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Ref. no.: 233

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# Volume flow controller

**Constant volume flow controller, model VRK - circular, self-regulating  
with tight push-fit ends or screwless flange-system  
spigot ends calibrated according to DIN 24147 part 1  
laser-welded housing**



- AS The sealing system works via a rolling rubber ring seal.
- AS Assembly without screws or rivets when installed horizontally.
- AS Considerably lowers the costs of assembly and installation.



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# Constant volume flow controller model VRK - circular, self-regulating

The AES volume flow controller VRK is an independent control element which works without an external power supply. It can be regarded as a self-actuating duct damper, as it delivers a required volume of air regardless of changes in system pressure. In consequence, the controller overcomes the need for system balancing and ensures constant air flow in service.

Variable air volume models are available with electric and pneumatic actuators.

**Operating principle:** The volume flow controller works with a free-moving control plate, supported by PTFE bearings and connected to an adjustment spring. Aerodynamic forces balance the force of the spring and push the blade to a defined position that finally controls the set volume flow.

**Pressure, accuracy and scope of use:** The controller operates reliably from a minimum pressure difference, which depends on the air velocity (see diagram 1), to a maximum pressure difference of 1000 Pa. The flow rate variation is usually within a tolerance of  $\pm 10\%$  (up to 100 m<sup>3</sup>/h:  $\pm 10$ m<sup>3</sup>/h). If the air velocity is below 4 m/s or the controller is installed horizontally, variations may well be higher than indicated. This will apply also if the air flow profile is not uniform or is distorted by bends, sharp edges or bottlenecks. Furthermore, the recommended air velocity is around 4.5 m/s and should not be below 2.7 m/s.

**Temperature:** The controller operates within a temperature range from  $-30^{\circ}\text{C}$  to  $100^{\circ}\text{C}$ . A special, heat-resistant version for temperatures up to  $250^{\circ}\text{C}$  (briefly even  $300^{\circ}\text{C}$ ) is available on request. For volume flow controllers with electric or pneumatic actuators, the operating temperatures of the actuators also have to be considered.

**Construction:** The housing of the controller is made from galvanized and laser-welded metal sheet without any intruding fold. The smooth surface of the housing enables the inclusion of shaped and calibrated spigot ends with rolling rubber ring seals. This sealing system is patented and offers many advantages, such as tightness, ease of installation and removal, and hence reduced installation costs.

Additionally and on request, the controller is available with a new flange connection without screws. This connection allows easy maintenance and modification by removing the controller sideways without dismantling the whole ductwork. The control plate of the controller is supported by PTFE bearings and equipped with an attenuator to prevent any oscillation of the plate.

The controller is also available in stainless steel or with a PUR coating in all RAL colours on request.

**Installation and adjustment:** The controller can be used for supply and extract ducts in high or low pressure air systems. Either vertical or horizontal installation is possible thanks to the exactly balanced control plate.

All controllers can be adjusted to the required flow rate in the factory. The controller with the manual adjustment device can easily be set or reset by the customer himself. Any given throughput within the respective operating range of the controller can be chosen.

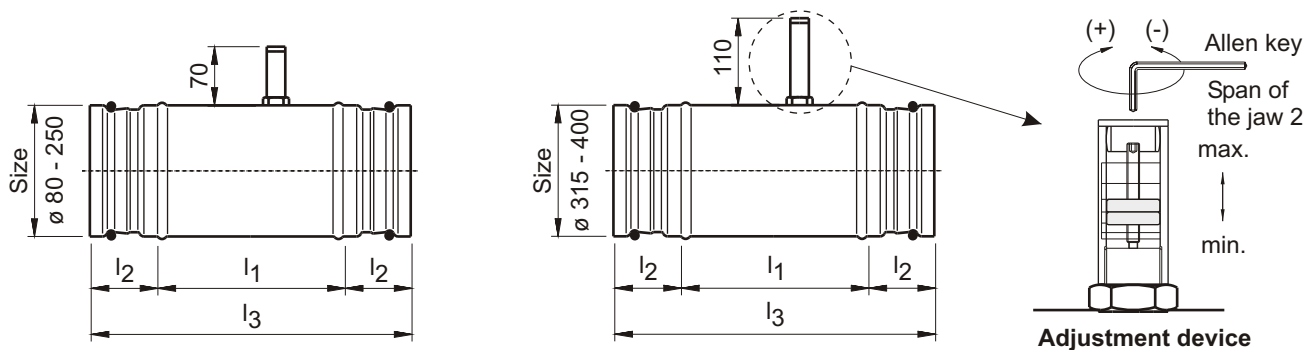
**Insulation:** On request, the controller is available with insulation in depths of 25 or 50 mm to reduce noise or heat transfer.



