min}** = 35% V_{max} and **OVF_{max}** = 70% V_{max} as well as with e.g. U = 7.6 V according to page 4, formula [1]:

V_{ref} = 35% + (70% - 35%) • 7.6 V : 10 V = 62% V_{max}

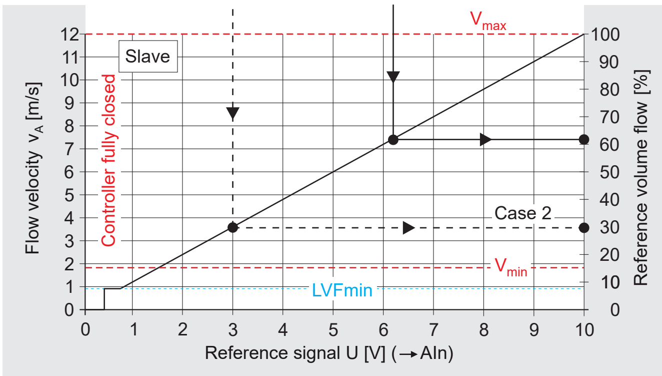
With $V_{act} = V_{ref}$, the **output signal** according to page 5, formula [1b] is:

AOut1 = 10 V • 62% : 100% = 6.2 V

This voltage is specified by the Master as reference signal to the Slave at **AIn** where **OVF_{max}** = 30 to 100% V_{max} can be variably adjusted.

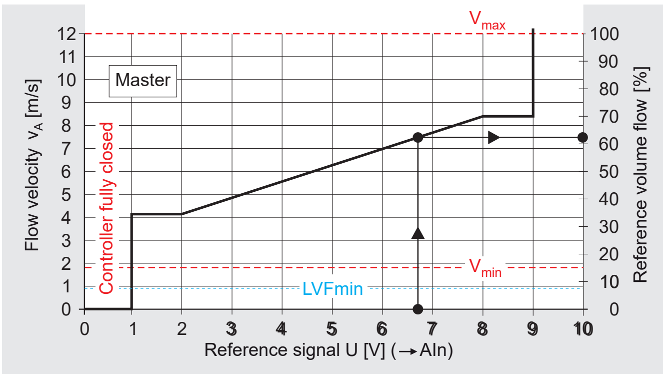
If **OVF_{max}** = 100% V_{max} is set at the **Slave**, according to page 4, formula [1]:

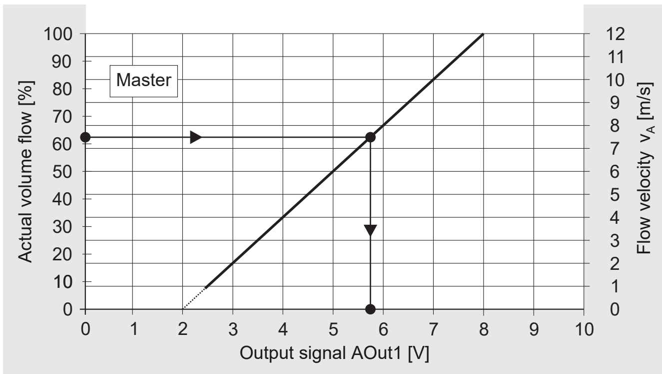
V_{ref} = 0% + (100% - 0%) • 6.2 V : 10 V = 62% V_{max}



If the actual volume flow at the Master does not reach the reference volume flow, the Slave follows the actual volume flow! ⇒ see example 2!

Example 5: Master/Slave sequential operation for volume flow controller with identical proportionally-equal volume flow





The operation modes 2 – 8 V are set at the **Master** and **Slave**. The Master is set to **OVF_{min}** = 35% V_{max} and **OVF_{max}** = 70% V_{max} and activated with U = 2 to 8 V. When U = 6.7 V, according to page 4, formula [3]:

V_{ref} = 35% + (70% - 35%) • (6.7 V - 2 V) : 6 V = 62% V_{max}

When $V_{act} = V_{ref}$, the corresponding **output signal** according to page 5, formula [3b], is:

AOut1 = 2 V + 6 V • 62% : 100% = 5.7 V

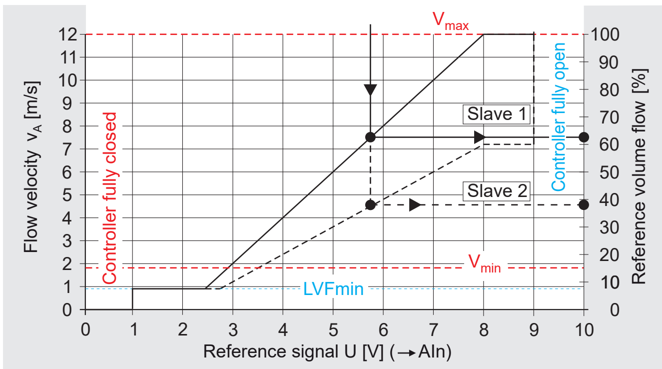
This voltage is specified by the Master as reference signal **AIn** to the Slaves. **OVF_{max}** = 30 to 100% V_{max} can be variably adjusted at these.

