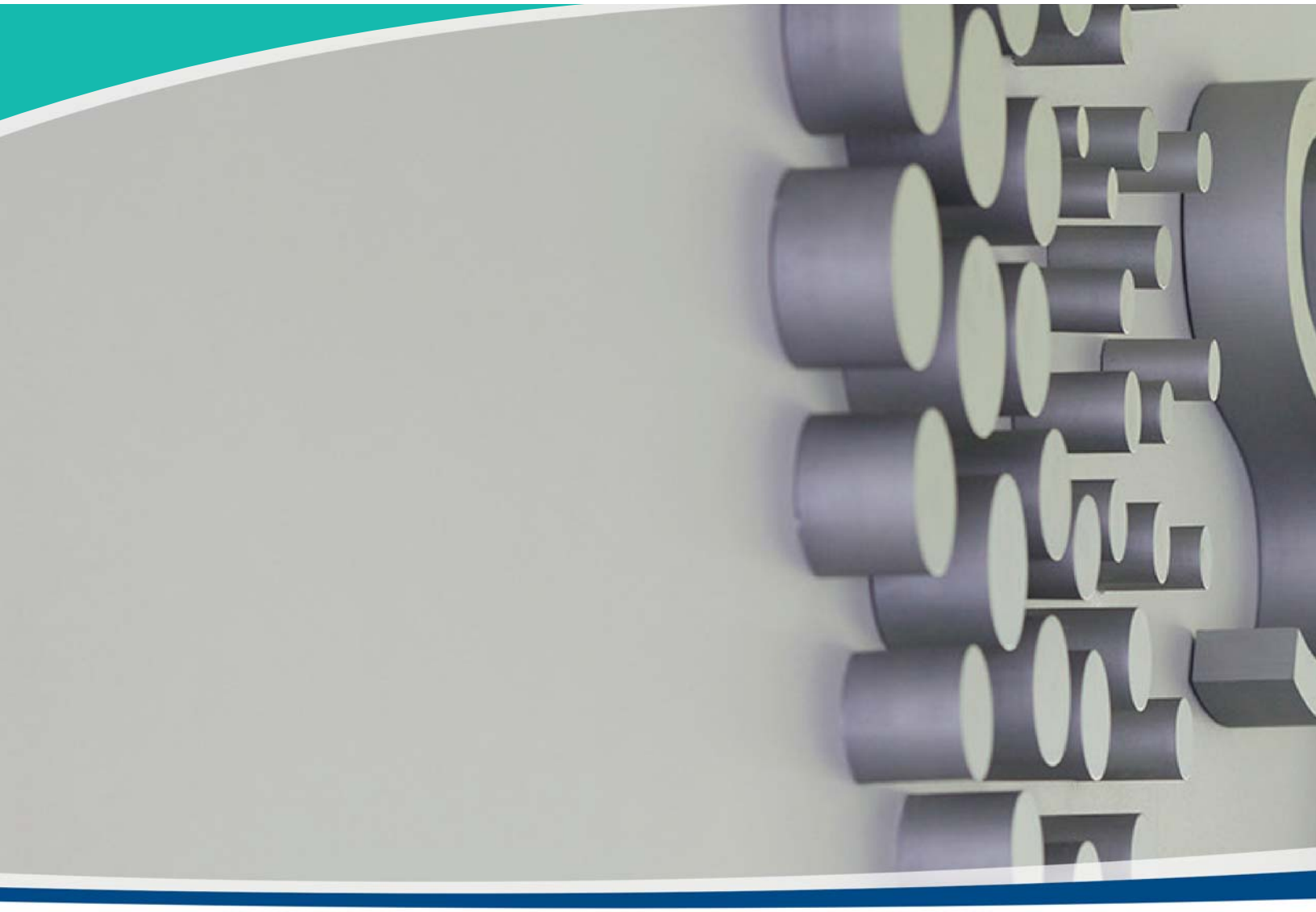
Fans and Air Distribution Products

Edition II

systemair



"To simplify" was our principal objective when Systemair entered the market in 1974 with the circular duct fan, a product that considerably simplified installation and design. "The straight way" soon became a concept for work in the Group and the basis of our values. Since then, it has developed into a business philosophy. The driving force is to constantly discover new ways of making Systemair products better for our customers and the environment.

Contents

Our product range has expanded at a rapid pace since the time when the circular duct fan first saw the light of day. Today, 40 years later, Systemair is one of the biggest names in the ventilation industry. We focus on developing energy efficient fans and energy recovery ventilators, products for air distribution and fire safety, air conditioning, air curtains and heating products.

More than 4,600 employees in more than 60 subsidiaries in over 47 countries ensure the necessary proximity to the customer.

We invite you to discover our product offering.

23 FACILITIES IN 18 AROUND THE WORL

Product groups

- A Fans
- B Residential ventilation
- C Swimming pool ventilation
- D Air handling units
- E Air conditioning
- F Air curtains and heating products
- G Air distribution products
- H Fire safety
- I Garage and tunnel ventilation

NORTH AMERICA

1	LENEXA, USA	A
2	TILLSONBURG, CANADA	D
3	BOUCTOUCHE, CANADA	B D

AFRICA

4	JOHANNESBURG, SOUTH AFRICA	A

COUNTRIES

EUROPE

5	WINDISCHBUCH, GERMANY	A H I
6	LANDENFELD, GERMANY	F
7	MÜLHEIM AN DER RUHR, GERMANY	C
8	WAALWIJK, NETHERLANDS	D
9	AARHUS, DENMARK	D
10	EIDSVOLL, NORWAY	D
11	SKINNSKATTEBERG, SWEDEN	A D F
12	HÄSSLEHOLM, SWEDEN	F
13	MILANO, ITALY	E
14	MADRID, SPAIN	D
15	TILLIÈRES, FRANCE	E

EUROPE

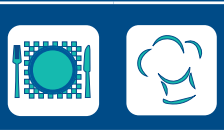
16	UKMERGÉ, LITHUANIA	B D
17	BRATISLAVA, SLOVAKIA	G
18	MARIBOR, SLOVENIA	H

ASIA

19	ISTANBUL, TURKEY	D
20	NEW DELI, INDIA	A D G H
21	HYDERABAD, INDIA	G H
22	KUALA LUMPUR, MALAYSIA	A D H I
23	WUJIANG, CHINA	D

Application overview

Systemair offers a range of fans, controllers for Constant (CAV) and Variable (VAV) Air Volume and ventilation accessories for use in various applications from small office premises to industrial applications. All items in the range have something in common: their components have been developed to satisfy stringent demands for low energy consumption. Extensive testing has been performed on the fans in laboratories and in the field to ensure a long service life of performance and low energy consumption. All products are manufactured to comply with environmental requirements.

		Areas of application			
					
	Page	Healthcare facilities	Municipality and government buildings	Dine, restaurant and kitchen facilities	Industrial buildings
Circular duct fans	22	•	•	•	•
Square duct fans	36	•	•	•	•
Exhaust roof fans	46	•	•	•	•
CAV controllers	52		•	•	•
VAV controllers	58	•	•	•	
Jet nozzles	88				•
Diffusers	90	•	•	•	•

Areas of application				
				
Transportation buildings	Retail and entertainment buildings	Lodging	Recreational and sport buildings	Education and institutional buidlings
•	•	•	•	•
•	•	•	•	•
•	•	•	•	•
•			•	•
	•	•		•
•	•	•	•	•
•	•	•	•	•

LEED®
Leadership in Energy and Environmental Design

Today's demands require buildings are designed to be sustainable, adaptable, and energy efficient. Systemair is committed to helping design and construction professionals achieve these goals. We offer solutions for indoor air quality and unsurpassed project support.

We can assist you with designing your project, ensuring that the indoor environmental quality complements your unique vision. Our ECM-fans and VAV controllers allow you to meet the specific requirements of the latest environmental design criteria, including the LEED® Green Building Rating Systems.

The key to your savings

Total cost for the ventilator's duty cycle

The energy consumption of a ventilation system usually represents the majority of the fan duty cycle cost. More efficient ventilation and air movement will have a significant impact towards preserving not only the environment but also improving the bottom line.

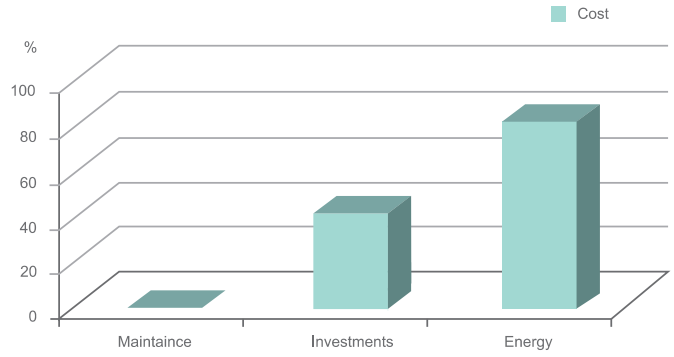
Energy efficient ventilation

Energy efficient ventilation is about designing the system in a smart way, using fans that have high efficiency and adjusting the ventilation rate to the actual need while keeping a good indoor air quality.

Systemair's range of ECM fans and air movement controllers greatly simplifies demand-controlled ventilation. Together they provide an intelligent system that is effective and very efficient. By controlling high efficiency, ECM-driven exhaust and/or supply fans, new levels of comfort and energy savings can be realized in a wide variety of applications.

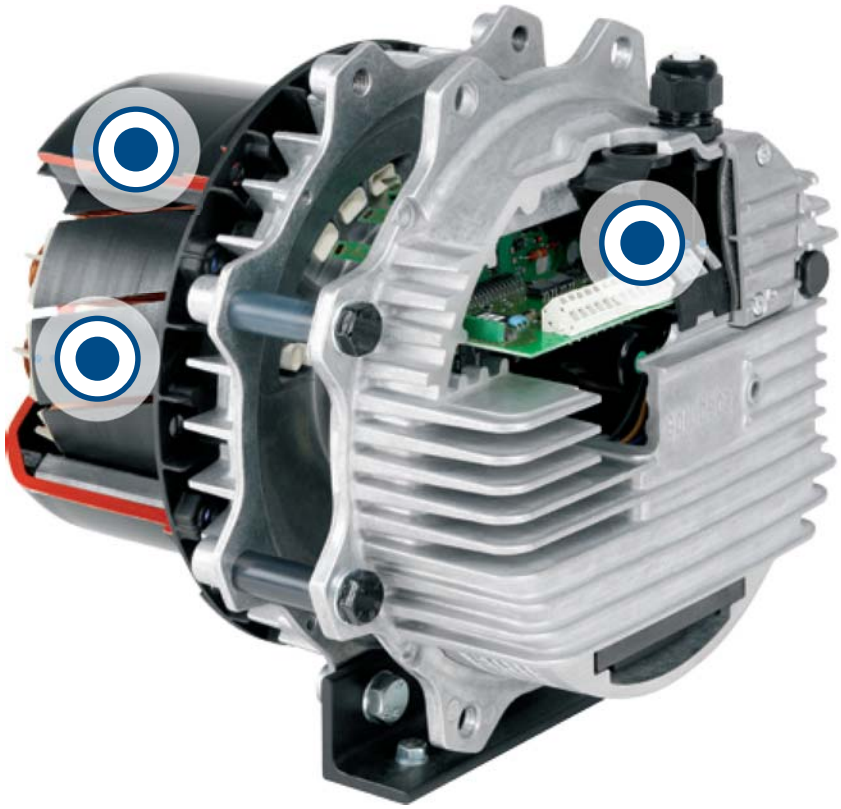
Efficient working point

Unusually high operating costs of ventilation systems are often caused by inefficient fan operation that, in turn, can be the result of improper fan selection, poor system design, or wasteful airflow control practices. Improper fan selection often means the fan is oversized for the application, resulting in high airflow noise affecting space and maintenance issues.



ECM-fans from Systemair

The heart of our fan is an EC (Electronically Commutated) Motor. It is a permanent magnet motor where the mechanical commutation has been replaced by electronic circuitry, which supplies the correct amount of current in the right direction at precisely the right time for accurate motor control. ECM motors have longer service life due to lower winding temperatures resulting in lower wear and tear.



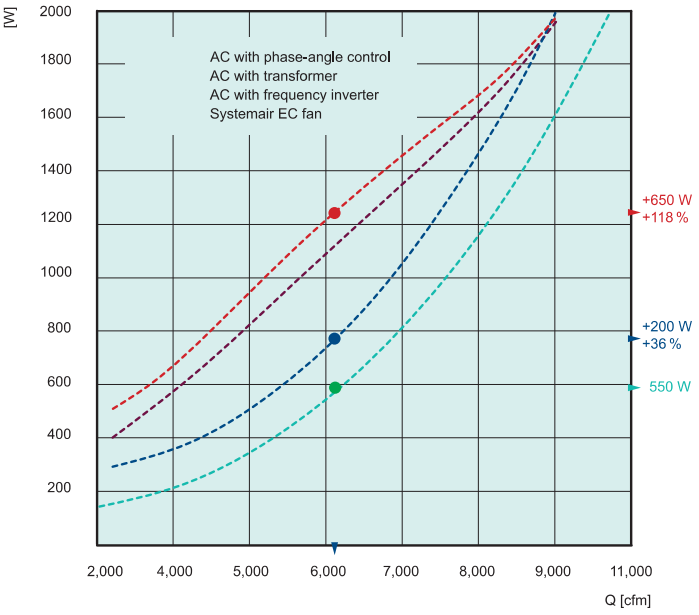
Since these motors have integrated electronic control they can easily be varied in speed to match the required air flow without creating extra noise, often related to speed controlling of AC (alternating current) motors. They do this without creating additional heat rise in the winding that would cause a shortening of the life time of the motor. For the same air volume, they consume distinctly less energy than standard motors.

ECM fans have high energy-saving potential not only at full load, but especially at part load, where the loss of efficiency is very much lower than with an asynchronous motor with the same output. This is one reason why our ECM fans are your first choice when it comes to economical use of energy and simple demand controlled ventilation.

Advantages of ECM fans

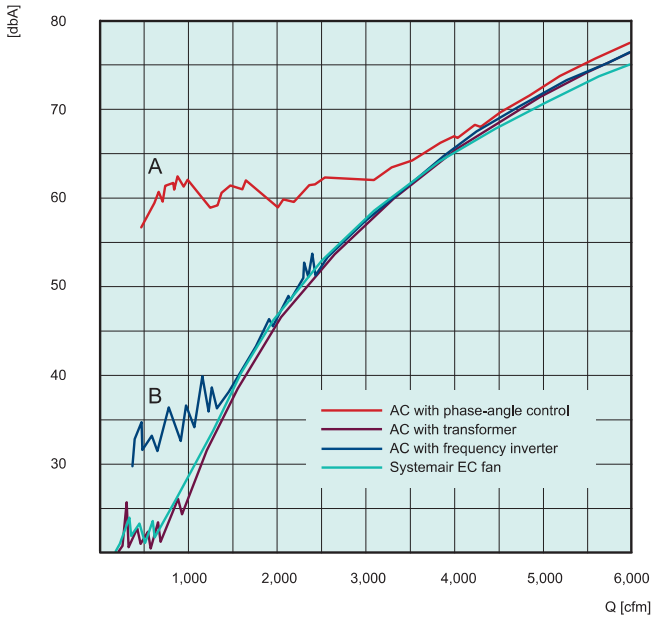
Energy savings using HVAC technology

Even for variable speeds an ECM fan retains its very high efficiency. With AC motors, on the other hand, the already lower efficiency drops significantly. Thus energy savings of over 10% are attained even at nominal speed. In the continuously controlled range, the relative and absolute savings are substantially greater. Compared to ECM technology, conventional phase-angle control can use twice as much energy, if not more, depending on the operating point.



Noise reduction at all speeds

With ECM technology you hear no motor noise across the entire speed range. When demand for ventilation is low, very low operating speeds can be selected. The resonance levels typical for frequency inverter operation or "phase noise" does not exist in our products, as a different operating principle is involved. Furthermore, combining standard motors with frequency inverter without an all-pole sinusoidal filter can cause winding and bearing damage.



- Up to 90% higher efficiency than conventional systems
- Higher efficiency and low sound level throughout the entire fan performance diagram
- Less energy use, resulting in lower energy costs
- Less energy use means lower CO_2 emissions
- Easy electrical connection and long service life
- Integrated electronics to control by 0-10V signal

What is this fan's ~~full load efficiency?~~ SFP at part load?

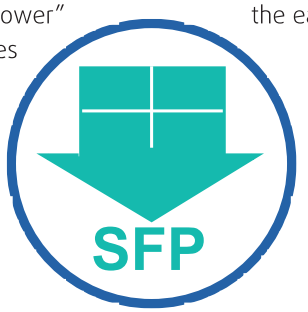
Let's talk SFP.

A lot of people like to talk about full load efficiency. But here's the thing. Many air movement applications only need to operate at full load a small percentage of the time. That's why we calculate the efficiency of our ECM fans at all duty points by using Specific Fan Power, or SFP. This value represents a fan's true efficiency during part-load periods. In other words, SFP tells the whole story. Like the other 364 days.

It's time to change the conversation.

Specific Fan Power (SFP)

The "Specific Fan Power" (SFP) value indicates the demand on power efficiency of all supply air and exhaust air fans in a building. The SFP should be determined during the early design stage of the building concept. It will help to choose the proper equipment to satisfy the required energy consumption.



What is the Specific Fan Power?

SFP is a measurement of the electric power that is needed to drive a fan, relative to the air volume that is circulated through the fan. This value is not constant for a given fan, but changes with both airflow rate and fan pressure rise. The definition of the SFP is different for heat recovery air handling units with supply air and exhaust air, and for separate supply air or exhaust air handling units and individual fans.

The SFP value for the whole building is defined as follows:

the combined amount of electric power consumed by all the fans in the air distribution system divided by the total airflow rate through the building under design load conditions:

$$SFP = \frac{P_{sf} + P_{ef}}{q_{max}}$$

where

P_{sf} - the total fan power of the supply air fans at the design air flow rate, W

P_{ef} - the total fan power of the extract air fans at the design air flow rate, W

q_{max} - the design airflow rate through the building, generally the extract air flow, cfm

In terms of SFP for the whole building, any fan powered terminals shall be included when they are connected to the main air supply system.

For individual air handling units or fans, to enable the designers of building projects to quickly determine whether a given air handling unit will positively or negatively meet the overall demands on power efficiency, a SFP_E for the individual fan or AHU has been defined.

The specific fan power – for supply and exhaust air units (normally also equipped with heat/energy recovery), is the total amount of electric power, in **W**, supplied to the fans in the AHU, divided by the largest of supply air or extract air flow rates (i.e. not the outdoor air or the exhaust air flow rates) expressed in **cfm** under design load conditions.

$$SFP_E = \frac{P_{tf} + P_{ff}}{q_f} \quad (W/cfm)$$

where

P_{tf} - total power for supply air fans, W

P_{ff} - total power for exhaust air fans, W

q_f - is the largest supply air or extract air flow through the air handling unit, cfm

Air handling units with liquid-coupled coil heat exchangers and separate supply air and extract air sections also belong to this category of air handling units.

For separate supply air or exhaust air handling units and individual fans, the specific fan power, SFP_E is the electric power, in **W**, supplied to a fan divided by the air flow expressed in **cfm** under design load conditions.

$$SFP_E = \frac{P_{tf} + P_{ff}}{q_f} \quad (W/cfm)$$

The lower the value, the more efficient the system is at transferring the air.

Principle to select appropriate equipment

The SFP principle in fan selection is to choose a fan to deliver the flow and pressure at all required duty points for an application at the best integrated efficiency rate practical.

Figure 1 illustrates the operating points of both high and low resistance systems, which might be chosen by either keeping a system efficient at the SFP equal 0.71 W/cfm or non-efficient at the SFP equal 2.06 W/cfm. It is best to select a fan that will give an operating point in the higher range. The low static pressure end of the performance curve is to maintain the fan rationally and to avoid it from stalling.

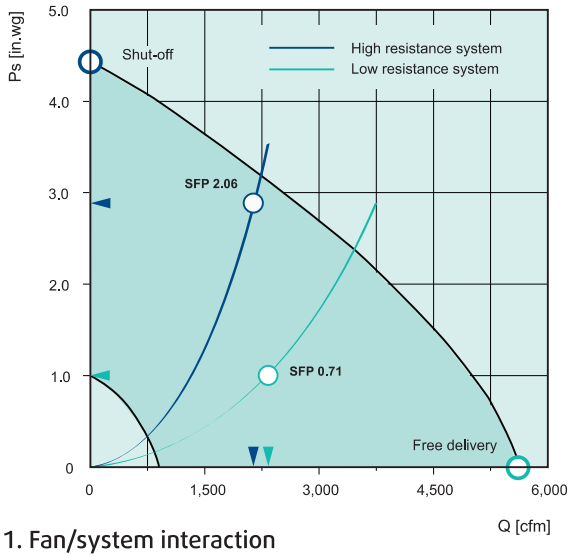


Figure 1. Fan/system interaction

Each particular system should be analyzed for possible reduction in the overall resistance to airflow. Other considerations, such as available space and power, noise, reliability, and operating environment should also be brought to bear on fan choice.

Efficiency as an advantage

First, it's important to realize that SFP is a wire to air metric that takes in consideration the complete fan, drive and motor while other metrics like FEG only consider part of the system. SFP also uses the actual power consumption at the required duty point instead of talking BHP or max watts of the motor.

Second, the above equation shows that SFP doesn't take into consideration the pressure so therefore the SFP target should always be follow by a pressure e.g. while designing the system, calculations show that for a specific fan the working point will be 3500cfm at 1."Ps. So to select the most energy efficient solution for this specific fan one should pick the fan with the lowest SFP at the required working point.

So what are the advantages of using SFP instead of watts at a certain duty point? If you have two or several fans and you use the actual watts at the same duty point to decide which one is most energy efficient there is really no need for SFP since SFP is an equation between watts and airflow. But if you are talking in more general terms it is difficult to know if the fan is working in an efficient way by only talking about watts because the watts number by its self doesn't tell you if an efficient fan has been picked i.e. "At the requested duty point the fan consumes 1.2kW", while the SFP does just that i.e. "*At the requested duty point the fan has an SFP of below 0.8*".

So what are the advantages of SFP vs efficiency?

Fans with a high static pressure value frequently have a greater maximum efficiency value than fans that are designed to operate at lower pressure. But these higher levels of efficiency are only achievable within a limited area where the system line represents a weaker air flow with a high pressure. The blue curve in **Figure 2** illustrates such a case, whereas the green line shows the performance line for a fan designed to operate at the lower pressure range. So while the fan that is represented by the green line has a lower maximum efficiency the actual power consumption at 1.0"Ps is lower. Therefore a fan with the lower SFP factor should be selected.

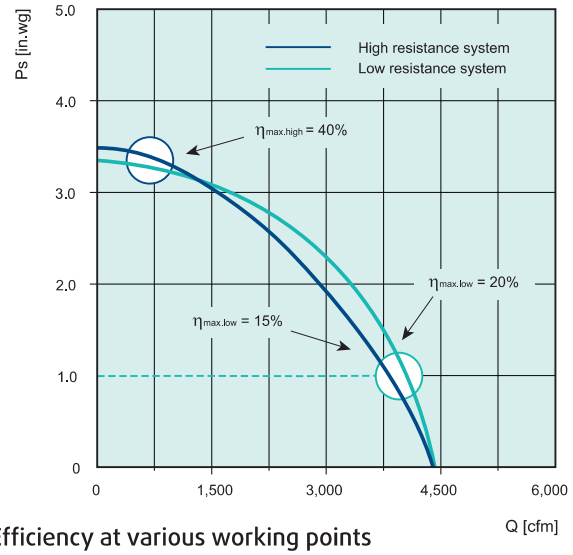


Figure 2. Efficiency at various working points

Traditional types of ventilation systems

Picking the right type of ventilation system requires important planning. The choice of system should be made after considering the following main factors:

- Practicality: the ability of the technical solution to meet the required quality demands.
- Reliability – the ability of the technical solution to function satisfactorily over time.
- Efficiency – the efficiency of the technical solution regarding power and cost-effectiveness.

When choosing a technical solution, one should always strive to attain simplicity, intelligibility and the ability to cope with fluctuating operating factors. Avoid technical solutions that do not allow the layout of the premises to be changed, windows to be opened or which are in any other way sensitive to external disturbances.

There are different ventilation solutions which can be implemented to fulfil the demands for correct air flows to all parts of a system.

CAV systems (Constant Air Volume)
Systems with constant air flow

CAV systems are used where both heat/cooling and pollutant production is low and reasonably constant. The flow of supply air is mainly determined by the quality demands on the air. CAV systems are often designed according to the branching principle with an adjustment damper in each branch. The pressure drops across the terminals is chosen so that these, together with the pressure drops across the dampers, give the correct flow distribution.

The disadvantage of this principle is that the system can easily become unbalanced because of the effects of thermal lift, changes in damper settings etc. Another disadvantage is the relatively high pressure drop across dampers and terminals that is required to ensure that the flow variations are not too large. In turn, this means that noise problems can be difficult to deal with and power consumption is unnecessarily high. Lowering the fan speed, to lower power consumption during certain periods means that the flow distribution cannot be maintained because the pressure drops across terminals and dampers is reduced.

VAV systems (Variable Air Volume)
Systems with variable air flow

VAV systems are used for variable occupancy rates and as a rule regulated by thermostats in each room. The fan is fitted with some form of pressure regulation device. VAV systems differ from CAV systems in a number of ways, one of which is that pressure is regulated in the main ducts for supply and exhaust air. This is necessary from both a power and a noise perspective.

Another difference is that in the immediate vicinity of the supply air terminal there are dampers regulating the air flow through the terminals.

Modulating airflows to save energy

DCV systems (Demand Controlled Ventilation)
VAV systems controlled by demand

With demand controlled ventilation the airflow is adjusted to the actual demand usually via an air quality or presence sensor. Therefore, only the energy needed to create the right level of comfort is used. The fan automatically slows down reducing the airflow when there is less demand. Demand controlled ventilation gives a more energy effective solution with lower running costs, reduced wear and less negative environmental effects.

It also provides lower noise levels and longer service life.
In other words, you get much better comfort for less money!

Tougher energy performance requirements for buildings are driving innovation in products and systems. This is especially true of ventilation systems, given that the losses from air change account for a big share of a building's total energy consumption. Many tests and studies and extensive monitoring have shown that demand controlled ventilation systems can make an effective contribution both to energy savings and to health and comfort. Automatically decreasing the airflow when demand is low not only decreases the energy used by the fan but even more important it lessens the amount of conditioned air exhausted and further reduces the total operating costs associated with air conditioning and heating in multi-storied buildings such as: hotels, multifamily complexes, institutional facilities, and high rise commercial buildings.

Whenever we talk about demand controlled ventilation we have to realize that ventilation equipment that uses ECM motors is the only solution. Not only because ECM motors are more energy efficient but more importantly because of the controllability. In true Demand controlled ventilation the fans rpm's changes all the time to provide the airflow that is needed to achieve a good indoor air quality. ECM motors can generate all these rpm changes and still keep a high efficiency without creating noise or shortening the lifetime of the motor because of additional heat created in the windings of the motor.

Traditional types of ventilation systems

DCV - Demand Controlled Ventilation

There are several ways of achieving DCV, one is by connecting the sensor (presence, CO_2, humidity, temperature etc) directly to the fan with the result that one single fan is controlled by one sensor and more or less only supplies the ventilations needs for one zone.

Another way is to connect the sensors and the fan to the building management system (BMS), and let the BMS control the fans according to the input that it gets from the sensors.

The third way, which is very useful when it comes to one fan controlling several zones without having a BMS system or having to wire the sensor to the fan, is to use a constant pressure system. The fan is controlled with a pressure regulator that makes sure that the fan's rpm changes so that the same negative pressure is maintained in the duct. Each zone or room is equipped with a damper that modulates according to temperature, presence, CO_2 etc. and when the sensors detects a bigger ventilation need it opens the damper.

This causes a change of pressure in the common exhaust duct which causes the fan to change its speed to be able to maintain the same negative pressure. More dampers open because of higher ventilation needs, which causes the fan to work at a higher RPM to be able to maintain the desired negative pressure in the duct.

The three big advantages with constant pressure applications are:

1. Automatically decreasing the airflow when demand is low decreases the energy used by the fan and more important it lessens the amount of conditioned air exhausted

2. One exhaust fan can be used for several zones

3. No wiring between the sensors and the fan is needed, the pressure in the common duct works as the communication channel between the sensors and the fan

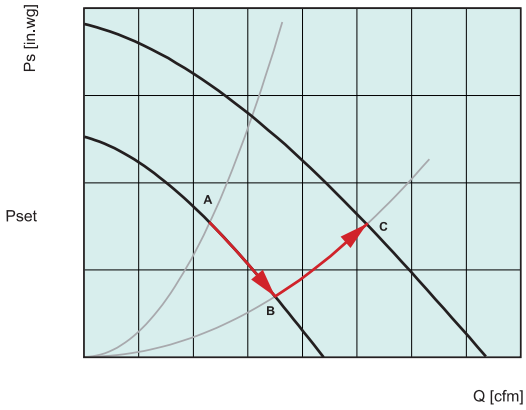


Figure 3. Exhaust fan ramp up

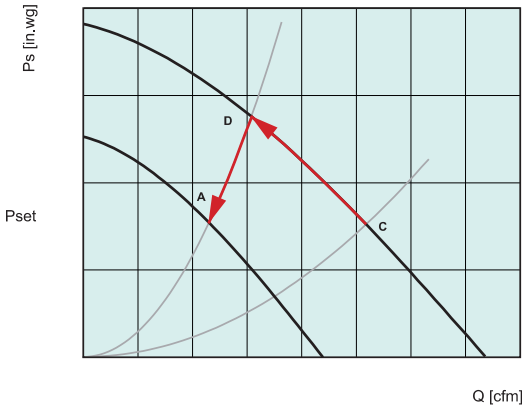


Figure 4. Exhaust fan ramp down

A Fan operating point on the curve with some dampers open
B Pressure drops as more dampers open in response to greater ventilation need
C Fan increases speed (RPM) to maintain P_{max}
P_{max} Set point operating pressure for the system

C Fan operating point from **figure 3** with multiple dampers open
D Pressure increase as dampers close in response to less ventilation need
A Fan decreases speed (RPM) to maintain P_{max}
P_{max} Set point operating pressure for the system

All system solutions can, of course, be designed for either mixing or displacement-regulated ventilation.

Both CAV and VAV systems can be combined with different heating and cooling units for regulating the indoor temperature.

Inline duct fans with ECM motors

Inline duct fans

With its revolutionary impeller and optimized air flow technology, this fan moves enormous volumes of air with very low energy input.

Airflow up to 1,235 cfm.

p. 22

Leading the way

In many ways the story of the first inline duct fan in the market embodies the values that make Systemair what it is.

It was a novel idea and a great duct fan, and with that, the story could have stopped there. But our engineers listened to our customer's needs and took responsibility for meeting those needs. They challenged their thinking, used their resources in a smart way, and made a great product even better. Today, the concept of the inline duct fan is used for various applications.

Inline duct fans

The original inline duct fans are known for their economical use of energy and excellent ease of control.

Airflow up to 6,000 cfm.

p. 26

Multi directional square duct fans

These supply/exhaust fans are specifically designed for large ventilation needs and where space is at a premium.

Airflow up to 6,300 cfm.

p. 36

Direct drive roof mount fan

Direct upblast ventilators are designed for roof mounted exhaust on commercial and industrial buildings.

Airflow up to 6,900 cfm.

p. 46

prioAir EC

Circular inline duct ECM fans

- High level of efficiency
- Integrated motor protection
- Pre-wired speed control potentiometer for air flow adjustments and balancing
- Speed control via 0-10 Vdc from BMS or other source

APPLICATION

The prio**Air** EC Series is designed for installation in ducts. Extremely efficient, prio**Air** fans are perfect for a wide assortment of powerful, quiet air-moving applications.

DESIGN

Compact size, low noise, very high efficiency and air tight casing. Aerodynamically optimized impellers and guide vanes with integrated external rotor motors. Includes a mounting bracket. Special composite material is corrosion-proof and light weight.

SPEED CONTROL

The prio**Air** EC fan motor's speed is controlled via a 0-10Vdc signal. The motor provides a +10V reference that can be used by a remotely-mounted potentiometer (such as MTP 10). The motor can also be controlled by an externally-provided 0-10Vdc signal that can come from any device or a Building Management System (BMS). The fan's motor also provides operational speed (tachometer pulse) output that can be used to verify fan operation. These control features allow the prioAir EC to be integrated into and play an active role in smart HVAC systems in buildings.

If constant (reduced) speed operation is desired, the fan's speed can be manually adjusted and set via the integral potentiometer located in the electrical enclosure. The potentiometer permits the system balancer to dial in the necessary air flow rate.

MOTOR PROTECTION

Thermal overload protection with automatic reset.

ACCESSORIES

Mounting clamps
p. 114

Duct silencer
p. 114

Iris damper
p. 55

SWITCHES AND CONTROLS

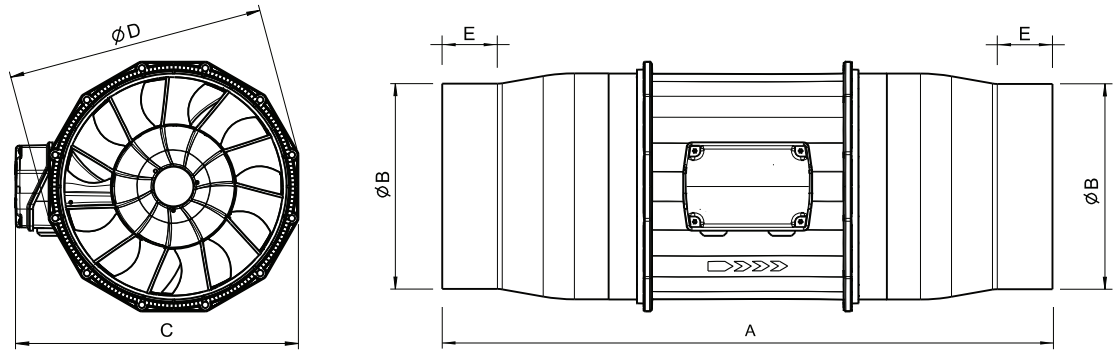
Potentiometer
p. 119

Constant pressure control
p. 119

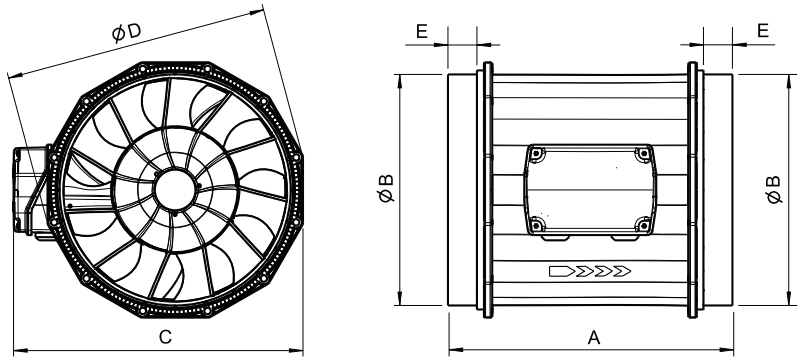
5-step switch
p. 119

DIMENSIONS

prio 150EC



prio 200EC, prio 250EC



Model	A	øB	C	D	E
prio 150EC	16 3/16	5 7/8	8 1/4	7 3/8	1 5/8
prio 200EC	9 11/16	7 7/8	9 3/4	9	1
prio 250EC	11 11/16	9 13/16	11 15/16	11 1/16	1 3/16

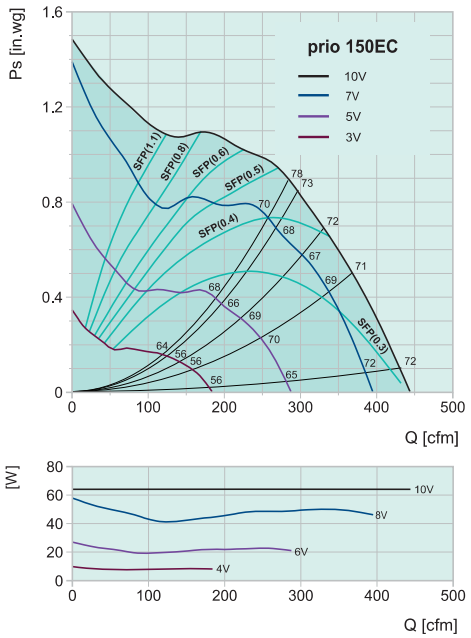
Dimensional information is in inches

SPECIFICATION DATA

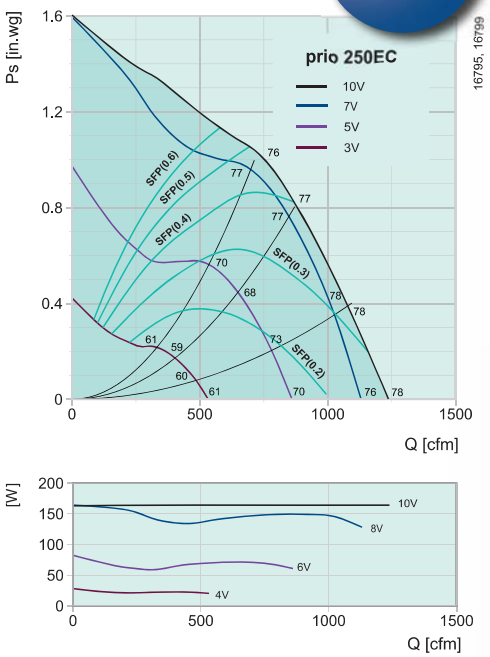
COMING IN FALL 2016

		prio 150EC	prio 200EC	prio 250EC
Voltage/Frequency	50/60Hz	120	120	120
Nominal voltage range	V	100...130	100...130	100...130
Phase	~	1	1	1
Maximum airflow	cfm	443	790	1,237
Rpm	min^{-1}	4,085	3,619	2,629
Power rating, motors	W	64	123	164
Current	A	0.88	1.58	2.11
Operational temperature	°F	-13...131	-13...131	-13...131
Weight	lbs	3	3	7
Insulation / Enclosure class	-	B / IP44	B / IP44	B / IP44

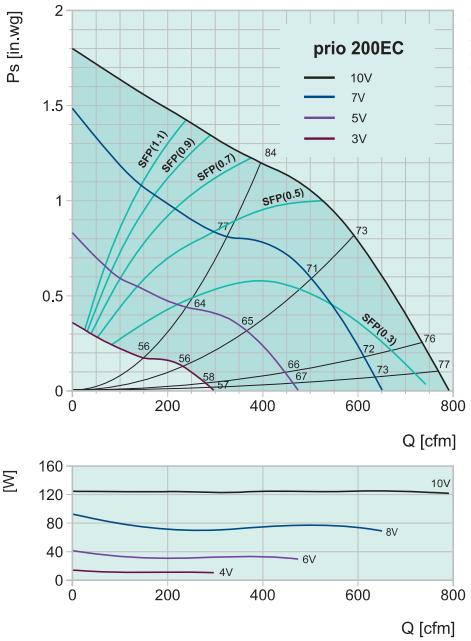
PERFORMANCE



dB(A)	Tot	Frequency bands [Hz]							
		63	125	250	500	1k	2k	4k	8k
L_{wA} Inlet	81	51	60	81	68	64	63	60	53
L_{wA} Outlet	78	48	62	78	65	63	64	61	55



dB(A)	Tot	Frequency bands [Hz]							
		63	125	250	500	1k	2k	4k	8k
L_{wA} Inlet	74	50	63	67	62	69	68	63	53



dB(A)	Tot	Frequency bands [Hz]							
		63	125	250	500	1k	2k	4k	8k
L_{wA} Inlet	84	63	72	81	77	73	70	65	57
L_{wA} Outlet	82	65	74	73	79	72	69	64	57

The most important advantages at a glance:

- **Revolutionary impeller**

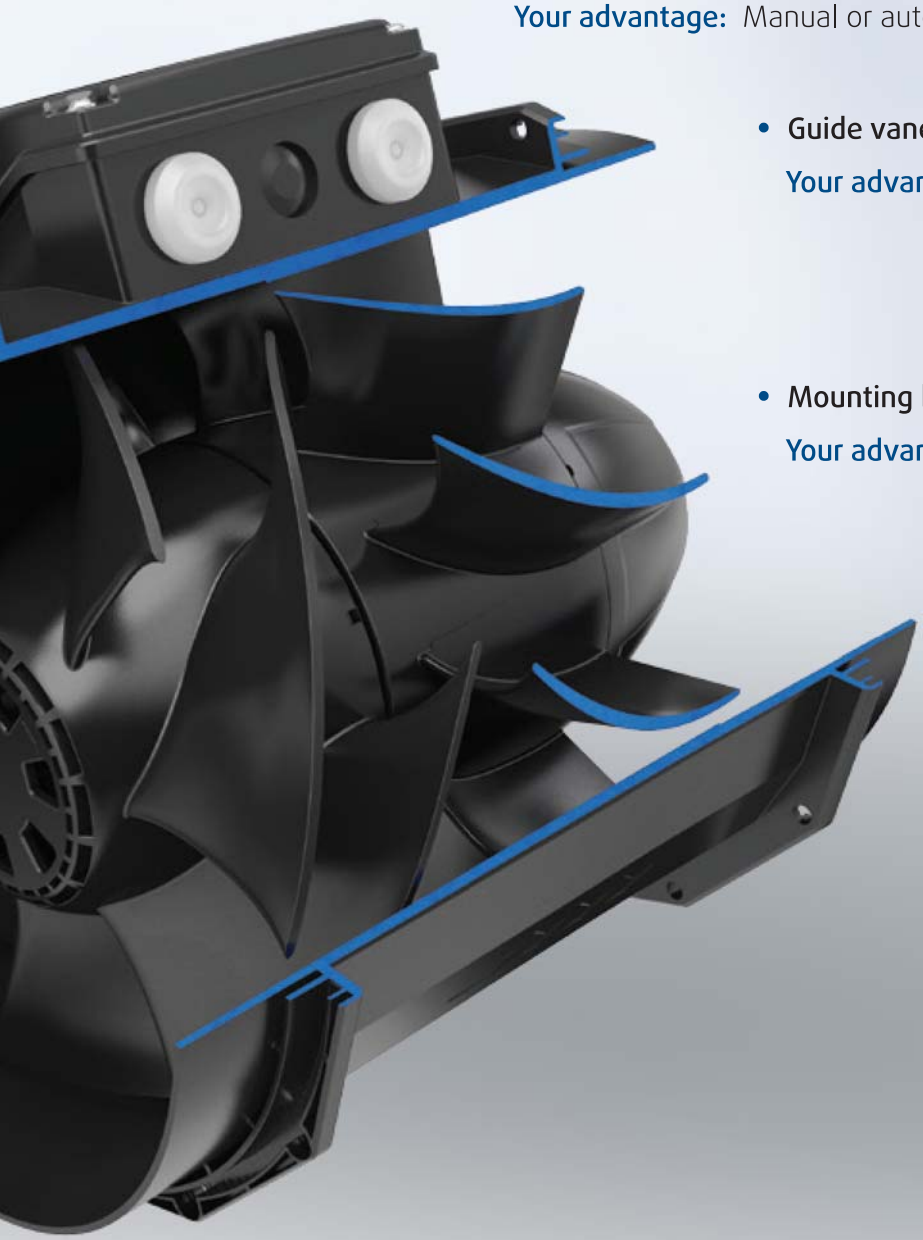
  Your advantage: Fully optimized for discharge flow characteristics result in the ideal air stream

- **Extremely efficient EC-motor**

  Your advantage: Highest operation efficiency, especially when speed is reduced to match air flow rate demand

- **Electronics**

  Your advantage: Manual or automated speed control



- **Guide vanes**

  Your advantage: Aerodynamically optimized guide vane geometry organizes the air discharged from the impeller. The result is a highly efficient, powerful and laminar airflow

- **Mounting bracket**

  Your advantage: Included mounting bracket simplifies installation. The fan can be mounted in any position.