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# Constant volume flow controller model VRK - circular, self-regulating

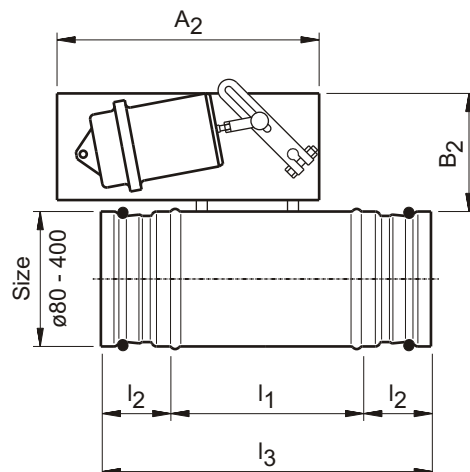


## Version 1:

- mechanical, no external power supply
- push-fit ends with rolling rubber ring seals
- flow rate factory preset and manually adjustable by the customer
- on request: flow rate only factory preset, without manual adjustment device
- $l_1$  = installation length                      **total length =  $l_1 + 2 * l_2 = l_3$**

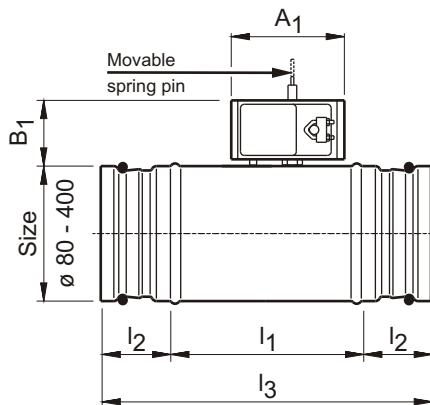
## Version 2:

- similar to version 1, but factory preset with variable control via pneumatic adjustment actuator, control pressure between 0.2 and 1.0 bar (max. pressure 1.3 bar)
- **motor type:** **LTG SMA 1** or equivalent for size **NW  $\varnothing$  80 - 250 mm**  
**ROX** or equivalent for size **NW  $\varnothing$  315 - 400 mm**



## Version 3:

- like version 2, factory preset with a 2 set-points control via an electric adjustment actuator for an operating voltage of 230 volts, 50 Hz; only 2 set points without intermediate positions; triggering via switch contacts
- **motor type:** **Belimo LM 230** or equivalent for size **NW  $\varnothing$  80 - 315 mm**  
**Belimo NM 230** or equivalent for size **NW  $\varnothing$  400 mm**



## Version 4:

- like version 3, but with additional auxiliary switch to trigger an additional switching command
- **motor type:** **Belimo LM 230 S** or equivalent for size **NW  $\varnothing$  80 - 315 mm**  
**Belimo NM 230 mit Sn1** or equivalent for size **NW  $\varnothing$  400 mm**



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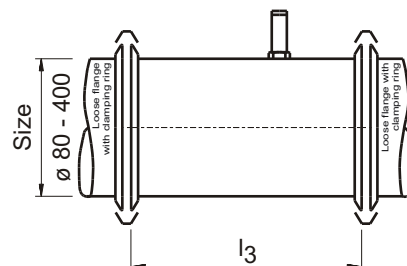
# Constant volume flow controller model VRK - circular, self-regulating

## Version 5:

- like version 3, but with an operating voltage of 24 volts, 50 Hz
- motor type: **Belimo LM 24** or equivalent for size **NW ø 80 - 315 mm**  
**Belimo NM 24** or equivalent for size **NW ø 400 mm**

## Version 6:

- like version 3, but with a variable control via an electric adjustment actuator for an operating voltage of 24 volts, 50Hz, with proportional control via unit signal 0 to 10 volt DC
- motor type: **Belimo LM 24 SR** or equivalent for size **NW ø 80 - 315 mm**  
**Belimo NM 24 SR** or equivalent for size **NW ø 400 mm**



## Design variant: flange ends

- All controllers version 1 – 6 are also available with new flange ends for fast and economical installation without screws (compared to traditional flange connection with screws).
- For installation, additional loose flanges and clamping rings are needed. These flanges have push-fit ends with rolling rubber ring seals and can be installed without any additional sealing or fastening.