If **OVF_{max}** = 100% V_{max} is set at **Slave 1**, according to page 4, formula [3]:

V_{ref} = 0% + (100% - 0%) • (5.7 V - 2 V) : 6 V = 62% V_{max}

If **OVF_{max}** = 60% V_{max} is set at **Slave 2** , according to page 4, formula [3]:

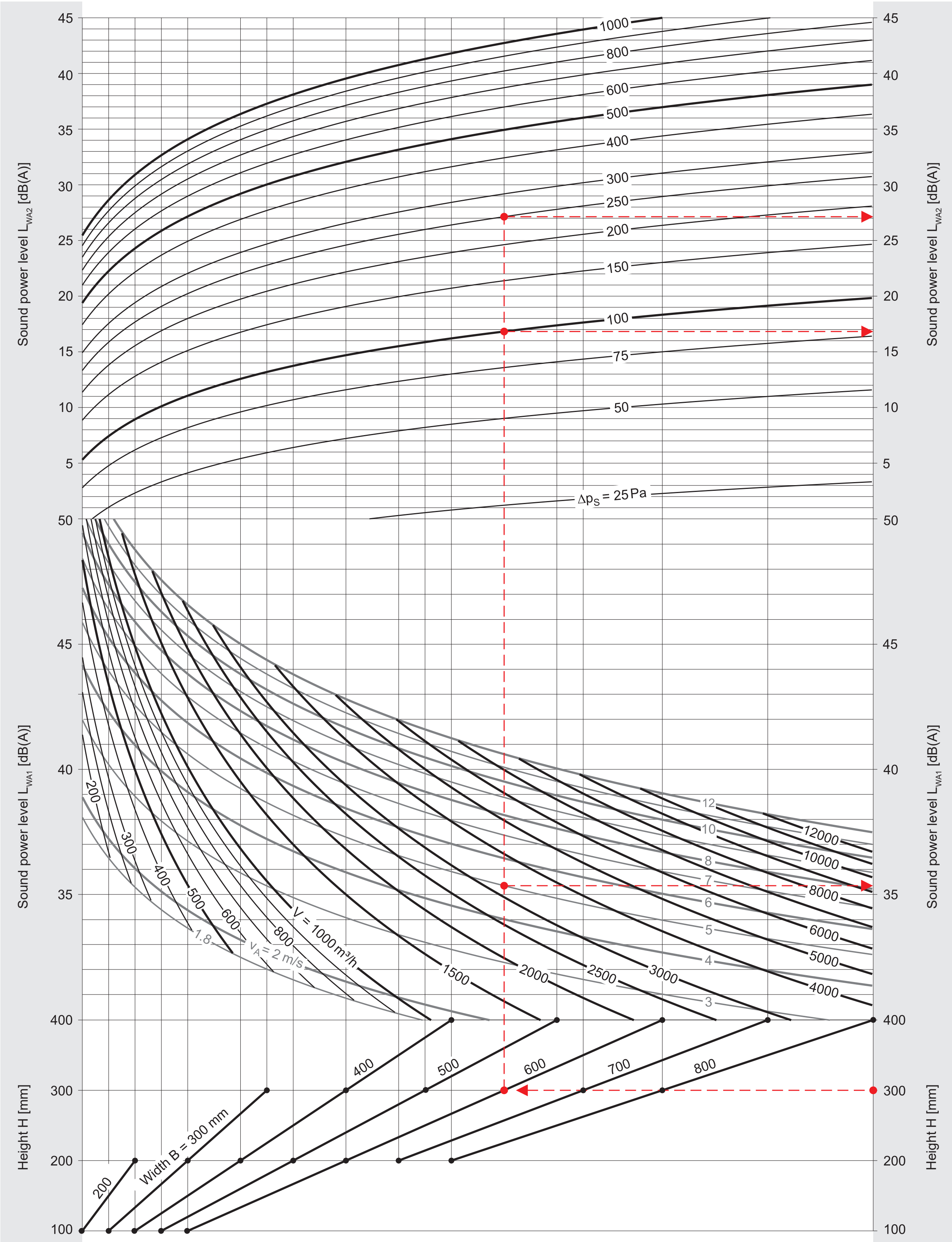
V_{ref} = 0% + (60% - 0%) • (5.7 V - 2 V) : 6 V = 37% V_{max}