K EC

Circular inline duct ECM fans

Systemair Inc. certifies that the models shown are licensed to bear the AMCA Seal. The ratings are based on the tests and procedures performed in accordance with AMCA Publication 211 and comply with the requirements of the AMCA Certified Ratings Program. Performance certified is for installation type D – Ducted inlet, Ducted outlet. Performance ratings do not include the effects of appurtenances (accessories).

- High level of efficiency
- Integrated motor protection
- Pre-wired speed control potentiometer for air flow adjustments and balancing
- Speed control via 0-10 Vdc from BMS or other source

ACCESSORIES

Mounting clamps
p. 114

Duct silencer
p. 114

Iris damper
p. 55

SWITCHES AND CONTROLS

Potentiometer
p. 119

Constant pressure control
p. 119

5-step switch
p. 119

APPLICATION

The K EC Series is designed for installation in ducts.These fans are known for their economical use of energy and ease of control. They can be varied in speed to match an application's demand, and operate at high efficiency levels. For the same air volume, they consume considerably less energy than a standard fan with an AC (alternating current) motor.

DESIGN

The casing is manufactured from galvanized sheet metal with the seams folded to give the fan an air tight casing. All fans have a minimum 1" long connection collar. The fans have backward-curved blades and external rotor EC-motors.

SPEED CONTROL

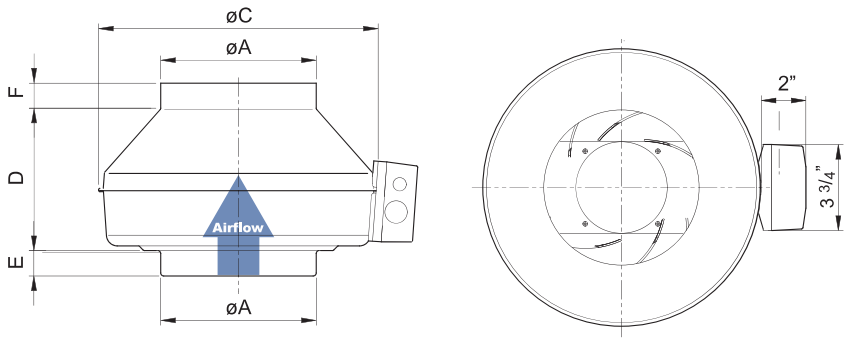
The K EC fan motor's speed is controlled via a 0-10Vdc signal. The motor provides a +10V reference that can be used by a remotely-mounted potentiometer (such as MTP 10). The motor can also be controlled by an externally-provided 0-10Vdc signal that can come from any device or a Building Management System (BMS). The fan's motor also provides operational speed (tachometer pulse) output that can be used to verify fan operation. These control features allow the K EC to be integrated into and play an active role in smart HVAC systems in buildings.

If constant (reduced) speed operation is desired, the fan's speed can be manually adjusted and set via the integral potentiometer located in the electrical enclosure. The potentiometer permits the system balancer to dial in the necessary air flow rate.

MOTOR PROTECTION

Motor protection is integrated in the electronics of the motor.

DIMENSIONS



	øA	øC	D	E	F
K 100 EC	4	13 1/2	6 1/2	1	1
K 150M EC	6	13 1/8	7	1	1
K 200 EC	8	13 1/4	6	1	1
K 250 EC	10	13 1/4	4 3/4	1 1/8	1
K 300 EC	12	16	6 11/16	1 1/4	1
K 300L EC	12	16	6 11/16	1 1/2	1

Dimensional information is in inches

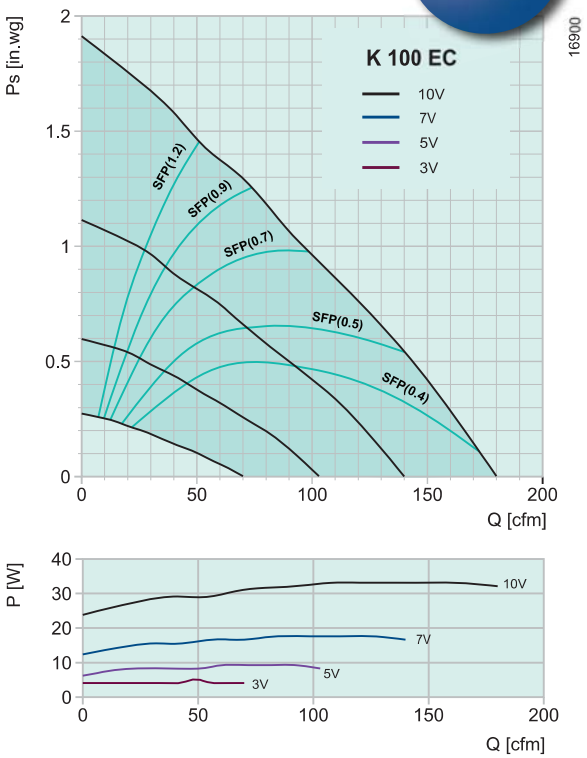
SPECIFICATION DATA

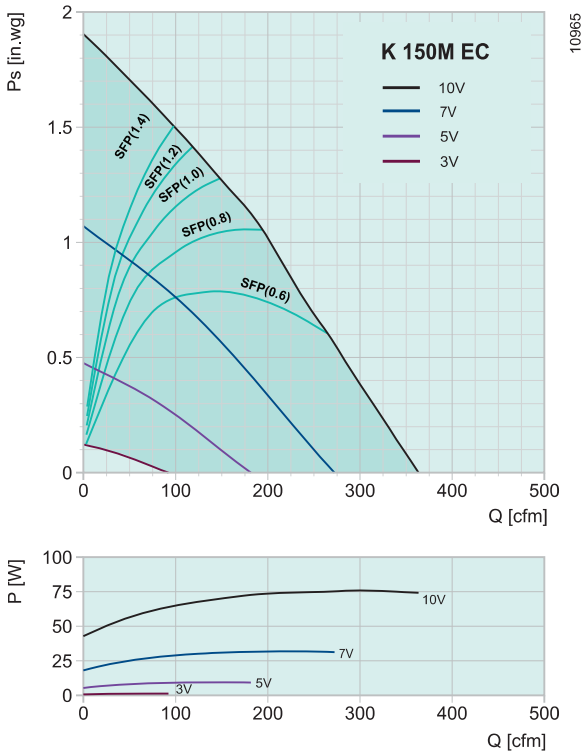
		K 100 EC	K 150M EC	K 200 EC	K 250 EC	K 300 EC	K 300L EC
Voltage/Frequency	50/60Hz	120	120	120	120	120	120
Nominal voltage range	V	100...130	100...130	100...130	100...130	100...130	100...130
Phase	~	1	1	1	1	1	1
Maximum airflow	cfm	180	364	428	511	638	807
Rpm	min^{-1}	4,038	2,491	2,515	2,311	2,654	2,510
Power rating, motors	W	33	74	71	94	136	166
Current	A	0.48	1.00	0.5	0.65	0.95	1.16
Operational temperature	°F	-13...140	-13...140	-13...140	-13...140	-13...140	-13...140
Weight	lbs	6	11	11	11	16	16
Insulation / Enclosure class	-	B / IP44	B / IP44	B / IP44	B / IP44	B / IP44	B / IP44

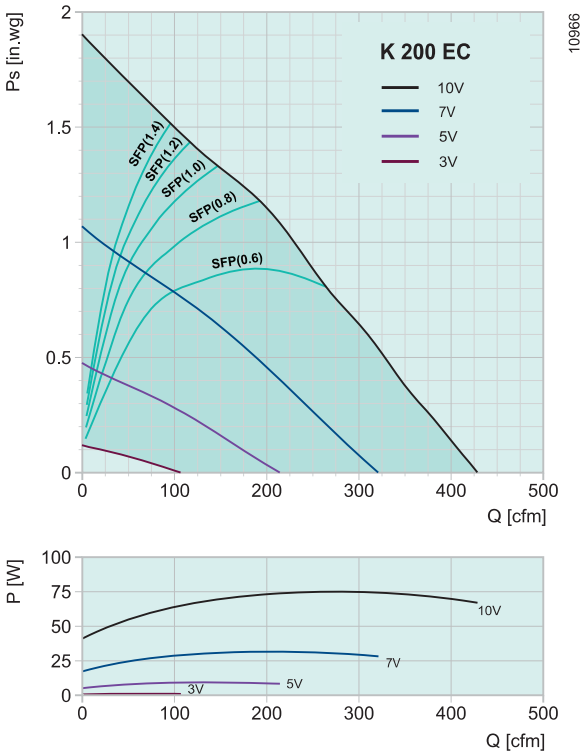
Performance certified is for installation type D – Ducted inlet, Ducted outlet. Speed (RPM) shown is nominal.
Performance based on actual speed of test. Performance ratings do not include the effect of appurtenance (accessories).
The AMCA Certified Ratings Seal does not apply to SFP performance data.

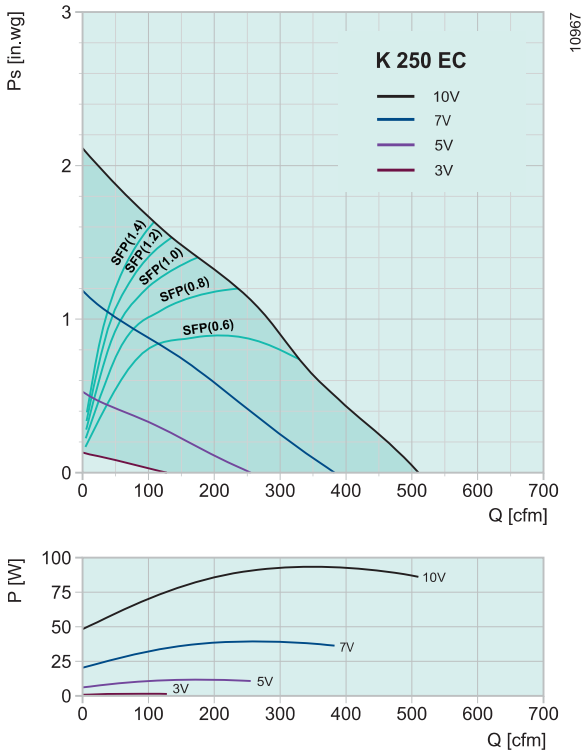
PERFORMANCE

NEW!



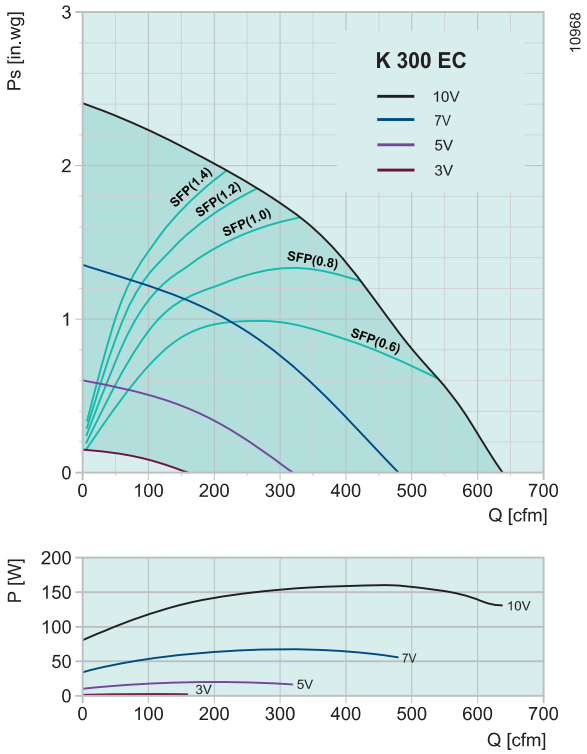


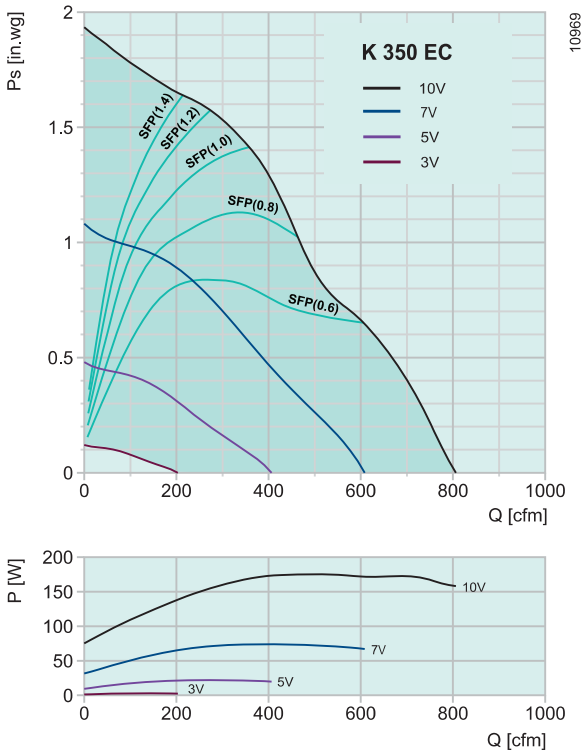




Performance certified is for installation type D – Ducted inlet, Ducted outlet. Speed (RPM) shown is nominal.
Performance based on actual speed of test. Performance ratings do not include the effect of appurtenance (accessories).
The AMCA Certified Ratings Seal does not apply to SFP performance data.

PERFORMANCE





Performance certified is for installation type D – Ducted inlet, Ducted outlet. Speed (RPM) shown is nominal.
Performance based on actual speed of test. Performance ratings do not include the effect of appurtenance (accessories).
The AMCA Certified Ratings Seal does not apply to SFP performance data.

KD EC

Circular inline duct ECM fans

Systemair Inc. certifies that the models shown are licensed to bear the AMCA Seal. The ratings are based on the tests and procedures performed in accordance with AMCA Publication 211 and Publication 311 comply with the requirements of the AMCA Certified Ratings Program. Performance certified is for installation type D – Ducted inlet, Ducted outlet. Performance ratings do not include the effects of appurtenances.

- Mixed flow impeller
- Integrated motor protection
- Lowest SFP values
- Pre-wired speed control potentiometer
- Speed control via 0-10 Vdc from BMS or other source

ACCESSORIES

Mounting clamps
p. 114

Duct silencer
p. 114

Iris damper
p. 55

SWITCHES AND CONTROLS

Potentiometer
p. 119

Constant pressure control
p. 119

5-step switch
p. 119

APPLICATION

These fans are known for their economical use of energy and excellent ease of control. They can be varied in speed to match the airflow demand, and operate at high efficiency levels. Perfect for commercial and institutional structures such as offices, hospitals, veterinary clinics, etc. The compactness and adaptability of the KD Series fans permit easy installation. The fans are shipped fully assembled and can be mounted in any orientation. For various methods of mounting, see installation manuals at systemair.net.

DESIGN

The casing is manufactured from galvanized sheet metal. The KD EC Series have an external rotor EC-motor with a mixed flow impeller, which reduces the external dimensions of the fans. These fans have a high air flow capacity in relation to their compact design. Brackets are supplied with the fans to make installation easier.

SPEED CONTROL

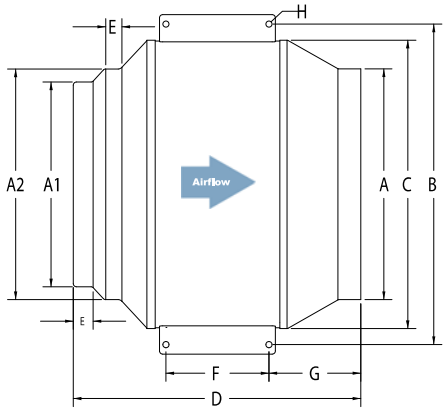
The KD EC fan motor's speed is controlled via a 0-10Vdc signal. The motor provides a +10V reference that can be used by a remotely-mounted potentiometer (such as MTP 10). The motor can also be controlled by an externally-provided 0-10Vdc signal that can come from any device or a Building Management System (BMS). The fan's motor also provides operational speed (tachometer pulse) output that can be used to verify fan operation. These control features allow the KD EC to be integrated into and play an active role in smart HVAC systems in buildings.

If constant (reduced) speed operation is desired, the fan's speed can be manually adjusted and set via the integral potentiometer located in the electrical enclosure. The potentiometer permits the system balancer to dial in the necessary air flow rate.

MOTOR PROTECTION

Motor protection is integrated in the electronics of the motor.

DIMENSIONS



	A	A1	A2	B	C	D	E	F	G	H
KD 300F EC	12	12	14	20 1/4	17 7/8	18 7/8	7/8	4	8 3/4	3/8
KD 355F EC	14	14	16	22 1/8	19 3/4	20 1/4	1 1/2	4	8 3/4	3/8
KD 400E EC	16	14	16	22 1/8	19 3/4	18 3/4	1 1/2	4	7 1/8	3/8
KD 400D EC	16	16	18	24 3/8	22 1/8	23 3/4	1 1/4	7 7/8	8 1/2	1/2
KD 450D EC	18	18	20	28 3/8	26 1/8	27 1/5	1 1/4	7 7/8	7	1/2
KD 500D EC	20	18	20	28 3/8	26 1/8	27 1/5	2	7 7/8	12 1/2	1/2

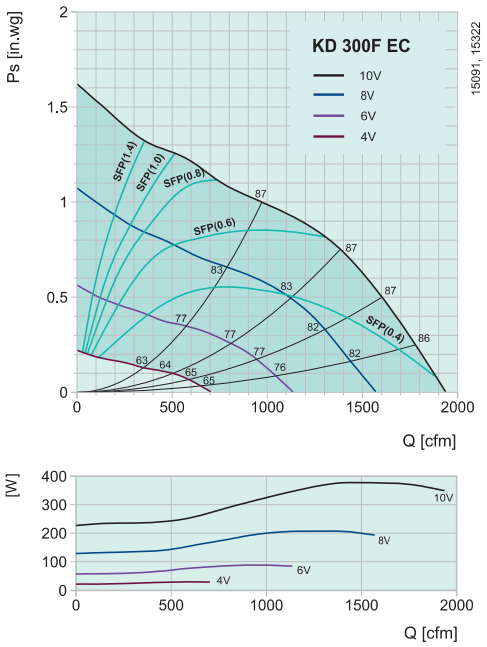
Dimensional information is in inches

SPECIFICATION DATA

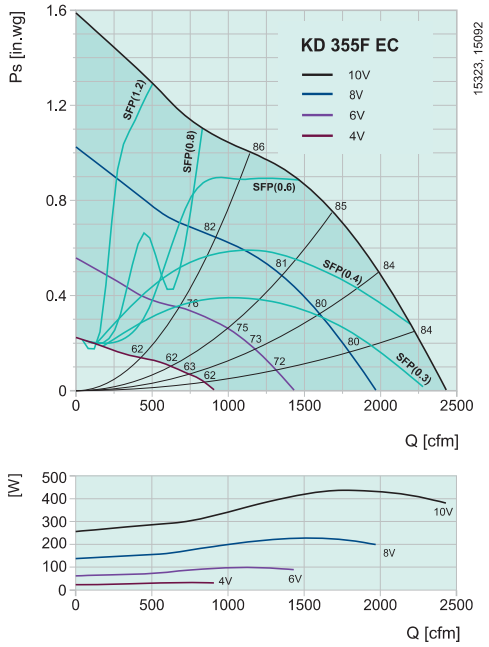
		KD 300F EC	KD 355F EC	KD 400E EC	KD 400D EC	KD 450D EC	KD 500D EC
Voltage/Frequency	50/60Hz	120	120	230	460	460	460
Nominal voltage range	V	110...130	110..130	208...277	440...480	440...480	440...480
Phase	~	1	1	1	3	3	3
Maximum airflow	cfm	1,936	2,443	4,250	5,136	5,992	6,064
Rpm	min^{-1}	1,698	1,424	1,982	1,910	1,612	1,598
Power rating, motors	W	366	406	1,082	1,965	1,979	2,002
Current	A	3.04	3.38	5.2	4.3	2.48	3.2
Operational temperature	°F	-13...104	-13...104	-13...104	-13...104	-13...104	-13...104
Weight	lbs	46	56	75	75	98	99
Insulation / Enclosure class	-	F / IP54	F / IP54	F / IP54	F / IP54	F / IP54	F / IP54

Performance Certified is for Installation Type D: ducted inlet, ducted outlet. Speed (RPM) shown is nominal. Performance is based on actual speed of test. The sound power level ratings shown are in decibels, referred to 10-12 watts calculated per AMCA Standard 301. The A-weighted sound ratings shown have been calculated per AMCA Standard 301. Values shown are for LWiA sound power levels for Installation Type D: ducted inlet, ducted outlet. Ratings include the effects of duct end correction. All values shown are calculated at 0.5" (static pressure in inches W.G.). The AMCA Certified Ratings Seal does not apply to SFP performance data.

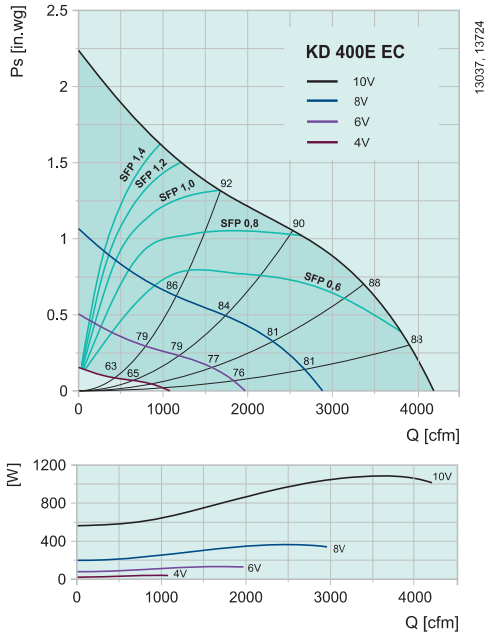
PERFORMANCE



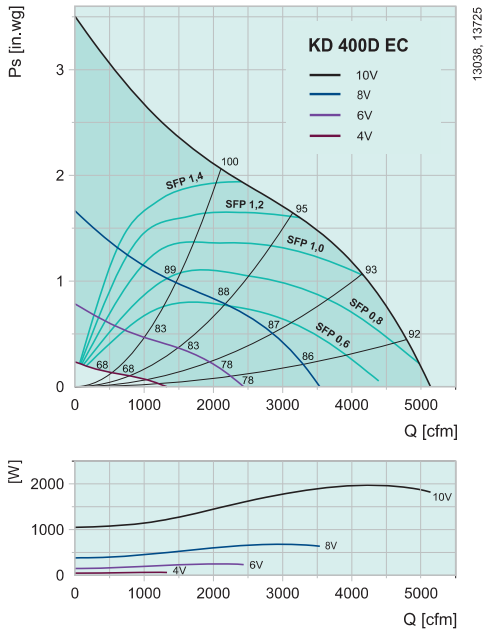
dB(A)	Tot	Frequency bands [Hz]							
		63	125	250	500	1k	2k	4k	8k
L_{wA} Inlet	87	81	83	81	74	73	67	62	54
L_{wA} Outlet	85	81	78	80	72	73	69	62	55



dB(A)	Tot	Frequency bands [Hz]							
		63	125	250	500	1k	2k	4k	8k
L_{wA} Inlet	86	80	83	81	73	70	64	59	53
L_{wA} Outlet	85	80	78	80	75	73	68	61	56



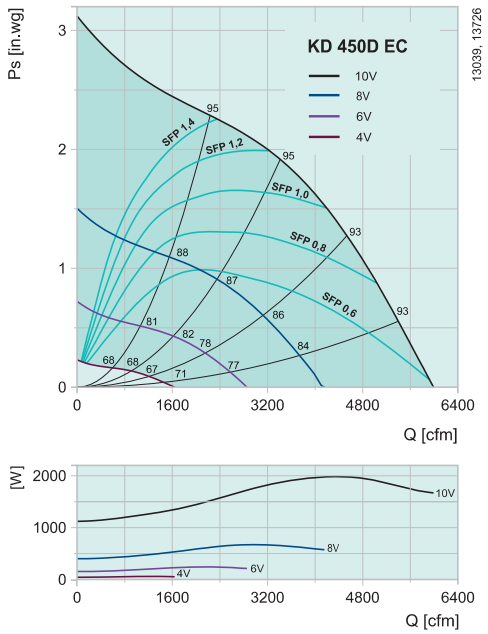
dB(A)	Tot	Frequency bands [Hz]							
		63	125	250	500	1k	2k	4k	8k
L_{wA} Inlet	92	90	84	83	79	74	70	66	60

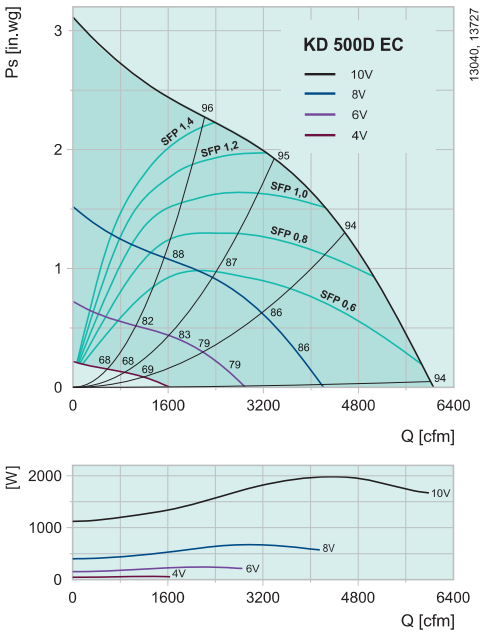


dB(A)	Tot	Frequency bands [Hz]							
		63	125	250	500	1k	2k	4k	8k
L_{wA} Inlet	100	97	88	94	86	81	77	72	67

Performance Certified is for Installation Type D: ducted inlet, ducted outlet. Speed (RPM) shown is nominal. Performance is based on actual speed of test. The sound power level ratings shown are in decibels, referred to 10-12 watts calculated per AMCA Standard 301. The A-weighted sound ratings shown have been calculated per AMCA Standard 301. Values shown are for LWiA sound power levels for Installation Type D: ducted inlet, ducted outlet. Ratings include the effects of duct end correction. All values shown are calculated at 0.5" (static pressure in inches W.G.). The AMCA Certified Ratings Seal does not apply to SFP performance data.

PERFORMANCE





dB(A)	Tot	Frequency bands [Hz]							
		63	125	250	500	1k	2k	4k	8k
L_{wA} Inlet	95	90	90	89	85	82	76	71	66

dB(A)	Tot	Frequency bands [Hz]							
		63	125	250	500	1k	2k	4k	8k
L_{wA} Inlet	96	90	91	89	85	80	76	71	65

Performance Certified is for Installation Type D: ducted inlet, ducted outlet. Speed (RPM) shown is nominal. Performance is based on actual speed of test. The sound power level ratings shown are in decibels, referred to 10-12 watts calculated per AMCA Standard 301. The A-weighted sound ratings shown have been calculated per AMCA Standard 301. Values shown are for LWiA sound power levels for Installation Type D: ducted inlet, ducted outlet. Ratings include the effects of duct end correction. All values shown are calculated at 0.5" (static pressure in inches W.G.). The AMCA Certified Ratings Seal does not apply to SFP performance data.

How much energy will this fan ~~waste?~~ conserve?

Let's talk SFP.

A lot of people like to talk about full load efficiency. But here's the thing. Many air movement applications only need to operate at full load a small percentage of the time. That's why we calculate the efficiency of our ECM fans at all duty points by using Specific Fan Power, or SFP. This value represents a fan's true efficiency during part-load periods. In other words, SFP tells the whole story. Like the other 364 days.

It's time to change the conversation.

MUB

Square inline duct ECM fans

- High airflow fan: up to 6,300 cfm
- Interchangable panels to choose the airflow direction
- Pre-wired speed control potentiometer for air flow adjustments and balancing
- Speed control via 0-10 Vdc from BMS or other source

APPLICATION

The MUB commercial inline fan is designed to be a part of an efficient, flexible and versatile supply or exhaust ventilation system. With its EC motor, the MUB fan is suitable for applications where energy can be saved via demand-based air movement control.

DESIGN

All models are equipped with impellers with backward curved aluminum blades with reduced noise emissions. The casing consists of an aluminum frame with fiberglass reinforced nylon corners; highly shock-resistant. The double skin panels are manufactured from galvanized steel with 25/32" polyolefin insulation for excellent sound reduction and thermal properties. The insulated space between the panels prevents condensation on the screws.The flexibility offered by the removable panels allowing the MUB's airflow direction to be selected on site: straight through or 90^0 airflow paths are possible. Any outlet side can be chosen.

SPEED CONTROL

The MUB fan motor's speed is controlled via a 0-10Vdc signal. The motor provides a +10V reference that can be used by a remotely-mounted potentiometer (such as MTP 10). The motor can also be controlled by an externally-provided 0-10Vdc signal that can come from any device or a Building Management System (BMS). The fan's motor also provides operational speed (tachometer pulse) output that can be used to verify fan operation. These control features allow the MUB to be integrated into and play an active role in smart HVAC systems in buildings.

If constant (reduced) speed operation is desired, the fan's speed can be manually adjusted and set via the integral potentiometer located in the electrical enclosure. The potentiometer permits the system balancer to dial in the necessary air flow rate.

MOTOR PROTECTION

The motor is integrated with electronic protection to ensure safe operation.

ACCESSORIES

Mounting clamps
p. 114

Duct silencer
p. 114

Iris damper
p. 55

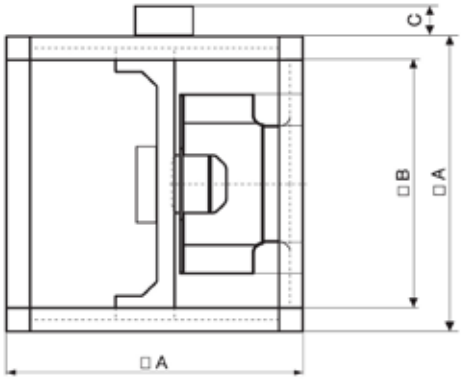
SWITCHES AND CONTROLS

Potentiometer
p. 119

Constant pressure control
p. 119

5-step switch
p. 119

DIMENSIONS



	A	B	C
MUB 16	19 5/8	16 1/2	2 3/8
MUB 20	23 5/8	20 1/2	2 3/8
MUB 24 / 24H	27 5/8	24 1/2	2 3/8

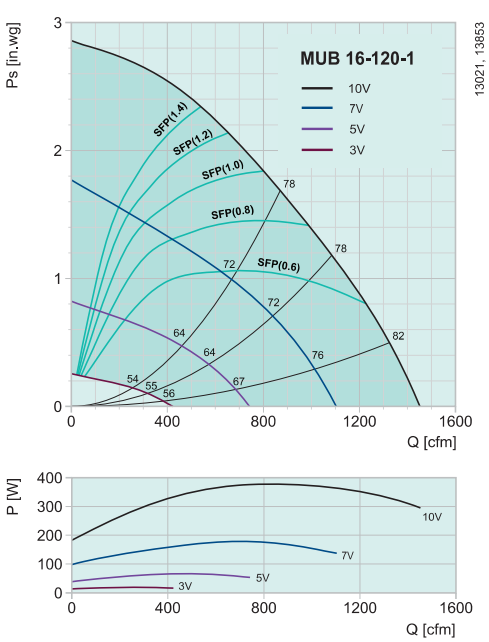
Dimensional information is in inches

SPECIFICATION DATA (STRAIGHT AIRFLOW / 90° AIRFLOW)

		MUB 16-120-1	MUB 16-240-1	MUB 20-120-1	MUB 20-240-1	MUB 20-230-3
Voltage/Frequency	50/60Hz	120	240	120	240	230
Nominal voltage range	V	100...130	200...270	100...130	200...277	200...240
Phase	~	1	1	1	1	3
Maximum airflow	cfm	1,451 / 1,462	1,572 / 1,576	2,044 / 2,240	2,570 / 2,822	2,627 / 2,873
Rpm	min^{-1}	2,193 / 2,207	2,446 / 2,456	1,300 / 1,307	1,691 / 1,701	1,764 / 1,762
Power rating, motor	W	378 / 395	501 / 508	364 / 373	747 / 753	826 / 821
Current	A	4.2	2.9	4.5	3.5	2.6
MCA	A	5.3	3.7	5.7	4.4	3.3
MOP	A	15	15	15	15	15
Operational temperature	°F	-13...140	-13...104	-13...104	-13...104	-13...104
Weight	lbs	60	60	95	95	95
Insulation / Enclosure class	-	B / IP44	B / IP44	B / IP54	B / IP54	B / IP54

		MUB 20-460-3	MUB 24-230-3	MUB 24-460-3	MUB 24H-230-3	MUB 24H-460-3
Voltage/Frequency	50/60Hz	460	230	460	230	460
Nominal voltage range	V	380...480	200...240	380...480	200...240	380...480
Phase	~	3	3	3	3	3
Maximum airflow	cfm	2,652 / 2,888	3,779 / 4,134	3,252 / 4,032	5,740 / 6,325	5,564 / 6,204
Rpm	min^{-1}	1,760 / 1,759	1,560 / 1,560	1,563 / 1,562	1,715 / 1,713	1,714 / 1,714
Power rating, motor	W	551 / 502	1,074 / 1,098	696 / 706	2,468 / 2,772	1,422 / 1,665
Current	A	0.9	3.3	1.1	8.5	1.9
MCA	A	2.0	3.7	2.4	10.7	5.4
MOP	A	15	15	15	20	15
Operational temperature	°F	-13...104	-25...122	-25...140	-13...122	-13...140
Weight	lbs	95	128	128	150	150
Insulation / Enclosure class	-	B / IP44	B / IP54	B / IP54	B / IP54	B / IP54

PERFORMANCE



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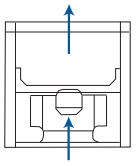

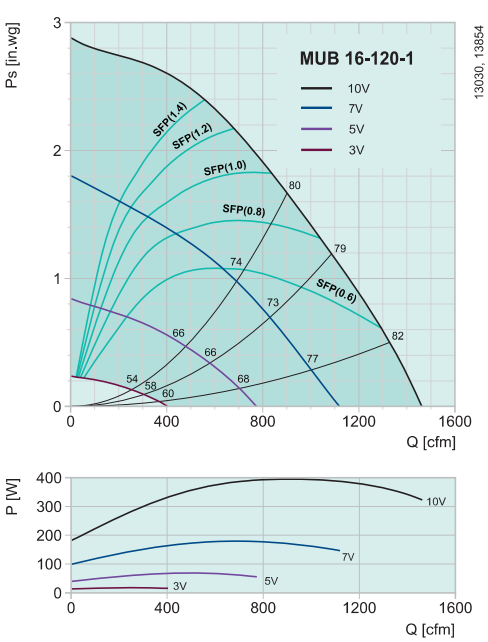

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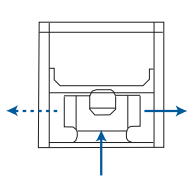
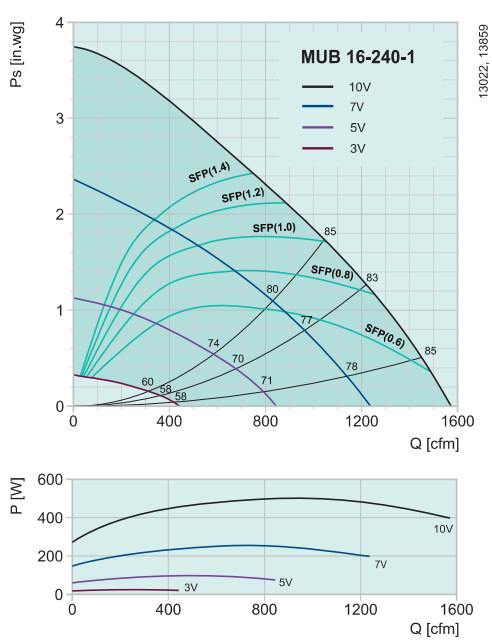


dB(A)	Tot	Frequency bands [Hz]							
		63	125	250	500	1k	2k	4k	8k
L_{wA} Inlet	80	70	73	76	71	69	68	66	60
L_{wA} Outlet	83	70	78	80	69	70	71	67	59
L_{wA} Radiated	67	62	53	64	57	47	43	40	31



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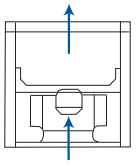

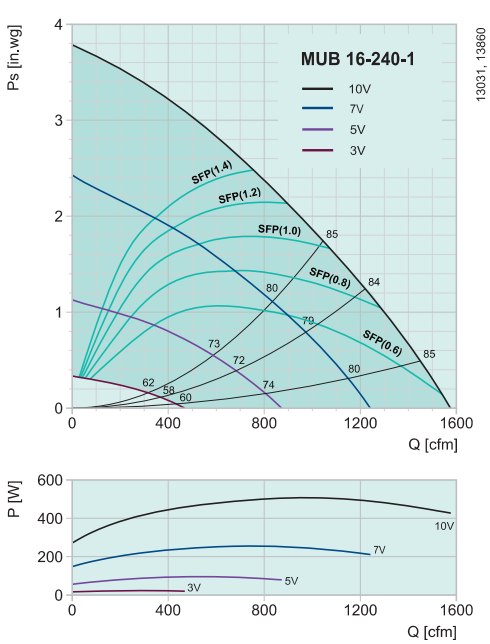

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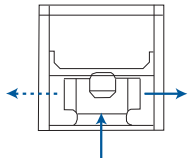
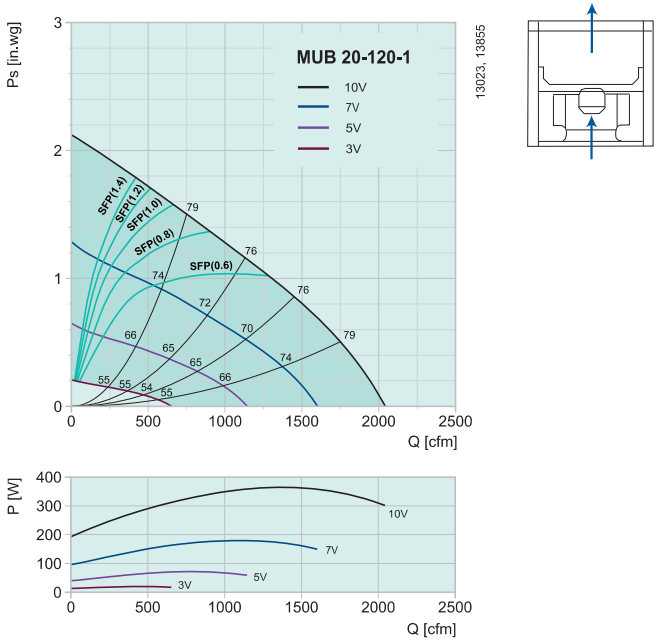
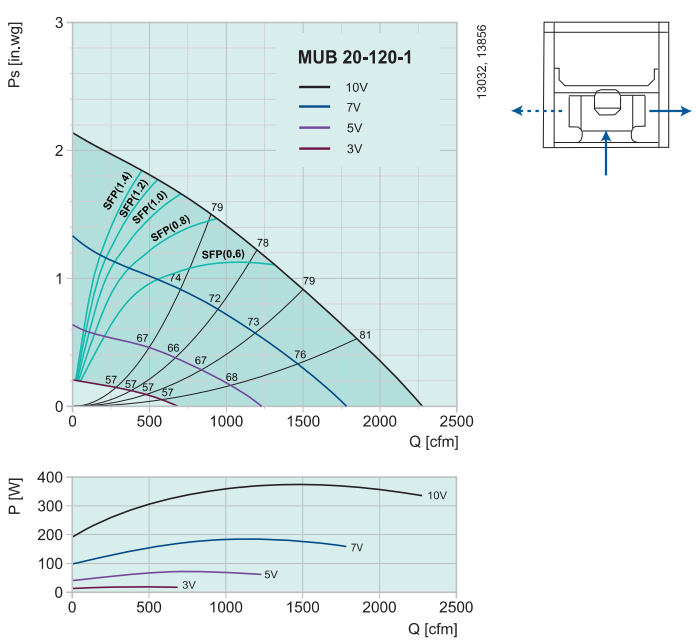