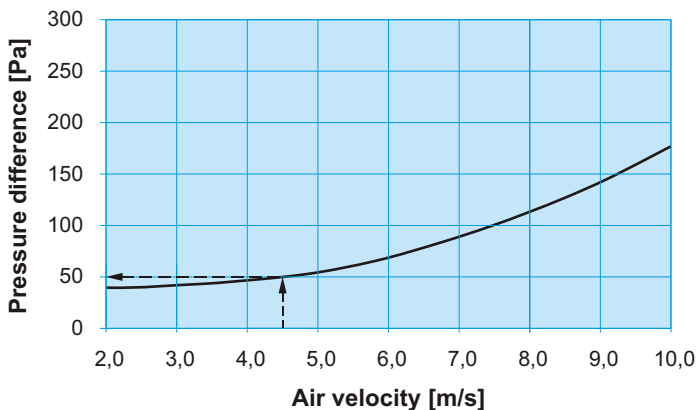
## Air flow rate

- The air flow rate for the controllers in versions 2 – 6 can be adjusted in the ratio of 1 to 3.

## Minimum pressure difference

- A minimum pressure difference at the controller is needed for the correct service of the controller (see diagram no. 1)

Diagram 1: Minimum static pressure difference at the controller



### Example:

Controller: Type 233  
Diameter: Size 160  
Air velocity: 4,5 m/s  
Airflow: 325 m<sup>3</sup>/h

Sought: minimum static pressure difference in Pa:  
 $\Delta p$  [Pa] see diagram 1: 50 Pa

## Dimensions and aerodynamics

| Size<br>[mm] | Volume flow<br>[m <sup>3</sup> /h] |      | Dimensions<br>[mm] |                |                |                |                |                |                |
|--------------|------------------------------------|------|--------------------|----------------|----------------|----------------|----------------|----------------|----------------|
|              | min.                               | max. | l <sub>1</sub>     | l <sub>2</sub> | l <sub>3</sub> | A <sub>1</sub> | B <sub>1</sub> | A <sub>2</sub> | B <sub>2</sub> |
| 80           | 40                                 | 125  | 120                | 40             | 200            | 155            | 105            | 225            | 100            |
| 100          | 70                                 | 220  | 170                | 40             | 250            | 155            | 105            | 255            | 100            |
| 125          | 100                                | 280  | 170                | 40             | 250            | 155            | 105            | 225            | 100            |
| 140          | 150                                | 400  | 170                | 40             | 250            | 155            | 105            | 225            | 100            |
| 160          | 180                                | 500  | 240                | 40             | 320            | 155            | 105            | 225            | 100            |
| 200          | 250                                | 900  | 240                | 40             | 320            | 155            | 105            | 225            | 100            |
| 250          | 500                                | 1500 | 240                | 40             | 320            | 155            | 105            | 225            | 100            |
| 315          | 800                                | 2800 | 220                | 60             | 350            | 155            | 105            | 300            | 150            |
| 400          | 1000                               | 4000 | 295                | 60             | 420            | 230            | 160            | 300            | 150            |

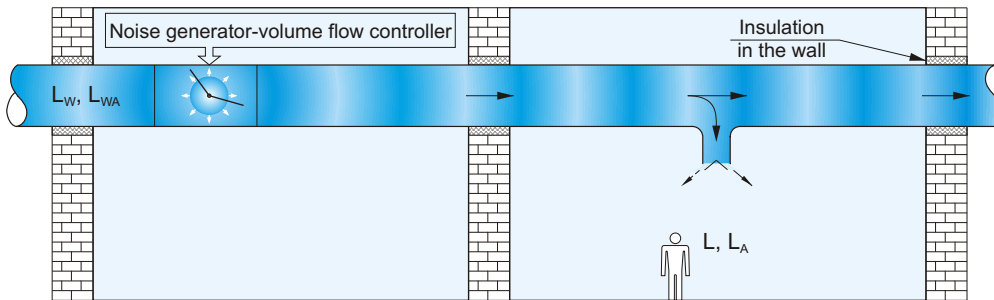


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# Constant volume flow controller model VRK - circular, self-regulating