Nomenclature ⇒ see page 4

VKE1 volume flow controller

Sound power level inside the connecting duct – flow noise



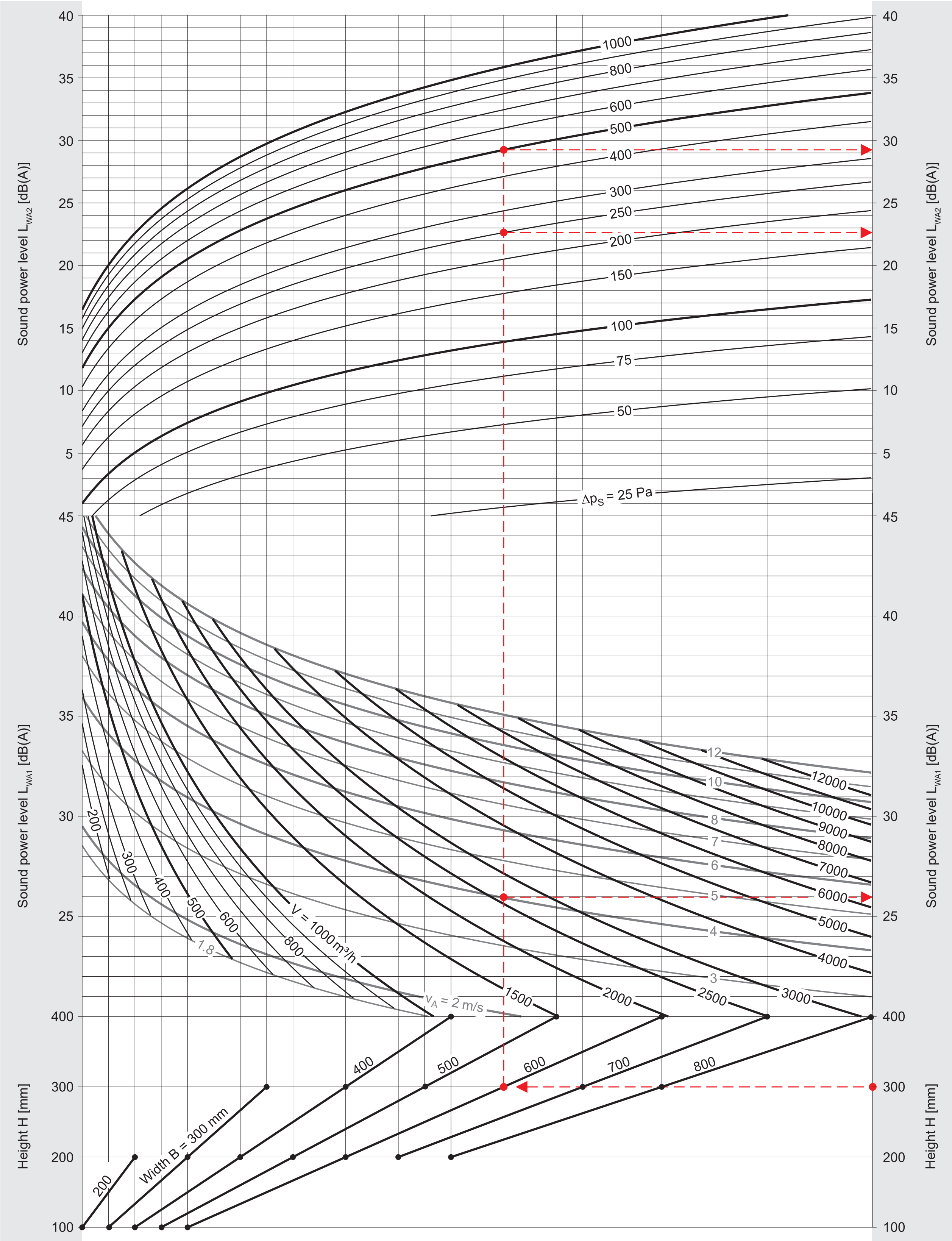
In the above nomogram, the sound power level inside the connecting duct is dimensioned as an overall level L_{WA}. Octave sound power levels $L_{W\text{-}Oct}$ for every size and any required operating point are obtained from the WILDEBOER dimensioning software.

⇒ see download at www.wildeboer.de

Nomenclature ⇒ see page 4
Examples ⇒ see page 10

VKE1 volume flow controller

Sound power level outside the connecting duct – radiated noise



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

⇒ see download at www.wildeboer.de

Nomenclature ⇒ see page 4

Examples ⇒ see page 10

VKE1 volume flow controller

Sound power level inside/outside the connecting duct – examples

Example ⇒ see page 8

Specified:	Width	B	=	600	mm
	Height	H	=	300	mm
	Volume flow	V	=	3240	m³/h
	Velocity	v_A	=	5.0	m/s
	Static pressure drop	Δp_S	=	100	Pa
Result:	Sound power level	L_{WA1}	=	35	dB(A)
		L_{WA2}	=	17	dB(A)
		$L_{WA} = L_{WA1} + L_{WA2}$	=	52	dB(A)

Example ⇒ see page 8

Specified:	Width	B	=	600	mm
	Height	H	=	300	mm
	Volume flow	V	=	3240	m³/h
	Velocity	v_A	=	5.0	m/s
	Static pressure drop	Δp_S	=	250	Pa
Result:	Sound power level	L_{WA1}	=	35	dB(A)
		L_{WA2}	=	27	dB(A)
		$L_{WA} = L_{WA1} + L_{WA2}$	=	62	dB(A)

- In the nomograms, the sound power level inside the connecting duct is calculated as an A-weighted overall level L_{WA}. Corresponding octave sound power levels $L_{W\text{-}Oct}$ are obtained from the Wildeboer dimensioning software for every size and all operating points; likewise for the design with additional SKB-V sound attenuators.
- With SKB-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 **sound power levels**! The values represent the sound energy introduced into the duct system. They should be applied for acoustic calculations, e.g. when adding sound attenuators.