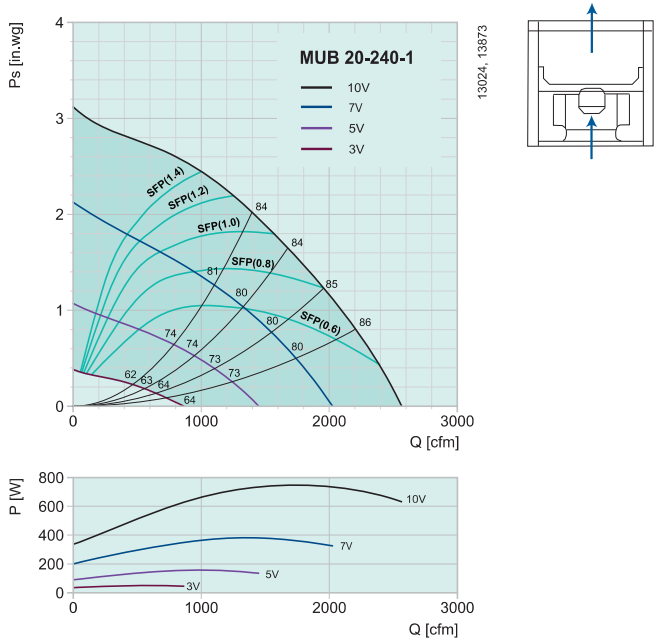
dB(A)	Tot	Frequency bands [Hz]							
		63	125	250	500	1k	2k	4k	8k
L_{wA} Inlet	85	69	78	80	79	76	72	70	63
L_{wA} Outlet	86	71	83	79	78	75	76	69	63
L_{wA} Radiated	74	68	59	71	67	53	51	45	36

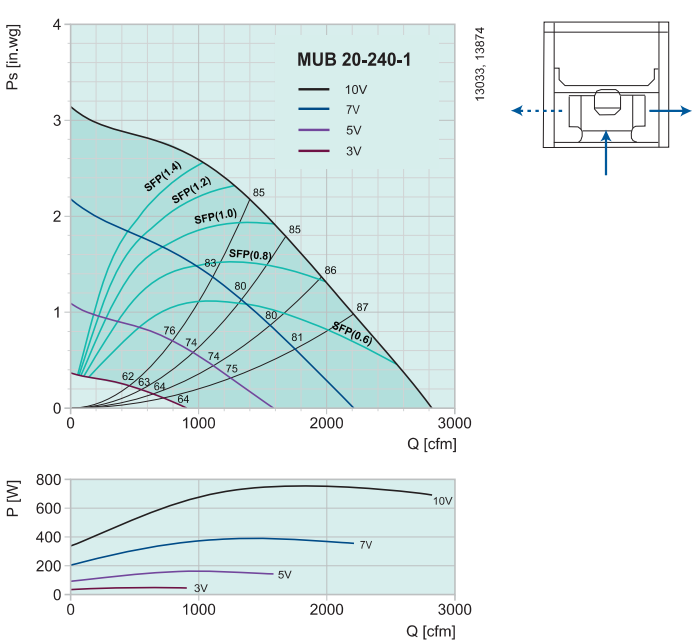
PERFORMANCE





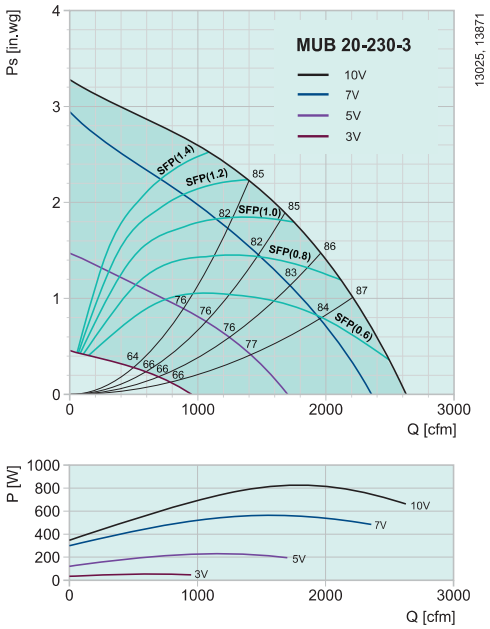
dB(A)	Tot	Frequency bands [Hz]							
		63	125	250	500	1k	2k	4k	8k
L_{wA} Inlet	79	72	76	71	68	63	62	59	53
L_{wA} Outlet	83	75	82	69	67	67	63	59	50
L_{wA} Radiated	66	62	60	61	55	40	36	34	27





dB(A)	Tot	Frequency bands [Hz]							
		63	125	250	500	1k	2k	4k	8k
L_{wA} Inlet	85	76	81	76	74	72	74	76	72
L_{wA} Outlet	89	78	88	77	75	75	73	73	68
L_{wA} Radiated	72	67	65	68	62	50	48	48	41

PERFORMANCE



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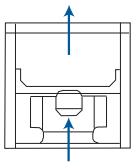

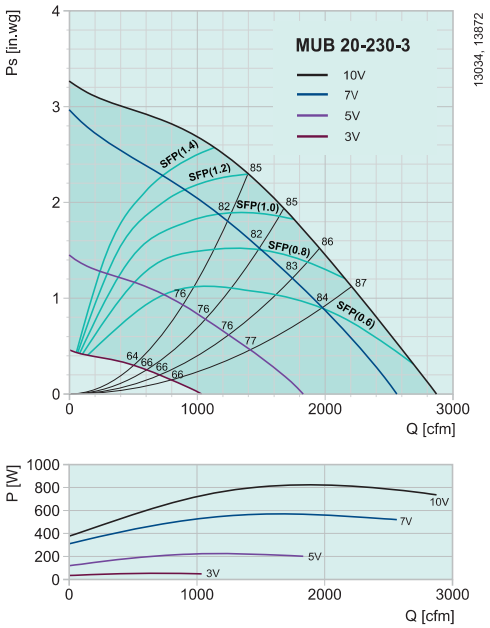

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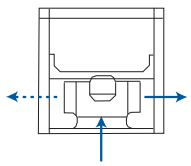
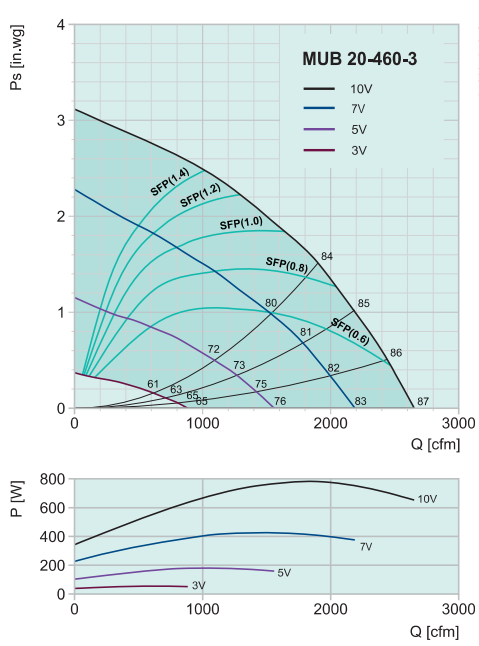


dB(A)	Tot	Frequency bands [Hz]							
		63	125	250	500	1k	2k	4k	8k
L_{wA} Inlet	86	75	82	78	75	72	73	76	76
L_{wA} Outlet	88	77	86	78	75	75	73	73	71
L_{wA} Radiated	73	67	65	69	63	51	46	49	44



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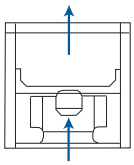
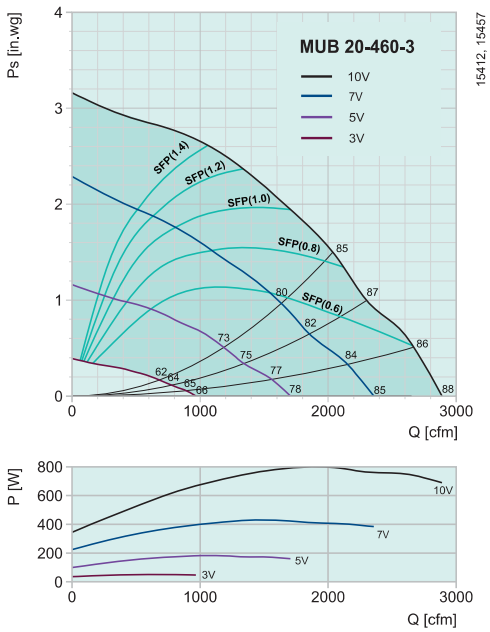
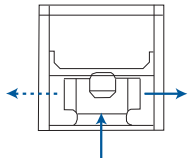


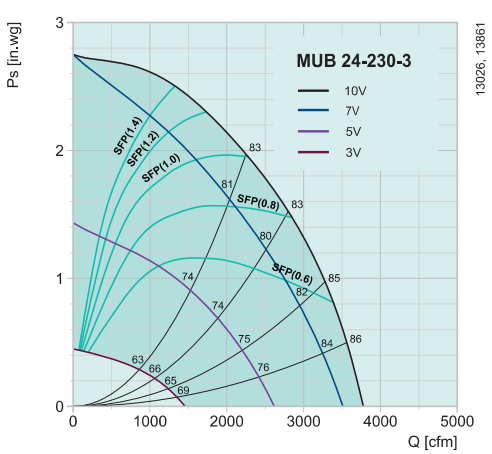


15412, 15457



dB(A)	Tot	Frequency bands [Hz]							
		63	125	250	500	1k	2k	4k	8k
L_{wA} Inlet	85	73	81	78	76	72	72	71	75
L_{wA} Outlet	88	75	86	80	78	76	73	71	71
L_{wA} Radiated	73	61	65	70	66	55	53	54	48

PERFORMANCE



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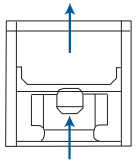

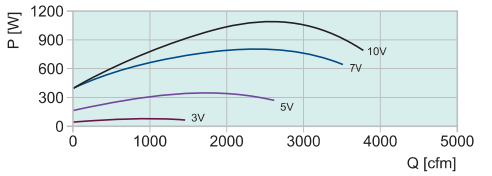

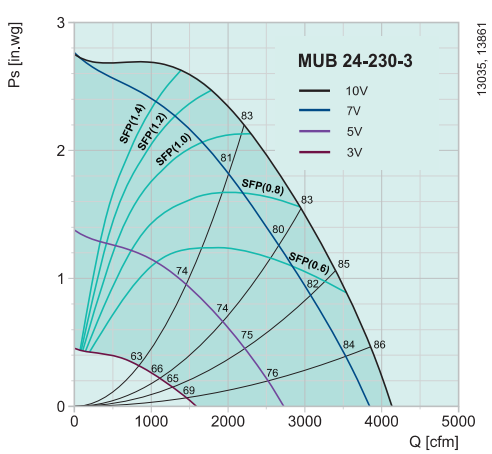

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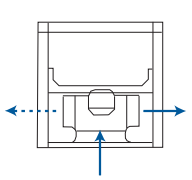
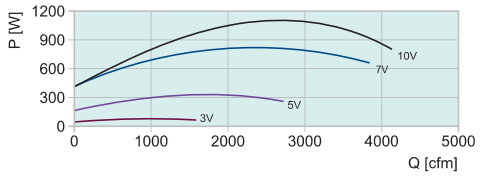
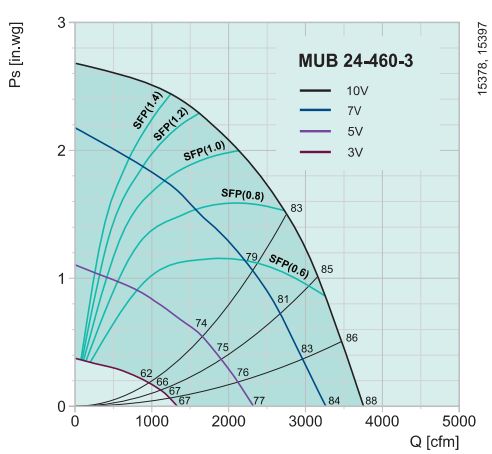




dB(A)	Tot	Frequency bands [Hz]							
		63	125	250	500	1k	2k	4k	8k
L_{wA} Inlet	84	74	80	76	73	71	70	65	61
L_{wA} Outlet	87	77	85	77	75	77	72	64	60
L_{wA} Radiated	72	57	65	70	62	52	45	41	34



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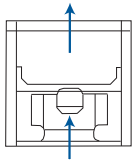

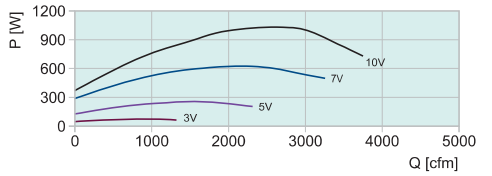

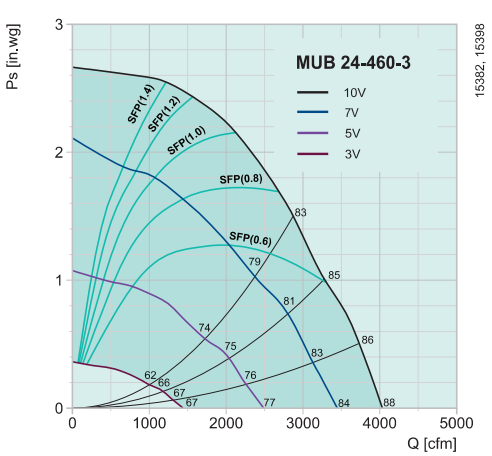

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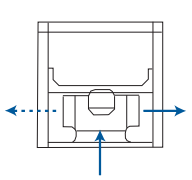
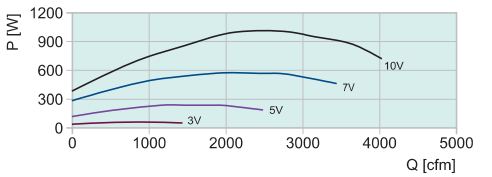
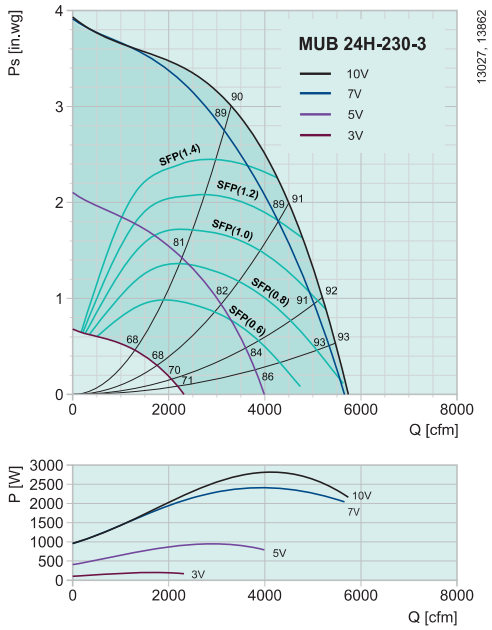




dB(A)	Tot	Frequency bands [Hz]							
		63	125	250	500	1k	2k	4k	8k
L_{wA} Inlet	83	73	80	77	74	68	68	68	59
L_{wA} Outlet	76	76	82	77	76	74	70	69	59
L_{wA} Radiated	73	59	66	71	64	55	45	41	28

PERFORMANCE



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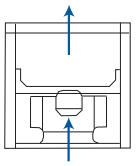

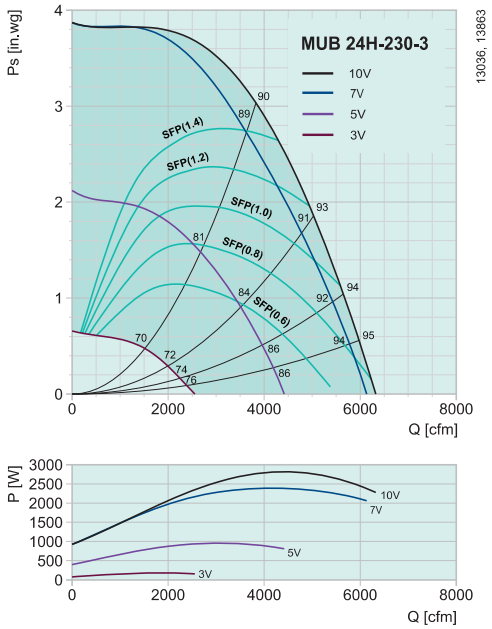

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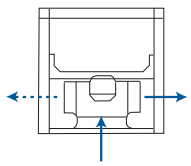
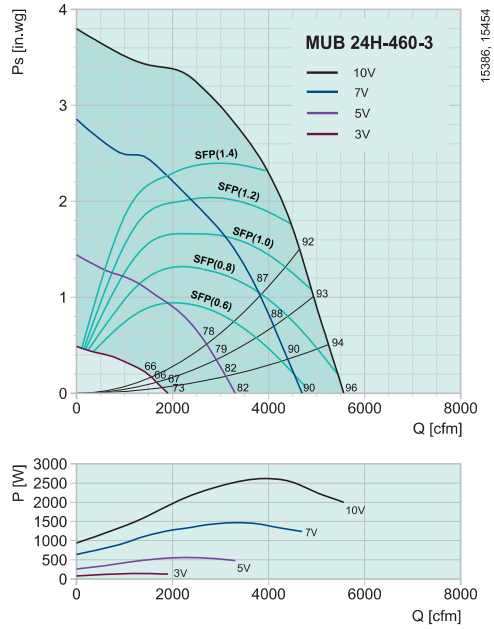


dB(A)	Tot	Frequency bands [Hz]							
		63	125	250	500	1k	2k	4k	8k
L_{wA} Inlet	90	82	82	87	81	77	76	73	68
L_{wA} Outlet	93	83	87	89	83	82	78	73	69
L_{wA} Radiated	82	72	66	80	70	56	50	49	40



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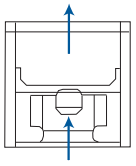

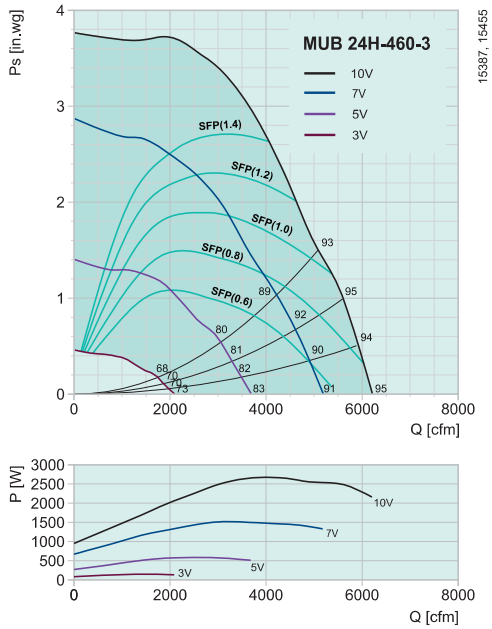

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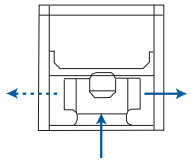


dB(A)	Tot	Frequency bands [Hz]							
		63	125	250	500	1k	2k	4k	8k
L_{wA} Inlet	93	82	85	88	86	79	80	82	70
L_{wA} Outlet	96	84	89	91	89	85	82	81	70
L_{wA} Radiated	84	71	70	83	75	64	55	56	42

Reference: Evergreen Heights Elementary School, Auburn, WA

How much does an ECM fan ~~cost?~~ save?

Let's talk SFP.

A lot of people like to talk about full load efficiency. But here's the thing. Many air movement applications only need to operate at full load a small percentage of the time. That's why we calculate the efficiency of our ECM fans at all duty points by using Specific Fan Power, or SFP. This value represents a fan's true efficiency during part-load periods. In other words, SFP tells the whole story. Like the other 364 days.

It's time to change the conversation.

DVC

Exhaust roof ECM fans

Systemair Inc. certifies that the Series shown are licensed to bear the AMCA Seal. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 211 and Publication 311 and certified and comply with the requirements of the AMCA Certified Ratings Program.

- Airflow up to 6,900 cfm
- 100% controllable fan
- Low noise emissions and safe operation
- Integrated pressure sensors
- Constant pressure operation
- Speed control via 0-10 Vdc from BMS or other source

ACCESSORIES

Flat curb
p. 118

Roof mount damper
p. 118

SWITCHES AND CONTROLS

Potentiometer
p. 119

Constant pressure control
p. 119

Motor diconnect
p. 119

5-step switch
p. 119

APPLICATION

With its EC motor, the DVC fan is suitable for roof-mounted exhaust applications where high operating efficiency and/or demand-based exhaust rates are desired.

DESIGN

The DVC P/S roof fans are driven by external rotor EC-motors with high efficiency. The input voltage for single phase units can vary between 200 and 277V, for three phase units between 380 and 480V. All motors are suitable for 60Hz and are suspended on effective vibration dampers.

Casing is manufacturd from seawater-resistant aluminum, base frame is made from galvanised steel. Backward curved impellers manufactured from seawater resistant aluminium.

SPEED CONTROL

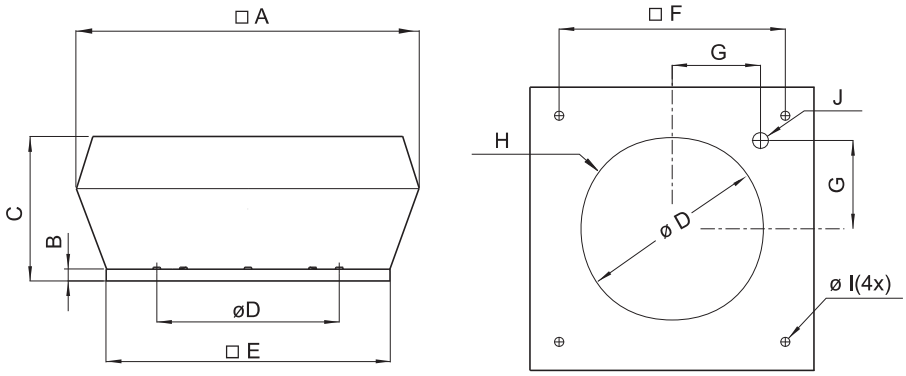
The DVC fan motor's speed is controlled via a 0-10Vdc signal. The motor provides a +10V reference that can be used by a remotely-mounted potentiometer (such as MTP 10). The motor can also be controlled by an externally-provided 0-10Vdc signal that can come from any device or a Building Management System (BMS). The fan's motor also provides operational speed (tachometer pulse) output that can be used to verify fan operation. These control features allow the DVC to be integrated into and play an active role in smart HVAC systems in buildings.

If constant (reduced) speed operation is desired, the DVC-S model's speed can be manually adjusted and set via the integral potentiometer located in the electrical enclosure. The potentiometer permits the system balancer to dial in the necessary air flow rate.

MOTOR PROTECTION

The motor is integrated with electronic protection to ensure safe operation.

DIMENSIONS



	A	B	C	øD	E	F	G	H	øI	J
DVC 10-P/S-230-1	14 1/2	1 3/16	6 11/16	8 3/8	13 3/16	9 5/8	4 1/8	M6 (6x)	10 (4x)	M20x1.5
DVC 14-P/S-230-1	22	1 3/16	13	11 1/4	17 1/8	13	5 3/4	M6 (6x)	10 (4x)	M20x1.5
DVC 18-P/S-230-1	28 5/16	1 3/16	15 3/8	17 1/4	23 7/16	17 11/16	7 7/8	M6 (6x)	12 (4x)	M20x1.5
DVC 22-P/S-460-3	35 7/16	1 3/16	18 5/16	17 1/4	26 3/16	21 1/16	9 5/16	M6 (6x)	12 (4x)	M20x1.5
DVC 30-P/S-460-3	45 1/4	1 3/16	22	23 13/16	37	29 1/2	11 17/32	M6 (6x)	12 (4x)	M20x1.5
DVC 30H-P/S-460-3	45 1/4	1 3/16	22	23 13/16	37	29 1/2	11 17/32	M6 (6x)	12 (4x)	M20x1.5

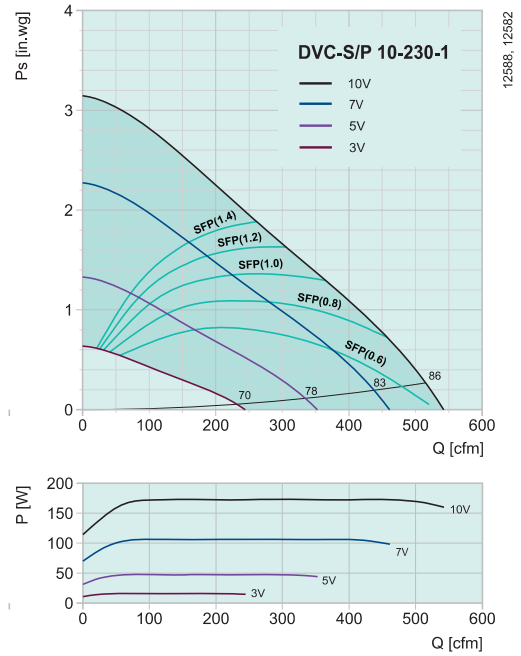
Dimensional information is in inches.

SPECIFICATION DATA

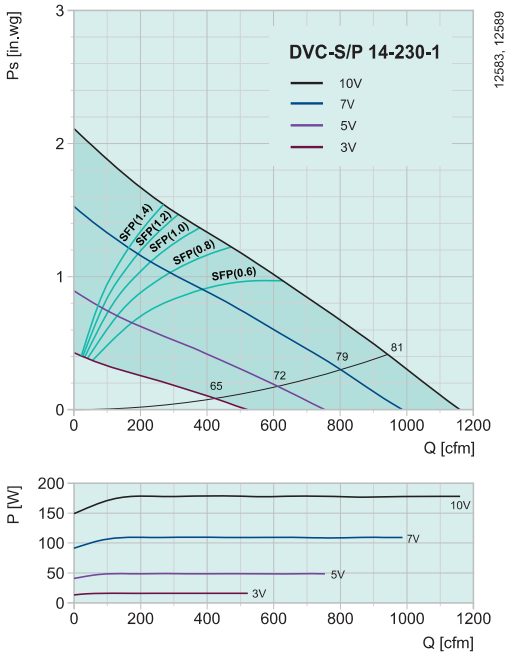
		DVC 10-P/S -230-1	DVC 14-P/S -230-1	DVC 18-P/S-230-1	DVC 22-P/S-460-3	DVC 30-P/S-460-3	DVC 30H-P/S-460-3
Voltage/Frequency	50/60Hz	230	230	230	460	460	460
Nominal voltage range	V	200.. 277	200.. 277	200.. 277	380.. 480	380.. 480	380.. 480
Phase	~	1	1	1	3	3	3
Maximum airflow	cfm	542	1,161	2,265	4,236	5,829	6,963
Rpm	min^{-1}	3,427	1,675	1,404	1,339	1,360	1,209
Power rating, motor	W	173	178	312	1,119	1,863	2,502
Current	A	1.3	1.3	2.5	1.7	2.5	3.1
MCA	A	1.38	1.56	3.1	2.13	4.25	5.13
MOP	A	15	15	15	15	15	15
Operational temperature	°F	-13...140	-13...140	-13...140	-13...140	-13...140	-13...140
Weight	lbs	20	29	46	108	159	179
Insulation / Enclosure class	-	B / IP44	B / IP44	B / IP54	B / IP54	F / IP54	F / IP54

Performance Certified is for Installation Type A: free inlet, free outlet. Performance ratings include the effects of an outlet bird screen. Speed (RPM) shown is nominal. Performance is based on actual speed of test. The sound power level ratings shown are in decibels, referred to 10-12 watts calculated per AMCA Standard 301. The A-weighted sound ratings shown have been calculated per AMCA Standard 301. Values shown are for L_{WiA} sound power levels for Installation Type A: free inlet, free outlet. Ratings do not include the effects of duct end correction. All values shown are calculated at 0.25" (static pressure in inches W.G.). The AMCA Certified Ratings Seal does not apply to SFP performance data.

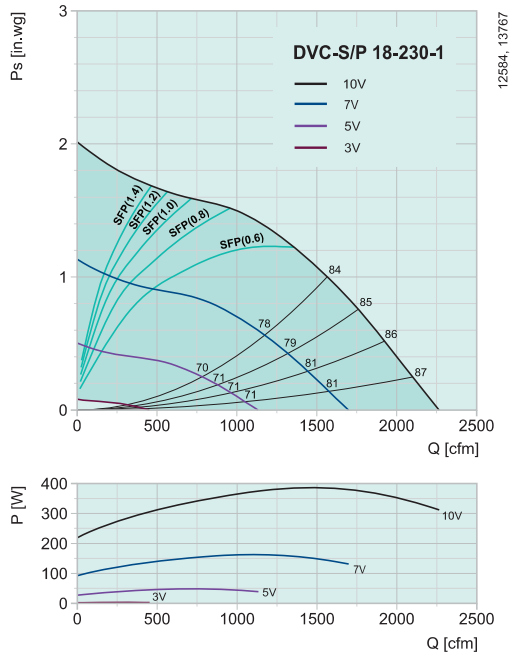
PERFORMANCE



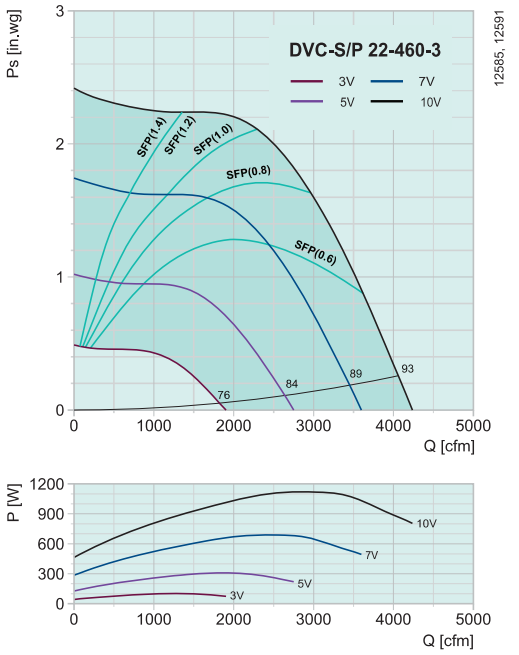
dB(A)	Tot	Frequency bands [Hz]							
		63	125	250	500	1k	2k	4k	8k
L_{WA} Inlet	86	75	75	79	82	78	75	73	70



dB(A)	Tot	Frequency bands [Hz]							
		63	125	250	500	1k	2k	4k	8k
L_{WA} Inlet	81	69	74	79	73	64	65	59	61



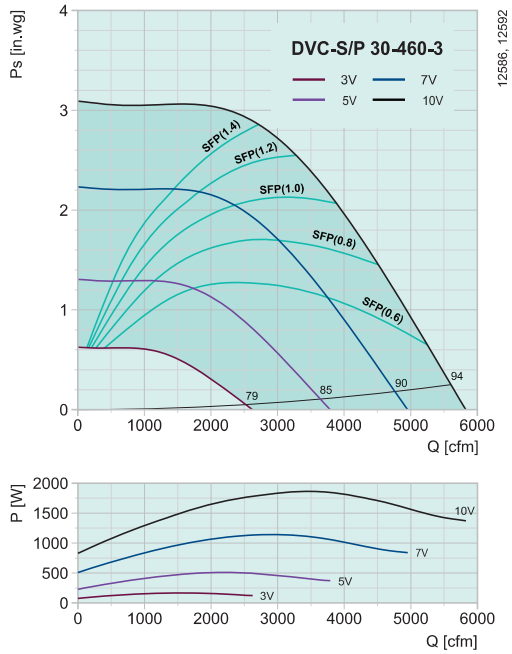
dB(A)	Tot	Frequency bands [Hz]							
		63	125	250	500	1k	2k	4k	8k
L_{WA} Inlet	84	75	78	82	71	61	58	68	56

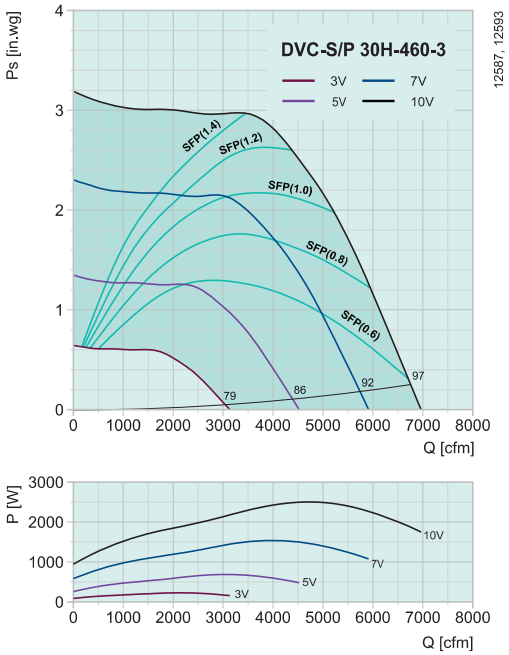


dB(A)	Tot	Frequency bands [Hz]							
		63	125	250	500	1k	2k	4k	8k
L_{WA} Inlet	93	76	90	88	81	71	71	76	76

Performance Certified is for Installation Type A: free inlet, free outlet. Performance ratings include the effects of an outlet bird screen. Speed (RPM) shown is nominal. Performance is based on actual speed of test. The sound power level ratings shown are in decibels, referred to 10-12 watts calculated per AMCA Standard 301. The A-weighted sound ratings shown have been calculated per AMCA Standard 301. Values shown are for LWiA sound power levels for Installation Type A: free inlet, free outlet. Ratings do not include the effects of duct end correction. All values shown are calculated at 0.25" (static pressure in inches W.G.). The AMCA Certified Ratings Seal does not apply to SFP performance data.

PERFORMANCE





dB(A)	Tot	Frequency bands [Hz]							
		63	125	250	500	1k	2k	4k	8k
L_{WA} Inlet	94	85	91	89	81	78	77	79	79

dB(A)	Tot	Frequency bands [Hz]							
		63	125	250	500	1k	2k	4k	8k
L_{WA} Inlet	97	84	94	94	78	77	75	77	78

Performance Certified is for Installation Type A: free inlet, free outlet. Performance ratings include the effects of an outlet bird screen. Speed (RPM) shown is nominal. Performance is based on actual speed of test. The sound power level ratings shown are in decibels, referred to 10-12 watts calculated per AMCA Standard 301. The A-weighted sound ratings shown have been calculated per AMCA Standard 301. Values shown are for LWiA sound power levels for Installation Type A: free inlet, free outlet. Ratings do not include the effects of duct end correction. All values shown are calculated at 0.25" (static pressure in inches W.G.). The AMCA Certified Ratings Seal does not apply to SFP performance data.

Air movement controllers

Wall-mount regulators

Exhaust grille/damper with presence and humidity sensors for automatic operation.

p. 52

Products with confidence

We test all of our products for air, sound and efficiency. It is important that the products perform at the levels we promise. To us, trust is very Systemair. Without giving our customers confidence, we wouldn't be where we are.

Duct-mount CAV regulators

Designed to measure and adjust airflow in circular ducts. Low noise level, centrically formed air stream and fixed test points.

p. 55

Duct-mount CAV regulators

Function to ensure the desired amount of air movement is maintained during variations in duct and space pressure.

p. 56

Duct-mount VAV regulators

Single and double wall insulation control-actuated dampers modulate air flow rate based on demand from the served space.

p. 58

BXC

Exhaust air self-regulating motorized damper with a motion and humidity sensor

- Integral presence and humidity sensors
- Silent operation
- Direct mounting on a wall
- Easy to install; automatic operation

APPLICATION

Automatic exhaust damper opens when presence or humidity is sensed. Damper may be part of a common-ducted, multi-port exhaust system.

DESIGN

BXC is a damper with integrated motion (PIR) and humidity sensor for bathroom installations. It may be installed either on the wall (in a vertical or horizontal position), or the ceiling. The BXC extract unit offers a range of possible airflow settings to meet specific needs, or regulatory requirements. The fixed shutter can be set at one of six positions, with an average step between each setting of + 17 cfm (maximum = + 85 cfm). This can be very useful to compensate for a lack of pressure.

CONTROLABILITY

The humidity and the motion sensors work independently of each other. The damper opens whenever motion is indicated and closes 25 min after the last indication. The humidity sensor controls the fully modulating damper from RH 30% to 75%. The movement sensor is dependent on a power supply and the BXC uses 12V AC. The humidity sensors will open the damper regardless of a power supply.

ACCESSORIES

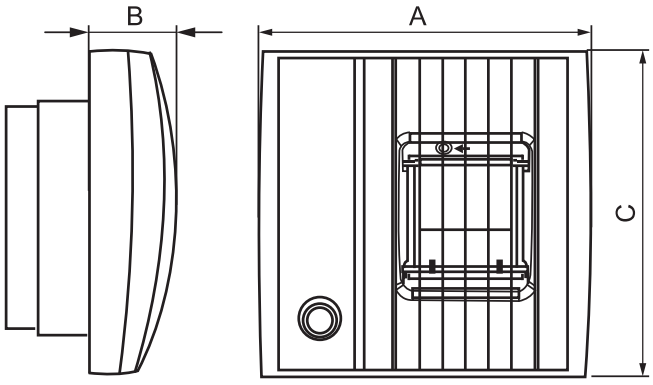
Duct adapter
p. 119

Power rectifier
p. 119

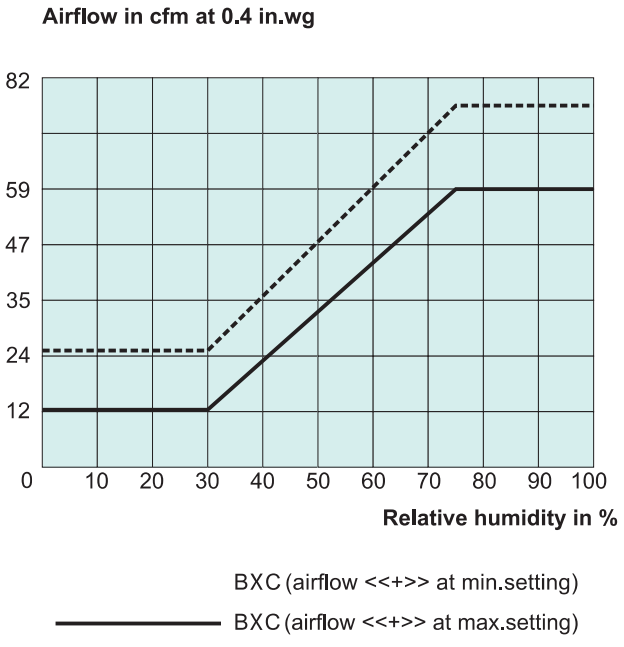
DIMENSIONS

	A	B	C
BXC 214EX	6 7/8	1 5/16	6 5/8

Dimensions are in inches



PERFORMANCE DATA



Data given on Ø4 inches

BXC

Exhaust air self-regulating motorized damper with a motion and humidity sensor

Precise and reliable mechanical humidity control

The humidity sensor incorporated in the BXC comprises an array of strips of polyamide; their natural hygroscopic properties are used to control one of the two dampers in the airflow.

Inherently reliable because of its simplicity (it operates without electricity), the array expands or contracts according to the relative humidity to which it is exposed. This movement is transmitted to the damper, thereby determining the flow area of the exhaust grille. This very responsive sensor (it reacts in less than two minutes following a sudden change of humidity) not only detects humidity but also controls the dampers with no additional energy input, using the natural motive force of the fabric subjected to a variation of humidity. Located outside of the airflow, the sensor is not at risk of clogging and retains its properties: its operation is guaranteed for 30 years. Each product undergoes no fewer than seven inspections and tests to make sure of its performance. A further advantage is the device's operating mode: it is proportional to the level of humidity, unlike most electronic sensors (hygrostats) incorporated in the fans on the market, which control on/off switches rather than adapt to the ventilation needed.

Image courtesy of Aereco S.A.

Smart presence detection for additional energy savings

The presence detection function in the BXC utilizes a very sensitive infrared detector that activates the peak airflow when it detects radiant movements within 6 ft in a 100° sector. Ideal for optimizing air quality in bathrooms these versions maximize energy savings:
A timer closes the exhaust grilles 20 minutes after the last detection to limit useless heat losses. Its action is delayed slightly for 60 seconds to avoid opening the unit unnecessarily.

So when the door of the bathroom is left open and someone walks past outside, the unit is not opened, but remains at the baseline airflow, thereby saving energy.

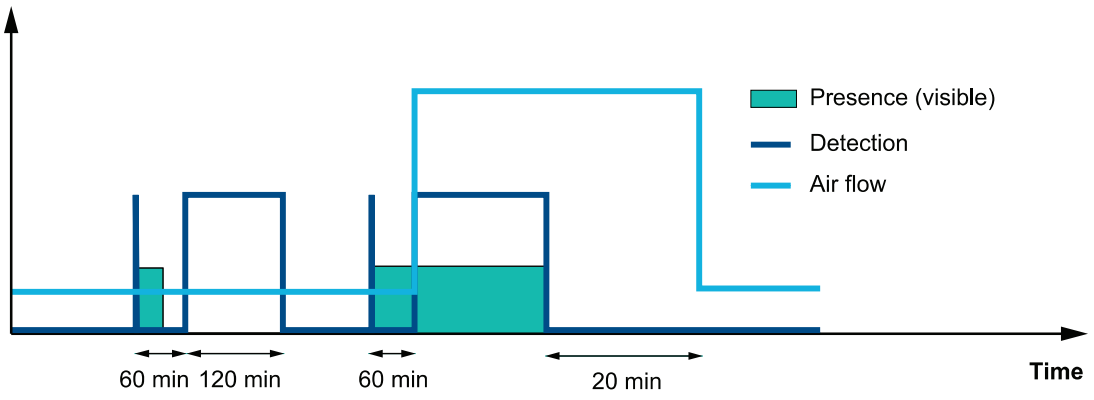


Chart courtesy of Aereco S.A.