## Flow noise and calculation of acoustic pressure



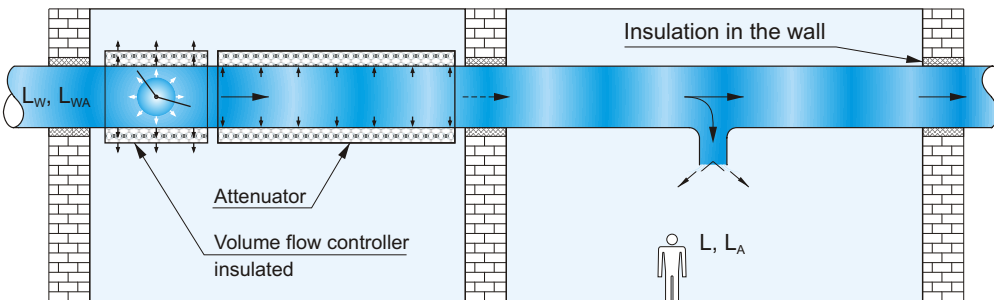
**Example 1:** Calculation of noise-generated by air flow (no attenuator)

| $f_m$                                | Sound level [dB/octave] |        |        |        |         |         |         |         | Summation<br>A-weighted dB (A) |
|--------------------------------------|-------------------------|--------|--------|--------|---------|---------|---------|---------|--------------------------------|
|                                      | 63 Hz                   | 125 Hz | 250 Hz | 500 Hz | 1000 Hz | 2000 Hz | 4000 Hz | 8000 Hz |                                |
| Flow noise $L_w$ acc. to table 1     | 53                      | 51     | 47     | 44     | 43      | 42      | 36      | 34      | 48                             |
| Reflection attenuation               | -21                     | -16    | -10    | -4     | -2      | 0       | 0       | 0       | -                              |
| Room attenuation                     | -4                      | -4     | -4     | -4     | -4      | -4      | -4      | -4      | -                              |
| A-weighting                          | -26                     | -16    | -9     | -3     | 0       | +1      | +1      | -1      | -                              |
| Corrected sound pressure level $L_A$ | 2                       | 15     | 24     | 33     | 37      | 39      | 33      | 29      | 42                             |

**Example:**

Acoustic pressure: 42 dB (A)  
 Model VRK: Type 233  
 Given: Size 140 mm  
 Air flow: 270 m<sup>3</sup>/h  
 Pressure difference: 100 Pa

**Result = 42 dB (A), o.k.**



**Example 2:** Calculation of noise-generated by air flow with attenuator

| $f_m$                                | Sound level [dB/octave] |        |        |        |         |         |         |         | Summation<br>A-weighted dB (A) |
|--------------------------------------|-------------------------|--------|--------|--------|---------|---------|---------|---------|--------------------------------|
|                                      | 63 Hz                   | 125 Hz | 250 Hz | 500 Hz | 1000 Hz | 2000 Hz | 4000 Hz | 8000 Hz |                                |
| Flow noise $L_w$ acc. to table 1     | 62                      | 60     | 56     | 53     | 51      | 51      | 44      | 43      | 57                             |
| Attenuation by silencer              | -1                      | -2     | -5     | -10    | -25     | -34     | -17     | -12     | -                              |
| Reflection attenuation               | -20                     | -14    | -9     | -3     | -1      | 0       | 0       | 0       | -                              |
| Room attenuation                     | -4                      | -4     | -4     | -4     | -4      | -4      | -4      | -4      | -                              |
| A-weighting                          | -26                     | -16    | -9     | -3     | 0       | +1      | +1      | -1      | -                              |
| Corrected sound pressure level $L_A$ | 11                      | 24     | 29     | 33     | 21      | 14      | 24      | 26      | 35                             |

**Example:**

Acoustic pressure: 38 dB (A)  
 Model VRK: Type 233  
 Given: Size 160 mm  
 Air flow: 340 m<sup>3</sup>/h  
 Pressure difference: 250 Pa  
 Attenuator: 160 / 200 x 1000 mm