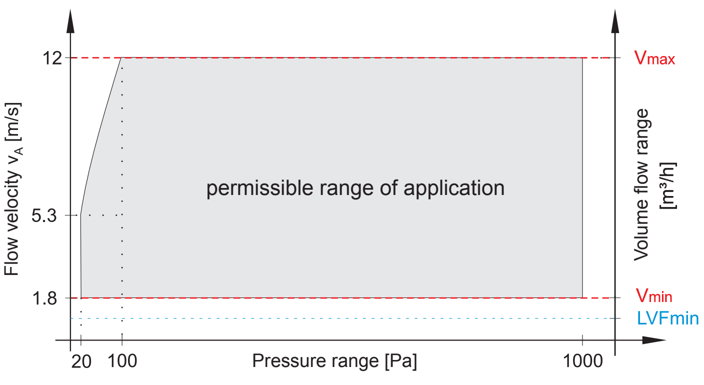
In other documents, **sound pressure levels** L_p or L_{pA} are **frequently specified** instead of sound power levels. They contain standardized attenuations of up to 21 dB. This distinction must be observed when comparing numeric values. Furthermore, the extent of these attenuations only becomes clear once the ducts, baffles, branches and spaces have actually been connected.

Example ⇒ see page 9

Specified:	Width	B	=	600	mm
	Height	H	=	300	mm
	Volume flow	V	=	2592	m³/h
	Velocity	v_A	=	4.0	m/s
	Static pressure drop	Δp_S	=	250	Pa
Result:	Sound power level [1)]	L_{WA1}	=	26	dB(A)
		L_{WA2}	=	23	dB(A)
		$L_{WA} = L_{WA1} + L_{WA2}$	=	49	dB(A)

Example ⇒ see page 9

Specified:	Width	B	=	600	mm
	Height	H	=	300	mm
	Volume flow	V	=	2592	m³/h
	Velocity	v_A	=	4.0	m/s
	Static pressure drop	Δp_S	=	500	Pa
Result:	Sound power level [1)]	L_{WA1}	=	26	dB(A)
		L_{WA2}	=	29	dB(A)
		$L_{WA} = L_{WA1} + L_{WA2}$	=	55	dB(A)



1) The average **sound pressure level in the room** with the following equipment is

- **14 dB less with acoustic insulation**
- **8 dB less without acoustic insulation**

than the sound power level L_{WA} specified in the nomograms.

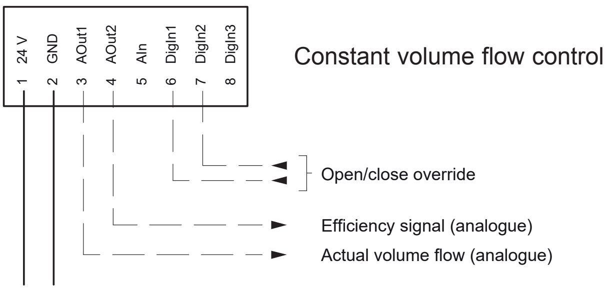
However, the sound attenuation of the acoustic insulation specified only applies if connected ventilation ducts are also insulated (isolated) accordingly.

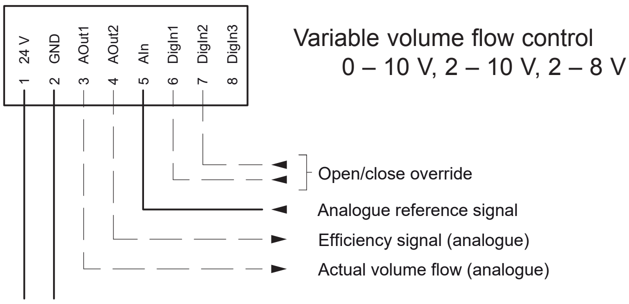
The sound pressure level can be further reduced by on site acoustic insulation measures (suspended ceilings, high room attenuation).

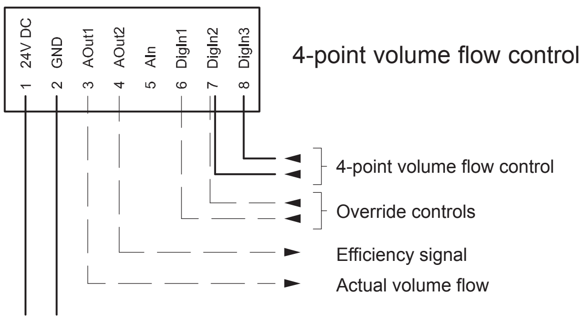
VKE1 volume flow controller

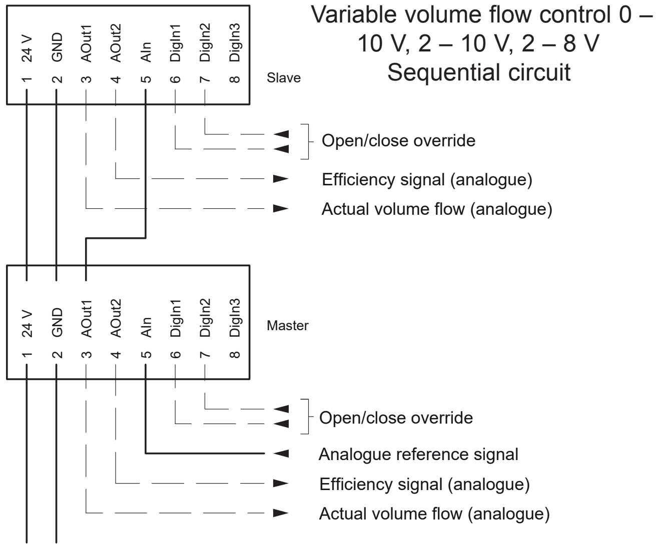
Electrical connections / terminal assignment