BXC damper designed to be a part of a complete system

The BXC can be used in both multi-family and single family dwellings. In multi-family dwellings, the exhaust can be collective (generally one or two fans on the roof) or else individual (one fan for each dwelling).

Collective exhaust from multi-family dwellings

The air in the dwellings is changed by the fan, most often located in the roof (in an attic or on the roof). The air is extracted by exhaust grilles in the service rooms (kitchen, bathroom, etc), imposing an air change throughout the dwelling.

The humidity-controlled air inlets then distribute the fresh air according to the needs of each main room. BXC exhaust grilles in this way make it possible to distribute the available airflow generated by the fan according to the needs of the service rooms and dwellings. This means that rooms or dwellings with large fresh air needs receive larger flows than empty rooms or dwellings.

Exhaust air optimization

An exhaust grille that optimizes the performance of balanced systems with heat recovery. Modulation of the airflows at the terminals, which Systemair provides on its mechanical and natural ventilation systems, must not be regarded as opposed to the balanced technique. Quite the contrary, BXC demand controlled exhaust grilles are not only compatible with the balanced principle, they in fact optimize its functioning, since they serve to distribute the extracted airflow according to the needs of the service rooms. This helps improve indoor air quality by delivering, for example, a larger airflow to a bathroom when someone is taking a shower (the humidity increases, and the airflow extracted follows), all fully automatically.

Individual exhaust from dwellings

A fan is in this case installed in each dwelling. Locating the fan inside the dwelling has the advantage of making it directly accessible, facilitating maintenance. As in the case of the collective treatment of dwellings, air is extracted by humidity-controlled and/or presence detection exhaust grilles located in the service rooms (kitchen, bathrooms, etc). The airflows are therefore distributed according to the needs of each of these rooms. The fresh air is distributed by humidity-controlled air inlets located in the main rooms.

GOT A QUESTION?

E-mail us at
ADP@systemair.net

SPI

NEW!

- For measuring and adjusting airflow
- Galvanized sheet steel housing
- Rubber gaskets
- Duct sizes 4" thru 20" (100 thru 500 mm)

Iris damper for measuring and adjusting airflow

APPLICATION

SPI dampers are designed for measuring and adjusting airflow in ducts. Low noise level, centrically formed air stream and fixed test points for precise measurements are advantages of using these dampers. The minimum and maximum airflow settings are adjusted by means of a measuring nipple, and are fixed mechanically with damper stops.

The damper is equipped with an adjustment aperture that can be fully opened or partially closed. Max temperature is 158°F.

DESIGN

The dampers are manufactured from galvanized sheet steel and fitted with a rubber gasket on both collars.

MOUNTING

The dampers must be installed in accordance with the distances required to minimize air flow deviation. The SPI enables the taking of precise air flow measurements at all points including points close to duct deviations such as T junctions and bends, and points in front of other supply-air devices (see below).

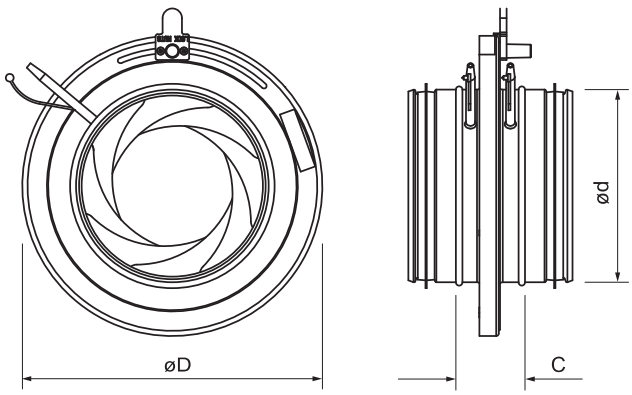
Minimum distance required	
before bends	1 X ØD
afterbends	1 X ØD
before Tee's	3 X ØD
after Tee's	1 X ØD
before supply-air devices	3 X ØD

AVAILABLE SIZES

4" (100 mm), 5" (125 mm), 8" (150 mm), 10" (200 mm), 12" (250 mm), 14" (300 mm), 16" (400 mm) and 18" (500 mm).

DIMENSIONS

	ød	C	øD	Weight, lbs
SPI 100	3 15/16	1 7/8	6 13/32	2
SPI 125	4 7/8	1 31/32	8 9/32	3
SPI 150	5 7/8	1 31/32	9 1/16	4
SPI 200	7 13/16	2 9/32	11 7/32	5
SPI 250	9 13/16	3 9/16	13 1/8	7
SPI 300	11 23/32	2 7/32	15 15/16	8
SPI 400	15 23/32	3 17/32	22 1/16	12
SPI 500	19 21/32	3 17/32	25 3/8	19



RDR-UL

- Constant airflow
- Silent operation
- Easy to install and operate

Round constant air volume (CAV) regulator

APPLICATION

The air flow regulator RDR-UL is a valve placed into the duct in order to obtain a constant flow within a pressure range from 0.2 and 1 in.wg. It is used in ventilation or air conditioning systems for supply or return air. For installation in horizontal and vertical ducts.

Design

The valve has a plastic material class M1 housing and galvanized steel sleeves. Available for various duct sizes from 4" to 10". Operating temperature is from 40°F to 140°F.

FUNCTIONALITY

The air is forced to pass through predetermined space, in which a flap can change the position according to the specified airflow. The requested airflow can be fixed by a manual screwdriver torx n10.

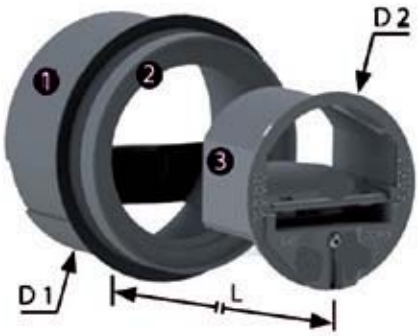
ORDERING EXAMPLE

RDR-UL-100/15 - 50

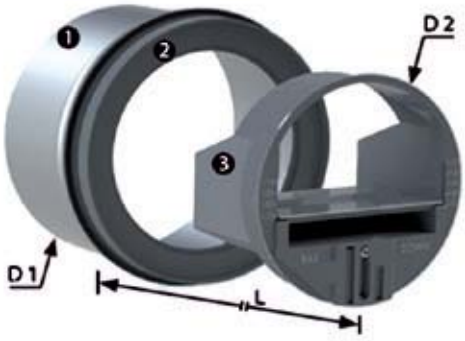
RDR-UL Regulator
Size of the duct in mm
Airflow in m^3/h (min-max)

AVAILABLE MODELS AND DIMENSIONS

	D1		D2		L	
	inch	mm	inch	mm	inch	mm
RDR-UL-100/15-50	3 3/4	96	3 5/8	93	2 3/4	70
RDR-UL-100/50-100	3 3/4	96	3 5/8	93	2 3/4	70
RDR-UL-125/15-50	4 3/4	120	4 5/8	117	3 3/8	86
RDR-UL-125/50-100	4 3/4	120	4 5/8	117	3 3/8	86
RDR-UL-125/100-180	4 3/4	120	4 5/8	117	3 3/8	86
RDR-UL-150/50-100	5 3/4	146	5 7/8	148	3 5/8	91
RDR-UL-150/100-180	5 3/4	146	5 7/8	148	3 5/8	91
RDR-UL-150/180-300	5 3/4	146	5 7/8	148	3 5/8	91
RDR-UL-200/100-180	7 1/2	190	7 5/8	195	3 5/8	91
RDR-UL-200/180-300	7 1/2	190	7 5/8	195	3 5/8	91
RDR-UL-200/300-500	7 1/2	190	7 5/8	195	3 5/8	91
RDR-UL-250/120-180	9 5/8	245	9 1/4	236	5	127
RDR-UL-250/180-300	9 5/8	245	9 1/4	236	5	127
RDR-UL-250/300-500	9 5/8	245	9 1/4	236	5	127
RDR-UL-250/500-700	9 5/8	245	9 1/4	236	5	127



Ø 3-4



Ø 5-10

RDR-UL

Round constant air volume (CAV) regulator

ACOUSTIC DATA

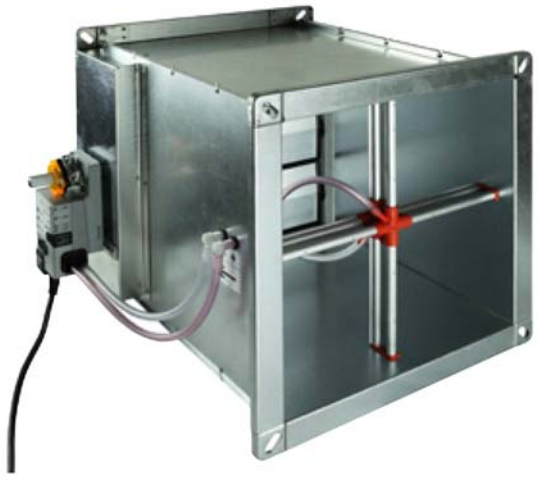
Airflow		Sound power Lw dB (A) @			
cfm	m3/h	0.2 in.wg	0.4 in.wg	0.6 in.wg	0.8 in.wg
8	15	25	29	32	35
16	30	26	31	35	38
26	45	27	33	36	39
29	50	32	37	39	42
35	60	32	37	39	42
44	75	32	37	40	42
53	90	32	38	41	44
71	120	30	34	39	42
88	150	33	37	41	45

Airflow		Sound power Lw dB (A) @			
cfm	m3/h	0.2 in.wg	0.4 in.wg	0.6 in.wg	0.8 in.wg
106	180	34	40	44	47
124	210	34	40	42	44
141	240	35	41	44	47
159	270	37	43	45	49
177	300	33	37	42	45
206	350	35	40	44	47
235	400	37	42	45	50
265	450	38	44	46	51
294	500	39	46	48	53

Optima-S

NEW!

Single wall rectangular VAV regulator



- Single skin VAV terminal device
- Airflow range from 85 to 33,696 cfm
- Pressure operating range up to 4 in.wg.
- Slave or Master control mode

APPLICATION

Optima-S VAV terminal units are ideal for multi-zone control with supply and return air applications at low or medium system pressures such as offices, hotel rooms or meeting rooms where the required cooling and heating load will vary on demand.

DESIGN

Optima-S units are constructed from sheet steel frame and aluminium profile blades. The frame construction contains a robust flanged mounting frame to ensure the sturdiness of the unit and to facilitate the mounting to upstream and downstream ducts.

The aerofoil blades are opposed action and are constructed from extruded aluminium throughout the blade to add rigidity and reduce the pressure loss and sound levels, which may be contributed to airflow stream passing over the blades. The blades are equipped with rubber gaskets to eliminate leakage in the closed position. The blade shafts sit in self-lubricating bearings, which are connected together by a gear wheel - rod combination to ensure a smooth ratio and transition from blade to blade.

AVAILABLE SIZES

W x H: 8" × 4" (200 x 100 mm) to 48" × 24" (1,200 x 600 mm)

CONTROL OPTIONS

- BLC1 - Belimo LMV-D3 compact controller WITH MP-Bus communication
- BLC4 - Belimo LMV-D3 compact controller WITHOUT MPBus communication
- BLC1-MOD - Belimo LMV-D3 compact controller WITH MODBUS communication

ORDERING EXAMPLE

Optima - Type - Size - Controller - Vmin - Vmax

S (Square)

Nominal size
W x H : 8”x4” to 48”x24”
(200x100 to 1,200x600 mm)

Controller type
BLC1, BLC4 or BLC1-MOD

Airflow (m^3/h)

If the Vmin and Vmax are not listed on your specification or order, Factory standard settings will be applied in accordance with the tables on the pages 60-61.

CONTROLABILITY

The Optima-S terminal units are standard equipped with BLC (Belimo compact) controllers without any bus- communication capability. The compact controllers are available with MPBus, ModBus and LON communication capability. On demand, gateway communication units can be provided and can be connected later in time to building management systems to create a zone control by creating bus-rings solutions (only possible if MP-Bus or Modbus communication is installed).

MOUNTING

On duct installations after elbow, reduction, T-branch etc. L to be minimum 3 times Duct equivalent effective diameter (D_{eff}). If L can not be respected, then minimum of 2 × D_{eff} with perforated equalizing grid should be installed.

$$D_{eff} = \frac{2 \times W \times H}{W + H} \qquad L_{min} = 3 \times D_{eff}$$

Optima-S

Single wall rectangular VAV regulator

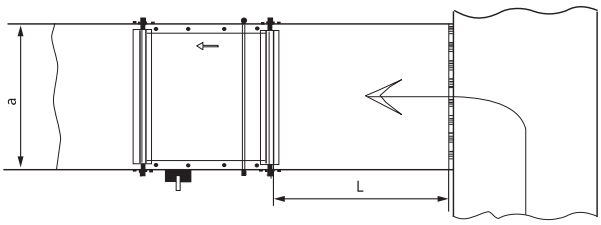


Fig. 1: Measuring track length after T-branch

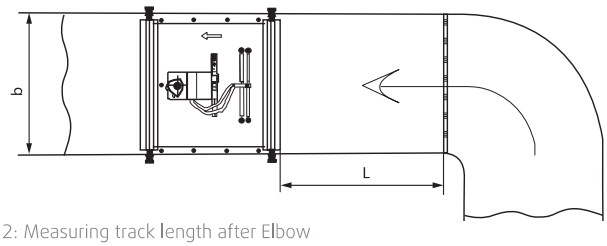


Fig. 2: Measuring track length after Elbow

On a horizontal T-branch installation L has to be 5-10 times duct cross-section. If L can not be respected, then minimum of 2.5 x cross section with perforated equalizing grid should be installed.

On a vertical T-branch or end dust installation L has to be 5-10 times duct cross-section. If L can not be respected, then minimum of 2.5 x cross section with perforated equalizing grid should be installed.

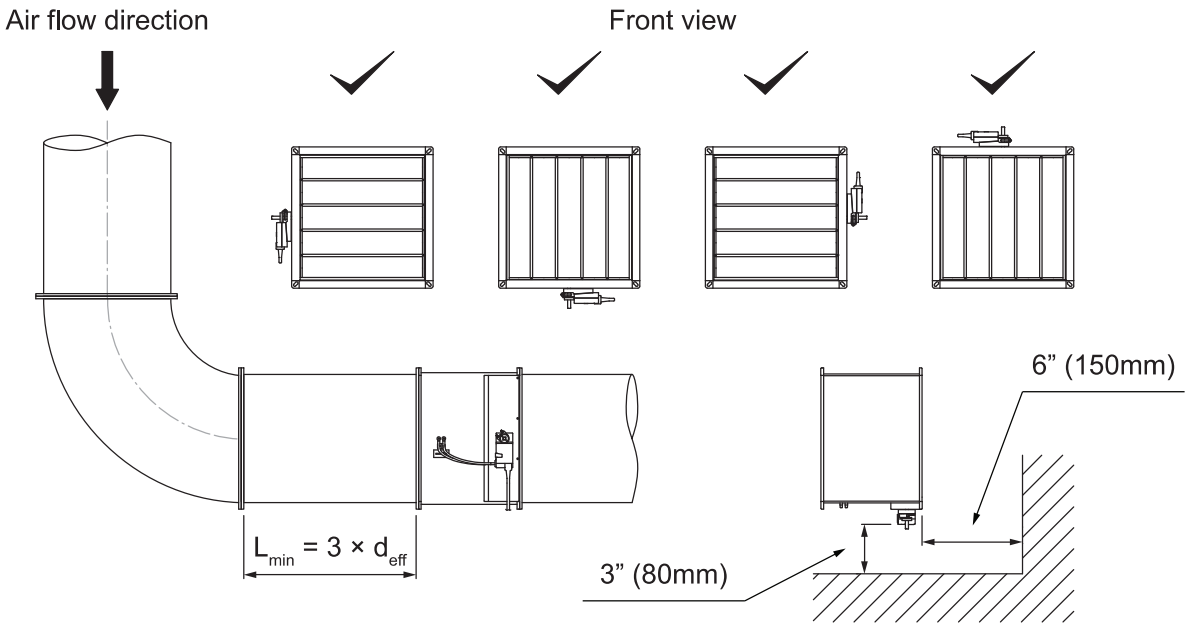
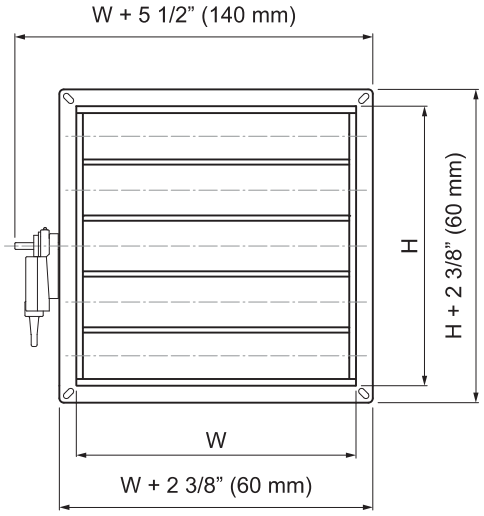
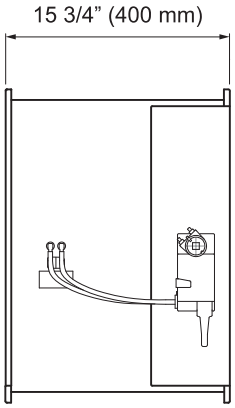
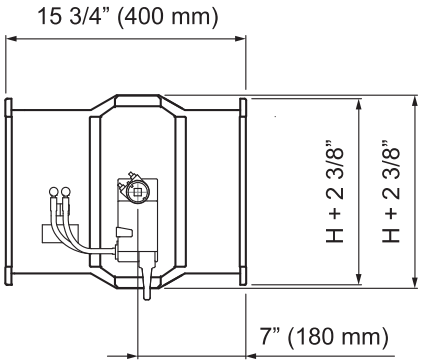


Fig. 3: Optima-S-I positioning and definition of measuring track length

DIMENSIONS • OPTIMA-S







(If H = 6, 10 or 14 inches or 150, 250, 350 mm)

QUICK SELECTION GUIDE • OPTIMA-S

Size				Weight	Airflow V_{min}		Airflow V_{max}		Control Option		
W		H			cfm	m^3/h	cfm	m^3/h	BLC1	BLC4	BLC1-MOD
inch	mm	inch	mm	lbs							
8	200	4	100	5	85	144	551	936	✓	✓	×
		6	150	9	127	216	826	1,404	✓	✓	✓
		8	200	13	170	288	1,102	1,872	✓	✓	✓
10	250	4	100	5	106	180	689	1,170	×	✓	×
		6	150	11	159	270	1,033	1,755	✓	✓	×
		8	200	15	212	360	1,377	2,340	✓	✓	✓
		10	250	15	265	450	1,722	2,925	✓	✓	×
12	300	4	100	7	127	216	826	1,404	✓	✓	×
		6	150	11	191	324	1,240	2,106	✓	✓	×
		8	200	15	254	432	1,653	2,808	✓	✓	✓
		10	250	15	318	540	2,066	3,510	✓	✓	×
		12	300	18	381	648	2,479	4,212	✓	✓	✓
16	400	4	100	9	170	288	1,102	1,872	✓	✓	×
		6	150	13	254	432	1,653	2,808	×	✓	×
		8	200	17	339	576	2,204	3,744	✓	✓	✓
		10	250	20	424	720	2,755	4,680	✓	✓	×
		12	300	22	509	864	3,305	5,616	✓	✓	✓
		16	400	26	678	1152	4,407	7,488	✓	✓	✓
20	500	6	150	15	318	540	2,066	3,510	×	✓	×
		8	200	20	424	720	2,755	4,680	✓	✓	✓
		10	250	20	530	900	3,443	5,850	✓	✓	✓
		12	300	20	636	1,080	4,132	7,020	✓	✓	✓
		16	400	24	848	1,440	5,509	9,360	✓	✓	✓
		20	500	33	1,059	1,800	6,886	11,700	✓	✓	×

QUICK SELECTION GUIDE • OPTIMA-S

Size				Weight	Airflow V_{min}		Airflow V_{max}		Controller Type		
W		H			cfm	m^3/h	cfm	m^3/h	BLC1	BLC4	BLC1-MOD
inch	mm	inch	mm	lbs							
24	600	6	150	17	381	648	2,479	4,212	✗	✓	✓
		8	200	26	509	864	3,305	5,616	✓	✓	✗
		10	250	22	636	1,080	4,132	7,020	✗	✓	✗
		12	300	31	763	1,296	4,958	8,424	✓	✓	✗
		16	400	31	1,017	1,728	6,611	11,232	✓	✓	✗
		20	500	40	1,271	2,160	8,264	14,040	✓	✓	✗
		24	600	42	1,526	2,592	9,916	16,848	✓	✓	✗
32	800	8	200	33	678	1,152	4,407	7,488	✗	✓	✗
		10	250	26	848	1,440	5,509	9,360	✗	✓	✗
		12	300	37	1,017	1,728	6,611	11,232	✗	✓	✓
		16	400	44	1,356	2,304	8,815	14,976	✓	✓	✗
		20	500	48	1,695	2,880	11,018	18,720	✓	✓	✗
		24	600	55	2,034	3,456	13,222	22,464	✓	✓	✗
		32	800	66	2,712	4,608	17,629	29,952	✗	✓	✗
40	1000	12	300	46	1,271	2,160	8,264	14,040	✓	✓	✗
		16	400	55	1,695	2,880	11,018	18,720	✓	✓	✗
		20	500	62	2,119	3,600	13,773	23,400	✓	✓	✗
		24	600	66	2,543	4,320	16,527	28,080	✓	✓	✗
48	1200	16	400	64	2,034	3,456	13,222	22,464	✗	✓	✗
		20	500	70	2,543	4,320	16,527	28,080	✗	✓	✗
		24	600	79	3,051	5,184	19,833	33,696	✗	✓	✗

✓	Standard option
✗	Non-standard option

Optima-S-I

NEW!

Double wall rectangular VAV regulator

- Double skin VAV terminal device
- Airflow range from 85 to 33,696 cfm
- Pressure operating range up to 4 in.wg.
- Slave or Master control mode

APPLICATION

Optima-S-I VAV terminal devices are ideal for multi-zone control with supply and return air applications at low or medium system pressures such as offices, hotel rooms or meeting rooms where the required cooling and heating load will vary on demand.

DESIGN

Optima-S-I units are constructed from sheet steel frame and aluminium profile blades. The frame construction contains a robust flanged mounting frame to ensure the sturdiness of the unit and to facilitate the mounting to upstream and downstream ducts.

The aerofoil blades are opposed action and are constructed from extruded aluminium throughout the blade to add rigidity and reduce the pressure loss and sound levels, which may be contributed to airflow stream passing over the blades. The blade shafts sit in self-lubricating bearings, which are connected together by a gear wheel to ensure a smooth ratio and transition from blade to blade.

AVAILABLE SIZES

W x H: 8" × 4" (200 x 100 mm) to 48" × 24" (1,200 x 600 mm)

CONTROL OPTIONS

- BLC1 - Belimo LMV-D3 compact controller WITH MP-Bus communication
- BLC4 - Belimo LMV-D3 compact controller WITHOUT MPBus communication
- BLC1-MOD - Belimo LMV-D3 compact controller WITH MODBUS communication

ORDERING EXAMPLE

Optima - Type - Size - Controller - Vmin - Vmax

S-I (Square-Insulated)

Nominal size
W x H : 8"x4" to 48"x24"
(200x100 to 1,200x600 mm)

Controller type
BLC1, BLC4 or BLC1-MOD

Airflow (m^3/h)

If the Vmin and Vmax are not listed on your specification or order, Factory standard settings will be applied in accordance with the tables on the pages 64-65.

CONTROLABILITY

The Optima-S-I terminal units are standard equipped with BLC (Belimo compact) controllers without any bus- communication capability. The compact controllers are available with MPBus, ModBus and LON communication capability. On demand, gateway communication units can be provided and can be connected later in time to building management systems to create a zone control by creating bus-rings solutions (only possible if MP-Bus or Modbus communication is installed).

MOUNTING

On duct installations after elbow, reduction, T-branch etc. L to be minimum 3 times Duct equivalent effective diameter (D_{eff}). If L can not be respected, then minimum of 2 × D_{eff} with perforated equalizing grid should be installed.

$$D_{eff} = \frac{2 \times W \times H}{W + H} \qquad L_{min} = 3 \times D_{eff}$$

Optima-S-I

Double wall rectangular VAV regulator

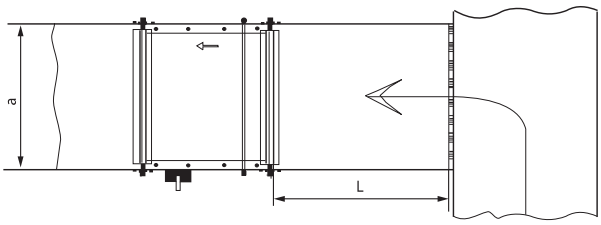


Fig. 4: Measuring track length after T-branch

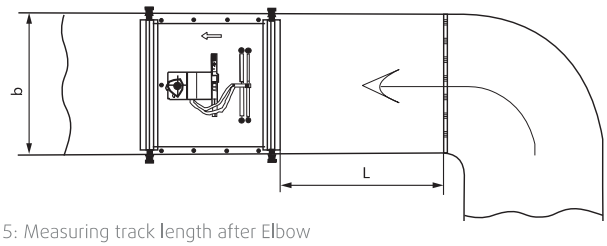


Fig. 5: Measuring track length after Elbow

On a horizontal T-branch installation L has to be 5-10 times duct cross-section. If L can not be respected, then minimum of 2.5 x cross section with perforated equalizing grid should be installed.

On a vertical T-branch or end dust installation L has to be 5-10 times duct cross-section. If L can not be respected, then minimum of 2.5 x cross section with perforated equalizing grid should be installed.

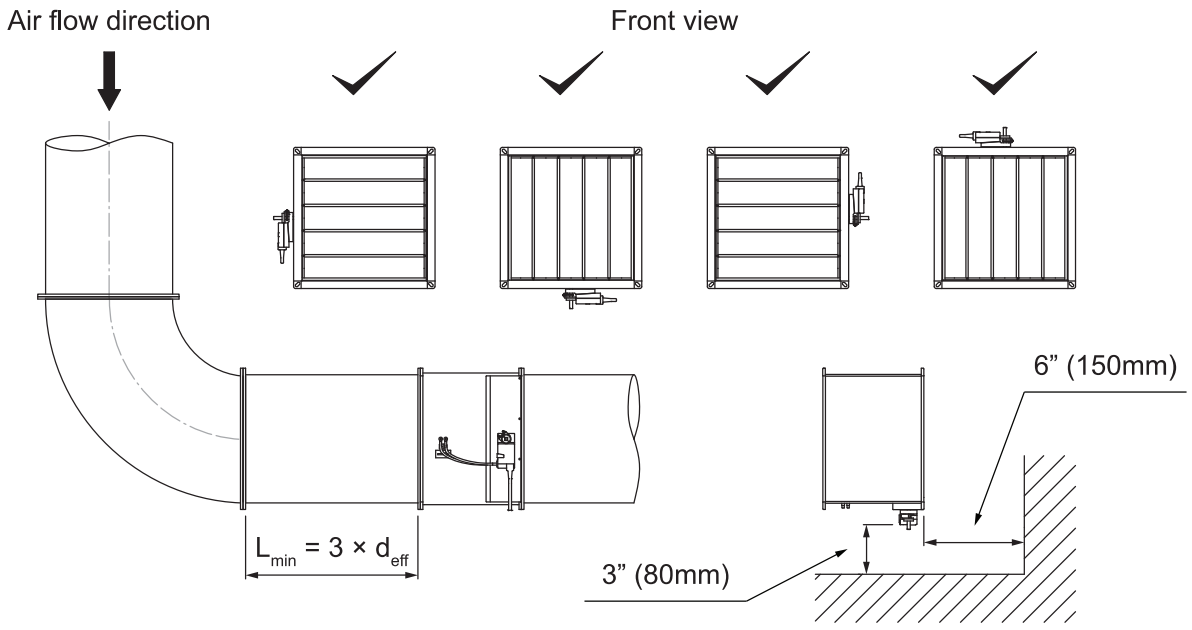
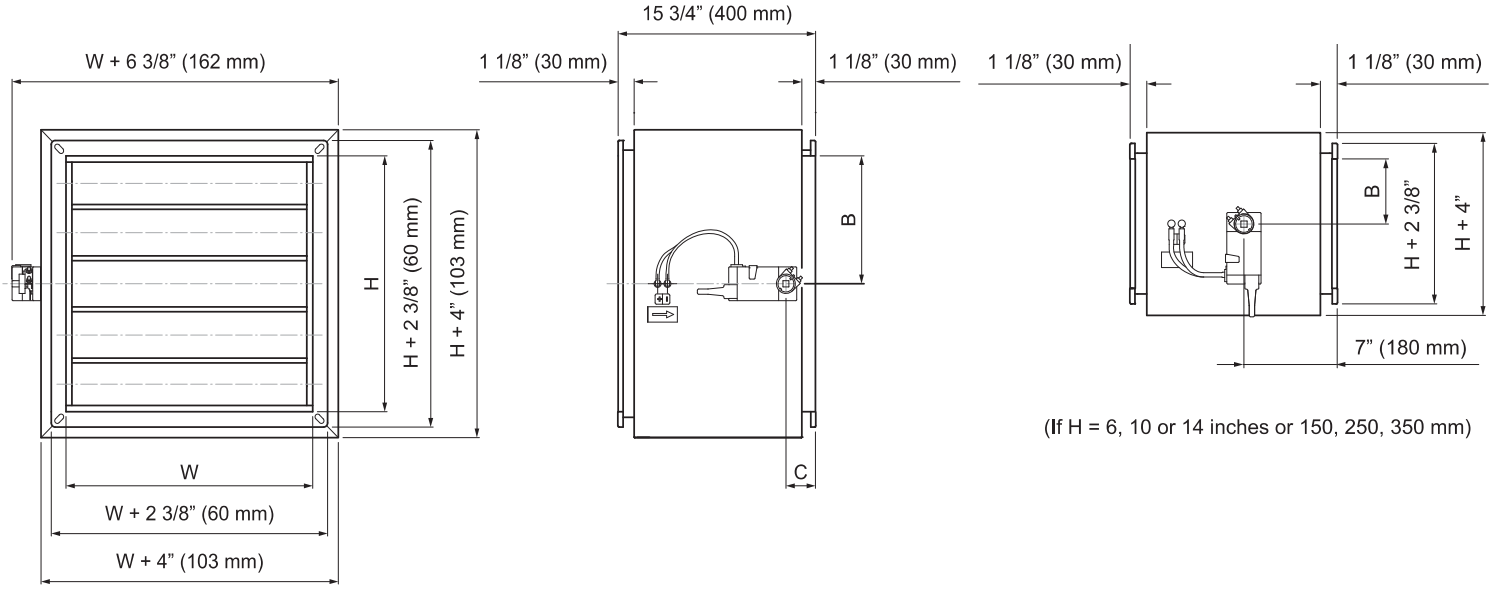


Fig. 6: Optima-S-I positioning and definition of measuring track length

DIMENSIONS • OPTIMA-S-I



(If H = 6, 10 or 14 inches or 150, 250, 350 mm)

QUICK SELECTION GUIDE • OPTIMA-S-I

Size				Weight	Airflow V_{min}		Airflow V_{max}		Control Option		
W		H			cfm	m^3/h	cfm	m^3/h	BLC1	BLC4	BLC1-MOD
inch	mm	inch	mm	lbs							
8	200	4	100	5	85	144	551	936	✓	✓	×
		6	150	9	127	216	826	1,404	×	✓	×
		8	200	13	170	288	1,102	1,872	✓	✓	×
10	250	4	100	5	106	180	689	1,170	×	✓	×
		6	150	11	159	270	1,033	1,755	×	✓	×
		8	200	15	212	360	1,377	2,340	×	✓	×
		10	250	15	265	450	1,722	2,925	×	✓	×
12	300	4	100	7	127	216	826	1,404	✓	✓	×
		6	150	11	191	324	1,240	2,106	✓	✓	×
		8	200	15	254	432	1,653	2,808	✓	✓	×
		10	250	15	318	540	2,066	3,510	×	✓	×
		12	300	18	381	648	2,479	4,212	✓	✓	×
16	400	4	100	9	170	288	1,102	1,872	✓	✓	×
		6	150	13	254	432	1,653	2,808	×	✓	×
		8	200	17	339	576	2,204	3,744	✓	✓	×
		10	250	20	424	720	2,755	4,680	×	✓	×
		12	300	22	509	864	3,305	5,616	✓	✓	×
		16	400	26	678	1152	4,407	7,488	✓	✓	×
20	500	6	150	15	318	540	2,066	3,510	×	✓	×
		8	200	20	424	720	2,755	4,680	✓	✓	✓
		10	250	20	530	900	3,443	5,850	×	✓	×
		12	300	20	636	1,080	4,132	7,020	✓	✓	×
		16	400	24	848	1,440	5,509	9,360	✓	✓	×
		20	500	33	1,059	1,800	6,886	11,700	✓	✓	×

QUICK SELECTION GUIDE • OPTIMA-S-I

Size				Weight	Airflow V_{min}		Airflow V_{max}		Controller Type		
W		H			cfm	m^3/h	cfm	m^3/h	BLC1	BLC4	BLC1-MOD
inch	mm	inch	mm	lbs							
24	600	6	150	17	381	648	2,479	4,212	×	✓	✓
		8	200	26	509	864	3,305	5,616	✓	✓	×
		10	250	22	636	1,080	4,132	7,020	×	✓	×
		12	300	31	763	1,296	4,958	8,424	✓	✓	×
		16	400	31	1,017	1,728	6,611	11,232	✓	✓	×
		20	500	40	1,271	2,160	8,264	14,040	✓	✓	×
		24	600	42	1,526	2,592	9,916	16,848	✓	✓	×
32	800	8	200	33	678	1,152	4,407	7,488	×	✓	×
		10	250	26	848	1,440	5,509	9,360	×	✓	×
		12	300	37	1,017	1,728	6,611	11,232	×	✓	✓
		16	400	44	1,356	2,304	8,815	14,976	✓	✓	×
		20	500	48	1,695	2,880	11,018	18,720	✓	✓	×
		24	600	55	2,034	3,456	13,222	22,464	✓	✓	×
		32	800	66	2,712	4,608	17,629	29,952	×	✓	×
40	1000	12	300	46	1,271	2,160	8,264	14,040	✓	✓	×
		16	400	55	1,695	2,880	11,018	18,720	✓	✓	×
		20	500	62	2,119	3,600	13,773	23,400	✓	✓	×
		24	600	66	2,543	4,320	16,527	28,080	✓	✓	×
48	1200	16	400	64	2,034	3,456	13,222	22,464	✓	✓	×
		20	500	70	2,543	4,320	16,527	28,080	×	✓	×
		24	600	79	3,051	5,184	19,833	33,696	×	✓	×

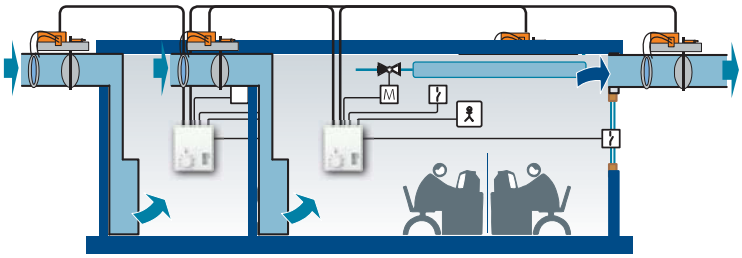
✓	Standard option
×	Non-standard option

Increased convenience
a better working atmosphere, optimum energy efficiency

VAV-Compact for convenient solutions

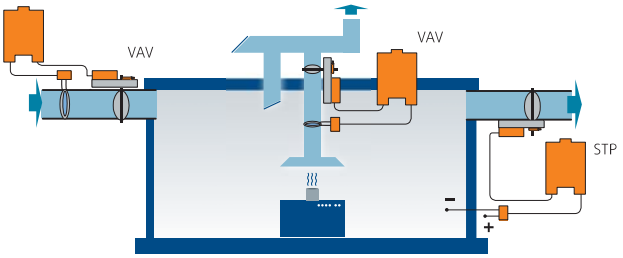
Individual room comfort

- Wide range of potential applications
- Adjustable to each application
- Demand-based single-room application
- Operation with fan optimizer



VAV-Universal with VRP-M controller and fast-running actuators for sensitive working areas

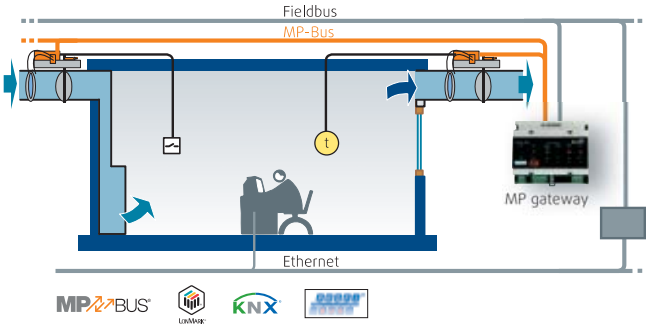
- Instant pure air
- Extraction of polluted air
- Ready-to-connect control system for maximum safety
- Integration in MP-Bus® network
- Volumetric flow or pressure control



VAV-Compact with bus connection

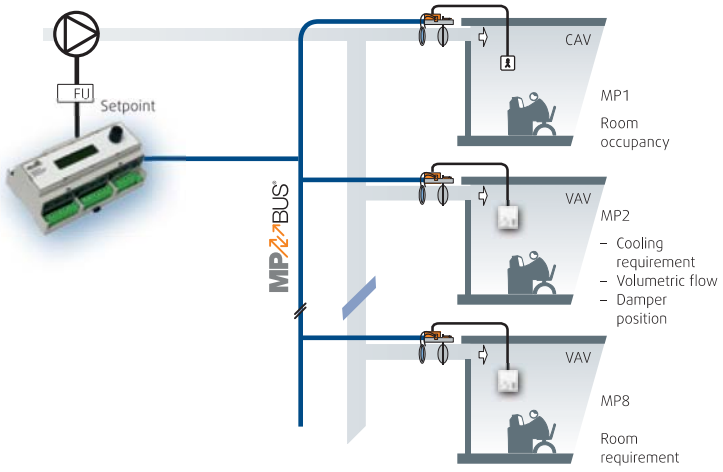
Intelligent simplicity

- System connection to DDC controller with
- MP interface via MP-Bus®
- Integration in higher-level systems such as LonWorks®, Konnex, Ethernet TCP/IP, Profibus DP, etc. via MP gateway
- Convenient, cost-efficient wiring
- Maximum flexibility in new, retrofitted, converted or renovated buildings



VAV-Compact with Belimo Fan Optimizer for reduced energy consumption

- Up to 50% fan energy savings
- Optimized consumption and operating costs
- Reduced flow noise due to lower supply pressure in the air duct system
- Reduced wiring expenses thanks to MP-Bus® network

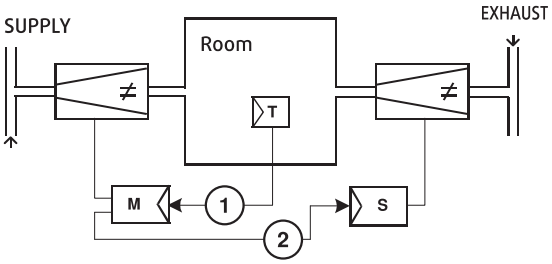


Function	VAV-Compact			VAV-Universal	
	MODBUS types	LON types	MP types	VRP-M system solutions	Universal program
Sensors	Modbus	LONMARK®	MP-BUS®	VFP.. VFD3	VFP.. VFD3
Controller	LMV-D3 MOD NMV-D3 MOD	LMV-D3LON NMV-D3LON	LMV-D3-MP NMV-D3-MP	MP-BUS® VRP-M	VRD3 VRP VRP-STP
Actuators			LHV-D3-MP	LMQ24A-SRV-ST NMQ24A-SRV-ST NM24A-V-ST SF24A-V-ST with emergency control function	LM24A-V NM24A-V SM24A-V LF24-V with emergency control function SF24A-V with emergency control function
Bus integration			MP-BUS® Into field bus systems via MP-Gateway LonWorks®: Gateway UK24LON Konnex: Gateway UK24EIB Modbus RTU: Gateway UK24MOD BACnet MS/TP: Gateway UK24BAC		
Ventilator optimization via MP bus			MP-BUS® Fan Optimiser COU24-A-MP		
Service tool	ZTH-GEN				
Parameterization and Service software	PC-Tool MFT-P				
Room controller			CR24.. CRA24..		
Positioner			CRP24.. SG..		

Information:
Documents to VAV-Compact LON version, VRP-M system solution, VAV-Universal, single room controllers CR24, CRA24, CRP24, Fan Optimizer COU24-A-MP and Tools and Interfaces are available as separate documents under www.belimo.us

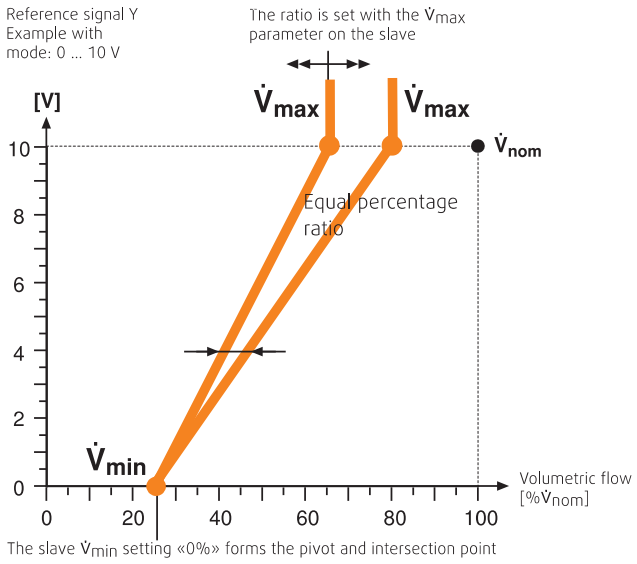
VAV-Compact
Functions

Master / slave connection



Principle:

1. A reference signal, e.g. from a room temperature controller, is connected to the master input. $\dot{V}_{min}$ and $\dot{V}_{max}$ are set on the master controller.
2. The volumetric flow actual value signal from the master acts as a reference signal for the slave controller. The master is installed on the supply or exhaust air side, depending on the application. See "Determination of the master controller".