**Result of calculation = 35 dB (A), o.k.**



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Table 1: Air flow noise generated by the controller

| Size [mm] | Volume flow [m <sup>3</sup> /h] | Static pressure difference at the controller [Pa] |        |         |         |         |         |  |       |                            |        |        |         |         |         |         |  |                            |        |        |        |         |         |         |         |  |    |    |  |
|-----------|---------------------------------|---|--------|---------|---------|---------|---------|--|-------|----------------------------|--------|--------|---------|---------|---------|---------|--|----------------------------|--------|--------|--------|---------|---------|---------|---------|--|----|----|--|
|           |                                 | 100 Pa  |        |         |         |         |         |  |       | 250 Pa                     |        |        |         |         |         |         |  | 500 Pa                     |        |        |        |         |         |         |         |  |    |    |  |
|           |                                 | Octave power level*                               |        |         |         |         |         |  |       | Octave power level*        |        |        |         |         |         |         |  | Octave power level*        |        |        |        |         |         |         |         |  |    |    |  |
|           |                                 | L <sub>w</sub> [dB/octave]                        |        |         |         |         |         |  |       | L <sub>w</sub> [dB/octave] |        |        |         |         |         |         |  | L <sub>w</sub> [dB/octave] |        |        |        |         |         |         |         |  |    |    |  |
| 63 Hz     | 125 Hz                          | 250 Hz  | 500 Hz | 1000 Hz | 2000 Hz | 4000 Hz | 8000 Hz | Summation<br>L <sub>w sum A-weighted</sub> dB(A) | 63 Hz | 125 Hz                     | 250 Hz | 500 Hz | 1000 Hz | 2000 Hz | 4000 Hz | 8000 Hz | Summation<br>L <sub>w sum A-weighted</sub> dB(A) | 63 Hz                      | 125 Hz | 250 Hz | 500 Hz | 1000 Hz | 2000 Hz | 4000 Hz | 8000 Hz | Summation<br>L <sub>w sum A-weighted</sub> dB(A) |    |    |  |
| 80        | 40                              | 37  | 37     | 35      | 33      | 33      | 28      | 27   | 38    | 39                         | 42     | 43     | 44      | 44      | 46      | 41      | 41   | 50                         | 46     | 49     | 49     | 50      | 51      | 53      | 48      | 48   | 57 |    |  |
|           | 82                              | 49  | 47     | 44      | 41      | 39      | 39      | 33   | 32    | 45                         | 51     | 51     | 50      | 49      | 48      | 49      | 44   | 44                         | 54     | 58     | 58     | 56      | 55      | 55      | 56      | 51   | 51 | 61 |  |
|           | 125                             | 52  | 51     | 48      | 45      | 44      | 44      | 38   | 37    | 49                         | 61     | 60     | 57      | 54      | 53      | 53      | 47   | 46                         | 58     | 68     | 66     | 63      | 61      | 59      | 59      | 53   | 52 | 65 |  |
| 100       | 70                              | 40  | 39     | 38      | 36      | 35      | 36      | 30   | 29    | 41                         | 43     | 45     | 46      | 46      | 47      | 49      | 44   | 43                         | 53     | 49     | 52     | 52      | 53      | 54      | 55      | 50   | 50 | 60 |  |
|           | 135                             | 50  | 48     | 45      | 42      | 41      | 40      | 34   | 33    | 46                         | 59     | 57     | 54      | 51      | 50      | 49      | 43   | 42                         | 55     | 60     | 60     | 58      | 57      | 57      | 58      | 53   | 52 | 63 |  |
|           | 200                             | 54  | 52     | 49      | 47      | 45      | 45      | 39   | 38    | 51                         | 63     | 61     | 58      | 55      | 54      | 54      | 48   | 47                         | 59     | 70     | 68     | 65      | 62      | 61      | 60      | 54   | 53 | 66 |  |
| 125       | 100                             | 41  | 40     | 38      | 36      | 35      | 36      | 30   | 29    | 41                         | 45     | 47     | 47      | 48      | 48      | 49      | 44   | 43                         | 54     | 52     | 54     | 54      | 54      | 55      | 56      | 50   | 49 | 60 |  |
|           | 190                             | 51  | 49     | 46      | 42      | 41      | 40      | 34   | 32    | 46                         | 55     | 54     | 53      | 51      | 51      | 51      | 46   | 45                         | 56     | 61     | 61     | 59      | 58      | 57      | 58      | 52   | 52 | 63 |  |
|           | 280                             | 54  | 53     | 50      | 47      | 45      | 45      | 39   | 37    | 50                         | 63     | 61     | 58      | 55      | 54      | 53      | 47   | 46                         | 59     | 64     | 64     | 62      | 61      | 61      | 62      | 57   | 56 | 67 |  |
| 140       | 140                             | 43  | 42     | 40      | 38      | 37      | 37      | 31   | 30    | 42                         | 47     | 49     | 49      | 49      | 50      | 51      | 46   | 45                         | 55     | 53     | 56     | 56      | 56      | 56      | 58      | 52   | 51 | 62 |  |