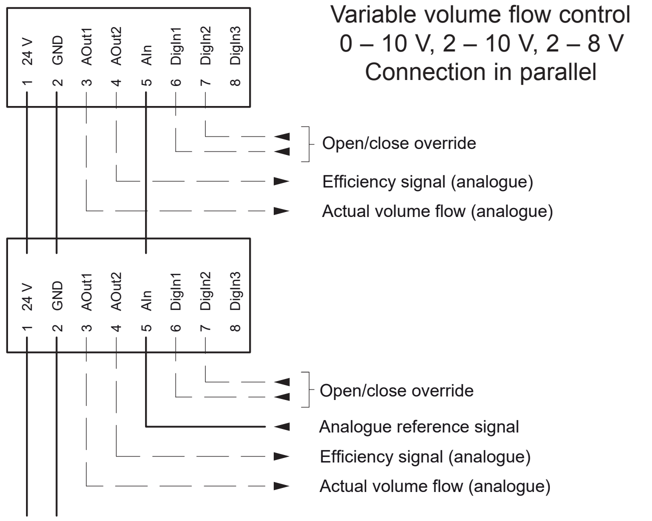
Electrical connections





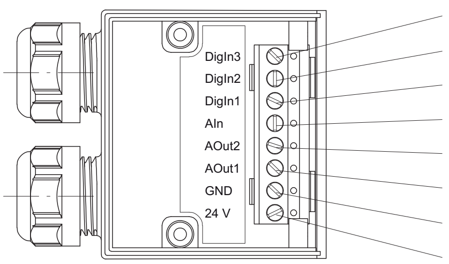






—— : Connections are absolutely required.
- - - : Connections are optional.

Terminal assignment of connection plug



8	**DigIn3**	→	Gate input 3, AC/DC		4-point volume flow control (Open/close) override
7	**DigIn2**	→	Gate input 2, AC/DC		
6	**DigIn1**	→	Gate input 1, AC/DC		
5	**AIn**	→	Analogue input 1, DC	→	Variable set point input
4	**AOut2**	→	Analogue output 2, DC	→	Efficiency signal
3	**AOut1**	→	Analogue output 1, DC	→	Actual volume flow
2	**GND**	→	-		24 V AC/DC supply voltage
1	**24 V**	→	+		

- Accuracy of analogue inputs and outputs: ±1% from end value
- All inputs and outputs are not electrically isolated.
- DigIn: 115 μA @ 24 V DC (HIGH > 19.1 V DC, LOW < 12.5 V DC)
  540 μA @ 24 V DC (HIGH > 13.8 V DC, LOW < 9.2 V DC)
- AIn: 50 μA @ 10 V DC (delay: up to 15 s)
- AOut: max.1 mA @ 10 V DC (load > 10 kΩ; short-circuit proof)

VKE1 volume flow controller

Installation instructions

- VKE1 volume flow controllers are designed for ventilation and air conditioning systems. Suitable air purity is a prerequisite for operation.
- VKE1 volume flow controllers are adjusted for the entire controllable volume flow range from V_{min} to V_{max} and achieve the specified control accuracy in this range. Larger deviations can occur with low volume flows, especially with small sizes.
- For the VKE1 volume flow controller to work efficiently, the flows must be extensively undisrupted. The straight inlet and outlet sections shown as examples must be adhered to as a minimum requirement downstream of flow disruption points (e.g. fire dampers, reductions, bends, branches); longer inlet sections may be required where several disruption points occur consecutively. Otherwise significant nonconformities must be anticipated.
- The current position of the damper blade is indicated from the outside by a groove in the axis of the damper blade (non-drive side).
- VKE1 volume flow controllers and SKB-V sound attenuators are delivered individually. They are assembled on site; in doing so always align the gap in the splitter at a right angle to the controller axis.
- VKE1 volume flow controllers are opened to a damper blade position of roughly 45° at the factory and are supplied with a standard setting or customer-specific presetting. ⇒ see page 14.
  Changes can be made on site at the:
  - Volume flow controller with the actuator M1 with the adjustment buttons and plain text display in the illuminated display.
  - PC with software supplied via the RS232 interface.

  Can be reset to the delivery condition.
- Once installed in the circular ventilation duct, the VKE1 volume flow controller identifies its installation position automatically and optimises its control accuracy accordingly. If the installation is subsequently changed, this optimisation can be carried out once again by switching the power supply off and back on.
  If no system operating pressure is present, the device is opened to a minimum damper blade setting angle which depends on the set point. Once the necessary minimum pressure loss or volume flow has been detected, the VKE1 volume flow controller goes into operation.
  ⇒ for limitations see pages 8 and 9
- To ensure lasting functionality and leak tightness, the devices must be installed in ventilation ducts free of tension. The assembly instructions are enclosed with the VKE1 volume flow controllers.
- The actuator is overload-proof. In the event of a power failure, it remains in the current position. The settings are retained.
- Cables should be routed separately to power and control lines, or be a sufficient distance from them. Whenever possible, they should have a radial form and be routed over the shortest possible distance to avoid loops.
- The signal inputs and outputs of the VKE1 volume flow controllers are not potential-free. The local potential relationships must be checked. Measures to prevent corrupting or harmful equalising currents may be required.
- Double controller: If the duct cross-section is larger than the available controller size, two or more VKE1 volume flow controllers can be installed in parallel. The volume flow must be distributed so that each controller is designed for the same flow velocity. Suitable metal plates for connecting the flange and compensating for differences in length must be provided on site. Sound power levels must be added up.