Determination of the master controller
If both units have:

- Non-identical $\dot{V}_{nom}$ settings, the controller with the lower $_{nom}$.
- Identical $\dot{V}_{nom}$ settings, the controller with the higher air volume setting acts as master

Positive pressure in the room
Master: Supply air unit Slave: Exhaust air unit

Negative pressure in the room
Master: Supply air unit Slave: Exhaust air unit

Room pressure ratio

In a master / slave connection, any changes in the air system of the master (supply pressure too low, e.g. due to a pressure control fault) are detected and reported to the slave. This guarantees an equal percentage ratio of supply air to exhaust air. In a master / slave configuration, only one controller can act as master. However, one master controller can control several parallel slave controllers.

When are master / slave connections used?

- In systems with air volume controllers in the supply and exhaust air that are required to work sequentially
- When an equal percentage ratio of supply air to exhaust air is specified.

Operating volumetric flow settings

The $\dot{V}_{max}$ and $\dot{V}_{min}$ values used for the required volumetric flow are set on the master and transferred to the slave by means of a reference signal.

CAV application

In constant air volume applications, operating mode control (CLOSED / $\dot{V}_{min}$ etc.) is only set on the master controller.

Slave setting if the room pressure ratio is balanced.
The $\dot{V}_{min}$ setting on the slave is always 0%. If the room pressure ratio is 1:1 and all controllers are the same size, the slave controller is set to $\dot{V}_{max}$ 100% / $\dot{V}_{min}$ 0%.

Slave setting if the room pressure ratio is unbalanced.
The $\dot{V}_{min}$ setting on the slave is always 0%. Setting with % scale on the ZTH-GEN hand-operated device. The ratio of slave volume to master volume is set as follows with the $\dot{V}_{max}$ value on the slave controller:

$$\dot{V}_{max}S\% = \frac{\dot{V}_{max}S \cdot \dot{V}_{nom}M}{\dot{V}_{max}M \cdot \dot{V}_{nom}S} \cdot 100$$

$\dot{V}_{max}S\%$ = $\dot{V}_{max}$ value that must be set on the controller in %
$\dot{V}_{nom}M$ = Nominal volume of the master unit in cfm
$\dot{V}_{max}M$ = Maximum volume of the master unit in cfm
$\dot{V}_{nom}S$ = Nominal volume of the slave unit in cfm
$\dot{V}_{max}S$ = Maximum volume of the slave unit in cfm

Setting with PC-Tool / ZTH-GEN
These two setting tools can be used to enter the volumetric flow ratio directly in cfm, i.e. there is no need to calculate the setting ratio.

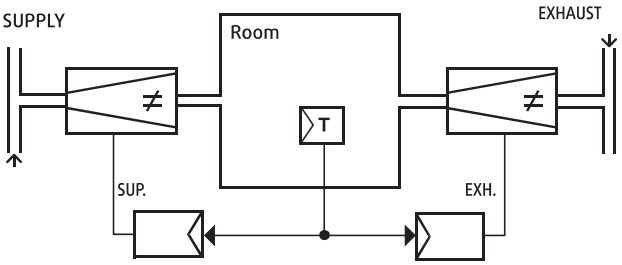
Example
Required: Positive pressure in the room with 20% excess air
– Supply air unit: $\dot{V}_{nom}$ 950 cfm / $\dot{V}_{max}$ 900 cfm
– Exhaust air unit: $\dot{V}_{nom}$ 1500 cfm/ $\dot{V}_{max}$ 700 cfm

Find: $\dot{V}_{max}$ setting of the slave controller

$$49\% = \frac{700 \cdot 950}{900 \cdot 1500} \cdot 100$$

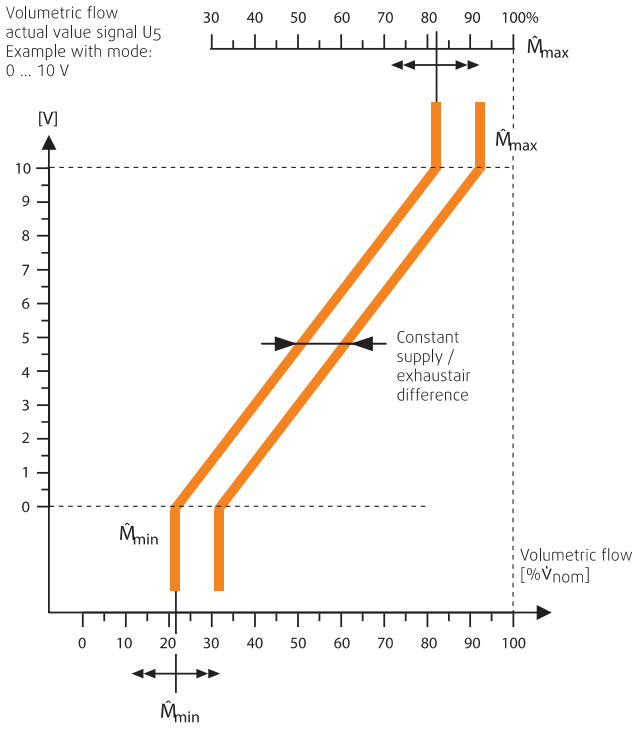
VAV-Compact
Functions

Parallel connection



Principle:

The reference signal of the temperature controller is connected in a parallel circuit with the reference value inputs of the supply and exhaust air controllers. The operating volumetric flows $\dot{V}_{max}$ and $\dot{V}_{min}$ are set on both controllers.



Room pressure ratio

In a parallel connection, the two VAV units are operated independently of one another with a common reference signal. The operating volumetric flows of the supply and exhaust air units must be set according to the required room pressure ratio.

The supply and exhaust air controllers work independently of one another, i.e. if a fault occurs in the supply or exhaust air system, the room pressure ratio is impaired for technical reasons. In the worst case, the unit tolerances may be accumulated. This circumstance must be taken into account by the project planning engineer.

When are parallel connections used?

- If air volume controllers operate with parallel supply and exhaust air (controlled by a common reference variable)
- If the supply and exhaust air devices have different sizes and different minimum and maximum volumetric flow settings
- If constant differential control is active between the supply and exhaust air
- In systems with several supply and exhaust air devices
- In circulating air systems for airtight rooms.

Operating volumetric flow settings

The $\dot{V}_{max}$ and $\dot{V}_{min}$ values used for the required volumetric flow must be set on each VAV controller.

CAV application

In constant air volume applications, operating mode control (CLOSED / $\dot{V}_{min}$ etc.) is set on both controllers.

Setting if the room pressure ratio is balanced

Owing to the proportional assignment of the reference signal to the value ranges for $\dot{V}_{max}$ and $\dot{V}_{min}$, it is possible to operate VAV units with different nominal widths and differentiated ranges parallel to one another.

Setting if the room pressure ratio is unbalanced

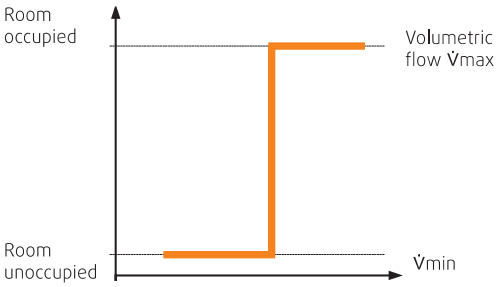
The operating volumetric flows of the supply and exhaust air units must be set according to the difference:

- Positive pressure ratio in the room Supply air volume > exhaust air volume
- Negative pressure ratio in the room Exhaust air volume > supply air volume

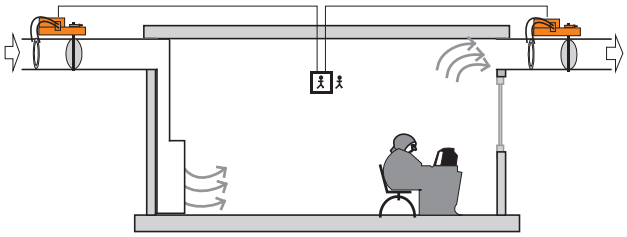
VAV-Compact
Conventional application

Single-duct systems

Function diagram



IRC-VAV CAV room solution with motion detector



CAV single-duct system, occupancy-controlled

Description

Control solution for CAV single-room application CAV single-duct system, occupancy-controlled Stand-alone operation or integrated in a building automation system (I/O integration)

Functions

The CAV controller is controlled by means of the motion detector in two modes on the basis of room occupancy $\dot{V}_{min}$ ... $\dot{V}_{max}$:

Room unoccupied: constant air volume $\dot{V}_{min}$

Room occupied: constant air volume $\dot{V}_{max}$

Motion detector

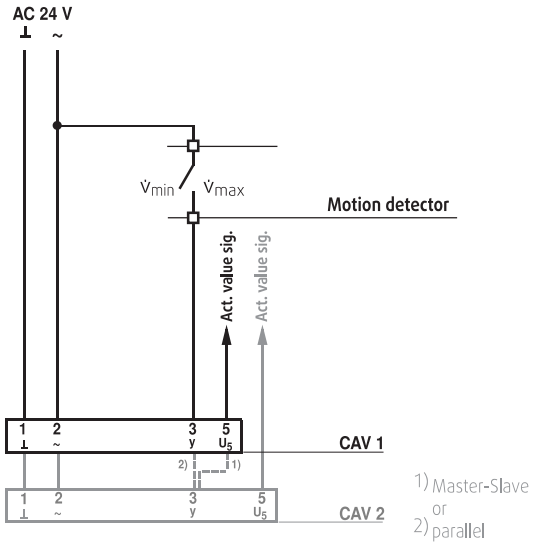
With switching output for low switching capacity (load 0.24 mA)

VAV-Compact control device ..MV-D3-MP

VAV-Compact control device for supply air, exhaust air or mixing units, comprising a sensor, VAV controller and actuator for pressure-independent air volume controls.

- Damper position feedback controlled via the MP-Bus for demand based fan optimisation.

Wiring diagram

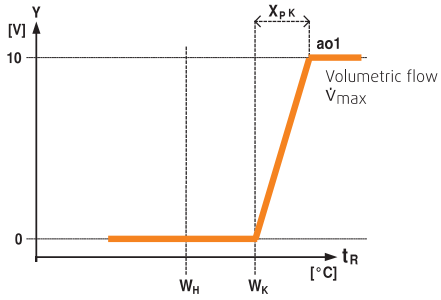


Notes

- Connection and terminal designations of the motion detector in accordance with the manufacturer's specification
- Mode setting on the CAV controller: 0 ... 10V or 2 ... 10V

VAV-Compact
Conventional application

Single-duct systems



Description
Control solution for VAV single-room application Stand-alone operation or integrated in a building automation system (I/O integration)

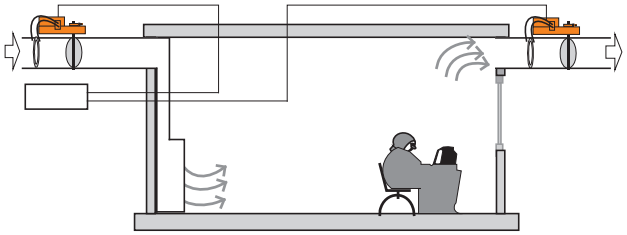
Functions
The 0 ... 10V single-room or DDC controller controls the VAV controller with vaiable air volume in the range from $\dot{V}_{min}$ ... $\dot{V}_{max}$, depending on the room cooling needs.

Single-room or DDC controller
With The 0 ... 10V output single (cooling sequence).
Controller functions in accordance with the manufacturer's specification.

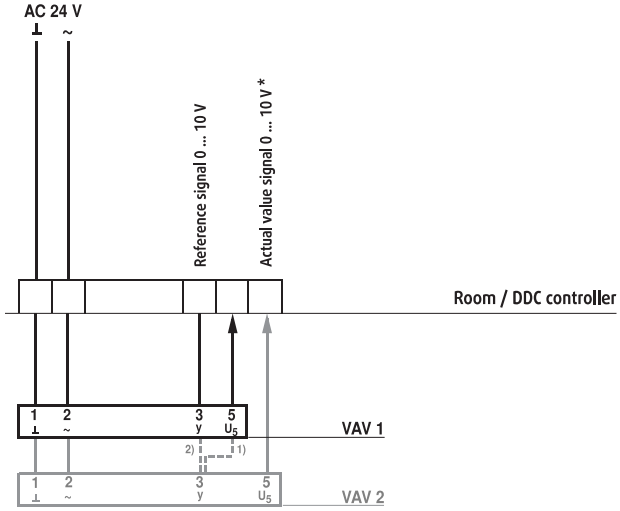
VAV-Compact control device ..MV-D3-MP
VAV-Compact control device for supply air, exhaust air or mixing units, comprising a sensor, VAV controller and actuator for pressure-independent air volume controls.

- Damper position feedback controlled via the MP-Bus for demand based fan optimisation.

IRC-VAV CAV room solution with 0....10V control



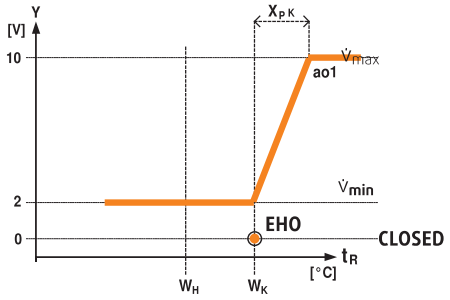
Wiring diagram



Notes
- Connection and terminal designations in accordance with the controller manufacturer's specification
- Mode setting on the VAV controller: 0 ... 10V

VAV-Compact
Conventional application

Single-duct systems



Description
Control solution for VAV single-room application, VAV single-duct system, room temperature-controlled, Stand-alone operation or integrated in a building automation system (I/O integration).

Functions
The CR24-B1 single-room controller controls the connected VAV controllers with a variable air volume in the range from $\dot{V}_{min}$ ... $\dot{V}_{max}$, depending on the room cooling needs. Other functions can be optionally connected (e.g. with a motion detector): energy hold off, standby, etc.

Room temperature controller CR24-B1 (automatic) CR24-A1
Room temperature controller (59... 97°F) with an integrated or external temperature sensor

- Mode selection with a pushbutton and three LEDs: AUTO, ECO (reduced room temperature for standby or night operation) and MAX (flushing operation with 15' timer)
- Room protection function (frost/excess temperature)
- Inputs for energy hold off, standby operation, external temperature sensor, summer/winter compensation VAV system output
- Self-resetting start-up and service function
- Tool connection for diagnostics, settings and trend recordings

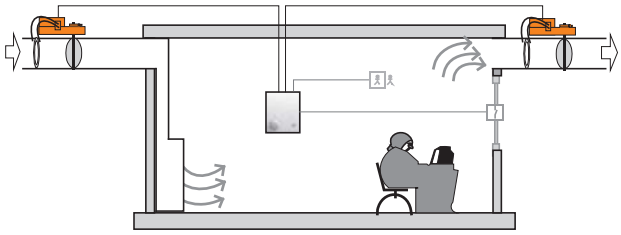
VAV-Compact control device ..MV-D3-MP
VAV-Compact control device for supply air, exhaust air or mixing units, comprising a sensor, VAV control & actuator for pressure-independent air volume controls.

- Damper position controlled via the MP-Bus for demand based fan optimisation.

Input and output assignment

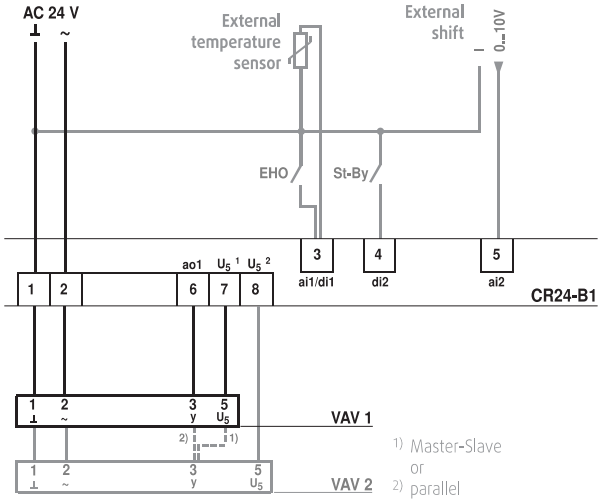
Functions	Description	Assignment
VAV	VAV system output (0) 2...10 V	Output ao1
Operational functions	**Description**	**Assignment**
EHO	Energy hold off (window)	Input di1
Sensor	External temperature sensor NTC 5K	Input ai1
Shift	External shift 0...10 V (Summer/Winter compensation)	Input ai2

IRC-VAV VAV room solution with CR 24 room controller



VAV single duct system, room tempreture-controlled

Wiring diagram



Notes

- Further VAV applications such as boost (fast heat up), night cool down (air heated with water or electrically), night cooling, combination available with chilled ceiling.
- Mode setting for VAV controller for this application: 2...10V
- Terminal designation in accordance with the Belimo final controlling element

Configuration, settings

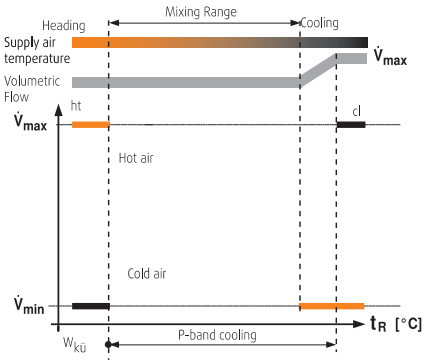
DIP switches

1	P-Band	normal	wide
2	di2	Stand by	Change over

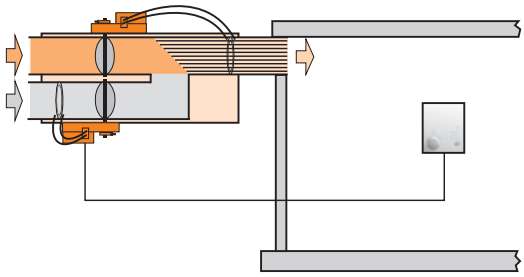
Setpoint WH range: 59... 97°F

VAV-Compact
Conventional application

Dual-duct systems



IRC-VAV VAV dual-duct solution with CR 24 room controller



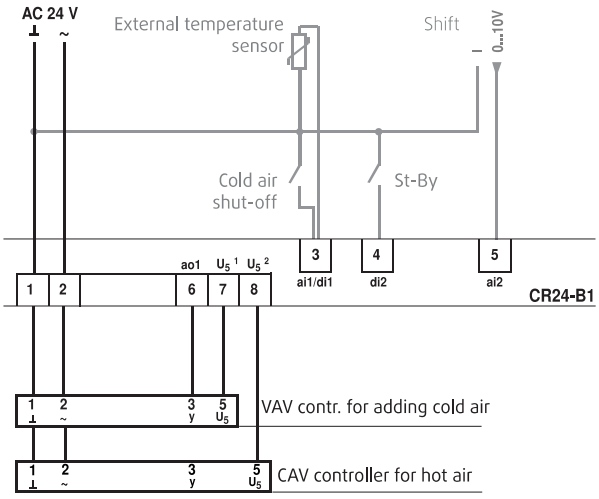
VAV dual-duct system, room tempreture-controlled

Description
VAV dual-duct system, room temperature-controlled Stand-alone operation or integrated in a building automation system (I/O integration)

Functions
The two air volume controllers mix the hot and cold air supplied by the dual-duct air conditioning system to obtain the condition requested by the CR24-B1 room temperature controller. The constant air volume (CAV) controller for the hot air adjusts to the set V̇max volume for heating. The variable air volume (VAV) controller for the cold air adds the variable amount of cold air requested by the room temperature controller. If cooling needs exceed the hot air volume, the hot-air part is shut off and only cold air is supplied.

Optional: The cold-air part can be shut off by means of a switching contact at input d1.

Wiring diagram



Room temperature controller CR24-B1 (automatic) CR24-A1
Room temperature controller (59... 97°F) with an integrated or external temperature sensor

- Mode selection with a pushbutton and three LEDs: AUTO, ECO (reduced room temperature for standby or night operation) and MAX (flushing operation with 15' timer)
- Room protection function (frost/excess temperature)
- Inputs for energy hold off, standby operation, external temperature sensor, summer/winter compensation VAV system output
- Self-resetting start-up and service function
- Tool connection for diagnostics, settings and trend recordings

VAV-Compact control device ..MV-D3-MP
VAV-Compact control device for supply air, exhaust air or mixing units, comprising a sensor, VAV control & actuator for pressure-independent air volume controls.

Configuration, settings
DIP switches

1	P-Band	normal	wide
2	di2	Stand by	Change over

Setpoint WH range: 59... 97°F

Notes
- Terminal descriptions correspond to the Belimo actuator connection.
- Mode setting for VAV controller for this application: 2..10V
- Terminal designation in accordance with the Belimo final controlling element

Input and output assignment

Functions	Description	Assignment
VAV	VAV system output (0) 2...10 V	Output ao1
Operational functions	**Description**	**Assignment**
Shut-off	Cold air shut-off	Input di1
Sensor	External temperature sensor NTC 5K	Input ai1
Shift	External shift 0...10 V (Summer/Winter compensation)	Input ai2

BLC4 VAV Compact Controller

APPLICATION

VAV-Compact controller with integrated pressure sensor, VAV controller and damper actuator for pressure-independent VAV and CAV applications in the comfort zone.

HIGHLIGHTS

- Control DC (0) 2.. 10V
- Diagnostic socket for Service and PC-Tool

Description

Application	The digital VAV-Compact has PI control characteristics and is used for pressure-independent control of VAV units in the comfort zone.
Pressure measurement	The integrated maintenance-free Belimo D3 differential pressure sensor is also suitable for very small volumetric flows. It is for this reason that it covers versatile applications in the comfort zone, e.g. in residential construction, offices, hospitals, hotels, cruise ships, etc.
Actuator	Two versions available, depending on the size of the VAV unit: 5 / 10 Nm. – Rotary actuator, depending on the size
Control function	VAV-CAV or Open-Loop operation for integration in an external VAV control loop.
Feedback	Current volumetric flow, damper position or differential pressure value.
VAV – variable volumetric flow	For variable volumetric flow applications with a modulating reference variable, e.g. room temperature controller or direct digital control, it enables demand-related, energy-saving ventilation of individual rooms or zones. The operating range $\hat{M}_{min}$ ...$\hat{M}_{max}$ can be connected via selectable mode. The following are available: DC 2 ... 10 V / 0 ... 10 V / adjustable range.
CAV – constant volumetric flow	For constant volumetric flow applications, e.g. in step mode, controlled by means of a switch. The following operating modes can be selected from: CLOSED / $\hat{M}_{min}$ / ($\hat{M}_{mid}$) / $\hat{M}_{max}$ / OPEN
Operating and service devices	Belimo PC-Tool or service tool ZTH-GEN, can be plugged into the VAV-Compact (PP connection) or connection U5.
Assembly and connection	The VAV-Compact, which is assembled on the unit by the OEM, is connected using the prefabricated connecting cable.
Test function / test display	The VAV-Compact features two LEDs with a functional readiness display for commissioning and functional checking. Extended information with ZTH-GEN.
OEM factory settings	The VAV-Compact is mounted on the VAV unit by the unit manufacturer, who adjusts and tests it according to the application. The VAV-Compact is sold exclusively via the OEM channel for this reason.

Type overview

Type	Torque	Power consumption	Dimensioning	Weight
LMV-D3-MF	5 Nm	2 W	4 VA (max. 8 A @ 5 ms)	Approx. 1 lb
NMV-D3-MF	10 Nm	3 W	5 VA (max. 8 A @ 5 ms)	Approx. 1.5 lbs

Technical data

Supply	
Nominal voltage	AC 24 V, 50/60 Hz DC 24 V
Operating range	AC 19.2 ... 28.8 V DC 21.6 ... 28.8 V
Differential pressure sensor	
Type, principle of operation	Belimo D3 sensor, dynamic response
Operating range	0 ... 600 Pa
Overload capability	±3000 Pa
Installation position	Any, no reset necessary
Materials in contact with medium	Glass, epoxy resin, PA, TPE
Control function	– VAV-CAV – Open-loop operation
Adjustment values	
$\hat{M}_{nom}$	OEM-specific nominal volumetric flow setting, suitable for the VAV unit
Δp @ $\hat{M}_{nom}$	38 ... 450 Pa
$\hat{M}_{max}$	20 ... 100% of $\hat{M}_{nom}$
$\hat{M}_{min}$	0 ... 100% of $\hat{M}_{nom}$
$\hat{M}_{mid}$	50% of $\hat{M}_{min}$ to $\hat{M}_{max}$
Classic control	
VAV mode for reference value input Y (Connection 3)	– DC 2 ... 10 V / (4 ... 20 mA with 500 Ω resistance) – DC 0 ... 10 V / (0 ... 20 mA with 500 Ω resistance) – Adjustable DC 0 ... 10 V } Input impedance min. 100 kOhm
Mode for actual value signal U_5 (Connection 5)	– DC 2 ... 10 V – DC 0 ... 10 V – Adjustable: volumetric flow, damper position or differential pressure } max. 0.5 mA
CAV operating modes (constant volumetric flow)	CLOSED / $\hat{M}_{min}$ / ($\hat{M}_{mid}$ *) / $\hat{M}_{max}$ / OPEN * (* only with AC 24 V supply)
Operating and service	Pluggable / PC-Tool (V3.6 or higher) / service tool ZTH-GEN
Push-button	Adaption
LED display	– 24 V supply – Status
Actuator	Brushless, non-blocking actuator with power-save mode
Direction of rotation	ccw / cw
Adaption	Capture of setting range and resolution to control range
Gear disengagement	Push-button self-resetting without functional impairment
Sound power level	Max. 35 dB (A)
Angle of rotation	95°∢, adjustable mechanical or electronic limiting
Spindle driver	– Clamp, spindle round 10 ... 20 mm / spindle square 8 ... 16 mm – Form fit in various versions, e.g. 8 x 8 mm
Connection	Cable, 4 x 0.75 mm²
Safety	
Protection class	III Safety extra-low voltage
Degree of protection	IP54
Electromagnetic compatibility	CE according to 89/336/EEC
Mode of operation	Type 1 (in accordance with EN 60730-1)
Rated impulse voltage	0.5 kV (in accordance with EN 60730-1)
Control pollution degree	2 (in accordance with EN 60730-1)
Ambient temperature	0 ... +50°C
Non-operating temperature	–20 ... +80°C
Ambient humidity	5 ... 95% r.h., non-condensing (in accordance with EN 60730-1)
Maintenance	Maintenance-free

Restrictions

Bus function MP	no MP Bus communication possible
Fan Optimiser (Fan control)	no communication to BELIMO Fan Optimiser COU24-A-MP
Sensor integration	no Sensor integration possible

BLC1 VAV Compact Controller

APPLICATION

VAV-Compact controller with integrated pressure sensor, VAV controller and damper actuator for pressure-independent VAV and CAV applications in the comfort zone.

HIGHLIGHTS

- Control: DC 0/2 ... 10V / MP-Bus
- Integration in bus systems
  - DDC controller with MP interface
  - LONWORKS® systems
  - Fan optimiser systems
- With additional switch-on option for sensors and switches
- Diagnostic socket for Service and PC-Tool

Description

Application
The digital VAV-Compact has PI control characteristics and is used for pressure-independent control of VAV units in the comfort zone.

Pressure measurement
The integrated maintenance-free Belimo D3 differential pressure sensor is also suitable for very small volumetric flows. It is for this reason that it covers versatile applications in the comfort zone, e.g. in residential construction, offices, hospitals, hotels, cruise ships, etc.

Actuator
Three versions available, depending on the size of the VAV unit: 5 / 10 / 20 Nm.
- Rotary actuator, depending on the size
- Linear actuator 150 N with 100, 200 or 300 mm linear movement

Control function
VAV-CAV or Open-Loop operation for integration in an external VAV control loop.

Feedback
Damper position for fan optimiser systems, current volumetric flow or pressure value.

VAV – variable volumetric flow
For variable volumetric flow applications with a modulating reference variable, e.g. room temperature controller, direct digital control or bus system, it enables demand-related, energy-saving ventilation of individual rooms or zones. The operating range $\dot{M}_{min}$ ...$\dot{M}_{max}$ can be connected via selectable mode. The following are available: DC 2 ... 10V / 0 ... 10V / adjustable range / bus operation

CAV – constant volumetric flow
For constant volumetric flow applications, e.g. in step mode, controlled by means of a switch. The following operating modes can be selected from: CLOSED / $\dot{M}_{min}$ / ($\dot{M}_{mid}$) / $\dot{M}_{max}$ / OPEN

Bus function
Up to eight Belimo MP devices (VAV / damper actuator / valve actuator) can be connected together over the MP-Bus and integrated into the following systems:
- LONWORKS® applications with Belimo UK24LON interface
- EIB Konnex applications with Belimo UK24EIB interface
- MODBUS RTU applications with Belimo UK24MOD interface
- BACnet applications with Belimo UK24BAC interface
- DDC controller with integrated MP-Bus protocol
- Fan optimiser applications with optimiser COU24-A-MP

A sensor (0...10V or passive), e.g. a temperature sensor or a switch, can optionally be integrated into the higher-level DDC or bus system via the MP-Bus.

Operating and service devices
Belimo PC-Tool or service tool ZTH-GEN, can be plugged into the VAV-Compact (PP connection) or via MP-Bus.

Assembly and connection
The VAV-Compact, which is assembled on the unit by the OEM, is connected using the prefabricated connecting cable.

Test function / test display
The VAV-Compact features two LEDs with a functional readiness display for commissioning and functional checking. Extended information with ZTH-GEN.

OEM factory settings
The VAV-Compact is mounted on the VAV unit by the unit manufacturer, who adjusts and tests it according to the application. The VAV-Compact is sold exclusively via the OEM channel for this reason.

Type overview

Type	Torque	Power consumption	Dimensioning	Weight
LMV-D3-MP	5 Nm	2 W	4 VA (max. 8 A @ 5 ms)	Approx. 1 lb
NMV-D3-MP	10 Nm	3 W	5 VA (max. 8 A @ 5 ms)	Approx. 1.5 lbs

Technical data

Supply	
Nominal voltage	AC 24V, 50/60 Hz, DC 24 V
Operating range	AC 19.2 ... 28.8V, DC 21.6 ... 28.8V
Differential pressure sensor	
Type, principle of operation	Belimo D3 sensor, dynamic response
Operating range	0 ... 600 Pa
Overload capability	±3000 Pa
Installation position	Any, no reset necessary
Materials in contact with medium	Glass, epoxy resin, PA, TPE
Control function	– VAV-CAV – Open-loop operation
Adjustment values	
$\dot{V}_{nom}$	OEM-specific nominal volumetric flow setting, suitable for the VAV unit
Δp @ $\dot{V}_{nom}$	50 ... 450 Pa
$\dot{V}_{max}$	20 ... 100% of $\dot{V}_{nom}$
$\dot{V}_{min}$	0 ... 100% of $\dot{V}_{nom}$
$\dot{V}_{mid}$	50% of $\dot{V}_{min}$ to $\dot{V}_{max}$
Classic control	
VAV mode for reference value input Y (Connection 3)	– DC 2 ... 10V / (4 ... 20 mA with 500 Ω resistance) – DC 0 ... 10V / (0 ... 20 mA with 500 Ω resistance) – Adjustable DC 0 ... 10V } Input impedance min. 100 kOhm
Mode for actual value signal U5 (Connection 5)	– DC 2 ... 10V – DC 0 ... 10V – Adjustable: volumetric flow, damper position or differential pressure } max. 0.5 mA
CAV operating modes (constant volumetric flow)	CLOSED / $\dot{V}_{min}$ / ($\dot{V}_{mid}$ *) / $\dot{V}_{max}$ / OPEN * (* only with AC 24V supply)
MP-Bus function	
Address in bus operation	MP1 ... 8 (classic operation: PP)
LONWORKS® / EIB-Konnex / Modbus RTU / BACnet	With BELIMO Interface UK24LON / UK24EIB / UK24MOD / UK24BAC 1 ... 8 BELIMO MP devices (VAV / damper actuator / valve)
DDC controller	DDC controllers/programmable controller with an integrated MP interface from various manufacturers
Fan optimiser (fan control)	With BELIMO Fan Optimiser COU24-A-MP
Sensor integration	Passive (Pt1000, Ni1000, etc.) and active sensors (0...10V), e.g. temperature, humidity 2-point signal (switching capacity 16 mA @ 24V), e.g. switches, occupancy switches
Operating and service	Pluggable / PC-Tool (V3.6 or higher) / service tool ZTH-GEN
Communication	PP/MP-Bus, max. DC 15V, 1200 baud
Push-button	Adaption / addressing
LED display	– 24V supply – Status / bus function
Actuator	Brushless, non-blocking actuator with power-save mode
Direction of rotation	ccw / cw or ↑ / ↓
Adaption	Capture of setting range and resolution to control range
Gear disengagement	Push-button self-resetting without functional impairment
Sound power level	Max. 35 dB (A), SMV-D3-MP max. 45 dB (A)
Actuator - rotating	
Angle of rotation	95°∢, adjustable mechanical or electronic limiting
Position indication	Mechanical with pointer
Spindle driver	– Clamp, spindle round 10 ... 20 mm / spindle square 8 ... 16 mm – Form fit in various versions, e.g. 8 x 8 mm
Actuator – linear	
Stroke	100, 200 or 300 mm, adjustable mechanical or electronic limiting
Connection	Cable, 4 x 0.75 mm^2
Safety	
Protection class	III Safety extra-low voltage
Degree of protection	IP54
Electromagnetic compatibility	CE according to 89/336/EEC

Technical data (continued)

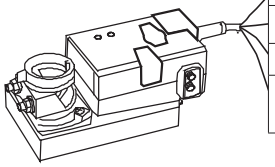
Safety	
Mode of operation	Type 1 (in acc. with EN 60730-1)
Rated impulse voltage	0.5 kV (in accordance with EN 60730-1)
Control pollution degree	2 (in accordance with EN 60730-1)
Ambient temperature	0 ... +50°C
Non-operating temperature	–20 ... +80°C
Ambient humidity	5 ... 95% r.h., non-condensing (in accordance with EN 60730-1)
Maintenance	Maintenance-free

Connection

Connecting cable

The connection is made using the connecting cable mounted to the VAV-Compact device.

Note
- Supply via safety isolating transformer!
- Connections 1 and 2 (AC/DC 24V) and 5 (MP signal) must be routed to accessible terminals (room temperature controller, floor distributor, control cabinet, etc.) in order to enable access with the tool for diagnostic and service work.

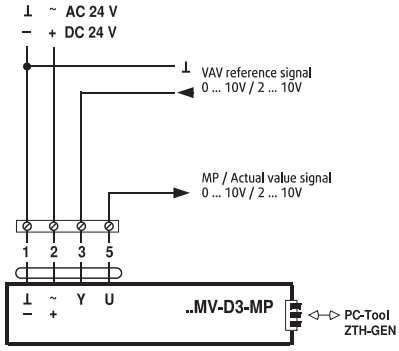


No.	Designation	Wire colour	Function
1	– ⊥	black	⊥ – AC/DC 24V supply
2	+ ~	red	~ + AC/DC 24V supply
3	Y	white	Reference signal VAV/CAV
5	U	orange	– Actual value signal – MP-Bus connection

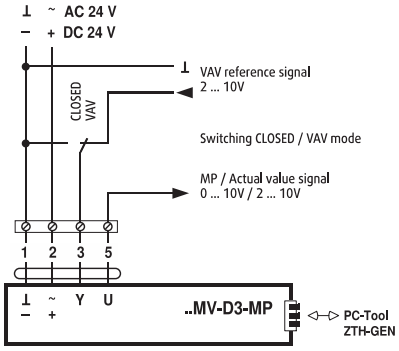
VAV – Variable operation $\hat{V}_{min}$...$\hat{V}_{max}$

Wiring diagrams

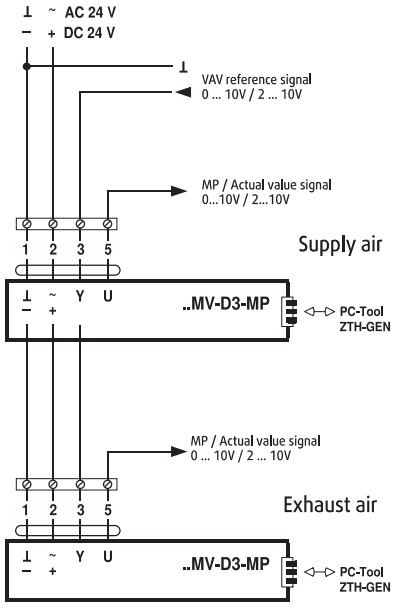
Example 1:
VAV with analogue reference signal



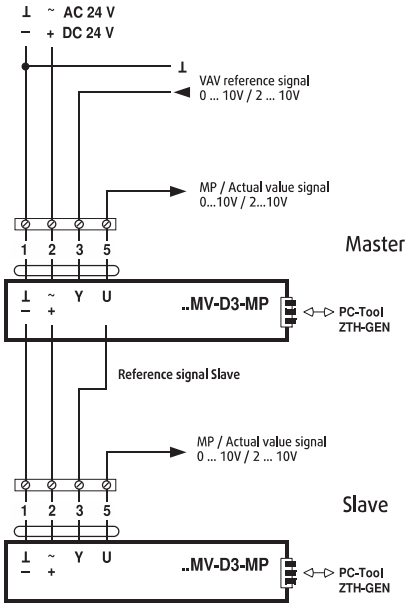
Example 2:
VAV with shut-off (CLOSE), 2 ... 10V mode



Example 3:
VAV with analogue reference signal
supply/exhaust air in parallel operation



Example 4:
VAV with analogue reference signal,
in Master/Slave operation



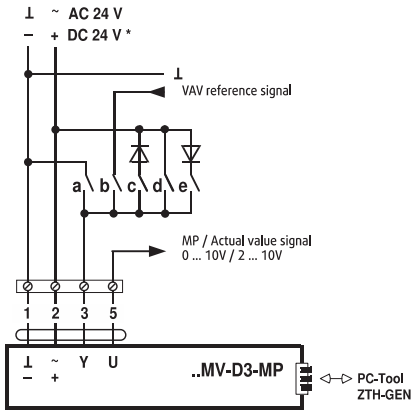
CAV – Step mode CLOSED / M̂min / M̂mid / M̂max / OPEN

CAV control

Three options are available for the CAV control:

- Standard 0.1 V shut-off: CLOSED –$\hat{M}_{min}$ – $\hat{M}_{max}$ – OPEN (default setting)
- Standard 0.5 V shut-off: CLOSED – $\hat{M}_{min}$ – $\hat{M}_{max}$ – OPEN
- Old Generation (NMV-D2M): CLOSED – $\hat{M}_{min}$ – $\hat{M}_{mid}$ – $\hat{M}_{max}$ – OPEN

Wiring diagrams



* Not available with DC 24 V supply.

CAV function: Standard

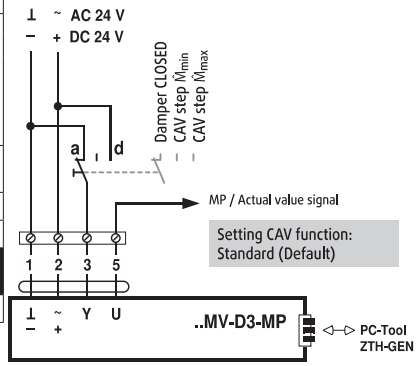
Mode setting	–	0 ... 10 V	0 ... 10 V	0 ... 10 V	0 ... 10 V
	2 ... 10 V	2 ... 10 V	2 ... 10 V	2 ... 10 V	2 ... 10 V
Signal	⊥ –	0 ... 10 V 2 ... 10 V	~	~ +	~
Function	3	3	3	3	3
Damper CLOSED	a) CLOSED		c) CLOSED *		
$\hat{M}_{min}$ ... $\hat{M}_{max}$		b) VAV			
CAV – $\hat{M}_{min}$	All open – $\hat{M}_{min}$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

Legend

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

* Not available with DC 24 V supply
** The damper is closed when the 0.5 V shut-off level is used.

Example:
CAV application CLOSED – M̂min – M̂max (mode 2 ... 10 V)



Note

In order to use the CAV step $\hat{M}_{mid}$, the Old Generation (NMV-D2M) CAV function must be selected.

CAV function: Old Generation (NMV-D2M)

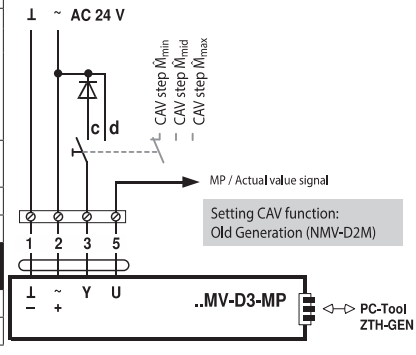
Mode setting	–	0 ... 10 V	0 ... 10 V	0 ... 10 V	0 ... 10 V
	2 ... 10 V	2 ... 10 V	2 ... 10 V	2 ... 10 V	2 ... 10 V
Signal	⊥ –	0 ... 10 V 2 ... 10 V	~	~ +	~
Function	3	3	3	3	3
Damper CLOSED	a) CLOSED				
$\hat{M}_{min}$ ... $\hat{M}_{max}$		b) VAV			
CAV – $\hat{M}_{min}$	All open – $\hat{M}_{min}$ active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

Legend

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

* Not available with DC 24 V supply

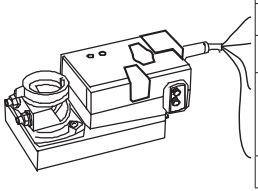
Example:
CAV application M̂min – M̂mid – M̂max (Mode 0 ... 10 or 2 ... 10 V)



MP-Bus operation – VAV / CAV operation

Connecting cable

The connection to the MP-Bus is made using the connecting cable mounted to the VAC-Compact device.