|           | 270                             | 53  | 51     | 47      | 44      | 43      | 42      | 36   | 34    | 48                         | 61     | 59     | 56      | 53      | 51      | 51      | 44   | 43                         | 57     | 63     | 63     | 61      | 60      | 59      | 60      | 54   | 54 | 65 |  |
|           | 400                             | 56  | 55     | 52      | 49      | 47      | 47      | 41   | 39    | 52                         | 65     | 63     | 60      | 57      | 56      | 55      | 49   | 48                         | 61     | 72     | 70     | 67      | 64      | 62      | 62      | 56   | 55 | 68 |  |
| 160       | 180                             | 44  | 43     | 41      | 39      | 38      | 38      | 32   | 31    | 43                         | 48     | 50     | 50      | 50      | 51      | 46      | 45   | 56                         | 55     | 57     | 57     | 57      | 57      | 57      | 58      | 53   | 51 | 63 |  |
|           | 340                             | 53  | 51     | 48      | 44      | 43      | 42      | 36   | 34    | 48                         | 62     | 60     | 56      | 53      | 51      | 51      | 44   | 43                         | 57     | 64     | 64     | 62      | 60      | 60      | 60      | 55   | 54 | 65 |  |
|           | 500                             | 57  | 55     | 52      | 49      | 47      | 47      | 40   | 39    | 52                         | 66     | 64     | 61      | 58      | 56      | 55      | 49   | 48                         | 61     | 72     | 70     | 67      | 64      | 62      | 62      | 56   | 54 | 68 |  |
| 200       | 250                             | 45  | 43     | 41      | 39      | 38      | 37      | 31   | 30    | 43                         | 51     | 52     | 52      | 51      | 51      | 51      | 45   | 44                         | 56     | 57     | 59     | 58      | 58      | 57      | 58      | 52   | 50 | 63 |  |
|           | 575                             | 55  | 53     | 50      | 46      | 44      | 44      | 37   | 36    | 50                         | 64     | 62     | 58      | 55      | 53      | 53      | 46   | 45                         | 59     | 66     | 66     | 64      | 62      | 62      | 62      | 56   | 56 | 67 |  |
|           | 900                             | -   | -      | -       | -       | -       | -       | -  | -     | -                          | 68     | 66     | 63      | 60      | 58      | 58      | 52   | 50                         | 64     | 75     | 73     | 70      | 67      | 65      | 65      | 58   | 57 | 70 |  |
| 250       | 500                             | 48  | 47     | 45      | 43      | 41      | 41      | 35   | 34    | 47                         | 54     | 56     | 55      | 54      | 55      | 49      | 48   | 60                         | 61     | 62     | 62     | 61      | 61      | 62      | 56      | 54   | 66 |    |  |
|           | 1000                            | 57  | 55     | 52      | 49      | 47      | 46      | 39   | 38    | 52                         | 66     | 64     | 61      | 57      | 55      | 55      | 48   | 47                         | 61     | 69     | 68     | 67      | 65      | 64      | 64      | 59   | 58 | 69 |  |
|           | 1500                            | -   | -      | -       | -       | -       | -       | -  | -     | -                          | 70     | 68     | 65      | 62      | 60      | 60      | 53   | 52                         | 65     | 77     | 75     | 72      | 68      | 67      | 66      | 60   | 58 | 72 |  |
| 315       | 600                             | 48  | 46     | 44      | 41      | 39      | 39      | 32   | 31    | 44                         | 55     | 56     | 55      | 54      | 53      | 53      | 46   | 44                         | 58     | 62     | 63     | 62      | 61      | 60      | 59      | 53   | 51 | 65 |  |
|           | 1400                            | 57  | 55     | 52      | 48      | 46      | 45      | 39   | 37    | 51                         | 66     | 64     | 60      | 57      | 55      | 54      | 47   | 46                         | 60     | 70     | 69     | 67      | 65      | 64      | 64      | 58   | 57 | 69 |  |
|           | 2200                            | -   | -      | -       | -       | -       | -       | -  | -     | -                          | 71     | 69     | 65      | 62      | 60      | 59      | 53   | 51                         | 65     | 77     | 75     | 72      | 69      | 67      | 66      | 60   | 58 | 72 |  |
| 400       | 1000                            | 50  | 48     | 45      | 42      | 41      | 40      | 33   | 31    | 46                         | 58     | 59     | 57      | 56      | 55      | 54      | 47   | 45                         | 59     | 65     | 65     | 64      | 62      | 61      | 61      | 54   | 51 | 66 |  |
|           | 2200                            | 58  | 56     | 52      | 49      | 47      | 46      | 39   | 37    | 52                         | 67     | 65     | 61      | 57      | 55      | 54      | 48   | 46                         | 61     | 72     | 71     | 68      | 66      | 65      | 65      | 59   | 57 | 70 |  |
|           | 3800                            | -   | -      | -       | -       | -       | -       | -  | -     | -                          | 73     | 71     | 67      | 64      | 62      | 61      | 55   | 53                         | 67     | 79     | 77     | 74      | 70      | 68      | 68      | 61   | 60 | 74 |  |