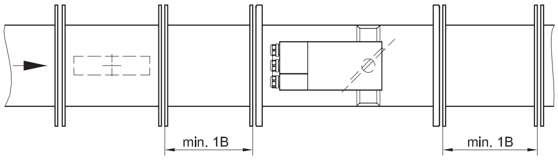


Figure 1: Installation downstream of disruption point, e.g. fire damper

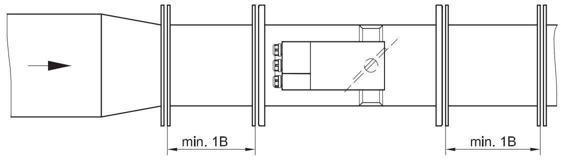


Figure 2: Installation downstream of disruption point, e.g. reduction

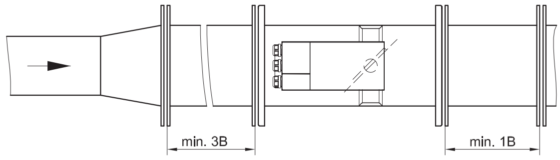


Figure 3: Installation downstream of disruption point, e.g. widenings

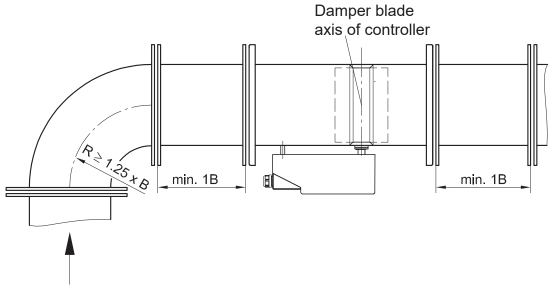


Figure 4: Installation downstream of disruption point, e.g. bend

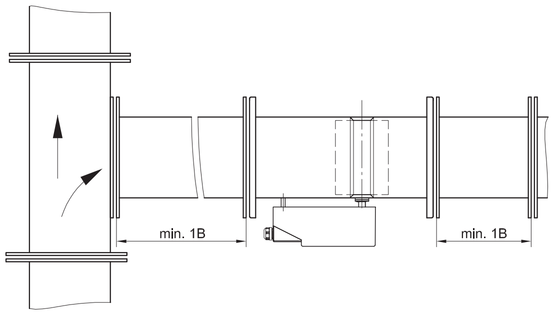


Figure 5: Installation downstream of disruption point, e.g. T-pieces

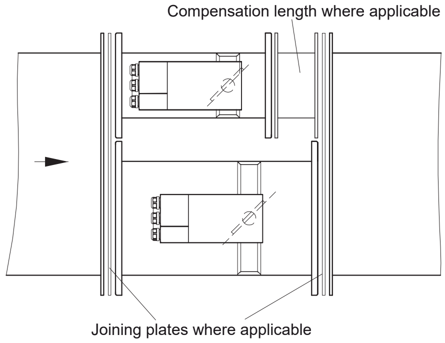


Figure 6: Installation in double arrangement

VKE1 volume flow controller

Order data

VKE1 ___ - ___ - ___ - ___ - ___ - ___

Size

B x H

⇒ see pages 2 and 3

Drives

- 24 V AC/DC actuator - standard - **M1**
  ⇒ see pages 2 to 4
- 24 V AC/DC actuator
  M2 without display, LEDs and adjustment buttons. Settings of PC with RS232 interface.

Option: Acoustic insulation

with acoustic insulation **DS**

⇒ see pages 2 and 3

Option: Presets[1)]

- **Operation mode**
  - Constant **KO**
  - 4-point **4P**
  - Variable, 0 V – 10 V - standard - **01**
  - Variable, < 2 V, 2 V – 10 V **21**
  - Variable, < 2 V, 2 V – 8 V, > 8 V **28**

- **Reference volume flow** in [m³/h]
  - **Constant reference volume flow** **OVFconst =**
    Standard: 45% V_{max} for operation mode KO
  - **Minimum reference volume flow** **OVFmin =**
    Standard: 30% V_{max} for operation mode 4P, 01, 21, 28
  - **1st average reference volume flow** **OVFmid1 =**
    Standard: 45% V_{max} for operation mode 4P
  - **2nd average reference volume flow** **OVFmid2 =**
    Standard: 60% V_{max} for operation mode 4P
  - **Maximum reference volume flow** **OVFmax =**
    Standard: 75% V_{max} for operation mode 4P, 01, 21, 28

⇒ see page 4

Entries depend on operation mode!