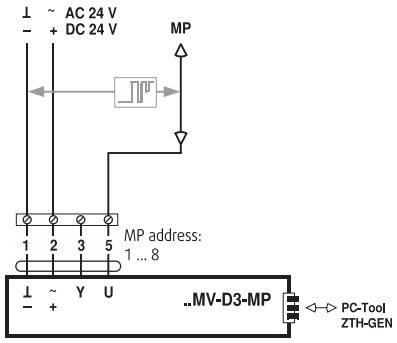


No.	Designation	Wire colour	Function
1	⊥ –	black	⊥ – } AC/DC 24V supply
2	~ +	red	~ + }
3	Y	white	Input for – Sensor interface – Override control
5	U	orange	MP-Bus connection

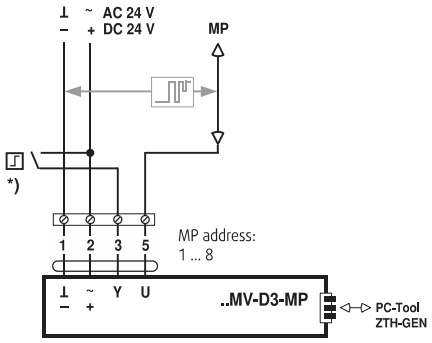
Note
- Supply via safety isolating transformer!
- Connections 1 and 2 (AC/DC 24V) and 5 (MP signal) must be routed to accessible terminals (room temperature controller, floor distributor, control cabinet, etc.) in order to enable access with the tools for diagnostic and service work.

Wiring diagrams

Control via MP-Bus
For detailed information, see section «MP-Bus integration»



MP-Bus control with integrated switch
For detailed information on sensor integration, see section «MP-Bus integration»



*) e.g. window contact

Note
- For further information about the connection, override controls, MP-Bus cables, etc., see section «MP-Bus integration»
- This is a connection description. Depending on the application, the terminal allocation may vary. The connection and commissioning must be carried out by trained personnel.

Dimensioning of supply and connecting cable

General

In addition to the actual wire sizing, attention must also be paid to the surrounding area and the cable routing.Signal cables must not be laid in the vicinity of load cables, objects liable to cause EMC interference etc. if possible. Paired or layer stranded cables improve immunity to interference.

24 V supply, dimensioning and cabling

The dimensioning and installation of the AC 24V supply, the fuse protection and the cables are dependent on the total operated load and local regulations. Account must be taken of the following performance data, including the starting currents of the actuators:
- Dimensioning values VAV-Compact controller, see Technical data
- Dimensioning values of further controlling elements etc. can be found in the current data sheets and product information
- Other devices which are intended to be connected to the same 24 V supply
- Reserve capacity for subsequent expansion, if planned.

MP-Bus integration – supply, dimensioning and cabling

See S4-VAV-Compact D3, MP-Bus integration

BLC1-MOD VAV Compact Controller

APPLICATION

A pressure sensor, digital VAV controller and damper actuator all in one, providing a VAV-Compact solution with a communications capability for pressure-independent VAV systems in the comfort zone.

HIGHLIGHTS

- Control function: VAV
- Communication via Modbus RTU (RS-485)
- Conversion of sensor signals
- Diagnostic socket for operating devices

Description

Application
The digital VAV-Compact has PI control characteristics and is used for pressure-independent control of VAV units in the comfort zone.

Mode of operation
The actuator is fitted with an integrated interface for Modbus RTU, receives its digital positioning signal from the superordinate Modbus-Master and returns the current status.

Converter for sensors
Connection option for a sensor (passive or active sensor or switching contact). In this way, the analogue sensor signal can be easily digitised and passed along to Modbus.

Parameterisable actuators
The factory settings cover the most common applications. As desired, individual parameters can be adapted for specific systems or servicing with a service tool (e.g. ZTH-GEN).
The Modbus communication parameters (address, baud rate, ...) are set with the ZTH-GEN. Pressing push-button 3 while connecting the supply voltage resets the communication parameters to the factory setting.
Quick addressing: The Modbus address can alternatively be set using push-buttons from 1 to 16. The value selected is added to the «Basic address» parameter and results in the effective Modbus address. For example, with a basic address of 140, Modbus addresses between 141 and 156 can be parameterised using quick addressing.

Pressure measurement
Maintenance-free, dynamic, differential pressure sensor, proven in a wide range of applications, suitable for use in offices, hospital wards, alpine hotels or cruise liners.

Actuator
Two versions are available, depending on the size of the VAV unit: 5 or 10 Nm.

VAV – variable volumetric flow
The VAV-Compact is supplied with its modulating setpoint by a room temperature controller via Modbus. This facilitates demand-related, power-saving ventilation in individual rooms or zones of air conditioning systems. The operating range ($\hat{M}_{min}$ and $\hat{M}_{max}$) can be set either locally with PC-Tool or ZTH-GEN or via Modbus.

Operating and service devices
Belimo PC-Tool or Service-Tool ZTH-GEN, pluggable on the VAV-Compact.

Assembly and connection
The VAV-Compact device, which is assembled on the unit by the OEM, is connected using the prefabricated connecting cable.

OEM factory settings
The VAV-Compact is mounted on the VAV unit by the unit manufacturer, who adjusts and tests it according to the application. The VAV-Compact is sold exclusively via the OEM channel for this reason.

Type overview

Type	Torque	Power consumption	For wire sizing	Weight
LMV-D3-MOD	5 Nm	2 W	4 VA (max. 5 A @ 5 ms)	Approx. 1 lb
NMV-D3-MOD	10 Nm	3 W	5 VA (max. 5 A @ 5 ms)	Approx. 1.5 lbs

Safety notes

- The actuator must not be used outside the specified field of application, especially in aircraft or in any other airborne means of transport.
- It may only be installed by suitably trained personnel. Any legal regulations or regulations issued by authorities must be observed during installation.
- The device may only be opened at the manufacturer's site. It does not contain any parts that can be replaced or repaired by the user.
- The cable must not be removed from the device.
- When calculating the required torque, the specifications supplied by the damper manufacturers (cross-section, design, installation site), and the air flow conditions must be observed.
- The device contains electrical and electronic components and is not permitted to be disposed of as household refuse. All locally valid regulations and requirements must be observed.

Modbus overview

Register

	No.	Adr	Register
In operation	1	0	**Setpoint [%]**
	2	1	**Override control**
	3	2	**Command**
	4	3	Actuator type
	5	4	Relative position [%]
	6	5	Absolute position [°] [mm]
	7	6	Relative volumetric flow [%] (only for VAV/EPIV)
	8	7	Absolute volumetric flow (pressure) [m^3/h] [l/min] [Pa] (only for VAV/EPIV)
	9	8	Sensor value [mv] [Ω] [–]
Service	101	100	Series number 1st part
	102	101	Series number 2nd part
	103	102	Series number 4th part
	104	103	Firmware version (Modbus module)
	105	104	Malfunction and service information
	106	105	**Min [%]**
	107	106	**Max [%]**
	108	107	**Sensor type**
	109	108	**Bus fail position**

- Registers in Bold can be written
- Registers <100 (In operation) which can be written are volatile and should therefore be updated periodically
- Registers >100 which can be written are non-volatile

Commands

All data is arranged in a table and addressed by 1..n (register) or 0..n-1 (address). No distinction is made between data types (Discrete Inputs, Coils, Input Registers, Holding Registers). As a consequence, all data can be accessed with the two commands for Holding Register. The commands for Discrete Inputs and Input Registers can be used as an alternative.

Standard commands:

Read Holding Registers [3]
Write Single Register [6]

Optional commands:

Read Discrete Inputs [2]
Read Input Registers [4]
Write Multiple Registers [16]

Note regarding Read Discrete Inputs

The command reads one or more bits and can alternatively be used for register 105 (Malfunction and service information). The start address to be used is 1664.

Modbus register description

Register 1: Setpoint

Setpoint for actuator setting or volumetric flow in hundredths of one percent, i.e. 0...10 000 corresponds to 0...100%

Override control	
0	None
1	Open
2	Close
3	Min
5	Max

Register 2: Override control

Overriding the setpoint with defined values

Command	
0	None
1	Adaption
2	Test run
3	Synchronisation
4	Reset actuator malfunctions

Register 3: Command

Initiation of actuator functions for service and test; the register is reset automatically.

Actuator type	
0	Actuator not connected / not known
1	Air/water actuators with/without safety function
2	Volumetric flow controller VAV / EPIV
3	Fire damper actuator

Register 4: Actuator type

Actuator type; the allocation may deviate from the basic category with some actuators.

Register 5: Relative position

Relative position in hundredths of one percent,
i.e. 0 ... 10 000 correspond to 0 ... 100%

Register 6: Absolute position

Absolute position
0 ... 10 000 (65535 if not supported by the actuator)
The unit depends on the device:
[°] for actuators with rotary movement
[mm] for actuators with linear movement

Register 7: Relative volumetric flow

Relative volumetric flow in hundredths of one percent of Vnom,
i.e. 0 ... 10 000 correspond to 0 ... 100%
This value is available only for VAV controllers and EPIV devices (actuator type: 2).
For all other types, 65535 will be entered.

Register 8: Absolute volumetric flow

Absolute volumetric flow
This value is available only for VAV controllers and EPIV devices (actuator type: 2).
For all other types, 65535 will be entered.
The unit depends on the device:
[m^3/h] for VAV controllers (or [Pa] for pressure applications)
[l/min] for EPIV devices

Register 9: Sensor value

Current sensor value; dependent on the setting in Register 108
The unit depends on the sensor type: [mv] [Ω] [-]

Register 101, 103: Series number

Each MP node has an unambiguous series number which is either impressed on or glued to the node. The series number consists of 4 segments, although only parts 1, 2 and 4 are displayed on Modbus. Example: 00839-31324-064-008

Register 9	Register 10	Register 11
1st part	2nd part	4th part
00839	31234	008

Register 104: Firmware Version

Firmware version of Modbus module (VX.XX)
e.g. 101 V1.01

Modbus register description (continued)

Register 105: Malfunction and service information

The status information is split into messages about the actuator (malfunctions) and other service information.

	Bit	Description
Malfunctions (low byte)	0	Excessive utilisation
	1	Mechanical travel increased
	2	Mechanical overload
	3	–
	4	Safety-relevant faults (fire protection only)
	5	Damper test error (fire protection only)
	6	Duct temperature too high (fire protection only)
	7	Smoke detector tripped (fire protection only)
Service (high byte)	8	Internal activity (test run, adaption, ...)
	9	Gear disengagement active
	10	Bus watchdog triggered
	11	–
	12	–
	13	–
	14	–
	15	–

The malfunction bits can be reset with Register 3 (command 4) or with the Belimo PC-Tool. Malfunctions 0 and 4 cannot be reset.

Register 106: Min / Vmin setting

Minimum limit (position or volumetric flow) in hundredths of one percent, i.e. 0...10 000 correspond to 0...100%
Caution: Changing the setting may result in malfunctions.

Register 107: Max / Vmax setting

Minimum limit (position or volumetric flow) in hundredths of one percent, i.e. 2000...10 000 correspond to 20...100%
Caution: Changing the setting may result in malfunctions.

Register 108: Sensor type

Sensor type connected to the actuator; in the absence of sensor specification, the switching at the Y input will have the effect of a local compulsion.

Sensor type	
0	None
1	Active sensor (mV)
2	Passive sensor 1 k (Ω)
3	Passive sensor 1 ... 20 k (Ω)
4	Switching contact (0 / 1)

Register 109: Bus fail position

Modbus communication is not monitored as standard. In the event of a breakdown in communication, the actuator retains the current setpoint.
The bus monitoring controls the Modbus communication. If neither the setpoint (Register 1) nor the override control (Register 2) is renewed within 120 seconds, the actuator controls to the bus fail position (closed / open).
Triggered bus monitoring is indicated in Register 105.

Bus fail position	
0	Last setpoint (no bus monitoring)
1	Fast close if time is exceeded
2	Fast open if time is exceeded

Note
After changing the sensor type, the actuator must always be restarted in order for correct sensor values to be read out.

Electrical installation

Note
Connection via safety isolating transformer.

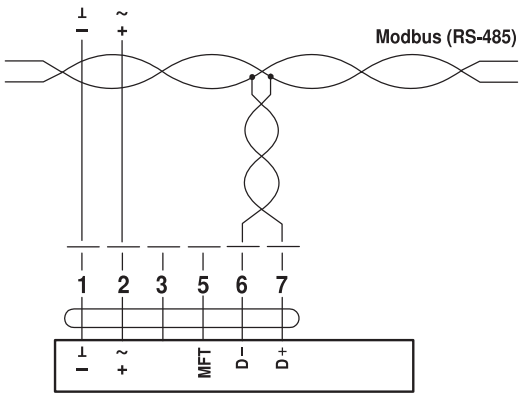
Note
Modbus signal assignment:
C1 = D– = A
C2 = D+ = B

Power supply and communication are not galvanically isolated.

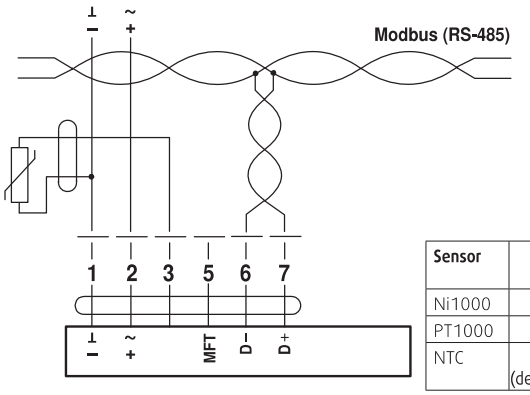
Interconnect ground signal of the devices.

Connection diagram for cable layout

Connection without sensor

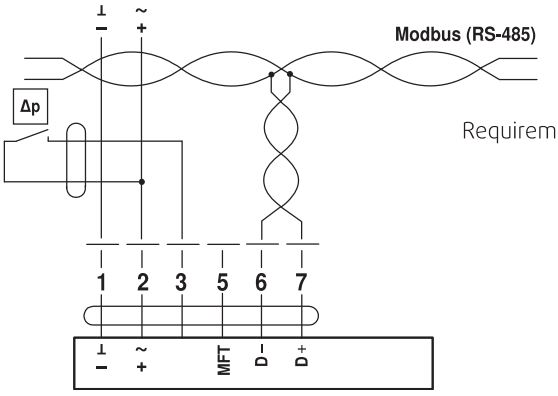


Connection with passive sensor, e.g. Pt1000, Ni1000, NTC



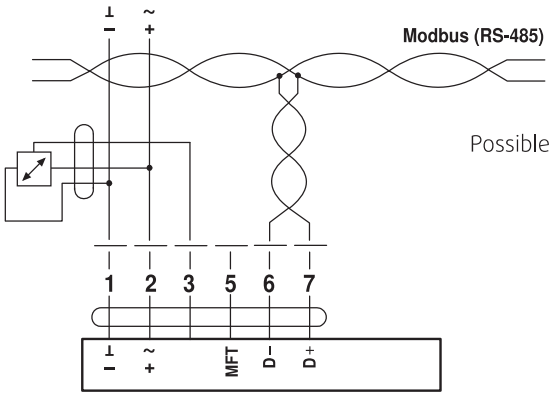
Sensor	Temperature range	Resistance range	Resolution
Ni1000	–28 ... +98°C	850 ... 1600 Ω	1 Ω
PT1000	–35 ... +155°C	850 ... 1600 Ω	1 Ω
NTC	–10 ... +160°C (depending on type)	200 ... 50 kΩ	1 Ω

Connection with switching contact, e.g. Δp-monitor



Requirements for switching contact:

Connection with active sensor, e.g. 0 ... 10 V @ 0 ... 50°C



Possible input voltage range:

Tool connection

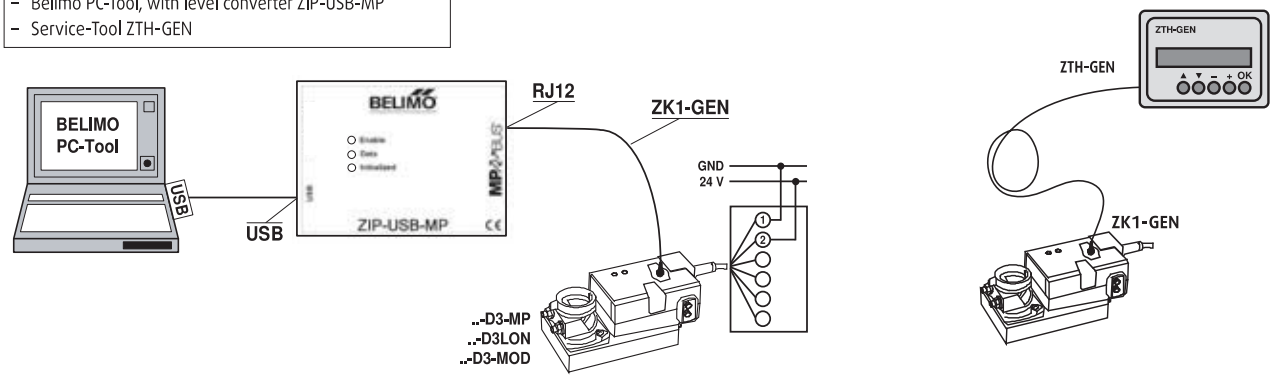
Setting and diagnostics

Setting and the diagnostics of the connected VAV-Compact controller can be checked and set quickly and easily with the Belimo PC-Tool or the Service-Tool ZTH-GEN.

On-board service connection

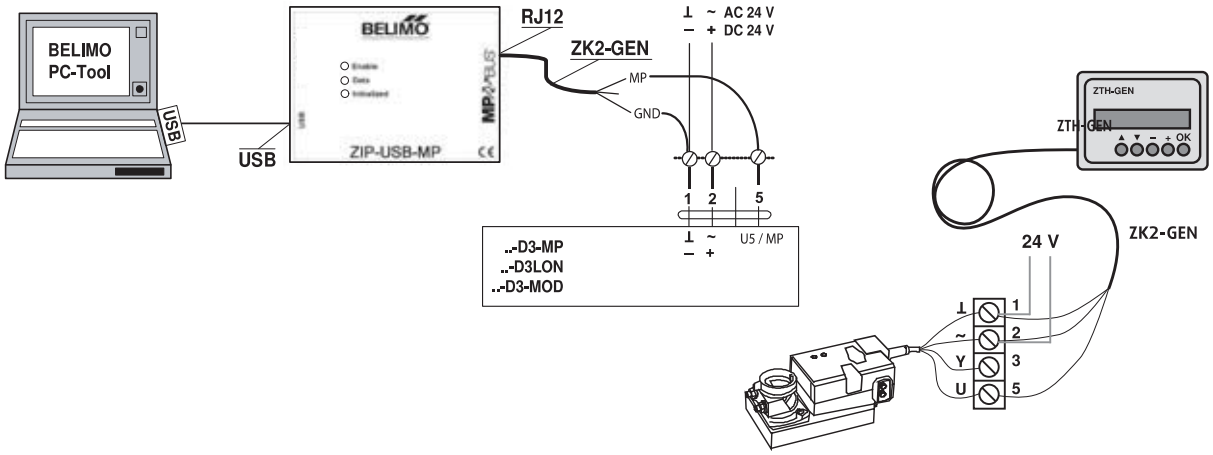
The service connection integrated in the VAV-Compact allows the console used to be connected quickly.

Belimo VAV operating and service devices
- Belimo PC-Tool, with level converter ZIP-USB-MP
- Service-Tool ZTH-GEN



MP connection (5)

The VAV-Compact can also communicate (connection wire 5) with the Service-Tools via the MP connection. The connection can be established during operation on site, i.e. in the connection socket, at the tool socket of the Belimo room temperature controller CR24 or on the floor or control cabinet terminals.



Operating controls and indicators

① **Push-button and LED display green**

Off:	No power supply or fault
Illuminated:	In operation
Flashing:	Address mode: pulses according to set address (1 ... 16) when starting: reset to factory setting (communication)
Press button:	in standard mode: switches on angle of rotation adaptation in address mode: confirmation of set address (1 ... 16)

② **Push-button and LED display yellow**

Off:	The actuator is ready
Illuminated:	Adaption or synchronising process active or actuator in address mode (green LED indicator flashing)
Flickering:	Modbus communication active
Press button:	in operation (>3 s): switch address mode on and off in address mode: address setting by pressing several times when starting (>5 s): reset to factory setting (communication)

③ **Gear disengagement button**

Press button:	Gear disengaged, motor stops, manual override possible
Release button:	Gear engaged, synchronisation starts, followed by standard operation

④ **Service plug**

For connecting parameterising and service tools

AJD

NEW!

Jet Nozzle Diffuser

- Adjustable nozzle
- Jet throw up to 100 ft
- For heating and cooling
- Powder coated RAL 9010

APPLICATION

The AJD nozzles provide long throws with a low noise level, releasing a long air jet with exceptional precision to a length up to 100 feet.

They can be used for spot cooling and are especially appropriate for large rooms requiring a decorative look, for instance, large vestibules, entertainment areas, airport halls, department stores, hotels, etc. The configuration allows the nozzle to swivel in all directions up to a maximum of ± 30° in the horizontal or vertical direction.

DESIGN

The AJD jet nozzle diffuser and the decorative ring are manufactured from aluminium, with a standard powder paint finish in white RAL 9010. The connection part is manufactured from galvanized steel sheet. The AJD nozzle has an extraordinary good aesthetic design and can be painted by special order to fit any decorative need.

AVAILABLE SIZES

Models are available with duct connection sizes 100, 125, 160, 200, 250, 315 and 400 mm.

ORDERING EXAMPLE

AJD - Size

Nominal size (mm)

Example

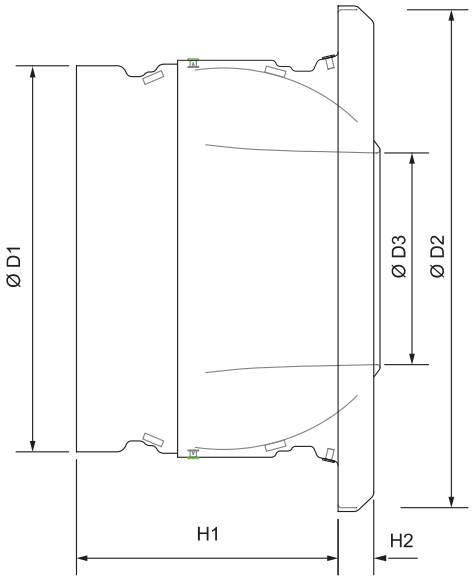
AJD-400

Jet nozzle diffuser AJD, 400 mm duct connection.

AJD

Jet Nozzle Diffuser

DIMENSIONS



	ØD1	ØD2	ØD3	H1	H2	Weight, lbs
AJD 100	3 7/8	5 7/16	1 9/16	4 1/8	1 1/4	2
AJD 125	4 7/8	6 11/16	2 3/16	4 11/16	1 1/4	2
AJD 160	6 3/16	8 1/16	3 1/8	5 3/8	1 1/4	3
AJD 200	7 13/16	10 9/16	4 5/16	5 13/16	1 1/4	3
AJD 250	9 3/4	12 13/16	5 3/8	6 5/8	1 5/16	4
AJD 315	12 5/16	16 1/8	6 7/8	7 3/16	1 5/16	5
AJD 400	15 5/8	20 1/16	8 5/8	7 13/16	1 5/16	8

Dimensional information is in inches

SPECIFICATION DATA

	Air flow range, cfm and throw $l_{0,2}$ ft										ΔP_t - Pressure drop, in.wg		
AJD 100	108										0.23	0.42	0.62
AJD 125	78	131									0.27	0.46	0.69
AJD 160		82	154								0.18	0.28	0.57
AJD 200			121	157	184						0.23	0.38	0.59
AJD 250				121	194		246				0.15	0.35	0.53
AJD 315						138	167	256			0.15	0.21	0.46
AJD 400								200	253	312	0.14	0.22	0.34
cfm	74	121	180	238	297	371	459	680	871	1062	20-25	30	35-40
												dB (A)	

To find out more about AJD jet nozzles, visit our online catalog at **systemair.net** and find a perfect match for your application.

BURE

NEW!

Circular ceiling high capacity diffuser with dual adjustable vents for high installations

- Suitable for heating and cooling
- Adjustable air pattern
- Tight rubber gasket duct connection
- Powder coated RAL 9010

Vertical flow pattern

Horizontal flow pattern

APPLICATION

The BURE is suited for comfort high capacity ventilation of big halls and industrial buildings. Suitable for heating and cooling. Installation height is between 13 and 40 ft. The air stream pattern (horizontal or vertical) can be adjusted manually.

The BURE consists of an inlet spigot and an inner and outer cage with openings for supply air in the peripheral surface and the underside. Depending on the operation method, the openings in the peripheral surface (cooling, horizontal air stream) or the underside (heating, vertical air stream) are opened. The control mechanism adjusts the flow pattern in any selected position on the adjustment scale (at the connection side of the product) between position 1 (fully horizontal) and 5 (fully vertical).

DESIGN

The BURE is made of powder coated steel (RAL 9010) and is available in the duct connection sizes 250, 400 and 500 mm. At underside the double segment blinds allow the free area of more than 50%.

MOUNTING

The BURE is mounted directly in a spiral duct by a tight rubber gasket connection.

AVAILABLE SIZES

Models are available with duct connection sizes 250, 400 and 500 mm.

ORDERING EXAMPLE

BURE - Size - Control - Color

Nominal size (mm)
10", 16" or 20"
(250, 400 or 500 mm)

Type of control
HC (manual control)

Surface treatment
RAL9010 white, gloss 30%

Example

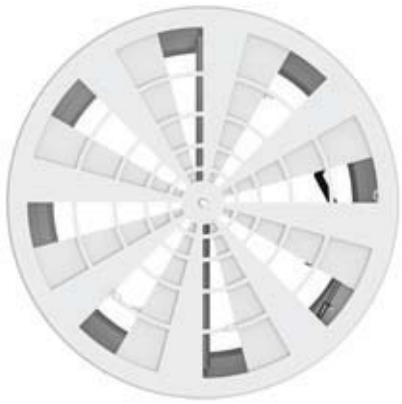
BURE - 400 - HC - RAL9010
High capacity diffuser BURE, duct connection 400 mm, with manual control. White color coating RAL9010, gloss 30%.

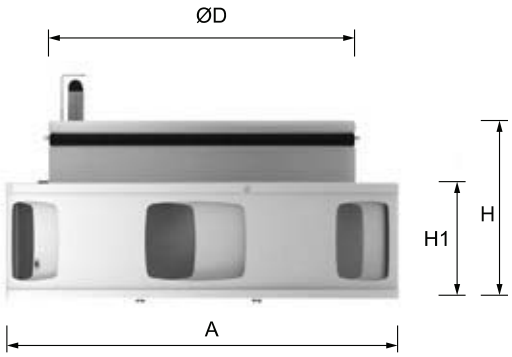
Note: If the ordering code does not contain surface treatment, so RAL9010, gloss 30 % will be delivered as standard.

BURE

Circular ceiling high capacity diffuser with dual adjustable vents for high installations

DIMENSIONS





	A	ØD	H	H1	Weight, lbs
BURE-250-HC	13 3/4	9 13/16	6 5/16	3 15/16	6
BURE-400-HC	19 11/16	15 3/4	8 1/16	5 11/16	13
BURE-500-HC	23 5/8	19 11/16	8 3/4	6 7/16	18

Dimensional information is in inches

To find out more about BURE high capacity diffusers, visit our online catalog at **systemair.net** and find a perfect match for your application.

BOR-R

NEW!

Supply air diffuser with a circular shape front plate

- Draught-free and low acoustic supply air
- Suitable for VAV systems
- Effective airflow aperture
- Powder coated RAL 9010, 30% gloss

APPLICATION

The BOR-R has been specifically developed for providing a draught-free and low acoustic noise air supply to offices, hotel and residential rooms etc. The flow pattern prevents the air stream from falling into the occupied zone before it has reached an acceptable temperature. Maximum temperature difference ΔT 10K.

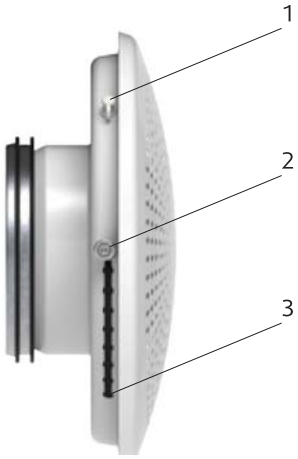
BOR-R is also suitable for VAV systems, as the distribution pattern is maintained across the entire flow area. The product is equipped for air flow adjustment and commissioning measurement.

DESIGN

The BOR-R is manufactured from galvanized steel with a convex, circular shaped front plate with perforation. The front plate is finished in the standard white powder coating (RAL 9010, Gloss 30%).

The diffuser is equipped with an adjustable blind that changes the effective air flow aperture and fine tunes the air flow volume. The mechanism is movable from outside by a miniature knob sliding in groove on the sidewall of the product. The movement has 9 fixed positions along the path defined by the notches in the groove. For adjustment only these positions provide desired noise parameters. The intermediate positions shall be avoided. The tables 1 and 2 show the k-factors of the product in each of these 9 fixed positions. Using the corresponding K-factor for the chosen adjustment along with the ΔP measured on the measurement pin (sidewall) of the product provides data for an easy actual flow calculation at commissioning. After commissioning the measurement pin shall be closed. For aesthetic reasons it can be replaced by the smooth plug which is packed in the product box.

ADJUSTMENT AND COMMISSIONING



1. ΔP measurement pin
2. Adjustment knob parked in position 1.
   To move the knob pull it radially out of the body and slide pulled into other position, then release to park it.
3. Adjustment position 9

AVAILABLE SIZES

Models are available with duct connection sizes 100 and 125 mm.

ORDERING EXAMPLE

BOR-R - Size - Color

Nominal size (mm)
4" or 5" (100 or 125 mm)

Surface treatment
RAL9010 white, gloss 30%

Example

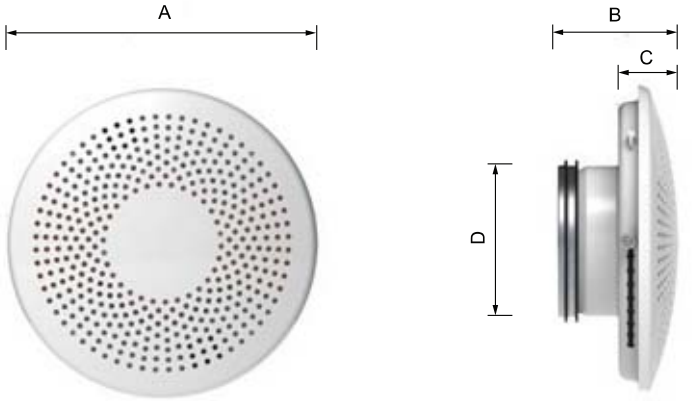
BOR-R - 125 - RAL9010

Supply air diffeser BOR-R, duct connection 125 mm, white color coating RAL9010, gloss 30%.

BOR-R

Supply air diffuser with a circular shape front plate

DIMENSIONS



	A	B	C	ØD	Weight, lbs
BOR-R-100	8 1/8	3 1/8	1 9/16	4	1
BOR-R-125	8 1/8	3 1/8	1 9/16	5	1

Dimensional information is in inches

To find out more about BOR-R diffusers, visit our online catalog at **systemair.net** and find a perfect match for your application.

BOR-R

Supply air diffuser with a circular shape front plate

BOR-R-100	q_v	Sound power levels L_w (dB)							
Position	cfm	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
1	21	11	8	8	8	8	7	7	9
	25	20	14	14	14	12	10	12	16
	30	27	18	19	18	16	13	15	21
	34	33	22	22	21	18	15	18	26
3	21	10	8	9	8	8	7	7	9
	25	19	15	15	14	13	11	12	16
	30	26	20	20	19	17	14	15	21
	34	32	25	24	23	20	16	18	26
6	21	15	11	11	11	10	9	10	13
	25	25	17	17	17	15	12	14	20
	30	32	22	22	21	18	15	17	25
	34	38	26	26	24	21	17	20	30
9	21	23	16	16	16	14	12	13	18
	25	32	22	22	21	18	15	17	25
	30	39	26	27	25	21	17	21	30
	34	45	30	30	28	24	20	23	35

Tab. 1: Linear (non-weighted) sound power levels L_w at octave-band frequencies (dB)

NOTE: The position 9 is the most left adjustment position seen from the front side of the diffuser. Smallest free area.
The position 1 is the most right adjustment position seen from the front side of the diffuser. Largest free area.

Octave band	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
Correction values for A-weighted filter (dB)	-26.2	-16.1	-8.6	-3.2	0.0	1.2	1.0	-1.1

Tab. 2: Correction table for calculation of A-weighted filter octave band sound values from non-weighted values

NOTE: Adding the correction value to unweighted values for certain frequency band results in A-weighted sound power level.

BOR-R

Supply air diffuser with a circular shape front plate

BOR-R-125	q_v	Sound power levels L_W (dB)							
Position	cfm	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
	25	14	11	11	12	11	10	9	10
	30	19	15	15	15	14	13	11	13
1	34	23	17	18	18	16	15	12	15
	38	27	20	20	21	19	17	14	17
	42	30	22	23	23	21	19	15	19
	25	15	12	12	12	11	11	9	10
	30	20	15	16	16	15	14	11	13
3	34	25	19	19	19	17	16	13	16
	38	29	21	22	22	20	18	15	18
	42	32	24	24	25	22	20	16	20
	25	17	13	14	14	13	12	10	12
	30	24	18	18	18	17	15	13	15
6	34	29	21	22	22	20	19	15	18
	38	34	25	25	26	23	21	17	21
	42	38	28	28	28	26	24	18	23
	25	20	15	16	16	14	13	11	13
	30	28	20	21	21	19	18	14	17
9	34	34	25	25	26	23	21	17	21
	38	39	29	29	30	27	25	19	24
	42	44	32	33	33	30	27	21	27

Tab. 3: Linear (non-weighted) sound power levels L_W at octave-band frequencies (dB)

NOTES: The position 9 is the most left adjustment position seen from the front side of the diffuser. Smallest free area.
The position 1 is the most right adjustment position seen from the front side of the diffuser. Largest free area.

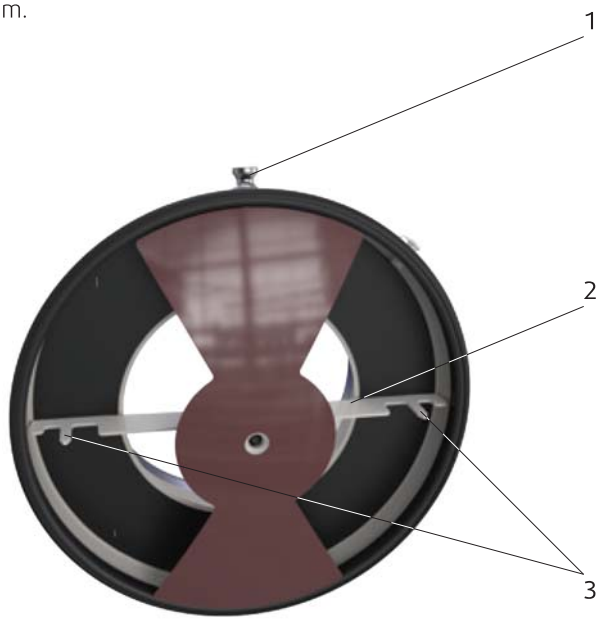
BOR-R

Supply air diffuser with a circular shape front plate

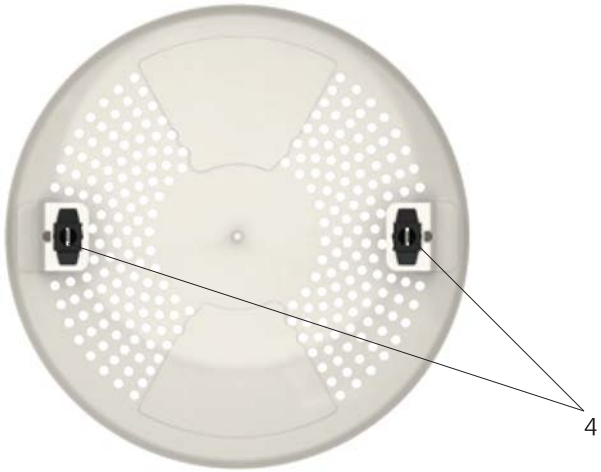
MOUNTING

The diffuser is installed directly at the end of the spiral duct sliding in the connection spigot with gasket. The unit can be fixed on the wall by screws through holes in the bottom of the body. For this, the diffuser front plate must be removed by pulling it away from the diffuser body.

The installation position is defined by the horizontal orientation of the adjustment mechanism bridge. The upside orientation adjustment knob is recommended - so it is better hidden behind the diffuser plate if installed in higher position of the wall in the room.



After diffuser body installation the plate can be attached by fitting the two fixing pins into the fixing springs in the plate and pushing the plate towards the body they touch and remain fixed together.



Parts of the product:

1. Adjustment knob (upside orientation recommended)
2. Adjustment mechanism bridge (horizontal orientation obligatory)
3. Front plate fixing pin on the bridge.
4. Fixing springs in the front plate.

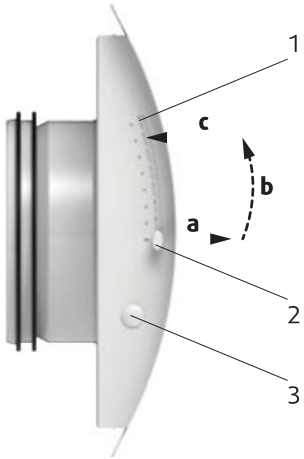
BOR-S

NEW!

Supply air diffuser with a square shape front plate

- Draught-free and low acoustic supply air
- Suitable for VAV systems
- Effective airflow aperture
- Powder coated RAL 9010, 30% gloss

ADJUSTMENT AND COMMISSIONING



1. ΔP measurement pin
2. Adjustment knob parked in position 1.
   To move the knob pull it radially out of the body and slide pulled into other position, then release to park it.
3. Adjustment position 9

APPLICATION

The BOR-S has been specially developed for providing a draught-free and low acoustic noise air supply to offices, hotel and residential rooms etc. The flow pattern prevents the air stream from falling into the occupied zone before it has reached an acceptable temperature. Maximum temperature difference ΔT 10K is permissible.

BOR-S is also suitable for VAV systems, as the distribution pattern is maintained across the entire flow area. The product is equipped for air flow adjustment and commissioning measurement.

DESIGN

The BOR-S is manufactured from galvanized steel with a convex, square shaped front plate with perforation. The front plate is finished in the standard white powder coating (RAL 9010, Gloss 30%).

The diffuser is equipped with an adjustable blind that changes the effective air flow aperture and fine tunes the air flow volume. The mechanism is movable from outside by a miniature knob sliding in groove on the sidewall of the product. The movement has 8 fixed positions along the path defined by the notches in the groove. For adjustment only these positions provide desired noise parameters. The intermediate positions shall be avoided. The tables 1 and 2 show the k-factors of the product in each of these 8 fixed positions. Using the corresponding K-factor for the chosen adjustment along with the ΔP measured on the measurement pin (sidewall) of the product provides data for an easy actual flow calculation at commissioning. After commissioning the measurement pin shall be closed. For aesthetic reasons it can be replaced by the smooth plug which is packed in the product box.

AVAILABLE SIZES

Models are available with duct connection sizes 100 and 125 mm.

ORDERING EXAMPLE

BOR-S - Size - Color

Nominal size (mm)
4" or 5" (100 or 125 mm)

Surface treatment
RAL9010 white, gloss 30%

Example

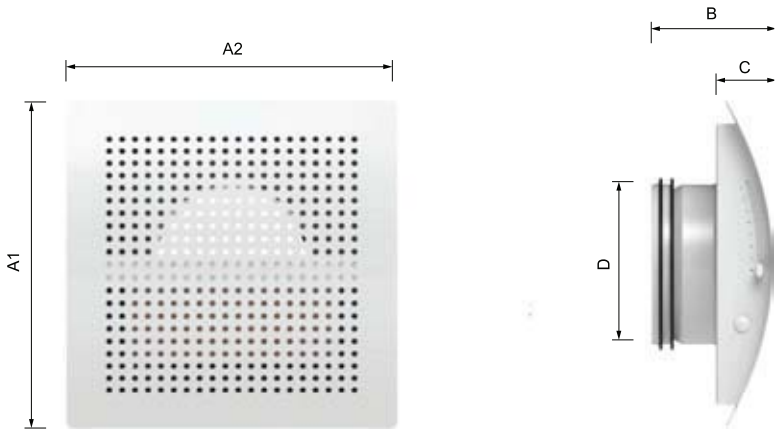
BOR-S - 100 - RAL9010

Supply air diffeser BOR-S, duct connection 100 mm, white color coating RAL9010, gloss 30%.

BOR-S

Supply air diffuser with a square shape front plate

DIMENSIONS



	A1	A2	B	C	ØD	Weight, lbs
BOR-S-100	8 1/16	8 1/8	2 15/16	1 7/16	4	1
BOR-S-125	8 1/16	8 1/8	2 15/16	1 7/16	5	1

Dimensional information is in inches

To find out more about BOR-S diffusers, visit our online catalog at **systemair.net** and find a perfect match for your application.