\* sound level in dB/octave in relation to 10<sup>-12</sup> W

If air is blown into a room, additional attenuation will occur as a result of the pipe outlet attenuation and room attenuation, thereby resulting in a reduction in the sound level. The room and outlet attenuation can be calculated according to VDI 2081. As a rough estimate, about 8 dB can be deducted.

The flow noise is heavily dependent on the local conditions, the radiating pipe length behind the sound absorber and the acoustic insulation and therefore the given data, calculated in the laboratory, can provide only a reference figure.

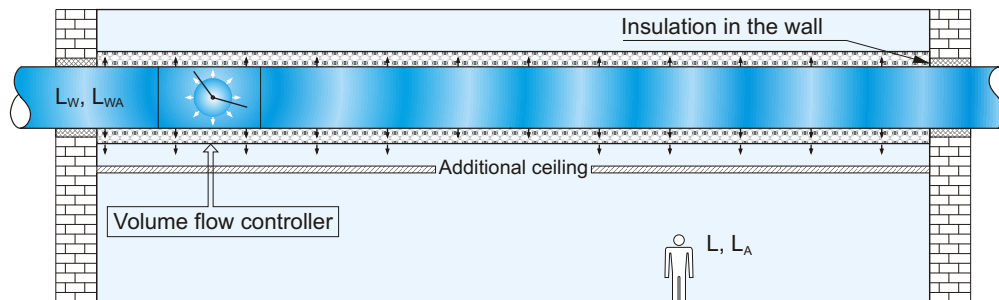


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**Table 2: Correction data for calculation of the radiating noise of a pipe 6 m in length with built-in volume flow controller**