Observe the following limit values for this in

Operation mode	
Constant:	V_{min} ≤ **OVFconst** ≤ V_{max}
Variable:	0 m³/h or 0.5 • V_{min} ≤ **OVFmin** < **OVFmax** and 30% V_{max} ≤ **OVFmax** ≤ V_{max}
4-point:	V_{min} ≤ **OVFmin** < **OVFmid1** < **OVFmid2** < **OVFmax** ≤ V_{max}

With sound attenuator

- from height 200 mm; attachment on site -

SKB-V	with glass fibre
SKB-V-L	with glass fibre + perforated sheet metal

⇒ For technical implementation, also see user manual 6.2: SB splitters and SKB sound attenuators

1) Controllers are preset as "standard" at the factory. Customer-specific settings for the operation mode and reference volume flow are possible as **factory pre-settings**.

Download from www.wildeboer.de:

- PC software for making on site changes to the pre-settings
- Hygiene certificate
- Hygiene instructions for disinfection

VKE1 volume flow controller

Specification text

Maintenance-free, electronic volume flow controller for variable and constant volume flows. Square design for installation in circular ventilation ducts for supply and exhaust air ventilation and air conditioning systems. Duct casing and centrally supported damper blade made of galvanised sheet steel, stainless steel bearing shafts in special bearing bushes. With seals on the damper blade to shut off the circular ventilation duct.

Measuring device integrated into the damper blade. High degree of control accuracy in a volume flow range of at least 1:6. The volume flow must be kept constant at variable pressures between 20 and 1000 Pa with a maximum deviation of ±5% to ±15%.

Maintenance-free 24 V actuator with integrated electrical connection and strain relief. Constant, Variable or 4-point operation modes can be set via illuminated display with plain text display or **using software via an RS232 interface. LED status displays for indication of controller operation statuses. Adjustable operation modes 0 - 10 V, 2 - 10 V and 2 - 8 V for variable operation. Higher-level override for opening and closing the damper blade. Analogue output signals for the actual volume flow and for efficiency in order to optimise the fan output. Equipment for parallel and sequential operation of several volume flow controllers.**

Leak tightness class C for the casing and leak tightness class 3 or 4 for the damper blade, each according to DIN EN 1751. Certificate of conformity as proof of compliance with the hygiene requirements in accordance with VDI 6022-1, VDI 3803-1, DIN 1946-4, DIN EN 13779, SWKI VA104-01, SWKI 99-3, ÖNORM H6020 and ÖNORM H6021. With Environmental Product Declaration certificate as per ISO 14025 and EN 15804.

With acoustic insulation.

.... **units**

Volume flow: **from** .... **m³/h**
to .... **m³/h**

Pressure drop: .... **Pa**

Maximum sound power level

Flow noise .... **dB(A)**
including SKB-V sound attenuator

Radiated noise .... **dB(A)**

Manufacturer: **WILDEBOER®**

Type: **VKE1**

Width: ....

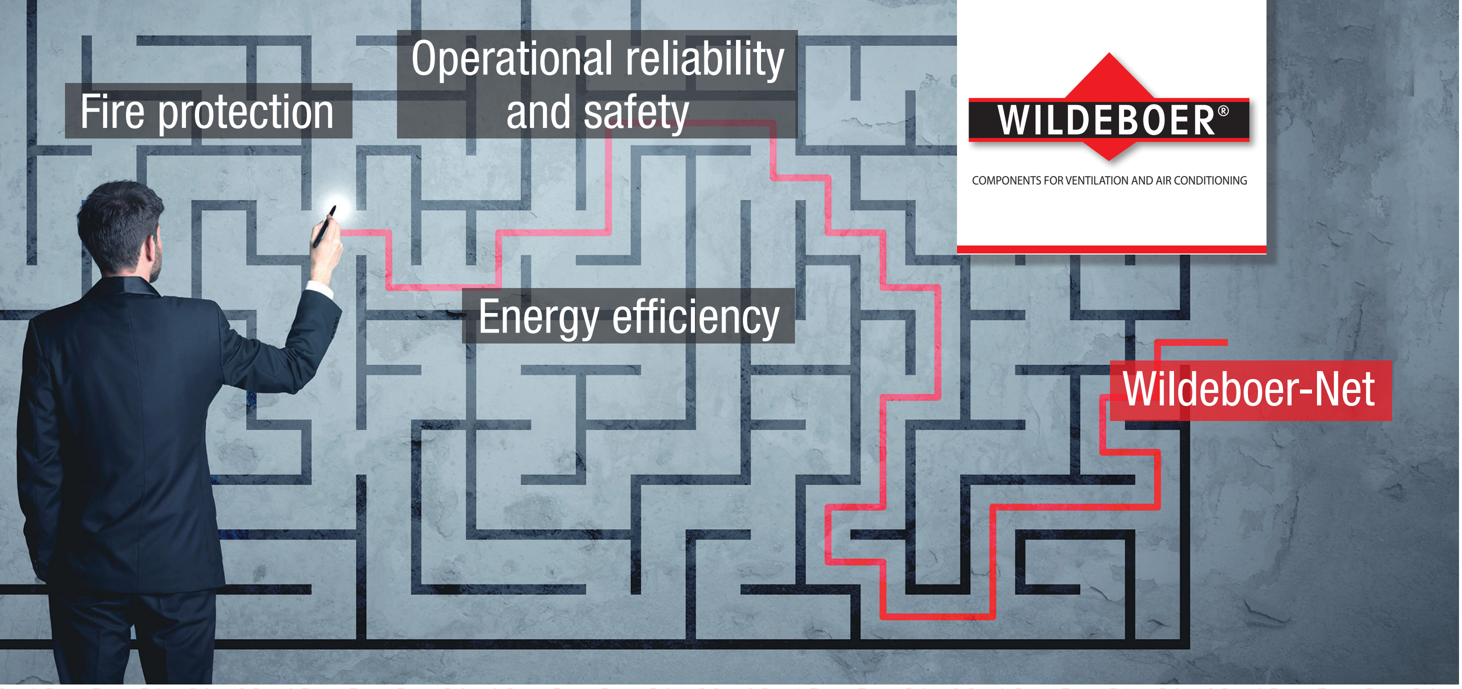
Height: ....