BOR-S

Supply air diffuser with a square shape front plate

BOR-S-100	q_v	sound power levels L_w (dB)							
Position	cfm	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
	17	31	18	9	8	8	9	14	20
	21	37	23	15	14	13	14	16	22
1	25	43	27	20	18	17	19	18	23
	30	47	30	23	22	20	21	18	23
	34	50	33	26	24	22	24	18	22
	17	34	21	10	7	8	8	14	20
	21	41	24	16	14	14	14	17	22
3	25	46	26	21	20	19	20	18	23
	30	50	28	25	25	23	23	19	23
	34	53	29	29	28	25	26	19	23
	17	35	21	12	15	15	14	15	21
	21	36	22	16	19	20	20	19	22
6	25	37	23	19	22	24	24	22	23
	30	37	24	22	25	27	28	25	23
	34	38	24	24	27	30	31	27	24
	17	39	21	13	14	16	16	15	21
	21	40	23	18	19	21	22	20	23
8	25	41	24	21	23	25	26	23	25
	30	42	26	24	25	28	30	26	26
	34	43	27	26	28	30	33	28	27

Tab. 4: Linear (non-weighted) sound power levels L_w at octave-band frequencies (dB)

NOTE: The position 9 is the most left adjustment position seen from the front side of the diffuser. Smallest free area.
The position 1 is the most right adjustment position seen from the front side of the diffuser. Largest free area.

Octave band	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
Correction values for A-weighted filter (dB)	-26.2	-16.1	-8.6	-3.2	0.0	1.2	1.0	-1.1

Tab. 5: Correction table for calculation of A-weighted filter octave band sound values from non-weighted values

NOTE: Adding the correction value to unweighted values for certain frequency band results in A-weighted sound power level.

BOR-S

Supply air diffuser with a square shape front plate

BOR-S-125	q_v	sound power levels L_w (dB)							
Position	cfm	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
	25	36	19	8	7	8	9	14	20
	30	42	22	12	12	11	12	16	22
1	34	47	24	16	15	14	13	16	22
	38	51	26	20	18	15	14	16	22
	42	53	27	22	20	16	15	16	21
	25	34	18	10	8	8	8	13	20
	30	39	22	16	14	13	14	16	22
3	34	43	25	20	19	17	17	17	22
	38	47	28	25	24	21	22	19	23
	42	50	30	28	28	24	24	19	22
	25	31	19	15	14	13	12	14	20
	30	35	21	19	19	19	19	18	22
6	34	38	23	22	23	23	25	21	22
	38	40	25	25	26	26	29	23	22
	42	42	26	27	28	28	32	24	22
	25	31	20	16	15	15	16	15	20
	30	32	23	21	21	20	22	20	22
8	34	33	25	24	25	24	26	23	23
	38	34	27	27	28	27	30	26	24
	42	35	28	30	31	30	33	29	24

Tab. 6: Linear (non-weighted) sound power levels L_w at octave-band frequencies (dB)

NOTES: The position 8 is the adjustment position farthest from the middle of the diffuser body. Smallest free area.
The position 1 is the adjustment position nearest to the middle of the diffuser body. Largest free area.

BOR-S

Supply air diffuser with a square shape front plate

MOUNTING

The diffuser is installed directly at the end of the spiral duct sliding in the connection spigot with gasket. The unit can be fixed on the wall by screws through holes in the edges of the body. For this the diffuser front plate must be removed by pressing the upper edge of the plate down approx. 1/4" and pulling the upper part of the plate away from the diffuser body (see Fig. 7). Attaching the diffuser plate back to the body: There are two railings on the plate inside, one with a notch, another one with two notches. These define the orientation of the plate on the body, where one respectively two rivets are fixed. at the contact site for the plate railings. The notches fit to the rivets, so the orientation of the plate is correct. Put the railing at the lower end on the body edge, press the upper edge of the plate down by approx. 1/4" attaching the upper side of the plate to the body (see Fig. 7).

Dismounting of the unit: Turn the unit and pull straight out.

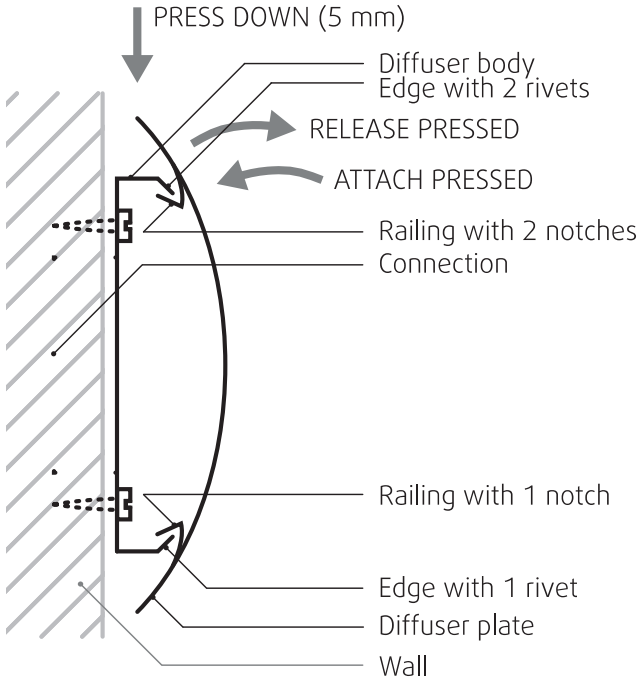


Fig. 7: Mounting and dismounting of BOR

CAP-G

NEW!

Square multi nozzle ceiling diffuser

- Adjustable nozzles for horizonal, vertical, diagonal, single, multi-directional and swirl air distribution
- Powder coated RAL 9010, 30% gloss

APPLICATION

CAP-G is a ceiling diffuser with directionally adjustable nozzles. This enables functionality in a vast range of operation modes like horizontal, vertical, diagonal, single- or multi-directional and swirl for both cooling and heating. Typical installation sites are offices, hospitals, public and business buildings etc. The installation height is up to 13 ft. It is possible to remove the diffuser face to access the duct system and for easy cleaning and service. Pull the front plate one step out from the main body to create an air gap around the diffuser increasing the flow capacity. Max temperature difference for cooled air ΔT=12 K.

DESIGN

The diffuser is made of powder paint coated galvanized steel sheet. The nozzles are made of ABS Plastics. The diffuser plate is adjustably attached to the base with circular tight connection.

MOUNTING

The diffuser is spefically designed for flush mounting in false ceiling. By opening a square hole in the ceiling slab the diffuser back box can be completely recessed into the opening onto the metal flange. The flange, which is part of the back box, is used to cover the edges of the opening. The diffuser is fastened to the duct from the inside of the spigot by screws or pop rivets. The front plate with the nozzles is easily detached from the back box by gently inserting a screwdriver in openings on the side after which the two parts are bent apart. In the same fashion a small extra air gap can be created around the diffuser.

AVAILABLE SIZES

Models are available with duct connection sizes 125, 160, 200, 250 and 315 mm.

ORDERING EXAMPLE

CAP-G - Size - Nr or nozzles

Nominal size (mm)

Number of nozzles
Prefixed: 16, 25 and 49

Example

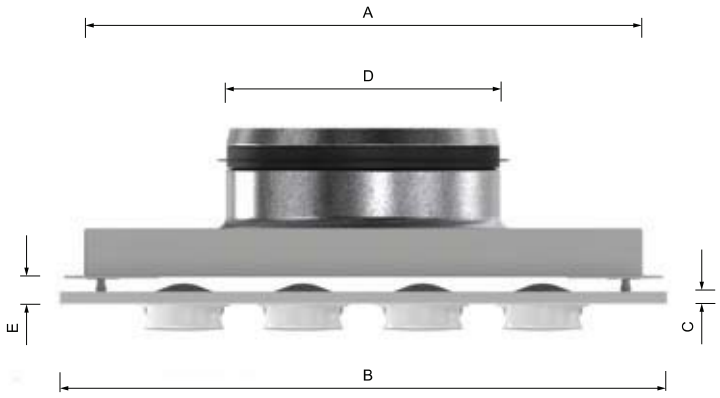
CAP-G - 125 - 16

Supply multi nozzle air diffuser CAP-G, duct connection 125 mm, 16 nozzles.

CAP-G

Square multi nozzle ceiling diffuser

DIMENSIONS



	A	B	C	ØD	E	Weight, lbs
CAP-G-125-16	12 13/16	13 15/16	5/16	4 7/8	5/16	5
CAP-G-160-16	12 13/16	13 15/16	5/16	6 1/4	5/16	5
CAP-G-200-26	18 5/8	17 15/16	5/16	7 13/16	5/16	8
CAP-G-250-49	22 1/16	23 7/16	5/16	9 13/16	5/16	11
CAP-G-315-49	22 1/16	23 7/16	5/16	12 3/8	5/16	11

Dimensional information is in inches

To find out more about CAP-G nozzle diffusers, visit our online catalog at **systemair.net** and find a perfect match for your application.

CAP-C

NEW!

Circular nozzle ceiling diffuser complete with side entry plenum box for visible installation

- Adjustable nozzles for horizonal, vertical, diagonal, single, multi-directional and swirl air distribution
- Powder coated RAL 9010, 30% gloss

APPLICATION

The CAP-C ceiling diffuser is suitable for visible connection and can be connected directly to the duct using the connection sleeve fitted with a rubber seal tested for air tightness. It is equipped with directionally adjustable nozzles. This enables functionality in a vast range of operation modes like horizontal, vertical, diagonal, single- or multi-directional and swirl for both, cooling and heating. The side gap is adjustable between 0 and 25/32" to enable increased air supply. The CAP-C consists of a front plate with nozzles and a sound insulated plenum box and damper. Installation height is up to 13 ft. Max. temperature difference is ΔT 12 K.

DESIGN

The diffuser is made of powder paint coated galvanized steel sheet. The nozzles are made of ABS Plastics. The diffuser plate is adjustably attached to the base with circular tight horizontal connection with flow adjustment damper.

MOUNTING

The diffuser is fixed securely by screwing it up into the ceiling from the inside of the unit. The front plate can be removed by pulling it straight out. The sound absorbing material is cut out of the diffuser's center to make room for the screws.

AVAILABLE SIZES

Models are available with duct connection sizes 100, 125, 200 and 250 mm.

ORDERING EXAMPLE

CAP-C - Size

Nominal size (mm)

Example

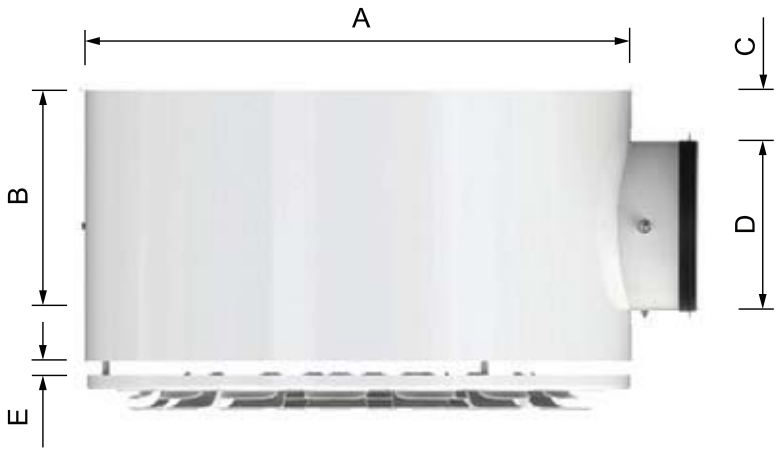
CAP-C - 125

Supply multi nozzle air diffuser with entry plenum box CAP-C, duct connection 125 mm.

CAP-C

Circular nozzle ceiling diffuser complete with side entry plenum box for visible installation

DIMENSIONS



	A	B	C	ØD	E	Weight, lbs
CAP-C-100	12 3/8	6 11/16	1 3/8	3 7/8	0 .. 3/4	6
CAP-C-125	15 15/16	7 7/8	1 7/16	4 7/8	0 .. 3/4	9
CAP-C-200	23 9/16	11 3/16	1 11/16	7 7/8	0 .. 3/4	18
CAP-C-250	23 9/16	13	1 9/16	9 13/16	0 .. 3/4	22

Dimensional information is in inches

QUICK SELECTION

	Gap height, inch	Airflow, cfm
CAP-C-100	0	29
	3/4	35
CAP-C-125	0	42
	3/4	62
CAP-C-200	0	99
	3/4	148
CAP-C-250	0	100
	3/4	203

Tab. 2: Quick selection for CAP-C diffuser

To find out more about CAP-C nozzle diffusers, visit our online catalog at **systemair.net** and find a perfect match for your application.

CAP-F

NEW!

Square multi nozzle ceiling diffuser

- Adjustable nozzles for horizonal, vertical, diagonal, single, multi-directional and swirl air distribution
- Powder coated RAL 9010, 30% gloss

APPLICATION

CAP-F is a ceiling diffuser with directionally adjustable nozzles. This enables functionality in a vast range of operation modes like horizontal, vertical, diagonal, single- or multi-directional and swirl for both, cooling and heating.

Typical installation application are offices, hospitals, public and business buildings etc. Exterior dimension 23 5/8" x 23 5/8" (600 mm × 600 mm). The installation height is up to 13 ft It is possible to remove the diffuser face to access the duct system and for easy cleaning and service. Pull the front plate one step out from the main body to create an air gap around the diffuser increasing the flow capacity. Max temperature difference for cooled air ΔT=12 K.

DESIGN

The diffuser is made of powder paint coated galvanized steel sheet. The nozzles are made of ABS Plastics. The diffuser plate is adjustably attached to the base with circular tight connection.

MOUNTING

The diffuser is specially designed for flush mounting in false ceiling and directly suspended in the T-bar framework carrying structure, and then fixed with the help of the connecting duct.

AVAILABLE SIZES

Models are available with duct connection sizes 125, 160, 200, 250 and 315 mm.

ORDERING EXAMPLE

CAP-F - Size - Dim. - Nr or nozzles

Nominal size (mm)

Front panel dimensions (mm)

Number of nozzles
Pre-fixed: 16, 25, 36, 49 or 81

Example

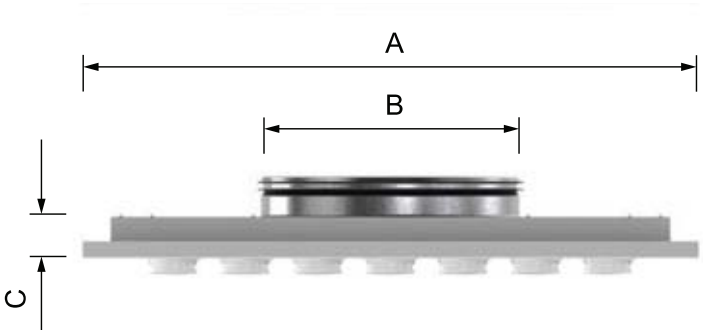
CAP-F - 100 - 600 - 16

Supply multi nozzle air diffuser CAP-F, duct connection 100 mm, 600 mm x 600 mm front plate, 16 nozzles.

CAP-F

Square multi nozzle ceiling diffuser

DIMENSIONS



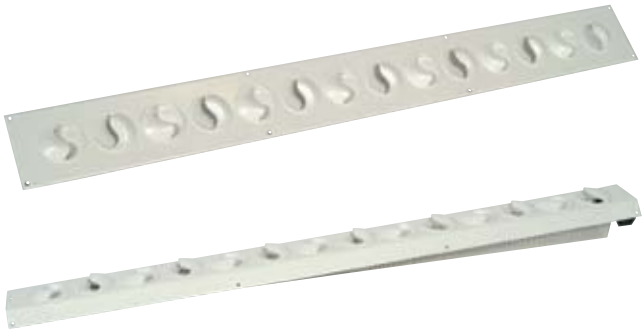
	A	B	C	Weight, lbs
CAP-F-125-600-16	23 7/16	4 7/8	1 9/16	11
CAP-F-160-600-25	23 7/16	6 1/4	1 9/16	11
CAP-F-200-600-36	23 7/16	7 13/16	1 9/16	11
CAP-F-250-600-49	23 7/16	9 13/16	1 9/16	11
CAP-F-315-600-81	23 7/16	12 3/8	1 9/16	11

Dimensional information is in inches

To find out more about CAP-F nozzle diffusers, visit our online catalog at **systemair.net** and find a perfect match for your application.

Sinus DC/DR

NEW!



- Adjustable nozzles for horizonal, vertical, diagonal, single, multi-directional and swirl air distribution
- Powder coated RAL 9010, 30% gloss

Circular / Rectangular duct nozzle supply diffuser

APPLICATION

Sinus-DC/DR is a nozzle diffuser for duct mounting. A Sinus-DC (for circular duct) and DR (for rectangular duct) diffuser consists of a frontplate with several nozzles and a check rail. The design of the nozzles enables the diffuser to achieve very high induction of room air.

The Sinus-DC/DR can be used for both cooled and heated air. Max. temperature difference is ΔT=10K. The nozzles can be individually set at any angle within 360°. This means that an unlimited number of distribution patterns can be set without affecting noise levels, air volume or pressure drop. The nozzles rounded edges prevent dust from settling and facilitate easy cleaning.

DESIGN

Sinus-DC/DR nozzle diffuser consists of a supply-air element (the front plate) and a check rail manufactured from galvanized sheet steel. The entire unit has a white powdercoated finish (RAL 9010-30). Around the edges of the front plate there is a seal tested for air-tightness made from polyten. The nozzles are made from recyclable ABS with a diameter of 2", and are finished in standard white which matches RAL 9010, 30% gloss.

MOUNTING

The diffuser is fixed securely by screwing it up into the ceiling Make a hole in the duct according to the dimension table. The diffuser is fitted in the hole and fixed securely by screwing it to the duct.

AVAILABLE SIZES

Models are available to fit duct sizes between 100 and 630 mm.

ORDERING EXAMPLE

Sinus DC - Size

Nominal size (mm)

Example

Sinus DC-1504

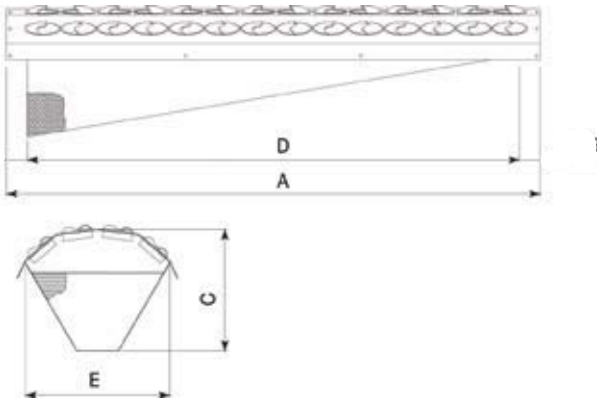
Circular duct mounted Sinus C diffuser, 1500 mm long, 4 rows of nozzles.

Sinus DC/DR

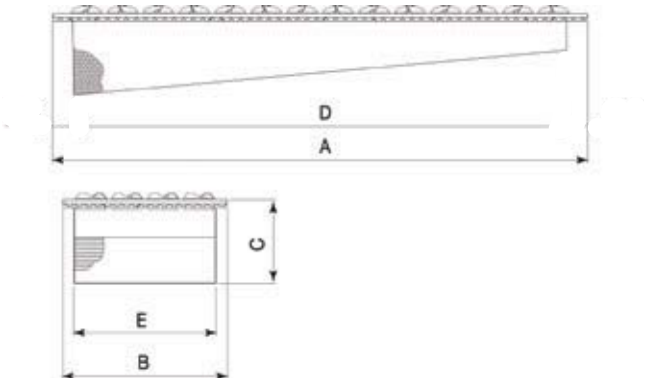
Circular / Rectangular duct nozzle supply diffuser

DIMENSIONS

Sinus-DC



Sinus-DR



	A	C	D	E	Fits, duct
Sinus DC-1001	41	2 3/4	38	2 3/4	4-10
Sinus DC-1501	60 11/16	2 3/4	57 11/16	2 3/4	4-10
Sinus DC-1002	41	5	38	5 5/16	6-12
Sinus DC-1502	60 11/16	5	57 11/16	5 5/16	6-12
Sinus DC-1003	41	7 5/16	38	7 7/8	12-25
Sinus DC-1503	60 11/16	7 5/16	57 11/16	7 7/8	12-25
Sinus DC-1004	41	7 7/8	38	9 7/8	12-25
Sinus DC-1504	60 11/16	7 7/8	57 11/16	9 7/8	12-25

	A	B	C	D	E	Fits, duct
Sinus DR-1001	41	4 5/16	2 3/8	38	2 3/4	4-10
Sinus DR-1501	60 11/16	4 5/16	2 3/8	57 11/16	2 3/4	4-10
Sinus DR-1002	41	7 1/16	3 9/16	38	5 1/2	6-12
Sinus DR-1502	60 11/16	7 1/16	3 9/16	57 11/16	5 1/2	6-12
Sinus DR-1003	41	9 7/8	4 15/16	38	8 1/4	12-25
Sinus DR-1503	60 11/16	9 7/8	4 15/16	57 11/16	8 1/4	12-25
Sinus DR-1004	41	12 5/8	4 15/16	38	11 1/16	12-25
Sinus DR-1504	60 11/16	12 5/8	4 15/16	57 11/16	11 1/16	12-25

Dimensional information is in inches

ACOUSTIC CHARACTERISTICS

Sound attenuation, ΔL (dB)								
	Mid-frequency band, Hz							
	63	125	250	500	1k	2k	4k	8k
Sinus DC/DR 1001	11	6	6	5	6	5	4	5
Sinus DC/DR 1002	11	6	5	5	6	5	4	5
Sinus DC/DR 1003	10	7	5	4	4	4	4	5
Sinus DC/DR 1004	9	7	5	4	4	3	3	6
Sinus DC/DR 1501	10	5	4	4	5	4	3	4
Sinus DC/DR 1502	10	5	3	4	5	4	3	4
Sinus DC/DR 1503	6	2	4	3	4	3	3	4
Sinus DC/DR 1504	6	5	4	3	3	2	3	5

Sinus DC/DR

Circular / Rectangular duct nozzle supply diffuser

SPECIFICATION DATA CHART - SINUS-DC

		Air flow range, cfm and throw, ft @ 40 fpm										ΔP_t - Pressure drop, in.wg.		
Sinus DC-1001		6	10	15								0.03	0.06	0.10
Sinus DC-1501				13	20		29					0.01	0.07	0.14
Sinus DC-1002						20	36		43			0.01	0.10	0.14
Sinus DC-1502							23	36		46		0.02	0.08	0.13
Sinus DC-1003			10	13	20							0.01	0.04	0.09
Sinus DC-1503						15	23	33				0.02	0.07	0.10
Sinus DC-1004							20	33		43		0.02	0.07	0.11
Sinus DC-1504									26	36	49	0.03	0.06	0.12
	cfm	35	53	71	106	124	182	235	294	383	544	20-25	30	35-40
												dB (A)		

SPECIFICATION DATA CHART - SINUS-DR

		Air flow range, cfm and throw, ft @ 40 fpm										ΔP_t - Pressure drop, in.wg.		
Sinus DR-1001		6	10	15								0.03	0.06	0.10
Sinus DR-1501				13	20		29					0.01	0.07	0.14
Sinus DR-1002						20	36		43			0.01	0.10	0.14
Sinus DR-1502							23	36		46		0.02	0.08	0.13
Sinus DR-1003			10	13	20							0.01	0.04	0.09
Sinus DR-1503						15	23	33				0.02	0.07	0.10
Sinus DR-1004							20	33		43		0.02	0.07	0.11
Sinus DR-1504									26	36	49	0.03	0.06	0.12
	cfm	35	53	71	106	124	182	235	294	383	544	20-25	30	35-40
												dB (A)		

To find out more about Sinus DC/DR nozzle diffusers, visit our online catalog at **systemair.net** and find a perfect match for your application.

SFD

NEW!

Swirl floor diffuser

APPLICATION

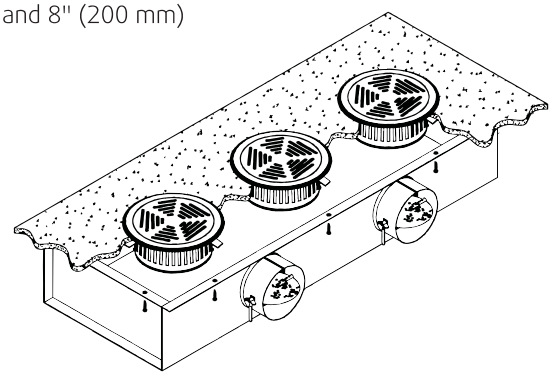
SFD is a circular swirl supply air floor diffuser suitable for false floor installations. The diffuser may be used in rooms with a variable or constant air volume.

DESIGN

Diffuser slots are designed to ensure a swirl air supply with high levels of induction, achieving reduced air velocities and a moderate temperature gradient in the occupied zone. The diffuser is manufactured from aluminum.

AVAILABLE SIZES

6" (150 mm) and 8" (200 mm)



- For false floor installations
- Aluminum housing
- Duct size connection 6" and 8"

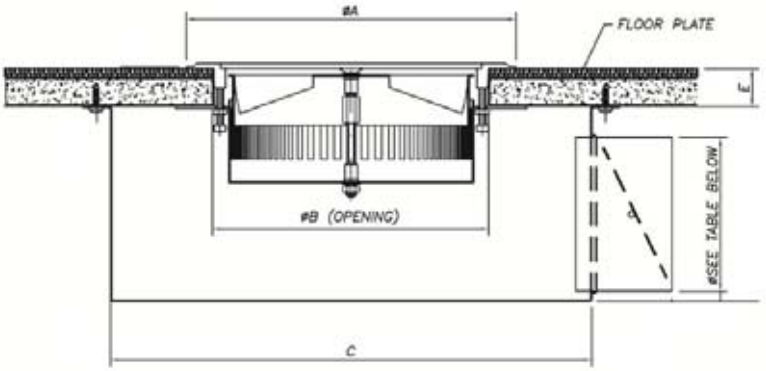
SPECIFICATION DATA

		Airflow range, cfm and throw, ft @ 40 fpm							ΔP_t - Pressure drop, in.wg (Pa)		
SFD 150		2	4	5	7 1/2				0.04	0.06	0.12
SFD 200			2	2 1/2	4	6	5	6	0.03	0.04	0.09
	cfm	18	29	41	59	77	88	100	20-25	30	35-40
										dB (A)	

DIMENSIONS

	øA	øB	C	Weight, lbs
SFD 150	7 1/2	5 7/8	8 7/8	1
SFD 200	9 1/2	7 7/8	10 7/8	2

Dimensions are in inches.



Accessories

Duct silencers

Silencers effectively reduce unwanted fan airflow and mechanical noise when installed in HVAC ductwork

p. 114

Multiple quality checks

Quality is very important to us and it's what sets us apart from everyone else. That's why we do multiple quality checks during our production process to ensure that every product is up to our standards.

Mounting clamps

Mounting clamps facilitate the installation and removal of fans for service and cleaning.

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Pressure controllers

The sensor reads the static pressure and regulates the fans RPMs to maintain a preset desired static pressure.

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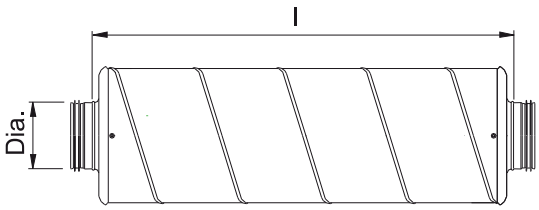
LDC

Silencer for a circular duct

- Insulation thickness 2 inches
- Fits a standard spiral duct

Easily-fitted silencer for circular ducts, fitted with a connection, which is compatible with a standard spiral duct. The LDC effectively reduces noise in the duct. Two silencers can be used together in installations where noise reduction is critical.



INSERTION LOSS, dB

dB(A)	Frequency bands [Hz]							
	63	125	250	500	1K	2K	4K	8k
LDC 100-600	4	3	11	24	36	49	34	17
LDC 125-600	3	3	9	23	30	40	22	14
LDC 150-600	-	3	7	20	27	31	16	11
LDC 200-600	2	3	7	16	21	23	9	8
LDC 250-900	3	4	8	20	26	23	10	8
LDC 315-900	1	3	7	16	22	12	6	7
LDC 355-900	-	3	6	13	18	10	6	7
LDC 400-900	1	3	5	10	13	7	5	6
LDC 500-900	4	8	13	18	24	28	17	16

TECHNICAL DATA

Model	Dia., inch	l, inch	Shipping weight, lbs
LDC 100-600	4	23 5/8	13
LDC 125-600	5	23 5/8	16
LDC 150-600	6	23 5/8	17
LDC 200-600	8	23 5/8	20
LDC 250-900	10	35 1/2	26
LDC 315-900	12 (315)	35 1/2	35
LDC 355-900	14	35 1/2	44
LDC 400-900	16	35 1/2	56
LDC 500-900	20	35 1/2	66

FK

Mounting clamp for a circular duct

Mounting clamps facilitate easy installation and removal of fans for service and cleaning. Made from galvanized sheet metal and fitted with an 1/3" neoprene lining which suppresses vibration and ensures a tight fit. The mounting clips are clamped together by two screws, which allow for connecting ducts with a marginal difference in diameter.

TECHNICAL DATA

Model	Diameter, inch	Width, inch	Shipping weight, lbs
FK 100	4	2 3/8	1
FK 125	5	2 3/8	1
FK 150	6	2 3/8	1
FK 160	8	2 3/8	1
FK 200	10	2 3/8	1
FK 300	12	2 3/8	1
FK 315	315 mm	2 3/8	1
FK 355	14	2 3/8	2
FK 400	16	2 3/8	2
FK 450	18	2 3/8	2
FK 500	20	2 3/8	2

LDK

NEW!

Silencer for a square duct

- Insulation thickness 2 inches
- Fits a standard spiral duct

INSERTION LOSS, dB

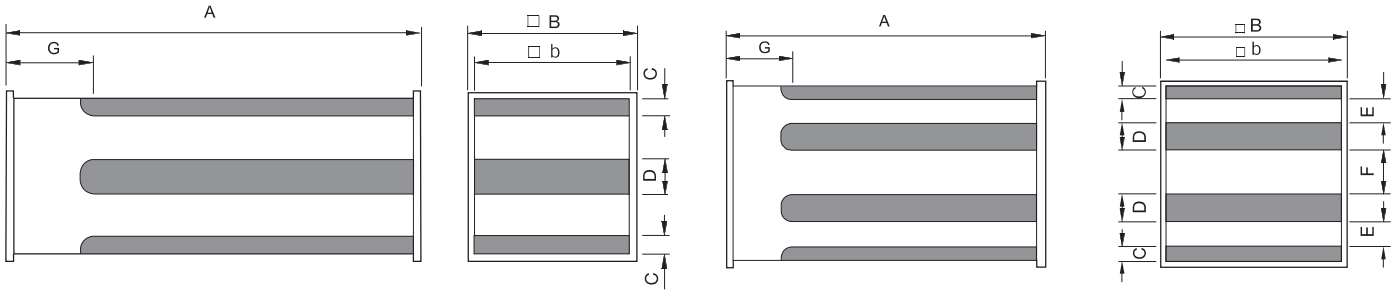
dB(A)	Frequency bands [Hz]							
	125	250	500	1k	2k	4k	8k	8k
LDK 45	5	8	13	12	8	7	7	17
LDK 50	7	8	13	12	9	8	7	14
LDK 55	9	9	13	12	10	9	8	11
LDK 65	6	7	14	13	9	8	7	8
LDK 70	5	7	19	24	23	15	10	8

DESIGN

The LDK Series of square duct silencers is used to reduces noise in ducts. Two silencers can be used together in installations where noise reduction is a particularly strong requirement.

The silencer should be used together with an insulated fan where there is a requirement for noise reduction both in the duct and in the surroundings as a whole.

TECHNICAL DATA



Model	A, inch	b, inch	B, inch	C, inch	D, inch	E, inch	F, inch	G, inch	Shipping weight, lbs
LDK 45	47 1/4	17 11/16	19 5/16	2	3 15/16	-	-	9 7/8	57
LDK 50	47 1/4	19 3/4	21 1/2	2	5 7/8	-	-	9 7/8	67
LDK 55	47 1/4	21 5/8	23 11/16	2	7 7/8	-	-	9 7/8	70
LDK 65	47 1/4	26	27 11/16	2	3 15/16	3 5/8	6 7/8	9 7/8	86
LDK 70	47 1/4	27 3/8	29 1/8	2	3 15/16	4 3/8	6 7/8	9 7/8	106

LDR

NEW!

Silencer for a rectangular duct

- Effectively suppresses noise in the duct
- Supplied with a flange

DESIGN

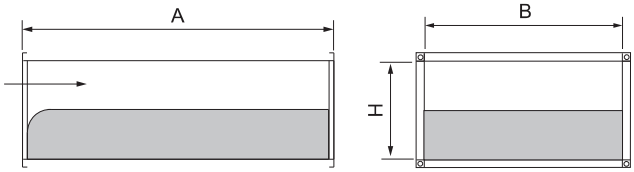
Easily-fitted silencer immediately before or after the duct fans. Effectively suppresses noise transmitted to the duct. The silencer should be used in conjunction with an insulated fan where there is a requirement for noise suppression both in the duct and in the surroundings as a whole. All silencers are supplied with a universal flange.

INSERTION LOSS, dB

dB(A)	Frequency bands [Hz]							
	125	250	500	1k	2k	4k	8k	8k
LDR 30-15	7	15	18	25	25	19	19	17
LDR 40-20	5	9	15	23	16	12	10	14
LDR 50-25	10	15	25	25	20	15	12	11
LDR 50-30	8	15	20	31	17	14	11	8
LDR 60-30	8	15	20	31	17	14	11	8
LDR 60-35	7	13	17	18	13	10	8	7
LDR 70-40	7	11	14	14	10	8	6	7
LDR 80-50	6	8	10	11	8	6	3	6
LDR 100-50	6	8	10	11	8	6	3	16

TECHNICAL DATA

Model	A, inch	B, inch	H, inch	Shipping weight, lbs
LDR 30-15	37 7/16	11 13/16	5 7/8	20
LDR 40-20	37 7/16	15 3/4	7 7/8	27
LDR 50-25	37 7/16	19 11/16	9 7/8	36
LDR 50-30	37 7/16	19 11/16	11 13/16	40
LDR 60-30	37 7/16	23 11/16	11 13/16	40
LDR 60-35	37 7/16	23 11/16	13 13/16	47
LDR 70-40	37 7/16	27 9/16	15 3/4	55
LDR 80-50	37 7/16	31 1/2	19 11/16	73
LDR 100-50	37 7/16	39 3/8	19 11/16	86



LDR-B

NEW!

Silencer for a rectangular duct

- Effectively suppresses noise in the duct
- Designed for low air resistance

DESIGN

LDR-B is fitted with built-in baffles and side baffles located outside the fitting dimensions. LDR-B has an external shell of trapezoidal corrugated sheet for stability and reduced risk of natural oscillation.

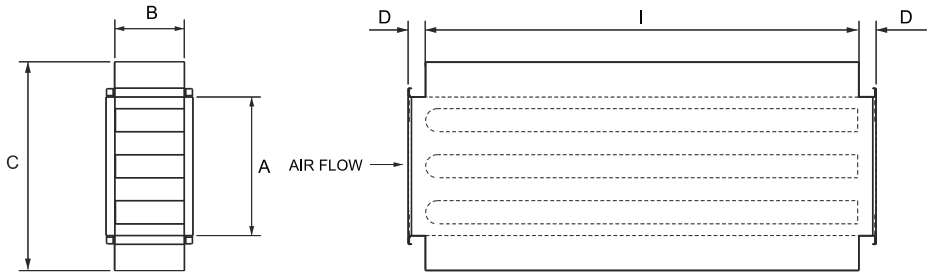
LDR-B is designed for low air resistance with baffle combinations that dampen particularly low-frequency noise well. Insulation material provides good noise reduction, low weight and to be cleaned if needed.

INSERTION LOSS, dB

dB(A)	Frequency bands [Hz]							
	125	250	500	1k	2k	4k	8k	8k
LDR-B 40-20	4	12	21	38	46	34	25	19
LDR-B 50-25	4	12	20	34	36	27	19	14
LDR-B 50-30	4	12	20	34	36	27	19	14
LDR-B 60-30	4	12	20	30	29	22	16	12
LDR-B 60-40	4	12	20	30	29	22	16	12
LDR-B 70-30	5	12	19	27	25	18	13	10
LDR-B 70-40	5	12	19	27	25	18	13	10
LDR-B 80-35	4	11	16	22	19	14	10	8
LDR-B 80-40	4	11	16	22	19	14	10	8
LDR-B 90-50	3	9	16	26	27	20	14	11
LDR-B 100-35	4	11	18	27	27	20	14	11
LDR-B 110-60	5	12	19	28	27	20	14	11
LDR-B 120-60	4	11	17	24	22	16	12	9

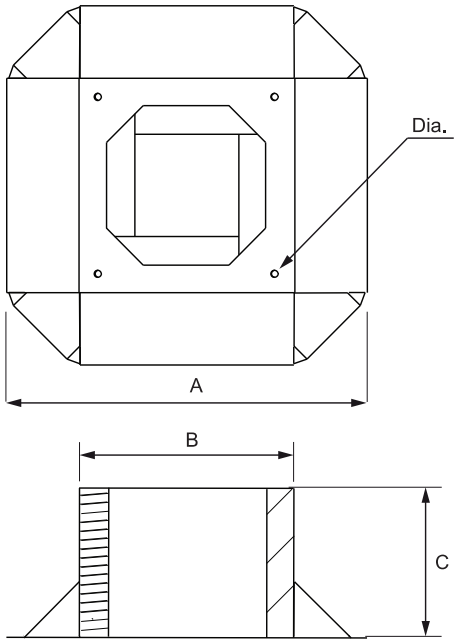
TECHNICAL DATA

Model	A, inch	B, inch	C, inch	D, inch	I, inch	Shipping weight, lbs
LDR-B 40-20	15 3/4	7 7/8	23 5/8	2	49 1/4	48
LDR-B 50-25	19 11/16	9 3/4	27 9/16	2	49 1/4	56
LDR-B 50-30	19 11/16	11 13/16	27 9/16	2	49 1/4	48
LDR-B 60-30	23 5/8	11 13/16	31 1/2	2	49 1/4	67
LDR-B 60-40	23 5/8	15 3/4	31 1/2	2	49 1/4	76
LDR-B 70-30	27 9/16	11 13/16	35 7/16	2	49 1/4	56
LDR-B 70-40	27 9/16	15 3/4	35 7/16	2	49 1/4	82
LDR-B 80-35	31 1/2	13 3/4	39 3/8	2	49 1/4	64
LDR-B 80-40	31 1/2	15 3/4	39 3/8	2	49 1/4	84
LDR-B 90-50	35 7/16	19 11/16	43 5/16	2	49 1/4	99
LDR-B 100-35	39 3/8	13 3/4	47 1/4	2	49 1/4	92
LDR-B 110-60	43 5/16	23 5/8	51 3/16	2	49 1/4	143
LDR-B 120-60	47 1/4	23 5/8	55 1/8	2	49 1/4	127



5ACC.. FS

Flat roof curb



- Galvanized sheet metal
- Mounts directly to the roof deck

Manufactured from heavy gauge galvanized steel. Corners are welded construction. The curb features fiberglass insulation that deadens sound and minimizes heat loss. The curb is equipped with shutter flange.

TECHNICAL DATA

Model	Used with fan model	Curb height, inch	Shipping weight, lbs
5ACC 10FS	DVC 10	8	16
5ACC 14FS	DVC 14	8	20
5ACC 18FS	DVC 18	8	22
5ACC 22FS	DVC 22	8	29
5ACC 30FS	DVC 30 & 30H	8	48

DIMENSIONS

Model	A, inch	B, inch	C, inch	Dia., inch
5ACC 10FS	19 11/16	11 11/16	8 1/16	25/64
5ACC 14FS	24 5/8	16 5/8	8 1/16	25/64
5ACC 18FS	29 15/16	21 15/16	8 1/16	25/64
5ACC 22FS	32 11/16	24 11/16	8 1/16	25/64
5ACC 30FS	43 1/2	35 1/2	8 1/16	25/64

5ACC.. RD

NEW!

Roof mount damper

- Galvanized sheet metal
- Aluminum blades

Manufactured from 19-gauge galvanized steel frame 2" deep with 1" flange. For quiet operation aluminum blades have felted edges. Pre-punched conduit hole knock-out. Used with DVC roof fans.

TECHNICAL DATA

Model	Used with curb model	Recommended Roof Opening	Outside Flange	Shipping weight, lbs
5ACC 10RD	DVC 10	10 1/2"x10 1/2"	10" x 10"	3
5ACC 15RD	DVC 12, DVC18	15 1/2"x15 1/2"	15" x 15"	4
5ACC 18RD	DVC 22	18 1/2"x18 1/2"	18" x 18"	6
5ACC 29RD	DVC 30, DVC 30H	29 1/2"x29 1/2"	29" x 29"	11

MTP 10

Potentiometer for manual speed control

Surface or recessed wall mounted controller for manual speed control of all EC-motor fan models.

Input is 10Vdc / Output is 0-10Vdc.

TECHNICAL DATA

Model	Voltage, V dc	IP Class	Shipping weight, lb
MTP 10	0 - 10	IP 54	1

DPC 200

Constant pressure control

This low pressure sensor with analog input and PI controlling mode is used with ECM fans for constant pressure applications. The sensor reads the static pressure and regulates the fans RPMs to maintain a preset desired static pressure.

TECHNICAL DATA

Model	Measuring range, w.g.	Output, Vdc	Shipping weight, lb
DPC 200	0 - 2.0" P_s	0 - 10	1

5ACC..MS

Motor disconnect switch (NEMA)

Provides manual "On-Off" control of single or three phase AC motors where overload protection is not required or is provided separately.

5ACC 01MS: 120/230/460V, 30A
5ACC 02MS: 208/230/460V, 30A

TECHNICAL DATA

Model	Poles	Max HP	Shipping weight, lbs
5ACC 001MS	2	3	1
5ACC 002MS	3	10	1

S-5EC/FRQ

NEW!

5-step switch (10V/0-10V) with on/off function for surface mounting

For direct control of EC fans or frequency converters via a 0-10V control input (DC). Including LED for status indication and an additional potentiometer for offset adjustment.