| Size [mm] | 6 m                                       |        |        |        |         |         |         |         | 6 m  |        |        |        |         |         |         |         | 6 m  |        |        |        |         |         |         |         |
|-----------|---|--------|--------|--------|---------|---------|---------|---------|--|--------|--------|--------|---------|---------|---------|---------|--|--------|--------|--------|---------|---------|---------|---------|
|           | Folded spiral pipe according to DIN 24145 |        |        |        |         |         |         |         | Insulation with 1mm steel sheet and 25 mm mineral wool |        |        |        |         |         |         |         | Insulation with 1mm steel sheet and 50 mm mineral wool |        |        |        |         |         |         |         |
|           | Correction value [dB/octave]              |        |        |        |         |         |         |         | Correction value [dB/octave]                           |        |        |        |         |         |         |         | Correction value [dB/octave]                           |        |        |        |         |         |         |         |
|           | 63 Hz                                     | 125 Hz | 250 Hz | 500 Hz | 1000 Hz | 2000 Hz | 4000 Hz | 8000 Hz | 63 Hz  | 125 Hz | 250 Hz | 500 Hz | 1000 Hz | 2000 Hz | 4000 Hz | 8000 Hz | 63 Hz  | 125 Hz | 250 Hz | 500 Hz | 1000 Hz | 2000 Hz | 4000 Hz | 8000 Hz |
| 80        | 36  | 33     | 32     | 23     | 17      | 12      | 11      | 11      | 39   | 35     | 39     | 35     | 32      | 33      | 34      | 29      | 42   | 37     | 45     | 46     | 47      | 54      | 56      | 47      |
| 100       | 34  | 32     | 30     | 22     | 16      | 12      | 11      | 10      | 38   | 35     | 38     | 34     | 31      | 33      | 34      | 28      | 41   | 38     | 46     | 45     | 47      | 54      | 57      | 47      |
| 125       | 29  | 29     | 31     | 24     | 21      | 19      | 15      | 11      | 35   | 33     | 37     | 36     | 32      | 33      | 36      | 27      | 35   | 36     | 42     | 48     | 51      | 60      | 58      | 45      |
| 140       | 27  | 28     | 27     | 21     | 18      | 14      | 12      | 10      | 29   | 29     | 32     | 32     | 32      | 33      | 33      | 26      | 31   | 30     | 37     | 42     | 45      | 52      | 54      | 44      |
| 160       | 23  | 23     | 20     | 18     | 11      | 10      | 9       | 8       | 27   | 26     | 28     | 29     | 27      | 31      | 31      | 25      | 29   | 28     | 35     | 40     | 44      | 51      | 54      | 44      |
| 200       | 22  | 19     | 16     | 16     | 15      | 11      | 9       | 8       | 23   | 18     | 23     | 26     | 29      | 29      | 29      | 24      | 26   | 22     | 29     | 37     | 42      | 51      | 53      | 43      |
| 250       | 19  | 16     | 13     | 12     | 12      | 10      | 9       | 8       | 23   | 18     | 20     | 24     | 26      | 30      | 28      | 24      | 25   | 20     | 26     | 35     | 41      | 50      | 52      | 42      |
| 315       | 18  | 14     | 12     | 13     | 11      | 11      | 8       | 8       | 22   | 17     | 19     | 23     | 27      | 29      | 28      | 24      | 26   | 18     | 26     | 38     | 42      | 51      | 53      | 45      |
| 400       | 17  | 11     | 10     | 10     | 10      | 9       | 7       | 6       | 19   | 14     | 17     | 22     | 25      | 28      | 27      | 23      | 20   | 16     | 23     | 33     | 39      | 48      | 50      | 40      |



**Example 3: Calculation of the radiating noise of an insulated pipe**

| $f_m$                                | Sound level [dB/octave] |        |        |        |         |         |         |         | Summation A-weighted dB (A) |
|--------------------------------------|-------------------------|--------|--------|--------|---------|---------|---------|---------|-----------------------------|
|                                      | 63 Hz                   | 125 Hz | 250 Hz | 500 Hz | 1000 Hz | 2000 Hz | 4000 Hz | 8000 Hz |                             |
| Flow noise $L_w$ acc. to table 1     | 72                      | 70     | 67     | 64     | 62      | 62      | 56      | 54      | 68                          |
| Reflection attenuation               | -27                     | -26    | -28    | -29    | -27     | -31     | -31     | -25     | -                           |
| Room attenuation                     | -4                      | -4     | -4     | -4     | -4      | -4      | -4      | -4      | -                           |
| A-weighting                          | -26                     | -16    | -9     | -3     | 0       | +1      | +1      | -1      | -                           |
| Corrected sound pressure level $L_A$ | 15                      | 24     | 26     | 28     | 31      | 28      | 22      | 24      | 35                          |

**Example:**

Acoustic pressure: 38 dB (A)  
 Volume flow controller: Type 233  
 Given: NW 160 mm  
 Air flow: 500 m<sup>3</sup>/h  
 Pressure difference: 500 Pa

Sought: radiating noise of a pipe 6 m in length (insulated 25 mm):  
 Result of calculation = 35 dB (A), o.k.  
 (-4 dB(A) if additional ceiling is installed)

**Zeichenerklärung**

$L_w$  [dB] sound power level  
 $L_{WA}$  [dB (A)] A-weighted sound power level  
 $L$  [dB] sound pressure level  
 $L_A$  [dB (A)] A-weighted sound pressure level



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