Complete with attachments **deliver:** ....
install: ....

.... **units sound attenuator SKB-V -** L

deliver: ....
install: ....

Select texts not highlighted in bold as required!



Communication system Wildeboer-Net

BS2-VR-01 volume flow and pressure controller module

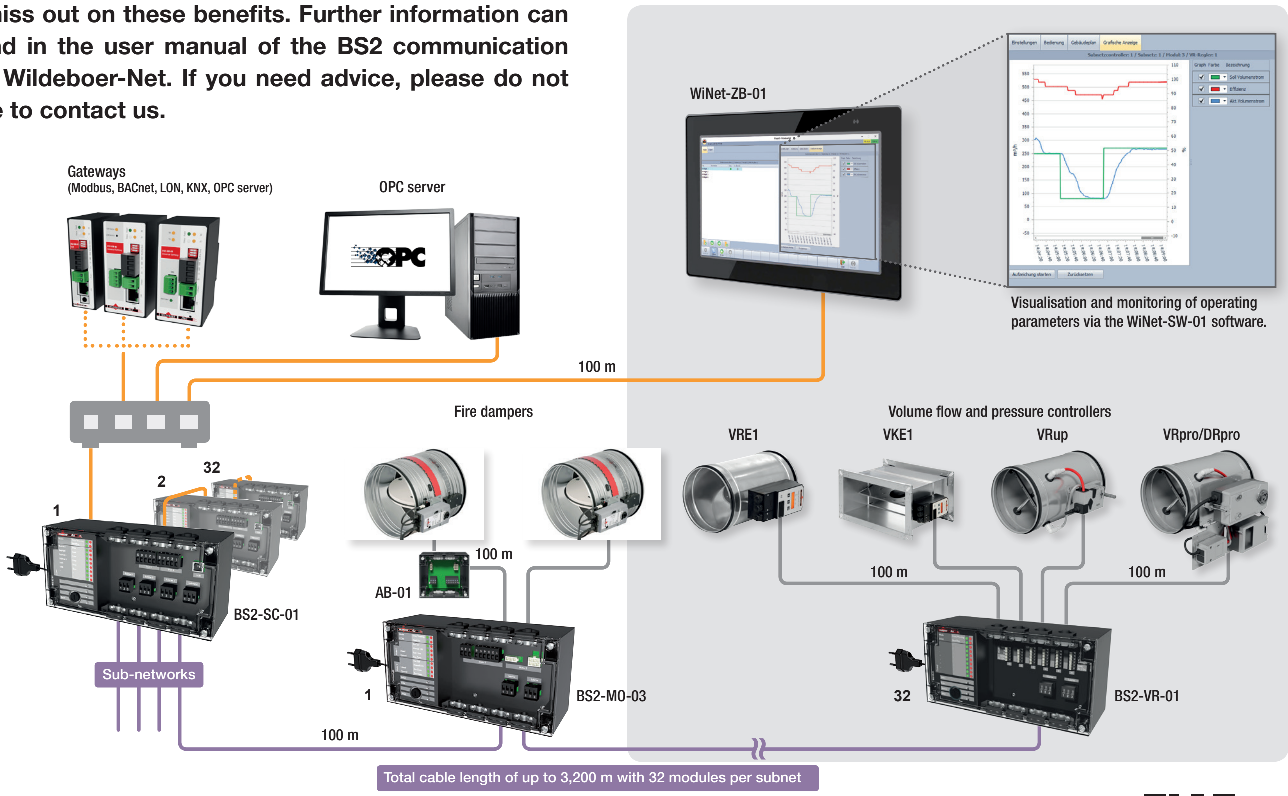
Network your fire protection and air distribution and significantly minimise the cost of planning, installation and function testing of fire dampers. The communication system Wildeboer-Net lays all the groundwork for you.

The BS2-VR-01 volume flow and pressure controller module extends the scope of functions to include new options for automatic control of the volumetric flow rates. Control takes place in accordance with thermal and material loads or to adjust the volume flows in accordance with time.

Additional protection against cold smoke transfer in accordance with VDI Guideline 6010 by closing existing electronic volume flow and pressure controllers via programmable tripping groups.

Energy saving by reducing the mean outdoor air volume flow rate using requirement-based air volume flow rate control via parametrised calendar and sequence controls.

Don't miss out on these benefits. Further information can be found in the user manual of the BS2 communication system Wildeboer-Net. If you need advice, please do not hesitate to contact us.



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Watch explanatory video
on YouTube
wildeboer.de/youtube