TECHNICAL DATA

Model	Output, Vdc	Max ambient temperature, °F	Shipping weight, lb
S-5EC/FRQ	0 - 10	158	1

CAL

Power rectifier 12VAC/3VDC

Power Inverter 12V AC / 3V DC for exhaust air elements with intensive ventilation (only in combination with an appropriate transformer). Replaces 2x 1.5V batteries. Shipping weight 0.1 lb.

AEA

Duct adapter 125/100

4" to 5" adapter for BXC exhaust unit. Shipping weight 0.1 lb.

FANS

The intention of this Theory Section is to explain the basic principles of acoustics and ventilation.

The theory section concludes with a description of the parts which are integral to a ventilation unit or an air-handling unit, i.e. fans, heaters, heat exchangers and filters.

Explanatory texts and further information are provided in the margin. Some diagrams and formulas also feature in the margins, together with examples of their application.

FANS

Fans are used in ventilating units to transport the air from various air intakes through the duct system to the room which is to be ventilated. Every fan must overcome the resistance created by having to force the air through ducts, bends and other ventilation equipment. This resistance causes a fall in pressure, and the size of this fall is a decisive factor when choosing the dimensions of each individual fan.
Fans can be divided into a number of main groups determined by the impeller's shape and its operating principle: radial fans, axial fans, semi-axial fans and cross-flow fans.

Radial fan

Radial fans are used when a high total pressure is required. The particular characteristics of a radial fan are essentially determined by the shape of the impeller and blades.

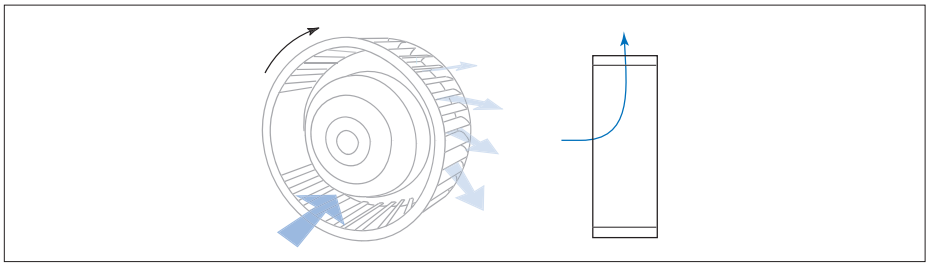


Figure #1: The air stream through a radial fan with forward-curved blades

Backward-curved blades (B impeller): The air volume which can be delivered by backward-curved blades varies considerably according to the pressure conditions. The blade form makes it less suitable for contaminated air. This type of fan is most efficient in a narrow range to the far left of the fan diagram. Up to 80% efficiency is achievable while keeping the fan's sound levels low.

Backward-angled straight blades (P impeller): Fans with this blade shape are well suited for contaminated air. Up to 70% efficiency can be achieved.

Straight radial blades (R impeller): The blade shape prevents contaminants from sticking to the impeller even more effectively than with the P impeller. No more than 55% efficiency can be achieved with this type of fan.

Forward-curved blades (F impeller): The air volume delivered by radial fans with forward-curved blades is affected very little by changes in air pressure. The impeller is smaller than the B impeller, for example, and the fan unit consequently requires less space. Compared with the B impeller, this type of fan's optimal efficiency is further to the right on the diagram. This means that one can select a fan with smaller dimensions by choosing a radial fan with an F impeller rather than a B impeller. An efficiency of approximately 60% can be achieved.

Axial fan

The simplest type of axial fan is a propeller fan. A freely-rotating axial fan of this type has a very poor efficiency rating, so most axial fans are built into a cylindrical housing. Efficiency can also be increased by fitting directional vanes immediately behind the impeller to direct the air more accurately. The efficiency rating in a cylindrical housing can be 75% without directional vanes and up to 85% with them.

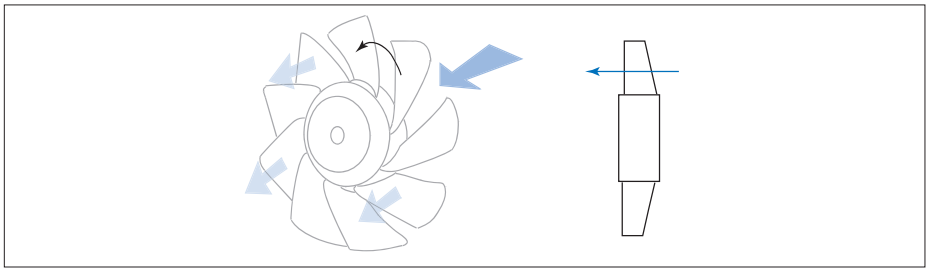
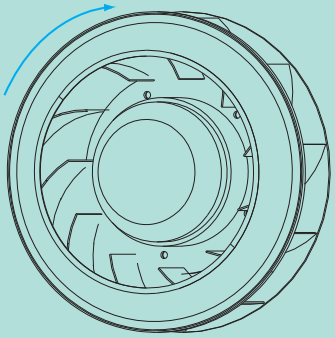


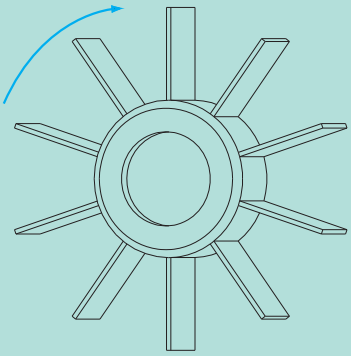
Figure #2: The air flow through an axial fan

Blade profiles for radial fans

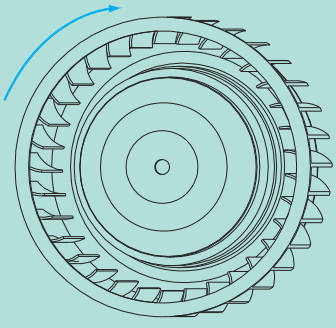
The arrow indicated the impeller's direction of rotation



Backward curved



Straight radial



Forward curved

Mixed flow fan

Radial impellers produce a static pressure increase because of the centrifugal force acting in a radial direction. There is no equivalent pressure increase with axial impellers because the air flow is normally axial. The mixed flow fan is a mixture between radial and axial fans. The air flows in an axial direction but then is deflected 45° in the impeller. The radial velocity factor which is gained by this deflection causes a certain increase in pressure by means of the centrifugal force. Efficiency of up to 80% can be achieved.

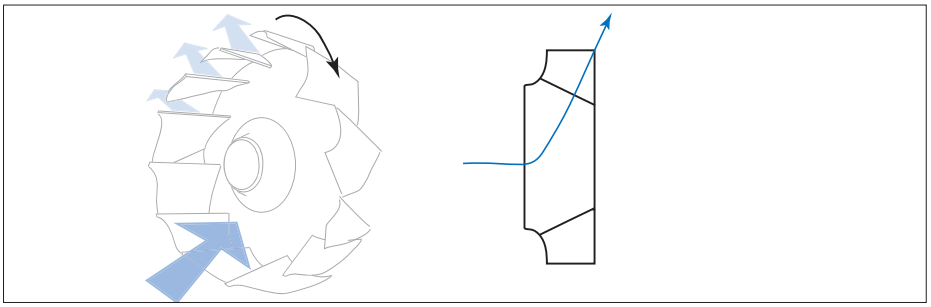


Figure #3: The air flow through a mixed flow fan

Cross-flow fan

In a cross-flow fan the air flows straight across the impeller, and both the in and out flow are in the periphery of the impeller. In spite of its small diameter, the impeller can supply large volumes of air and is therefore suitable for building into small ventilation units, such as air curtains for example. Efficiency of up to 65% can be achieved.

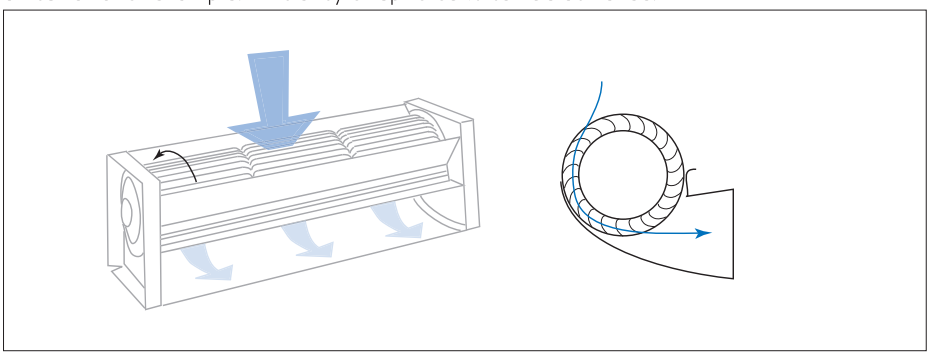


Figure #4: The air flow through a cross-flow fan

Fan curves

The fan diagram indicates the fan's capacity at different pressures. Each pressure corresponds to a certain air flow, which is illustrated by a fan curve.

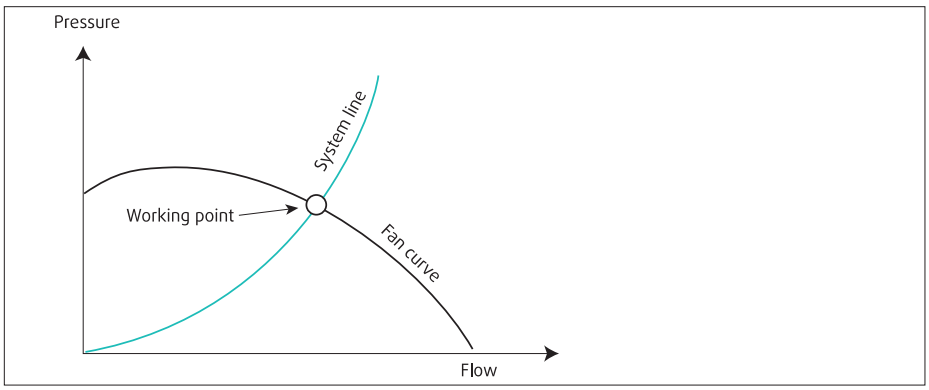


Figure #5: Curves in a typical fan diagram

System lines

The duct system's pressure requirement for various air flows is represented by the system line. The fan's working point is indicated by the intersection between the system line and the fan curve. This shows the air flow which the duct system will produce.
Each change of pressure in the ventilation system gives rise to a new system line. If the pressure increases, the system line will be the same as line B. If the pressure reduces, the system line will be the same as line C instead. (This only applies if the rotational speed of the impeller, i.e. the revolution count, remains constant).

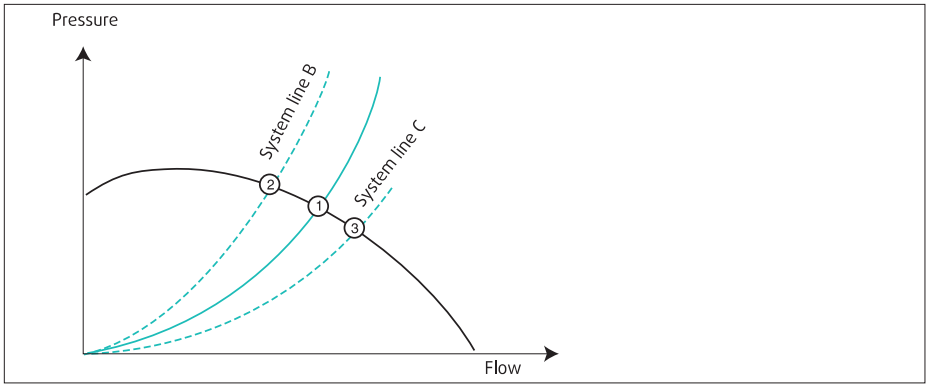


Figure #6: Changes in pressure give rise to new system lines
If the ventilation system's actual pressure requirement is the same as system line B, the working point will move from 1 to 2. This will also entail a weaker air flow. In the same way, the air flow will increase if the system's pressure requirement corresponds instead to line C.

Theoretical calculation of the system line

$$\Delta P = k \cdot q_v^2$$

where
P - the fan's total pressure, in.wg
q_v - air flow, cfm

k - constant

Example

A certain fan produces an air flow of 3,000 cfm at a pressure of 1 in.wg.

A. How does one produce a system line in the diagram?

a) Mark the point on the fan curve (1) where the pressure is 1 in.wg and the air flow is 3,000 cfm.

Enter the same value in the formula above to obtain a value for the constant k.

$k = \Delta P/q_v^2 = 1/3{,}000^2 = 0.0000001$

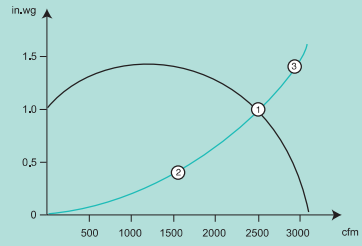
b) Select an arbitrary pressure reduction, for example 0,4 in.wg, calculate the air flow and mark point (2) in the diagram.

$q = \sqrt{0.4/(0{,}00000011)} = 1{,}907$ cfm

c) Do the same thing for 1.4 in.wg. and mark point (3) in the diagram.

$q = \sqrt{1.4/(0{,}00000011)} = 3{,}550$ cfm

d) Now draw a curve that indicates the system line.



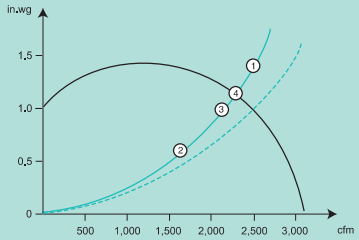
B. What will happen if the pressure in the system increases by 0.4 in.wg. (for example because of a clogged filter)?

a) Calculate the constant for the new system line:
$k = 1.4/3{,}000^2 = 0.00000015$

b) Select two other pressure reductions, for example 0.6 in.wg and 1.0 in.wg, and calculate the air flow for them.

$q = \sqrt{0.6/(0.00000015)} = 1{,}964$ cfm

$q = \sqrt{1/(0.00000015)} = 2{,}540$ cfm



c) Plot in the two new points (2 and 3) and draw in the new system line.

The new working point (4) is located at the intersection between the fan curve and the new system line.

This diagram also indicates that the pressure increase causes a reduction of the air flow to approximately 2,300 cfm.

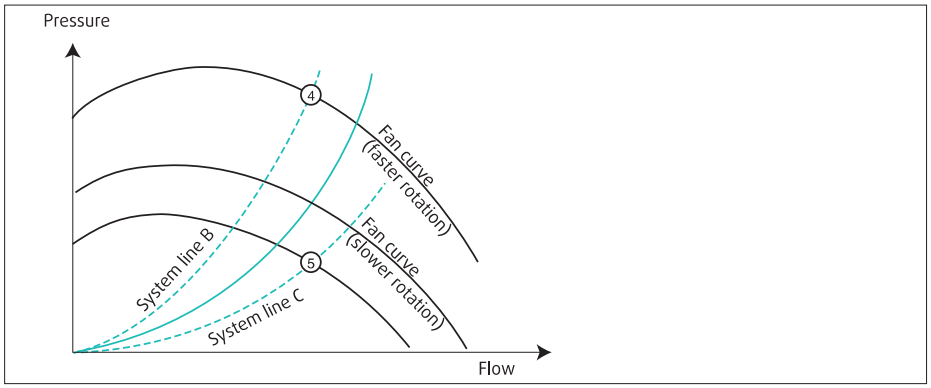


Figure #7: Increase or reduction of the fan speed

To obtain the same air flow as calculated, one can in the first case (where the system line corresponds to B) quite simply increase the fan speed. The working point (4) will then be at the intersection of system line B and the fan curve for a higher rotational speed. In the same way, the fan speed can be reduced if the actual system line corresponds to line C.

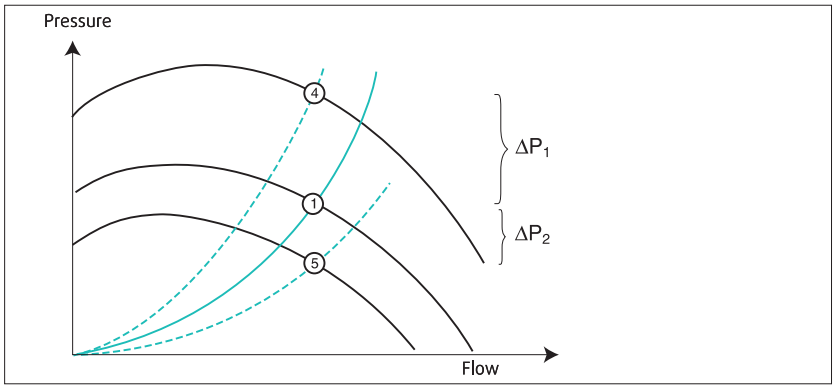


Figure #8: Pressure differences at different rotational speeds

In both cases, there will be a certain difference in pressure from that of the system for which the dimensioning has been calculated, and this is shown as ΔP1 and ΔP2 respectively in the figure. This means that if the working point for the calculated system has been chosen so as to give the maximum degree of efficiency, any such increase or decrease of the fan's rotational speed will reduce the fan's efficiency.

Efficiency and system lines

To facilitate the selection of a fan, one can plot in a number of considered system lines in a fan diagram and then see between which lines a particular type of fan should operate. If the lines are numbered 0 to 10, the fan will be completely free-blowing (maximum air flow) at line 10 and will be completely choked (no air flow at all) at line 0. This then means that the fan at system line 4 produces 40% of its free-blowing air flow.

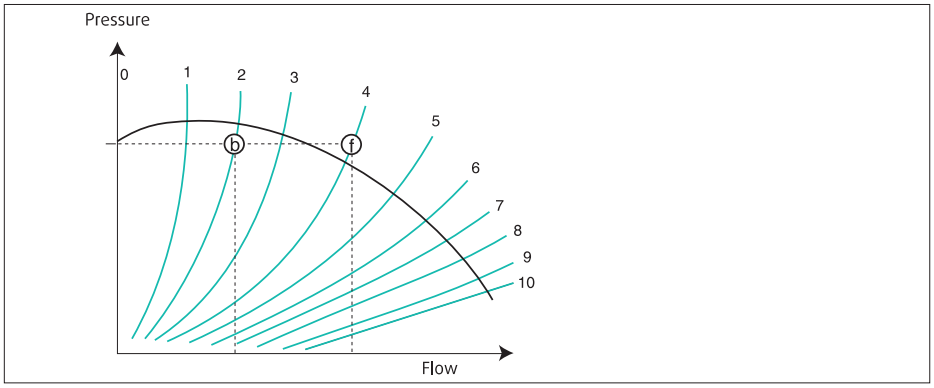


Figure #9: System lines (0-10) in a fan diagram

Each fan's efficiency remains constant along one and the same system line. Fans with backward-curved blades frequently have a greater efficiency than fans with forward-curved blades. But these higher levels of efficiency are only achievable within a limited area where the system line represents a weaker air flow at a given pressure than is the case with fans with forward-curved blades.

To achieve the same air flow as for a fan with forward-curved blades, while at the same time maintaining a high level of efficiency, a fan with backward-curving blades in a larger size would have to be selected.

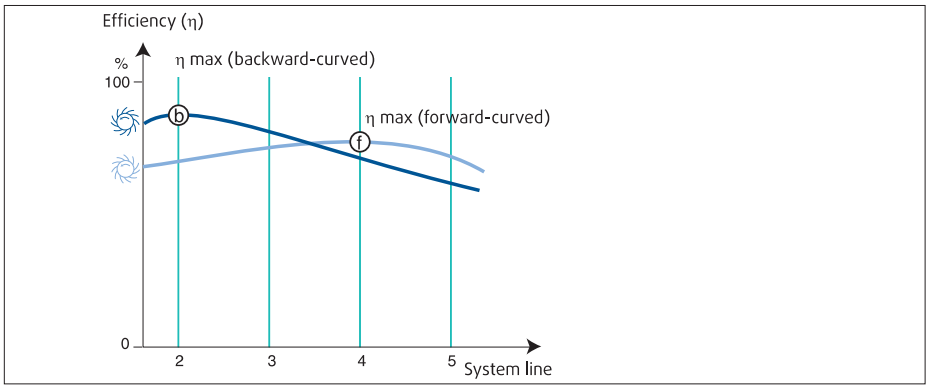


Figure #10: Efficiency values for the same size of radial fan with backward-curved and forward-curved blades respectively

Definition of the system line

$$L = 10 \cdot \sqrt{\frac{\Delta P_d}{\Delta P_t}}$$

where
L - the fan's system line
P_d - dynamic pressure, in.wg.
P_t - total pressure, in.wg.

Efficiency of a fan

$$\eta = \frac{\Delta P_t \cdot q}{P}$$

where
P_t = total pressure, in.wg.
q = airflow, cfm
P = power, W

Specific Fan Power

The Specific fan power for an entire building

$$SFP_E = \frac{P_{tf} + P_{ff}}{q_f} \quad (W/cfm)$$

where
P_{tf} - total power for air supply fans, W
P_{ff} - total power for air extract fans, W
q_f - dimensioned air flow, cfm

Theoretical calculations of a fan's power consumption

$$P = \frac{P_t \cdot q}{\eta_{fan} \cdot \eta_{belt} \cdot \eta_{motor}}$$

where
P - the fan's consumption of electric power from the network, W
P_t - the fan's total pressure, Pa
q - air flow, cfm
h_{fan} - the fan's efficiency
h_{belt} - efficiency of the transmittion
h_{motor} - efficiency of the fan's motor

Fan application

It is assumed in the fan diagram that the fan's connections to the inlet and outlet are designed in a specific way. There must be at least 1 x the duct diameter on the suction side (inlet) and 3 x the duct diameter on the pressure side (outlet).

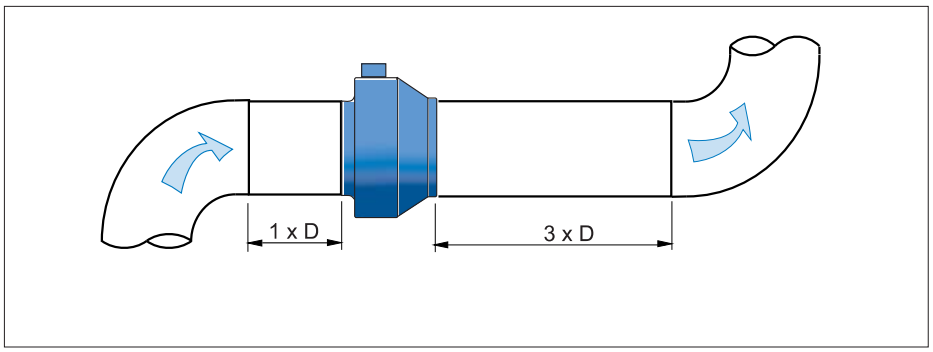


Figure #11: Correctly installed duct fan

If the connections are different from this, there could be a greater pressure reduction. This extra pressure drop is called the system effect or system dissipation, and can cause the fan to produce a smaller volume of air than indicated in the fan diagram. The following factors must be considered in order to avoid system dissipation:

At the inlet
- The distance to the nearest wall must be more than 0.75 x the inlet's diameter
- The inlet duct's cross-section must not be greater than 112% or less than 92% of the fan inlet
- The inlet duct's length must be at least 1 x the duct diameter
- The inlet duct must not have any obstacles to the air flow (dampers, branching or similar)

At the outlet
- The angle at the reduction of the duct cross-section must be less than 15°
- The angle at the enlargement of the duct cross-section must be less than 7°
- A straight length of at least 3 x the duct diameter is required after a duct fan
- Avoid 90° bends (use 45°)
- Bends must be shaped so that they follow the air stream after the fan

Specific Fan Power

In Europe, there are now stringent requirements to ensure that power consumption in a building is as efficient as possible so as to minimize energy costs. The Svenska Inneklimatinstitutet [Swedish Inner Climate Institute] has introduced a special concept known as the Specific Fan Power (SFP_E) as a measurement of a ventilation system's energy efficiency.

The Specific Fan Power for an entire building can be defined as the total energy efficiency of all the fans in the ventilation system divided by the total air flow through the building. The lower the value, the more efficient the system is at transferring the air.

The recommendations for public sector purchasing and similar are that the maximum SFP_E should be 2.0 when maintaining and repairing ventilating units, and 1.5 for new installations.

ACOUSTICS

Basic principles of sound

Before we discuss the connection between the sound power level and the sound pressure level, we must define certain basic concepts such as sound pressure, sound power and frequency.

Sound pressure

Sound pressure is the pressure waves with which the sound moves in a medium, for instance air. The ear interprets these pressure waves as sound. They are measured in in.wg.

The weakest sound pressure that the ear can interpret is 0.00002 Pa, which is the threshold of hearing. The strongest sound pressure which the ear can tolerate without damage is 20 Pa, referred to as the upper threshold of hearing. The large difference in pressure, as measured in Pa, between the threshold of hearing and the upper threshold of hearing, makes the figures difficult to handle. So a logarithmic scale is used instead, which is based on the difference between the actual sound pressure level and the sound pressure at the threshold of hearing. This scale uses the decibel (dB) unit of measurement, where the threshold of hearing is equal to 0 dB and the upper threshold of hearing is 120 dB.

The sound pressure reduces as the distance from the sound source increases, and is affected by the room's characteristics and the location of the sound source.

Sound power

Sound power is the energy per time unit (Watt) which the sound source emits. The sound power is not measured, but it is calculated from the sound pressure. There is a logarithmic scale for sound power similar to the scale for sound pressure.
The sound power is not dependent on the position of the sound source or the room's sound properties, and it is therefore easier to compare between different objects.

Frequency

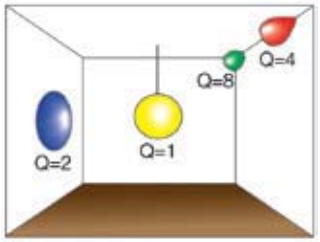
Frequency is a measurement of the sound source's periodic oscillations. Frequency is measured as the number of oscillations per second, where one oscillation per second equals 1 Hertz (Hz). More oscillations per second, i.e. a higher frequency, produces a higher tone. Frequencies are often divided into 8 groups, known as octave bands: 63 Hz, 125 Hz, 250 Hz, 500 Hz, 1000 Hz, 2000 Hz, 4000 Hz and 8000 Hz.

Sound power level and sound pressure level

There is a link between a sound source's sound power level and the sound pressure level. If a sound source emits a certain sound power level, the following factors will affect the sound pressure level:
The position of the sound source in the room, including the direction factor (1), the distance from the sound source (2) and the room's sound-absorbing properties, referred to as the room's equivalent absorption area (3).

1) Direction factor, Q

The direction factor indicates the sound's distribution around the sound source. A distribution in all directions, spherical, is measured as Q = 1. Distribution from a diffuser positioned in the middle of a wall is hespherical, measured as Q = 2.



Q = 1 In center of room
Q = 2 On wall or ceiling
Q = 4 Between wall or ceiling
Q = 8 In a corner

Figure #12: The distribution of sound around the sound source

Calculation of equivalent absorption area

$$A_{eqv} = \alpha_1 \cdot S_1 \cdot \alpha_2 \cdot S_2 + \ldots + \alpha_n + S_n$$

where
S_n - a size of surface, sq.ft.
α - an absorption factor, depending on the material
n - a number of surfaces

Calculations of sound pressure level

Estimate based on figures 1, 2 and 3 together with table 1.

A normally damped room in a nursing home, measuring 1060 cb.ft. is to be ventilated. According to the information in the catalogue, the directional supply-air terminal device fitted in the ceiling has a sound pressure level (L_{pA}) of 33 dB(A). This applies to a room with a space damping equivalent to 107 sq.ft. Sabine, or 4 dB(A).

A) What will the sound pressure level be in this room, 3,28 ft from the diffuser?

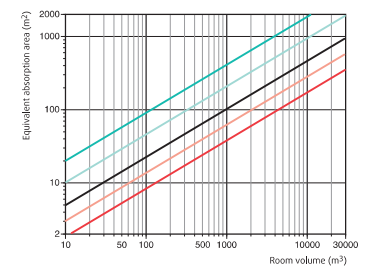
The sound pressure level depends on the room's acoustic properties, so first of all it is necessary to convert the value in the catalogue to a sound power level (L_{WA}).

Figure #14 shows that
ΔL (space damping) = $L_{pA} - L_{WA}$
$L_{WA} = L_{pA} + \Delta L$
$L_{WA} = 33 + 4 = 37$ dB(A)

With the following values

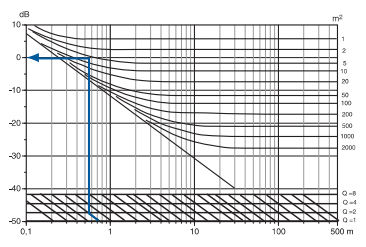
r = 1
Q = 2 (Figure 12)

and information about the room's dimensions, you can calculate the equivalent absorption area with the help of Figure #13.



The equivalent absorption area is therefore 4 m².

It is now possible to use Figure 3 to establish the difference between the sound pressure and the sound power.



$L_{pA} - L_{WA} = 0$

$L_{pA} = 0 + L_{WA}$

Enter the L_{WA} value which has already been calculated.

$L_{pA} = 0 + 37 = 37$ dB(A)

A) The sound pressure level (L_{pA}) one meter from the diffuser in this particular nursing home room is therefore 37 dB(A)

This calculation has to be made for all rooms not corresponding to the information in the catalogue which assumes a standard 10 m² Sabine.

The less damped (harder) the room is, the higher the actual sound pressure level will be in comparison with the value indicated in the catalog.

2) Distance from sound source, r
where **r** indicates the distance from the sound source in metres.

3) The room's equivalent absorption area, A_{eqv}
A material's ability to absorb sound is indicated as absorption factor a. The absorption factor can have a value between '0' and '1', where the value '1' corresponds to a fully absorbent surface and the value '0' to a fully reflective surface. The absorption factor depends on the qualities of the material, and tables are available which indicate the value for different materials.

A room's equivalent absorption area is measured in ft² (m²) and is obtained by adding together all the different surfaces of the room multiplied by their respective absorption factors.

In many instances it can be simpler to use the mean value for sound absorption in different types of rooms, together with an estimate of the equivalent absorption area (see figure 13).

4) Equivalent absorption area based on estimates
If values are not available for the absorption factors of all the surfaces, and a more approximate value of the room's total absorption factor is quite adequate, an estimate can be calculated in accordance with the diagram below. The diagram is valid for rooms with normal proportions, for example 1:1 or 5:2.

Use the diagram as follows to estimate the equivalent absorption area: calculate the room's volume and read off the equivalent absorption area with the correct mean absorption factor, determined by the type of room, see also table 1.

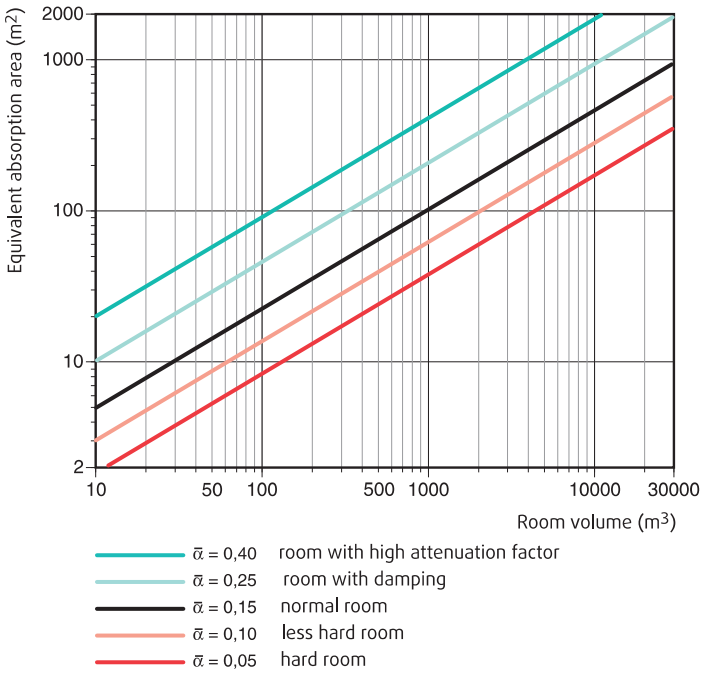


Figure #13: Estimate of equivalent absorption area

Type of room	Mean absorption factor
Radio studios, music rooms	0.30 - 0.45
TV studios, department stores, reading rooms	0.15 - 0.25
Domestic housing, offices, hotel & conference rooms, theatres	0.10 - 0.15
School halls, nursing homes, small churches	0.05 - 0.10
Industrial premises, swimming pools, large churches	0.03 - 0.05

Table #1: Mean absorption factors for different types of rooms

Calculation of sound pressure level

With the help of the factors previously described, it is now possible to calculate the sound pressure level if the sound power level is known. The sound pressure level can be calculated by means of a formula incorporating these factors, but this equation can also be reproduced in the form of a diagram.

When the diagram is used for calculating the sound pressure level, you must start with the distance in metres from the sound source (r), apply the appropriate directional factor (Q), and then read off the difference between the sound power level and the sound pressure level next to the relevant equivalent absorption area (A_{eqv}). This result is then added to the previously calculated sound power (see also the example on page 108).

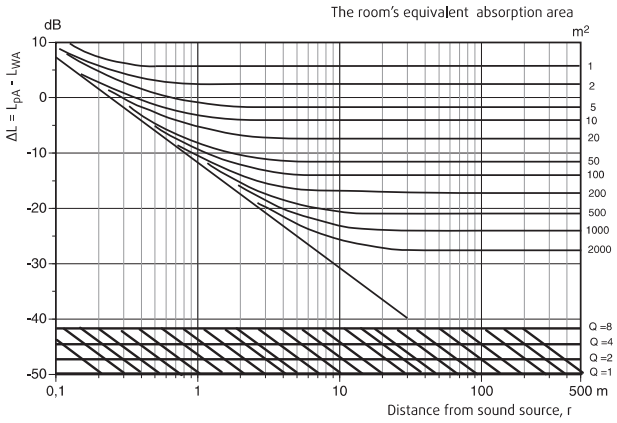


Figure #14: Diagram for estimating the sound pressure level

Near field and reverberation field

Near field is the term used for the area where the sound from the sound source dominates the sound level. The reverberation field is the area where the reflected sound is dominant, and it is no longer possible to determine where the original sound comes from. The direct sound diminishes as the distance from the sound source increases, while the reflected sound has approximately the same value in all parts of the room.

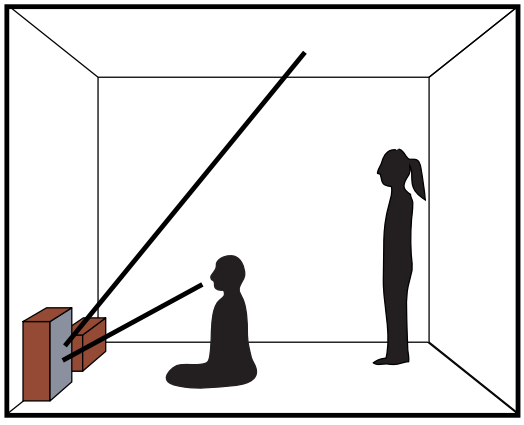


Figure #15: Direct and reflected sound

The reverberation time indicates the time it takes for the sound level to reduce by 60 dB from the initial value. This is the echo effect one hears in a quiet room when a powerful sound source is switched off. If the reverberation time is measured precisely enough, the equivalent absorption area can be calculated.

Calculation of sound level

$$L_{pA} = L_{wA} + 10 \cdot \log\left[\frac{Q}{4\pi r^2} + \frac{4}{A_{eqv}}\right]$$

where
L_{pA} - sound pressure level, dB
L_{wA} - sound power level, dB
Q - direction factor
r - distance from sound source, ft
A_{eqv} - equivalent absorption area, sq.ft
Sabine

Calculations of reverberation time

If a room is not too effectively damped (i.e. with a mean absorption factor of less than 0.25), the room's reverberation time can be calculated with the help of Sabine's formula:

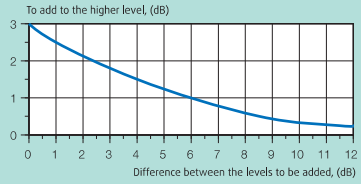
$$T = 0{,}163 \cdot \frac{V}{A_{eqv}}$$

where
T - reverberation time (s). Time for a 60 dB reduction of the sound pressure value
V - room volume, cb.ft
A_{eqv} - the room's equivalent absorption area, sq.ft

Example of addition

There are two sound sources, 40 dB and 38 dB respectively.

1) What is the value of the total sound level?



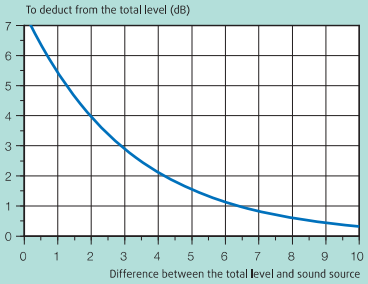
The difference between the sound levels is 2 dB and, according to the diagram, 2 dB must be added to the highest level.

1) The total sound level is therefore 42 dB.

Example of subtraction

The total sound level is 34 dB in a room fitted with both supply and exhaust ventilation systems. It is known that the supply system produces 32 dB, but the value for the exhaust system is not known.

2) What is the sound level produced by the exhaust system?



The difference between the total sound level and the sound level of the supply system is 2 dB. The diagram indicates that 4 dB must be deducted from the total level.

3) Therefore the exhaust system produces 30 dB.

Several sound sources

To establish the total sound level in a room, all the sound sources must be added together logarithmically. It is, however, often more practicable to use a diagram to calculate the addition or subtraction of two dB values.

Addition

The input value for the diagram is the difference in dB between the two sound levels which are to be added. The dB value to be added to the highest sound level can then be read off the scale.

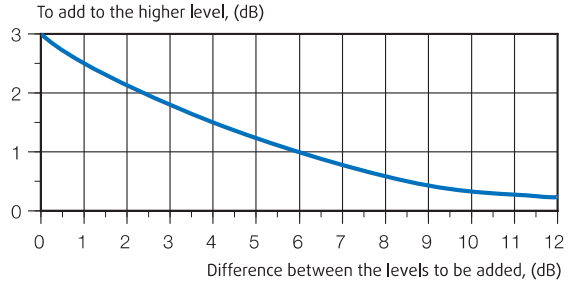


Figure #16: Logarithmic addition

Subtraction

The input value for the diagram is the difference in dB between the total sound level and the known sound source. The y scale then shows the number of dB that have to be deducted from the total sound level to obtain the value for the unknown sound source.

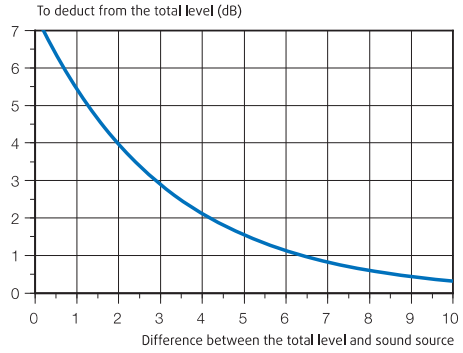


Figure #17: Logarithmic subtraction

Adjustment to the ear

Because of the ear's varying sensitivity at different frequencies, the same sound level in both low and high frequencies can be perceived as two different sound levels. As a rule, we perceive sounds at higher frequencies more easily than at lower frequencies.

Filter

The sensitivity of the ear also varies in response to the sound's strength. A number of so called weighting filters have been introduced to compensate for the ear's variable sensitivity across the octave band. A weighting filter "A" is used for sound pressure levels below 55 dB. Filter "B" is used for levels between 55 and 85 dB, and filter "C" is used for levels above 85 dB.

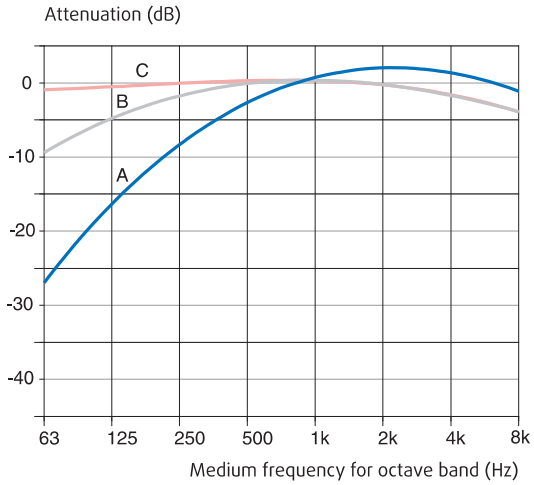


Figure #18: Damping with different filters

The filter "A", which is commonly used in connection with ventilation systems, has a damping effect on each octave band as shown in table 2. The resultant value is measured in dB(A) units.

Hz	63	125	250	500	1k	2k	4k	8k
dB	-26,.2	-16.1	-8.6	-3.2	0	+1.2	+1.2	-1.1

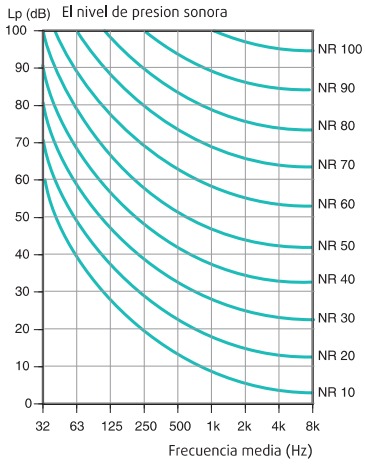
Table 2: Damping with the A filter

There are also other ways of compensating for the ear's sensitivity to different sound levels, apart from these filters. A diagram with NR curves (Noise Rating) shows sound pressure and frequency (per octave band). Points on the same NR curve are perceived as having the same sound levels, meaning that 43 dB at 4000 Hz is perceived as being as loud as 65 dB at 125 Hz.

Sound attenuation

Sound attenuation is principally achieved in two ways: either by absorption or by reflection of the sound. Attenuation by absorption is achieved by internal insulation in ducts, by special silencers or by means of the room's own sound absorption. Attenuation by reflection is achieved by forking or bending, or when the sound bounces back from a supply-air device into the duct, which is referred to as end reflection. The degree of sound attenuation can be calculated by using tables and diagrams presented in the relevant supplier's technical documentation.

NR Curves



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